Engineering Design and Construction Guidelines

February 2025

Town of Canmore | 902 7 Avenue | Canmore, AB | T1W 3K1

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TERMS OF USE

The “2025 Engineering Design and Construction Guidelines, Section 1” is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The “2025 Engineering Design and Construction Guidelines – Section 1” is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers’ or suppliers’ recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

1.0 Introduction

The *Engineering Design and Construction Guidelines* (EDCG) are intended to aid Developers, Consulting Engineers, Landscape Architects and Contractors in the design and construction of infrastructure and amenities.

This document is a consolidation of engineering design standards, landscape design standards and solid waste standards for the construction of public infrastructure and amenities owned or maintained by the Town of Canmore and provides guidance for the development of private sites. This document covers topics ranging from approval processes for development and subdivisions, surface and underground infrastructure design guidelines, transportation system guidelines, to steep creek hazards and other local conditions.

1.1 Reference Documents

The documents listed below are intended to form the reference material for the EDCG. A list of reference material is hosted on the Town's website. From time to time, new reference material may become available and will be listed on the Town's website and included in the EDCG as subsequent updates are made, for this reason the reader is directed to the website for the comprehensive listing. Please note that this list assumes the most recent edition of the document, except in cases where a specific edition is referenced.

1.1.1 Province of Alberta

Consulting Engineers must be familiar and comply with all Provincial guidelines and regulations. The following is a brief list of Provincial documents relevant to the content of the EDCG:

- Alberta Transportation and Economic Corridors. *Highway Geometric Design Guide*
- Alberta Environment. *Standards & Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*
- Alberta Environment. *Municipal Policies and Procedures Manual*
- Alberta Environment. *Stormwater Management Guidelines for the Province of Alberta*
- Alberta Environment. *Alberta Guide to Wetland Construction in Stormwater Management Facilities*
- Alberta Health Services. *Public Health Guidelines for Water Reuse and Stormwater Use*
- Province of Alberta. *Municipal Government Act - Canmore Undermining Review Regulation* (AR34/2020)
- Province of Alberta. *2020 Guidelines to Evaluate Proposed Development over Designated Undermined Lads in the Town of Canmore, Alberta*
- Province of Alberta. *Municipal Government Act - Canmore Undermining Exemption from Liability Regulation* (AR 113/1997)
- Province of Alberta. *Financial Administration Act - Canmore Undermining Indemnity Regulation* (AR 112/1997)
- Province of Alberta. *Traffic Safety Act* (RSA 2000, T-6)
- Province of Alberta. *Environmental Protection and Enhancement Act* (RSA 2000 E-12)

- Province of Alberta. *Water Act* (RSA 2000 W3)
- Alberta Ministry of Municipal Affairs. *Accessibility Design Guide*.

1.1.2 City of Calgary

Unless otherwise noted in the EDCG, the Town of Canmore follows the latest versions of the City of Calgary's standard specifications for water, sanitary, stormwater and transportation systems, and landscape development, and the full suite of design guidelines maintained by the City, along with Industry Bulletins released from time to time by the City of Calgary to amend these guidelines. This includes, but is not limited to, the most recent version of the following City of Calgary documents:

1.1.2.1 Standard Specifications

- Standard Specifications for Waterworks Construction
- Standard Specifications for Sewer Construction
- Standard Specifications for Roads Construction
- Development Guidelines and Standard Specifications: Landscape Construction
- Standard Specifications for Erosion and Sediment Control

1.1.2.2 Guidelines

- Design Guidelines for Subdivision Servicing
- Design Guidelines for Development Site Servicing Plans
- Design Guidelines for Street Lighting
- Guide to Lot Drainage – Residential Development
- Geotechnical Guidelines for Land Development Applications
- Wastewater Lift Station Design Guidelines
- Stormwater Management and Design Guidelines
- Low Impact Development Modules 1, 2, 3, and 6
- Principles for Stormwater Wetlands Management
- Guidelines for Supply of Stormpond Water for Irrigation Use
- Guidelines for Erosion and Sediment Control
- Fire Department Access Standard
- Transportation Impact Assessment Guidelines
- Consulting Engineer's Field Services Guidelines
- Design Guidelines for Erosion and Flood Control: Streambanks and Riparian

1.1.2.3 Industry Bulletins

Development Engineering

- Wheelchair ramp design (September 2023)

- Test Manhole (January 2017)

Water Development

- Updates to the Stormwater Management and Design Manual (January 2024)
- Dead end Watermains in New Subdivisions (February 2021)
- Test Manholes (June 2019)

Inspection Services

- Portland Limestone Cement (December 2022)

Provincial Standards and Guidelines take precedence, followed by the Town of Canmore then City of Calgary where discrepancies occur.

1.1.3 Town of Canmore Statutory Documents

The following statutory documents are referenced in these guidelines and are to be respected and considered:

- Municipal Development Plan
- Land Use Bylaw
- Area Structure Plans and Area Redevelopment Plans

1.1.4 Town of Canmore Bylaws

Developers, Builders and their Consulting Engineers and Contractors must comply with relevant bylaws, as amended from time to time, that may include provisions and requirements supplementary to those included in this document (EDCG). Where revised or updated, the most recent version will be used.

Note that the list may be amended from time to time as new and revised bylaws are adopted. The reader is advised to consult the Town of Canmore website for a comprehensive listing.

- Traffic and Road Use Bylaw 2020-03
- Building Permit Bylaw 2022-31
- Regulating Blasting Explosives Bylaw No. 32-96
- Fire Bylaw 2013-08
- Offsite Levy Bylaw 2020-27
- Parks Bylaw 2019-09
- Recyclables and Waste Bylaw 2016-11
- Sewerage Use Bylaw 2015-18
- Water Bylaw 2003-39
- Land Use Bylaw current version
- Protection of Municipal Improvements and Lands Bylaw No. 15-2001

- Tree Protection Bylaw 2019-10
- Community Standards Bylaw 2022-16

In addition to bylaws, the Town maintains several Policies, some of which should be considered. For a complete list please refer to www.canmore.ca.

1.1.5 Town of Canmore Guiding Documents

Town Guiding documents of particular relevance to the content of the EDCG include the following and should be referenced in the preparation of development related applications:

- Council Strategic Plan
- Integrated Parking Management Plan
- Integrated Transportation Plan
- Canmore Local Transit Service Review
- Canmore Wayfinding Program – Design Intent
- Stormwater Master Plan
- Climate Emergency Action Plan
- Guidelines for Subdivision and Development in Mountainous Terrain
- Open Space Development Guidelines
- Open Space and Trails Plan
- Recreation Master Plan
- Urban Forest Management Plan
- Utilities Master Plan
- Wildfire Mitigation Strategy
- Human Wildlife Coexistence Implementation and Action Plan

1.1.6 Other Agencies

The following publications have been considered in the development of the EDCG and should be used as reference material for Consulting Engineers.

- American Society of Civil Engineers. *Flood Resistant Design and Construction.* Standards ASCE/SEI 24-14. ASCE. 2014.
- ANSI/AWWA C651. *Disinfecting Water Mains*.
- ANSI/AWWA C605. *Underground Installation of Polyvinyl Chloride Pipe (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings*.
- British Columbia Ministry of Transportation and Infrastructure. *Active Transportation Design Guide*.
- City of Edmonton. *Access Management Guidelines*.
- CSA Group. *Construction of bioretention systems*. CSA W201.
- CSA Group. *Design of bioretention systems*. CSA W200.
- CSA Group. *Guideline on Basement Flood Protection and Risk Reduction*. CSA Z800-18.

- Fire Underwriters Survey. *Water Supply for Public Fire Protection – A Guide to Recommended Practice in Canada* (2020).
- Illuminating Engineering Society of North America, ANSI/IES RP-8-22. *Recommended Practice: Lighting Roadway and Parking Facilities*.
- National Fire Protection Association. *Standard for Wildland Fire Protection.* NFPA 1140.
- Transportation Association of Canada. *Geometric Design Guide for Canadian Roads*.
- Transportation Association of Canada. *Manual of Uniform Traffic Control Devices for Canada*.

The EDCG as well as the City of Calgary's standard specifications shall form part of all contract documents for the installation of all new infrastructure and amenities and for maintenance work on all existing infrastructure and amenities within the Town of Canmore. Where bylaws, acts, regulations, policies, codes, standards, and other documents are referred to within this document, the most recent edition or amendment applies.

1.2 Document Revisions

The first edition of the EDCG was developed in 1998. Since then, numerous revisions have been made with major revisions completed in 2005, 2010 and 2020.

1.2.1 Future Updates and Amendments

Change is a constant and as such the EDCG will need to be updated. The process for future updates and amendments is described below:

1.2.1.1 Initiating a Change

a. Either the Town of Canmore (through Engineering Manager), the building and development industry, represented by Bow Valley Builders and Developers Association (BOWDA) or a private party may propose a change to EDCG.
b. Either Town, BOWDA or private party submits a written request to the other party noting the EDCG section that is proposed to be changed, how it is recommended to be changed, with supporting rationale. The Town will maintain an inventory of proposed changes.
c. Town and BOWDA EDCG Committee representatives to meet and/or discuss via email the proposed changes and come to a consensus on the changes.
d. Town to update EDCG through a bulletin notification or wholesale update.

1.2.1.2 Periodic Review

a. Town and BOWDA EDCG Committee to meet annually to review EDCG and identify any issues with EDCG or sections of EDCG that need to be amended or improved.
b. Town and BOWDA EDCG Committee to determine best approach to the identified issue and come to consensus on any changes to EDCG.
c. Town to update EDCG through a bulletin notification or wholesale update.

1.2.1.3 Full Review of EDCG

a. A full review of the EDCG is to occur every five years to ensure that the guidelines are up to date, cost effective and are using industry best practices.
b. The Town, the BOWDA EDCG Committee and other relevant stakeholders to review EDCG and come to consensus on any changes or updates to EDCG.
c. Town and BOWDA EDCG Committee review the Process for Changing and Reviewing, and Dispute Resolution Process.
d. Town to update EDCG accordingly.

1.2.1.4 Dispute Resolution

a. If Town Engineering Manager and BOWDA or other stakeholders cannot come to a consensus on a proposed change to EDCG, then:
    i. Issue to be escalated to Town of Canmore General Manager of Municipal Infrastructure for a decision;
    ii. Decision can be appealed to Town of Canmore Chief Administrative Officer.

1.3 Organization of Document

Readers may not be familiar with some of the abbreviations and terms used in the EDCG - Refer to Appendix A for a complete list of abbreviations (Table 1) and a glossary of terms (Table 2) used in the EDCG.

Figures are located at the end of the document.

1.4 Terms of Use

The EDCG is presented as accurate and complete as of the date of issue. Use of these guidelines does not absolve any user from the obligation to exercise their professional judgement and to follow good practice. Should any user have questions as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and this manual, the user is advised to seek clarification from the Town Engineer.

It is recommended that the private sites storm, sanitary and water design comply with the current version of the EDCG. Any deviation from these specifications and guidelines on private sites are at the risk and discretion of the Engineer of Record. Any aspects of private site design deemed to have an adverse impact on Municipal Improvements, adjacent properties or public health and safety will not be approved.

1.5 Terminology

The use of the words should and shall in this document has been carefully considered with the following definitions as guidance:

The EDCG establishes desired outcomes in support of the Council Strategic Plan, Town's Guiding Documents, and Bylaws. Should clauses in the EDCG are designed to achieve these outcomes and are intended as a minimum requirement, however are not meant to stifle innovation. Where Should is used, Consulting Engineers and Landscape Architects may propose alternatives to the guidelines by providing a

description of the alternative and how this accomplishes the goals of the EDCG and the Town's Guiding Documents. This information is to be provided in the design narrative and authenticated by the Engineer of Record.

The EDCG also outlines certain requirements which are supported by Bylaws, Codes, Provincial Regulations and Standards. These are typically strict requirements to protect public safety and health and will be identified by the use of the word Shall. Any rationale for deviations from shall clauses will require comprehensive technical studies and/or written narratives authenticated by the Engineer of Record.

1.6 Deviations from Guidelines

1.6.1 Engineering-Related Guidelines

Guidelines, outlined in Sections 3 – 9 (inclusive) and Section 11, are intended to be the minimum standards. Where conditions dictate and good engineering practice requires, higher standards than those indicated should be incorporated into the design.

While the goal of this document is to provide a comprehensive set of guidelines that result in effective, reliable and economical systems that align with Council priorities and guiding documents, the guidelines are not meant to stifle technological innovation and evolution, nor eliminate design approaches that may be appropriate for local conditions.

Alternative approaches may be considered if it can be demonstrated that there are better ways of achieving the same objectives. Similarly, the Town of Canmore has the discretion to grant relaxations from the guidelines when, to the satisfaction of the Town, all other options are exhausted and safe and satisfactory operation is still ensured. At all times the Consulting Engineer remains responsible for the design as Engineer of Record.

1.6.2 Landscape Development Guidelines and Construction Specifications

The guidelines and specifications outlined in Section 10: Landscape Development Guidelines and Construction Specifications are considered to be normal practice for the development and construction of landscape elements in the Town of Canmore. While the goal of this Section is to provide a comprehensive set of guidelines and specifications that result in effective, reliable and economical landscape development that aligns with Council priorities and guiding documents, the guidelines are not meant to stifle technological innovation and evolution, nor eliminate design approaches that may be appropriate for local conditions.

The Town also acknowledges site specific conditions may make it difficult to achieve all direction and guidance provided in this document. Alternative approaches and modifications may be considered if it can be demonstrated that there are better ways of achieving the same direction and/or remedying conflicting direction. Similarly, the Town of Canmore has the discretion to grant relaxations from the guidelines and specifications when, to the satisfaction of the Town, all other options are exhausted, safe and satisfactory operation is still ensured, and the general intent of the direction/guidance is maintained. The Town of Canmore Parks Planner is responsible for granting proposed relaxations, deviations, or modifications, while the Consulting Landscape Architect remains responsible for the design at all times.

1.6.3 Relaxation Registry

The Town of Canmore will maintain a registry of relaxations requested by Consulting Engineers/Landscape Architects or deviations required by the Town. This registry will be consulted regularly to inform future updates to the guidelines.

SECTION 2 APPLICATIONS AND PERMITS

TERMS OF USE

The “2025 Engineering Design and Construction Guidelines, Section 2” is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The “2025 Engineering Design and Construction Guidelines – Section 2” is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers’ or suppliers’ recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

2.0 Applications and Permits

This section of the Engineering Design and Construction Guidelines (EDCG) provides Developers, Consulting Engineers, Contractors and Builders with guidance on the Engineering aspects of applications for subdivision approval, development permit (DP) or building permit (BP). This section also outlines acceptance procedures of a completed development. Lastly, information about commonly required permits for various construction activities is provided.

Subdivision, Development Permit and Building Permit applications are made through the Town of Canmore's Planning and Development Department. The Planning and Development Department will coordinate the necessary reviews and requirements with other Town departments including Engineering, Public Works and Emergency Services.

Permits listed in Section 2.6 are applied for through the Town's Engineering Department, unless otherwise noted.

2.1 Contractual Relationships

This section is intended to provide an overview of the roles and responsibilities of parties involved in the development process. Please note for the purposes of this Section, engineering-related guidelines and direction provided in this document involve the Town Engineer and Consulting Engineer, while landscape development guidelines and construction specifications involve the Town of Canmore Parks Planner and Consulting Landscape Architect.

2.1.1 Developer/Town

The Developer may be required to enter into an agreement (subdivision servicing agreement or development agreement) with the Town to complete the construction of a subdivision or other development in accordance with Canmore's Land Use Bylaw and the EDCG. The Developer is, and shall remain, responsible to the Town for the full and proper performance of all obligations and municipal improvements under the agreement. When, in the opinion of the Town Engineer, or Parks Planner for all landscape-related development, the work being performed is not receiving full-time inspection (or the otherwise-approved level of inspection), or it can be reasonably shown that the work is not being completed in accordance with the applicable standards, the Town may issue a stop order to the Developer. The stop order will specify the reason for the stoppage and provisions for remedy. The Town, with reasonable cause and as specified in the agreement, may stop construction and installation of municipal improvements at any time. A copy of the stop order will also be given to the Contractor to stop work on the municipal improvements. Any work on municipal improvements that is completed while a stop order is in effect may be rejected by the Town Engineer or Parks Planner.

2.1.2 Developer/Consulting Engineer

The Developer must retain a Consulting Engineer for Intermediate and Large Developments, and sometimes for small developments as defined in Section 2.2.3. Landscape Architect is required in cases where landscaping on Municipal lands will be constructed. The role of the Consulting Engineer and Landscape Architect is to ensure Municipal Improvements conform to, or exceed, all standards and guidelines. It is the responsibility of the Developer to inform the Town Engineer and Parks Planner of the engagement of a Consulting Engineer and/or Landscape Architect for Field Inspection Services, where

required as defined above. In these cases, the Consulting Engineer and/or Landscape Architect must complete and submit to the Town Engineer a notice of engagement as described in Submission Requirements.

2.1.3 Developer/Contractor

The Developer shall enter into a contract with the Contractor(s), to complete the construction of a subdivision or development in accordance with the designs and specifications approved and accepted by the Town. The Contractor is responsible to the Developer for the quality of municipal improvements and for conformance with the EDCG.

2.1.4 Town/Contractor/Consulting Engineer/Landscape Architect

There is no direct contractual relationship between the Contractor and the Town. In the interests of efficiency and clear communication, any communication from the Town Engineer/Parks Planner regarding ongoing work should be communicated directly to the Consulting Engineer/Landscape Architect and Developer unless otherwise agreed upon in writing.

There is no direct contractual relationship between the Town and the Consulting Engineer and/or a Landscape Architect in the construction process. The Consulting Engineer and/or Landscape Architect liaises with the Town Engineer/Parks Planner as required, including but not limited to commencement of construction, construction meetings, design/construction changes and issuance of Construction Completion Certificates (CCCs) and Final Acceptance Certificates (FACs), all with copies to the Developer. As the Consulting Engineer and/or Landscape Architect is a representative of the Developer, the Town Engineer/Parks Planner has the right to request through the Consulting Engineer and/or Landscape Architect that observed deficiencies be corrected. In the interests of clear communication, the Town Engineer/Parks Planner must copy the Developer on such instructions when issued. It is the Developer's responsibility to review and understand the full scope of the obligations of the Consulting Engineer/Landscape Architect.

Any verbal communication must be followed up with a written or digital (i.e., email) record of the communication, by one or more of the parties.

2.2 Classification of Project and Engineering Requirements

When applications are received, the Town Planning and Development department designates the application into one of four development/project categories: very small, small, intermediate and large developments. Fees and level of engineering review for a development will be determined by the project category in accordance with the fee schedule approved by Council and posted on the Town's website. The project categories and typical projects described below are both general and subjective and the Town reserves the right through the Planning and Development Department to reasonably determine a project's category. The project fee schedule can be found on the Town of Canmore website: www.canmore.ca.

Note that subdivisions are considered developments. In this section, subdivision refers to a specific area of land characterized by the splitting of larger parcels of land into smaller blocks, lots, reserves, roadways, rights-of-way, etc., and may include the installation of related municipal improvements on or adjacent to those lands to service developments on those lands.

Development in this section refers to buildings, structures or works located on one or more parcel of land in a new or existing subdivision and the related municipal improvements on or adjacent to the parcel to be developed.

The Town reserves the right to reasonably determine additional engineering and/or landscape requirements for any development application, should the application warrant such additional work. The engineering requirements for each development/project category are defined below.

2.2.1 Application of Project and Engineering/Landscaping Requirements

Acknowledging that standards and specifications, including the EDCG, change over time, the guidelines and specifications applicable to a submission to the Town for a project, development or subdivision will be those guidelines and specifications in effect and officially published at www.canmore.ca (or www.calgary.ca for referenced specifications as the case may be) on the date of submission to the Town (including fee payment) of a complete application.

2.2.2 Very Small Development

Very small developments typically refer to renovations, balconies, porches and accessory buildings with no new, or altering of, existing services, grades or drainage.

Although there is typically no engineering component involved, the Town reserves the right to have any project reviewed by the Town Engineer, or to ask that a Consulting Engineer be engaged should the Town feel that the project requires specialized knowledge (e.g., structural retaining walls, fuel storage tanks, etc.).

Typically requires no additional engineering permits or agreements.

2.2.3 Small Development

Small developments are defined as detached single-family dwellings, duplex, garages (including garage/garden suites), projects that involve changes in grades, services or drainage patterns, small industrial, institutional or commercial projects with a minimal engineering component, or other serviced buildings under 200m^2. The Town reserves the right to ask any Developer or Builder to obtain the services of a Consulting Engineer if they feel that the project requires specialized knowledge (e.g., structural retaining walls, complex servicing). Small developments that fall within the criteria outlined in the Stormwater section of the EDCG will require a Consulting Engineer for their stormwater requirements.

Minor on-site engineering review is required when there are changes in lot grading, drainage, stormwater management, or the lot is located in a Low Steep Creek Hazard zone.

In addition to the Town requirements mentioned above, certain small development infrastructure inspections must be witnessed by the Town. Service inspection services are offered by the Town for a fee. The Engineering Department requires a minimum of 24 hours advanced notice for these inspections (contact the Engineering Department at engineering@canmore.ca).

Alternatively, the Developer may submit a stamped letter and inspection report prepared by a Consulting Engineer for the inspection of water and sanitary services. If a Consulting Engineer is engaged they will be required to inspect all aspects of the service installation, inclusive of insulation (where required) and pressure testing.

Infrastructure inspections that must be conducted include the following:

- Verification of adequate slope and depth of water and sanitary lines
- Water (or air) pressure test (water service pipe and low pressure sanitary sewer pipe)
- Materials confirmation
- Insulation specifications and placement (if required)

Contractors must have the bedding and servicing in place but still exposed for inspections.

2.2.4 Intermediate Development

Any development that requires construction of new or replacement of water, sanitary or storm service connections beyond the parameters of Small Development as described above. Typically defined as multi-unit (3 to 10 units) projects, subdivisions creating 3 to 10 lots or less, or buildings with a gross floor area between 200m^2 and 2,000m^2.

These applications require a Consulting Engineer and a notice of engagement letter as outlined in the Submission Requirements (2.4), below. A Landscape Architect is required in cases where municipal landscaping will be provided.

2.2.5 Large Development

Large developments are defined as multi-unit projects greater than 10 units (may be integral to one structure or multiple structures); buildings with a gross floor area more than 2,000 m^2; commercial, industrial or institutional developments that require a Transportation Impact Assessment, and projects of unusual complexity (at the discretion of the Town) where significant variances to Town guidelines and standards are required.

Subdivisions creating more than 10 lots will be considered large developments.

These applications require a Consulting Engineer and a notice of engagement letter as outlined in the Submission Requirements section, below. A Landscape Architect is required in cases where landscaping on municipal lands will be provided.

2.3 Development/Subdivision Application Review Process

Development permits (DP) are required for most developments and must be obtained from the Town of Canmore Planning and Development Department.

The milestones detailed below outline the engineering review process for subdivisions and developments. The engineering review process timeline is based on these milestones and is intended to work alongside the requirements of the Planning and Development Department.

2.3.1 Milestone #1 – Pre-Application Meeting

A pre-application meeting is intended to provide guidance to a Developer or Builder regarding Town of Canmore expectations for a specific project, prior to an Applicant making significant investments of time and resources in a proposal

Pre-application meetings are required for various types of applications and are optional for small scale developments. Additional information is available at www.canmore.ca.

2.3.2 Milestone #2 – Development Permit/Subdivision Approval

The DP/subdivision approval is usually the first milestone of the review process for a development project.

A comprehensive description of the DP review and approval process is outlined in the Land Use Bylaw. The Town's website includes Development Permit Requirements Checklists specific to the various types of DP applications. If a pre-application meeting was held, Town administration will outline application requirements specific to the development based on their interpretation of the information provided by the Applicant. Section 2.5 provides additional information regarding the typical Engineering and landscape submittals required.

A Development Permit Approval is subject to conditions outlined in the Schedule A document, while an approval of Tentative Plan of Subdivision is subject to conditions outlined in the unratified extract. The Developer is responsible for understanding the conditions and ensuring they are met.

For small developments, a building permit (BP) may be the first milestone of the review process where a DP is exempted in the Land Use Bylaw.

Significant modifications to approved DP drawings will require submittal and approval of a new DP. Minor modifications may be considered by the Development Officer and Town Engineer, at their discretion.

2.3.3 Milestone #3 – Execution of Development Agreement/Subdivision Servicing Agreement

The Developer is free to start stripping and grading a site and construction of infrastructure after execution of a Development Agreement or Subdivision Servicing Agreement and once the Notice to Proceed (NTP) has been issued. In the case of a Development Permit, once the NTP is issued, infrastructure work can commence prior to issuance of a Building Permit unless otherwise conditioned in the Schedule A. The Developer is required to obtain the necessary Road Permits for work within Municipal Road ROW.

The following is required to execute the Development Agreement or Subdivision Servicing Agreement subsequent to issuance of a Development Permit or approval of Subdivision:

1. Approved detailed design drawings;
2. Approved securities estimate;
3. Certificate of Insurance (COI) with the Town named as additional insured;
4. Notice of Engagement;
5. Construction Management Plan (inclusive of ESC plan where required);
6. Satisfaction of Schedule A 'Prior to Construction' conditions or relevant conditions of subdivision approval.

The Town Engineer will issue the NTP upon execution of the agreement.

The grouping and application sequence of CCCs is detailed and recorded as a schedule that is part of the executed development agreement or subdivision servicing agreement and are used for determining securities. In Development Permit and Subdivision applications, securities are required for Town Municipal Improvements and for onsite private landscaping. CCC categories typically required for Development Agreements and Subdivision Servicing Agreements and used for securities determinations are outlined below. Alternative classifications may be considered by the Town Engineer upon request by the Developer.

2.3.3.1 Securities Categories - Intermediate/Large Development Permit

- Municipal Improvements – Water and Sanitary
- Municipal Improvements - Stormwater
- Municipal Improvements - Surfaceworks
- Private Infrastructure - Landscaping
- Municipal Improvements - Landscaping

2.3.3.2 Securities Categories - Subdivision

- Underground Improvements
    - Water mains and hydrants
    - Sewer and water service connections
    - Stormwater pond facilities
    - Sanitary sewer system
    - Storm sewer system
- Surface Improvements
    - Surface drainage facilities
    - Sidewalk, curb and gutter, and catch Basins
    - Paved roads, paved lanes and paved walkways
    - Emergency access
    - Signage and pavement markings
    - Final lift of asphalt
- Shallow Utilities
    - Street lighting, walkway lighting, pathway lighting
    - Signalization
    - Power facilities
- Landscaping
    - Reserves (including play equipment, irrigation, furnishings etc)
    - PULs, medians, boulevards
    - Fencing

In order to establish the securities amount, the Developer must submit detailed cost estimates prepared by the Consulting Engineer and Landscape Architect based on the approved plans, and which follow the agreed upon CCC categories. In the event that actual tendered costs become available prior to Commencement of Construction of the Development Area, then the securities amounts will be adjusted to reflect the actual tendered costs for construction. The securities amount is calculated by adding minimum 15% to the total value in order to account for Engineering, Geotechnical and contingency. A decrease in the required securities amount may be granted based on building performance commitments as described in Section 10 of the Land Use Bylaw.

2.3.4 Milestone #4 - Building Permit

Once a DP has been approved, a building permit (BP) is required. When a BP is released, the Developer can start construction of foundations and buildings.

Any proposed changes from the approved DP in the civil drawings, landscaping or site plan must be dealt with through the DP process as described above. Civil and municipal landscaping plans are not to be submitted with the BP application.

In the case of a single-family home, duplex or triplex for which a DP is not required, the site plan and servicing drawings will be submitted, reviewed and accepted with the BP application.

The requirements of a building itself are governed by the safety codes officer pursuant to the Alberta Building Code.

In a subdivision context, the Developer/Builder must ensure that the infrastructure facilitating water supply to the Lands is installed and functional prior to requesting the release of a Building Permit for any building to be serviced by the same.

2.3.5 Milestone #5 - Construction Completion Certificates

The Construction Completion Certificate (CCC) procedure is the process the Town Engineer and Parks Planner uses to sign off on all municipal improvements performed by others. Developers of both subdivisions and developments must adhere to this process for successful project completion and for the return of securities.

2.3.5.1 Construction Completion Certificates - Categories & Classification

Separate CCC applications are required for private and public municipal improvements, including maps showing the extents of the infrastructure covered. Clear delineation of private Infrastructure and public municipal improvements and determination of the CCC categories is to be included in the subdivision servicing agreement or development agreement.

Municipal Improvements CCC

Municipal Improvements are works that the Town will own, operate and maintain when all of the Developer's obligations are met.

The intent of a Municipal Improvements CCC is to ensure that all components of infrastructure construction have been addressed. Drawings showing the extent of works covered must be submitted

with all CCC applications. Templates for the Municipal Improvements CCC forms are provided in the appendices.

Typical categories for Municipal Improvements CCCs are described in the Securities section above.

Municipal improvements require a CCC, a two-year warranty period and a FAC. The two-year warranty period begins upon acceptance of the CCC.

Where a utility easement is required through or on private property and the infrastructure will be owned by the Town, the public municipal improvements process applies. Registration of the easement or URW is required prior to issuing CCC.

Private Infrastructure CCC

Private Infrastructure are works that are not maintained or serviced by the Town after the Developer's obligations are met.

Private Infrastructure requires a CCC process only, no warranty period applies. The intent of the private infrastructure CCC process is for the Consulting Engineer to confirm that the private infrastructure has been constructed in alignment with approved plans. The Consulting Engineer may determine the categories used for private CCC process, using the Town CCC categories above as a guide and must incorporate the following Private Infrastructure:

- Surfaceworks and Grading
- Water and Sanitary
- Stormwater
- Landscaping

The Town will use its discretion to determine if a Town inspection is required for portions of private infrastructure, based on the complexity of the infrastructure and the potential for impacts to Municipal Improvements. If the Town inspects portions of private infrastructure using its discretion, the Town will issue a record of the inspection to the Consulting Engineer with a copy to the Developer/Builder within 10 days of the inspection. The Town does not sign off on private CCC certificates for private infrastructure, however these certificates must be submitted to the Town prior to release of a Development Completion Certificate (DCC). Furthermore, CCC for private and public water and sanitary sewer systems are required for occupancy permits to be issued.

2.3.5.2 Construction Completion Certificates – Inspection Procedure

After either a public municipal improvement or private infrastructure is completed, the Consulting Engineer for civil works CCC or Landscape Architect for landscaping CCC must complete the following tasks in the order shown:

1. Inspect the municipal improvement or Private Infrastructure, record any deficiencies and advise the Contractor to repair any deficiencies. Once the Contractor has repaired the deficiencies, carry out further inspection(s) and subsequent repairs as required until satisfied with the corrections.
2. Ensure all related outstanding field orders are resolved.

3. Submit the CCC documents for Municipal Improvements for Town review and acceptance. Submit the CCC documents for Private Infrastructure for Town review for Occupancy or DCC purposes. The Town will advise the Consulting Engineer if an inspection of Private Infrastructure is required.
4. Arrange and conduct an inspection for Municipal Improvements attended by representatives of the Consulting Engineer/Landscape Architect and the Town Engineer and/or Parks Planner. Attendance by the Contractor and Developer is optional. Representatives of the Town's Engineering and/or Parks Departments will be available for the site inspections within a reasonable time from the date of request (typically within two weeks).
5. If deficiencies in Municipal Improvements are noted at the time of inspection, a list of those deficiencies must be prepared by the Consulting Engineer/Landscape Architect and submitted to the Town Engineer/Parks Planner for agreement.
6. When the deficiencies in Municipal Improvements have been corrected, the Consulting Engineer/Landscape Architect will, within a reasonable period of time, request a re-inspection of the deficient items with the Town Engineer/Parks Planner. Re-inspection fees will apply in accordance with the Fee Schedule. The Consulting Engineer/Landscape Architect can request the Town Engineer/Parks Planner to defer inspections of the corrected deficiencies to the FAC inspection.

An inspection fee will be charged to the Developer in accordance with the Fee Schedule for repeat and extra inspections beyond those listed above and for additional inspections requested by the Developer or Developer's representative.

2.3.5.3 Construction Completion Certificates – Notes

Acceptance of CCCs by the Town Engineer/Parks Planner indicates only acceptance of the certificates that the Consulting Engineer/Landscape Architect has issued. The Town accepts no responsibility for deficiencies, failures, incomplete work, errors, omissions, faulty materials, design failures or non-performance of the design. Evaluation of the performance of the Municipal Improvements will be at the sole discretion of the Town Engineer/Parks Planner.

It is the responsibility of the Developer to ensure that Municipal Improvements are constructed in accordance with the drawings accepted by the Town Engineer/Parks Planner. Should failures during the warranty period occur in the Municipal Improvements as a result of deficiencies, failures, incomplete work, errors, omissions, faulty materials, design failures or non-performance of the design, then it is the responsibility of the Developer to direct the Consulting Engineer, Landscape Architect and/or Contractor to correct or redesign the Municipal Improvements to obtain suitable performance and acceptance by the Town Engineer/Parks Planner.

When determining which items are essential or non-essential for CCC acceptance, the Town Engineer will utilize the latest edition of the CCC Checklist sheets on the City of Calgary website as referred to in the City's *Consulting Engineer's Field Services Guidelines*.

Note that the Town will only perform Landscaping inspections from May 15 to September 30, in good weather conditions, when deciduous trees and shrubs are in leaf and when the ground is free and clear of snow. CCC and FAC inspections for Municipal Improvements other than landscaping may be performed outside of these dates at the discretion of the Town, provided weather and snow conditions permit a reliable inspection.

A template of the Town CCC form is found in Appendix B.

The Town requires that record drawings for both Municipal Improvements and Private Infrastructure be submitted no later than 90 days after CCC acceptance. For Municipal Improvements, the Town requires that the record drawings be submitted no later than December 15 to allow time for the Town to add the new assets into its records.

2.3.6 Milestone #6 – Securities Release

Prior to release of securities pertaining to record drawings, record drawings must be submitted in both PDF and CAD formats to the Town of Canmore to the satisfaction of the GIS Department and in accordance with the Submission Requirements section. Record drawings are required for both Municipal Improvements and Private Infrastructure, inclusive of servicing, grading, landscaping and surfaceworks. Record drawings not conforming to City of Calgary standards, including syntax and formatting, will not be accepted. Record drawings must be received by the Town within 90 days of CCC acceptance.

The Town Engineer and/or the Parks Planner may use reasonable discretion to release a CCC certificate while withholding a portion of the securities to address deficiencies. In this case the Consulting Engineer/Landscape Architect will produce a cost estimate for the corrective actions, which will be reviewed by the Town. An additional 15% will be added to the cost estimate for the corrective actions for Engineering, Geotechnical and Contingencies and the total will be withheld until the deficiencies have been resolved.

Upon acceptance of a CCC or FAC certificate, the Town Engineer and/or Parks Planner will endeavour to authorize a securities reduction within 10 days. This authorization will trigger the administrative process to return the authorized amount. Typically, securities are reduced as follows:

- 60% - for successful CCC acceptance
- 20% - for successful record drawings acceptance
- 20% - for successful FAC acceptance

For higher value projects such as large developments, the amount of securities retained for record drawing acceptance will be capped at a maximum of $150,000 per major securities category as described below:

- Water, Sanitary Storm
- Surface
- Shallow Utilities
- Landscaping

The Town will retain a minimum $5,000 security until the final outstanding FAC is accepted by the Town Engineer and/or Parks Planner.

2.3.7 Milestone #7 – Occupancy

When Building Permit occupancy is granted, building owners and/or tenants can occupy the premises. A Developer/Builder typically applies for Building Permit occupancy when construction is very near completion.

The Planning and Development and Engineering Departments have requirements that must be satisfied prior to a Builder/Developer being able to book the Safety Codes inspection of the building for occupancy. Please contact the Planning and Development Department for a list of their requirements.

For small developments, in addition to any planning and safety code requirements, Engineering will review the following:

1. Water and Sanitary services passed inspection, or service exemption letter on file;
2. Curb Stop – visible, undamaged, accessible and level with surface;
3. Rough Grading and Overland Drainage completed;
4. Documentation received for Low Pressure Sanitary Service (if applicable);
5. Letter of compliance received for retaining wall(s) exceeding 1.0m in height.

At the discretion of the Town, outstanding items may be noted and resolved subsequent to occupancy but prior to file closure. Item (1) listed above is a strict requirement prior to occupancy.

For intermediate and large developments, in addition to any planning and safety code requirements, Engineering will require the following:

1. Municipal Improvements CCC accepted for water and sanitary servicing (where applicable);
2. Private Infrastructure CCC accepted for water and sanitary servicing.

Occupancy applies to Building Permits and not to subdivision or development permit; however, it should be noted that, in new subdivisions, the subdivision will need to have obtained CCC acceptance of the underground infrastructure for Municipal Improvements and acceptance of CCC for Private Infrastructure (water and sanitary) for occupancy to be granted to the pertinent development lots.

2.3.8 Milestone #8 – Warranty Period and Maintenance Requirements

The acceptance of a CCC for Municipal Improvements by the Town Engineer/Parks Planner signals the beginning of the Warranty Period. The Warranty Periods as described below commence on the date of CCC acceptance:

- Water, Sanitary and Storm: two years
- Stormwater Pond Facilities landscaping within High Water Level area: three full growing seasons
- Surface: two years
- Shallow Utilities: two years
- Landscaping: two full growing seasons

A growing season means the time between the dates the Town accepts the CCC to:

a) June 30 of the following year; or
b) The date when, in the sole opinion of the Town, the irrigation system(s) are operating and the vegetation is in full leaf, whichever event occurs last.

Extended warranty periods for deficiency repairs may be required at the discretion of the Town Engineer/Parks Planner, acting reasonably, to a maximum of one year after repair completion notification by the Consulting Engineer/Landscape Architect.

2.3.8.1 Infrastructure

During the Warranty Period the Town assumes the ownership, normal operation and routine maintenance (excluding repairs or matters arising from inadequate or deficient design or construction). During the Warranty Period, the Developer is responsible for the adjustment of valve boxes, manholes, hydrants and other appurtenances where top lift of pavement or other such grades are not yet established.

Prior to FAC application the Developer must submit a CCTV inspection report of Town sanitary and storm sewers. Should flushing and cleaning of sewers and related appurtenances be reasonably required by the Town Engineer this work must be undertaken by the Developer and accepted by the Town prior to acceptance of the FAC.

2.3.8.2 Landscaping

During the applicable Warranty Period for Municipal Improvements - Landscaping, the Developer is responsible for maintaining all landscaped features, including but not limited to, fencing, turf, trees, shrubs, trails, signage, irrigation systems, play equipment and “mutt mitt” dispensers. The Developer is responsible for providing and maintaining adequate and appropriate measures to protect landscaping from damage.

Prior to acceptance of the Landscaping Construction Completion Certificate, the Developer must submit maintenance schedules satisfactory to the Town with respect to grass cutting, watering, “mutt mitt” dispenser refilling, litter control and emptying of pedestrian waste containers; and maintenance programs for fertilizing and weed control, tree care and playground inspections.

During the Warranty Period for Landscaping, the Developer is responsible for advising the Town of any observed private encroachments onto Municipal Reserves or Environmental Reserves.

2.3.9 Milestone #9 – Final Acceptance Certificate

A successful Final Acceptance Certificate (FAC) inspection signifies the end of the Warranty Period and marks that time at which municipal improvements are the full responsibility of the Town for operations, maintenance, and repairs. All deficiencies must be rectified to the satisfaction of the Town Engineer prior to signing of a FAC. Generally, a successful FAC signifies the end of a Developer’s obligations for public municipal improvements.

The Consulting Engineer and/or Landscape Architect must follow the process outlined above for Town CCC inspections when requesting a FAC inspection.

A template FAC form is found in Appendix B.

2.3.10 Milestone #10 – Development Completion Certificate

A Development Completion Certificate (DCC) is issued by the Planning and Development Department when all obligations have been met by the Developer. All CCC certificates for Private Infrastructure and FAC certificates for Municipal Improvements must be issued in order to release DCC.

2.4 Submission Requirements

Development Permit and Subdivision application requirements are outlined in checklists available at www.canmore.ca. The Town will provide clarifications on documents required to form a complete application as part of the pre-application process. This section of the EDCG is intended to provide information on the format and contents of submittals.

All submission forms including drawings, letters, reports and any other documentation must be submitted in PDF digital format and authenticated in accordance with APEGA requirements. Original applications are submitted through the Planning and Development Department. PDF drawing packages should be limited to a maximum size of 40MB where practical and must be flattened and have all viewports deleted. In cases where this file size cannot be respected, consideration may be given to providing multiple smaller files.

Consulting Engineers and Landscape Architects must submit record drawings in PDF and CAD format, unless permission is granted by the Town to use a different format. As a default, the Town will require that civil construction CAD drawings conform to the layer names, colours and linetypes described in the Civil Layers reference document in the City of Calgary's CAD Standard. See the City of Calgary website for details and downloadable templates. In addition, all submitted CAD drawings must meet the Spatial Reference Standards described in Section 2.5.6.3.

Applications that are incomplete or are not in accordance with the requirements will be rejected.

All revisions to existing applications for subdivisions or developments must include a letter prepared by the Consulting Engineer and/or Landscape Architect which gives a description of the revisions. Any significant variances from the Town's guidelines that are proposed by a Developer or Consulting Engineer/Landscape Architect must be discussed with the Engineering and/or Parks Department prior to making an application. If proposed variances are minor, they may be noted in the application letter.

2.4.1 Notice of Engagement

The Notice of Engagement letter for Field Inspection Services from the Consulting Engineer/Landscape Architect may optionally be submitted with the application, but is required prior to execution of the Development Agreement or Subdivision Servicing Agreement. A sample letter is provided in Appendix B.

2.4.2 Field Services

Field services will be in accordance with the City of Calgary's Consulting Engineers Field Services Guidelines. Field services shall be carried out by and are the responsibility of the Consulting Engineer/Landscape Architect for private and/or public municipal improvements. The Consulting Engineer/Landscape Architect is responsible for ensuring that all field service staff under his or her supervision are trained as outlined in the Consulting Engineers Field Services Guidelines. In addition to the City of Calgary requirements, field service staff must be familiar with the Town of Canmore's standards, guidelines and procedures.

2.4.3 Level of Service

The Consulting Engineer/Landscape Architect must provide Field Inspection services at a level of service which adheres to the stipulations of the City of Calgary *Consulting Engineer's Field Services Guidelines*. It will also be the responsibility of the Consulting Engineer/Landscape Architect to employ professional,

knowledgeable, qualified staff to provide the above services and to adequately submit all required documentation, field submittals and record drawings as stipulated in these guidelines.

The Town Engineer will immediately advise the Developer if, in the Town Engineer's opinion, the Consulting Engineer/Landscape Architect is not providing sufficient inspection and supervision according to generally accepted engineering practices.

2.4.4 Plot Plan

A surveyed plot plan shall be prepared by an Alberta land surveyor and must show all existing/proposed legal components/settings of the property. The plot plan must be submitted as part of the development application. The plot plan is to be submitted digitally; however, it may be accompanied by a hard copy.

2.4.5 Landscaping Plans

Detailed landscape and construction drawings are a requirement of applications where municipal improvements will be built on Town owned land or land operated by the Town. They must be provided digitally and should include the following:

- Detailed layout plan
- Detailed planting plan
- Detailed grading plan
- Detailed irrigation plan (where applicable)
- Details of solid waste facilities including locations
- Construction details of all landscaping improvements
- Specifications for all landscaping improvements

Construction landscape plans and specifications must also identify natural features intended to be retained and detail the intended methods of protecting and maintaining natural features during construction.

Site plans must identify Town owned trees. A Tree Protection Plan may be required, please contact the Parks Department for further information.

2.4.6 Design Brief

Intermediate and Larger development applications require an engineering report prepared by the Consulting Engineer that identifies the proposed water and sanitary sewer servicing design for the proposed development, the impacts on the capacity of the existing infrastructure and possible requirements for public infrastructure upgrades. This design brief must include a declaration that the design respects the Alberta Environment Guidelines and Standards and the relevant Town of Canmore Guidelines and Standards, or must specify where the design does not comply and provide a justification.

The Town's *Utility Master Plan* as published on www.canmore.ca must be used as a reference document in the preparation of this report.

2.4.7 Municipal Improvements Plan

For intermediate and large developments, a plan showing the proposed ownership (hence operation and maintenance obligations) of the public versus private municipal improvements (both offsite and onsite) is required.

2.4.8 Stormwater Management Plan

Intermediate and larger development applications require a complete stormwater management plan. This plan must be submitted in report-style by a Consulting Engineer, however in the case of intermediate developments the Town Engineer may accept that the calculations be provided on the relevant drawing in lieu of a report. In the case of Large Developments, the proposed terms of reference for the report should be submitted to the Town Engineer for review, using these guidelines, following the pre-app meeting for the proposed development and prior to submittal of the application. The Town Engineer will endeavour to provide feedback on the proposed scope within 10 working days of submission.

2.4.9 Transportation Impact Assessment

A Transportation impact Assessment (TIA) may be required for development and subdivision applications. The Town generally requires a TIA according to the criteria outlined in the City of Calgary *Transportation Impact Assessment Guidelines*.

Should the Trip Generation be expected to be below the established thresholds, the Town Engineer may require that the Developer submit a memorandum from a Transportation Engineer confirming the anticipated volumes. On occasions, despite the development not reaching the threshold value abovementioned, a TIA will still be requested due to particular circumstances in the area surrounding the project or due to concerns of the surrounding/adjacent communities, or other circumstances that the Town Engineer deems appropriate to review.

For Developments in areas supported by a subdivision level TIA, a site specific TIA may be required if traffic generation exceeds the values assumed for the site in the subdivision level TIA.

The proposed terms of reference for these reports must be submitted to the Town Engineer for review, using these guidelines, following the pre-app meeting for the proposed development and prior to submittal of the application. The Town Engineer will endeavour to provide feedback on the proposed scope within 10 working days of submission.

2.4.10 Geotechnical Study

For all applications the Consulting Engineer must follow the requirements outlined in the City of Calgary *Geotechnical Report Guidelines for Land Development Applications*.

Development Permit applications typically require the submittal of a site-specific geotechnical study. In areas where stormwater drainage is proposed to be managed that includes infiltration measures, the study should include permeability testing to inform the stormwater design.

In certain cases, it may not be possible to perform infiltration testing prior to development of the stormwater management plan. In these cases, the Consulting Engineer may submit a stormwater management plan with assumed infiltration values for the purpose of the application. In these cases,

revised plans incorporating measured infiltration values are required prior to commencement of construction and will be included as a condition of development approval.

2.4.11 Wellhead Protection Area

For projects located in the wellhead protection area, a hydrogeological report may be required, depending on the type of development proposed, in accordance with the Town's *Land Use Bylaw*. For projects in the wellhead protection area conforming to the *Land Use Bylaw*, the Town Engineer may alternatively require a letter from the Consulting Engineer stating that no adverse impacts on the aquifer are anticipated due to construction or the design of the project.

2.4.12 Construction Management Plan

A Construction Management Plan is required for all Intermediate and Large Developments. The Construction Management Plan Guidelines in Appendix G specify the minimum requirements for the plan. These Guidelines are updated from time to time, the Applicant is encouraged to obtain the latest version on the Town's website.

The Construction Management Plan must identify the location and swing radius of any overhead cranes. Crane Swing Limitations (No Fly Zones) are to be clearly marked on the plans. If the crane swing radius occupies airspace above municipal lands or rights of way, then a crane swing agreement will be required prior to erection of the crane.

The Developer/Builder is responsible to submit a CMP and have it accepted by the Town Engineer prior to execution of the Development Agreement or Subdivision Servicing Agreement.

For Subdivisions and Developments with significant Municipal Improvements, the Developer must invite the Town Engineer to attend the construction kick-off and subsequent regular site meetings regarding Municipal Improvements.

2.4.13 Site Grading/Overland Flow Drainage Plan

The site grading/overland storm drainage plan will be used for both planning and engineering purposes. The site grading/overland storm drainage plan must reflect the requirements outlined in the grading and storm water management sections of the EDCG. The site grading/overland storm drainage plan is meant to show three main aspects of design as follows:

- Design elevations of earthworks – specifically those along property boundaries and building faces
- Building floor elevations, storm sewer, invert elevations and locations
- A representation of how overland storm drainage will behave in the design storm event

Details of the site grading/overland storm drainage plan must include the storm design features listed below. See Figure EDCG AP 2.1 Grading Plan Requirements.

2.4.13.1 Small Developments

- Directional flow arrows based on finished grading for minor event
- Directional flow arrows based on finished grading for major event

- Vegetative drainage features including berms and swales
- Location and details of weeping tile assembly and associated infiltration pit
- Finished grading of retaining wall (sufficient points to show slope)

2.4.13.2 Intermediate/Large Developments

In addition to the requirements for detached dwellings and duplexes, larger projects will require more detail including:

- Areas outside the property lines that drain into the development
- Constructed drainage features including catch basins and piped system infrastructure, size, material specifications
- Construction details and locations of all infiltration basins
- Any infiltration values used in the storm calculations
- Storm specific landscaping that is part of stormwater treatment
- Drainage areas and coefficients of run-off
- The boundaries of high-water levels for detention ponds
- Trapped low areas in the subdivision

Design calculations must also be provided indicating the hydraulic design of the system.

2.4.14 Sites with Building Grade Plan and Lowest Top of Footing Requirements

Typically, when a subdivision is created, the Consulting Engineer will create a building grade plan (also known as a grade slip, development grading plan) for each single family and duplex development lot created. Developments in new subdivisions should conform to the site servicing and grading requirements shown on the accepted building grade plan for that subdivision.

If a building is proposed with a footing elevation lower than the lowest top of footing elevation shown on the accepted building grade plan, the proposal must be accompanied by a letter from a qualified Consulting Engineer addressing the proposed change. The statement must indicate that the proposed change will have no adverse impact on the development or the servicing of that site, or alternatively, that all impacts and required mitigation have been addressed in the proposed change. This deviation must be noted on the lot grading plan accompanying the building permit application. See Figure EDCG AP 2.2 Building Grade Plan – Minimum Requirements.

2.5 Additional Documentation Required at Construction Completion Certificate Submission

All testing noted below must be performed by an independent testing firm contracted by the Developer or Consulting Engineer. For small developments, testing results must be submitted prior to release of excavation permit deposits. The following additional documentation is required with CCC submissions:

- Letter from geotechnical engineer if weeping tile is not installed
- Compaction results as per requirements of the excavation permit for work within Municipal right of ways

- For footing elevations lower than that indicated on the building grade plan, a letter from a Consulting Engineer representing the Builder as outlined in the requirements above.
- Where applicable, Utility Rights of Way for Municipal Improvements on private property are to be registered on title prior to accepting CCC.

2.5.1 As-Constructed Grade Certificate

This requirement applies to the construction of a duplex, semi-detached or single-detached dwelling; a multifamily development; and any building on a commercial or industrial site.

The Developer or Builder must submit an as-constructed grade certificate within six months of the date that Occupancy is granted by the Town. In the case of sites with multiple buildings, this applies only if construction has not begun on a subsequent building on that parcel of land within that period of time.

This document reflects both the proposed (original design) and constructed surface grades. The As-Constructed Grade Certificate must indicate that grading was completed within the acceptable tolerances specified in Table 2-1 below, as adapted from City of Calgary bylaw 32M2004. The Certificate must be certified by a Professional Land Surveyor, Consulting Engineer or Registered Architect.

2-1: Acceptable Grading Tolerances

Item	Acceptable Grade Tolerances	Over-Riding Minimum Grades	Other
Top of Footing Verification	±0.15m	Top of footing must not be lower than the recommended lowest top of footing per Building Grade Plan	If house or building constructed with minimum entrance grade below minimum grade (MG) or Registered Minimum Grade (RMG) specified, 0.08m maximum tolerance
As constructed grades for landscape after loaming	±0.15m	Meet intent of Building Code	Maximum grade ratio of 3:1 without a retaining wall
Areas within 1.2m of house or building foundation wall under decks and cantilevers		Meet intent of Building Code	
Concrete driveways, sidewalks and patios		Meet intent of Building Code	Not applicable to driveways in cases where below-grade garages are approved
Intermediate/Large Developments			Trap-low areas must have volume capacity

			set out in Stormwater Management Plan

2.5.2 Municipal Improvements - Deep Utilities

2.5.2.1 Record Drawings

The layout plan must indicate all deep utilities (i.e., water, sanitary sewer and storm sewer). Direction of flow, alignments, locations in relation to property line or mains as well as the purpose, material type and size of mains is required on the plan. Related infrastructure pertaining to these utilities is also required (catch basins, manholes, hydrants, and appurtenances). A metric chainage, where appropriate, must be shown. Design calculations for water main and service sizing, as well as sanitary design calculations should be referenced on the drawings.

The Consulting Engineer is responsible to show the placement of all shallow utilities as well as associated street furniture inside of municipal rights of way or easements. Pedestals, transformers or other shallow utility appurtenances must be shown with approximate dimensions.

- Water record drawings must include the following information:
    - valves, bends, tees and junctions of all watermains
    - main and service sizes, material type and class
    - curb stop locations
- Sanitary record drawings must include the following information:
    - locations and surveyed inverts of manholes and catch basins (drywells)
    - main and service sizes, material type and class
    - slopes of gravity mains and services
    - service invert elevations at terminus

2.5.2.2 Water System Reports – Private Infrastructure and Municipal Improvements

CCC submissions for watermains and hydrants must include the testing and documentation as detailed in Section 4 of the EDCG. The Private Infrastructure CCC shall also meet the testing and documentation as detailed in Section 4 of the EDCG. By submitting test results with a CCC application the Consulting Engineer certifies that they have reviewed the tests and that the results meet all applicable standards and guidelines. The results below are required for both Private Infrastructure and Municipal Improvements except where otherwise noted:

- Pressure testing
- Bacteriological testing
- Hydrant flow testing
- Compaction test results for public Municipal Improvements

2.5.2.3 Sanitary and Storm System Reports – Municipal Improvements

CCC submissions for Municipal Infrastructure sanitary and underground stormwater works must include the following testing and documentation:

- A leakage test must be completed under the supervision of the Consulting Engineer as per Section 5 of the EDCG. All public mains with inverts below the 1:100-year groundwater elevation must be tested.
- A pressure test shall be completed for low pressure sewer systems as per Section 5 of the EDCG.
- Compaction test results (trench backfill) shall be provided for public Municipal Improvements. Compaction testing must be done so there is adequate representation of the trench backfill area.
- A CCTV inspection shall be completed and must include all newly placed public mains that are 150 mm or larger. The Consulting Engineer must view and sign off on the CCTV inspection results. The CCTV inspection results must be submitted to the Town digitally and must include videos, a summary report and the Consulting Engineer's verification. A subsequent CCTV inspection is required to be completed not more than 30 days prior to FAC application.

2.5.3 Municipal Improvements - Surface Works

2.5.3.1 Record Drawings

The layout plans for surface works must indicate all locations and measurements (widths and radii etc.), and the type of material used for Municipal Improvements – Surface Works, such as but not limited to, roads, lanes, parking areas, sidewalks, walkways, pathways. The plans must indicate the extents and type of curbs and gutters. Plans must include the location of street signage, traffic signage, pavement markings, animal proof waste containers and postal kiosks. Separate details may be required for corner detailing at intersections.

CCC submissions for Municipal Improvements surface works must include the following testing and documentation.

2.5.3.2 Concrete Works

- Concrete Strength Test Results: for concrete on Municipal Improvements for surface works
- Compaction results for base, sub-base and sub-grade on Municipal Improvements beneath concrete surface works

2.5.3.3 Paved Roadways (First Lift) And Pathways

- Marshall Mix Analysis of the asphalt material (where required by City of Calgary)
- Compaction results for base, sub-base and sub-grade – include Municipal pathways
- Gradation tests for base and sub-base granular material
- Compaction tests for first lift asphalt
- Paving (second lift – if required)
- Marshall Mix Analysis of second lift asphalt (where required by City of Calgary)

- Compaction tests for second lift asphalt

2.5.4 Municipal Improvements – Utility Facilities

2.5.4.1 Record Drawings

Record drawings and operation and maintenance (O&M) manuals must be submitted with the CCC submission for all facilities forming part of Municipal Improvements. See Section 2.3 of the EDCG for more information.

Record drawings for Utility Facilities such as lift stations, pump houses, PRV chambers, reservoirs, must include the following details:

- Description and location of the facility
- Architectural record drawings
- Electrical and instrumentation record drawings (schematic and PLC programming)
- Mechanical record drawings (process piping, pumps, schematics, probe settings, HVAC, etc.)
- Equipment manufacturers' information

2.5.4.2 Operations and Maintenance Manuals

Operation and maintenance (O&M) manuals must be submitted to the Town for Municipal Improvements constructed along with record drawings. The O&M manuals must be prepared according to the requirements outlined in this section. Other documents (ex: Construction Contract Documents) with the Town for specific Municipal Improvements or capital projects may include more detailed requirements outside of the requirements of the EDCG.

The O&M manual must be an organized compilation of all operating and maintenance data pertaining to any facility provided by the Developer and must be prepared by the Consulting Engineer in electronic and hardcopy formats. Manuals are to be provided in a three-ring or similar type of binder with hard covers and spine, divider sheets with labeled tabs and envelopes for over-sized inserts. The binder must be of heavy-duty construction, suitable for removing and inserting pages, and of adequate size for the material presented. The O&M manual may include more than one volume. All binders must be clearly labeled with the date, name and location of the facility.

Three complete hard copy sets of the O&M manuals and one digital version are to be submitted to the Town prior to, or together with, the CCC application. The O&M manuals are subject to review by the Town Engineer prior to acceptance by the Town. Operation and maintenance manuals must include, but not be limited to, the following information:

- List of names and contact details of firms involved in the design, construction and supply of equipment or services for the facility
- General description, application and operating conditions of the facility
- Equipment manufacturer's detailed technical information including installation, operation and maintenance instructions, parts lists and component diagrams
- Installation and performance test results

- Service and repair instructions
- Inspection compliance certificates
- Warranties and guarantees

2.5.5 Municipal Improvements - Landscaping

2.5.5.1 Record Drawings

Record drawings must illustrate the Municipal Landscaping Improvements as constructed, including:

- Detailed layout plan
- Detailed planting plan
- Detailed grading plan
- Detailed irrigation plan (where applicable)
- Details of solid waste facilities including locations
- Construction details of all landscaping improvements
- Specifications for all landscaping improvements

For information about irrigation system record drawings, see Section 10 of the EDCG.

2.5.5.2 Tangible Capital Asset Accounting

A document detailing the following parameters must be submitted with the record drawings for Municipal Improvements – Landscaping:

- Total lengths and width of trails (asphalt and gravel/clay)
- Furniture inventories
- Park signage inventories
- Playground inventories
- Fencing quantities
- Irrigation system inventories
- Solid waste bins
- Total area of maintained turf/sports fields/active areas (municipal reserves)
- Unmaintained natural areas (environmental reserves)

The following information is required for each new improvement:

- Installer's name
- Manufacturer
- Supplier
- Cost
- Part number (where applicable)

- CCC date

2.5.6 Electronic Data Submission Requirements

2.5.6.1 Delivery Methods

Data will be provided by email, FTP site, external file sharing, or by an alternate method as approved by the Town.

2.5.6.2 Acceptable File Types

Data must be provided in PDF and CAD format. All files must adhere to the City of Calgary CAD Standard and meet the Spatial Reference standards below. City of Calgary downloadable CAD templates may be used to assist in the preparation of drawing submissions.

2.5.6.3 Spatial Reference Standards

All data must be provided in NAD83 3TM projection with reference meridian being 114° West. as per the City of Calgary CAD standard. The well known ID (WKID) of this horizontal coordinate system is 3776, defined by the European Petroleum Survey Group (EPSG) authority.

Vertical geodetic elevations must be provided in the Canadian Geodetic Vertical Datum of 1928 (CGVD28) as per the City of Calgary CAD standards. The well known ID (WKID) of this vertical coordinate system is 5713, defined by the European Petroleum Survey Group (EPSG) authority.

2.6 Other Engineering Permits

This section of the EDCG is provided to advise Developers, Consulting Engineers and Builders of permits that may be required prior to any construction in the Town of Canmore. The intent is to provide Applicants with the information necessary to undertake construction. Please note that failure to comply with the permit application instructions or permit conditions may result in safety issues, processing delays, rejected permit applications and/or a stop work order.

2.6.1 Utility and Pipeline Locations

Prior to commencing work, the Contractor shall contact the appropriate agencies listed below and other private utility locator as required to locate existing underground utilities and pipelines in or adjacent to the construction work site prior to commencement of work. Any utility companies not covered under Utility Safety Partners as well as EPCOR shall be contacted for locates of water, sanitary and storm utilities.

Town owned underground cables servicing traffic signals and pedestrian lighting are not registered with Utility Safety Partners. It is the Contractor's responsibility to identify if the site is in proximity to these facilities and to engage a private utility locator. Upon request to engineering@canmore.ca, the Town of Canmore will provide drawings that indicate the approximate locations of these facilities to assist the private utility locator. Note that drawings may not be available for all facilities.

- Utility Safety Partners (Click before you dig): utilitysafety.ca
- EPCOR (Water and Sanitary Utilities): canmorelocates@epcor.com

- Town of Canmore: engineering@canmore.ca

2.6.2 Road Right-of-way Usage Permits (Road Use Permits)

Road use permits are required for any work within a Town of Canmore road right-of-way prior to any construction activity or placement of construction equipment or materials, including oversize equipment or structure moves. Please see the Town of Canmore's website at www.canmore.ca for the application form and process. Applications must be submitted a minimum of four full business days in advance. If a partial or full road closure is required, the application must be submitted according to the following timelines:

- Arterials and transit routes – 20 business days prior to work
- Collector roads – 10 business days prior to work
- Local roads – four business days prior to work.

In emergency situations the Town may waive or reduce the minimum advance notice requirement.

Note that provincially owned and operated highways exist inside Canmore municipal boundaries such as Highway 742 (locally partially named Three Sisters Drive, Three Sisters Parkway and Spray Lakes Road), Highway 1, and Highway 1A. Prior to any work on/near these provincial highways, the Applicant/Contractor is to contact Alberta Transportation and Economic Corridors and obtain appropriate permits.

Traffic control person (flag person) accreditation is required by the Town on arterial and collector roads when a directional closure is required. Any individual acting as a traffic control person must be properly trained.

2.6.3 Permission to Work Permits – Outside Regular Hours

A permission to work permit is required when an Applicant or Contractor wishes to work before 7:00 a.m. and after 10:00 p.m., Monday to Saturday, and any time on Sundays or statutory holidays, in accordance with the Town's Community Standards Bylaw. The application and further information about this process is available on the Town of Canmore's website at www.canmore.ca.

2.6.4 Excavation Permit

An excavation permit is required to excavate or break-up the surface of a road, lane/alley, sidewalk or landscaped area within a Town owned road or utility right-of-way or other public land (e.g., parks and municipal reserve). Please see the Town of Canmore's website for the most up-to-date application form and process. Applications must be submitted a minimum of four full business days in advance. If the work is to take place within road right-of-way, a Road Use Permit will be required as described above. If the excavation is approved and secured through a Development Agreement or Subdivision Servicing Agreement with Consulting Engineer involvement, no Excavation Permit is required.

2.6.5 Blasting Permit

A blasting permit is required for all blasting operations within the Town of Canmore and shall conform to Town's *Regulation of Explosives Bylaw* 32-96, the provisions of the *Explosives Act* (Canada) and the regulations made thereunder, and with the provisions of the *Occupational Health and Safety Act - General*

Safety Regulation. In the event of conflict between any of these, the more stringent shall take precedence. As there is inherent danger with blasting activities, these applications shall be handled on a case-by-case basis. The application for a blasting permit can be found on the Town of Canmore's website at www.canmore.ca.

2.6.6 Demolition Permit

A demolition permit is required whenever an existing structure is to be demolished or moved. Demolition permit applications are submitted through the Planning and Development Department. Procedures and requirements for utility disconnects and waste disposal requirements are dealt with by the Engineering Department through this permit process in addition to Building Code requirements.

2.6.7 Cross Reserve Permit

A Cross Reserve Permit, applied for through the Town Parks Department, is required for any work or travel on Town owned or managed public lands, such as Municipal Reserves, Environmental Reserves and Park spaces.

2.6.8 Crane Swing Agreement

When preparing a Construction Management Plan, the Developer or Builder must anticipate the erection of a crane and provide its location and swing radius in the plan. Prior to erecting and operating the crane, the Developer is required to enter into a Crane Swing Agreement with the Town.

2.6.9 Engineering Department Fees

The schedule of fees assessed by the Engineering Department for engineering services is reviewed and updated annually. The current *Master Fee Schedule* is available on the Town of Canmore's website at www.canmore.ca.

SECTION 3 – SITE GRADING AND OVERLAND DRAINAGE

TERMS OF USE

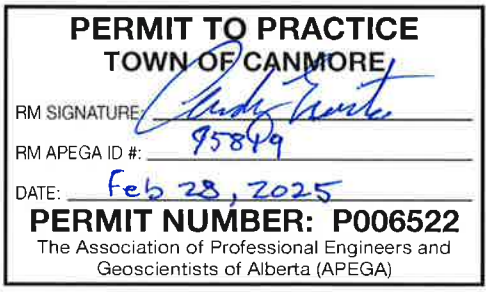
The "2025 Engineering Design and Construction Guidelines, Section 3" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

FEB 28, 2025

Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 3" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

3.0 Site Grading and Overland Drainage

The intent of this section is to ensure the protection of property from flooding, to encourage stormwater infiltration and to provide guidelines for overland drainage.

3.1 Design Considerations

Where developments and subdivisions exist in high groundwater conditions, the Town reserves the right to ask for a geotechnical or hydrogeological investigation to address specific issues related to groundwater.

3.1.1 Grading Considerations

Grading for all developments should be kept to a minimum where practical and feasible considering servicing, road access, emergency access or other factors. Building and site layouts that accommodate and conform to the pre-development landscape as much as reasonably possible should be considered. alterations to the natural topography should be minimized as per the Town's *Guidelines for Subdivision and Development in Mountainous Terrain*.

3.1.2 Lowest Top of Footing

Lots with existing development grading plans generally have a dictated lowest top of footing elevation. In cases where applications do not have a dictated lowest top of footing elevation, a Consulting Engineer should be engaged to confirm if a building can be serviced by gravity for the sanitary sewer system or if a sewage lift pump will be required. Note that gravity services are preferred over sewage pumping due to complexity, energy consumption and maintenance requirements.

3.1.3 Grading Transition Between Properties and Street ROW

Particular attention must be given to transitions with neighboring properties on Small and Intermediate Developments, especially in redevelopment scenarios, to ensure that proposed grades transition smoothly to existing grades on adjacent properties. Designers of Small and Intermediate Developments will be required to show the existing grades as per the plot plan on all submissions.

Large Developments will need to consider overall transitions and surrounding grades in an appropriate context to the application.

When developing in the valley bottom, the Minimum Floor Elevation must respect the elevations in Figure EDCG HLC 9.8, 1:100 Year Design Groundwater Elevations and Figure HLC 9.3, Overland Flow Elevations, as outlined in the *Land Use Bylaw*. Developers should be mindful of nearby grades that are not reflected in these figures.

In some redevelopment cases, using these elevations without being mindful of nearby grades can cause the proposed dwelling to fall in a low spot with respect to the surrounding area grades and eliminate the possibility of an escape route for a major event. See Figure EDCG GRD 3.1 Overland Escape Route, for more information. Developers are required to have their legal plot plan reflect elevations of nearby parcels that will fall higher than their minimum habitable floor elevation.

The Engineering Department reserves the right to dictate a higher minimum habitable floor elevation should they reasonably assess that a proposed habitable space may be adversely affected by stormwater runoff. The Land Use Bylaw allows for an adjustment of Maximum Building Height for the purpose of ensuring positive drainage.

3.1.4 Grading and Stormwater

Grading plans should be mindful of the stormwater management of the application area and Consulting Engineers should be familiar with the information in the Stormwater section of the EDCG (Section 6). Developers are reminded that grading should not direct stormwater runoff exceeding pre-development rates and patterns to neighboring private properties, Town sidewalks or onto a lane or street, except in accordance with an approved grading plan.

Lots should be graded in such a way that quantity and velocity of surface runoff is minimized, and that infiltration and detention is maximized, as reasonably feasible or in accordance with applicable Stormwater Management Plans.

Grading of lots should follow the approved development grading plan where available.

Where there is no existing development grading plan (or in the case of a re-development), two general approaches to grading should be used which are described in the following figures: Figure EDCG GRD 3.2 Lots in Valley Bottom: General Grading, and Figure EDCG GRD 3.3 Lots on Slope: General Grading.

It should be noted that grading is intrinsically related to stormwater and landscaping. Consulting Engineers should consider these three areas concurrently. As a general rule, to distinguish landscaping from grading, Consulting Engineers are asked to consider the shape of the land to be the grading, and the landscaping to be the plantings themselves on top of that shaped land. Should discrepancies arise between grading and landscaping design, the grading plan will always govern over the landscaping plan.

3.1.5 Snow Removal and Storage

Site plans for Intermediate and Large developments are required to show at least one proposed location for snow storage or describe the approach to snow management. Snow storage locations should not impede access to or the function of bicycle racks, sidewalks and active transportation facilities.

Consideration should be given to snow removal and storage during design to minimize the amount of deicing chemicals required. This can be achieved by considering the flow paths created by snow melt, which can create diurnal melting/icing cycles, leading to increased use of deicing chemicals which can negatively impact the quality of soils and receiving waters.

3.1.6 Slope Stability

For all applications the Consulting Engineer should follow the requirements outlined in the City of Calgary *Geotechnical Report Guidelines for Land Development Applications*. This guideline establishes the documents to be submitted with an application and defines the testing and reporting methods.

Slope stability reports are required for all sites where existing or final grades exceed 15% or where, in the opinion of the Town Engineer, slope stability is considered to be a potential concern.

All land proposed for development as defined in the City of Calgary Geotechnical Report Guidelines for Land Development Applications must have a minimum Factor of Safety (FOS) of 1.5 against slope failure. Lands with a FOS less than 1.5 may be taken as Environmental Reserve at subdivision at the discretion of the Town.

Municipal Reserve lands that will accommodate structures such as paved pathways, playgrounds, picnic shelters, etc. are required to achieve an FOS of 1.5. Other areas of Municipal Reserve may be accepted with a minimum FOS of 1.3 at the discretion of the Town.

3.2 Special Features

3.2.1 Retaining Walls

Retaining walls that are higher than 1.0 m or a series of retaining walls where the combined slope is steeper than 3H:1V must be designed and sealed by a Consulting Engineer (typically structural or geotechnical, or both for large structures). The Town may accept retaining walls on slopes steeper than 3H:1V where approved and sealed by a Consulting Engineer. The design submitted to the Town must include a letter of engagement outlining the scope of the Consulting Engineer's assignment, which is to include the Consulting Engineer's responsibility as Engineer of Record, design and specifications for all elements (or combined engineering by multiple professionals that encompass the design as a whole), and inspection for compliance with the design.

Refer to Detail Sheet 74: Dry Pack Rock Retaining Wall from the City of Calgary Parks 2022 Development Guidelines and Standard Specifications: Landscape Construction for further details regarding rock retaining walls.

Plan and elevation drawings submitted to the Town should show general dimensions including:

- Wall foundation and minimum toe embedment
- Wall backfill and drainage
- Wall inclination
- Elevation of top and bottom of wall
- Sizing of all elements
- Material type
- dimensions of offset of wall from property boundaries and structures
- The Engineer(s) of Record shall indicate on the retaining wall design whether or not the wall requires safety railings and shall provide rationale for the decision. Details and dimensions of safety railing (guard) on top of retaining wall to be shown if required.

Upon completion, the Engineer(s) of Record must submit a letter to the Town certifying that the retaining wall has been constructed in accordance with the design or outlining where deviations have occurred along with rationale.

3.2.2 Window Wells and Sunken Entrances

The following are design criteria for window wells and sunken entrances (see Figures EDCG GRD 3.4 Window Well Drain, and EDCG GRD 3.5 Sunken Entrances):

- Window wells and sunken entrances should not be placed in overland drainage paths.
- Grading around sunken entrances and window wells should ensure runoff is directed away from the sunken entrances and wells.
- Sunken entrances must have an exterior step up or curb at any building entry point.
- Window wells and sunken entrances will require a drain that directs runoff trapped in the well to an appropriately sized seepage pit or other discharge facility.

3.2.3 Weeping Drain Tile

As governed by the Alberta Building Code, weeping tile is required for all developments unless otherwise recommended by a geotechnical engineer based on a thorough investigation and analysis of local subsurface soil and groundwater conditions.

All sump pump discharge is to be day-lighted and directed in such a way to avoid the recirculation into the basement foundation, a neighbouring property, or causing adverse effect to Municipal Improvements. Avoid discharge to hard surfaces to prevent slippery conditions, directing discharge towards landscaped areas is encouraged. The invert elevation of a sump pump discharge for properties located in the Valley Bottom Flood Hazard Overlay and High Groundwater Area Overlay shall be positioned above the defined flood elevation.

Discharging to ground is preferred, however if weeping tile discharge to a piped storm system is proposed, the connection should be made exterior to the building and above grade, with an adequate air gap to eliminate the possibility of backflow. Design of weeping tile showing specific invert elevations for weeping tile, sumps and discharge locations will be required if piped storm systems are to be proposed, and their design must take into account the contributions of weeping tile for sizing purposes. All weeping tile connections to a storm system will need to be indicated on the application and be accepted by the Town Engineer.

Weeping tile and sump pumps shall not be connected to the sanitary sewer system.

3.2.4 Garage and Parkade Drains

All garage drains shall meet the requirements of the *Alberta Building Code* and Alberta Environment standards.

Parkade floor drains shall be directed to an oil/grit separator and discharged to the sanitary sewer. Trench drains at the bottom of a parkade ramp shall be directed to an oil/grit separator and discharged to the storm sewer. In the High Groundwater Regulation area, provisions should be made to prevent ingress of groundwater into the sanitary sewer system.

3.2.5 Driveways

Grading of lots must accommodate a smooth transition from the front of the property to the street ROW. This is especially critical with driveways that access a sloped street. Retaining to accommodate access must be done on private property to allow the Town to modify the street within existing street grades.

Driveway and parkade ramp grades should adhere to the latest edition of the *City of Calgary Roads Construction Standard Specifications*.

Driveways sloping towards the building are discouraged. Reverse sloped driveways should meet the freeboard requirements of Section 3.4.2.3 of the 2011 *City of Calgary Stormwater Management & Design Manual* and *DSSP Design Guidelines*.

To review a reverse sloped driveway proposal, the Town may require supplementary information from the Consulting Engineer be provided with the application, including, but not limited to topographic survey and an assessment of adjacent stormwater runoff patterns. A statement in the design narrative is required indicating that the design provides adequate protection from stormwater ingress. The Consulting Engineer should consider the density of topographic elevation points needed on the As-Constructed Grade Certificate to demonstrate and certify that the as-constructed condition respects the approved design.

Proposed reverse sloped driveways must include a gravity connection to the storm sewer system complete with a backflow prevention valve located in a separate manhole on public property. Sump pumps are generally not permitted, however they may be considered for parkades on Large Developments. It is recommended that the driveway slopes away from the garage door at 2% for minimum 600mm.

In certain cases of infill development an existing driveway crossing and/or depressed curb is no longer required due to the proposed access location. In these cases, the Developer is responsible for replacing the sidewalk and curb as required to eliminate the driveway crossing.

Driveway widths must not exceed the limits stated in the Town of Canmore's *Land Use Bylaw*.

Permits and Commencement of Construction

Typically, stripping and grading signal the commencement of construction. It is up to the Developer or Contractor to ensure all necessary permits and approvals from other governing agencies are in place prior to work. No construction, including stripping and grading, may take place without a construction management plan (CMP) that has been approved by the Town if required by the EDCG. See Section 2.4 of the EDCG for further information about submission requirements and applicable development application sizes.

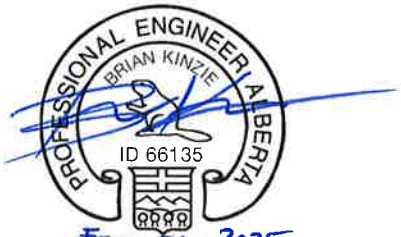
It is the responsibility of the Developer to ensure that erosion and sediment control (ESC) measures are in place prior to construction commencement. It is essential that ESC measures are maintained for the duration of the project including through the placement of landscaping. The removal of vegetation and topsoil during construction or other soil disturbing activities, as well as groundwater disturbing activities can have detrimental impacts on the Town's stormwater management infrastructure, its surface water bodies, and the groundwater aquifer. The Town of Canmore requires Contractors to follow the most recent edition of the City of Calgary Water Resources', *Erosion and Sediment Control Guidelines* with regards to details and specifications. Consulting Engineers may propose alternative inspecting and reporting requirements in consideration of site-specific conditions, including building sites within an area already under construction with ESC measures in place such that the overall intent is maintained.

SECTION 4 – WATER SYSTEM

TERMS OF USE

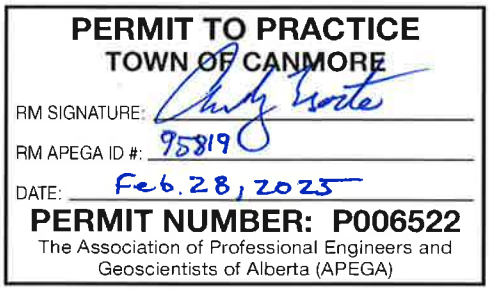
The "2025 Engineering Design and Construction Guidelines, Section 4" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025



Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 4" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

4.0 Water System

Water system elements not specifically referenced in this document shall be in accordance with the latest edition of the documents listed in Section 1.

4.1 Design Parameters

The intent of the design parameters provided is for the network to be designed for build out. In areas where system modeling determines the criteria cannot be achieved with existing boundary conditions, these will be considered on a case-by-case basis by the Town of Canmore Engineering Department and the proposed systems consultant.

4.1.1 Demands and Peak Factors

Water demands shall be determined in accordance with the latest edition of the Town's *Utilities Master Plan* published at www.canmore.ca at the time of application based on land use, density and unit consumption rates. Specific design flow rates and peak factors for residential, commercial, industrial and institutional developments or defined land use districts shall follow minimum rates shown in the *Utility Master Plan* or other criteria applicable to specific developments in accordance with good engineering practice, and as approved by the Town Engineer.

Table 4-1 provides a summary of current and future water demands, system pressures and the associated design criteria.

Table 4-1: Water Demand and Pressure Summary

	Units	Design Criteria
		2022 UMP
Average Daily Demand (ADD)		
Water Treatment Plant Production (composite)	L/c/d	360
Consumption (residential only)	L/c/d	250
ICI	m^3/ha/d L/unit/d	30 810
Hotel	L/unit/d	700
Peak Day Water Demands (PDD)	Peak Factor[a]	2 x ADD
Peak Hour Water Demands (PHD)	Peak Factor[a]	4 x ADD
System Pressures		
Minimum Service Pressure at Peak Hour Demand	kPa	350
Minimum System Node Pressure to Calculate Fire Flow	kPa	140
Maximum Service Pressure	kPa	620
Maximum Pressure in Downtown Pressure Zone	kPa	496
Maximum Allowable Velocity in Distribution System	m/s	3.0
Notes:		

a) For large industrial or commercial developments, peak factors specific to the types of developments proposed shall be used.
L/c/d: Litres per capita per day
m^3 /ha/d: cubic metres per hectare per day

4.1.2 Pressure Zones

The distribution system shall be designed with consideration given to various pressure zones within the subdivision. Service pressure shall be maintained within a range of 350–620 kPa (40–90 psi). If the proposed subdivision is to be tied into the existing downtown distribution system, it shall be designed so that the downtown pressure does not exceed 496 kPa (72 psi).

For the Peak Hour Demand minimum pressure specifically, the Town will consider a lower service pressure to a minimum of 280kPa when it is clearly demonstrated that the target minimum service pressure of 350kPa cannot be achieved.

See notes in Section 4.2.10.3 of the *Engineering Design and Construction Guidelines* (EDCG) for pressure requirements of service connections.

4.1.3 Fire Flows

Pipes in the waterworks system and private service connections shall be adequately sized. A sufficient number of hydrants shall be installed to provide the minimum required fire flows at each location.

Available Fire Flow is calculated by maintaining a minimum 140kPa in the system under the Maximum Daily Demand scenario.

4.1.3.1 Greenfield Development

The required Fire flows in greenfield developments are shown in Table 4-2 below.

Table 4-2: Required Fire Flows

Land Use Category or Development Type	Fire Flow (litres per second)	Design Criteria Time Duration (hours)
Detached and Duplex Residential	85 L/s	2 h
Multi-Family, Small to Medium Size Units	120 L/s	2 h
Commercial, Institutional, Industrial – adequately separated, 3 floors or less	200 L/s	2.5 h
Multi-Family, Medium Density (4-plex to 6-plex)	200 L/s	2.5 h
High Density, Multiple Closely Spaced or Contiguous Buildings of 3 or More Floors	300 L/s	3.5 h

4.1.3.2 Infill Development

Water supply for fire protection systems should meet *Fire Underwriters Survey "Water Supply for Public Fire Protection" (2020)* and shall meet Alberta Fire and Building Code requirements.

In redevelopment areas where the Town's water network may not have the available fire flows to meet the requirements of the proposed development, the Consulting Engineer will evaluate the available and required fire flows and address in the Design Brief. Upon request, the Town will provide the modeled available fire flow at the Town's watermain that the development will connect to.

If the Consulting Engineer determines that the available fire flow is less than the required fire flow, the Consulting Engineer may propose water network improvements to achieve the required fire flow. Alternatively, the Consulting Engineer may use the methodology contained in the latest edition of the Fire Underwriters Survey "Water Supply for Public Fire Protection" to adjust the building design such that the required fire flows are equal to or less than the available fire flows.

4.2 Design and Construction of Water System Components

4.2.1 General Notes

Any proposed water distribution system or part of a system shall be designed to serve the area within a subdivision development boundary as well as any known future area that is contiguous with the proposed system. Proposed extensions to the water distribution network shall be modeled by the Consulting Engineer under various demand scenarios to determine the required water main sizes. The impact of all new major developments placing significant water demands on existing water supply, storage, transmission and distribution systems and the need for any resulting off-site improvements shall also be determined by network modeling. Existing network operating conditions at the proposed connection nodes (i.e., boundary conditions) will be provided by the Town upon request.

Development (or redevelopment) of a site currently served by a well will be required to connect to the municipal water supply as per the Town of Canmore *Water Bylaw*. The existing well shall then to be decommissioned as per Provincial regulations.

Distribution mains shall be continuous (looped) whenever possible. Where a closed system (dead end) is accepted, the maximum number of single dwelling units shall not exceed 45 on a permanent basis.

No cross-connections are allowed under any conditions. Backflow prevention devices shall be installed, inspected and tested as required by applicable regulations (e.g. plumbing code).

Water system components shall remain accessible. There shall be no obstruction or impediment to free and direct access to any service, water main, valve, curb stop, fire hydrant, water meter or other appurtenances on the waterworks system.

See the City of Calgary *Standard Specifications Waterworks Construction* for water systems to be installed in areas contaminated or potentially contaminated. with volatile organic compounds.

4.2.2 Easements, Legal Requirements and Implications

Distribution mains shall not be placed on private land without a registered easement. The typical minimum easement or public utility lot (PUL) width for an independent non-encased water main (or any main) is

9.0m, this may be reduced to 6m for an independent encased water main (or any main). All encasement pipes shall extend 1.0m beyond the property line. The typical minimum easement or public utility lot width increases to 12.0m for two utilities in the same easement (sleeved or unsleeved). Services connections to a water main located in an easement or PUL are discouraged. Easement or PUL width reduction may be considered if mains have shallow, insulated bury.

A sufficient number of valves shall be provided to permit isolation of the main in the easement or PUL without disruption of services outside the easement.

Where a reduced easement or PUL is accepted by the Town, and where future maintenance of mains would be difficult due to proximity of foundations or other adjacent improvements, the Town may require the mains to be placed into a casing pipe or the foundations (of adjacent improvements) protected by some other method.

Any landscaping improvements approved by the Town in excess of sod or hard surfacing within a utility right-of-way/easement (URW) that may be disturbed by future maintenance operations will be replaced by sod or the approved hard surfacing to match adjacent areas by the Town.

Development permit (DP) applications shall include an overall plan showing what portions of the water system being constructed will function as a private system. Any on-site portions of distribution water mains to be owned and maintained by the Town of Canmore require a URW survey plan prepared by a legal surveyor (and not by description) to be registered accompanied by the Town's standard Utility Right of Way agreement prior to CCC issuance and return of securities.

4.2.3 Water Mains Design in Town Right-of-Way

4.2.3.1 Size

Water mains must be consistent with those in adjacent subdivisions so that continuity of main size is maintained between subdivisions. The maximum length of mains between ties permissible in residential development are as follows:

- 150mm diameter mains (in cul-de-sac less than 150m in length only)
- 200mm diameter mains: maximum 550m between ties
- 250+mm diameter mains: maximum 760m between ties

Minimum main size shall be 200mm diameter in a residential subdivision and 250mm diameter in an industrial or commercial subdivision. The Town engineer may require that larger mains be installed to service or benefit adjacent or future developments or as required when, in the opinion of the Town, the increase in size is required to hydraulically compensate for dead end mains or high-density developments. *Endeavour to Assist* financial clauses for oversize mains will be considered in development agreements.

Mains in residential cul-de-sacs that are shorter than 150m may be reduced to 150mm diameter, where the conditions on the City of Calgary *Design Guidelines for Subdivision Servicing* can be respected.

Dead-end mains are strongly discouraged and will only be contemplated in circumstances which meet the applicable City of Calgary guidelines.

Flush-outs shall be required at the end of a dead-end watermain if there is no hydrant located at or near the end of the main. The flush-out shall be of sufficient size to provide 0.75m/s of velocity in the main and shall have a minimum diameter of 50mm. See Figure EDCG WAT 4.1 Typical 50mm Watermain Flush-Out for flush-out details. A park service may be accepted in lieu of a separate flush-out subject to acceptance by the Town Engineer.

4.2.3.2 Cover

In streets, lanes, PULs and easements, the minimum cover from the top of the water main to the final surface grade shall be as follows:

- 2.7m in clay soil
- 3.3m in soil that is predominantly gravel

For dead-end mains, the minimum cover from the top of the water main to the final surface grade shall be as follows:

- 3.0m in clay soil
- 3.3m in soil that is predominantly gravel

In areas with high groundwater, water mains may be installed with reduced cover and insulated where accepted by the Town engineer. The minimum depth of bury in such areas should be as close to the above specifications as possible, however not less than 1.8 m below the final surface grade, subject to Town approval.

In areas where pipe insulation is used, insulation shall be as specified in Section 4.2.3.4 of the EDCG.

4.2.3.3 Backfill Requirements

Backfill requirements for deep utility services shall be in accordance with the latest edition of the City of Calgary *Standard Specifications Waterworks Construction*.

Much of the Town of Canmore sits on an aquifer and has fluctuating groundwater levels. As a result, specific attention should be given to the need for clay plugs. The spacing (frequency) of clay plugs shall be as follows or as otherwise approved by the Town:

- On slopes of 4-7%: not more than 100m apart;
- On slopes greater than 7%: not more than 50m apart.

At all intersecting pipes in steep slope areas

4.2.3.4 Insulation

Insulation used for in-ground construction shall be extruded polystyrene to CAN/ULC S701, Type 4 classification. Approved products are DuPont HI-40 or HI-60 and Owens Corning Foamular 400 or 600, or as otherwise accepted by the Town.

Where required by the Town, pre-insulated piping systems incorporating a core pipe, polyurethane foam, closed-cell insulation and outer jacket shall be used in place of sheet or granular insulation materials in the pipe zone. Pre-insulated piping systems shall be designed for each specific application in accordance with the manufacturers' recommendations.

See Figures EDCG Water WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & Smaller and City of Calgary Standard Specifications Waterworks Construction, file Number 453.1044.001 and 453.1045.001 for further information. The Town of Canmore EDCG Figure takes precedence except in situations not covered by this Figure.

4.2.3.5 Material

Approval of pipe material, and any other materials used in the distribution system shall be as per the latest version of the City of Calgary *Standard Specifications Waterworks Construction*.

4.2.4 Isolation Valves

Valves on distribution mains shall be located to minimize the number of valves required to be closed in order to isolate a section of main. The maximum number of isolating valves for a section of main shall be four. No more than one hydrant shall be isolated (out of service) when a single section of main is isolated.

All valves in the distribution system shall be equipped with a 50mm x 50mm operating nut and shall turn counter-clockwise (left) to open.

Isolation valves required at intersections shall be located on the projection of property lines or dimensioned to property lines.

The following criteria should be considered in the placement of isolation valves:

- Preferred at intersections; Mid-block locations are subject to the approval of the Town Engineer
- Three valves at cross intersections
- Two valves at tee intersections
- Not more than three valves required to isolate line (four if cross intersection involved)
- Not more than one hydrant is taken out of service during shutdown
- Not more than 45 single family units, one multi-family site, or one commercial site are taken out of service during shutdown

Private water systems shall have an isolation valve on the Town side of the entrance to the private system.

4.2.5 Booster Pump Stations

Design guidelines will be provided by the Town to streamline booster pump station designs. Each installation, however, will be reviewed by the Town on a site-specific basis.

Sizing calculations and detailed drawings shall be submitted for review and acceptance by the Town. Equipment and programmable logic controller (PLC)/supervisory control and data acquisition (SCADA) systems shall be designed in accordance with the requirements of the Town. These standards change as

new technologies emerge and as existing facilities in Canmore are upgraded. Contact the Engineering Department for current requirements at the planning stage of new projects.

The equipment shown in Table 4-3 are approved manufacturers for public installations, unless otherwise reviewed and accepted by the Town.

Table 4-3: Booster Pump Station Equipment and Manufacturer

Equipment	Approved Manufacturer
Pumps (potable water supply)	Peerless, Gould, Myers or Weir
Master Control Cabinets	Allen-Bradley
Level Controls	Milltronics
Programable Logic Controllers	Modicon, Allen-Bradley, ITT Flygt
Electrical Relays/Transfer Switches	Allen-Bradley
Variable Frequency Drives	Allen-Bradley

4.2.6 Pressure Reducing Valves

Pressure reducing valves (PRVs) and PRV stations shall maintain a constant downstream pressure regardless of varying inlet pressure. The City of Calgary *Standard Specification Waterworks Construction* shall be followed, except as noted below.

Town of Canmore PRVs and PRV stations shall be complete with and conform to the following minimum requirements:

- Valves shall have a tight monolithic structure. Where construction joints occur, water stops shall be incorporated. Valves shall turn counter-clockwise (left) to open
- Each structure shall be insulated with spray-on urethane foam on all interior walls and ceiling (reinforced mesh required).
- A floor drain and sump shall be used wherever practical and outside the groundwater protection zone.
- All steel piping shall be painted blue (to Alberta Environment standards).

Piping and fittings within a PRV station shall comply with the following requirements.

Piping and fittings within a PRV station shall be a prefabricated steel module including pipe, fitting and flanges, with a fusion-bonded epoxy internal lining and external coating that meets the City of Calgary's Standard Specifications Waterworks Construction, section 505.01.02 Type A. The external coating for all piping shall also comply with the City of Calgary's standard detail sheet #45, note #9. The external coating should be blue in colour, either as pigmentation in the fusion-bonded epoxy (if available) or as an additional overcoat of compatible material.

The external coating of the pipe cast within the wall of the PRV chamber shall form a watertight seal with the concrete to protect against groundwater infiltration. The coating in this area may be roughened or otherwise treated as recommended by the manufacturer. Alternatively, a waterstop flange can be welded around the outside of the pipe in the centre of the embedded section of pipe. This flange can be left

uncoated to form a better bond with the concrete. The exterior coating of the pipe outside of the wall of the PRV chamber shall be wrapped with an approved Polyethylene tape or Denso Mastic tape or Yellow Jacket shrink sleeve.

All PRVs and PRV stations shall have a surge relief valve tied to the storm sewer or other suitable option to provide physical protection of downstream pressure settings. If a surge relief valve is not possible or practical, the PRV station shall include a downstream surge-arrester that will automatically close the valve if the downstream set pressure is exceeded.

If required, PRV stations shall have a pressure sustaining pilot control to protect upstream pressures. An analysis of flow requirements for each pressure zone will be required to determine the need for this option. If a pressure sustaining pilot control is required, the design shall include the following:

- "Y" screens to capture grit and debris on the pilot line
- Position indicators
- Liquid-filled pressure gauges for both upstream and downstream
- Adequate pipe support.
- Pilot control isolating cocks for valves 75 mm or larger
- Isolating gate block valves to allow bypass and valve servicing
- Speed controls as determined by the valve supplier
- Domestic water supply valve bypass
- Epoxy-coated valves
- Valves and piping that meet all pressure requirements
- Inlet and outlet ventilation piping

Detailed drawings of the proposed pressure sustaining pilot control installation shall be sent to the Town for review and acceptance prior to tendering or fabrication as applicable. Once constructed, all operating pressures shall be clearly marked in the PRV station and in the operating/maintenance manuals supplied to the Town. This shall include an operating description of each installation, including location.

4.2.7 Hydrants

4.2.7.1 Hydrant Type

Hydrants shall be free draining. If hydrants are installed in areas with high groundwater, the hydrant drains shall be plugged. Non-draining hydrants shall have the top and caps painted red and shall be clearly marked with a disk labelled Fire Service Only installed on the hose port; the disk shall be installed when the hydrant is installed.

All hydrants shall be Mueller (Modern and Super Centurion), McAvity (Clow Brigadier McAvity), or AVK (model 2700 and 2780) unless otherwise approved by the Town engineer.

All hydrants shall be 150mm dry barrel type with one 100mm diameter "Storz" pumper connection and two 65mm threaded hose connections. Threaded hose connections shall be 4 threads per inch (TPI) conforming to the Alberta Mutual Aid (AMA) thread standard.

The exterior of the hydrant above and 300mm below the grade-line flange shall be painted in accordance with City of Calgary Standard Specifications Waterworks Construction, Section 505.01.00 (Type C) in the following colours:

- Red body, equal to C.I.L. #22370, Riley PM2506 or approved equal
- Black caps (for free-draining hydrants) Cloverdale #11107 or approved equal
- Red top

Hydrant details can be found in Figures EDCG WAT 4.4 Hydrant Details, EDCG WAT 4.5 Hydrant Valve Tie-Back and EDCG WAT 4.6 Hydrant Valve Tie-Back Flanged Valve to Flanged Tee.

4.2.7.2 Hydrant Coverage

Hydrants shall be located such that proper hydrant coverage is provided for the entire subdivision, development or as required by Emergency Services.

To provide complete coverage of any structure, hydrants shall be spaced so that the maximum distance from the hydrant shall not exceed 90m radius in low-density residential areas or 60m radius for institutional, commercial, industrial and high-density developments (measured along the street).

4.2.7.3 Hydrant Placement

Hydrants shall be placed to provide complete accessibility and to minimize the possibility of damage from vehicles or injury to pedestrians. Where possible, hydrants should be placed at intersections. Mid-block hydrants should be avoided unless required for specified coverage. Hydrants in cul-de-sacs shall be located at the entrance of the cul-de-sac.

The minimum distance from a hydrant to any driving surface or any structure shall be 2.0m or 1.0m from back of curb where provided. If a suitable location is unavailable, bollards shall be placed around the hydrant between the driving surface and the hydrant. Bollards shall be placed such that they do not block access to the pumper or hose ports. Trees or above-grade hard landscaping in the vicinity of hydrants shall be located to maintain adequate clearance from the hydrant.

The minimum distance of a hydrant from a power pole, light standard or transformer shall be 3.0m unless a greater separation is the Alberta Electrical Utility Code.

4.2.7.4 Hydrant Construction Requirements and Sign-off

Newly-installed hydrants on private and public property shall be functional and shall be put into service before construction of new buildings on the property proceeds beyond the foundation stage where such stages are constructed primarily of combustible materials.

Newly-installed and non-functioning hydrants shall be clearly marked with a cover bag labeled *Out of Service* or other marking as accepted by the Town. Bags shall be a commercially-available product manufactured from polyethylene or canvas for this specific purpose (E.g. – RS Steel “Fire Hydrant Out of Service Covers” bag). Bags shall be installed when the hydrant is installed and shall not be removed until the requirements of Sections 4.2.8 and 4.2.9 have been met.

A hydrant flow test shall be performed on all newly-installed hydrants according to AWWA Manual M-17. A copy of the results shall be forwarded to the Engineering Department prior to putting the hydrants into service and prior to the acceptance of the Construction Completion Certificate.

All hydrant installations, whether new construction or the repair of existing, shall be reviewed by the Consulting Engineer and/or Town prior to backfilling. The Consulting Engineer is responsible for final sign-off of the hydrant installation for CCC submission purposes.

4.2.7.5 Permission to use Hydrants for Construction

Prior to hydrant usage, the user shall apply to the Utility Operator and/or the Town.

A meter shall be obtained from the Utility Operator prior to the use of the hydrant. The user shall follow the rules of use as established by the Utility Operator and the Town *Water Bylaw*, including payment of deposits and water usage charges.

The hydrant user shall only use the hydrant designated by the Utility Operator. The user accepts responsibility for any and all damages caused by improper use of the designated hydrant during use of that hydrant.

If it is determined by the Utility Operator that the meter or hydrant has been tampered with for the purpose of fraudulent misrepresentation of usage during the use of the hydrant, then the deposit paid by the user shall be forfeited and the user shall be suspended from further hydrant use in addition to any fines or penalties levied pursuant to the non-permitted use.

4.2.8 Private Water Mains and Hydrants

All hydrants and water mains supplying water for firefighting that are located on private property outside of a public utility right-of-way are the responsibility of the private development to maintain in accordance with the applicable codes. Some legacy developments are equipped with a public hydrant where there is a registered utility right-of-way (URW) plan and agreement executed jointly with the Town.

4.2.9 Tie-ins, Disinfection, Bacteria Test and Final Flushing of Water Mains

The order of testing and disinfection shall be in accordance with the latest editions of ANSI/AWWA C605, Underground Installation of Polyvinyl Chloride Pipe (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings, Section 10 - Preparation for Use, and the City of Calgary Standard Specifications Waterworks Construction. Where discrepancies between these documents occur, ANSI/AWWA C605 shall govern.

The contractor shall notify the Utility Operator and Town a minimum of three full business days in advance of any proposed water main tie-in or service disruption. This is to ensure that there are no conflicts with system operation or maintenance and to allow for time to comply with any special procedures required by the Utility Operator or the Town. See the Watermain Tie-in Checklist included in Section 0 of the EDCG.

New watermains and hydrants shall be flushed, hydrostatically (pressure) tested, disinfected, tested for bacteria and flushed as outlined below. The Consulting Engineer shall provide advance notice to the Town Engineer of the pressure test such that the Town Engineer may also witness the test if desired. The

developer is responsible for ensuring that the construction drawings at the subdivision approval or development permit (DP) stage include the information described in the following sections.

4.2.9.1 Operation of Isolation Valves

Isolation valves shall be opened by the Utility Operator to put a watermain into service only after the watermain pressure and bacteriological testing has been completed and accepted by the Town.

All operation of isolating valves shall be by the Utility Operator except in the case of an emergency or other unforeseen shutdown requirement, and then only by qualified operators with immediate notification, or under the direction and permission of the Utility Operator.

4.2.10 Service Connections

Developers shall install service connections to all single family, semi-detached or duplex lots created through subdivision. These services shall extend either 2.5m (no shallow utility easement) or 5m (with shallow utility easement) into the lot.

Each lot requires one service of suitable size with a curb stop/isolation valve located 0.3 m on the Municipal side away from the property line. More than one service for any lot may be authorized by the Town under appropriate terms and conditions and in conformance with the National Plumbing Code.

Where existing lots are not serviced, but subject of subdivision application, the provision of services may be deferred to the Development Permit stage at the discretion of the Town. The Town will require registration of a Deferred Servicing Agreement on the title of the lots without municipal services.

Servicing drawings for Development Permit applications for properties that are not pre-serviced must indicate whether the connection to the existing main is proposed as a hot tap or cut-in tee. When evaluating the approaches, the Consulting Engineer should consider the impacts of depressurizing the main and providing temporary water to impacted properties. When a cut-in tee is accepted, costs incurred by the Town of Canmore to support the depressurization, temporary water and recommissioning of the main will be borne by the Developer.

Services for separately-titled properties may not cross under another property, unless within an easement between the separately titled properties, and shall connect to main services located on municipal property. Proposals for alternative servicing configurations for multi-unit properties such as condos must respect the National Plumbing Code

In circumstances where an application for subdivision requires that services for a single parcel must cross an adjacent parcel to connect to the municipal mains, an easement between the two parcels must be registered on title for these private utilities. Both parcels require a separate connection to the public mains. This scenario is illustrated in Figure 4-1.

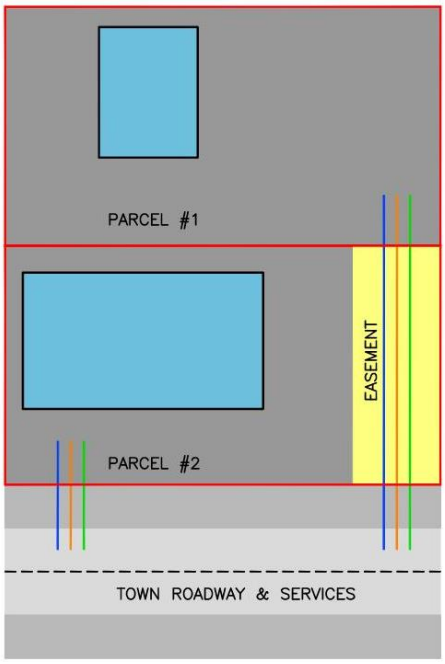


Figure 4-1: Utilities Easement

In the case where an application for subdivision requires that services for multiple parcels must cross an adjacent parcel, the services must be built to EDCG standards, are subject to the CCC/FAC process and are to be placed in a PUL. Alternatively, a URW naming the Town as Grantee must be registered on the affected parcel. In this scenario the services will be dedicated as public. This latter scenario, as illustrated in Figure 4-2 is strongly discouraged and will only be considered in unusual circumstances.

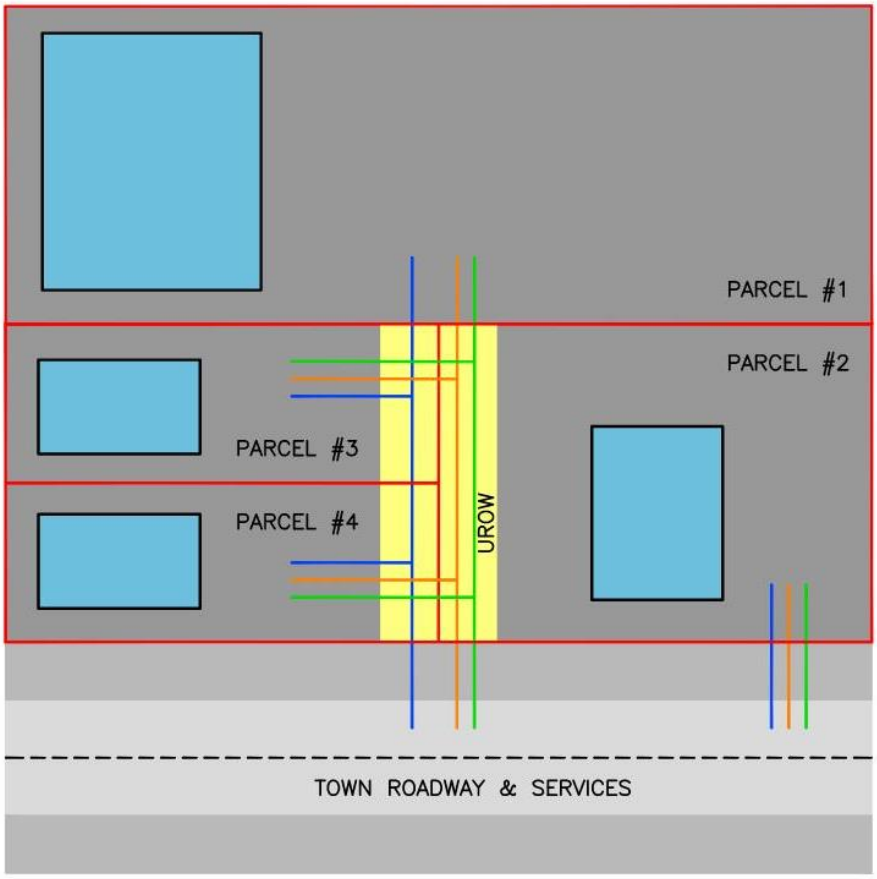


Figure 4-2: Utility ROW

Placement and Separation

Horizontal separation requirements for services shall be as indicated in the table below, taken from the City of Calgary Design Guidelines for Development Site Servicing Plans.

Table 4-4: Horizontal Separation Requirements

Utilities and Infrastructure	≤ 50 mm diameter water service pipe	≥100 mm diameter water service pipe	Within Public Right of Way	Within Private Property
Foundation or building wall	3.0m	3.0m	Required	Required
Property line	2.0 m	3.0 m	Required	Required
Storm pipe	2.0 m	2.0 m	Required	Recommended
Sanitary pipe	0.3 m (same trench)		Required	Recommended
Shallow utility pipe	2.0 m	2.0 m	Required	Recommended
Telus Cable pedestal, power pole, or streetlight std.	2.5 m	2.5 m	Required	Recommended
Trees	3.0 m	3.0 m	Required	Recommended
Edge of transformer or pull box/junction terminal	3.0m	3.0 m	Required	Recommended
Catch basin	3.0 m	3.0 m	Required	Recommended

Note that shallow utility companies may require different separation. Separation requirements must be verified by the Consulting Engineers responsible for civil and shallow utility design.

Services installed to existing buildings should be on an alignment that will best suit the interior plumbing, or as required by the Town engineer. A water service expansion loop (gooseneck) shall be laid in the horizontal position.

Service pipe 100mm and larger that passes through building floor slabs or exterior foundation walls shall comply with the City of Calgary *Standard Specifications for Waterworks Construction*.

All water services shall be installed complete with isolation valve, rod and stem, an approved means of protection during construction and marker posts. The water service pipe shall be plugged in a manner compatible with the service pipe to prevent ingress of foreign material and contamination of the service pipe and to prevent discharge in case the service valve is opened.

4.2.10.1 Materials

All water service materials shall comply with NSF/ANSI 61.

For detached dwellings and duplexes the following materials will be accepted for new water services:

- Service pipe shall be cross-linked polyethylene (PEX), sizes 20-40mm, minimum SDR-9, conforming to AWWA C-904, ASTM F876/877, CSA B137.5; as manufactured by Rehau (Municipex), Plasco, or approved alternative.
- Should PEX not be available, service pipe up to and including 40mm shall be Type K soft copper conforming to ANSI/AWWA C800-89 Standard and ASTM B88. All copper pipe shall be third-party certified (TPC).
- For 50mm services, the Town of Canmore allows only polyethylene pipe, minimum SDR-9 or PC160, conforming to ANSI/AWWA C901, PE3408 or 3608 or 4710 and SCA B137.1. Compression-type fittings with stainless steel inserts or electro-fusion joints shall be used. The Town of Canmore does not allow 50 mm copper service pipe of any type.

For multi-unit residential, commercial and institutional construction, the Town will accept polyvinyl chloride (PVC) pipe - ANSI/AWWA C900 Standard and ASTM B88, minimum class 150, DR-18 pipe for new water service 100mm diameter and larger. The Town will also consider HDPE material for pipe 100mm or larger.

4.2.10.2 Insulation

All services shall be protected against freezing. Where the specified cover cannot be maintained, insulation of the service is required as shown on Figure EDCG Water WAT 4.2.

4.2.10.3 Pressure Guidelines for Services

The minimum water service size for detached residential lots is 20mm. Where the static water pressure measured at the main is less than 350kPa (approx. 50psi), a 25mm (minimum) service connection is required. Note that the requirements of the National Plumbing Code apply and additional criteria are outlined in the City of Calgary *Design Guidelines for Subdivision Servicing*.

Service connections with static water pressures that may exceed 550kPa (80psi) shall have a pressure reducing valve installed in the residence and notation shall be made on the servicing plan. Existing pressure zones in the Town are described in the *Utility Master Plan*. Pressure zone boundaries may be adjusted to incorporate new developments or to respond to operational issues. Contact the Engineering Department for current requirements at the planning stage of a new development.

4.2.10.4 Inspections

Detached Dwellings and Duplexes

For sites which are not pre-serviced, service connections, both construction from the main to the curb stop and construction from the curb stop to the building, shall be inspected by the Town of Canmore's Engineering Department prior to backfilling. Service installation from the curb stop shall precede construction of the footings on new developments.

For water services up to 25mm, all on-site servicing up to the water meter shall be inspected by the Town of Canmore. The contractor shall arrange an inspection a minimum of one full business day in advance with the Town of Canmore.

Contractors are reminded that water service lines 50mm and smaller must be one piece from the curb stop valve to the inside of the building up to the future building meter.

The contractor is responsible to pressurize the water line from the curb stop to the end of pipe. All residential connections up to and including 50mm shall be hydro-static (water) tested to 1050kPa (150psi), or 1.5 x line operating pressure, whichever is greater for 1 hour. Services installed under freezing conditions or subject to freezing prior to a building being heated may be tested with air to 450kPa (65psi) for one hour. The test pressure shall not exceed the manufacturer's recommended maximum test pressure.

Following satisfactory testing, and prior to the water meter being installed, the builder shall install a reduced flow meter-spacer. This spacer may be obtained from the Town's building inspector or the Utility Operator. The spacer is installed in the water line at the point where the water meter will be installed and allows for testing of the system. The builder shall install a wire for an external reading device as per drawing WAT-01. As the final requirement of obtaining an Occupancy Certificate, submit a Water Meter Installation Request Form at canmore.ca. Upon receipt of the request, the Utility Operator will schedule a time to remove the spacer, install a water meter and open the curb stop. Refer to the Town of Canmore Water Bylaw for details governing connections and operation of curb stops. See Figure EDCG WAT 4.10 Residential Water Meter Installation (20mm Example).

Multi-unit Residential and Commercial, Institutional and Industrial

The Consulting Engineer engaged by the builder/property owner is responsible for inspections of the installation of all public/private servicing. This includes the pressure test of the water service from the curb stop to the end of the pipe (length of pipe must be long enough to reach and will eventually be hooked up to the water meter) and for submission of test results to the Town of Canmore prior to application for a water meter.

The Consulting Engineer is responsible to ensure that all pipe work is reviewed prior to backfilling. The Construction Completion Certificate, Final Acceptance Certificate or Development Completion Certificate may not be accepted if review of new construction and/or maintenance work is not signed off by the consulting engineer.

All commercial/industrial service connections and multi-family (R3) sites with services greater than 50mm shall be hydrostatic (water) tested to 1050kPa (150psi), or 1.5 x line operating pressure, whichever is greater. The test pressure shall not exceed the manufacturer's recommended maximum test pressure. The contractor is responsible for providing manufacturer's documentation on the product being installed if requested by the Town engineer.

Commercial/industrial or multi-unit developments with service size 50mm or smaller shall be as per detached dwellings and duplexes above.

4.2.10.5 Service Connections to Existing Water Mains

Detached Dwellings and Duplexes

A saddle connection is required, as per the City of Calgary's *Water Resources*, *Standard Specification*, *Water Works Construction*, for services to detached dwellings and duplexes. All water service pipe shall be continuous from main to curb stop and from the curb stop into the building with no couplings joining short

lengths of pipe. Copper water pipe may not be suitable if the required length exceeds the maximum length available for copper pipe. In such a case, PEX or polyethylene (PE) pipe should be used.

Multi-unit Residential, Commercial and Institutional

A cut in connection is required for extensions to the distribution system or connections to a private system for on-site development. These connections are usually done at 90° to the existing main. The contractor is responsible for effective disinfection, including methodology of chlorination, for the existing line that is affected by the cut in connection. The method of disinfection may need to be approved by the Town unless it directly follows methodologies outlined in relevant AWWA or City of Calgary standards. The Town Engineer may require a hot tap connection in situations where the main line is considered critical, and not suitable for a cut in connection. The Consulting Engineer is responsible for reviews and final sign off of all connections.

On pre-serviced sites to the property line, isolation valves/curb stops shall only be operated by an authorized party in accordance with the *Water Bylaw*. Plumbers and other contractors may not operate isolation valves/curb stops exceeding 25mm (as per Town of Canmore *Water Bylaw*). Contact the Utility Operator for more information on authorized isolation valve/curb stop operation.

On unserviced sites, the contractor shall first install the services from the Town's mains to the property line. The Consulting Engineer engaged by the developer/property owner is responsible for reviews of the installation of all off-site servicing and submission of all required testing requirements. Following satisfactory installation of the public portion of the service, the line shall be flushed, pressure tested, and, if necessary, disinfected and tested, after which time the isolation valve/curb stop shall be closed. The isolation valve/curb stop shall not be opened until acceptance of the installation by the Town of Canmore after which an authorized party may open the curb stop upon request by the developer/property owner.

4.2.10.6 Placement of Subdivision Pre-service

All services shall be identified with a marker post. Posts shall be 50 x 100mm, blue painted wood stakes extending from the invert of the terminated service connection to a minimum of 0.6m above the ground level.

Flexible Pre-services

The water service pipe shall be extended 5.0m into the property with a coil of pipe of sufficient length that there are no joints or couplings between the curb stop and water meter. The coil(s) of service pipe are to be left in a wooden box capable of withstanding earth pressures and protected from freezing. See Figure EDCG WAT 4.8 Pre-Service Connection Detail: Flexible Pipe.

Non-Flexible Pre-services

For services of non-flexible material (e.g. 150 mm PVC DR18D) the Contractor shall install the pre-servicing as shown in Figure EDCG WAT 4.9 Pre-Service Connection Detail: Non-Flexible Pipe.

4.2.11 Service Connections – Existing Systems

Where the existing structure is demolished and replaced, the water service must be replaced to the main at the expense of the developer if it is greater than 30 years old or if required due to sizing. The same conditions apply where additional serviced buildings or an addition to an existing building is proposed.

The property owner may submit a request to reuse the water service and is encouraged to submit this request with the Building Permit or Development Permit application to avoid delays during construction. The request must include the following:

- Age of water service (if known)
- Depth, diameter and insulation
- Presence of bleeder (if known)
- Location of curb stop relative to property line
- Confirmation that the existing service meets the NPC sizing requirements

Should the Town deem the reuse of the water service an acceptable consideration, the property owner will be required to expose the service pipe for inspection by the Town Engineer. The Town will assess the proposal based on the inspection and the information provided. In some cases existing water services include a bleeder to prevent freezing. Services with bleeders must be replaced regardless of age or condition. In the case where the Town approves the reuse of an existing service, the property owner shall execute a *Service Replacement Exemption Letter*, a copy of which can be obtained from the Town Engineering Department.

Where the service is found to be unacceptable for re-use, complete replacement of the existing service, including disconnection at the main, is required at the property owner's expense. The new service must meet the current City of Calgary Water and Sewer Standard Specifications and the sizing requirements of the National Plumbing Code (current edition).

All sewer and water service pipes within the same trench must be replaced if either cannot be reused. Where sewer and water pipes are not in a common trench, permission may be granted to re-use one or more of the existing service pipes based on the condition assessment.

4.2.11.1 Abandonment of Existing Services

All Demolition Permits require abandonment of existing services unless otherwise approved under a *Service Replacement Exemption Letter* or as part of a Development Permit or Building Permit. A Road Use and Excavation Permit may be required and the abandonment shall be witnessed by either the Town, the Utility Operator, an authorized professional acting on behalf of the Town, or the property owner's Consulting Engineer. Water service lines shall be abandoned outside the private side of the property line, at the curb stop or at the main as directed by the Town Engineer. Abandonment of existing water services shall be required if an existing building is demolished and nothing is constructed on site, if a replacement service is constructed in an alternate location, if an existing building is demolished and a new building requiring different service sizes is erected or if the Town engineer determines the existing service cannot be used due to condition.

If lots are being consolidated, the unneeded water service(s) shall be abandoned as follows:

1) The service line shall be excavated back to the curb stop.
2) The service to be terminated shall be shut off at the curb stop.

The service line is to be cut between 300mm outside of the private side of the property line and 300mm from the curb stop (where feasible, otherwise 300mm from the curb stop) and crimped if copper pipe or plugged with a manufactured plug approved by the Town if material other than copper.

The main stop or saddle shall be repaired or replaced by the property owner if it is deemed unacceptable by the Town Engineer.

4.2.12 Metering

The Town of Canmore requires a water meter to be installed on all residential, commercial, institutional and industrial services. A request for water meter installation must be submitted prior to issuance of an Occupancy Certificate. Once the meter is installed, the water shall be turned on by the Utility Operator. For installation or more information, contact the Utility Operator. The stipulations for metering are as follows:

- For each legal property title, installation of one water meter is required.
- Refer to City of Calgary *Standard Specifications, Waterworks Construction* for meter installation details.
- For water meters 75mm in size and larger, the Builder shall install a 120V outlet within 1.5m of the water meter for the purpose of providing power to the meter.
- Water meter nut couplers must be used on either side of the water meter to allow for safe installation and replacement.
- No branch line or tap is permitted between a water meter and the curb stop.
- For multi-unit developments a multi service header pipe may be permitted, as per City of Calgary, Standard Specification, Waterworks Construction. A header splitter on the property side, after the curb stop may be considered, as long as each unit has an isolation valve and meter on the service to each unit.
- A subsidiary water meter may be provided on the downstream side of the Town's meter by a customer for their own purposes. Any subsidiary water meters shall have tags to identifying them as private water meters.
- The Developer shall submit a water meter installation request and propose the size, type and number of water meters to be supplied and installed for each customer, for review by the Town. Subsequent to Building Permit approval, the Developer is advised to submit water meter requests for intermediate and large developments 4-6 months in advance of the required installation date due to supply chain considerations.

Detached Dwellings and Duplexes

For detached dwellings, a single service and a single meter is required. For up-and-down, back-to-front duplexes, there is one service to the building and one water meter for each unit. For side-by-side or semi-detached duplexes, one service and one water meter is required for each side.

Garden Suites

For garden suites that do not have a separate title from the main dwelling, it is expected water (and sanitary sewer) services will generally be connected to the existing dwelling's service downstream of the water meter. A subsidiary meter may be provided on the downstream side of the Town's meter by a customer for their own purposes. A subsidiary water meter shall have a tag to identify it as a private water meter.

Multi-Family Residential

For multiple housing units consisting of three or more attached units, one service feeds the building with one water meter per unit.

For multi-unit dwellings, each dwelling unit shall be metered individually. All water meters shall be installed at the header, where the service line enters the building and shall be located in one common area.

In residential multiplexes with four or more units, a minimum one common hose bib is required and shall be metered. Placement of the hose bib should accommodate contractors as well as residents.

Commercial, Institutional and Industrial

Single-unit commercial buildings require a single service and single water meter. For multiple side-by-side units in industrial and commercial buildings, one water meter per legal property title is required.

Each site will be unique with respect to flow requirements and water meter sizing. The sizing of the meter will affect the water and wastewater rates.

4.2.13 Park/Irrigation Service

See Section 11 of the EDCG.

4.3 Water Main Tie-in Checklist

(Example only. List to be specific to the development.)

Water System Tie-In / Scheduled Disruption Checklist			
Task	**Responsibility**		
	Consulting Engineer	**EPCOR**	**Contractor**
Obtain all required permits from Town (www.canmore.ca)			
Prepare Service Interruption Notice to residents			
Review Service Interruption Notice			
Notify residents of service interruption (minimum 48 hours prior)			
Notify Town of Canmore Engineering, EPCOR & EMS of service interruption and out of service hydrants			
Provision of all hoses, gauges, etc. to facilitate work			

Shut off existing service valves affected by service interruption			
Boundary valve operation for service interruption			
Bag out of service hydrants			
Installation of new cut in tees and valves at tie-in points			
Swabbing new pipe, valves & fittings with superchlorinated water (to AWWA C651)			
Inspection of installation of new cut tees and valves at tie-in points			
Flushing (operation of boundary valves)			
Operation of existing hydrants for flushing			
Operation of new valves and hydrant for flushing			
Choose water discharge location (and de-chlorination method if required)			
Dechlorination			
Turbidity measurements of flushing water			
Bacteriological sample collection after service interruption			
Approval to re-activate mains and services after service interruption			
Re-activation of boundary valves and mains			
Infrastructure installation past tie-in valve			
Bag out of service hydrants			
Onsite infrastructure installation inspection past tie-in valve			
Preliminary flushing (operation of boundary valves)			
Preliminary flushing (operation of onsite valves and hydrants)			
Hydrostatic test			
Pressure gauge readings			
Operation of existing hydrants for water injection during superchlorination			
Superchlorination (to AWWA C651) (commencement measurements)			
Superchlorination concentration measurements (after 24 hours)			
Choose water discharge location (and de-chlorination method if required)			

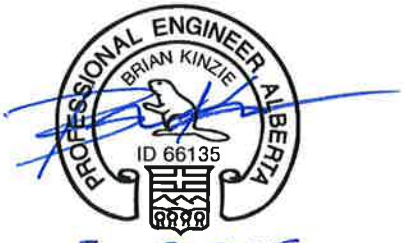
Flushing (operation of boundary valves)			
Flushing (operation onsite valves and hydrants)			
Dechlorination			
Chlorine concentration measurements			
Turbidity measurements			
Bacteriological sample collection			
Record and distribute water testing results			
Compilation of test results and CCC applications			
Notification that Town has accepted onsite water testing results			
Activation of new waterworks infrastructure and services			

SECTION 5 – SANITARY SEWER

TERMS OF USE

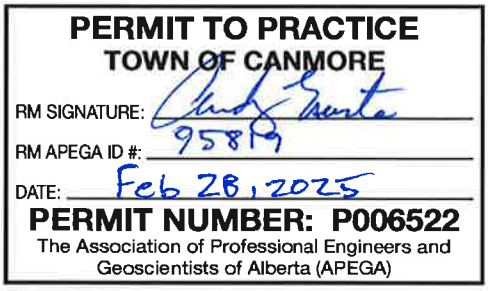
The "2025 Engineering Design and Construction Guidelines, Section 5" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025



FEB. 28, 2025
Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 5" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

5.0 Sanitary Sewer

Sanitary sewer system elements not specifically referenced in this document shall be in accordance with the latest edition of the documents listed below in Section 1.

5.1 Design Parameters

Any sanitary system or part of a system should be designed to serve not only the area within the subdivision development boundary, but, in the opinion of the Town Engineer, any reasonably known future development which is tributary to the system in accordance with the *Utilities Master Plan* and/or other relevant servicing studies.

5.1.1 Sewage Flow Generation and Peak Factor

Specific sewage design rates for residential, commercial, industrial or institutional developments or defined land use districts should follow minimum rates shown in the latest edition of the *Utilities Master Plan.* Sewage design rates for uncommon developments must be considered on an individual basis in accordance with good engineering practice. Flow demand calculations shall be referenced on the drawings. Direction of flow shall also be shown on the drawings.

Table 5-1 shows the minimum sewage design rates given in the 2022 edition of the *Utilities Master Plan*.

Table 5-1: Sewage Design Rates

Development Type	Minimum Sewage Design Rate
Wastewater Treatment Plant (Composite Rate)	360 L/c/d
Residential	250 L/c/d (40 persons/developable ha min. for detached residential)
ICI	30 m^3/ha/d gross hectares
Hotels	700 L/unit/d
Residential Peaking Factor	1+14 / (4+P ½) (Harmon's Formula)
ICI Peaking Factor	3.5
Hotel Peaking Factor	4

Peaking Factors (Multiplied by dry Weather Flow except as noted.)

The peak (population generated) flow for a residential population shall be determined by the following formula:

$$Q_{ppw} = \frac{GxPxPf}{86.4}$$

Where:

Q_{ppw}	=	peak dry weather flow (L/s)
G	=	the per capita average daily design flow (L/c/d)
P	=	the design contributing population in thousands
Pf	=	"a peaking factor"

The peaking factor (Pf) to the larger of 2.5 or Harmon's Peaking Factor where:

Harmon's Peaking Factor	=	1+14 / (4+P ½)
Where P	=	The design contributing population in thousands

Residential	Harmon Formula determination (2.5 minimum)
Commercial, Industrial, Institutional	3.5
Hotel	4.0
Composite	Peak wet weather flow (WWF) = 3.8 x ADWF at WWTP

Extraneous Flow Allowance

The minimum inflow/infiltration outside high groundwater regulated areas shall be 0.284 L/s/ha. The minimum inflow/infiltration within high groundwater regulated areas shall be 0.66 L/s/ha.

Hydraulic Capacity

The capacity of any section of a sanitary line shall be determined based on the portion of the line which has the least slope. The Manning formula shall be used to calculate gravity flow in pipes.

Use Manning's n=0.018 for pipes older than 1980 and n=0.013 for pipes from 1980 and newer.

5.2 Design and Construction of Sanitary Sewer Components

5.2.1 Gravity and Force Main

5.2.1.1 Type

Gravity mains shall be polyvinyl chloride (PVC) with a minimum standard dimension ratio (SDR) 35 unless otherwise accepted by the Town Engineer. In areas of high groundwater, fused PVC or high-density

polyethylene (HDPE) pipe may be considered for reducing extraneous flow. Clay tile, cast iron or concrete sewer pipes are not permitted.

5.2.1.2 Size

Minimum sizes of public sanitary mains are as follows:

- Residential Subdivision: 200mm diameter minimum
- Commercial, Multi-family, Mixed Use, Industrial Subdivision: 250mm diameter minimum; unless the Consulting Engineer can demonstrate flows and grades justify a smaller diameter

5.2.1.3 Slopes

Minimum permissible slope for sanitary sewer pipes shall be as per City of Calgary *Design Guidelines for Subdivision Servicing*.

5.2.1.4 Cover

For gravity mains the minimum cover from crown to finished grade shall be 2.50m. If the required cover cannot be maintained, insulation, as per Figure EDCG WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & Smaller is required. Alternative insulation configurations that meet manufacturer's recommendations and that are authenticated by a Professional Engineer may be considered.

Cover for force mains shall be designed as for water mains. In streets, lanes, easements and public utility lots (PULs) the minimum cover from crown to the final grade shall be 2.7m in clay or silty soils and 3.3m where the soil is predominantly gravel. If the required cover cannot be maintained, insulation shall be required as per water mains.

5.2.1.5 Placement and Alignment

Sewer mains should be laid as straight as possible. If a simple horizontal curve is required to conform to curved streets, curved sewers are permitted provided they meet the manufacturers recommendations and the City of Calgary's Design Guidelines for Subdivision Servicing and Calgary's Standard Specifications for Sewer Construction.

For all commercial and multi-unit residential sites where deep utility services are to be installed within predominantly clay or other relatively impermeable material such as bedrock, a clay plug shall be installed within the trench backfill adjacent to the site boundary. The clay plug shall be as described in the latest edition of the City of Calgary's *Standard Specifications Sewer Construction*.

5.2.1.6 Extraneous Flow

Where the invert of a sanitary main falls below the 100-year groundwater elevation, or where required by the Town Engineer, an inspection for infiltration/exfiltration shall be undertaken prior to a Construction Completion Certificate (CCC) being issued. Refer to ASTM D3212 and the City of Calgary's *Standard for Sewer Construction*.

5.2.1.7 Video Inspection

A closed-circuit television (CCTV) video inspection of all sanitary mains shall be undertaken in accordance with the City of Calgary's *Standard Specifications Sewer Construction*. Observations shall be coded in accordance with the NASSCO (National Association of Sewer Service Companies), *Manual of Sewer Condition Classification* or Town approved equivalent.

The CCTV video inspection must be received and accepted by the Town prior to CCC. A confirmatory CCTV re-inspection must be submitted with the FAC application. The inspection must have been performed no more than four weeks prior to the submittal of the request.

5.2.2 Manholes

All manholes and appurtenances shall conform to the City of Calgary, *Standard Specifications Sewer Construction* and City of Calgary, *Design Guidelines for Subdivision Servicing* except as noted below.

- Standard, precast, pre-benched manholes should be used where possible.
- Sewer inverts through manholes shall be benched to provide directional flow.
- The maximum distance between manholes should be 120m for sewers 375mm or less, or 150m for sewers 450mm to 750mm. In all cases, a manhole is required at the upper most end of a sewer, and at all changes in grade, size or alignment.
- The invert of services entering manholes shall be less than 760mm above the outgoing pipe centreline. If the drop is greater, a drop structure shall be provided.
- Services greater than 150mm shall require a manhole where tying to the main.

A continuous mortar bed shall be placed between the top slab, collars and frame as shown on City of Calgary Detail Sheet 38. Mortar shall not be placed solely on the inside face of the collars.

5.2.3 Frames and Covers

Manhole frames and covers shall be manufactured in accordance with the City of Calgary *Standard Specifications – Sewer Construction* and the Calgary memo from March 21, 2024, titled *Water and Sewer Utility Castings Specifications*.

If requested, the manufacturer shall submit to the Town stamped and signed shop drawings with full dimensions and with markings specified.

Shallow (150mm) manhole frames and *Town of Canmore – Sanitary* solid covers or other covers as approved by the Town shall be installed on all sanitary manholes for Municipal Improvements. Covers labeled *Town of Canmore* are not to be used on private infrastructure.

5.2.4 Low Pressure Sanitary System Mains

Development areas in the Town which cannot be adequately or economically serviced by gravity sewer systems may be serviced by low pressure sanitary (LPS) systems where approved by the Town. All LPS systems shall be engineered in accordance with applicable regulations, generally accepted design principles and approved equipment manufacturer's recommendations. Low pressure sewer mains shall be sized to suit the area and type of development to be serviced by the LPS system.

Terms and conditions of the Town of Canmore, *Sewerage Use Bylaw 2015-018* apply to LPS systems. See Section 5 of the EDCG for information about LPS system service connections.

5.2.5 Lift Stations

Lift stations are generally located along mains where needed to overcome gravity. The use of lift stations in subdivision design should be minimized whenever possible. Where unavoidable, rationale should be provided describing why no alternative design was viable.

The intent of the guidelines in this section of the EDCG is to streamline sanitary lift station design. Each lift station installation will be reviewed by the Town on a site-specific basis. Lift stations shall be located, designed and constructed in accordance with the City of Calgary, *Wastewater Lift Station Design Guidelines.* EPCOR design guidelines for controls, automation and equipment standards are updated annually and will be provided to the Consulting Engineer early in the design process.

Detailed design briefs and engineered drawings with completed calculations shall be submitted for review and acceptance by the Town. The design brief must address how environmental concerns such as noise, odour and light trespass will be mitigated. A Lift Station Control Philosophy is required early in the design process to outline the following:

- Alarming strategy
- Operator interfaces
- PLC communication failure
- Control modes
- Equipment
- Building and process alarms
- PLC system
- Trend and historian data
- LOI security

A building must be provided to house the following equipment at a minimum, in separate ‘wet’ and ‘dry’ sides:

- Generator
- Wet well
- Controls
- Electrics

The Town will provide guidance on the architecture of the building, a building permit application is required. Doors to the ‘dry’ side of the facility must be sized to allow extraction of the generator.

The following equipment is required, at a minimum:

- Water service, with hose bibs and sink
- Electrical hoist
- Heating/ventilation as per Alberta Environment standards

- Intermediate floor and clear access
- Sub-structure concrete or steel with cathodic protection
- Interior lighting
- Minimum of two pumps with automatic alternating operation
- 100mm camlock connection on discharge piping for emergency bypass
- Separate check and isolation valves for each pump (ball type check valve, full ported eccentric isolation valve)
- Valve operators outside chamber so no access required
- Amp meters on all motors over 5 HP
- Emergency power, fueled by diesel
- Odour control system
- Inlet flow metering (continuous) and pump hour meters
- Photocell controlled exterior lighting
- Outlet flow metering
- Pressure gauges and pressure transmitters on the discharge piping
- Electrical air-source heat pump and electrical hot water heating should be considered (no natural gas connection required).

Table 5-2, below, shows lift station equipment along with approved manufacturers that should be installed as a minimum, unless otherwise reviewed and accepted by the Town.

Table 5-2: Lift Station Equipment and Manufacturer

Equipment	Approved Manufacturer
Motor Control Centre Cabinets	Allen-Bradley
General Control Cabinets	Hoffman, Rittle, Hammond
Level Controls	Endress & Hauser, Pulsar
Programmable Logic Controllers	Modicon
Electrical Relay	Allen-Bradley
Transfer Switches	Eaton, Cummins or approved alternative
Variable Speed Drives	Toshiba
Pumps (submersible, sewage)	ITT Flygt, KSB, Vaughan

Programmable logic controller (PLC)/supervisory control and data acquisition (SCADA) systems shall be designed in accordance with the requirements of the Town. These standards may change as new technologies emerge and as existing facilities in Canmore are upgraded. Contact the Engineering Department for current requirements at the planning stage of new projects The developer is responsible

for initial SCADA programming and radio studies (if required). The Developer is responsible for programming of PLC and HMI equipment, the Town will provide sample programs.

5.2.6 Service Connections – Gravity Services

5.2.6.1 Size

The pipe diameter and class of pipe used for gravity service connections shall conform to the City of Calgary, *Standard Specifications Sewer Construction*.

5.2.6.2 Cover

Minimum cover for gravity service connections, from crown of pipe to finished grade, shall be 2.50m. If the required cover cannot be maintained, insulation shall be required as per Figure EDCG WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & Smaller, or as per manufacturer's recommendations as designed by a professional engineer and accepted by the Town.

5.2.6.3 Placement and Alignment

A separation of 0.6m shall be maintained between individual services along mains. Sanitary services should be placed a minimum of 2m off neighboring property lines. Where practical, sanitary services should be placed below a foundation wall as opposed to boring through the wall.

Bends in gravity services are discouraged. Consulting Engineers are encouraged to provide straight gravity servicing wherever practical. Gravity servicing with bends will require a variance. A maximum of two 22.5° bends will be allowed only where it can be shown that a practical methodology for emergency cleanout is possible, and where compliant with the relevant sections of the plumbing code. Alternatives will require approval of the Town Engineer.

Developers shall install service connections to all single family, semi-detached or duplex lots created through subdivision. These services shall extend minimum 2.5m (no shallow utility easement) or minimum 5m (with shallow utility easement) into the lot.

For all multi-family or commercial sites where a sanitary service is to be installed within predominantly clay or other relatively impermeable material such as bedrock, a clay plug shall be installed within the trench backfill adjacent to the property line. The clay plug shall be as described in the City of Calgary, *Standard Specifications Sewer Construction*.

5.2.7 Test Manholes

Test manholes are required on sanitary sewer services from all new Industrial, Commercial and Institutional (ICI) developments and in certain Change of Use applications. Refer to section 6.11 of the City of Calgary *Design Guidelines for Development Site Servicing Plans* and the City of Calgary Industry Bulletin released June 2019 titled *Test Manhole Update* for details.

Test manholes shall comply with Drawing number 452.1001.015 of the City of Calgary *Standard Specifications – Sewer Construction*.

5.2.8 Service Connections – Low Pressure Sanitary System Services

Service connections to an existing low pressure sanitary (LPS) system shall comply with the design criteria developed for that system. The design criteria may be obtained upon written request from the Engineering Department. Terms and conditions of the Town of Canmore, *Sewerage Use Bylaw 2015-18* apply.

Applications for connection shall be made using the forms appended to this section. All conditions for the LPS system shall be completed as stated in the schedule appended.

Private system owners shall be responsible for all operation and maintenance of private grinder pump systems including, and not limited to, all replacement costs.

5.2.8.1 Size

Low pressure sanitary system service connections shall be a minimum of 38mm copper tube sizing (CTS) HDPE with a minimum pressure rating of 1,100kPa (160psi) from the LPS main to the building connection.

5.2.8.2 Cover

Minimum cover from crown of pipe to finished grade shall be 2.7m in clay, 3.3m in granular soils. If the required cover cannot be maintained, insulation shall be required as per Figure EDCG WAT 4.2 Box Insulation Requirements: Services & Mains 150mm & smaller, or as per manufacturer's recommendations as designed by a professional engineer and accepted by the Town. Refer to Section 4 of the EDCG for further information.

5.2.8.3 Placement and Alignment

A horizontal separation of 0.6m shall be maintained between individual services along mains. Sanitary services should be placed a minimum of 2m off neighboring property lines.

5.2.8.4 Curb Stop Component

The curb stop shall have an adjustable cast iron service box with stem as per City of Calgary, *Standard Specifications Sewer Construction*.

The curb stop shall conform to Town of Canmore specifications for water service connections except that it will have *Sanitary* printed on the curb stop.

5.2.8.5 Grinder Pumps

Connections to LPS systems shall be with a grinder pump system capable of solids grinding and appropriate dynamic head to deliver contents under a wide range of pressure conditions.

The pumping chamber (sump) shall be manufactured from HDPE, fiberglass reinforced pipe (FRP), sulfate-resisting concrete or other approved corrosion-resistant material. The sump shall be protected from freezing, be leak-proof and prevent the infiltration of groundwater. The sump shall be sealed and vented in accordance with the Plumbing Code. For a typical detached dwelling unit, the net pump-out capacity of the collection sump (tank) should not exceed 500L. The total pump-out capacity of the sump shall be

larger and include reserve storage capacity for power outages, etc. For homes with above-average water consumption (due to installations of hot tubs, swimming pools, etc.), or for multi-unit residential developments, a professional designer should be consulted for proper sump sizing.

Grinder pumps designed for a LPS system application shall be manufactured by Environment One, Hydromatic, Meyers or equal approved by the Town Engineer with a design capacity of 41L/min at 27m (11 US gpm at 90ft.) total dynamic head. The pump shall be capable of intermittent operation at pressures at least 25% above and 50% below the design rating.

The pump shall be complete with controls to automatically start and stop the pump at pre-selected liquid levels in the sump.

The discharge piping shall include unions or couplings that allow the pump to be disconnected for servicing or repair. The discharge piping shall also include a double check valve, shutoff valve and pressure gauge within the building or access chamber.

5.2.9 Service Connections – Existing Systems

Where the existing structure is demolished and replaced, the sanitary service must be replaced to the main at the expense of the Builder or Developer if it is not PVC (gravity) or 38mm copper tube sizing HDPE with a minimum pressure rating of 1,100kPa (160psi) (LPSS) and/or if it is greater than 30 years old. The same conditions apply where additional serviced buildings or an addition to an existing building is proposed.

The new service should be on the same alignment as the existing service and, may utilize the existing service tie-in at the main if the existing connection is of acceptable material and in good condition. Existing pre-formed junctions on the main shall be utilized with a suitable transition fitting. Existing strap-on saddles shall be removed and replaced to suit the new PVC service pipe for gravity systems.

If not replacing the existing service along the original alignment, the old service shall be terminated at the main at the expense of the Builder or Developer.

In the case of a PVC gravity service greater than thirty years of age, the property owner may submit a request to reuse the sanitary service and is encouraged to submit this request with the Building Permit or Development Permit application to avoid delays during construction. The request must include the following:

- Age of sanitary service (if known)
- Depth, diameter and insulation
- Confirmation that the existing service meets the NPC sizing requirements
- CCTV-video and report prepared by a qualified contractor
- Processing fee as outlined in Fee Schedule

A Low Pressure Sanitary Service (LPSS) must be replaced if it does not meet the size and material specifications outlined above, or is greater than 30 years of age. In the case of a Low Pressure Sanitary Service greater than thirty years of age, the following information is required to support a service replacement exemption request from the Builder or Developer:

- Age of sanitary service (if known)
- Depth, material, diameter and insulation

- Location of curb stop relative to property line
- Confirmation that the existing service meets the NPC sizing requirements
- Processing fee as outlined in Fee Schedule

If, following review of the submittal, the Town deems that the existing service is in good condition, is adequately sized and is insulated or at adequate depth below frost, the service does not have to be replaced. However, the Builder or Developer shall execute a *Service Replacement Exemption Letter*, a copy of which can be obtained from the Town Engineering Department.

All the sewer and water service pipes within the same trench must be replaced if either cannot be reused. Where sewer and water pipes are not in a common trench, permission may be granted to re-use one or more of the existing service pipes based on the condition assessment.

5.2.10 Abandonment of Existing Services

All Demolition Permits require abandonment of existing services, unless otherwise approved under a *Service Replacement Exemption Letter* or as part of a Development Permit or Building Permit. A Road Use and Excavation Permit may be required and the abandonment shall be witnessed by the Town, the Utility Operator, an authorized professional acting on behalf of the Town, or the Consulting Engineer.

Sanitary sewer services shall be abandoned as follows:

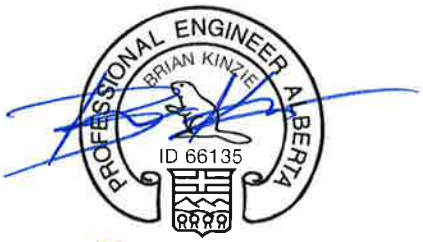
1) The service line shall be excavated and removed from the main to the property line.
2) If the service line is not completely removed within the property, the service line shall be cut at property line and the private service sealed with a watertight cap or plug if the service material is PVC. If the service line is composed of a material other than PVC, the service pipe shall be plugged with a non-shrink grout.
3) If the service material at the main is PVC, the terminated service shall be capped. If the service material is vitrified clay pipe (VCP) or other material, the stub shall be covered with a plastic cap. Capping of sanitary lines is preferred; grouting of pipe will be considered on a case-by-case basis by the Town Engineer.
4) If the service is a LPSS, the main stop shall be closed and a 300mm length of service pipe beyond the main stop shall be left in place and sealed with a watertight cap. If the service pipe is not removed on the private property, the curb stop shall be removed and the service pipe plugged with a plug with the same pressure rating as the pipe at least 300mm inside the private side of the property line.

SECTION 6 – STORMWATER

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 6" is made available for use in the Town of Canmore effective as of the date below:

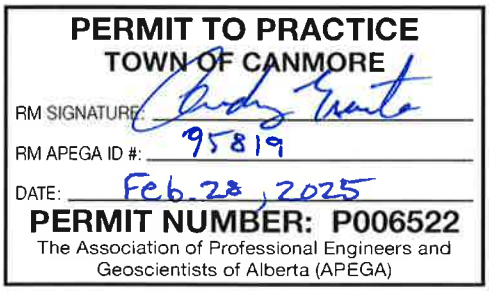
February 28, 2025



FEB. 28, 2025

Brian Kinzie, P.Eng.

Municipal Engineer



Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 6" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

6.0 Stormwater

It is important that Consulting Engineers and others treat these guidelines as a tool to assist them and not as a rulebook for stormwater management solutions. There are many site-specific issues that affect development and stormwater management planning. Although these guidelines provide practical and specific guidance, there must be flexibility to account for site-specific conditions. Stormwater management solutions are location dependent, and this must be recognized when applying the guidance provided in this document.

Stormwater should be treated as a resource. As opposed to the traditional capture, detain and release approach, Consulting Engineers are encouraged to harvest, reuse, and re-infiltrate stormwater as much as is practical to the site. Specific attention should be paid to the suitability of infiltration-based approaches in undermined lands.

Low impact development storm management and techniques should be used whenever practical, particularly reducing the imperviousness of the site. Please visit the following website for information about low impact development techniques: www.alidp.org. The Town encourages the use of distributed, low embodied carbon stormwater solutions such as bioretention facilities, raingardens and permeable pavements. While carbon intensive, traditional grey stormwater systems continue to play an important role in stormwater management, the multiple co-benefits offered by Low Impact Development solutions can be superior in terms of cost and performance.

Developers are encouraged to use stormwater systems that reduce the amount of manufactured infrastructure required. Developers are encouraged to harness the slope of the land. Where practical, natural materials and organics should be used as filtering media.

6.1 Reference Documents

A complete list of reference documents is provided in Section 1.

Consulting Engineers should refer to Stormwater management reports specific to respective developments (as part of area structure and area redevelopment plans, subdivision applications) as available from the Town or respective developer.

6.2 Conceptual Planning

6.2.1 Hierarchical Approach

Stormwater management planning for subdivisions and developments shall be based on a hierarchical approach. This entails working from the watershed to the sub-watershed to the subdivision and finally down to the site level. The hierarchical approach acknowledges the linkage and interdependence of community planning to stormwater management planning at all levels. This is particularly important when designing legal boundaries of new subdivisions. When subdividing large tracts of land, development teams are encouraged to seek out boundaries that complement the existing hydrology and existing stormwater aspect of the site. Parcel selection should complement the existing or planned infrastructure.

The following four key aspects of stormwater systems need to be addressed.

1) Quantity

In addition to reducing erosion implications, stormwater designs shall minimize the potential for downstream flooding and ponding. A wide spectrum of rainfall events shall be accounted for and it must be shown that smaller storms are kept on site as stipulated in this section.

2) Quality

Stormwater designs shall reduce contaminant loading from urban storm drainage to meet current removal requirements of City of Calgary.

3) Erosion and Sediment Control

All stormwater designs shall incorporate erosion and sediment control (ESC) measures as the City of Calgary standards.

Stormwater management shall be designed and constructed such that downstream erosion is prevented.

4) Hydrologic Cycle

Stormwater management in accordance with the principles of the hydrologic cycle is encouraged. Stormwater designs should try to mimic the original characteristics of the site hydrology. Please note that in some literature, this aspect of stormwater management is also known as base flow maintenance.

6.2.2 Design

Any stormwater system design shall meet the following standards, goals and plans:

- Comply with current editions of Alberta Environment, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage, the City of Calgary's Stormwater Management Design Manual and relevant City of Calgary Industry Bulletins such as the 2023 Stormwater Management Facilities (SWMF) and Miscellaneous Items.
- Identify trapped low areas and place caveats on affected lots
- Mitigate potential for downstream flooding and erosion as much as possible
- Conform to the relevant accepted stormwater management master plan for the area

In addition, Consulting Engineers are encouraged to:

- consider principles of sustainability discussed in this section.
- minimize the potential risks arising from stormwater system designs to persons and property within the development boundaries.
- minimize inconvenience caused by surface ponding and flooding
- reduce contaminant loading from urban storm drainage and industrial runoff discharges by the use of best management practices.
- design pretreatment and infiltration facilities to operate under cold climate conditions and to be protected from damage due to frost.
- not pump stormwater unless it forms part of a progressive system for rainwater harvesting or as otherwise deemed acceptable to the Town Engineer.
- grade lots in such a way that quantity and velocity of surface runoff is minimized, and infiltration and detention is maximized throughout the site (as is practical).

- include acceptable stormwater management techniques that direct runoff to an acceptable drainage system for lots that are lower than adjacent roadways.
- direct runoff from an event that cannot be feasibly infiltrated to an appropriate stormwater system.
- minimize runoff flowing onto / across pedestrian walkways or multi-use pathways as is practical.
- sustain a sites' pre-development hydrologic regime by using techniques that infiltrate, filter, store, and evaporate stormwater runoff close to its source, where feasible.
- utilize plants to support phytoremediation by helping to contain, degrade, or eliminate pollutants and mitigate contamination of soil, water, and air.

6.2.3 Stormwater Management in High Groundwater Conditions

In instances (developments and subdivisions) where high groundwater exists, the Town reserves the right to ask for a geotechnical investigation to address specific issues of groundwater including highest anticipated groundwater level and lowest footing elevation for each lot.

6.2.4 Stormwater, Grading and Landscaping Relationship

Developers and Consulting Engineers must be aware of the relationship between stormwater, grading and landscaping. These disciplines will need to work together. Stormwater management will dictate the grading, and landscaping will be dictated by both of these factors. Development teams are encouraged to bring these three disciplines together at the early stages of the project in accordance with the integrated planning and design approach to work towards a cohesive design. It is recognized that compromises may be required to maintain a balance with existing policies and guidelines.

6.3 Design and Construction of Stormwater Management Components

6.3.1 Runoff Coefficients

The average runoff coefficient shall be weighed according to the amount of each type of area tributary to a given inlet. Values of coefficients should be in accordance with standard values from the City of Calgary's *Stormwater Management Design Manual*.

6.3.2 Dual Drainage Concept

For all sites, storm drainage shall be designed on the basis of minor and major systems.

Minor systems include components such as roof leaders, gutters, lot drainage, catchbasins, underground pipe systems, and on-site infiltration. Minor systems provide a basic level of service by conveying flows during minor storm events. In Canmore, the 1:5-year, one-hour event shall be used for design of minor systems.

Major systems include components such as lot drainage, roads, gutters, and storage facilities. Major systems convey runoff from the extreme events in excess of the minor system capacity. In Canmore, the City of Calgary stormwater criteria shall be used for design of major systems. Extended-period modeling may be required for larger developments, as directed by the Town.

Provisions shall be made for overland drainage during frozen ground conditions or over-saturation of the infiltration zone where applicable.

6.3.3 Design of Small Sites in the Valley Bottom

Small (detached dwellings and duplexes) and intermediate developments located on the valley bottom shall generally follow a "treatment, then infiltrate" approach to deal with stormwater runoff. Stormwater details shown in Figures EDCG STM 6.2 Rain Garden: Full Infiltration (Typical Section) and EDCG STM 6.3 Typical Drainage Well should be used for infiltration of the site stormwater runoff.

6.3.4 Design of Large Sites

For sites 2.0ha and larger (or where required by the Town Engineer), an overland flow analysis shall be provided for all new subdivisions and for all redevelopment sites in Canmore. The Town will require detailed computer modeling to be carried out to define the complete system, including depth of flow and velocity along the conveyance route, as well as the behavior of trap-lows and their interaction with storm sewers. Stormwater runoff determination for all new areas shall be made using a unit area release rate approach unless otherwise specified in a Stormwater Management Master plan accepted by the Town.

6.3.5 Surcharged Pipe Storage

Surcharged pipe storage is discouraged in the Town of Canmore. However, with approval from the Town Engineer, storage tanks can be used. For example, Cultec Stormwater Chambers and Brentwood Industries StormTank Modules are acceptable for use on private property. For stormwater management on Municipal Improvements the Town prefers alternatives to storage tanks, such as a distributed approach to managing stormwater with LID facilities. If a storage tank is unavoidable, an adequately sized oil/grit separator shall be installed upstream and the storage tank shall be equipped with access points for inspections and sediment removal.

6.3.6 Infiltration Systems

Infiltration systems shall address and show the 100-year groundwater elevation, lowest parkade elevation, lowest floor elevation, lowest footing elevation and geotechnical infiltration rates as applicable. Infiltration systems shall be placed with a minimum of 0.6m clearance (from the lowest horizontal plane of the system) from the 100-year groundwater elevation, as is practical.

In redevelopments, the design should re-infiltrate the first 19mm/day of runoff in the 1:5-year event.

6.3.7 Infiltration Facilities

An infiltration rate of $8x10^{-4}$ m/s has typically been used in the lower valley area of Canmore, unless the site-specific geotechnical testing shows otherwise. An infiltration rate based on 24-hour sustained saturated condition, may be used to calculate infiltration area requirements. The rate shall be based on in-situ tests performed at the proposed infiltration site, or on conservative values based on similar soils and laboratory testing. A suitable reduction factor dependent on finished site conditions shall be applied to the infiltration rate to account for possible future sediment build up and clogging. Where the peak runoff rate is greater than the adjusted infiltration rate, buffer storage shall be provided.

Detention storage volume, where required for infiltration purposes, shall include only the drywell volume and effective porosity of the drain rock around the drywell that is located above the 1:100-year groundwater elevation. For infiltration tanks, the basin bottom and side area shall be used to calculate the required area. For drywells, the drain rock circumference times height shall be used to calculate the required area.

Pretreatment best management practices (BMP) shall be used to reduce solids input to an infiltration system and to capture hydrocarbons. In order to ensure adequate water quality treatment, the Consulting Engineer should select an appropriate Impervious to Pervious (I/P) ratio as described in the City of Calgary *Low Impact Development Guidelines Module 2 – Bioretention and Bioswales*.

In the wellhead protection zone, additional treatment to remove pollutants may be required by the Town. These treatment processes may include vegetative filters, sumps, detention storage, oil-grit-separators (OGS) etc.

Capability for inspection and maintenance (access ports and entrances) shall be provided for all infiltration facilities.

6.3.8 Stormwater Ponds

Detailed information on stormwater ponds shall be submitted to the Town with an application. See Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage System* for further information. Design and construction of stormwater ponds shall follow the latest edition of the City of Calgary *Stormwater Management & Design Manual* and the relevant sections of the Calgary Parks *Development Guidelines and Standard Specifications: Landscape Construction*.

The Consulting Engineer is encouraged to consider the role of source controls at the lot level which can achieve volume and peak flow reductions which may justify a smaller storm pond than would be required using traditional stormwater management techniques. The Consulting Engineer is also encouraged to contemplate integrating existing wetlands into the stormwater management facility.

Consulting Engineers are encouraged to utilize an Integrated System Approach to selection and design of stormwater ponds that balances stormwater management, habitat and biodiversity, and amenity and placemaking. Due to superior water quality treatment and potential for recreational, habitat and aesthetic value, wet ponds and engineered wetlands are preferred over dry ponds. Dry ponds may be contemplated under extenuating circumstances or where they are proposed to provide a recreational amenity and are designed to minimize nuisance ponding.

All stormwater ponds require the appropriate authorization from the Town and Alberta Environment prior to construction. Pursuant to Alberta's *Environmental Protection and Enhancement Act (EPEA)*, a registration is required for the construction of all stormwater ponds. The Consulting Engineer is responsible for preparing and submitting the required information to Alberta Environment subsequent to an authorization from the Town.

6.3.9 Outfalls

All stormwater runoff from subdivision and site development areas shall be managed prior to discharge for both water quality and quantity control to minimize the adverse impact on the environment.

Manufactured oil/grit separators are required to meet the performance specifications in the City of Calgary Stormwater Management & Design Manual, supplemented with specifications in the 2023 Industry Bulletin Stormwater Management Facilities (SWMFs) and Miscellaneous Items

Design of outfalls into any watercourse shall be submitted for review and acceptance by the Town, Fisheries and Oceans Canada (where required), and by Alberta Environment.

6.3.10 Culvert End Details

Culvert inlet and outlet details shall typically be constructed per the latest edition of the Alberta Transportation Highway Geometric Design Guide, as detailed in figure C-4.7, Hand Laid Rock Riprap. Also refer to Alberta Transportation's Highway Geometric Design Guide, Section C-4 for culvert installation guidelines.

The Consulting Engineer may request to exclude the installation of a clay seepage seal if they believe it would provide negligible benefit due to coarse granular native soils and intermittent flow. Such requests are subject to the approval of the Town Engineer.

Rock supplied for riprap shall be hard, durable, angular in shape, resistant to weathering and water action, clean and shall meet the following Class 1 gradation:

- 0% larger than 450mm
- 20–50% larger than 350mm
- 50–80% larger than 300mm
- 100% larger than 200mm

Small outfalls (300mm and smaller) with low outlet velocities may be proposed with smaller gradations.

Rip rap shall be placed on a geotextile.

6.3.11 Piped Systems

Storm sewers shall be designed as a separate sewer system. Effluent from sanitary sewers or any potentially contaminated drainage from industrial, agricultural or commercial operations shall not be discharged to storm sewers. Contaminated drainage means the introduction of any foreign or undesirable physical, chemical or biological substance into the environment which results in or is likely to result in deleterious effects.

Storm sewers shall be designed and constructed in accordance with the City of Calgary's *Stormwater Management and Design Manual* and the City of Calgary's *Standard Specifications Sewer Construction*.

The minimum size for a public storm sewer is 300mm diameter in low-density residential subdivisions and 375mm diameter in multi-family, commercial and industrial subdivisions. There is an exception to these minimum sizes for weeping tile roadway drains, which typically vary from 100mm to 250mm diameter.

Catchbasins shall be equipped with a 600mm-deep sump.

Town of Canmore – Storm solid covers or other covers as approved by the Town shall be installed on all storm manholes for municipal improvements on public property. Covers on oil-grit separators shall provide

some means of identifying the device. Covers labeled *Town of Canmore* are not to be used on private infrastructure.

6.3.12 Downspouts

Downspouts are to be constructed such that they:

1. Are directed away from neighbouring properties, structures, driveways and sidewalks;
2. Are directed towards absorbent landscape features;
3. Are a minimum of 2m away from any public infrastructure such as sidewalks, streets, lanes and alleys to reduce potential for icing.

6.4 Best Management Practices

Stormwater best management practices (BMPs) are methods of managing stormwater drainage for adequate conveyance and flood control that are economically acceptable to the community. Stormwater BMPs are management methods that retain as much of the natural runoff characteristics and infiltration components of the undeveloped system as possible and reduce or prevent water quality degradation.

Stormwater BMPs are normally looked at as five levels of control. All stormwater systems should address these five levels of control, as noted below. It is generally accepted that the cost of control measures increases as they get farther from the source. As such, the order in which these BMP control measures should be addressed is the same order in which they are listed below (starting closest to the source). In addition to the Town of Canmore *Stormwater Master Plan*, Consulting Engineers are encouraged to review the documents referenced in Section 1 of the EDCG for more details regarding these controls. All stormwater BMPs require acceptance by the Town.

6.4.1 Five Levels of Best Management Practices

To assist Consulting Engineers during their consideration of stormwater system designs, the Town notes that there are generally five levels of BMPs that are recognized:

1) Pollution Prevention

Pollution prevention involves public education, awareness and participation, in addition to regulations, enforcement, and application of bylaws. Developers should provide literature where applicable summarizing the private stormwater management system made available to the bodies that represent a conglomerate of units such as a condominium board. The literature should outline a recommended maintenance schedule along with a description of what type of inspections may be required.

2) Source Controls

Source controls are measures designed to minimize the generation and entry of pollutants into stormwater runoff. Emphasis is on non-structural and semi-structural measures applied at or near the source. Examples of source controls include:

- minimizing the sediment that is used in the winter for ice control.
- minimizing pollutant content for salt/sediment used on ice.
- catch basin cleaning.

- use of environmentally friendly de-icing agents.
- runoff separation: runoff that has not travelled across a vehicle carriageway may not require pretreatment and can be infiltrated directly into the ground.

3) Lot Level Best Management Practices

Lot level BMPs are practices that reduce runoff volumes and/or treat stormwater before it reaches a municipal conveyance system. These controls can be either structural or non-structural in nature and applied at the individual lot level or on multiple lots that drain a small area. Typically, these techniques would be implemented on individual dwelling lots or for small commercial/industrial lots.

4) Conveyance Best Management Practices

Conveyance BMPs are measures that mitigate the impacts of urbanization when conveying runoff such as promoting soil moisture replenishment, groundwater recharge and infiltration, where practical. Conveyance systems for both the minor and major systems shall be low energy overland flow where practical. Consulting Engineers are reminded that runoff needs to be of a quality so that it does not negatively affect the groundwater. Stormwater conveyance systems transport drainage from developed areas through sewer or grassed swale systems.

5) End of Pipe Best Management Practices

End of pipe BMPs provide flow attenuation, major flow conveyance, and water quality enhancement of stormwater before discharge into a receiving water body. A number of end-of-pipe alternatives are available for application depending on the characteristics of the upstream catchment, and the regulations and requirements for water quality in the receiving waters. End of pipe practices that provide extended detention reduce the rate of stormwater discharge by storing the stormwater runoff temporarily and releasing it at a controlled rate. Water quality treatment is provided through enhanced settling and biological processes.

6.5 Maintenance

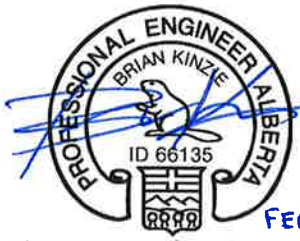
The Consulting Engineer is responsible for providing the Town with a suggested maintenance schedule for all treatment facilities on private lands as well as those on right-of-ways (ROWs). The maintenance schedule should suggest the frequency for replacement of filters for all components that are meant to filter runoff and for all filter mediums. There should also be a suggested schedule for the removal of sediment and any other maintenance requirements to ensure the treatment facilities are functioning properly with maximum efficiency.

SECTION 7 – TRANSPORTATION SYSTEMS

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 7" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

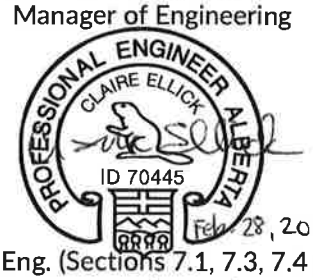


FEB. 28, 2025

Brian Kinzie, P.Eng. (Sections 7.5 and 7.6)
Municipal Engineer

Feb 28, 2025
ID 95819

Andy Esarte, P.Eng. (Section 7.2)
Manager of Engineering



Feb 28, 2025

Claire Ellick, P.Eng. (Sections 7.1, 7.3, 7.4 and 7.7-7.11)
Transportation Engineer

PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Andy Esarte, P.Eng.
Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 7" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

7.0 Transportation Systems

The Town of Canmore's 2018 Integrated Transportation Plan (ITP) provides strategic direction for how to accommodate current and future transportation needs in a manner consistent with the Municipal Development Plan (MDP). The Municipal Development Plan envisions a transportation network that accommodates multiple modes of travel through a Complete Streets approach (defined in section 4.5 of the ITP), and a trail network that prioritizes and encourages walking, cycling and transit use while accommodating private vehicles within a reasonable capacity. The MDP states the design of public systems, including roads, sidewalks, parks, pathways, lighting, landscaping and street furniture, should support and encourage walking and cycling modes of transportation for accessing the Town Centre and other commercial areas.

As directed by the MDP and ITP, Complete Streets and the active transportation network should address accessibility and connectivity for all ages and skill levels for each season of the year. This is referred to by the City of Calgary, and throughout this document as a 5A Network, or Always Available for All Ages & Abilities.

The transportation network envisioned in the MDP places added emphasis on streetscaping and the design of both private and public realm to nurture Canmore's unique sense of place. The MDP indicates the transportation network is intended to provide both movement but also be livable, providing places to be and gather. This is reflected in the ITP in section 4.5.2 Balance Place and Link and 5.2.3 A Unique Network of Connections & Places.

The ITP provides vision and guiding principles for the street network, active transportation network, traffic calming, transit service, and commercial goods movement. The ITP assesses network capacity in the Town Centre and has established a 2030 goal of 40% non-vehicular trip share to maintain a functional roadway network while accommodating growth. The ITP provides guidance for new development and roadway retrofits in support of this target.

The direction of the MDP, and recommendations of the ITP have informed development of the guidelines in this section for construction of roadways, pathways and developments. The Town has endeavored to align these guidelines with existing standards and legislation including Alberta's Traffic Safety Act, Transportation Association of Canada guidelines, and the Manual of Uniform Traffic Control Devices for Canada (MUTCDC), current editions. Where these guidelines and the EDCG fall short of providing sufficient detail to accomplish the principles of the ITP, design may be inspired by standards and designs of other jurisdictions, and best practice guidelines such as the BC Active Transportation Design Guide, with appropriate consideration for professional practice requirements in Alberta.

The information in this guide does not absolve private and public sector planners, architects or engineers from their duty to carry out due diligence when designing private and public infrastructure. This includes checking relevant standards, regulation, and legislation. The Engineer of Record is responsible for applying these guidelines to site specific context and to accept professional responsibility for any professional work product in accordance with the Engineering and Geoscience Professions Act.

7.1 Layout and Connectivity

7.1.1 General

The layout, street classification, and connectivity of a newly planned subdivision should result in outcomes broadly consistent with the vision and policy of the MDP and recommendations of the ITP.

Road and pathway networks should coincide with the layout shown under the applicable statutory document, for example Area Structure Plans, to ensure logical ties to adjacent subdivision areas.

Where a proposed subdivision or development site is not connected to the existing or planned active transportation and transit network, the developer is responsible for providing off-site connectivity to connect the development in accordance with MGA 650(1), and any relevant statutory documents.

7.1.2 Network Planning

The MDP states that the transportation network will provide capacity for the movement of people through seamlessly connected active transportation links, as well as 'Complete Streets', defined as streets prioritizing sustainable modes including walking, cycling and transit. Where additional travel capacity is required for the existing network, new walk, cycle and transit connections will be favoured over adding vehicle lanes.

The MDP under 13.1.3 Subdivision Design provides guidance for submissions to include the following, along with other considerations:

- limited direct driveway access onto arterial roads and major traffic routes;
- separation of pedestrian and cycle travel from vehicle traffic;
- pedestrian connections linking with the Town pathway and trail system, schools; recreation areas, and commercial activity centres;
- transit stops or planned locations for future transit stops.

The conceptual design of an area, whether at statutory/non-statutory plan preparation, or at the subdivision planning stage, is expected to consider the preservation of natural vegetation, natural grades and landscape features, in addition to transportation considerations. The conceptual design should demonstrate how natural features, natural grades and landscape features are preserved and integrate with transportation design elements. The conceptual design should allow for subdivision level design of roadways, pathways, and developments that provide direct connections to the local and community network for walking and cycling, safe and accessible grades, and consider requirements of maintenance and operation.

Per MDP 14.3.5, Transportation Impact Assessments (TIA) may be required to be submitted for development proposals, including area structure plans, land use bylaw amendments, and subdivision and large development permit applications. Walking, cycling and transit should be key considerations in all traffic impact assessments. Transportation Impact Assessments should be based on the City of Calgary's Transportation Impact Assessment Guidelines. Inputs into assessments should be supported by local statutory documents to establish trip generation and mode-share targets and incorporate Town approved data or data collected for the purpose of the assessment as may be required. Section 2.4.9 provides additional detail on TIA submission process and requirements.

Section 7.7 includes guidelines for off-street connectivity to the network.

7.1.3 Mixed-use Commercial Areas

Area plans may consider mixed-use commercial areas with a street-oriented pattern of development and may include higher quality pedestrian realms. This development pattern is typically characterized by buildings that are built to minimum setbacks with building entrances directly on the street. Per MDP 10.1.3, mixed-use commercial areas will have a strong pedestrian-oriented design with good connections to pathways and sidewalks. The EDCG includes design elements in support of MDP 10.3.2, which states that developments should include a high-quality design such as landscaping treatments, gathering places, and street furniture. Planning policy objectives of the MDP can be accomplished by emphasizing walking, cycling and transit facilities in these areas.

7.1.4 Residential Areas

Per 6.1.2 of the MDP, residential neighbourhood design should include the following key characteristics: provision of a safe pedestrian and cycling environment; neighbourhood nodes or activity centres to encourage community interaction and engagement and facilitate future local transit.

Per MDP 6.1.3, all residential areas should be integrated with the municipal commuter pathway system and connected to the trail system. Public trails or pathways should be provided on public property in general. Trails or pathways on private property that are intended for public use shall be protected by rights-of-way or easements that grant public access.

Low density residential developments should be laid out in a way that vehicle access to individual parcels is provided by way of local road, lanes, or private mews.

7.1.5 Pathway Network

Pathways network layout should conform to the latest edition of the Town of Canmore's Open Space and Trails Plan, Integrated Transportation Plan, relevant area plans and other statutory documents. The Town will endeavor to maintain alignment between these plans over time, particularly where they overlap, however each plan may have unique requirements. Where the plans are conflicting, the most recent plan should take precedence.

7.1.6 Walking and Cycling

The MDP 14.3.2 states that the movement of pedestrians and cycling should be integral in the design and reconstruction of the transportation network.

The MDP and ITP reference the use of both Complete Streets and a pathway network to separate people walking, using mobility devices, and cycling from vehicular traffic and to connect between origins and destinations including the transit network.

The design of facilities for walking and cycling should consider the following principles of an 5A Network as identified in section 5.2.1 of the ITP:

- Directness: provide direct access to and between various destinations for commuting, visiting, shopping, and other everyday activities.
- Safety: be both statistically safe and perceived as safe.

- Comfort: Ensure an enjoyable experience through features such as smooth surfaces, wide bicycle lanes, and spaces that promote social interaction and easy passing.
- Continuity: a seamless experience through intersections, with no breaks or dead ends.
- Attractiveness: streets that are quiet, clean, and aesthetic are more appealing than congested, noisy, and polluted ones.

Designs may achieve the above principles through a variety of approaches. The EDCG provides design details that address common situations such as typical cross sections and intersection designs. Where the EDCG does not address a location specific requirement, the MDP 14.1.1 states that designs shall meet, and are encouraged to exceed leading industry guidelines and standards and encourages designers to think creatively and harness local or site-specific advantages.

While vehicle trips may be accommodated through indirect travel routes, the network should be designed to be highly permeable for walking and cycling trips, and provide direct connections for walking and cycling and direct access to transit infrastructure. Where long unbroken blocks, crescents, and cul-de-sacs create barriers for travel, connections should be provided every 100m–150m, or where desire lines are best served. While it is preferred that connections are on public land, some circumstances may require access to be provided across private land. In such cases a public access easement should be provided.

Pathways outside of the road right-of-way may be planned to serve transportation or recreation requirements for an area or both. The provision of separate pathways will not replace the need to provide walk and cycle infrastructure within the road right-of-way.

End of trip facilities for cycling play an important role in connectivity and are addressed in Section 7.8.

7.1.6.1 Cul-de-sac, Crescents

A crescent or cul-de-sac should provide one or more 5.0m PUL or MR to provide walking and cycling connectivity, except where it can be demonstrated that there are no desire lines, and there will be no future connections within (or beyond) the area, for example where restricted by a wildlife corridor.

7.1.7 Public Transit

The MDP 13.1.3 Subdivision Design states that transit stops, or planned locations for future transit stops, should be incorporated into subdivision proposals to support good urban design.

The MDP 14.3.8 states that facilities to accommodate expansion of the public transit system should be considered in new development proposals.

New developments should incorporate a road network that supports transit operations by utilizing collector and arterial streets for transit routes. To maintain efficient service delivery and safety, transit routes are not to be planned for local roads, except when necessary to provide turnaround capability during interim phases of development. Where bus routes are planned on collector roadways, parking should be minimized to provide space for bus stops and allow efficient flow of bus traffic.

All collector and arterial roadways within new developments should provide adequate connectivity and designated turnaround points to support public transit bus movements and route continuity without the requirement to access on private property. This includes ensuring that buses have sufficient space for turning at the ends of collector and arterial roadways at all phases of development.

In areas where immediate bus service is not planned, developments should include the placement of signage at all planned bus stop locations on collector and arterial roadways to indicate that the area has been designed for potential future transit service. This will inform residents and visitors of future service plans, fostering awareness and readiness for transit integration. The signage may be integrated with other parking signage to minimize clutter.

To align with the requirements of the MDP, convenient 5A network walk and cycle connections should be provided between planned transit infrastructure and adjacent developments. Stops should be in located in pairs on the opposite sides of the road, in close proximity to road crossings. Rights-of-way should be designed to include the space required for future transit stops.

7.1.8 Emergency Access

Emergency access requirements will be reviewed as part of the development approval process. The City of Calgary's Fire Department Access Standard (2018) should be used as guidance for emergency access, in addition to other applicable guidelines (including the National Fire Protection Association 1140 Standard for Wildland Fire Protection), or as determined by the Canmore Fire Chief to appropriately meet standards of safety and the best interests of the community. Where a Wildfire Risk Assessment is required as part of an application, this document should provide recommendations for emergency access locations for the purposes of efficient evacuation and access by emergency services.

Maximum cul-de-sac and crescent lengths shall account for emergency access requirements, as outlined in NFPA 1140 and the Calgary Fire Department Access Standard.

7.2 Street Design

7.2.1 General

Designers may achieve the principles of the ITP through a variety of approaches. The EDCG provides specific details of design that address common situations such as typical cross sections and intersection designs. Designs should be adapted to site specific conditions, and existing network conditions, to align with principles of the ITP.

Where the EDCG does not address a location specific requirement, MDP 14.1.1 guidance states that designs shall meet, and are encouraged to exceed leading industry guidelines and standards and encourages designers to think creatively and harness local or site-specific advantages.

Road rights-of-way should be flat across the full cross section, notwithstanding minimum crossfall for drainage. In support of accessibility, active transport modes, transit operations and maintenance, grades of 6% or less in profile should be targeted. Maximum grades of 8% are permitted for local and collector roads, and 7% permitted on arterial roads where 6% or lower grades cannot practically be achieved.

The following guidelines are to be addressed in the design of streets, in addition to criteria outlined in Figure EDCG STR 7.1 Design Elements for Urban Thoroughfares.

Details related to signage can be found in Figure EDCG STR 7.11 Typical Street Sign Installation.

7.2.1.1 Public Realm

The space adjacent to vehicle lanes and any adjacent mountable elements is termed the public realm. This is the public space along a street where people can walk, cycle, sit, wait for transit and interact with each other. The public realm is comprised of:

- The boulevard (or furnishing zone) where infrastructure such as streetlights, benches, bike racks, and landscaping are located adjacent to the curb. The furnishing zone may be primarily hardscaped in busy commercial environments. Intermittent parking bays (Figure EDCG STR 7.7 Parking Bay) may also be accommodated within this space along local and collector roadways.
- The active transportation zone is located adjacent to the boulevard (or furnishing zone). This is the space where people can walk or cycle along a corridor, free of obstructions. The size of the active transportation zone that is required to accommodate pedestrians depends on the roadway classification and adjacent land uses, as outlined in the following sections. Active transportation zones should be clear of all obstructions, including space on each side of the hard surfaces that is clear of vertical hazards for travel and maintenance equipment.
- The frontage (or buffer) zone is located between the active transportation zone and building faces. It provides pedestrians with an offset from adjacent buildings, and provides clearance from doors opening outwards, ramps, stairs, enclaves, and other elements that aid in interfacing between the active transportation zone and the building and building access.

MDP 10.1.9 states the design of public systems, including roads, sidewalks, parks, pathways, lighting, landscaping and street furniture, should support and encourage pedestrian and bicycle modes of transportation for accessing the Town Centre and other commercial areas.

Details on how to accommodate these elements into various roadway classifications are outlined in Sections 7.3.2, 7.3.3 and 7.3.4, and Figures EDCG STR 7.2 Road Classification, STR 7.3 Local (ULU 50) Parking Both Sides Cross-Section, EDCG STR 7.4 Local Rural Parking Both Sides Cross-Section, EDCG STR 7.5 Collector (UCU 50) Parking Both Sides Cross-Section and EDCG STR 7.6 Arterial (UAD 50) No Parking Cross-Section.

Figure EDCG STR 7.23 On-street Bicycle Parking provides detail on the positioning of bike racks within public spaces. Bicycle racks positioned within road right-of-way should ensure that parked bicycles can be accommodated within the furnishing zone, and do not encroach on the active transportation zone. Racks placed adjacent to motor vehicle parking should be placed between parking stalls to avoid conflict with opening doors.

7.2.1.2 Walking

Where specific pedestrian design requirements are not addressed in the EDCG, universal design principles of the Accessibility Design Guide, GoA, should be adhered to for all elements of the pedestrian realm, to facilitate year-round access to public infrastructure and spaces.

Sidewalks should be continuous across all access points and intersections and maintained at a grade elevated from the roadway. Exceptions may be made to accommodate flow of emergency services and transit vehicles, or where local conditions may preclude maintaining a continuous facility.

Next to parking bays, sidewalks should be constructed monolithically with the curb and gutter adjacent to the parking bay. When a midblock pedestrian crossing is required, it should be placed where there are no

parking bays, such that sightlines are maintained and the maximum distance crossed by a pedestrian is the width of the travel lanes.

Planning and design of the pedestrian realm is related to anticipated levels of pedestrian activity within different contexts and based on adjacent building orientation and location, and land uses. See specific road design by classification for guidance on widths.

Details particular to the design of sidewalks and pathways can be referenced in Figure EDCG STR 7.13C Patterned Concrete Buffer Detail, Figure EDCG STR 7.16 Tactile Warning Plates (at Curb Ramps), Figure EDCG STR 7.17 Expansion Joint Layout, and Figure EDCG STR 7.18 Crosswalk and Elephants Feet Pavement Markings.

7.2.1.3 Cycling

Cycle paths should be unidirectional. There may be certain contexts under which a section of bidirectional cycle path may be considered to accommodate connectivity and desire lines, however this should be established early in the planning process to minimize or eliminate conflicts with intersections, driveways and accesses.

Cycle paths should be separated from the driving surface with space to accommodate buffering, parking, snow storage, lighting, landscaping and transit stops. Where parking bays are constructed adjacent to separated cycling infrastructure, a minimum hard-surfaced buffer of 0.6m should be provided from the back of curb to the edge of the cycling facility.

Cycle paths should be maintained at a grade elevated from the roadway and should be continuous across all access points and intersections. Cycle paths at intersections may be at street level, crossing roadway asphalt, and delineated by pavement markings, where vehicle traffic is given priority, for example where it is desired to accommodate flow of emergency services and transit vehicles.

Cycle paths should be broom-finished, pigmented red colour saw-cut concrete, or red pigmented asphalt. A buffer should be provided between cycle paths and sidewalks along collector and arterial roadways. See Figure EDCG STR 7.13C Patterned Concrete Buffer Detail for specifications.

Where a separated cycling facility intersects with another separated cycling facility or pathway, a minimum corner radius of 2.5m should be provided.

Utility appurtenances should be located outside of bikeways and paved shoulders accessible to cyclists. Appurtenances within these areas should be “cycle-safe” models with top elevations set flush with the surrounding pavement surface.

7.2.1.4 Public Transit

New transit stops should be designed in accordance with Figure EDCG STR 7.8 Bus Stop Layout.

Transit infrastructure should meet universal design principles of the Accessibility Design Guide, GoA, including connections to adjacent walking and cycling infrastructure.

New transit stops should include an accessible concrete pad, and lighting. For stops that are to be put into use at the time of development, the stop should also include a shelter, garbage and recycling bin, bench, "next bus" signage and bicycle parking. Widened road right-of-way, public utility lots or municipal reserve

may be required for the accommodation of a transit stop, and as such should be considered at each stage of the approvals process.

Where transit operations will interact with cycling infrastructure, best practices in cycling design should be applied. Physically separated cycling facilities should be accommodated by means of a bend-out design, where they are not already separated from the curb by a boulevard, to ensure continuity of cycling movement and the avoidance of conflict with passengers boarding and alighting the bus. The bend out design requires the cycling facility to be behind the entire bus stop pad (including passenger waiting area, bike racks and shelter). Tactile walking surface indicators (specifically tactile direction indicators) should be provided for pedestrians to be able to locate the transit stop from the sidewalk. Detectable warning surfaces should be provided on both sides of the cycling facility where people accessing transit are required to cross the cycling facility.

7.2.1.5 Parking

Parking should be provided on local and collector roads only and should not be included in the design of arterial roadways.

Where barrier-free stalls are provided on-street, access to the sidewalk is to be provided in accordance with the Accessibility Design Guide, GoA, so as not to require any travel in a vehicle lane by a person using a mobility device. This may require adjustments to the standard cross section to accommodate additional sidewalk width.

The provision of on-street parking should be limited to parking bays. Parking bays may be interspersed with access points, street trees, landscaping and street lighting and should typically accommodate a maximum of five vehicles. Each bay should be separated from travel lanes by a concrete invert crossing. Standard or rolled curb with reverse gutter should be used between the edge of a parking bay and any adjacent sidewalk. Design details for parking are outline within respective road designs based on classification.

Signage design for on-street parking is to be developed as part of roadway design, with Town input for regulations (permitted use, time restrictions, and pricing), and included in development submissions.

7.2.1.6 Intersections and Mid-block Crossings

Intersecting roads should be as near to 90 degrees as possible to allow for safer turn movements, shorter crossings, and to maximize sightlines. Intersections on the inside of curves are undesirable as they can reduce visibility, make turning more difficult, and can reduce safety, and should be avoided wherever possible. Access is to be considered at time of network planning as outlined in Section 7.4 Access Management and Design.

Intersection corner radii should be designed to the minimum value as demonstrated to operate acceptably by a transportation engineer. Design vehicles must be able to turn from inside lane to inside lane without encroaching on adjacent lane configurations. Control vehicles may have larger turn radii than design vehicles and may be accommodated using aprons. Encroachment into adjacent lanes may be permitted in areas of low traffic, for example on local roads.

Emergency vehicles must be able to physically manoeuvre between fixed objects on all corners but are permitted to use the entire pavement width. In addition to the design and control vehicles below,

intersection geometry should include accommodation for walking and cycling and should adhere to universal design principles.

Intersection right-of-way should accommodate infrastructure and geometry for walking and cycling facilities appropriate for the road classifications and street design.

Separate signals for walking and cycling should be included at all signalized intersections where walking and cycling facilities are present.

When a midblock pedestrian crossing is required, it should be placed where there are no parking bays to limit crossing distance to the width of the travel lanes. In retrofit situations, as an interim measure, precast concrete can be utilized to create safe mid-block crossings and for other traffic calming measures. Details for precast concrete medians are provided in Figure EDCG STR 7.20A Precast Concrete Median 600mm - 1500mm, Figure EDCG STR 7.20B Precast Concrete Median 2000mm – 3000mm, and Figure EDCG STR 7.20C Precast Concrete Median Anchoring Details.

7.2.1.7 Utility Rights-of-way

A 3.5m-wide utility right-of-way should be provided on both sides of road rights-of-way to accommodate utility requirements except where it can be demonstrated that utility requirements can otherwise be accommodated through laneways. Other street and utility designs may be approved by the Town provided utility requirements are adequately accommodated.

7.2.2 Local Roads

Local roads provide direct access to abutting residential properties. They collect and distribute trips from residential properties to collector roads and the pathway network (see Figure EDCG STR 7.3 Local (ULU 30) Parking Both Sides Cross Section).

Use of the EDCG local road cross sections, raised crossings, raised intersections, and continuous sidewalks is expected to result in a typical driver speed at or below the 30km/h posted maximum. Provided the details of the EDCG are applied, additional engineering consideration with respect to design speed is not required.

Where local roads serve local traffic only, with low density housing and a limited number of units, the Town may direct the use of a rural cross-section, as shown in Figure EDCG STR 7.4 Local Rural Road Parking Both Sides Cross-Section, and other changes to the standard local road cross-section as may be appropriate for the context.

Table 7-1 provides a summary of design values for local roads. More context regarding the application of these values can be found in the sections following.

Table 7-1: Local Road Quick Reference Table

Design Element	Value
Right-of-Way Width	15.3m
Target Road Capacity	2000 vehicles per day
Design Speed	30km/h

Posted Speed	30km/h
Driving Surface Width*	6.0m
Sidewalk Width	1.8m
Boulevard Width	2.2m
Median separation/painted centre line	No
Parking Bay Width**	1.95m

*Measured from face-of-curb
**Measured from back of concrete invert crossing to face-of-curb (see Figure EDCG STR 7.3 Local (ULU 50) Parking Both Sides Cross-Section)

7.2.2.1 Walking

Local roads should have a minimum 1.8m wide broom-finished, trowelled, natural colour concrete sidewalks on both sides. Next to parking bays, sidewalks should be constructed monolithically with the curb and gutter adjacent to the parking bay with a minimum width of 2.3m to incorporate a door swing zone.

Sidewalks should be separated from driving surfaces by a curb and gutter and by a minimum 2.2m wide boulevard.

7.2.2.2 Cycling

Cycling on local roads will be accommodated in shared-use lanes. Where volumes are at or below 1000 vehicles per day, local roads may be used as connections to the cycling network. For network continuity, unless physical separation of the cycling facility from the vehicle lanes is provided, local roads should not be relied on beyond local connectivity.

7.2.2.3 Parking

On-street parking is encouraged on both sides of local roads within parking bays.

7.2.2.4 Access and Intersections

Where safe to do so, local road access to local and collector roads should be controlled through appropriate regulatory signage, as determined by a transportation engineer.

Traffic calming measures, such as raised crossings and raised intersections, EDCG Figure SRT7.14 Typical Raised Intersection, should be considered for use at all intersections and crossings. Additional design attention may be required in areas with higher volumes of pedestrian activity, and areas where speed compliance may be a concern.

Table 7-2 outlines design and control vehicles for local roadways. For further details on the design vehicles below, refer to TAC GDG Section 2.4.

Table 7-2: Design Vehicles by Roadway Classification

Street Classification	*Design Vehicle	**Control Vehicle	Control Vehicle Allowable Encroachments
Local Road	Passenger Car	Waste Collection Truck, School Bus, Fire (Ladder) Truck, Medium Single Unit Truck	Maneuver within hard surfaced areas. Wheel-tracking limited to paved road including adjacent gutters and mountable elements. Minimum 0.3m clearance from body overhang to vertical obstructions outside of clear width driving surface.

*The design vehicle is the most common vehicle to use the street. The goal is for these vehicles to keep turn speeds below 15km/h.
**The control vehicle is the largest vehicle that will occasionally use the street. This vehicle can make turns at very low (or "crawl") speeds and is expected to turn over mountable elements or enter the lane adjacent to its lane of origin. Turn speeds should be set to 2-8km/h. Field testing may be necessary as software can be inaccurate at lower speeds.

7.2.3 Collector Roads

Collector roads collect and distribute trips from residential, commercial and industrial areas. They distribute travel from neighbourhood to neighbourhood within the community and serve secondary trip generators, such as schools, community business centers, parks, sports fields, etc. Public transit may operate along collector roads within the community (see Figure EDCG STR 7.5 Collector Parking Both Sides Cross-Section).

Travel lane widths for collector roads should be 3.55m to the face-of-curb where two opposing travel lanes are adjacent. Where there is separation between opposing travel lanes, minimum lane widths of 3.25m (face of curb to face of curb) are acceptable provided there will be no mirror overhang into adjacent walking/cycling refuge space by design or control vehicles.

There may be cases where right-of-way adjustments are necessary on collector roadways that include horizontal curvature, to allow for rollover zones at the back of curb to accommodate control vehicles, while ensuring no encroachment into, or reduction of, the public realm.

Depending on context, the Town may direct the use of a rural cross-section for collector roadways per Figure EDCG STR 7.5 Collector Parking Both Sides Cross-Section, modified as may be required for context.

Table 7-3 provides a summary of design values for collector roads. More context regarding the application of these values can be found in the sections following.

Table 7-3: Collector Road Quick Reference Table

Design Element	Value
Right-of-way Width	22.0m

Target Road Capacity	2,000 to 10,000 vehicles per day
Design Speed	30km/h
Posted Speed	30km/h
Travel Lane Width*	3.25-3.55m
Sidewalk Width**	
Residential areas	1.8m
Adjacent to schools, loading zones, and commercial development	2.5m
Boulevard Width	2.8m
Unidirectional Cycle path Width	2.3m Typical Cross Section
Median Separation/Painted Centre Line	No
Parking Bay Width***	1.95m

*Measured from face-of-curb
**Except where adjacent to on-street parking, or fronting onto mixed-use commercial development (see Walking section)
***Measured from back of concrete invert crossing to face-of-curb

7.2.3.1 Walking

Collector roads should have a minimum 1.8m, broom-finished, natural-colour concrete sidewalk on both sides. 2.5m or wider sidewalks should be considered adjacent to mixed-use or commercial areas, loading areas, and school zones.

Where sidewalk width varies from the standard cross section, the boulevard width may be adjusted to suit.

Crosswalks should be placed where there are no parking bays, such that the maximum distance crossed by a pedestrian is the width of two travel lanes (7.1m face-of-curb to face-of-curb).

7.2.3.2 Cycling

On collector roadways, unidirectional cycle paths have an ideal width of 2.5m where space allows to accommodate side-by-side cycling. Otherwise, unidirectional cycle paths should be a minimum width of 2.3m. Where the cross-section is constrained, typically in retrofit situations, a minimum width of 2.0m should be provided.

Bi-directional cycle paths should be avoided where conflicts with access and intersections exist. Bi-directional facilities have an ideal minimum width of 3.0m where space permits and a minimum width of 2.5m. Wider facilities may be required based on local context or area planning.

7.2.3.3 Public Transit

Transit stops may be accommodated within travel lanes along collector roads. On collector roads, a layby should be provided for within the right of way at stops with higher ridership, and every three to four stops to facilitate traffic flow.

7.2.3.4 Parking

On collector roads, parking bays may be placed on one or both sides of the street depending on right-of-way availability and expected use.

7.2.3.5 Access and Intersections

Table 7-4 outlines design and control vehicles for collector roadways. Control vehicles may have larger turn radii than design vehicles and may be accommodated using aprons Control vehicles should not cross the centreline of the intersection approach. Emergency vehicles must be able to physically manoeuvre between fixed objects on all corners but are permitted to use the entire pavement width. For additional information on access, refer to Section 7.4 of the EDCG.

For further details on the design vehicles below, refer to TAC GDG Section 2.4.

Table 7-4: Design Vehicles by Roadway Classification

Street Classification	*Design Vehicle	**Control Vehicle	Control Vehicle Allowable Encroachments
Collector Road	Single-unit Bus, Passenger Car	School Bus, Fire (Ladder) Truck, WB-21	Maneuver within clear width driving surface without encroachment into oncoming traffic. Wheel-tracking limited to paved road including adjacent gutters and mountable elements. Minimum body overhang clearance of 0.3m to approach centreline, and vertical obstructions outside of clear width driving surface.

*The design vehicle is the most common vehicle to use the street. The goal is for these vehicles to keep turn speeds below 15km/h.
**The control vehicle is the largest vehicle that will occasionally use the street. This vehicle can make turns at very low (or "crawl") speeds and is expected to turn over mountable elements or enter the lane adjacent to its lane of origin. Turn speeds should be set to 2-8km/h. Field testing may be necessary as software can be inaccurate at lower speeds.

7.2.4 Arterial Roads

Arterial roads facilitate mobility and longer distance travel, and provide connectivity throughout the community, and the Provincial highway network. Arterial roads serve the major trips between principal areas of trip generation generally with relatively few controlled access points. Transit is expected to operate along arterial roads within the community (see Figure EDCG STR 7.6 Arterial [UAD 50] No Parking Cross-Section).

Table 7-5 provides a summary of various design values for arterial roads. More context regarding the application of these values can be found in the sections following.

Table 7-5: Arterial Road Quick Reference Table

Design Element	Value
Right-of-way Width	30.0m
Target Road Capacity	10,000 - 15,000 vehicles per day
Design Speed	50km/h
Posted Speed	50km/h
Travel Lane Width*	3.25-3.55m
Sidewalk Width:	
Commercial or high-activity areas	3.0m
Pedestrian-oriented** roadways	2.5m
Non-pedestrian-oriented roadways	1.8m
Boulevard/Furniture Zone Width	3.0m
Unidirectional Cycle path Width	2.5m ideal, 2.0m constrained
Median Separation/Painted Centre line	Yes
Parking Bay Width***	-

*Measured from face-of-curb
**Pedestrian-oriented roadways feature buildings that front onto or have pedestrian access within 4.0 m of road rights-of-way
***Measured from back of concrete invert crossing to face-of-curb

7.2.4.1 General

Travel lane widths for arterial roads should be 3.55m to the face-of-curb. Where there is separation between opposing travel lanes, and under constrained conditions, minimum lane widths of 3.25m between curb faces may be considered, providing that it can be demonstrated that there will be no mirror overhang into adjacent walking/cycling refuge space by design or control vehicles.

Median separation should be provided intermittently along arterial corridors including to provide refuge at all pedestrian crossing locations and to accommodate turn bays at intersections. Emergency access must be considered in the layout and frequency of medians, to allow emergency vehicles opportunities to pass queued traffic.

There may be cases where right-of-way adjustments are necessary on arterial roadways with horizontal curvature to allow for rollover zones at the back of curb to accommodate control vehicles, while ensuring no encroachment or reduction of the public realm.

Depending on context, the Town may direct the application of a rural cross-section for arterial roadways, modified as may be required for context. See Figure EDCG STR 7.6 Arterial (UAD 50) No Parking Cross-Section.

7.2.4.2 Walking

Arterial roads should have a 2.5m broom-finished, natural-colour concrete sidewalk on both sides. 3.0m or wider sidewalks should be considered adjacent to commercial areas or high-activity areas, and 1.8m sidewalks may be considered in areas of low pedestrian activity.

Sidewalks should be separated from curb and gutter by a minimum 3.0m wide boulevard or furniture zone. Where sidewalk width varies from the standard cross section, the boulevard width may be adjusted to suit. In a commercial or high-activity street the furnishing zone may be predominantly hardscaped.

Marked pedestrian crossings should include median refuge islands (EDCG drawing *STR 7.15 - At Grade Crossing with Median Refuge*) that allow pedestrians to cross one direction of travel at a time.

Crosswalks should be placed where there are no parking bays, such that the maximum distance crossed by a pedestrian is the width of two travel lanes (7.1m face-of-curb to face-of-curb).

7.2.4.3 Cycling

Cycling should be accommodated on unidirectional and continuous cycle paths. Unidirectional cycle paths should be an ideal minimum width of 2.5m to accommodate side-by-side cycling. Where the cross-section is constrained, typically in retrofit situations, a minimum width of 2.0m should be provided. Bi-directional cycle paths should be avoided where conflicts with access and intersections exist. Bi-directional facilities should have an ideal minimum width of 3.0m and a minimum width of 2.5m. Wider facilities may be required based on local context or area planning.

7.2.4.4 Public Transit

Transit is expected to operate along all arterial roads within the community. Transit stops may be accommodated within travel lanes along arterial roads, however a layby should be provided for within the right of way at all major destinations, and at a minimum each two to three stops to facilitate traffic flow.

7.2.4.5 Parking

On-street parking will not be provided along arterial roads.

7.2.4.6 Access and Intersections

Table 7-6 outlines design and control vehicles for arterial roadways.

Design vehicles should be able to turn from inside lane to inside lane without encroaching on adjacent lane configurations. Control vehicles may have larger turn radii than design vehicles and may be accommodated using aprons or space from adjacent lanes where deemed appropriate by a transportation engineer, and to the satisfaction of the Town. Control vehicles should not cross the centreline of the intersection approach.

Emergency vehicles must be able to physically manoeuvre between fixed objects on all corners but are permitted to use the entire pavement width.

For further details on the design vehicles below, refer to TAC GDG Section 2.4.

Table 7-6: Design Vehicles by Roadway Classification

Street Classification	*Design Vehicle	**Control Vehicle	Control Vehicle Allowable Encroachments
Arterial Road	Single-unit Bus and Passenger Car	School Bus, WB-21, Fire (Ladder) Truck	Maneuver within clear width driving surface without encroachment into oncoming traffic. Wheel-tracking limited to paved road including adjacent gutters and mountable elements. Minimum body overhang clearance of 0.3m to approach centreline, and any other vertical obstructions outside of clear width driving surface.

*The design vehicle is the most common vehicle to use the street. The goal is for these vehicles to keep turn speeds below 15km/h.
**The control vehicle is the largest vehicle that will occasionally use the street. This vehicle can make turns at very low (or "crawl") speeds and is expected to turn over mountable elements or enter the lane adjacent to its lane of origin. Turn speeds should be set to 2-8km/h. Field testing may be necessary as software can be inaccurate at lower speeds.

7.2.5 Lanes

Lanes provide the following functions in the Town's transportation system:

- Access between residential, commercial or mixed-use properties and the adjacent roadway network
- Emergency access

Lanes are to meet the following design parameters:

- Lanes shall have a minimum 6m clear space for travel lanes and should be for emergency response where abutting development.
- The entire lane width shall have a load bearing capacity of 38,556kg (85,000lbs.) or greater.
- All newly constructed lanes should be paved.
- Lanes in existing areas that provide access to commercial land, parkade entrances or development fronting onto the lane should be paved.

Parking is not allowed within the travel lanes of a lane.

The layout of lanes should be designed to prevent possible shortcutting, which could result in requirements for gates.

Maximum lengths of lanes between exits to streets should not exceed 175m, unless pedestrian connectivity to adjacent roads and pedestrian facilities is provided per Section 7.1.6, in which case the maximum permitted length of lane is 350m.

7.2.6 Private Mews

Private mews are privately owned roadways that provide an alternative to lanes or local roads. They are recommended for new developments where access is required for rear-facing units or other unique circumstances where a lane would be inadequate, but a full local road cross-section is already provided to the front of the property or is otherwise undesired.

Private Mews should meet the following design parameters:

- 9m corridor or larger
- 20km/hr travel speeds
- Shared space with cycling
- Shared space or separate 1.8m sidewalk
- Pedestrian level lighting
- Hard surface travel areas, with a minimum of 6m of clear space for travel lanes
- Where designed as emergency access, have a load bearing capacity of 38,556kg (85,000lbs) or greater and provide appropriate emergency vehicle egress

Public utilities for serving adjacent properties must not be constructed in a private mews.

7.2.7 Emergency Access Roads

Emergency access roads provide secondary access and are typically utilized during an emergency. They are otherwise closed to all public traffic but should allow for pedestrian and cycling connectivity. Vehicle access from properties abutting an emergency access road is not permitted.

Typically, lanes and roads are favoured over emergency access roads in order to reduce assets requiring maintenance and to eliminate the need for gates and bollards. A multi-use pathway or other pedestrian facilities of sufficient width may serve as an emergency access if the area served is limited, and traffic volumes and potential conflicts during an emergency are expected to be low.

Emergency access roads are to meet the following design parameters:

- The road shall have a paved width of 6m with a load bearing capacity of 38,556kg (85,000lbs) or greater, unless otherwise approved by the Fire Chief.
- Curves in emergency access roads should be designed to provide sufficient width to accommodate the largest piece of fire apparatus available, a Bronto Fire Truck, with an overall length of 13.93m, overall width of 2.6m and curb to curb turning radius of 11.36m. The swept path for this design vehicle shall be demonstrated to be maintained within the proposed road surface (utilizing the full road width as needed).
- Lands for emergency access roads should be dedicated as municipal road right-of-way.
- The full width of the of the emergency access roadway surface should be set at or above the 1:200 year flood elevation when located in overland flood areas.

See Figure EDCG STR 7.21 Swinging Emergency Gate Access, and Figure EDCG STR 7.19 RLP Bronto 230WB Turn Radius Diagram for details related to the design of infrastructure for emergency services.

Parking is not allowed within the right-of-way of an emergency access road.

7.3 Vehicle Access Management and Design

7.3.1 General

Vehicle accesses should be located and designed to minimize conflicts with pedestrians, cyclists, transit and between motor vehicles. Vehicle access widths should be minimized to reduce the conflict area where motor vehicles drive across active transportation facilities. Emphasis should be placed on preserving or enhancing the character of the street and the pedestrian realm through the design of access.

Separation distances between accesses and intersections should be maximized, and should align with opposing access points to the street. Where possible, it is encouraged to consolidate access between sites to minimize the number of intersections along the fronting road. Beyond requirements for emergency access, multiple access points to an individual site should be avoided.

In areas expected to generate higher traffic volumes, including mixed-use development and medium to high density residential uses, including any rear-fronting developments, vehicle access should be provided via lanes or private mews and by way of consolidated access, rather than fronting driveways to individual units.

In areas expected to generate lower traffic volumes including low density residential areas, front driveway accesses to the adjacent local roadway may be considered if permitted in the LUB.

In residential areas that feature rear-fronting developments, access for walking, cycling and driving should be provided via lanes, or private mews.

For development sites that front onto collector roads and flank lanes, private mews, or local roads, access should be provided from those facilities, rather than the collector road.

Direct access to an arterial road shall not be permitted, except where no other access is available. Where access to an arterial road is permitted, adequate space must be provided on site to ensure that all motor vehicles (including waste, loading, and passenger vehicles) are able to exit the property facing forward.

Vehicle access design should not impede continuous, uninterrupted sidewalks and pathways at any point of travel. Typical details of how access across continuous sidewalks and pathways may be achieved are provided in Figure EDCG STR 7.12 Ramp Layout, Figure EDCG SRT 7.12A “Bend Out” Driveway Crossing Plan View, Figure EDCG STR 7.12B “Bend Out” Driveway Crossing Section View, Figure EDCG STR 7.13A “Bend In” Driveway Crossing Plan View, and Figure EDCG STR 7.13B “Bend In” Driveway Crossing Section View.

Offset intersections are generally discouraged but may be considered on a case-by-case basis along residential streets if the offset is 60m or greater between centrelines, subject to review and approval the Town.

7.3.2 Waste Collection and Loading

Where loading is required to support a commercial use, accommodation of loading activities should occur either on site or within a lane and must not require blocking of sidewalks, cycling facilities, vehicle lanes, on-street parking, or any other element within the road right-of-way.

Development sites that require on-site waste collection should demonstrate that waste collection vehicles can turn around on-site to avoid reversing into the adjacent street.

7.3.3 Active Transportation Facilities

The following considerations should be made when designing access across active transportation facilities:

- The sidewalk and cycle path surface should maintain their longitudinal grade (no ramping) as they intersect with the driveway surface.
- The cross-slope of the sidewalk and cycle path should be designed to a maximum of 2% where the driveway crosses them, and a maximum of 1% where a longitudinal grade of 1.5% or greater exists.
- The sidewalk and cycle path should be maintained in the same surface material through the driveway.
- Where a cycle path, or multi-use pathway exists, aprons of minimum 0.6m and up to 2.0m width should be provided on roadway side of the driveway, and a minimum of 2.0m on the development side of the driveway, in a contrasting material on both sides of the sidewalk and cycle path to emphasize the crossing location.
- At high volume driveways and minor intersections, the cycle path will be set back between 5.5m and 6.0m per Figure EDCG STR 7.12A “Bend Out” Driveway Crossing Plan View.
- Where road elevation and site grading permit, the driveway surface should ramp up to cross the sidewalk and path, and ramp down on the far side of the sidewalk and path. Designers should consider ramp slope and length to effectively reduce vehicle speeds without resulting in vehicles bottoming out.
- Tactile warning indicator plates are required on the sidewalk at both edges of the driveway crossing, as illustrated in Figure EDCG STR 7.12A “Bend Out” Driveway Crossing Plan View and Figure EDCG STR 7.13A “Bend In” Driveway Crossing Plan View.

7.3.4 Public Transit Considerations

A space of 10m should be provided between a transit stop and the nearest perpendicular edge of drive lane of an access. Access design should not impact existing or planned transit stop locations unless a change to that location is addressed through the development approval process.

7.3.5 Grades and sightlines

Accesses should not exceed maximum slopes as identified in the “Driveway Grades” detail in the City of Calgary’s Roads Construction Standard Specifications.

Sightlines for any access are to meet the requirements of the latest version of the Transportation Association of Canada’s Geometric Design Guide for Canadian Roads. Sightline evaluations should be provided where an access is proposed along a vertical or horizontal curve, where a roadway includes existing or future dedicated cycling facilities as identified in the ITP, and/or where existing street furnishings (including bus stop, trees, advertising signage, fences, retaining walls or buildings) may restrict clear sightlines at the proposed access location.

7.4 Pathway Design

7.4.1 Multi-use Pathway Sizing and Separation of Walking and Cycling

Threshold levels for determining pathway widths and when walking and cycling volumes warrant separation are provided in Table 7-7 below. Estimated volumes are to be provided through a Transportation Impact Assessment, based on the expected corridor volumes and area plan requirements.

Table 7-7: Guidance on Pathway Separation

User Ratio for Separation	Typical peak daily volumes for various pathway widths (people)*		
	3.5m	4.0m	4.5m or greater or separation
>20% of people using the path are walking	Up to 1200	Up to 1400	1400+
<20% of people using the path are walking	Up to 1750	Up to 2000	2000+

*Typical peak daily volumes should be calculated using the average of peak day of the week use during peak season (typically June–August, though may vary depending on location).

7.4.2 Multi-use Pathway Design

Multi-use pathways are typically gravel/clay or asphalt surface paths for combined walking and cycling. Widths and surfacing of multi-use pathways will typically be defined in the OSTP, ITP and statutory planning documents.

Where part of the 5A Network, pathways should be a minimum 3.5m asphalt surface in accordance with EDCG STR 7.9 Typical Multi-Use Path Cross-Section - Asphalt Surface.

Where a pathway is part of an unmaintained pathway network, a clay-gravel mix may be used in accordance with EDCG STR 7.10 Typical Multi-Use Path Cross-Section - Gravel/Clay Surface.

Pathways should be protected from root intrusion and associated damage as illustrated in the figures listed above. In designing root protection, consideration should be given to site specific conditions. In cases where the Town determines that root damage is not expected to occur, root protection may be excluded.

Pathways should be separated from the road by a minimum of 2m and should be above or equal to the road elevation at centreline, particularly at crossings, driveways and accesses. See Section 7.4 of the EDCG and Figure EDCG STR 7.12 Ramp Layout, Figure EDCG SRT 7.12A “Bend Out” Driveway Crossing Plan View, Figure EDCG STR 7.12B “Bend Out” Driveway Crossing Section View, Figure EDCG STR 7.13A “Bend In” Driveway Crossing Plan View, and Figure EDCG STR 7.13B “Bend In” Driveway Crossing Section View for more details.

7.4.2.1 Drainage

Where practical, pathways are preferred to be oriented and cross sloped in a way that takes advantage of sun exposure to promote melt of ice and snow. In sloped areas, particular care in design of drainage will be required to avoid sheet flow across pathways, ice build-up and erosion. Point drainage and outfall

locations should avoid draining immediately upslope of pathways unless drainage measures are provided to carry flows away from or under the path surface.

7.4.2.2 Pathway Intersection Design

Pathways should intersect at as close to 90 degrees as possible, with a clear hierarchy between the through pathway and the connecting pathway, along with appropriate yield signage or pathway markings or both as required.

At intersections, a minimum corner chamfer of 2.5m, is required for maintenance equipment. A larger chamfer may be required as determined through geometric design for pathway users. A radius may be used in lieu of a chamfer where it will not result in a narrow point. A mixing circle should be used when transitioning between multi-use and separated facilities.

Sightlines approaching intersections and crossing points should meet the recommended guidelines for stopping sight distance and sight triangles within the *Transportation Association of Canada Geometric Design Guide for Canadian Roads*. Minimum stopping sight distance for a person cycling is a factor of the speed being travelled, the surface material and condition (friction between tires and surface), a person cycling's perception-reaction time, and the grade of the facility. Stopping sight distance can be greater for people cycling than for people driving a motor vehicle and should be considered in the design of cycling facilities.

Placement of landscaping, signage, fencing and other elements should be reviewed at the time of pathway design.

7.4.2.3 Transit

Where pathways interact with transit, pathway facilities should be accommodated by means of a bend-out design, to ensure continuity of walking and cycling movement and the avoidance of conflict with passengers boarding and alighting the bus. The bend out design requires the bicycle facility to be behind the entire bus stop pad (including passenger waiting area, bike racks and shelter). Tactile walking surface indicators (specifically tactile direction indicators) should be provided for pedestrians to be able to locate the transit stop from the sidewalk.

Pathway surfacing should be consistent with the Town's *Open Space and Trails Plan*.

7.5 Roadway Lighting

7.5.1 Scope and Applicability

The intent of the lighting section is to provide guidance for Roadway and Active Modes Facility lighting which aligns with the goals of the geometric design section. Illumination design should follow IES standards, while the EDCG provides guidance on materials selection, level of service and streetscaping. *The City of Calgary Design Guidelines for Street Lighting* may be used as a reference for aspects of the design that are not addressed by the EDCG or IES. The Consulting Engineer is encouraged to contact the Town Engineer for clarifications where necessary.

Specifications for lighting of private buildings and parking facilities are provided in the Land Use Bylaw and are not addressed in this document.

7.5.2 Roadway Classification

Roadway lighting requirements are set by the Illuminating Engineering Society of North America (IES) in the Recommended Practices for Design and Maintenance of Roadway and Parking Facility Lighting ANSI/IES RP-8-18 based on the classification of the roadway. To determine the appropriate classification which should be applied to roads in Canmore, the Town's road classifications have been compared against City of Calgary classifications and those in the Transportation Association of Canada's Geometric Design Guide for Canadian Roads (TAC GDG) below in Table 7-8.

Table 7-8: Roadway Classification Comparison

Roadway Classification		Town of Canmore	The City of Calgary	TAC GDG	IES
Arterial	Classification Name	Arterial	Arterial	Minor Arterial	Major
	Lanes	2	4 - 6	-	-
	Capacity (veh/day)	</=15,000	20,000 - 35,000	5,000 - 20,000	-
	Design Speed (km/h)	50	50 - 60	50 - 70	-
	Basic ROW Width (m)	30.0	36.0 - 46.0	20.0 - 45.0	-
Collector	Classification Name	Collector	Collector	Residential Collector	Collector
	Lanes	2	2	-	-
	Capacity (veh/day)	</=10,000	2,000 - 8,000	<8,000	-
	Design Speed (km/h)	30	50	50 - 80	-
	Basic ROW Width (m)	22.0	22.5	20.0 – 24.0	-
Local	Classification Name	Local	Residential	Local	Local
	Lanes	2	2	-	-
	Capacity (veh/day)	1,000 (bike route) 2,000 (non-bike route)	2,000 (non-bike route maximum)	≤2,000	-
	Design Speed (km/h)	30	40	30 - 50	-
	Basic ROW Width (m)	15.3	16.0 / 18.4 / 22.5	15.0 - 22.0	-
Activity Street	Classification Name	Activity Street	Activity Centre	-	-
	Lanes	2	2	-	-
	Capacity (veh/day)	3,000	3,000 – 15,000	-	-

Roadway Classification		Town of Canmore	The City of Calgary	TAC GDG	IES
	Design Speed (km/h)	20	50	-	-
	Basic ROW Width (m)	-	26.0	-	-

Based on the comparison presented above, arterial roadways within the Town accommodate a lower vehicle capacity and have a lower number of lanes than is typical for other jurisdictions. The Town's arterial roads are similar to collector roads in other jurisdictions. Based on this, the application of IES lighting requirements for a collector road is recommended on the Town's arterial roads. The Town's collector and local roads are similar to the respective classification in other jurisdictions and should receive collector and local classified IES lighting. The activity street classification is intended as a pedestrian oriented main street, and therefore should receive collector level lighting. Lanes, access lanes and emergency lanes do not require lighting. Recommendations for the application of IES lighting to the Town's roadway classification are summarized below in Table 7-9.

Table 7-9: Recommended IES Lighting Classification

Town of Canmore Road Classification	Roadway Lighting Classification (ANSI/IES RP-9)
Arterial	Collector
Collector	Collector
Local	Local
Activity Street	Collector
Lane, Access Lane, Emergency Lane	Not Typically Lit

7.5.3 Lighting Design Criteria

7.5.3.1 Lighting Levels

The Town requires that design criteria follow the recommendation of IES RP-8. These guidelines, outlined in Table 7-10, are to be used at the Engineer's discretion and can be adjusted on a case-by-case basis. An illumination study is required when new walking or cycling infrastructure crosses an existing roadway, to assess potential lighting upgrades.

Table 7-10: Roadway Lighting Design Criteria

ToC Class (IES Class)	Pedestrian Activity	Avg. Luminance (L_{avg}cd/m^2)	Avg. Uniformity Ratio (L_{avg}/L_{min})	Maximum Uniformity Ratio (L_{max}/L_{min})	Maximum Veiling Luminance	Illuminance (Lux)	Avg/Min Uniformity

					Ratio ($L_{v,max}/L_{avg}$)	R2, R3 pavement	
Arterial & Collector (Collector)	High*	0.8	3	5	0.4	12	3
	Medium	0.6	3.5	6	0.4	9	3.5
	Low	0.4	4	8	0.4	6	4
Local (Local)	High*	0.6	6	10	0.4	9	6
	Medium	0.5	6	10	0.4	7.5	6
	Low	0.3	6	10	0.4	4.5	6

*To be used in limited scenarios only, with ToC Engineer's approval.

Luminance should be the primary design method. The illuminance method is to be used only where luminance method is not possible or not appropriate, such as intersections, cul-de-sacs, short blocks, or surround areas.

7.5.3.2 Surround Ratio

The new release of RP-8-21, approved by ANSI/IES in December 2021 defines a new parameter for roadway lighting, the surround ratio SR, which sets the required illumination levels adjacent to the roadway. The surround, for the purpose of calculating the SR design parameter, is defined as the area with a width of 3.6m outside the travel lane. Its purpose is to improve visibility of shoulders, cycle paths and other areas adjacent to the roadway. The SR is the ratio of surround illumination to the adjacent travel lane illumination. The SR should be 0.8 or greater.

Meeting the SR parameter in certain scenarios may not be desirable (e.g., environmentally sensitive areas, or where additional lighting equipment creates additional roadside hazards), or may not be critical (e.g., low speeds residential local roads). The balance and need for visibility improvements should be considered along with any potential negative impacts.

7.5.3.3 Color Temperature and Rendering

A color temperature of 3000K should be adopted for fixtures across all road classifications, as it generally represents the industry standard for street lighting. Color rendering affects the ability of a light source to reveal colors of objects in contrast to a natural light source and is measured by the color rendering index (CRI). Most streetlighting products have a minimum of 70CRI and this value is adopted as the minimum allowable CRI.

7.5.3.4 Maximum and Minimum Lighting Levels

Lighting levels should be designed to minimize excess illumination. Any lighting levels which are designed more than 15% above the required lighting criteria should be reviewed by the Town and specific justification should be provided by the lighting designer.

Lighting levels should be designed to provide adequate illumination. Any proposed lighting levels which are designed below the required lighting criteria require justification provided by the lighting designer and written acceptance by the Town in the form of a Fortis lighting waiver.

7.5.3.5 Light Trespass

The Consulting Engineer should consider IES recommended levels for light trespass values as based on Lighting Zones defined in the IES/IDA (International Dark-Sky Associations) Model Lighting Ordinance (MLO). These values should be considered maximum allowable levels at property line or the face of the building, whichever is greater. Deviation from these levels will be reviewed by the Town and specific justification should be provided by the lighting designer.

Lighting zones vary from Zone 0 (e.g., wilderness areas, parks and preserves) to Zone 4 (e.g., high density entertainment districts, heavy industrial uses). The typical lighting zones for the Town of Canmore are Lighting Zone 0 (e.g. wilderness areas, parks and preserves and undeveloped areas), Lighting Zone 1 (e.g., single- and two-family communities, business parks), Lighting Zone 2 (e.g., multifamily residential, schools, recreational facilities, neighborhood business districts).

Light trespass should be addressed in lighting design in accordance with the recommended values in the MLO, and should be considered maximum allowable levels at property line or the face of the building, whichever is greater.

Light trespass and glare can be controlled with light distribution, shielding, location and lumen output. Many complaints are triggered not by the light trespass itself, which can be insignificant, but rather by the glare and glow of a light source against the dark sky. As long as there is a direct line of sight to the fixture, lighting can generate complaints even if the light trespass is zero. Consideration should be given to shielding opportunities in this scenario.

7.5.4 Material

Fortis Alberta maintains roadway streetlighting for the Town. Roadway streetlighting should be standardized in accordance with Fortis practices where possible, including using the Fortis standard streetlighting product catalogue.

7.5.4.1 Streetlight Products

Town standard streetlighting products are shown below in Table 7-11. All products listed below are available through Fortis Alberta's standard catalogue. The widespread use of the GLEON Galleon on all roads except Activity Streets is intended to consolidate the type of lighting installations, provide a uniform aesthetic and simplify maintenance operations. Galleon fixtures are an environmentally friendly fixture (Dark-Sky IDA approved) while the Candela Pendant used on Activity Streets is not Dark-Sky IDA approved. Lighting designers should contact the Town for additional specifications when designing activity street lighting.

Table 7-11: Streetlight Styles

Road Classification	Streetlight Product
Arterial	GLEON Galleon with davit (Cooper Lighting) or Cobra Head in BLACK
Collector	GLEON Galleon (Cooper Lighting)
Local	GLEON Galleon (Cooper Lighting)
Activity Street	Candela CAND3 Pendant (Signify Lumec)

Figure 7-1: Cobra Head

Figure 7-2: GLEON Galleon

Figure 7-3: Candela Pendant

Luminaire wattages are a function of the illumination design and the wattages required to achieve the required lumens have been decreasing with advances in luminaire technology.

A tapered or davit pole, as appropriate, should be used for Cobra Head and Gleon Galleon style lighting on arterials. A square pole should be used for Gleon Galleon style lights on Collector and Local Streets. A round pole should be used for Candela Pendant style lights on Activity Streets.

7.5.4.2 Pole Height

Streetlight pole height is an important factor affecting streetlight design and user experience. Larger pole heights enable a single streetlight to cover a larger area and offer lower capital and maintenance costs. Lower pole heights are pedestrian-scale and create a more inviting space for walking and cycling street users. The maximum recommended spacing between poles based on the Town's typical cross sections is shown below in the table below.

Table 7-12: Maximum Light Spacing based on Pole Height

Pole Height	Arterial	Collector	Local	Activity
9.0m (30ft)	46m	-	-	-
7.6m (25ft)	-	47m	-	-
6.0m (20ft)	-	-	34m	-
5.0m (16ft)	-	-	-	24m

Notes:

- These maximum spacings are achieved in ideal conditions, where no conflicts exist with driveways, trees, utilities, intersections. Actual spacing may be less and should be confirmed by the lighting designer.
- Arterial road – lighting is assumed to be on both sides of the roadway.
- Collector and local road – lighting is assumed to be on one side of the roadway.

Recommended pole heights are shown in the table below. Lower pole heights are recommended for Activity Streets as they support the pedestrian oriented nature of these streets.

Table 7-13: Pole Height

Road Classification	Pole Height
Arterial	9.0m (30ft)
Collector	7.6m (25ft)
Local	6.0m (20ft)
Activity Street	5.0m (16.4ft)*

*Pole height at luminaire.

All precast concrete bases used should comply with City of Calgary standard types.

7.5.4.3 Summary

Recommended roadway lighting products are summarized below in Table 7-14.

Table 7-14: Recommended Roadway Lighting Products

Road Classification	Streetlight Style	Pole Height	Pole Style
Arterial	Gleon Galleon (Cooper Lighting) or Cobra Head in black	9.0m (30ft)	Square, galvanized with black powder coat; Davit as required
Collector	Gleon Galleon (Cooper Lighting)	7.6m (25ft)	Square, galvanized with black powder coat

Local	Gleon Galleon (Cooper Lighting)	6.0m (20ft)	Square, galvanized with black powder coat
Activity Street	Candela CAND3 Pendant (Lumec/Signify)	6.0m (20ft)	Round with shroud, galvanized with black powder coat, Lumec PC-1A luminaire support bracket; NOVA Pole custom aluminum tenon adaptor required (DWG# 22-MC-000-03816-F, November 18, 2022)
Lane, Access Lane, Emergency Lane	Not typically lit	N/A	N/A

7.6 Active Modes Lighting

7.6.1 Lighting Decision Tool

7.6.1.1 Design Objectives

The IES recommends evaluating the need for continuous lighting of pathways but does not provide specific guidance on how to complete an evaluation. This section was developed based on a review of standards from other jurisdictions and incorporates the following general principles:

- Provide lighting and eliminate glare sources at locations that demand multiple information gathering processes, such as intersections, conflict points and facilities where both pedestrians and cyclists are present.
- Lighting should particularly be considered where night use is expected such as routes serving commuters.
- Areas where nighttime security is an issue such as underpasses and tunnels should be lit.

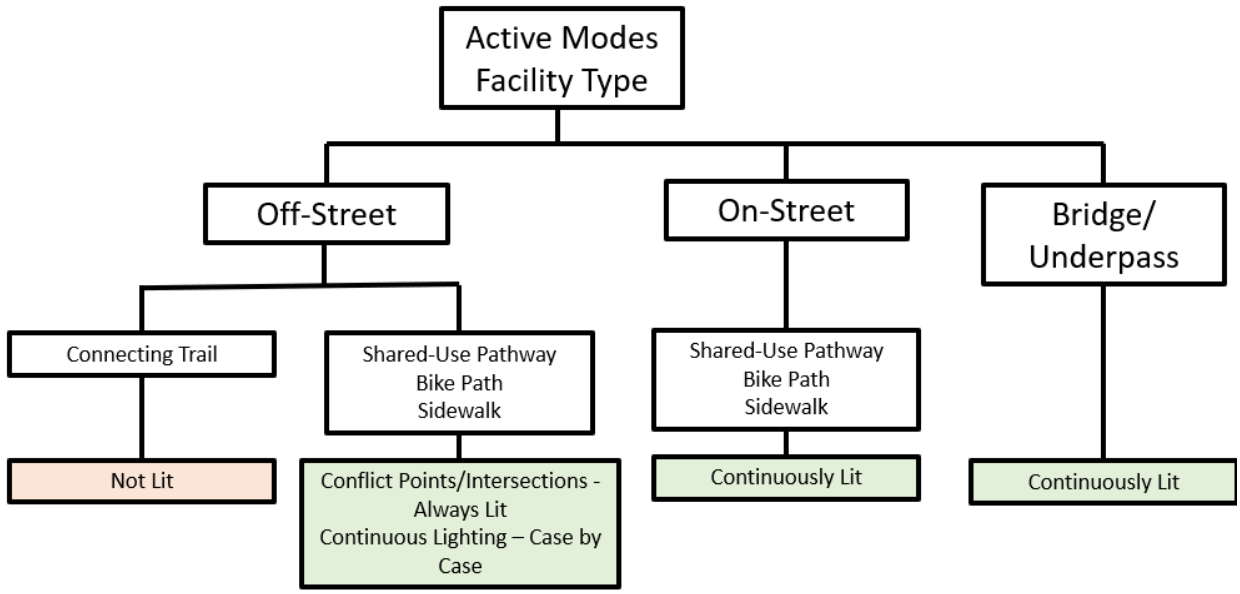
Medium and light use pathways should ensure wayfinding as a minimum lighting requirement alongside hazard points or areas of interest, such as bridges, obstacles, stairs, curves, termination, or resting points.

7.6.1.2 Decision Tree

Figure 7-4: Active Modes Facility Lighting Decision Tree provides recommendations about which active modes routes should be prioritized for lighting of new and retrofit projects. Active modes facilities such as sidewalks on local roads may not be required to meet a specific lighting level as spillover lighting generally provides sufficient light. Definitions for on-street and off-street facilities are provided:

- On-Street: facility is within the road right-of-way and classified as arterial, collector or activity street; the alignment is parallel to the road and may or may not be separated from vehicle traffic
- Off-Street: active modes facilities which are not directly parallel to the roadway, or follow an alignment separated from vehicle traffic

Figure 7-4: Active Modes Facility Lighting Decision Tree



Notes:

- Off-street shared-use pathways that form part of a designated commuter network should be continuously lit. Shared-use pathways that are primarily recreational will be reviewed on a case-by-case basis.
- Wayfinding lighting and lighting for safety and comfort should be considered for all active modes.

7.6.2 Lighting Design Criteria

7.6.2.1 On-Street and Bridge/Underpass Facilities

The current IES standard RP-8-21 recommends the following illumination levels for cycle paths and sidewalks. These lighting requirements should be applied to On-Street and Bridge/Underpass facilities. The Town may require increased lighting at underpass facilities dependent on geometry and sightlines.

Table 7-15: Recommended IES Lighting Levels for On-Street Facilities

Condition	Eavg (lux)-Horizontal*	Ev,avg (lux)-Vertical**	Eavg/Emin-Horizontal
High pedestrian activity	10	5	5
Medium pedestrian activity	5	2	5
Low pedestrian activity	2	1	10

*Calculated at pavement level
**Calculated at 1.5m above grade, in both directions parallel to main pedestrian flow

7.6.2.2 Off-Street

The Active Modes Facility Lighting Decision Tree is used to determine whether lighting is required based on facility type. The ANSI/IES RP-43-22, Recommended Practice: Lighting Exterior Applications provides recommendations for illumination levels for active transportation facilities outside the road right-of-way when lighting is required.

Lighting levels to be used within the Town of Canmore are shown in Table 7-16 and are intended to act as a guideline for lighting designers rather than a specific requirement.

Table 7-16: Proposed Lighting Levels for Off-Street Facilities

Mixed Cycling and Pedestrian Paths	Eavg (lux) - Horizontal	Eavg/Emin - Horizontal
LZ2		
Lower limit	8	5
Upper limit	15	5
LZ1		
Lower limit	4	5
Upper limit	8	5
LZ0	No lighting prescribed	

Note: For Cycle paths, the same illumination values are recommended, but with a relaxed uniformity ratio of 10:1.

According to the Active Modes Facility Lighting Decision Tree, lighting at conflict points and intersections should be applied in all cases except LZ0. Proposed lighting levels for conflict points should meet the minimum proposed lighting levels for off-street facilities and should exceed the minimum standards outlined in Table 7-17.

Table 7-17: Proposed Lighting Levels for Conflict Points for Off-Street Facilities

Condition	Eavg (lux) - Horizontal	Eavg/Emin - Horizontal
Illuminated pathways	≥ Pathway Eavg ≥ 8	5
Unlit pathways	8	5

7.6.3 Materials

7.6.3.1 On-Street

Active modes facilities within the road right-of-way may receive adequate illumination from the roadway lighting luminaires, depending on their photometric distribution, amount of backlight, pole spacing and pole layout (single sided, staggered or opposite). Human scale lighting is preferable and may be required at the discretion of the Town. Pedestrian level luminaires mounted on roadway poles at a height of 4.5m (15ft) or specific 4.5m (15ft) pedestrian level pole and luminaires should be used when human scale lighting is implemented.

On-street active modes lighting should use the same product line and style that was used for roadway lighting.

Arterial and Collector: GPC Galleon Pedestrian Companion (Cooper lighting) on pedestrian level pole and/or at 4.5m on roadway light pole

Activity Street: Candela Pendant by Lumec (Signify)

7.6.3.2 Off-Street

Off-street lighting may be accomplished by either bollards or pole mounted lights powered through a wired connection or solar. A product for each of these applications is provided in Table 7-18 below.

Table 7-18: Off-Street Active Modes Lighting Products

Lighting Style	Product	Additional Details
Wired Pole Mounted	GPC Galleon Pedestrian Companion (Cooper Lighting)	4.5m (15ft) pole height Square pole, galvanized with black powder coating
Wired Bollard	BRT6 (Cooper Lighting) BRM836 Gardco (Philips)	1.1m (42”) high with beveled top
Solar Pole Mounted	LX95 or TX300 (Solar Vision)	4.5m (15ft) pole height Square pole, galvanized with black powder coating
Solar Bollard	SB40 (Solar Vision) PLB Series (First Light) WLB Series (First Light)	Black finish Black finish Black finish

Bollards versus Pole Mounted Lighting

Off-street pathways can be illuminated by either pole mounted luminaries or bollards. A maximum recommended spacing between bollards and pole mounted pathway lighting has been calculated for a 3.5m wide pathway and is shown in Table 7-19. This is provided for illustrative purposes, the Consulting Engineer is required to perform an illumination design.

Table 7-19: Maximum Light Spacing for 3.5 m Wide Pathway

Height and Lighting Style	Spacing
1.0m (3.3ft) – Bollard	10m
4.5m (15ft) – pole and luminaire	44m

Notes:

- The above analysis is applicable to both medium activity situations and dark-adapted situations. The limiting factor in all cases is the E_{avg}/E_{min} ratio, which is affected by pole height.
- Wired bollards and pole mounted luminaire systems have been assumed. The bollard used for spacing calculations and pricing is a McGraw-Edison BRT6 Bollard. The pole and luminaire used is the GPC Galleon Pedestrian Companion. Lighting was assumed to be single sided.
- Where a 5:1 uniformity is required (medium activity situations) and the pathway is wider than 3.5m, bollards should be installed on both sides of the pathway at a reduced spacing.
- There is no significant difference when using 4.5m poles on 5.5m pathways; the spacing remains consistent with those for the 3.5m pathways.

Bollard lighting does not provide adequate vertical illumination and should only be used where obtrusive lighting is a concern or where the primary intent is wayfinding. In cases where illumination design criteria must be met, pole mounted lighting is necessary to achieve the vertical illumination objectives. When lighting a large active modes intersection or areas where safety is an issue, pole mounted luminaires should be used.

Wired versus Solar Active Modes Lighting

When a power source is readily available, wired lighting should be utilized as it is the most cost-effective and reliable solution. Solar lighting generally has a lower lumen output, can be un-reliable during periods without sunlight and will require replacement of batteries. Solar lighting should not be utilized except in areas where providing power is not feasible or cost prohibitive.

7.7 Off-street Connectivity

The importance of ensuring that pedestrian and cycling facilities connect effectively with private infrastructure and development is highlighted in the MDP and ITP. MDP 10.1.3 states buildings will front toward and address the public street and provide quality spaces that contribute to the public realm. The design of commercial developments should support and encourage pedestrian use of the area.

MDP 13.1 Urban design speaks to high quality site and building design in support of walkable and bikeable neighbourhoods and a comfortable pedestrian environment.

In determining the design of private infrastructure, consideration should be given to requirements for mode-share for walking, cycling and transit use for the area. Mode-share targets are established in the ITP, and statutory documents and supporting technical assessments. The following provides consideration for best practice to meet typical requirements of statutory plans.

Off-street connectivity should be direct, safe, comfortable, and continuous and provide a consistent experience for travel with requirements for on-street facilities. Per the MDP 10.3.2, uses requiring large surface parking areas and vehicle access may be allowed, however multi-use commercial areas shall have a

strong pedestrian-oriented design with good connections to pathways and sidewalks. Connections through vehicle parking areas should be designed to be separate from driving areas, and at a continuous elevation.

Pedestrian connections should be designed to best practice as outlined in the Accessibility Design Guide, GoA. For example, on-site sidewalks should be a minimum of 1.8m in width and be free of vertical obstructions.

Connections for cycling should be a minimum of 2.5m wide, uninterrupted and at a continuous grade, and with no obstructions between on-street facilities and secure bicycle parking. Cycle access may be shared with pedestrian access. Where volumes are expected to be high, consideration should be given to wider facilities, or separate accesses for walking and cycling. Cycle access may be provided through shared access with vehicles where that provides a solution consistent with ITP principles.

In existing neighbourhoods, where a unit fronts onto a lane, a hard-surfaced walking connection with pedestrian level lighting should be provided from the fronting street to the rear development fronting onto the lane (though the development site).

In cases where a site is subdivided, and access is provided via an easement on the site, access for walking and cycling should be provided in a manner consistent with public facilities including sidewalks (1.8m minimum width) or multi-use paths (minimum 2.5m width) between public roadways and subservient parcel building entrances and associated bicycle parking. These facilities are to be included in an instrument on title to ensure pedestrian and cycle access in perpetuity.

7.8 Off-Street Parking

Off-street motor vehicle and bicycle parking shall be provided as per the requirements of the Town of Canmore's *Land Use Bylaw*. Any parking studies required by the Land Use Bylaw or other statutory documents should give consideration to the strategies of the Integrated Parking Management Plan, 2018 and be based upon a Terms of Reference approved by the Town.

The Accessibility Design Guide, GoA provides guidelines and best practice for accessibility of off-street parking and provides the basis for off-street parking accessible design.

7.8.1 Bicycle Parking Design Standards

The layout and design of all bicycle parking should meet or exceed the dimensions identified within this document.

Short-term bicycle parking is defined as parking that meets the needs of people spending two hours or less at a site. They may not be regular visitors to the site, and therefore it is important that short-term bicycle parking be conveniently located and visible, ideally within 15m of the principal entrance of the building. Weather protection for short-term bicycle parking is encouraged to facilitate access for people cycling in all weather and seasons.

Long-term bicycle parking is intended to meet the needs of people spending several hours or longer at a site (e.g. residents, employees, people using transit, etc.) and should provide security and weather protection. Where residents and employees can be expected to store bicycles for a longer duration, access should be limited by means of a locked bike room or other secure enclosure with access control. Options for facilitating secure access include keys, fobs, smart cards or other technologies. Long term bicycle

parking should either be provided at grade or on P1 of a parkade structure, with convenient and barrier-free access provided between the offsite roadways and paths, and the bicycle parking stall.

Long-term bicycle parking should be comprised of no less than 70% floor-mounted racks that do not require a person to lift a bicycle. Floor-mounted racks should be provided as "inverted-U" style racks with spacing as outlined in Figure EDCG STR 7.22 Bicycle Parking Area. While the figure provides a design domain range for aisles and adjacent to walls, minimums should only be used in constrained situations. Alternative rack types may be used where the intent of this guideline is met. Any alternatives to the "inverted-U" style should support the frame of a bicycle in at least two places, to prevent it from falling over, and allow for the locking of the frame and one or both wheels to the rack with a U-lock. Racks should be no less than 0.85 m in height. The cross-slope of areas with bicycle parking should not exceed 2%.

7.8.1.1 High-Density Bicycle Parking

In some constrained situations, higher density of bicycle racks may be considered for securely enclosed, long-term bicycle parking. Higher rack density is not appropriate for short-term bicycle parking applications. The proportion of high-density racks on a site should not exceed 30% of the required supply. While high density bicycle parking can maximize the use of space to store bicycles, it does not accommodate all people or all bicycle types, and as such should be limited in its application. Two-tier bike racks may be considered for high-density parking applications only if they include lift-assisted access to the upper tier, and if they provide for the secure locking of both the wheel and frame of the bicycle to the rack with a U-lock. Access to and design of high-density bicycle parking is required to meet all the dimensional requirements shown in Figure EDCG STR 7.22 Bicycle Parking Area. Other forms of high-density bicycle parking will be accepted in the place of regular "inverted U" if it can be demonstrated that it provides the same level of security, accessibility, and convenience as a standard "inverted U" style rack.

7.8.1.2 Rack Access and Placement

All racks should be secure and well-anchored to concrete (either by means of an in-ground mount, or tamper-proof mounting techniques if surface-mounted). Bicycle parking areas should be located where racks and storage rooms receive active surveillance by passers-by, when located near main entrances, and where they are visible from surrounding building windows.

All changes in grade between a site's property line and short or long-term bicycle parking areas should be accommodated by ramps or sloped paths to facilitate barrier-free access. Long-term bicycle parking areas located on P1 of a parkade should be made accessible through both the building elevator and via the parkade ramp. All doors that must be navigated between a site's property line and areas for short or long-term bicycle parking should be barrier-free with power assist, including to and from elevator vestibules. If elevator use is required or expected to access bicycle parking areas, it should be demonstrated that the interior dimensions of the elevator can accommodate a variety of bicycle types.

While the dimensions in this guide reflect parking requirements for a standard bicycle, design should consider the presence and accommodation of a variety of bicycle types and accessories. These may include bicycle trailers, cargo bicycles, and recumbent bicycles among others. To accommodate these types of cycles, an additional 0.9m of in-line clearance should be considered for some stalls, without encroaching into the aisles required for maneuvering bicycles into and out of a bicycle parking area as shown in Figure EDCG STR 7.22 Bicycle Parking Area. Signage to indicate that access to these stalls is prioritized for longer bicycles may help to avoid their being occupied with the same frequency as other

standard stalls. The provision of these spaces should be given extra consideration in destinations where one might expect a higher proportion of trips that may require bicycle trailers or cargo bikes (e.g. outside of a daycare or grocery store).

Designated areas for snow storage should not encroach into outdoor bicycle parking areas at any time of year.

7.8.2 Passenger Vehicle Parking Design Standards

Minimum dimensions for the design of parking areas should be as shown in Table 7-20.

An on-site loading space should be designed and located so that all vehicles using that space can be parked and maneuvered entirely within the bounds of the site before moving onto adjacent streets. A loading space should be:

- A minimum width of 3.1m.
- A minimum depth of 10.0m.
- Maintain a minimum overhead clearance of 4.3m.

Parking stall dimensions should be clear of all obstructions, other than wheel stops. Wheel stops should be provided in any stalls that front onto an adjacent pedestrian facility, to ensure there is no vehicle encroachment over the sidewalk.

Parking stalls abutting a wall or other physical vertical barrier to door access should be a minimum width of 3.1m.

Driveways, loading spaces and bus parking stalls should be designed for the appropriate design vehicles to allow for adequate turning radii and movement within the site. Where required by the Town, modelling for vehicle swept paths to be provided. Large vehicles may be accommodated through use of the full drive and aisle widths within a site.

Table 7-20: Design Standards for Parking Areas

Stall Width	Parking Angle	Aisle Width* (A)	Stall Depth Perpendicular to Aisle (D)	Stall Width Parallel to Aisle	Half Parking Module (D+A)	Parking Module (2D+A)
Dwelling Units						
2.50m	90 degrees	7.20m	5.40m	2.50m	12.60m	18.00m
2.50m	75 degrees	6.12m	5.64m	2.59m	11.76m	17.40m
2.50m	60 degrees	4.82m	5.49m	2.89m	10.31m	15.80m
2.50m	45 degrees	4.00m	5.00m	3.54m	9.00m	14.00m
Other Developments						
2.60m	90 degrees	7.20m	5.40m	2.60m	12.60m	18.00m
2.60m	75 degrees	6.12m	5.64m	2.69m	11.76m	17.40m

2.60m	60 degrees	4.82m	5.49m	3.00m	10.31m	15.80m
2.60m	45 degrees	4.00m	5.00m	3.68m	9.00m	14.00m

*This value is both a minimum and a maximum unless otherwise demonstrated to be a requirement for vehicle swept paths on the site.

Parking stalls that are accessed directly from a lane shall be a minimum of 6m in length. Parallel parking stalls should be a minimum length of 7m.

The maximum grade of a parking stall should not exceed 8% in any direction. Parking dimensions for parking angles between 75 degrees and 45 degrees should be calculated using a straight-line interpolation between dimensions shown in Table 7-20.

7.9 Pavement Markings

Longitudinal Lines to use water-based paint with Low VOC. This includes:

- Pavement long lines
- Barrier-free stalls
- Parking lot lines
- Pathway markings (yield signs, cycle marking, pedestrian marking, pathway text)

Symbols and Lateral makings to use surface thermoplastic or surface MMA. This includes:

- Arrows
- Stop lines and stop box lines
- Barrier-free stalls
- Crosswalks including zebra markings
- Sharrows
- Elephant's feet
- Electric vehicle parking stall symbols

7.10 Street Name Blades

Street Name Blades should be green background with uppercase white lettering, utilizing 3M High Intensity sheeting or approved equivalent. Street name blades mounted at ground level should be 150mm high with 100mm text in Highway Gothic Series C 2000. Signage mounted on traffic signals should be evaluated by the Consulting Engineer in accordance with the MUTCDC.

7.11 Wayfinding

Vehicle and pedestrian scale wayfinding is used to direct network users to popular destinations. The document *Canmore Wayfinding Program – Design Intent* provides guidance on the graphic design, materials and physical design of wayfinding elements.

SECTION 8 – SHALLOW UTILITIES

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 8" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The "2025 Engineering Design and Construction Guidelines – Section 8" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

8.0 Shallow Utilities

The design and installation of shallow utilities in the Town of Canmore is guided by the Alberta Electrical Utility Code, the City of Calgary's Design Guidelines for Subdivision Servicing, and the design guidelines and standards produced by service providers.

Guidelines for the design and installation of street lighting are provided in Section 7.

The following information is supplementary to the above-mentioned documents.

8.1 Application Process

When submitting a subdivision detailed design or a development permit application for Intermediate or Large developments, the developer is required to provide a detailed shallow utility plan for each phase of development for review by the Town Engineer. The shallow utility Facility Map must show the location of all underground and aboveground facilities relative to existing and proposed deep utilities, surface works and landscaping.

The developer shall engage the shallow utility providers or a specialized consultant for preparation of the shallow utility Facility Map which addresses conflicts and service needs for all shallow utility providers. This Facility Map is submitted with the Development Permit or Subdivision application for review and approval by the Town. Subsequent to this approval, the shallow utility providers are required to submit utility line assignment (ULA) requests to the Town Engineer for review and acceptance. Line assignment applications associated with an approved Facility Map shall be accompanied by a letter that includes:

1. The Town's subdivision or Development Permit file number;
2. Date of the Town's approval of the shallow utility Facility Map;
3. A statement confirming that the line assignment application complies with the approved Facility Map;
4. The total number of metres of trench proposed.

The ULA application drawings shall include the following:

1. Surfaceworks features such as curb and sidewalk (existing or design);
2. Property lines, URW and easement boundaries;
3. Deep utilities;
4. Municipal trees (in accordance with Tree Protection Plan requirements).

The developer is responsible for providing rights-of-way, easements registered in the name of the Town of Canmore or public utility lots to accommodate the servicing. The tentative legal plan and utility right-of-way plan, together with the utility right-of-way agreements are to be submitted to the Town for acceptance prior to submittal to Land Titles for registration and are required prior to, or concurrent with, subdivision endorsement. In the case of a bareland condominium, the developer must register a URW in the name of the shallow utility providers prior to, or concurrent with, subdivision endorsement where applicable.

The developer and shallow utility providers are responsible for identifying the requirements for federal and provincial permitting. The developer and shallow utility providers shall prepare, submit and pay all

costs associated with these applications. In areas of infill development and redevelopment where aerial facilities exist, builders or homeowners may wish to relocate existing poles, anchors, transformers, etc. In these cases, the applicant must request a preliminary design from the appropriate service provider which is forwarded to the Town for review. Should the Town agree to the work in principle, the applicant will be required to provide the design details to affected property owners and register their consent. The Town will identify the scope of property consents required and will approve the ULA request only if 100% of owners surveyed consent to the work.

The Streetlight Investment will be directed to the municipality for the construction of new public streetlights.

8.2 Design

All new cable and conduit installations shall be underground. For rural applications where the installation of buried services is not practical, aerial infrastructure may be accepted by the Town Engineer. Adequate ducts shall be installed under roads prior to construction to accommodate the installation of shallow utilities. The use of municipal reserve lands for shallow utilities is discouraged to minimize constraints to future development. Above ground infrastructure shall be placed within a URW on private property or on a PUL lot. The use of MR lands for above ground equipment will not be permitted by the Town except under extenuating circumstances or where it is required to service Municipal Infrastructure or schools within the MR parcel.

Separations between trees and shallow utilities shall conform to the specifications in the City of Calgary *Development Guidelines and Standard Specifications: Landscape Construction* (current edition).

Shallow utilities shall be installed in a four-party trench wherever practical. Four-party trenches must be located in continuous dedicated 3.5m wide easements located adjacent and parallel to roads in the front of lots abutting roads, however the Town of Canmore may support reduced URW widths in extenuating circumstances and if agreed to by the shallow utility providers.

Shallow utilities shall be separated laterally from water and sewer mains by not less than 3.0m and shall be located a minimum distance of 3.0m from any valve or hydrant, however decreased lateral separation may be considered by the Town where water and sewer mains are installed at shallow depths and where the shallow utility providers are in agreement. Horizontal separation from shallow utilities to water services is defined in Section 4 of the EDCG.

When properties with existing aerial services drops are undergoing redevelopment the Town does not permit additional poles on Municipal Right of Way. If the service can be maintained as an aerial drop without an additional pole on public land it is acceptable, otherwise the drop must be buried.

8.3 Construction

Trenchless methods should be used whenever possible for proposed services crossing existing roads to avoid compromising the integrity of the road surface. The developer, shallow utility provider and contractor should familiarize themselves with local soil conditions to ensure that an appropriate methodology is selected.

The following must be obtained from the Town for any work on Municipal Rights of Way. Refer to Section 2 for details on permit types and application requirements.

- Road Use Permits

- Excavation Permits
- Cross Reserve permits

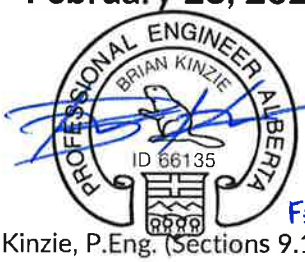
These permits must reference the ULA reviewed and accepted by the Town during the approval process. The utility provider must notify the Town of completion of work on an approved ULA within 10 calendar days. The utility provider must submit as-built drawings within 60 calendar days following completion of the work.

SECTION 9 – HAZARDS AND LOCAL CONDITIONS

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 9" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025



FEB. 28, 2025

Brian Kinzie, P.Eng. (Sections 9.1, 9.4, 9.5)

Municipal Engineer

Feb 28, 2025

Felix Camire, P.Eng. (Sections 9.2, 9.3, 9.6)

Project Engineer

PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Andy Esarte, P.Eng.

Manager of Engineering

The "2025 Engineering Design and Construction Guidelines – Section 9" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

9.0 Hazards and Local Conditions

In addition to hazards that municipalities in Western Canada are typically exposed to such as high surface water levels, wildfire and transportation related events, the town of Canmore is also vulnerable to steep creek hazards, undermining from former coal mining activities and high groundwater levels.

This section of the EDCG provides a description of the hazards and location conditions associated with undermining, valley bottom flood hazard, steep creeks, high groundwater, and railway risk in the town of Canmore. It provides information about the constraints when working in these areas and possible mitigation measures that Developers and Consulting Engineers need to consider when presenting development applications and undertaking capital projects in the town.

9.1 Undermining

Surface and underground coal mines were developed on the south side of the Bow River valley, between Pigeon Mountain and the Town of Canmore, from the 1880s to the 1970s. Coal was primarily extracted by underground mining, however some surface exploration and mining also occurred. Subsidence, surface features of past mining activity and the presence of coal seam outcrops all present potential concerns. When developing land where these hazards may be present, an undermining assessment is required, and remedial action may be necessary.

9.1.1 Alberta Regulation AR 34-2020

The Natural Resources Conservation Board (Decision report #9103, issued in 1992) approved a variety of urban land uses on lands where mining hazards may be present. The Provincial regulation and guidelines have been produced to regulate and assist in the evaluation of these lands. This regulation states that Part 17 of the Act and the *Subdivision and Development Regulation (AR 43/2002)* does not apply with respect to undermining in the designated lands.

This regulation designates the applicable lands and sets out the requirements for an undermining review that a Developer must undertake.

When the undermining review has been completed satisfactorily, a compliance certificate will be issued, and acknowledgment of receipt forwarded by the Province of Alberta to the Town of Canmore. The Town of Canmore is required to retain copies of certificates and reports and make them available to the general public. This regulation also requires the Developer to file with the Register of Land Titles a caveat against any title to land for which an undermining report is prepared and a compliance review certificate is completed.

Within the Regulation Area, a compliance certificate is required:

1. Before the adoption of or an amendment to an Area Structure Plan;
2. Before a subdivision application is submitted;
3. Before Canmore issues a development permit.

9.1.2 Guidelines to Evaluate Proposed Development over Designated Undermined Lands

The Province of Alberta approved *Guidelines to Evaluate Proposed Development Over Undermined Lands in the Town of Canmore*, Alberta April 1, 2020, through Ministerial Order MSD: 004/20. The purpose of the guidelines is to establish a staged process which provides for progressively increasing levels of confidence and confirmation as to whether a surface development may be undertaken without jeopardy to public safety and without incurring an unacceptable risk of damage.

The guideline addresses three stages of development:

1. Area Structure Plan Stage
2. Land Use & Subdivision Stage;
3. Development & Building Permit Stage.

9.1.3 Indemnification and Liability

Alberta Regulation 113/1997 exempts the Town of Canmore from liability for losses and damage that arise during development or use of the designated lands. Alberta Regulation 112/1997, in combination with the 1999 Indemnity Agreement, indemnifies the Town of Canmore and its agents in respect of loss and damage associated with the development or use of the designated lands.

Regulation AR34/2020 also specifies the insurance amounts that must be held by the Developer and the undermining professional engineer with respect to undermined lands.

9.1.4 Site Developments outside of Designated Lands

The undermining regulation area covers lands that were the subject of the 1992 NRCB decision, however undermined lands exist outside the current regulation area. Should an application for an Area Structure Plan, land use amendment, subdivision or development permit be submitted for such lands, an amendment to include them in the undermining regulation area will be required prior to Municipal approvals.

9.2 Valley Bottom Flood Hazard

Certain areas of the valley bottom of the Town of Canmore are located in the floodway, flood fringe and overland flood zones of the Bow River, as designated by Alberta Environment. These areas are described in the Town's *Valley Bottom Flood Hazard Overlay* section of the *Land Use Bylaw*. These regulations establish permitted and discretionary uses, minimum first-floor elevations, and locations of mechanical and electrical equipment. Refer to Figure EDCG HLC 9.3 Overland Flow Elevations for specific details.

9.3 Steep Creeks

After the flood event in 2013, the Town of Canmore established the Mountain Creek Hazard Mitigation Program with the goals of re-establishing damaged infrastructure, learning about hazards from steep creeks in the community, assessing the consequences and mitigating accordingly. The Town has adopted a risk-based approach for evaluating options for mitigation. This means that mitigation is not solely based on

a return period but on the consequences of a hazard occurring, including but not limited to the overall community impact, the safety risk to individuals and potential economic losses.

Steep creeks have been addressed in the Town of Canmore *Municipal Development Plan* (MDP) and *Land Use Bylaw* (LUB). Development in steep creek hazard zones may be permitted according to these regulations.

For development in moderate hazard zones, flood protection measures shall be designed to mitigate flood, debris flood or debris flow hazards. The level of protection required is determined on a case-by-case basis with the goal of meeting tolerable risk criteria as adopted by the Town in the MDP.

The Steep Creeks section of the EDCG provides direction and guidance to support resilient development in hazard areas where development is permissible. It provides guidance for small-scale on-site mitigation up to established thresholds defined within this document. Off-site mitigation, and mitigation work that exceeds these thresholds, shall be designed by a qualified professional. The EDCG are also applicable for existing developments in identified hazard zones to reduce vulnerability.

The Town may use in-house personnel or retain an independent qualified professional to provide advice during the review and approval process for any proposed work in hazard areas.

9.3.1 Policies, Regulations, and Emergency Plan

9.3.1.1 Government

The adoption by the Town of Canmore of guidelines on steep creek hazard and risk, and changes in land use regulations are all aiming at reducing the risks due to steep creek hazards. The 2023 edition of the *Alberta Building Code* does not have any specific codes related to buildings in flood or steep creek hazard zones.

9.3.1.2 Developer

Evacuation routes for proposed developments, including main and alternate routes, shall be designed and analyzed carefully to ensure that building occupants and rescuers can successfully evacuate the property when required.

9.3.2 Design – General

Hazards in mountain creeks strongly depend on geological conditions and morphology of the catchment. Steep creek hazards considered herein are, in order of increasing sediment concentration: clear water flood, debris flood, and debris flow. There is a continuum between these hazard types: floods transition to debris floods, and eventually to debris flows. Conversely, dilution of a debris flow through partial sediment deposition and tributary injection of water can lead to a transition of debris flows to debris floods, and eventually floods. The damage potential usually increases with increased sediment concentration. These three hazard types are considered in the present guidelines, as they can all occur during a single event. Each hazard type has different implications for mitigation design; therefore, Consulting Engineer of steep creek mitigation need to identify which hazard type or types could affect each area of development.

Steep creek hazard zones are areas identified as potentially dangerous for development. The MDP defines the different hazard zones under the Section *Steep Creek Hazard Zone*. The zones are identified in the Steep Creek Hazard Overlay in the LUB.

9.3.2.1 Level of Protection

Due to the risk-based approach for assessing steep creek hazards adopted by the Town, the level of protection required can change on a case-by-case basis and depends on the type and number of elements that are exposed to the hazard.

The Town's requirements for assessment studies, and policy for development in steep creek hazard zones, can be found in the MDP and the LUB.

In high/extreme hazard zones, only the developments listed in Section 7.8.2 of the LUB are allowable. Measures outlined in these guidelines might be applicable.

In moderate hazard zones, a site-specific steep creek risk assessment (SCRA) is required. The risk assessment will determine if the development is allowed and what level of protection is required. SCRAs shall be undertaken by a qualified professional. Site-Specific SCRA guidelines are found in Appendix C of the EDCG, with supplemental information regarding risk analysis, vulnerability and loss estimation in Appendix D Quality Assurance Statement for Site-Specific SCRAs is found in Appendix E

In low and residual hazard zones, the risk can be mitigated by adopting some of the measures outlined in these guidelines. A risk assessment is usually not required for developments in low and residual hazard zones. However, where a development proposal may result in significant economic losses or damage to buildings in the case of an event, a site-specific steep creek risk assessment, specifically related to economic risk, may be required to evaluate the development and proposed on-site mitigations.

9.3.3 On-Site Mitigation Measures

In general, any mitigation measures proposed or constructed should not cause any material adverse impact on other properties. Ideally, it should also reduce the overall flood risk.

Flood avoidance ensures that the water will not come into contact with the building. Flood resistance, or dry-proofing, stops water entering a building. Flood resilience, or wet-proofing, accepts that water will enter the building, but through careful design will minimize damage and allow the re-occupancy of the building quickly.

9.3.3.1 Minimum Floor Elevation

Minimum floor elevations are established to ensure that the habitable space of a development is higher than modeled flood levels. This ensures adequate flood protection.

9.3.3.2 Minimum Building Opening Elevation

The minimum building opening elevation concept is similar to the minimum floor elevation. However, it is used for below-grade basement in low and residual hazard zones, or in moderate hazard zones if deemed

acceptable (once a site specific steep creek risk assessment has been completed). Building openings refer to window wells, garage doors, door entrances, and the top of foundation walls.

9.3.3.3 Low and Residual Hazard Zones

In low and residual hazard zones, the minimum floor elevation and the minimum building opening elevation shall be a minimum of 300 mm above proposed finished grades (see

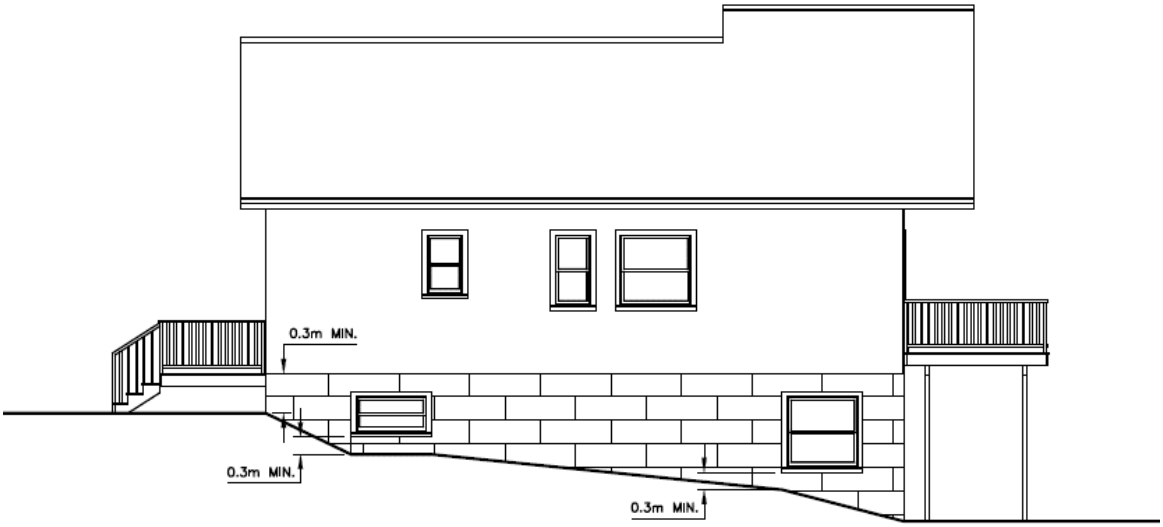


Figure 9-1). The design shall also consider Section 6 of the EDCG regarding stormwater management. A higher minimum floor elevation or minimum building opening elevation might be required to account for stormwater management.

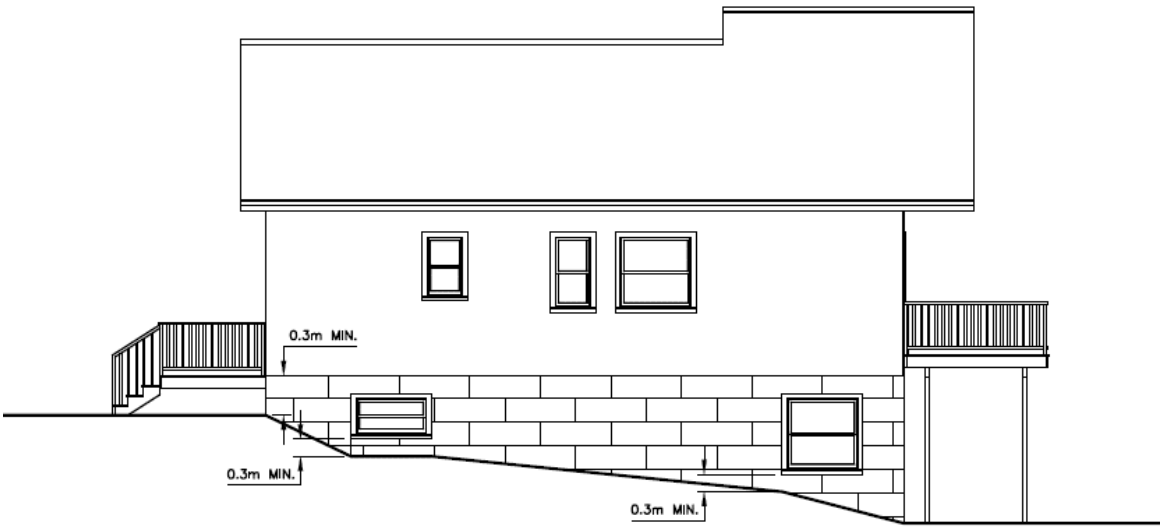


Figure 9-1: 300 mm above proposed finished grades

9.3.3.4 Moderate Hazard Zones

In moderate hazard zones, the modelled flood levels, plus 100mm of freeboard, is used to define the minimum floor elevation and the minimum building opening elevation. The modelled flood levels are based on model results from the applicable hazard assessment and provided by the Town of Canmore for the site-specific steep creek risk assessment.

9.3.3.5 Flood Avoidance

Avoidance measures are aimed at preventing water coming into contact with a building. The most basic principle of flood avoidance is to not build in identified flood hazard areas.

Avoidance can be accomplished by raising the development above the modeled flood level, or by using the topography to divert flood waters away from the development.

Driveways

Driveways sloping towards the building are discouraged. However, they are acceptable in low and residual hazard zones when the minimum building opening elevation requirement of 300 mm is met, and may be permitted in moderate hazard zones where an SCRA addresses the potential hazard, and the minimum building opening elevation requirement is met. This requirement can be met through grading or other passive measures. Requirements of Section 3.3.5 (Driveways) of the EDCG shall also be met.

Elevation: Raising the Development Above the Design Flood Level

The development is not exposed to the hazard when raised above modeled flood level. Development can be built on higher ground by raising the property lot, or by raising the development itself on foundations that can withstand the impact of the flow. Minimum floor elevation shall be used.

Raising the Lot

Raising the lot can be considered for infill development sites that are low compared to neighboring lots, where raising the lot would reduce its risk without significantly increasing flood risk elsewhere. If raising of a lot is required, it might have to be offset by the provision of additional flood storage areas or improved flood routes elsewhere.

Creating an island effect with surrounding areas inundated by floodwater is not acceptable as there must be safe access for emergency vehicles and evacuation. Essential and emergency access routes should be designed above design flood level.

Raising the elevation of a lot shall be designed by a qualified professional and shall consider the following:

- Topsoil stripping, storage and reinstatement
- Existing ground conditions and type of material
- Compaction and settlement of structural fill material
- Possibility of mobilizing contaminants
- Possible changes to flow behavior of debris floods

Slope and embankment fill is required to be stable under conditions of flooding, including rapid rise, rapid drawdown and prolonged inundation. Fill side slopes shall be no steeper than 2(H):1(V). Moreover, a minimum Factor of Safety of 1.3 should be used for the design of those slopes.

Erosion protection of side slopes shall be designed according to Table 9-1 below.

Table 9-1: Design Standard for Side Slope Protection

Hazard Zone	Flow Conditions (depth & velocity)	Design Standard
Low	Less than 1m & 1m/s	Grassed side slopes, as per Design of Deflection Measures section, below.
Moderate	As per site specific flow data	Shall be designed by a qualified professional.

Retaining Walls

Elevation of a building or a lot may also be done with wood (only in low and residual hazard zones), stone, concrete, or stone-pitched retaining walls. An example of a stone wall is shown in Figure EDCG HLC 9.4 Stone Retaining Wall on Silvertip Road, Canmore AB. Retaining walls over 1 m in height or in moderate hazard zones, shall be designed in accordance with Section 3.3.1 of the EDCG and minimum requirements described in

. Stone-pitched walls and concrete walls shall be designed by a qualified professional. An example of stone-pitched wall is shown in Figure 9-3.

Table 9-2: Retaining Walls

Hazard Zone / Flow Velocities	Foundation Depth	Wall Type
Low/Less than 1 m/s	Only EDCG Section 3.3.1 applies	Wood, stone retaining wall, concrete wall or stone-pitched wall.
Moderate/1 m/s to 2 m/s	Minimum 1 m 0.5 m acceptable if wall is directly adjacent to a paved road or has adequate scour protection	Either: a) Stone retaining wall b) Stone-pitched wall c) Concrete walls (covered by rock or abrasion resistant material for walls exposed to debris flood / debris flow impacts)
Moderate / Greater than 2 m/s	Minimum 1.5 m 0.5 m acceptable if wall is directly adjacent to a paved road or has adequate scour protection	Either: a) Stone-pitched wall b) Concrete walls (covered by rock or abrasion resistant material for walls exposed to debris flood / debris flow impacts)

Figure 9-2: Stone Retaining Wall on Silvertip Road, Canmore AB

Figure 9-3: Example of Raised Lot Grading with Stone-Pitched Retaining Wall

Reinforced Foundations

Elevation may also be accomplished with reinforced foundations, providing space for flood waters below the main floor. This solution is also outside the scope of these guidelines and shall be designed by a qualified professional.

9.3.3.6 Fuel Storage and Other External Installations

Fuel storage containers, private pumping stations and any other external service installations with mechanical or electrical parts should be raised and secured at or above the minimum floor elevation.

9.3.3.7 Flood Resistance

Resistance measures are aimed at preventing floodwater ingress into a building; they are designed to minimize the impact of floodwaters directly affecting buildings and to give occupants more time to relocate ground floor contents. They are only effective for short duration flooding of low flow depth. They include the use of low permeability materials that reduce the rate of water ingress into a property. However, total prevention of water ingress, or dry proofing of a building, is very difficult to achieve. Structural reinforcement can also be used to reduce the impacts of debris flood or debris flow.

Temporary Measures

Temporary measures may be adequate only for existing development in low and moderate hazard zones of steep creeks. The application of temporary measures shall be assessed on a case-by-case basis by a qualified professional.

Examples of temporary measures for flood protection include:

- Flood shields, panels, doors and gates
- Temporary covers for openings in the foundation walls
- Sandbags
- Deployable flood barriers

However, the following issues with temporary measures have been identified:

- Homeowners have the responsibility to store, maintain and install the flood protection products.
- Future homeowners must be made aware of the use of temporary products as the chosen flood mitigation measure.
- The durability and sustainability of some products has not been proven.

Temporary measures are therefore not appropriate for new developments and shall not be pursued. Consequently, only permanent flood resistance measures are permissible for new development.

Permanent Measures

Lot Grading and Drainage

Landscaping of a development site or property boundary to direct or divert floodwater away from buildings can be effective, particularly in low or residual hazard zones, where the predicted duration of flooding is short (i.e., hours rather than days) and/or velocity is low (less than 1 m/s).

Grades adjacent to new buildings should be sufficient to allow for settlement of fill and maintenance of positive drainage away from the building. A minimum slope of 2% should be established on all lots to provide positive drainage away from the buildings. The minimum grade should be exceeded if topography allows. Grades shall be designed by a qualified professional.

Basement and Below Grade Spaces

Because of potential harm to building occupants, flood-proofing of spaces below the top of foundation wall is only permitted in low and residual hazard zones, or for non-residential occupancies in moderate hazard zones (non-habitable structures, crawl spaces, building access, garages, and additional storage area for residential buildings), unless a site-specific risk assessment demonstrates that the risk associated with a habitable basement is within acceptable threshold. In such cases, walk-out basements are permitted, if they are on a non-flow exposed side of the property. Walk-out basements are usually built into a hill or into a lot with strong grades between the front and rear yard.

Walk-up basements, containing sunken entrance, or dug-in stairs that go from the ground level down to the basement as an entry/exit to the building should be avoided. However, they are permitted in low and residual hazard zones, and maybe permitted in moderate hazard zones where an SCRA allows it.

Foundation Design

Table 9-3 below, describes the recommended design consideration for foundation walls.

In moderate hazard zones, the qualified professional undertaking the foundation design shall consider the anticipated flood loads (lateral hydrostatic forces and the vertical buoyant), potential debris impact loads (impact forces based on velocities), and scouring of foundation walls, in combination with other regular anticipated loads, as per Part 4 of the Building Code. The design flood elevation should also be considered to determine bearing capacity requirements of footings.

Table 9-3: Foundation Design Considerations

Hazard Zone	Design Requirements	Scouring Consideration
Low and residual hazard	Waterproofing measures apply and steel-reinforced concrete walls recommended on all sides,	None
Moderate hazard	Steel-reinforced concrete walls recommended on all sides, designed to withstand expected debris impact forces.	Building should have either: a) deep foundations able to resist anticipated scouring, b) scour protection to protect the foundations.

Openings in Foundation Walls

Openings (doors, windows, dryer outlet, etc.) in foundation walls may be allowed in accordance with

Table 9-4, below.

Table 9-4: Allowable Openings in Foundation Walls

Hazard Zone	Openings on Flow Exposed Foundation Walls	Openings on Non-flow Exposed Foundation Walls
Low and residual hazard	Windows allowed. Consider non-opening and sealed windows. The bottom of window, or top of window well, shall be above the Minimum Building Opening Elevation Other openings: not allowed	Windows allowed. The bottom of window, or top of window well, shall be above the Minimum Building Opening Elevation Walk-out basement entrances allowed: door sills shall be above the Minimum Building Opening Elevation. Walk-up basement entrances: top of retaining walls and landing (step-up) shall be above the Minimum Building Opening Elevation. Other openings allowed: shall be above the Minimum Building Opening Elevation
Moderate hazard	SCRA determines if openings are allowed.	Openings allowed: shall be above modelled flood level, plus 100 mm freeboard.

Window Wells

All window wells in a steep creek hazard zone shall follow the requirements set-out below, and as detailed in Figure EDCG GRD 3.4 Window Well Drain.

- Window well drainage system shall be designed by a qualified professional and shall minimize the likelihood of water accumulation in the well.
- The contact between the window well and the foundation wall shall be sealed.
- The bottom of the well shall be at a minimum of 150mm below the underside of the window.
- The top of the window well shall extend at least to the Minimum Building Opening Elevation.
- Grades around the window well must slope away at 2% minimum.

Waterproofing Measures

Waterproofing of foundation walls significantly increase the flooding resistance of a building and could be adopted for building in steep creek hazard zones.

The Foundation Walls section of the National Institute of Building Science's *Whole Building Design Guide* provides descriptions of waterproofing membranes, drainage materials, and systems common in foundation walls and below-grade building enclosure systems that could be adopted. The information is found at: www.wbdg.org/guides-specifications/building-envelope-design-guide/below-grade-systems/foundation-walls.

9.3.3.8 Flood Resiliency

Flood-resilient buildings, or wet-proofing of buildings, are designed and constructed to reduce the impact of flood water entering the building so that minimal permanent damage is caused, structural integrity is maintained, and drying and cleaning is easier. Such measures could be adopted for building in steep creek hazard zones.

Internal Space Layout

Careful layout of internal space is an effective measure to minimize the impact of floods. Living accommodation, mechanical room and electrical panel, storage space for key provisions and equipment, should be located at or above the design flood level. Further consideration should be given to locate the mechanical room and the more-frequented rooms in the sheltered area of the building opposite to the flow-exposed side(s) of the building.

An access to the building shall be located on a side that is not reasonably expected to be directly exposed to flood. This will help guarantee safer egress in case of an event.

For developments with underground parking below the modeled flood level, flood-proofing may not be necessary to prevent damage from floodwater as vehicles can be moved to higher ground. However, mechanical and electrical services should not be located below the modeled flood level. An unobstructed means of pedestrian ingress and egress should be provided above the modeled flood level.

Suggested Strategies to Minimize Flood Impacts

Suggested strategies to minimize flood impact to buildings and their occupants, flood resiliency measures, are described in **Error! Reference source not found.**, below.

Table 9-5: Suggested Strategies to Minimize Flood Impact to Buildings

Building Components	Strategies to Minimize Flood Impact
Walls and Insulation	Consider solid walls with external insulation instead of cavity construction to avoid problems of contamination entering the cavity. If cavity insulation is selected, consider using rigid closed-cell materials instead of other common insulation material such as wool batts to minimize moisture retention.
Foundation Openings for Services	Where possible, all service entries/openings should be sealed.
Water, Electricity and Gas Meters	Consider locating these services a minimum of 1m above finished grades.
Electrical Services	Consider locating electrical panel a minimum of 1.5m above slab elevation, and outlets 1 m above slab elevation to minimize damage to electrical services.

HVAC Systems and Hot Water Tanks	Consider installing air conditioning compressors, heat pumps, furnaces, hot water tanks, tankless water heaters, ductwork and ancillary devices 1 m above slab elevation and preferably above ground. Consider hanging units from the ceiling. Consider not installing baseboard heaters and underfloor heating in below grade basements. Hydronic baseboards should be considered.

9.3.4 Deflection Measures

This section covers the design of simple deflection measures, including basic principles of bioengineering. Deflection measures minimize the building exposure to the hazard by deflecting flow away from the development. Deflection measures will typically be off-site.

The retention of water and/or sediment to reduce peak discharges and sediment volumes, extensive soil bioengineering, as well as forest management measures, are out of scope for these guidelines. Any such measures shall be designed by a qualified professional.

9.3.4.1 Deflection Measure Requirements

The deflection measures shall be designed by a qualified professional and shall take into consideration the following requirements:

- Deflection measures shall be designed and constructed in a way that the risk to people inside buildings are reduced in case of a modeled flood event.
- Measures shall be designed according to the flow impacts / impact intensities determined in hazard assessment studies or site-specific steep creek risk assessments.
- Consideration shall be given to access and egress from a property in case of an event.
- Deflection measures can also function as a retaining wall to elevate a building.

9.3.4.2 Design of Deflection Measures

Deflection of flow can be achieved with berms, walls or wedges. These deflection measures may be applied for floods, debris floods and debris flow of different flow depths and velocities. However, these guidelines apply only for the design of an earth berm in a low or residual hazard zone, with maximum flow velocities of 1 m/s and maximum flow depth of 1m.

Deflection measures in a moderate hazard zone shall be designed by a qualified professional. Impact pressure and geotechnical conditions are critical design consideration for such designs. The design of deflection walls shall include structural analysis of the proposed structure according to the impacts as provided by a hazard assessment. Minimum berm height shall be the modeled flood level plus 300 mm of freeboard.

9.3.4.3 Design of Seeded Earth Berm

In low and residual hazard zones, a grassed earth berm without additional erosion protection may be sufficient. The berm shall be constructed according to the specifications below. Alternate protection measures shall be designed by a qualified professional.

Berm specifications:

- Maximum slope steepness of 2(H):1(V)
- Berm height shall be 1.3m, which includes the required 150mm of topsoil and 300mm of freeboard.
- The foundation of the berm shall be stripped of all vegetation, organic and otherwise objectionable materials, to a minimum depth of 300mm. After stripping, the earth foundation should be moistened if dry and should be compacted to 95% Standard Proctor Max Dry Density before placement of the first layer of fill material. Fill shall not be placed on frozen soils, ponding or standing water, or on deleterious materials.
- Fill material should be locally sourced, if readily available. Table Table 9-5, below, shows suitable materials for berm construction, as per the Unified Soil Classification System (USCS), ASTM D-2487. Inclusion of vegetation, organic material or frozen soil in the berm is not permitted.
- The fill shall be layered along the full length of the berm in depths appropriate to the equipment used. Maximum lift thickness of 100mm is appropriate for small equipment use, such as vibratory plate compactor. Maximum lift thickness of 200-300mm is permitted for heavy equipment use, such as sheepsfoot rollers, vibratory and smooth-wheeled rollers, depending on material type.
- Compaction shall meet 95% Standard Proctor Max Dry Density.

Table 9-5: Materials Suitable for Berms, in Preferential Order

Material Classification (USCS)	Description
GC	Clayey gravel
SC	Clayey sand
GM	Silty gravel
CL	Lean clay (low plasticity)
CI	Intermediate clay (moderate plasticity)

9.3.4.4 Topsoil, Seeding, and Plant Material

Topsoil and plant material used for flood protection, as well as the maintenance requirements, shall adhere to the landscaping guidelines in Section 0 of the EDCG. Additional specifications are provided below.

On an earth berm, on side slope of a raised lot, or within the banks and channel of a creek, only grass and small shrubs shall be planted. The following shrub species, with a maximum trunk diameter of 40mm, are appropriate:

- Green Alder (*Alnus crispa*)
- Pussy Willow (Salix discolor)
- Smooth Willow/Gray-leaved Willow (Salix glauca)
- Meadowsweet/Birch Leaved Spiraea / White Spiraea (Spiraea betulifolia)

Only the Willow species can grow from the stump and can be used for brush layers or willow staking. Plant material should ideally be harvested within the Bow Valley, from a location with similar growing conditions. Approvals for harvesting from private and public lands shall be obtained if sourced offsite.

Strong rooted grass species, of the seed mix shown in Table Table 9-6, below, shall be used. An alternate seed mixes could be considered if the required seed mix is not readily available. A seeding rate of 25 kg/ha shall be used. Erosion protection, such as coconut mat, geofabric and hydromulch, should be considered, especially when grass has not been established prior to autumn and winter months.

Table 9-6: Seed Mix for Flood Protection

Scientific Name	Common Name	Target Cover	% of Seed Mix (PLS)	Kg Required (PLS)
Deschampsia ceaspitosa	Tufted Hairgrass	20%	6.6%	1.65
Koeleria macrantha	Junegrass	20%	5.2%	1.30
Bromus carinatus	Mountain Brome	10%	28.4%	7.10
Agropyron smithii	Western Wheatgrass	10%	23.3%	5.83
Poa alpina	Alpine Bluegrass	20%	10.2%	2.55
Agropyron dasystachyum	Northern Wheatgrass	10%	16.6%	4.15
Elymus canadensis	Canada Wildrye	5%	9.3%	2.33
Agrostis scabra	Rough Hairgrass	5%	0.4%	0.1

9.3.4.5 Maintenance of Grass and Plant Material

The following maintenance is required on berms and raised lot side slopes:

- The grass shall be cut once, only after a year of growth, to promote early root growth.
- Re-seeding shall be undertaken every spring until the grass is well established.
- Weeds shall be removed as per Alberta's Weed Control Act.
- Trees, plants or shrubs shall be cut when trunk diameter of 40mm is reached.

9.3.4.6 Design of Other Deflection Measures

The design of other deflection measures, such as timber plank wall and earth berms with stone-pitching, is out of scope for these guidelines. Other deflection measures shall be designed by a qualified professional.

9.3.5 Steep Creek Mitigation of Medium to Large Developments

Mitigation of debris-flood and debris-flow hazards for medium to large developments (i.e., on subdivision level, area structure plan) must be designed by a qualified professional who is experienced in steep creek hazard mitigation design. The mitigation design must adequately address the nature of debris floods and debris flows, which are substantially different from clear water or river flooding.

9.3.5.1 Hazard Type Characteristics and Design Scenarios

The qualified professional designing mitigation measures must identify the specific hazard type (i.e., clear water flood, debris flood, debris flow) that could impact the development and the designed mitigation measures. On many fans, multiple hazard types can impact the same location. The design basis for mitigation measures shall be based on multiple design scenarios that together represent the range of possible hazard impacts (e.g., hazard type, flow depth, flow velocity, peak discharge, volume). Hazard type(s) should be derived from the existing steep creek hazard and risk assessment reports that are available on the Town of Canmore online Property Viewer. If the appropriate assessment reports are not available for a new development area, then the Developer shall retain a qualified professional experienced in steep creek hazard assessment.

Designs may have different performance objectives for each design scenario, as needed to meet the risk reduction target. For example, a structure may be designed to fully contain a smaller, more frequent flow, but allow overtopping without erosion or collapse for larger, less frequent flows.

Debris-flood and debris-flow mitigation designs that are located on a fan need to simultaneously manage several overlapping and equally important aspects of these hazards:

a) Water and debris-flow discharge: The discharge includes the mixture of water, sediment, and debris.
b) Watershed sediment: This is the volume of sediment that enters the fan from the watershed.
c) Fan sediment: This is the volume of sediment that is redistributed on the fan through erosion, entrainment, and re-deposition.
d) Woody debris: This includes small branches to large logs that are carried on top of (debris floods) or mixed into (debris flows) the flow.
e) Bank erosion: This is the removal of sediment, soil, and rocks from the bank of the creek channel causing the channel to widen and the bank to move laterally away from the channel.
f) Flow avulsion: This is the potential for flows to exit the existing dominant channel due to discharge exceeding the channel capacity, channel blockage, or bank erosion.
g) Dynamic impacts: This is the force of the flowing mixture against structures.

9.3.5.2 Mitigation Measures

A functional chain of multiple mitigation measures is typically needed to address these various hazard aspects and meet the performance objectives of all design scenarios. The following mitigation measures may be applicable:

a) Land use planning: Use steep creek hazard zones to inform the development layout, with high occupancy land uses (e.g., housing) and critical infrastructure in the lowest hazard zones. Highest

hazard zones should be used for low risk uses like parking lots and green spaces, consistent with the LUB and MDP.

b) Local building and infrastructure protection: Protect individual buildings and infrastructure with site specific measures that deflect flows, resist erosion, resist dynamic impact, and resist ingress of flood water and debris. These measures are described in Section 9.3.4.2 of the EDCG.

c) Site grading: Place infrastructure and buildings above modeled flood levels. Protect fills and building foundations from erosion and undermining. Incorporate floodways into the site grading plans that convey flood waters through designated, low occupancy areas (e.g., parking areas, green spaces). Raising the development elevation is described in Section 9.3.3.5 of the EDCG.

d) Conveyance channels: Design conveyance channels to carry floods and debris floods from a steep creek to a safe outlet point. The conveyance channel design must accommodate or incorporate elements (e.g., sediment basin, erosion protection) that manage: the sediment volume arriving from the watershed; the peak discharge of the flow; woody debris; and the potential for erosion and redistribution of sediment along the channel. Conveyance structures can transfer hazard and risk. Risk transfer must be assessed against the risk tolerance criteria adopted in Section 3.5 of the MDP,. Where possible, wide and shallow channels, or floodways defined by berms set far back from the channel, should be considered instead of narrow and deep channels. A wide and shallow channel mimics natural debris-flood channels, reduces forces on erosion protection, reduces redistribution of sediment on the fan, reduces lateral bank migration, and can accommodate larger volumes of woody debris without channel blockage. Narrow and deep channels could be inappropriate for debris-flood conveyance in new development since they could be prone to unexpected lateral bank migration and flow avulsion.

e) Sediment and debris-flow retention: Capture debris-flood sediment or debris-flows using a suitably sized basin and/or barrier. A retention structure located near the fan apex would be sized for the sediment or debris-flow volume arriving from the watershed. A retention structure located part way down the fan needs to also account for the volume of sediment eroded from the fan, as well as potential for avulsion upstream. A suitably sized wide and shallow conveyance channel may also act as a sediment and debris flow retention structure. Other types of retention structures generally include one or more outlets or spillways that allow flows to safely pass the structure. Channels downstream of retention structures must be designed to accommodate the high erosive power of flows that have been stripped of sediment by the retention structure.

f) Diversion structures: Diversion structures are erosion protected channels and/or berms that intercept and carry flows around critical infrastructure, buildings, or discrete areas. Diversion structures can transfer hazard and risk. Risk transfer must be assessed against the risk tolerance criteria adopted in Section 3.5 of the MDP s. Risk transfer can be managed by discharging floods safely into downstream water body or into existing, appropriately sized, flood conveyance structures located downstream of the development.

g) Water or debris attenuation: Debris-flows and debris-floods contain surges of relatively higher peak discharge. The peak discharge of water and/or sediment can be reduced by temporarily capturing and storing the water and/or sediment with a barrier and/or basin. The reduced peak

discharge allows for relatively smaller conveyance structures downstream of the attenuation structure.

h) Erosion protection: Erosion protection in steep creek mitigation structures could include stone pitching, grouted stone pitching, suitably sized riprap, or concrete structures that protect against bank migration, scour, and entrainment of sediment from the channel bed and banks. Erosion protection can be a revetment placed on top of erodible soil or can include channel stabilization, grade control structures, or ground sills that resist knickpoint migration, downcutting, outflanking of structures, and bank migration.

i) Woody debris retention: Capture woody debris in an area that allows water to be conveyed past the woody debris and is protected from flow avulsions from the channel. The volume of woody debris that can be captured is a function of the woody debris deposition area. Basins, ponds, and wide conveyance channels can retain a much larger volume of woody debris than deep narrow channels.

9.3.5.3 Design Guidance

Mitigation measures should be designed using criteria, parameters, and methods that are suitable for steep creek hazard mitigation. The following provides specific design guidance:

a) Sizing of channels and openings: The peak discharge of debris floods and debris flows can be many times larger than the peak discharge of a clearwater flood. Identify the hazard type and size channels and openings for the specific hazard that may occur. Identify where multiple hazard types may occur. Allow for sediment and woody debris conveyance and deposition, as appropriate, given the functional chain of mitigation measures.

b) Freeboard: Freeboard is the vertical distance from the design water surface (i.e., given the design discharge) to the top of the confining channel wall. Freeboard is similar to a factor of safety that compensates for many factors that could contribute to the top of flow elevation being greater than the design water surface. These factors could include: waves; uncertainties or changes in channel roughness; uncertainties in peak discharge; return period of the design discharge (and likelihood of exceedance); superelevation (or runup) of flow at bends; changes in the bed level (e.g., sediment deposition); or woody debris that is carried on top of the water surface. Freeboard would typically be in the range of 0.3 m to 2 m, and selection of the freeboard should be justified by the qualified professional based on the design return period of the flow and how the factors listed above were addressed in the design. If a design directly accounts for uncertainty in other ways (e.g., using risk concepts), the term and concept of freeboard may be omitted.

c) Debris-flow and debris-flood loads: Load cases need to account for static, dynamic and drag loads as relevant for the specific structure. Dynamic loads occur when debris flows, debris floods, or woody debris initially impact structures. Static loads occur when structures are retaining sediment and debris, and drag forces occur where flows pass over a structure, for example over a spillway. Load should be assessed as a function of flow depth, deposit depth, flow velocity, and flow density.

d) Woody debris management: Design woody debris retention structures to resist the relevant impact forces and identify how the volume of woody debris retained relates to the capacity of other design elements and the expected total volume of woody debris.

e) Sediment management: Identify the volume of sediment that can be contained by the sediment retention structure, allowing for an appropriate sediment deposition slope (typically between 0.5

and 1.0 times the natural gradient of the fan surface). Justify selection of the sediment deposition slope. Describe how the sediment storage capacity relates to the expected volume of sediment from the watershed and volume that may be entrained from the fan upstream of the sediment retention structure.

f) Erosion protection: Alberta Class 3 riprap is the minimum size of riprap acceptable for erosion protection in debris-flood and debris-flow mitigation structures including channels and berms, except in areas not subjected to direct impact of debris-flood or debris-flow, such as in areas of ponding with low flow velocity. Justification to use smaller than Class 3 must be provided. Stone pitching, grouted stone pitching, and/or concrete structures are required in areas that are exposed to high intensity flows, defined as an intensity of 5 m^3/s^2 or greater (flow depth times flow speed squared).

g) Berms: Berms should be designed with appropriate consideration for the unique characteristics of debris-flow and debris-flood processes described in Section 9.3.6.1. Seek to use locally available materials as borrow, if the aggregate characteristics are appropriate. Consider material availability and consequences of seepage on berm stability and flooding due to seepage. Given the relatively short duration of debris flows and debris floods (i.e., minutes to days), it may be acceptable to omit a low permeability liner or low permeability fill if the berm stability objectives are met and there is an adequate method for managing water that seeps through the berms. Protect berms from erosion.

h) Super-elevation: Due to high velocities, flows may super-elevate around channel bends. Channel and berm sizing should account for the potential for super-elevation.

9.4 Groundwater

The central portion of the Town of Canmore (situated in the valley bottom) is underlain by coarse and pervious river gravels to a considerable depth. These gravels together with the nearby presence of the Bow River result in high groundwater levels that impact trench and foundation excavations as well as completed building foundations and underground utilities. A number of piezometers and staff gauges are located throughout the central area of Canmore. Groundwater levels are recorded regularly and analyzed for historic trends. This information is available to the Town and Developers to improve the design, construction, operation and maintenance of municipal infrastructure, stormwater management systems and buildings with respect to the impact of high groundwater levels.

Monitoring locations are shown on Figure EDCG HLC 9.6 Piezometer and Staff Gauge Location and sample level fluctuations on Figure EDCG HLC 9.7 Typical Water Level Fluctuation.

9.4.1 Building Floor Elevations

Town's *Land Use Bylaw*, *High Groundwater Area Regulations*, prohibits the building of habitable floor space below the maximum 1:100-year design groundwater elevation. These elevations, which include a freeboard allowance between 0.2m to 0.6m, are based on a groundwater model and are shown on Figure HLC 9.8, 1:100 Year Design Groundwater Elevations. Local conditions such as soil types and topography may influence groundwater elevations and a site specific geotechnical or hydrogeological study is recommended to assess groundwater levels at seasonal highs and compare to statistical data.

In the case of data discrepancies that may exist between information on Figure EDCG HLC 9.6, Figure EDCG HLC 9.8 and more recent piezometer data, the engineer should propose whether the highest

anticipated groundwater elevation will be determined using the highest of elevations from Figure EDCG HLC 9.6, data from Town historical records or by recent data from test wells or piezometers on site.

Certain areas within the High Groundwater Regulation Area are marked as 'To be determined'. In these areas a qualified professional is required to assess existing data and perform a site specific evaluation to determine the appropriate elevation.

All sanitary sewer and water service piping located in a subsurface mechanical room shall be sealed against infiltration of any groundwater and water meters shall be situated above the 1:100-year ground water level unless the mechanical room is designed and constructed to withstand the infiltration of groundwater. All sanitary sewer and manholes located below the 1:100-year groundwater elevation should be tested for infiltration/exfiltration as outlined in Section 5 of the EDCG. The Developer is responsible for all costs associated with the testing.

9.4.2 Underground Parkade and Lowest Parking Slab Elevation

Parkade floor levels may be lower than the 1:100-year groundwater level but not lower than the 1:20-year groundwater level to avoid frequent nuisance flooding. However, the Town has the authority to make the final decision on the appropriate elevation to be used on a site. The impact of periodic flooding shall be determined and evaluated by the Consulting Engineer. In all cases, the structure should be designed to address all hydrostatic and hydrodynamic forces due to high groundwater conditions at the site.

9.4.3 Mechanical and Electrical Installation Elevation

The Province of Alberta and Town of Canmore require that all mechanical and electrical installations be installed above the maximum 1:100-year design and groundwater elevations noted above.

9.4.4 Utility Installations and Foundation Excavations

The installation of deep utilities and excavation for buildings in the central area of Canmore should be scheduled for times when groundwater levels are at their lowest. This occurs between the late fall and early spring. When excavation into the water table cannot be avoided, disposal of groundwater from an excavation may be necessary. The Consulting Engineer shall prepare and submit plans for such disposals to the Town engineer as part of the construction management plan. Provided there is no detrimental impact to the aquifer, vegetation, adjacent properties or structures, groundwater may be discharged as follows:

- Water may be discharged to a temporary, on-site infiltration basin specifically designed for that purpose based on the maximum discharge pumping rate and the soil infiltration rate. If the discharged water contains a high sediment load, a separate sedimentation basin or an additional allowance for the infiltration basin shall be provided.
- Water may be discharged to a naturally vegetated area of adequate size and with suitable soils. If the discharged water contains a high sediment load, a geotextile filter shall be installed at the discharge point to collect and contain the sediment; this shall be removed upon completion and any disturbed areas restored to an acceptable condition.
- Water may be discharged to a natural watercourse or surface water body provided the discharge has first been treated and the quality of the discharged water is equal to or better than that of the receiving body, especially with respect to sediment and turbidity. While possible in theory, this option has seldom been utilized due to the relatively high infiltration rates which favor the use of

on-site infiltration basins. The Consulting Engineer (and in smaller cases the Builder) is responsible to obtain additional approvals that may also be required from the Province of Alberta.

In all cases, the point of discharge shall be protected against erosion. If sediment-laden or turbid discharge water finds its way into any surface water course, discharge shall cease immediately, sediment shall be removed, and the area shall be restored to its pre-existing condition. All groundwater disposal methods proposed on municipal lands or within the Town's wellhead capture zone must be accepted by the Town Engineer prior to construction. The Consulting Engineer (and in smaller cases the Builder) is responsible to obtain additional approvals that are required from the Province of Alberta.

Trench or excavation groundwater may not be discharged to the sanitary sewer system.

Discharge to a contained stormwater sewer system (system with a detention pond that does not discharge directly to a surface water body) or to a stormwater drywell may be considered where the water is of acceptable quality and such discharge has been authorized in writing by the Town Engineer.

9.5 Protection of Aquifer for Municipal Water Supply

The Town obtains a significant portion of its' total municipal water supply from groundwater in the Bow River valley aquifer beneath the Town. Existing production wells are located adjacent to Policeman's Creek near the intersection of Railway Avenue and Old Canmore Road. The Town has adopted a wellhead protection strategy made up of three control mechanisms to protect this water supply source. Development in the area upstream of and near to the production wells is controlled by the Town and restricted to uses or activities that will not adversely affect the quality of the groundwater. Refer to the *Land Use Bylaw*, *Section 7.4 Groundwater Protection Overlay* for additional details.

9.5.1 Control Mechanisms

9.5.1.1 Control Mechanism #1 - Construction Activity Control

Construction of municipal improvements on municipal lands or other activities not regulated by the *Land Use Bylaw* and located within the wellhead capture protection zone (see Figure EDCG HLC 9.9 Wellhead Capture Protection Zone) as defined by hydro-geological parameters, shall comply with these guidelines and any other specific requirements deemed necessary by the Consulting Engineer for the protection of the Town's water supply source.

9.5.1.2 Control Mechanism #2 - Land Use Control

The Town's *Land Use Bylaw* establishes the wellhead protection area, which is used to regulate land use for all development sites wholly or partly within the boundary of the area. The limits of the wellhead protection area (land use) are shown in Section 7.4 of the *Land Use Bylaw*. Certain types of land uses are prohibited from the wellhead protection area. Permitted or discretionary uses must conform to the performance criteria listed in the *Land Use Bylaw* and the Town may require a risk assessment report as part of a site development permit application. Refer to the *Land Use Bylaw* for additional details.

9.5.1.3 Control Mechanism #3 – Stormwater Disposal Control

Stormwater treatment and disposal for all outfalls (including drywells and other infiltration devices) shall be in accordance with the Town of Canmore's EDCG or Alberta Environment standards, whichever is the more stringent. Refer to Section 6.0 of the EDCG for additional details.

9.5.2 Technical Requirements and Performance Regulations

A wellhead protection area is considered to be the extent of the areas covered by the three control mechanisms described in the previous section (construction activity control, land use control, and stormwater disposal control). The technical requirements for development in wellhead protection areas are described in Table Table 9-7, below.

Table 9-7: Technical Requirements for Development in Wellhead Protection Areas

Development Description	Technical Requirements
All Proposed Developments	A stormwater drainage plan shall be prepared for all proposed developments to the satisfaction of the development authority. The plan shall show how surface water can be effectively managed, including the identification, containment and appropriate disposal of contaminants found in surface water should they occur.
All New Developments Where On-Site Collection and Treatment are Proposed	Stormwater systems shall be constructed in conformance with the guidelines provided in the Town of Canmore's EDCG.
Development in Residential Areas of the Wellhead Protection Area	It shall be demonstrated, to the satisfaction of the development authority, that excavations shall not expose the aquifer to any harmful degradation including the removal of overburden for extended periods of time and the creation of permanent pathways without stormwater disposal control between the ground surface and the aquifer.
Development that Uses Pilings	It shall be demonstrated, to the satisfaction of the development authority, that the pilings shall not degrade the aquifer including the development of pathways without stormwater disposal control between the ground surface and the aquifer.
Development in Commercial and Industrial Areas of the Wellhead Protection Area	• All new petroleum storage tanks and all petroleum storage tank replacements shall be placed above ground. Tanks shall have secondary containment with dikes, impervious liners or equivalent, a leak detection and/or monthly statistical inventory reconciliation analysis system and shall have an overfill or spill prevention system. • All containers of material that could contaminate the aquifer shall have secondary containment and continuous monitoring. • It shall be demonstrated, to the satisfaction of the development authority, that excavations shall not expose the aquifer to any harmful degradation including the removal of overburden for extended periods

	of time and the creation of permanent pathways without stormwater disposal control between the ground surface and the aquifer. • All holes created by the removal of piles, foundations, drilling or any other similar activity shall be properly sealed in a manner to minimize seepage into the underlying aquifer. • If required, monitoring programs that detect contamination of the aquifer shall be prepared and implemented to the satisfaction of Alberta Environment. • A materials handling management plan shall be prepared for hazardous and dangerous materials that are brought on site. The plan shall be in compliance with the Canadian Transportation of Dangerous Goods Act, WHMIS and Alberta Environmental Protection and Enhancement Act.
Development that Involves Compressed Gas Pipelines	• All pipeline plans shall meet the conservation and reclamation requirements of the Alberta Environmental Protection and Enhancement Act. • It shall be demonstrated, to the satisfaction of the development authority, that excavations shall not expose the aquifer to any harmful degradation including the removal of overburden for extended periods of time and the creation of permanent pathways without stormwater disposal control between the ground surface and the aquifer.
Development that Involves Liquid Petroleum and Oil Pipelines	The same requirements as those listed for compressed gas pipelines shall apply.
Development that Involves Pasture, Dry Land Farming and Passive and Active Recreational Activities	• A pesticide and/or fertilizer management plan that complies with the Alberta *Environmental Protection and Enhancement Act*, Section 5 and the *Public Health Act*, *Nuisance and General Sanitation Regulation* AR 242/85 shall be prepared and implemented. • Pesticides shall only be stored in facilities that comply with Alberta's *Safety Codes Act* and environmental *Enhancement and Protection Act Regulations*. • The application of pesticides shall be done only by individuals holding a valid and applicable pesticide applicators certificate or by uncertified individuals working under the direct supervision of a provincially certified applicator. • All new petroleum storage tanks and all petroleum storage tank replacements shall be placed above ground. All tanks shall incorporate secondary containment with dikes, impervious liners or equivalent, leak detection and/or monthly statistical inventory reconciliation inventory system and each tank shall have an overfill or spill prevention system.

All Current Uses Which Involve the Handling of Biomedical Wastes	All such business or operations shall register their existing management plans with the Town of Canmore and shall ensure that the Town is notified of any plan modifications.
All Commercial Kennels and Veterinary Clinics	All such businesses shall develop animal waste management plans and register these plans with the Town of Canmore and shall ensure the Town is notified of any plan modifications.

9.6 Development Adjacent to the Railway

Development adjacent to the railway shall be in accordance with this guideline to ensure risks to life and property are within generally accepted risk tolerances.

9.6.1 Baseline Risk Assessment

A baseline risk assessment was undertaken in 2019 on all parcels adjacent to the railway corridor in Canmore (Canmore Railway Risk Assessment, 2019). Provided that the development meets the railway proximity and envelope requirements below for the specific land use classification, no further assessment is required. Where a variance from guidelines is proposed, the Applicant will be required to complete further assessment in accordance with the City of Calgary Development Next to Freight Rail Corridors Policy Implementation Guide.

9.6.2 Rail Proximity Envelope

These guidelines utilize the concept of Rail Proximity Envelope (RPE), which determines the area of potential exposure of developments along the railway corridor. The RPE has three dimensions:

- Width – measured parallel to the rail track
- Depth – measured perpendicular to the rail track
- Height – measured vertically to the rail track

The Height of the RPE is 7m for all scenarios. For new developments, the Depth of the RPE is 30m from the property line, which is necessary to take into consideration possible future expansion of train traffic along the corridor (see Figure 9-4) However, for existing buildings, the Depth is measured from the middle of the rail track since it is not feasible to relocate them outside of the RPE and further from the rail track (see Figure 9-5 below). The Width is defined below.

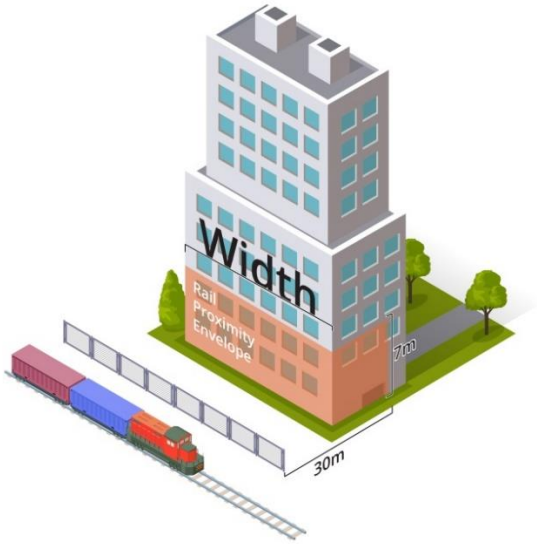


Figure 9-4: Illustration of the Rail Proximity Envelope for New Developments

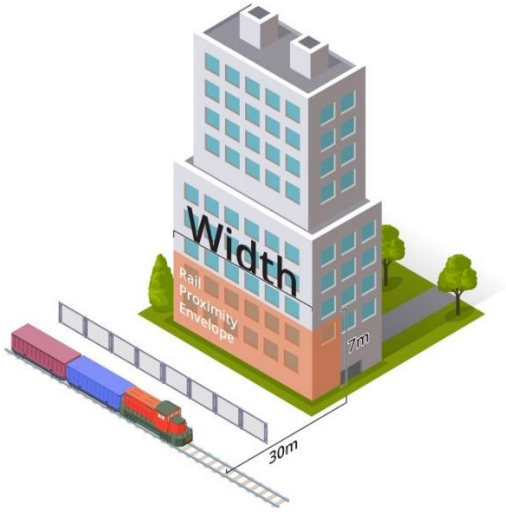


Figure 9-5: Illustration of the Rail Proximity Envelope for Existing Buildings

9.6.3 Maximum Widths

The maximum building or use width, for allowable uses, is outlined in Table 9-8 below.

Table 9-8: Maximum Building or Use Width

Allowable Uses	Maximum Building Width or Maximum Use Width* (meters)
Sensitive Use	25
High Density Use	84
Low Density Use	837
Manufacturing (and open space) Use	unlimited

*Only applies to Use(s) within the Rail Proximity Envelope

9.6.4 Use Classification

Reference Table Table 9-9 or use classification for the purpose of development adjacent to railway.

Table 9-9: Allowable Uses Classification

High Density Uses	Low Density Uses	Sensitive Uses
Visitor Accommodation*	Live/Work Studio*	Medical Clinic*
Apartment Building*	Duplex*	Care Facility*
Hostel*	Manufactured Dwelling*	Daycare*
Townhouse*	Detached Dwelling*	Education Institution*
Townhouse, Stacked*	Accessory Dwelling Unit*	Hospital*
Bed & Breakfast*	Retail	Library*
Arts and Crafts Studio	Financial Institution	Bulk Fuel Station
Eating and Drinking Establishment	Automotive and Equipment Repair	Gas Bar and Service Station
Office	Personal Service Business	Laboratory
Common Amenity Housing	Automotive Part Sales	
Automotive Sales and Rentals	Industrial Equipment Sales and Rentals	
Kennel	Contractor Services and Repair	
Museum	Car Wash	

Pet Care Facility	Laundry Facility	
Private Club	Light Manufacturing	
Veterinary Clinic	Printing Establishment	
Athletic and Recreational Facility, Indoor	Rapid Drive-Through Vehicle Service	
Convention Centre	Storage Facility and Warehouse	
Entertainment Establishment	Brewery/Distillery	
Public Building	Wholesale Store	
Retail Sales with 500 m2 or greater of GFA	Athletic and Recreational Facility, Outdoor	
	Funeral Home	
	Religious Assembly	
	Recycling Depot	

*Considered Noise Susceptible Uses

9.6.5 Sensitive Uses

For any development where a building is within the RPE and includes a Sensitive Use, further assessment is required in accordance with the City of Calgary Development Next to Freight Rail Corridors Policy Implementation Guide.

9.6.6 Noise Study

A noise study might be required for Noise Susceptible Uses listed Table 9-9 that are located within the RPE. See the City of Calgary Development next to Freight Rail Corridors Policy Implementation Guide for noise study requirements.

9.6.7 Development adjacent to the Trans-Canada Highway

A Noise Impact Assessment is required when development is proposed adjacent to the Trans-Canada Highway, as specified in Section 2.18 of the Land Use Bylaw. The study shall be prepared by a qualified professional and shall adhere to the criteria described in the latest edition of the *Noise Attenuation Guidelines for Provincial Highways Under Provincial Jurisdiction within Cities and Urban Areas* prepared by Alberta Transportation.

Developers are required to submit a Roadside Development Permit application to the Province for any development within the development control zone as defined by Alberta Transportation and Economic Corridors.

SECTION 10 – Landscape Development Guidelines and Construction Specifications

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 10" is made available for use in the Town of Canmore effective as of the date below:

July 8, 2025

The "2025 Engineering Design and Construction Guidelines – Section 10" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA and AALA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Parks Planner

10.0 Landscape Development Guidelines and Construction Specifications

10.1 Introduction

This purpose of this section is to provide guidance and direction for landscape and amenity-related development and construction on Town of Canmore public lands. It is divided into two parts:

Part A: Landscape Development Guidelines, which provides direction for designing public lands, including parks, natural areas, public utility lots, and streets/roads landscaped areas; and

Part B: Landscape Construction Specifications, which specifies how landscape elements should be constructed and/or installed.

As outlined in Section 1.1.2, unless otherwise outlined in this Section, the Town of Canmore follows the latest version of the City of Calgary guidelines and standard specifications for landscape development and construction. Developers and/or their consultants will use the direction provided in this Section first and refer to the City of Calgary document for all other direction. The Town of Canmore Parks Planner will provide direction and decide on any discrepancies or conflict between this Section and the City of Calgary document, or where no direction is provided.

Landscape designs will be informed by policy direction provided by applicable approved land use and development planning documents including area structure plans, area redevelopment plans, and/or conceptual schemes. The land use and development planning documents will conform to and be consistent with Federal and Provincial legislation and Council approved policies, including:

- Municipal Development Plan
- Open Space Development Guidelines
- Open Space and Trails Plan
- Recreation Master Plan
- Integrated Transportation Plan
- Climate Emergency Action Plan
- Human Wildlife Coexistence Implementation and Action Plan

Developers and/or their consultants are encouraged to review these documents to better understand how the Town's community parks and open space goals and objectives can be achieved through their landscape design.

Part A: Landscape Development Guidelines

Part A outlines the landscape design elements and activities a developer should consider and include when developing public lands. Landscape development direction is provided for the following public lands: parks; natural areas; streets and road landscaping areas; Public Utility Lots (PUL); and Town-owned Rights-of-Ways (ROW). Landscape designs should align with Part B Landscape Construction Standards and Specifications.

10.2 Parks

10.2.1 Minimum/Maximum Requirements for Park Landscape Development

The following tables outline the development activities a Developer is responsible to undertake in Linear Parks, Neighbourhood Parks and Regional Parks.

Table 10-1: Linear Parks

Development Activity (landscape action, feature or element)	Quantity/Extent		Additional Information
	Minimum	Maximum	
Grading/Loaming/Topsoil	Entire Site	Entire Site	As per specifications
Turf	Entire Site[a]	Entire Site[a]	As per specifications
Irrigation	Areas with trees or shrubs (excluding natural areas)	Entire Site	As per specifications
Trees	200 trees/ha with a minimum 1 tree on each side of a pathway for each 10 linear meters		As per approved species and specifications
Fencing	As required	As required	As per approved policy and/or specification
Multi-Purpose Pathway, asphalt or gravel/clay surface	1 per site	As required	As per approved plan/policy and/or specification
Trails	0 per site	As required	As per approved policy and specification
Benches	0 per site	1 per 100 linear metres	As per specification
Picnic Tables	0 per site	1 per site	As per specification
Bollards (Decorative, With Lights, Removable)	As required	As required	As per specifications
Signage	As required	As required	As per specifications
Lighting	As required	As required	As per specifications
Other activities	As approved by Town of Canmore Parks		

Notes: (a) Excluding areas identified as naturalized zones.

Table 10-2: Neighbourhood Parks

Development Activity (landscape action, feature or element)	Quantity/Extent		Additional Information
	Minimum	Maximum	
Grading/Loaming/Topsoil	Entire Site	Entire Site	As per specifications
Turf	Entire Site[a]	Entire Site[a]	As per specifications
Irrigation	Areas with trees or shrubs	Entire Site	As per specifications Excluding: - Natural areas - Naturalized zones - Naturalized planting beds
Trees	70 trees/ha for parks < 0.5ha 45 trees/ha for parks 0.5ha and greater	100 trees/ha	As per approved species and specifications
Shrubs	10 m^2/ha	50 m^2/ha	As per approved species and specifications
Play Equipment and/or other recreational equipment	As approved		As per approved policy and/or specification
Ball Field	0 per site	1 per site	As per approved policy and/or specification
Fencing	As required	As required	As per approved policy and/or specification
Pathway	As required	As required	As per approved policy and/or specification
Trails	0 per site	As required	As per approved policy and/or specification
Benches	2 per site	4 per site	• As per specification. • Total number of benches is exclusive of benches that may be required for sport related amenities e.g. ball fields
Picnic Tables	2 per site	As required	As per specifications
Bollards (Decorative, With Lights, Removable)	As required	As required	As per specifications

Waste/Recycling Receptacles	Refer to Section 11 Solid Waste specifications		• Near park entrances as close to a road/street as possible • Located away from seating areas • 1.5m flat, walkable area clear of obstacles around the receptacle(s)
Signage	As required	As required	As per specifications
Lighting	As required	As required	As per specifications
Other activities	As approved by Town of Canmore Parks		

Notes:

a) Excluding areas identified as naturalized zones where vegetation will be specified.

Table 10-3: Regional Parks

Development Activity (landscape action, feature or element)	Quantity/Extent		Additional Information
	Minimum	Maximum	
Grading/Loaming/Topsoil	Entire Site	Entire Site	As per specifications
Turf	Entire Site[a]	Entire Site[a]	As per specifications
Irrigation	Entire Site	Entire Site	As per specifications
Trees	50 trees/ha	100 trees/ha	As per approved species and specifications
Shrubs	10m^2/ha	50m^2/ha	As per approved species and specifications
Play Equipment and/or other recreational equipment	MR Parcel: 0 per site MSR/Joint Use Site: 1 per site	1 play space with two separate age group play structures	As per approved policy and/or specifications
Soccer Field	MR Parcel: 0 per site MSR/Joint Use Site: 1 per site	As per specifications will allow	As per approved policy and/or specifications
Football Field	MR Parcel: 0 per site	1 per site	As per approved policy and/or specifications

	MSR/Joint Use Parcel: As per school requirements		
Ball Field	MR Parcel: 0 per site MSR/Joint Use Site: 1 per site	As per specifications will allow	As per approved policy and/or specifications
Fencing	As required	As required	As per approved policy and/or specification
Pathway	As required	As required	As per approved plan/policy and/or specification
Trails	0 per site	As required	As per approved policy and/or specification
Benches	5 per site	As required	As per specification Additional benches may be required for individual sports/recreation amenities
Picnic Tables	5 per site	As required	As per specifications
Bollards (Decorative, With Lights, Removable)	As required	As required	As per specifications
Waste/Recycling Receptacles	Refer to Section 11 Solid Waste specifications		▪ Placed near park entrances and/or easily accessible locations ▪ Located away from seating areas ▪ 1.5m flat, walkable area clear of obstacles around the receptacle(s)
Signage	As required	As required	As per specifications
Lighting	As required	As required	As per specifications
Parking	As required	As required	
Public Washroom Facility	1 per site	As required	Unisex

			Heated Fully serviced with water and sanitary
External Power Outlets	As required	As Required	
Other activities	As approved by Town of Canmore Parks		

Notes:

a) Excluding areas identified as naturalized zones.

10.2.2 Naturalized Zones

In addition to the minimum and maximum development activities, Parks should include Naturalized Zones. These areas should be limited to portions of a park where park users are not expected, such as areas outside of active or passive recreation spaces, and pathways or trails, as well as areas that are not intentionally manicured e.g. planting beds. The extent of naturalized zones will be at the discretion of Town of Canmore Parks.

10.2.3 Retaining Trees Credit

At the discretion of Town of Canmore Parks department, existing trees retained onsite may be counted towards the minimum number of trees required within a park. Retained trees should:

a. Be a species listed on the Approved Planting List outlined in Appendix F;
b. Be healthy and free of disease and/or pest infestation;
c. Not be a fruit tree;
d. Not likely to fall due to exposure to wind and/or erosion; and
e. Be consistent with Section 10.5 Wildfire Mitigation Landscape Design Guidelines.

10.3 Natural Areas (Municipal Reserve and Environmental Reserve)

Development within an identified Natural Area will be determined by Town of Canmore Parks Department on a case-by-case basis considering provincial legislation, Town plans and policies, and technical studies and assessments, including environmental impact statements, biophysical assessments, geotechnical reports/slope stability analysis, wildfire risk assessments/mitigation etc.

10.3.1 Development within Natural Areas

Natural Areas will be determined through the land development approval process, including the preparation of statutory and non-statutory plans, and subdivision and development permit applications. Generally, development activities within Natural Areas are prohibited, however limited development may occur on a case-by-case basis to the extent necessary to ensure consistency and conformance with provincial and federal legislation, statutory and non-statutory plans and policies, and the recommendations of associated technical studies and assessments. This includes but is not limited to the following circumstances:

- Providing access to the bed and shore of a water body or other natural area;
- Plantings related to rehabilitation or restoration of an area;

- Approved wildfire mitigation/management control;
- Weed/pest management control;
- Fencing to restrict access;
- Educational/directional signage;
- Non-intensive amenities, such as benches and trails.

The Town may require additional studies and assessments to determine the appropriate development within natural areas.

10.4 Streets and Roads Landscaping

10.4.1 Boulevard Landscaping

Boulevard landscaping should be installed in accordance with Table 10-4.

Table 10-4: Boulevard Landscaping

Required landscape action, feature or element	Quantity/Extent	Additional Information
Grade	All areas	As per specifications
Loam/Topsoil	All areas not covered by hard surfacing or structures	As per specifications
Turf	All areas not covered by hard surfacing or structures	As per specifications
Trees	Boulevards less than 6.0 m wide: • 1 deciduous tree on each side of a street/road for each 10 meters of street/road length Boulevards 6.0m wide or greater: • 1 tree per 100m^2 with 1 deciduous tree on each side of a street/road for each 10 meters of street/road length	As per: • species outlined in Appendix F; • specifications; and • setbacks. Deciduous trees: minimum 75mm caliper Coniferous trees may be planted within boulevards 6.0m or wider. Minimum height: 2.5m
Other items	As approved by Town of Canmore Parks	

10.4.2 Median Landscaping

Median landscaping should be installed in accordance with Table 10-5.

Table 10-5: Median Landscaping

Required landscape action, feature or element	Quantity/Extent	Additional Information
Grade	All areas	As per specifications
Median width 3.0m or less: • low maintenance hard surface material approved by Town of Canmore Parks and Engineering	Entire area	As per specifications
Median width greater than 3.0m: • low maintenance hard surface material approved by Town of Canmore Parks and Engineering; • Loam/Topsoil and Turf may be required at the discretion of Town of Canmore Parks	All areas not covered by structures	As per specifications
Trees (discretionary)	As approved by Town of Canmore Parks and Engineering	As per approved species, specifications, setbacks, and maintenance and traffic safety considerations.
Other items (discretionary)	As approved by Town of Canmore Parks and Engineering	As per maintenance and traffic safety considerations

10.4.3 Traffic Island Landscaping

Roundabout landscaping should be installed in accordance with Table 10-6.

Table 10-6: Traffic Island Landscaping

Required landscape action, feature or element	Quantity/Extent	Additional Information
Areas < 500m^2		
Grade	Entire area	As per specifications
low maintenance hard surface material approved by Town of Canmore Parks and Engineering	Entire area	As per specifications
Areas > 500m^2		
Grade	Entire area	
Loam/Topsoil and Turf	All areas not covered by hard surfacing or structures	As per specifications
Trees (discretionary)	As approved by Town of Canmore Parks and Engineering	As per approved species, specifications, and maintenance and traffic safety considerations. Conifer trees are discouraged.
Concrete maintenance strip	Min 0.5m width Perimeter of island behind curb	
Other items	As approved by Town of Canmore Parks	Considering traffic safety and maintenance.

10.5 Public Utility Lots and Rights-of-Way Landscaping

Public utility lot (PUL) and right-of-way (ROW) landscaping should be installed in accordance with Table 10-7.

Table 10-7: PUL and ROW Landscaping

Required landscape action, feature or element	Quantity/Extent	Additional Information
Public Utility Lot (PUL)		
Grade	Entire area	As per specifications
Loam/Topsoil and Turf	Entire area	As per specifications
Trees (discretionary)	As approved by Town of Canmore Parks and Engineering	As per specifications.
Fencing	As required	As per specifications
Other items	As approved by Town of Canmore Parks	
Right-of-Way (ROW)		
Grade	Entire area	As per specifications
Loam/Topsoil and Turf	Entire area	As per specifications
Fencing	As required	As per specifications
Other items	As per ROW agreement and/or at the discretion of Town of Canmore Parks	

10.6 Wildfire Mitigation Landscape Design Guidelines

Canmore is located in the heart of the Bow Valley, bordering on and, in some areas, integrated into the surrounding wildland forest. This wildland/urban interface exposes Canmore to the risk of wildfire. Special precautions must be put in place to protect against and prevent the spread of wildfire through the community. The following landscaping design guidelines are based on FireSmart Canada principles and are intended to mitigate Canmore's wildfire risk. These guidelines should be adhered to when designing landscaped areas on public lands and take precedence over other landscape design guidelines that may be in conflict.

For the purpose of this section Building/Structure means anything constructed or erected on the ground containing walls and a roof or attached to something having a fixed location consisting of walls and a roof.

10.6.1 General Guidelines:

a. All plantings should conform with Appendix F – Approved Planting List. Please note, coniferous trees and shrubs are included within the Approved Planting List despite being discouraged for wildfire mitigation purposes. These plants are not prohibited as they may be considered in FireSmart-appropriate locations per the guidelines below;

b. Native and drought tolerant plant species should be prioritized;

c. New coniferous trees and shrubs should generally be avoided. Limited quantities of coniferous vegetation may be considered depending on location e.g. not located near any buildings or combustible structures/features as per the guidelines below;

d. Unless located in an identified natural area, wherever possible existing coniferous trees should be selectively removed to ensure at least 3 metres of horizontal space between single or grouped tree crowns;

e. Dead or unhealthy trees and shrubs should be removed;

f. Woody debris/materials, including branches, bark, logs, dead vegetation such as grass, leaves/needles etc. should be removed;

g. Mature tree branches within 2 metres of the ground should be removed;

h. Organic mulch, including wood chip, bark, pine needle, shredded wood or rubber should be avoided and non-combustible alternatives, such as rock, gravel, shale etc. should be used.

10.6.2 Landscaping within 30 metres of a Building/Structure

The following three zones outline acceptable landscaping features, elements and actions within 30 metres of a building or structure:

a. Non-Combustible Zone – the area within 1.5 metres of any building or structure, including attachments such as decks, awnings, cantilevers, etc.

   i. No combustible materials or vegetation should be within this zone, including raised planters or storage of any combustible materials. All existing vegetation and/or combustible materials should be removed down to the soil and replaced with non-combustible materials such as rock, gravel, brick, concrete.

b. Intermediate Zone – the area 1.5 meters to 10 meters from any building or structure.
   i. Generally, only fire-resistant vegetation (deciduous trees and shrubs) and limited amounts of non-combustible landscape materials should be within this zone. At the discretion of Town of Canmore Parks, limited quantities of combustible landscape furniture such as benches, picnic tables or similar furnishings may be considered on a case-by-case basis.

   ii. Trees:
   - Dead or unhealthy trees should be removed;
   - New deciduous trees may be planted and existing healthy deciduous trees should be retained;
   - Existing coniferous trees should be removed, and no new coniferous trees should be planted within this zone. At the discretion of Town of Canmore Parks, a limited amount of existing healthy coniferous trees may remain provided:
     - They are located towards the periphery of the zone, away from any building or structure;

- There is a minimum 3 metre gap between the tips of tree limbs. A larger gap may be specified for immature trees; and
- Mature tree branches within 2 metres of the ground should be removed.

iii. Surface vegetation:
- Only maintained turf and/or fire-resistant, low growing discontinuous plants should be included in this zone.
- Woody debris/materials, including branches, bark, logs, and dead vegetation such as grass, leaves/needles etc. should be removed.
- Organic mulch and shredded rubber mulch should not be used.

c. Extended Zone – the area 10 metres to 30 meters from any building or structure

i. New deciduous trees may be planted, and existing healthy deciduous trees should be retained;

ii. Coniferous trees should be selectively removed to ensure at least 3 metres of horizontal space between single or grouped tree crowns.

iii. Mature tree branches within 2 metres of the ground should be removed.

iv. Dead or unhealthy trees should be removed.

v. Woody debris/materials, including branches, bark, logs, dead vegetation such as grass, leaves/needles etc. should be removed

vi. Shredded wood, shredded rubber, or pine needle mulch should not be used.

10.7 Grading and Drainage

Unless otherwise outlined in this Section, grading and drainage will occur in accordance with Section 3.0 Site Grading and Overland Drainage.

10.8 General Sod and Turf Seed

10.8.1 Turf Seed Mixes

The following outlines where the accepted turf seed mixes should be used:

a. Seed Mix 1: non-native seed mix for all maintained turf areas, including passive recreation areas.

b. Seed Mix 2: non-native seed mix for sloped turf areas, natural areas and non-maintained areas.

d. Seed Mix 3: mowing tolerant native seed mix for slopes, natural areas and non-maintained areas.

e. Seed Mix 4: non-mowed native grass seed mix for slopes, natural areas and non-maintained areas.

f. Seed Mix 5: wildflower seed mix for slopes, natural areas and non-maintained areas.

10.8.2 Sod

Sod should be used for the following:

a. Sports fields, including, but not limited to ball diamonds and areas surrounding sports facilities (community courts, multi-use facilities);

b. Playground areas; and

c. Stormwater pond area of inundation.

10.9 Tree, Shrub and Wildflower Planting

10.9.1 General Guidelines:

a. Tree, shrub and wildflower plantings should be consistent with those species listed in Appendix F.

b. New tree plantings should not exceed 15% of any one genus.

c. Trees should be planted within continuous soil volumes. This applies to all landscape settings.

d. Unless otherwise specified, trees should be planted in groups.

10.9.2 Tree Setback and Spacing Guidelines

Table 10-8 identifies setback and spacing that should be used for all tree plantings in Parks, Public Utility Lots (PUL), Rights-of-Way (ROW), and Stormwater Ponds.

Table 10-8: Tree Planting Setbacks and Spacing

		Poplar Trees & Willows Trees	Deciduous Trees (except poplar and willows)	Coniferous Trees
Setback Scenario	Parks and Open Spaces: • Vertical elements • Hard surfaces • Irrigation main lines	5.0m	2.0m	½ maximum branch spread of species
	Boulevards, medians and traffic islands: • Back of curb or hard surfaced edge • Edge of sidewalk or pathway • Edge of driveway or other access	10.0m	1.0m	½ maximum branch spread of species
	Private Property Fences: • Chain-link • Post & cable • Solid screening (wood, brick, stone, or other solid material)	10.0m	2.0m	½ maximum branch spread of species

	Sports Fields	10.0m from any defined line/boundary	5.0m buffer from any defined line/boundary + ½ maximum branch spread of species	5.0m buffer from any defined line/boundary + ½ maximum branch spread of species
Tree Spacing		½ maximum branch spread of species	½ maximum branch spread of species	

Notes:

a) Poplar Trees:
   i. Trembling/Quaking Aspen is subject to 'Other Deciduous Trees' setbacks.
   ii. The minimum setbacks for poplars may be reviewed and adjusted by Town of Canmore Parks.
b) Maximum tree spread as per *Alberta Yards & Gardens: What to Grow*;
c) No more than 50% of any one species planted in a park will be Poplar;
d) The maximum tree branch spread of any tree should not encroach within 1.5m of a waste or recycling bin/receptacle.

10.9.3 Line Assignment (setback) Requirements

Table 10-9 identifies the setback requirements for trees planted adjacent utilities.

Table 10-9: Tree Setback Distances to Utilities

Deep Utilities	Poplar		Deciduous			Coniferous		
	Services	Mains Parallel to tree line	Services		Mains Parallel to tree line	Services		Mains Parallel to tree line
			Medians	Blvds		Medians	Blvds	
Sanitary	3.0 m	4.0 m	0 mb	2.5 m	3.0 m	0 mb	3.0 m	4.0 m
Storm (<4.5m deep)	3.0 m	4.0 m	0 mb	2.5 m	3.0 m	0 mb	3.0 m	4.0 m
Water	3.0 m	4.0 m	0 mb	2.5 m	3.0 m	0 mb	3.0 m	4.0 m
Hydrants	3.0 m	4.0 m	N/A	2.5 m	2.5 m	N/A	3.0 m	4.0 m
Shallow Utilities	**Poplar**		**Deciduous**			**Coniferous**		
	Services	**Mains Parallel to tree line**	**Services**		**Mains Parallel to tree line**	**Services**		**Mains Parallel to tree line**
ATCO	2.0 ma	2.0 ma	2.0 m		2.0 m	2.0 ma		2.0 ma
TELUS	2.0 ma	2.0 ma	1.5 m		1.5 m	2.0 ma		2.0 ma
CTV	2.0 ma	2.0 ma	1.5 m		1.5 m	2.0 ma		2.0 ma
FORTIS ALTALINK	2.0 ma	2.0 ma	1.5 m		1.5 m	2.0 ma		2.0 ma

Above Ground Utilities	Poplar	Deciduous	Coniferous
Overhead (to outside conductor)	9.0 md	7.0 m – 9.0 md	7.0 m – 9.0 md
Transformers (within Utility Rights-of-Way)	**N/A (Tree planting not permitted in Utility Rights-of-Way)**		
Street Light Poles	Poplar	Deciduous	Coniferous
	5.0 m	4.0 m – 5.0 m	Min. 4.0 m

Notes:

a) A 3.0 m separation may be required at the discretion of utilities.
b) Pipe joints are not permitted on water or services located under medians.
c) Trees on residential (15.0 m ROW) boulevards, with no sidewalks, can be planted 1.0 m from driveways. Driveway crossings are to be aligned, where possible, to allow space for tree planting.
d) A greater setback may be required depending on site topography and grade relative to a tree fall line and wire swing strike potential.

10.9.4 Tree Protection Guidelines

The Town of Canmore Tree Protection Bylaw provides direction for the protection of trees on Town land. Public trees are assets and should be protected from removal or damage due to construction activities. Any development within 6.0m of a Town Tree (tree on public land) is required to submit a Tree Protection Plan to Town of Canmore Parks in advance of project commencement. For more information regarding Tree Protection Plan requirements, refer to the Tree Protection Plan Guidelines, and/or contact Town of Canmore Parks: Parks@canmore.ca

10.9.5 Plantings Near Playgrounds

Tree, shrub, and wildflower plantings must ensure clear sight lines to the playground area and/or play equipment.

10.9.6 Shrub and Wildflower Plantings

Parks:

a. Shrubs should be planted in planting beds in accordance with Section 10.9

b. Wildflowers may also be considered in addition to shrubs in planting beds and count towards the required shrub area.

c. Planting beds are not necessary in Natural Areas or Naturalized Zones.

Boulevards:

Except in the Town Centre, no shrub or wildflower planting is permitted on boulevards unless it fulfills a low impact development function including bioretention and/or bioswales. Low impact development plantings should be coordinated with Town of Canmore Parks and Engineering Services.

Medians and Traffic Islands:

No shrub or wildflower planting is permitted on medians and traffic islands. Town of Canmore Parks may consider plantings within larger medians or traffic islands at the entrances to communities/neighbourhoods provided:

a. The landscaped area is Naturalized and consists of vegetation resistant to road salt; and
b. Plantings:

    i. Do not obstruct sightlines of pedestrians or vehicles;
    ii. Do not conflict with utilities;
    iii. Do not impede vehicle drive lanes, sidewalks, pathways, and/or crosswalks (from the time of planting to maturity).

Public Utility Lots:

Shrub and wildflower planting is generally discouraged in Public Utility Lots. Shrub planting may be considered at the discretion of Town of Canmore Parks provided it occurs in a Naturalized Zone consisting of low maintenance species. Plantings should not interfere with the utility function of the lot as determined by Town of Canmore Parks and Engineering.

Utility Easements and Rights-of-Way:

No shrub or wildflower planting is permitted within Utility Easements or Utility Rights-of-Way, unless otherwise stated in the easement or right-of-way agreement.

10.10 Planting Beds

Planting beds are classified into the following two types:

a. Planting Beds - Ornamental: a defined landscaped area containing sufficient topsoil for the purpose of enabling tree or shrub growth. Regular maintenance is required once established.

    Planting beds - ornamental should be placed in operationally accessible locations and should not be located on slopes greater than 8 %.

b. Planting Beds - Naturalized: a defined landscaped area containing sufficient topsoil for the purpose of enabling low maintenance, native tree and/or shrub growth. Little to no maintenance is required once established.

10.11 Pathways

10.11.1 General Guidelines:

a. Acceptable surface materials are asphalt and gravel/clay. Other surface materials will be at the discretion of Town of Canmore Parks.

b. Town of Canmore Parks will have discretion over all materials used for pathway and trail related structures, including steps/stairs, railings/guardrails, bridges, tunnels, underpasses etc.

10.11.2 Pathway Design Guidelines

a. Multi-purpose Pathway Grades (asphalt and gravel/clay):
Multi-purpose pathways should be designed to achieve a longitudinal grade of 4% or less. Where this grade cannot be established due to existing topographical challenges, the following should apply:

   i. Grades between 4% and 6% should not be longer than 200 m. Segments longer than 200 m should be separated with a flattened resting area (3% grade or less).
   ii. Grades between 6% to 8% should not be longer than 50 m. Segments longer than 50 m should be separated with a flattened resting area (3% grade or less).
   iii. Grades over 8% will not be accepted and are to be rerouted or softened using switchbacks.

b. Multi-purpose Pathways should be designed to anticipated desire lines of travel and to avoid short-cutting across landscaped or natural areas. Short-cutting routes should be identified and mitigated through the placement landscape features such as rocks or boulders.

10.12 Recreation Amenities and Facilities

10.12.1 Playgrounds

a. Playgrounds should be designed for 2 years to 5 years and 5 years to 12 years age categories. Playgrounds for each age category may be grouped together provided there is adequate separation between each age-specific play area to ensure no overlapping activity.

b. Playgrounds should be located in an area that:

   i. is highly visible;

   ii. is dry, well drained;

   iii. is easily accessible for all users and operation/maintenance purposes e.g. adjacent or near a public street/road or pathway;

   iv. is separated from walkways;

   v. is away from and does not conflict with sports fields, or other open play areas/amenities; and

   vi. is away from and does not conflict with an off-leash dog park or wildlife corridor or habitat patch e.g. noise and activity does not interfere with the functioning of the wildlife corridor or habitat patch.

c. Playground developments should incorporate the following:

   i. Play equipment:

      - A main play structure with a minimum of five play equipment pieces, which conform to the latest version of the CAN/CSA - Z614-14; *Children's Play Spaces and Equipment CSA Standards. Incorporating individual play pieces around the main structure is desirable.*

- *Play equipment should be inclusive and incorporate accessibility features as per the latest versions of* CAN/CSA - Z614-14; *Children's Play Spaces and Equipment CSA Standards Annex H: Children's playspaces and equipment that are accessible to persons with disabilities and the Alberta Accessibility Design Guide.*
- *Play equipment should satisfies the four basics of physical play: jumping, swinging, climbing, and sliding.*
- *Playgrounds developed for children between the ages of 5 years to 12 years should also include creative equipment, such as games, music producing devises, climbing walls, overhead ladders, sliders/gliders, suspension bridges etc.*

ii. Surface:

- A 7-10 mm gyra rock (washed, screened and rounded) base installed to a minimum depth of 300 mm. An alternative rubberized cushion play surface may be used at the discretion of Town of Canmore Parks. Rubberized material shall be installed at the manufacturer's recommended depth and shall confirm to the critical fall height requirements in the latest version of the CAN/CSA - Z614; *Children's Play Spaces and Equipment CSA Standards.*
- Where rubberized and gyra roack play surfacing materials are being considered within one play space site, the gyra rock (pea gravel) play surface should be separated from the rubberized play surface area to an extent that avoids gravel contamination of the rubberized surface.
- a surface and/or subsurface drainage system with an approved retainer or border (wood, plastic, or bolders/rock). A retainer or border is not required for rubberized surface areas.

iii. An open turf area, or be accessible to an open turf area.

iv. Seating in an area providing full view of the play equipment.

v. A picnic table.

vi. Protection from the elements including shaded areas for both the playground and seating areas.

vii. A pedestrian dual waste/recycle container placed in an operationally accessible location e.g. adjacent or near a public street/road or pathway.

viii. Bicycle racks near to the playground area.

ix. 1.2 metre tall chain link fencing along the public road, street or lane frontage.

10.12.2 Sports Fields

a. Sports fields should be located in an area that:

i. is flat, open, and dry – well drained;
ii. is easily accessible for all users and operation/maintenance purposes e.g. adjacent or near a public street/road or pathway;
iii. is separated from walkways;
iv. is away from and does not conflict with a playground or other open play areas/amenities.

b. Sport fields should incorporate seating and bicycle racks.

c. Sports fields should be designed to ensure enough width to accommodate a side-to-side shift of three standard goal areas (7.32m). The side-to-side shift is based on providing three goal areas on each end of the playing field; one centered and one on either side. The shift allows for playing surface rotation to avoid turf deterioration.

10.12.3 Off-leash Dog Parks

a. Off-leash Dog Parks should be located in an area that:

   i. is (relatively) flat;
   ii. is easily accessible for all users and operation/maintenance purposes e.g. adjacent or near a public street/road or pathway;
   iii. is a minimum 20m away from residential uses;
   iv. is a minimum 10m away from a playground;
   v. is away from and does not conflict with sport fields/courts or similar recreation amenity, or a wildlife corridor or habitat patch. Conflict means interference with the use and enjoyment of the sport or recreation amenity or the wildlife corridor or habitat patch function.

b. All off-leash dog park developments should incorporate the following:

   i. 1.5 cubic metre capacity tipping waste container at each entrance with access accommodating the collection vehicle with a gross vehicle weight of 8,000 to 11,360 kg;
   ii. Dog waste bag (Mutt Mitt) dispenser(s);
   iii. Signage, attached to the off-leash dog park fence or a post;
   iv. Seating;
   v. Open run area(s);
   vi. Shade trees and vegetated areas (non-toxic plantings);
   vii. Maintenance access entrance/gate;
   viii. Maintenance vehicle access.

c. Dog Runs and Neighbourhood Off-leash Dog Parks should incorporate the following:

   i. 1.5m high permitter chain-link fencing (black vinyl/powder coated);
   ii. a 2.5m x 2.5m dog containment area/entrance. The containment area/entrance will include two pedestrian gates with a self closing mechanism (spring or approved alternate). Two or more containment areas/entrances may be required for neighbourhood dog parks;
   iii. a pathway or trail leading to/from the outer entrance gate, a trail through the dog containment area, and a 5.0m trail leading from the inner pedestrian gate into the dog park area;
   iv. Trail(s) for Neighbourhood Dog Parks:

d. Destination Off-leash Dog Parks should incorporate the following:

   i. Clearly delineated boundaries provided through physical structures and/or signage. Town of Canmore Parks may require all or a portion of a Destination Dog Park to be fenced. Fencing will be in accordance with the details outlined for Dog Runs and Neighbourhood Off-leash Dog Parks;
   ii. Signage, attached to the off-leash dog park fence or a pole;
   iii. Parking, as determined by Town of Canmore Parks.

10.12.4 Super-standard Recreation Amenities

Recreation amenities not listed in Section 10 are considered Super-standard Recreation Amenities. Super-standard Recreation Amenities are considered prohibited unless identified and approved through the Town's land use planning application process, including area structure plans, conceptual schemes, subdivision or development permitting. Please refer to the Town of Canmore Open Space and Development Guidelines for further information.

10.13 Landscape Amenities

10.13.1 Furnishings

All proposed furnishings will be identified on the detailed landscape and construction drawings and reviewed and accepted by Town of Canmore Parks prior to installation.

Site furnishings should:

- Complement and enhance Canmore's mountain environment and/or mining history;
- Be consistent with the applicable detail sheets and construction specification outlined in Part B;
- Be consistent with local/native materials, colour and style;
- Be vandal-proof where possible; and
- Be located in areas that are easily accessible to the public and Town operations.

10.13.2 Fencing

The following applies to fencing of public lands and rights-of-way:

a. Chain-link fencing should be black powder coated posts with black vinyl coated mesh. Black powder and vinyl coating will not be required for chain-link fencing for recreation/sport amenities where it is likely to be frequently struck by a ball, puck or similar equipment e.g. hockey rink, community/tennis court, ball diamond.

b. At the discretion of Town of Canmore Parks, perimeter chain-link fencing may be required around sports fields, school sites, parks or public utility lots for safety, wildlife exclusion and/or access management purposes. Gate systems may be installed at identified access points along road frontages, pathways or trails in accordance with the Pedestrian and Maintenance Access Gate Detail Sheet.

c. Chain-link Fencing heights:

   i. 2.4 metre high:
      - wildlife exclusion fencing where required by the Town

   ii. 1.5 metre high:
      - along road frontage of school sites and parks containing sports fields;
      - along flankage and rear lots of private parcels adjacent to parks, PULs, and Town ROWs. Solid screen fencing may also be accepted at the discretion of Town of Canmore Parks. A maintenance agreement will be required for solid screen fencing.

   iii. 1.2 metre high:
      - along the road frontage of neighbourhood parks and regional parks.

d. Post and cable fencing may be installed to control access to the following locations:

i. passive recreation areas within parks and open spaces along a roadway;
ii. public utility lots along a roadway; and
iii. along the perimeter of public parking areas within parks and public utility lots.

e. No fencing will be permitted within an environmental reserve/natural area unless permitted by Town of Canmore Parks.

10.13.3 Rocks and Boulders

Boulders provide landscape aesthetics in various scenarios and may be considered in parks and natural areas. Boulders should not be placed on pathways or trails unless approved by Town of Canmore Parks. Setbacks from pathways should align with horizontal setbacks noted in the 'Typical Shared-Use Path Cross-Section Asphalt Surface' and the 'Typical Shared-Use Path Cross-Section Gravel/Clay Surface' figures.

Setbacks from gravel/clay multi-use trails may be relaxed depending on trail type and site conditions.

Boulder placement adjacent single-track trails will be determined on a case-by-case basis.

10.13.4 Paving Stones / Plazas

Paving stones are generally discouraged, however may be considered for areas identified as public plazas. Various concrete finishing/patterns/colour should be considered as an alternative.

10.13.5 Signage

a. Where possible signage should complement the mountain valley context of Canmore and blend into the landscape and site development. Signage proliferation is discouraged, and multiple signs should be grouped on one signpost where possible.

b. Only the specified park-related signage and/or park regulatory type signage outlined in Section 10 Part B will be placed on or at any public space. Proposals for other signage types should be submitted to Town of Canmore Parks for consideration and acceptance prior to installation.

c. Signage should be placed in locations appropriate for the signage type and purpose. Signage may be purposely attached to chain-link fences where appropriate for the amenity type e.g. community courts, dog parks, baseball diamonds etc.

10.13.6 Super-standard Landscape Amenities

Landscape amenities not listed in Section 10 are considered Super-standard Landscape Amenities. Super-standard Landscape Amenities are considered prohibited unless identified and approved through the Town's land use planning application process including, area structure plans, conceptual schemes, subdivision or development permitting. Please refer to the Town of Canmore Open Space and Development Guidelines for further information.

10.14 Irrigation

- Irrigations systems shall be designed by qualified irrigation specialist. Qualifications may be requested by Town of Canmore Parks prior to acceptance.

- A fully automatic underground irrigation system is required for manicured areas of neighbourhood parks including planting beds (ornamental). Irrigation controllers should conform to the Parks Department's existing systems (e.g., Eklof Park, Town Entrance Features).

- A fully centralized (from a main AC controller) automatic underground irrigation system is required for manicured areas of regional parks and sport facilities. (e.g., Riverside Park or Lions Park). Centralized irrigation systems will be approved by Town of Canmore Parks.

- Irrigation systems should be separate and independent from irrigation systems on private property.

PART B: Landscape Construction Specifications

This Part outlines the specifications for how landscaping and recreation facilities and amenities will be installed and constructed. This details the municipality's acceptable standard for how each recreation facility or amenity, or landscape feature will be constructed. This Part should be read in conjunction with Part A: Landscape Development Guidelines.

10.15 Introduction

As outlined in Section 1.1. Reference Documents, the Town of Canmore follows the latest versions of the City of Calgary's standard specifications, including Calgary Parks and Open Space Development Guidelines and Standard Specifications: Landscape Construction.

Landscape Development/Construction Inspections:

The Consulting Engineer and/or Landscape Architect is responsible for the quality of the landscape development (municipal improvements) and conformance with the EDCG. Consequently, the Town of Canmore will only require inspections of landscape development and/or construction in accordance with Construction Certificate Completion (CCC) application and Final Acceptance Certificate (FAC) application processes. The Town reserves the right, at its sole discretion, to require inspections in accordance with the City of Calgary processes based on site-specific conditions, project scope, or other relevant considerations.

10.16 Site Preparation, Grading, Topsoil

This section specifies the quality control and assurance of materials, the preparation of subgrade, and topsoil supply, volumes, and spread.

10.16.1 Quality Control and Assurance

Acceptance of all materials, including topsoil and fill, should be obtained in writing from Town of Canmore Parks prior to installation. Topsoil used for any landscaped area should be tested and the results submitted to Town of Canmore Parks for review and acceptance.

Topsoil source(s) testing should be completed by an approved commercial laboratory (CSA/ASTM/CALA) (The Canadian Association for Laboratory Accreditation) that is ISO 17025 certified and will be at the Developer/Applicant's cost. The soil analysis report should include:

- the name and location of testing laboratory;
- verification of credentials/certification/accreditation;
- testing date;
- the location of the topsoil stockpile or source;
- photos of the stockpile or source; and
- the test results, including analysis and recommendations.

Topsoil test results should be analysed against Section 10.14.2.2 and Table 10-11: Topsoil Type and Quality. Where soils are not consistent with the quality requirements, the topsoil should be amended to the satisfaction of Town of Canmore Parks, consistent with Section 10.14.2.3. Amendment proposals will

clearly outline the amendment type, quantity, and application procedure. Post amendment in-situ testing of the soil at the Developer's cost may be required by Town of Canmore Parks, including submittal of the soil analysis report of the amended soil

A minimum four test samples are required from the topsoil source, with one every 25% vertical increment of the stockpile at a depth of 0.30 metres. Each vertical increment sample should be taken at different locations on the stockpile to ensure a broad representation of the topsoil to be used.

10.16.2 Products/Materials

10.16.2.1 Fill Materials

Non-engineered fill using organic material sourced within the development may be used in select areas that do not impact development of the public reserve lands or adjacent lots. Organic backfill material stripped from the develop lands for use as fill material will be comprised of organic A and B horizon only. Waste, debris, trees, brush, and rocks larger than 300 mm are not acceptable for placement in reserve lands under this specification.

10.16.2.2 Topsoil Materials

a. Topsoil should be a fertile medium loam and be capable of sustaining good agricultural growth. Topsoil is to be loose and friable, free of subsoil, clay lumps, stones more than 50 mm, live plants, roots, weeds, litter or any other deleterious material greater than 50 mm diameter.

b. The volume of rock 50mm in diameter and under in the topsoil should not exceed 20%.

c. Topsoil containing construction debris, sod clumps, quack grass or other noxious weeds is not acceptable.

d. Topsoil type and quality should be consistent with Table 10-10.

Table 10-10: Topsoil Type and Quality

Soil Quality Criteria	Topsoil Type			
	1 Basic/Native Topsoil	2 High Sand	3 High Organic Matter	4 LID Growing Media
Coarse gravel (<19 mm to 50 mm)	0-3%	0-1%	0-1%	See City of Calgary LID Guidelines
All gravel (2 mm to 50 mm)		0-5%		
Very coarse sand (1 mm to 2 mm)		<10%		

Coarse sand (0.5 mm to 1 mm)		20-50%		
Medium sand (0.25 mm to 0.50 mm)		20-50%		
Fine sand (0.15 mm to 0.25 mm)		<20%		
Combined medium to very coarse sand (2 mm to 0.25 mm)		>60%		
Combined very coarse sand, fine gravel and gravel		<25%		
Sand (2 mm to 0.0.5 mm)		60-70%		
Silt (0.05 mmto 2 µm)		<=20%		
Clay (<2 µm)		<=20%		
Clay and silt combined		Maximum 40%		
Textural Class	Loam, Sandy loam, Silt loam, Sandy clay loam	Sandy loam	Sandy loam, Loam	
Organic matter content	4-10%	6-8%	10-15%	
pH (acidity, from saturated paste)	6.0-8.0	6.0-8.0	6.0-8.0	
EC dS/m (salinity)	<2	<2	<4	
SAR (sodicity)	-	-	<4.5	
Available phosphorus	20-60 mg/kg (or as per site requirements)	20-60 mg/kg (or as per site requirements)	20-60 mg/kg (or as per site requirements)	
Total phosphorus	NA	NA	NA	

Available potassium	300-1000 kg/ha (or as per site requirements)	300-1000 kg/ha (or as per site requirements)	300-1000 kg/ha (or as per site requirements)	

10.16.3 Soil Amendments

Topsoil amendments should be screened and free of subsoil, sawdust, commercial wood products, stones, lumps, plants, roots, sticks, invasive and noxious plant parts and seeds per the Weed Control Act and Regulations, high seed content, chemical contaminants and other organic or inorganic materials harmful to plant life. Topsoil amendments should be applied where the topsoil does not meet the requirements in Table 10-11.

Organic topsoil amendments should meet the following criteria:

- Be commercially prepared and meet the CCME Guidelines for Compost Quality (2005), ensuring compost applications do not overload soils with heavy metals
- Be substantially free from coliform, pathogens, and chemical or organic contaminants harmful to plant, animal, or human health
- Meet the foreign matter and sharp foreign matter requirements outlined in CCME (2005)
- Have a total carbon-to-nitrogen (C:N) ratio not exceeding 40:1; a ratio between 25:1 and 30:1 is recommended
- Contain well-rotted wood residuals as a compost component only if the total C:N ratio of the topsoil mix remains within 25:1 to 30:1
- Manure compost must comply with CCME (2005) guidelines before use.
- High-lignin organic material (e.g., bark) used in topsoil must:
  - Be fibrous plant material (not sawdust)
  - Have 1–15 mm particle size (max 10% under 2 mm)
  - Maintain a pH range of 4.5–7

Inorganic fertilizer topsoil amendments should meet the following criteria:

- Be applied as needed to bring topsoil fertility within the ranges set out in Table 10-11, based on topsoil testing results and recommendations from a Qualified Professional.
- Any substitutions or variations in fertilizer type or application method should be approved by both the Qualified Professional and the Town of Canmore Parks before use.
- Comply with all municipal and provincial regulations, as well as the Federal Fertilizers Act and Regulations.
- Be in granular, pellet, or pill form, dry and free-flowing, with a guaranteed N-P-K analysis.
- Liquid fertilizers are not permitted unless specifically approved by Town of Canmore Parks.

Sand should be natural and coarse and meets the analytical specification of Table 10-11.

10.16.4 Topsoil Application, Volume, Depth and Spread

10.16.4.1 Topsoil Application

Topsoil types should be applied in accordance with Table 10-11.

Table 10-11: End Use Landscape Area Topsoil Type

Type 1 - Basic/Native Topsoil	
• Linear Park • Neighbourhood Park • Regional Park • Playground • Sports Field • Ball Diamond Outfield • School Site • Public Utility Lot	• Stormwater Management Facility • Naturalized Area, Zone or Planting Bed • Urban Hardscaped Area (Trees/Shrubs) • Street/Road: - Boulevard - Median - Traffic Island - Roundabout
Type 2 – High Sand Topsoil	
• None	
Type 3 – High Organic Matter Topsoil	
• Planting Bed (Ornamental – Trees and Shrubs)	
Type 4 – Low Impact Development Growing Media	
• Low Impact Development Areas	

10.16.4.2 Topsoil Depth and Spread

Minimum topsoil depth and spread should occur in accordance with Table 10-12.

Table 10-12: Topsoil Depth and Spread by Landscaped Area End Use

Landscape Area End Use	Minimum Soil Depth and Spread
Turf/Grass only: • Linear Park • Neighbourhood Park • Regional Park • Playground • Sports Field • Ball Diamond Outfield • Public Utility Lot (excluding stormwater management facility) • Street and Road: - Boulevard - Median - Traffic Island - Roundabout	Seed: 150mm Sod: 125mm Spread evenly over entire area.
Stormwater Management Facility	300mm spread evenly over entire area
Shrubs or Trees: • Naturalized Area or Zone • Planting Beds (ornamental or naturalized)	600mm spread evenly over entire area or Soil Trenches: 450mm – 900mm to achieve minimum tree soil volumes whichever is greater
Urban Hardscape Area with trees	600mm or Soil Trenches: 450mm – 900mm to achieve minimum tree soil volumes Soil cells or soil trenches should be considered to achieve minimum tree soil volumes
Low Impact Development	As per City of Calgary LID Guidelines

Notes:

- Minimum soil depth is after settlement.
- 300mm soil depth is encouraged for seeded and sodded areas. Where 300mm soil depth is applied, planting bed and tree pits are not required beyond the minimum depth cover over the rootball.

10.16.4.3 Tree Soil Volumes

Tree plantings require specific topsoil volumes to support growth and health. Minimum tree soil volume requirements are based on tree canopy volume, which is calculated through a formula using a tree's typical canopy radius at maturity. Where trees share a continuous volume in a tree trench or planting bed, the soil volume required for each individual tree may be reduced by 20%. The depth of soil may be adjusted based on the design but may not exceed the minimum and maximum as identified in Table 10-13. Soil cells should be considered to meet minimum soil volume.

Table 10-13: Tree Soil Volumes

Canopy Volume (m^3)	Soil Volume per Individual Tree (m^3)	Soil Volume per Individual Tree when Grouped with Others (m^3)
< 500	10	8
500 - 700	20	16
> 700	30	24
Canopy Volume Calculation: Canopy Volume = (π(Canopy Radius)^2) * (Height - 2 meters)		

10.16.5 Execution

10.16.5.1 General

The contractor should ensure that care is taken to protect the following against damage:

- existing plant material, including trees in accordance with the Town of Canmore Tree Protection Guidelines
- existing natural undisturbed soil conditions
- lawns
- buildings
- sidewalks
- curbs
- fences
- paved areas
- any other natural and built features.

The contractor should maintain adequate barriers and construction signs to ensure public safety at all stages of work.

Contact the Engineering Department for permitting prior to any type of planned traffic disruption within the Town's road right-of-way (ROW), which includes roadways, back lanes, utility right-of-ways (URWs) and sidewalk.

Contact Town of Canmore Parks for permitting prior to any type of planned closures or crossings within the Town's existing municipal reserves (MR), environmental reserves (ER) or parcels including trails and public green space.

10.16.5.2 Subgrade Preparation

Sub-grade elevation should be the final grade minus surfacing material depth as shown:

- seeded areas: 150 mm below final design grade
- sodded areas: 125 mm below final design grade
- planting beds: 600 mm below final design grade
- tree trench: per design - 450 mm minimum, 900 mm maximum below final design grade

Fine grade the subgrade to even running levels with a tolerance of +/- 75mm. Surface debris, roots, vegetation branches and stones in excess of 50 mm diameter should be removed and disposed of off-site.

In turf and planting areas, the area to receive topsoil should be scarified to a depth of 75 mm. Scarification to 200mm depth should be applied in areas where equipment used for hauling and spreading has compacted the subgrade to equal or greater than 95% standard proctor Dry Density.

10.17 Turf Seeding and Sodding

10.17.1 Products

10.17.1.1 Seed

Canada No.1, Blue, or Gold certified grass seed must be free of disease, weed seeds, or other foreign materials and must meet the requirements of the Seeds Act.

Seed mixes should be made using pure live seed (PLS) to calculate the percentages of each species in the mix. For native species, the Tz results (live seed) may be used in place of germination within the PLS calculations for some species due to the long dormancy of many native species. Calculate PLS using the following formula:

SR (PLS)	=	This seed is required by the project (kg).
SR	=	Seed required (kg) - final kg of seed required after PLS is accounted for in the mix
SP1 (PLS)	=	% (PLS) of species "1" required in the mix.
SP (PLS)	=	% (PLS) of a species required in the mix.
SP1	=	% (PLS) of species "1" required in the mix.
Gr1	=	% germination of species "1" (Tz or germination may be used).
Gr	=	% germination of each species.

$$SR = (\Sigma SP\ (PLS)\ (1/Gr)^{*}SR\ (PLS) \qquad SP1\ (kg) = SP1^{*}SR$$
$$SP1 = SP1(PLS)\ (1/Gr1)) \qquad \Sigma SP(PLS)\ (1/Gr)$$

See Table 10-14 and Table 10-15, below, for examples of these calculations.

Table 10-14: Seed Required

(PLS) Seed Required (kg)	Seed Required (kg)
25	34.47

(25 kg/ha PLS Recommended for Native Mixes)

Table 10-15: Calculation of PLS Required

% PLS in mix	Species	% Germination	% of actual mix	Kg needed
35%	Idaho Fescue/*Festuca idahoensis*	100%	25%	8.75
15%	Blue Grama Grass / *Bouteloua gracilis*	50%	22%	7.5
10%	Western Wheatgrass / *Pascopyron (Agropyron) smithii*	85%	9%	2.94
10%	June Grass / *Koelaria macrantha*	90%	8%	2.78
20%	Alpine Bluegrass / *Poa alpina*	50%	29%	10.00
10%	Perennial Ryegrass / *Lolium perenne*	100%	7%	2.5

Acceptable native and non-native grass seed mixes are provided below. Seed mix location application guidelines are found in Part 1.

Non-Native Seed Mixes:

Only use certified Canada # 1 seed varieties, in accordance with the Canadian Seeds Act for lawn grass mixtures. Mixes should have minimum purity of 97% and germination of 75% mixed by weight to the following specifications:

Mix 1 - grass seed mixture for sports fields and maintained turf areas:

- 25% Able I Kentucky Bluegrass / *Poa pratensis*
- 25% Shadow Chewing Fescue / *Festuca rubra ssp fallax*
- 15% Award Kentucky Bluegrass / *Poa pratensis*
- 15% Nu-destiny Kentucky Bluegrass / *Poa pratensis*
- 10% Creeping Red Fescue / *Festuca rubra*
- 10% Player Pier Perennial Ryegrass / *Labium perenne*

Mix 2 - grass seed mixture, non-native mix for slopes, natural areas and non-maintained areas:

- 25% Canada Blue Grass/ *Poa compressa*
- 25% Hard Fescue / *Festuca ovina var duriuscula*
- 20% Sheep's Fescue / *Festuca ovina*
- 02% Alpine Blue Grass/ *Poa alpina*
- 10% Manhattan III Perennial Ryegrass (nurse crop) / *Lolium perenne*

Native Seed Mixes:

The use of any native seed should only be conducted using seed that is free of all prohibited noxious and noxious weeds. A seed purity and weed certificate should be included for all species in the mix for review. All weed analysis and germination certificates should be included. Both germination and Tz analysis should be submitted if the Tz formula is to be used in the PLS calculations. Native seed mixes, mix by weight to the following specifications:

Mix 3 - mowing-tolerant native grass seed mixture for slopes, natural areas and non-maintained areas:

- 35% Idaho Fescue / *Festuca idahoensis*
- 15% Blue Grama Grass / *Bouteloua gracilis*
- 10% Western Wheatgrass / *Pascopyron (Agropyron) smithii* and/or Northern Wheatgrass / *Elymus lanceolatus (Agropyron dasystachyum*)
- 10% June Grass / *Koelaria macrantha*
- 20% Alpine Blue Grass / *Poa alpine*
- 10% Manhattan III Perennial Ryegrass (nurse crop) / *Loium perenne*

Mix 4 - non-mowed native grass seed mixture for slopes, natural areas and non-maintained areas:

- 25% Idaho Fescue / *Festuca idahoensis*
- 15% Festuca campestris / *Festuca campestris*
- 10% Western Wheatgrass / *Pascopyron (Agropyron) smithii* and/or Northern Wheatgrass / *Elymus lanceolatus (Agropyron dasystachyum*)
- 15% June Grass / *Koelaria macrantha*
- 15% Alpine Blue Grass / *Poa alpine*
- 10% Manhattan III Perennial Ryegrass (nurse crop) / *Lolium perenne*
- 10% Optional species use one or a number of the following species depending on site characteristics:
    - Alkali Bluegrass / *Poa ampla*,
    - Parry's Oat Grass / *Danthonia parryii*,
    - Western Porcupine Grass / *Stipa curtiseta*,
    - Mountain Brome / *Bromus carinatus*,
    - Alpine Timothy / *Pheleum alpinum*,
    - Tufted Hair Grass / *Deschampsia caespitosa*

Mix 5 - wildflower mix for slopes, natural areas and non-maintained areas:

- 25% Yarrow / *Achillea millefolium*
- 25% Blue flax / *Linum perenne*
- 25% Brown Eyed Susan / *Gaillardia aristata*
- 25% Canada Milk Vetch / *Astragalus canadensis*

Seed Mix Substitutions:

Any substitutions to the above seed mixes should be submitted to and accepted by Town of Canmore Parks prior to use.

The following species will not be accepted as a substitution into native seed mixes because they are either non-native, or there is a high risk of them being non-native even if a registered variety:

- Rocky Mountain Fescue / *Festuca saximontana* (DNA-proven native varieties not
- available)

- Sheep's Fescue / *Festuca ovina* (Not native)
- Creeping Fescue / *Festuca rubra* (Not native)
- Hard Fescue / *Festuca ovina*

10.18 Trees, Shrubs and Perennials

10.18.1 Products

10.18.1.1 Plant Sizes

Plants should meet the sizes listed in Table 10-16 at the time of planting. Trees that exceed the maximum sizes in this table will be subject to a five (5) year maintenance period calculated from the date of issuance of CCC.

Table 10-16: Plant Sizes at Time of Planting

Plant Type	Minimum Size	Maximum Size
Coniferous Tree	2.0 m height	4.0 m height
Deciduous Tree	50 mm caliper	100 mm caliper
Coniferous Shrub	450 mm spread	n/a
Deciduous Shrub	300 mm height	n/a

10.18.1.2 Mulch

a. Wood Mulch:

Wood mulch should be used in ornamental planting beds, naturalized planting beds, and tree rings to conserve soil moisture, suppress weeds, regulate soil temperature, and improve soil structure over time.

Wood mulch in rain gardens or bioretention basins should be a blend of fine and coarse bark that is aged/composted for a minimum of 4-6 months.

b. Rock Mulch:

Where accepted by Town of Canmore Parks, rock mulch should be between 12mm-100mm diameter, angular material with no fines. It may be a graded material within this range or a consistent size within this range. No fabric is to be used under rock mulch on public lands. Rock mulch materials should be locally sourced within the Bow Valley.

c. Other Non-wood Mulch:

Non-wood mulch materials may be considered. Requests should be submitted to and accepted by Town of Canmore Parks prior to use. Acceptance will be based on the following:

- Safety (non-toxic, non-flammable, and low injury risk)
- Aesthetics (natural appearance and color stability)
- Durability (resistance to decomposition and longevity)
- Decomposition rate (timeline and replenishment needs)
- Ease of renewal and replacement
- Breakdown products (impact on soil chemistry and plant health)
- Resistance to salts and solvents
- Recyclability (sustainability and disposal considerations)
- Permeability (adequate water and air flow to soil)
- Impact on soil retention, structure, and biology
- Mitigation of unfavorable impacts, such as leaching or compaction

Town of Canmore Parks may request more information on any of the above considerations.

10.18.2 Execution

10.18.2.1 Excavation

The location of trees and plant beds should be staked out prior to excavation. Any necessary adjustments to excavation locations should be approved by the developer's representative and Town of Canmore Parks.

Plant pits for trees and specimen shrubs should be excavated in a cylindrical shape with vertical sides and a forked, saucer-shaped bottom to a depth of 50 mm. When planting on a slope, the minimum planting pit depth should be measured from the downslope side to ensure proper soil volume and water retention.

10.18.2.2 Seed & Sod

The Consultant is responsible for verifying seed and sod type and confirming seed and sod quality prior to seeding/laying.

10.18.2.3 Tree and Shrub Installation

Tree stakes may be installed at the discretion of the Developer in locations where wind exposure may impact newly planted trees. If used, staking must follow industry best practices to prevent damage to the tree and ensure proper establishment. All stakes, ties, and associated materials must be removed prior to the final acceptance certificate (FAC) to prevent girdling and promote natural trunk development.

10.18.2.4 Mulching and Watering

a. Mulch should be spread evenly and kept 50mm clear of tree trunks and plant stems to prevent rot and pest issues.
b. Rock mulch areas within planting beds should include at least 100mm depth of rock mulch placement. If placed after plantings, care should be taken to not damage any plant material. Damaged plant material should be replaced.

Rock mulch areas outside of planting beds should be prepared by stripping of organic materials, compaction of the subgrade and placement of at least 100mm depth rock mulch.

Where rock mulch is adjacent to hard surfacing such as a sidewalk, pathway, or curbs, the rock mulch should not be more than 25mm below the hard surface and not sit higher than the hard surface.

c. All trees should be thoroughly watered on the same day they are planted. Water probing is not acceptable. After watering, trees should remain at grade. Wood mulch in rain gardens and bioretention basins should be dampened prior to installation then wetted thoroughly immediately following installation to settle and knit the material.

10.19 Amenities

10.19.1 Furnishings

10.19.1.1 Quality Control and Assurance

All site furnishing designs and specifications should be reviewed and accepted by Town of Canmore Parks prior to installation. The Town may request submittal of shop drawings and specifications as part of the approval process.

10.19.1.2 Delivery Handling and Storage

Protect furnishings during transportation to site. Broken or damaged furniture elements will not be accepted.

10.19.1.3 Products

Table 10-17 outlines acceptable public space furnishings and details. Recycled plastic options are preferred where available.

Table 10-17: Site Furnishings Models and Details

Site Furnishing	Approved Models and Furnishing Details
Park Benches Figure EDCG LSC 10.12	Series “B” Park Bench by Custom Park & Leisure or approved equivalent “BR” Park Bench model (recycled plastic option) Details: • free-standing • #1 grade clear cedar for “B” option, recycled plastic for “BR” option • Steel Finish • in-ground or bolted down (depending on application) • “B” model used for Memorial Plaque Applications (routered for bronze plaque installation)

Public Benches	Wishbone Ltd.: Mountain Classic Straight – Model# MCSB-5 or approved equivalent Details: • free-standing • ## ft. long with arm rests • bolted down only, with concrete spreader inserts and tamper-proof hardware • recycled plastic slats, seat colour in “Sand” • powder-coated aluminum frame, colour in “Textured Black” • stainless steel hardware
Picnic Tables Figure EDCG LSC 10.13	Custom Park & Leisure Ltd: Model# Series B – PBS2 or equivalent recycled plastic option Details: • free-standing • cedar style, finished in sikkens stain or recycled plastic • frame colour: brown, TGIC polyester outdoor finish • wheelchair accessible • surface-mounted onto pour in place concrete pad or compacted trail mix pad • 4 in. x 4 in. treated wood border and trail mix infill pad
Bike Racks	Custom Park & Leisure Ltd: Model# Series B or approved equivalent Details: • in-ground or bolted down (depending on application) • individual loop fits any area • black powdered-coated metal frame, TGIC polyester outdoor finish • For multiple applications, install additional individual units in succession to meet the targeted number of bikes.
Trail Head Large Information Kiosk	H.R. Construction (a division of Rief Industries); 4477 Dick, Rd., Quesnel, British Columbia, V2J 6W9 or approved equivalent Details: • same style and design as the Alberta Parks’ kiosk • Lockable aluminum-framed information board with plexi-glass cover • constructed out of wood with recycled rubber roof shakes • in-ground installation

Parks Amenity Small Information Kiosks	Information Kiosks – source to be approved by Town of Canmore Parks Details: • constructed of wood with recycled rubber roof shakes • Lockable aluminum-framed information board with plexi-glass cover • in-ground installation
Bollards with Lights	Gardco (Philips): LED School Bollard Lights or approved equivalent Model # BRM836, 42 in. high with beveled top Details: • LED control - DR • LED natural Light - LNW • light coverage optional at 360o to 180o • voltage 120-240 • finished in black TGIC polyester outdoor finish - BLP • complete with high strength galvanized steel tenon
Large Decorative Bollard	Reliance Foundry Co. Ltd.: Decorative Steel Bollard Model# R-7736 Details: • polyester powder-coated finish; use an epoxy prime coat and a polyester topcoat • can be utilized for decorative or security applications • decorative - height: 36 in. / 91.4 cm • decorative - base diameter: 11-¾ in. / 29.8 cm • decorative – finished in textured semi-gloss black • security - height: 31 in. / 78.7cm • security - base diameter 10-¾ in / 27.3 cm • security - optional steel or galvanized steel pipe • security - Anti-Ram protection fill pipe with concrete • security - finished in Safety Yellow • installation mounting options depend on application (decorative or security); hardware sold separately
Removable Bollard	TrafficGuard Direct: round post, removable top lock or approved equivalent Model #: TL-1004R

	Details: • heavy-duty construction • 36 in./914 mm tall, 4.5 in./114 mm od • flush-mounted when post is removed • galvanized ground sleeve and filler piece • all surfaces are primed with rust & corrosion resistant, zinc-rich primer w/5,000-hour salt spray performance • standard finish, TGIC polyester outdoor finish RAL1028 in Safety Yellow or custom black, depending on application • optional reflector tape, as required
Permanent Small Bollard	Custom Park & Leisure Ltd.: Permanent Bollard Series or approved equivalent Details: • optional surface mount or in–ground, depending on application • available in three sizes, depending on application • must withstand vehicle impact • standard powder-coated finishes, Safety Yellow for security applications and Matte Black for architectural applications • optional reflector tape, as required

10.19.2 Signage

All signage should be vandal and graffiti–proof and should have a protective, cleanable, anti-graffiti, clear surface coating that is durable and long-lasting.

Park-related regulatory signage placed within the road-right-of-way (ROW) will be approved by the Engineering Department and the Streets & Roads Department and follow ROW signage specifications and requirements.

10.19.2.1 Park-related Signage

Park-related signage drawings are as follows:

Landscaping - Park Signage:

- Figure EDCG LSC 10.14 Playground Sign Age 2 – 5 Years
- Figure EDCG LSC 10.15 Playground Sign Age 5 – 12 Years
- Figure EDCG LSC 10.17 Type “B” Trail Signage (Trail-Multi Use)

- Figure EDCG LSC 10.18 This Park is Closed to the Public (23:00 to 06:00)

Landscaping – Regulatory Signage:

- Figure EDCG LSC 10.19 No Pets
- Figure EDCG LSC 10.20 No Pets Within 20 Meters of Play Apparatus
- Figure EDCG LSC 10.21 Pet on Leash
- Figure EDCG LSC 10.22 No Bicycles
- Figure EDCG LSC 10.23 Day Use Only Parking Lot Signage
- Figure EDCG LSC 10.24 No Camping/No Bicycling/No Campfires

10.19.2.2 Custom Signage:

Signage for special applications or one-off type applications should be reviewed and approved by Town of Canmore Parks. Some custom signage examples are as follows:

- Interpretive Signage Examples:
  - Water Shed Loop
  - Quarry Lake Community/History/Heritage
  - Larch Islands Interpretive Loop Trail
  - Amenity protocol signage (small amenity kiosks)
  - Kiosk Map Panel (large trail head kiosks)
  - Quarry Lake; Pets on leash zone/No pets zone/Pets off leash zone
  - Quarry Lake; No Lifeguard on Duty/Deep Water Notification
  - Quarry Lake; Keep Off Ice

- Park Entry Signage Example:
  - “Welcome to Centennial Park”

10.19.3 Fencing

Fencing should be installed in designated areas to delineate boundaries, provide security, and enhance public safety. All fencing will be constructed to ensure durability, longevity, and resistance to environmental conditions.

10.19.3.1 Delivery Handling and Storage

Fencing materials should be transported and stored in a manner that prevents damage, warping, or deterioration. Any damaged materials will be replaced at the contractor’s expense.

10.19.3.2 Products

Chain-link Fencing:

- Black vinyl coating to be applied to mesh and black powdercoat finish to be applied to posts and fasteners, unless otherwise exempted by Town of Canmore Parks.
- Pedestrian gates should include a drop pin closure mechanism and be installed plumb and square with a clearance from finished grade between 100mm-150mm.

10.19.3.3 Execution

Installation is to meet or exceed the City of Calgary standards for chain link fencing and post and cable fencing. Installation to be include removal and disposal of excavated material and repair of disturbed landscaping with sod.

10.19.4 Landscape Boulders

10.19.4.1 Products

- Boulders should be sound and of sturdy materials, not shale or sandstone.
- Boulder size should be between 600mm x 600mm to 750mm x 750mm. Larger rock and boulders may be considered by Town of Canmore Parks on a case-by-case basis based on purpose, site characteristics, safety, and operation and maintenance considerations.

10.19.4.2 Execution

Boulder should be placed in a stable position to ensure it does not shift over time.

Boulders placed in turf areas do not require a concrete maintenance strip.

10.20 Irrigation

Automated irrigation systems may be required where turf areas are to be used for recreational purposes, sports fields and aesthetic features.

This section specifies the supply and installation of irrigation systems. Installers should have experience at this type and scale of work and be willing to provide proof of experience.

The developer is responsible for verifying all conditions on the site and should immediately report all discrepancies and variations from the drawings to Town of Canmore Parks.

10.20.1 Product Delivery, Handling and Storage

All materials should be stored off the ground and under protection until they are used. Materials should be supported as required to prevent excessive strain on the piping.

All material that is damaged or rejected should be removed from the site and not be used. Town of Canmore Parks reserves the right to reject any material that does not meet the specifications.

10.20.2 Products

Any materials specified by name and/or model number in the specifications, irrigation drawings or detail drawings should be used to identifying the materials and to ensure the specific use of that material in the construction of the system. No substitutions will be permitted without prior written approval from Town of Canmore Parks.

All materials used in the system will be new and without flaws or defects of any type and should be the best of their class and kind. All materials should have a minimum two-year guarantee against material defects or defective workmanship.

The Town retains the right to order removal or replacement of any items, which do not present a reasonably neat and professional appearance.

1. Park Water Service

One 50 mm irrigation service is required for neighbourhood parks and regional park, subject to the Town's water services agent's approval. A 100 mm service may be required for larger park sites.

A back-flow prevention device (i.e., double-check valve) should be installed on each irrigation service line to Town's water services agent's specifications.

Water meters are provided by the Town of Canmore through Town's water services agent and are to be sized and installed by Town's water services agent. The developer/contractor should make all water meter supply and installation arrangements with Town's water services agent.

2. Piping and Fittings

All piping downstream of parks water service shall be certified series PVC (SDR26 160psi) with schedule 40 fittings and schedule 80 nipples, or 75 psi CSA polyethylene pipe for lower capacity systems. All piping should be ringed with tracer wire.

- Swing Joints and Risers

  Swing joints should be three elboxs, using PVC elbows and nipples and brass saddles.

  All riser for shrub beds should be galvanized or schedule 80 PVC and bushed down after the final elbow. A double-clamped tee bar stake should be used.

- Sprinkler/Spray Heads

  The type of sprinkler/spray heads to be used for irrigation in active open spaces (community regional parks) should be as follows:
  - Sports Fields: Rain Bird Eagle, Hunter I-40 or Rain Bird Falcon
  - Baseball Diamonds: Rain Bird Eagle, Hunter I-40 or Rain Bird Falcon
  - Parks: Hunter I-40, I-25 or Rain Bird Falcon
  - Playgrounds: Hunter I-40, I-25 or Rain Bird Falcon
  - Passive Open Space (Sub-Neighbourhood Tot-Lot Parks & Landscaping Beds): Hunter I-40, I-25 or
  - Rain Bird Falcon (depending on the area).

Sprinklers should meet the following general requirements:
- be described on the drawings and conform to the manufacturer's performance standards for durability and operation.
- have a heavy-duty stainless riser.
- have ratcheting riser features on all bodies for easy adjustment.
- have two-year, over-the-counter warranty.
- have a minimum 4 in. pop up, 6 in pop up preferred. If used on a sports field or ball diamond, the sprinkler shall have a rubber cover to ensure user safety.
- be equipped with a drain check valve to prevent low head drainage and be capable of checking up to 8 ft. in elevation changes.
- To assist in water conservation, adjustable heads may be used in place of full circle heads for perimeter applications.

- Controllers

  Neighbourhood parks and landscaping beds should have underground automated irrigation systems that include controllers that are compatible with the Town's centralized irrigation system.

  Community regional parks, park/school sites and sports facilities should have one centralized above ground AC controller with multiple irrigation stations and schedule options.

  Wiring to and from the controller and valves shall conform to the Canadian Electric Code and any other regulatory conditions which govern this type of installation. All wiring should follow irrigation lines where appropriate. Where wiring leaves pipe alignment, it should be placed in a conduit.

  Below-ground, PVC conduit is acceptable; above-ground, galvanized conduit should be used. Splices should be made waterproof with the use of an acceptable outdoor waterproof wire connector.

- Electric Valves

  Electrical valves should meet the following specifications:
  - be Rain Bird P.E.B. with a latching solenoid or approved equal.
  - be without screens and filters that require replacement.
  - have a flow control stem.
  - have a manual open/close valve.
  - close slowly without a hammer or chatter.
  - work under extremely low flow and low pressure.

- Irrigation Boxes

  Irrigation boxes should be constructed of heavy-duty weight polyethylene and be capable of being extended, withstanding the weight of a heavy tractor, and being locked. The gravel beds in boxes should consist of clean, washed 19 mm gravel with an area marginally larger than the box opening. Irrigation boxes should be recessed into the ground so the top cover sits flush with the existing turf's finished grade.

- Backfill Material

Backfill material for pipe trenches within 150 mm of the pipe should be clean, approved sand fill or gravel less than 10 mm in diameter. Backfill material should be free of organic material, stones and sharp objects capable of damaging pipe.

- Substitutions

  For substitutions, descriptive literature and material samples should be provided at least three weeks before commencement of work. Any substitutions should meet or exceed specifications and performance standards of the proposed system without any additional cost to the Town.

10.20.3 Execution

The contractor should maintain the existing irrigation system, or such portions as may be planned for retention, in satisfactory working order during the time of the contract work. If cut-ins or tap-ins to an existing system are required, shutdown time of the existing system should be minimized as much as is practical.

If the irrigation system being installed is replacing an existing system, the existing system should be maintained in a satisfactory working order until the new system is available for use in any given area.

All materials and equipment should be installed following manufacturer's recommendations.

All excavated materials that are not suitable for backfill are to be removed from site and disposed of at an appropriate facility.

10.20.4 Record Drawings

Record drawings showing the irrigation system should be submitted electronically. Drawings should be drafted in a professional manner and should be drawn to scale on a legal base plan. Drawings should show the location of the irrigation system relative to the property line, the power source/tie-in (AC) for the main controller, the main controller location, the electrical providers' consumption meter location. Drawings should include the locations of all lines, sprinkler heads, valves (drain and zone control), boxes, the water meter location and type of housing, spool to replace the water meter when it is removed during the winter months, double-check valve, park water service (stop and drain type), curb stops, underground pipe fittings not adjacent to surface fixtures (tee, elbows, etc.), saddles for poly-pigtails and other irrigation materials.

Acceptable record drawings should include but not be limited to the following details:

- a key plan showing the site location.
- a site plan showing property lines, bearings, surrounding site uses, north location, on-site structures, utilities, fences, buildings, walkways, etc., all to a suitable metric scale.
- the municipal address and legal description of the property, including a registered plan number
- 1:250 scale
- the year of the specification and the detail sheet name and number (i.e., 1996, Drain Pit for PVC Pipe, Detail sheet #66)
- the type of irrigation system (gravity drain, a blow out or a main line gravity drain with a lateral line that has to be blown out)
- irrigation zones with numbering
- the name, address and 24-hour phone number of the irrigation system installer, as well as the developer and consultant, where applicable.

- the serial number, installation date and confirmation of up-to-date inspection by the Town of the double check valve.

Where deviation from the design drawing is anticipated, all required shop drawings should be submitted to the Town of Canmore Parks for approval. Where deviation from the design drawing conflicts with standard specifications, conflicts should be identified and an explanation provided.

All work should conform to the approved shop drawings and/or design drawing.

Upon completion of the work, the contractor should provide Town of Canmore Parks with a complete set of record drawings, showing the sprinkler system as installed.

10.20.5 System Maintenance

The developer is required to warranty and maintain the irrigation system for a two-year period, including fall shutdown and spring start-up procedures. Start-up of the irrigation system will require arrangements to be made with EPCOR to install the water meter and start the water consumption tracking process. At the same time, arrangements should be made to have the backflow prevention device inspected, tested and sealed by a certified backflow device inspector. This should be completed prior to activating the system. All records of the backflow prevention device inspection process should be submitted at FAC for the Town's files.

Winterization of the irrigation system will require shutting down and blowing out the system. This should include the removal of the water meter and proper draining of the backflow prevention device to avoid potential freeze-up damages. Arrangements should be made with EPCOR to remove and store the water meter, install the spool, and record water consumption amounts for the season. The developer is responsible for water consumption during the development process and the warranty/maintenance period and will be billed by EPCOR for water consumption.

Following inspection by the Town of Camore Engineering or Parks representative, the developer is responsible for any required repairs at the end of the two-year warranty/maintenance period to make the irrigation system fully operational. If the system has been approved and accepted and all other deficiencies have been resolved, the FAC will be approved.

For Town irrigation projects, the contractor is required to warranty and maintain the irrigation system for a one-year period, including fall shut-down and spring start-up procedures.

10.21 Sports Fields

10.21.1 Products

a. Soccer fields:
   i. 1 pair of movable soccer goals with ground pin per field. Acceptable models, or equivalent:
      - Junior: Scoremaster SM-DM1600-PC – White Powder Coat Finish
      - Official Size: SM-DM1600-PC – White Powder Coat Finish

b. Canadian football/soccer combination field:
   i. Where a Canadian football field and soccer field is combined on one field, a combination goal post is required. Goal posts will be movable with in-ground aluminum sleave mounts to allow for

a side-to-side shift of the playing surface. Refer to City of Calgary Major/Minor Soccer Goal Post Detail – Option Installation.

10.21.2 Structures

For all structures, the developer should submit engineered shop drawings, stamped by a Professional Engineer licensed in Alberta, to the Town for approval prior to construction. Drawings must include:

- Structural design and load calculations
- Materials and finishes
- Connection and fastener details
- Foundation and anchoring requirements
- Installation procedures

All structures should use durable, weather-resistant materials, such as pressure-treated wood, steel, aluminum, or reinforced concrete, with corrosion-resistant fasteners. Prefabricated components should be inspected before installation, and construction must minimize environmental impact. A one-year warranty on workmanship and materials is required, along with a maintenance manual upon completion.

Any structure placed near or over water should not consist of a material that is stained or require the use of stains for aesthetic or maintenance purposes.

10.22 Landscape Maintenance

The Developer is responsible to maintain all landscaping from the time of installation/construction or planting until the date of acceptance of the FAC.

Maintenance includes all measures necessary to ensure:

a) consistency with the approved landscape plans/drawings;
b) all non-vegetative landscaping is in good condition, operational, and free of any damage; and
c) all plant material is in a vigorous and healthy growing condition.

10.22.1 Turf Areas

10.22.1.1 Weed and Pest Control

Invasive plant/weed, insect and fungus control should be completed when required. Weed control may be by manual removal, mowing or chemical application. Chemicals should be used in accordance with manufacturer's recommendations, jurisdictional laws and be applied by a licensed applicator. Upon completion of a pesticide or herbicide application, signs shall be erected within the area sprayed, which identify that the area has been sprayed, the date of application, contact name and phone number of the licensed applicator, and the type of pesticide/herbicide applied. Signs shall remain in place for 48 hours and shall be removed by the applicator within 72 hours of the application time.

10.22.1.2 Turf Maintenance

All turf areas should be maintained in a healthy, vigorous, growing condition until accepted by the Town on the date of the FAC or DCC. All areas that are damaged during deficiency repairs or those showing deterioration, bare-spots, burns, or areas that are thin or washed out should be top-dressed and re-seeded or re-sodded in a timely manner. The maintenance period for areas seeded in the fall may, at the discretion of the Town, commence the following spring, one month after the start of the growing season, provided conditions specified above are fulfilled.

Work under this section will be accepted when:

- growth of seeded or sodded areas has been properly established;
- turf is free of bare and dead spots; and
- turf is invasive plant-free (free from prohibited noxious, noxious, invasive grasses and annual weeds).

10.22.2 Plants and Planting Beds

10.22.2.1 Plant Material Maintenance

All plant material should be maintained in a vigorous and healthy growing standard until the date of FAC or DCC.

Watering: Plants should be watered in accordance with the following schedule:

Time from planting	Watering schedule
First 72 hours	Three times
First six months	Once every four days
After six months to FAC	Once every 10-14 days

Notes:

a) Watering is weather dependent and is subject to applicable water restrictions.

During the warranty period, plants found dead or not in a healthy, satisfactory growing condition or which do not meet specified requirements should be removed and replaced in a timely manner. Replacement plant material should be of the same size and species and should be supplied and planted in accordance with approved drawings and specifications.

Unmulched beds and tree pits should be freshly cultivated and free of weeds, rubbish, and debris. Mulched beds should be free of weeds and rubbish.

10.22.2.2 Tree/Shrub Pruning

Pruning of trees and shrubs during the warranty period (after planting and prior to FAC) should be conducted by or directly supervised by a certified professional (ISA Certified Arborist, Landscape Industry Certified Technician, Landscape Horticulturist, or equivalent designation) according to best practices as

defined by the ISA. Pruning may only be undertaken for public safety and/or to ensure tree health, and tree structure including:

- Removal of dead branches
- Removal of a double leader
- Pruning of broken portions of branches back to live lateral

Trees and shrubs on Town-owned land after FAC should only be pruned or removed with permission from the Town of Canmore and as part of the Tree Protection Program.

SECTION 11 – SOLID WASTE

TERMS OF USE

The "2025 Engineering Design and Construction Guidelines, Section 11" is made available for use in the Town of Canmore effective as of the date below:

February 28, 2025

The "2025 Engineering Design and Construction Guidelines – Section 11" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement, follow good practice, and authenticate their work products in accordance with APEGA regulations. Should any user have question as to the intent or accuracy of any specification or drawing herein, or concern that conflict may exist between the manufacturers' or suppliers' recommended installation procedures and these Guidelines, the user is advised to seek clarification from the Municipal Engineer.

11.0 Solid Waste

For definitions related to solid waste guidelines and specifications, please see the Glossary of Terms in Appendix A, Table 2.

11.1 Guidelines for New and Redeveloped Residential Development

Three stream waste collection for all residential developments is provided by the Town and the waste facilities provided by the Developer must meet the criteria below. Collection for mixed-use residential/commercial developments can either by provided by the Town or a private waste collection agency. Mixed-use developments opting for Town collection must meet the criteria in Section 11.1, whereas mixed-use or other developments utilizing private collection are subject to the criteria in Section 11.2.

11.1.1 Animal Proof Waste, Beyond Curbside Recycling and Food Waste Containers

11.1.1.1 Container Location

Animal proof waste (APW), beyond curbside recycling (BCR) and Food Waste (FW) containers shall be located within a 200m radius from intended users. They should be combined with another container or other utility (e.g., Canada Post mail kiosk) where feasible. The containers shall be located on public land. For multi-family developments over 10 units, the Town may, at its sole discretion, permit APW, BCR and FW containers to be located on private property.

11.1.1.2 Container Enclosure

APW, BCR and FW containers should be screened unless otherwise approved by the Town. Suggested screening shall be artificial screening as illustrated in Figure EDCG SWS 11.1 Animal Proof Waste Container – Artificial Screen Dimensions and detailed in Figure EDCG SWS 11.2 Animal Proof Waste Container – Artificial Screen Detail, or as otherwise approved by the Town.

The Town shall have the authority to place its decals on each APW, BCR and FW containers installed by the developer.

11.1.1.3 Container Quantity

When a Development Permit application that increases the number of residential units is approved, the Developer responsible for the application is required to provide and install containers or provide monies in lieu of containers as per the guidelines below.

- One to 15 new or additional residential dwelling units: Fees per dwelling units apply, refer to the current Town of Canmore Fee schedule.
- Sixteen to 40 new or additional residential dwelling units: Purchase, locate and install one APW container, one BCR and one FW container.
- Over 40 new or additional residential units: Provide APW, BCR and FW containers as per Town specifications.

11.1.2 Pedestrian Waste Containers and Dog Bag Dispensers

Pedestrian waste containers, pedestrian waste/returnable containers and dog bag dispensers are to be provided and installed by the Developer as described below at playgrounds, parks and trailheads if such amenities are part of a new or redeveloped residential development.

Each pedestrian waste container, pedestrian waste/returnable containers and dog bag dispenser shall have a minimum clearance radius of 1.5m from individual containers/dispensers or if grouped, from the outside containers.

Final quantities and locations of all APW container, BCR container, FW, pedestrian waste container, pedestrian waste/returnable container and dog bag dispenser are subject to Town approval.

11.1.2.1 Sub-Neighbourhood Playgrounds

Sub-neighbourhood playgrounds as defined by the Open Space Development Guidelines require the developer to provide and install a minimum of one pedestrian waste container.

11.1.2.2 Neighbourhood and Community Parks

Neighbourhood and community parks as defined by the *Open Space Development Guidelines* require the developer to provide and install a minimum of one pedestrian waste and one pedestrian returnable container.

11.1.2.3 Trailheads

Trailheads for official trail systems require the developer to provide and install a minimum of one pedestrian waste container and one dog bag dispenser.

11.1.2.4 Dog Parks

Dog parks require the developer to provide and install a minimum of one pedestrian waste container and one dog bag dispenser per entrance.

11.2 Guidelines for Commercial Development

11.2.1 Waste Containers, Animal Proof Waste, Beyond Curbside Recycling and Food Waste Containers

11.2.1.1 Container Location

The location requirements for commercial waste and recycling enclosures, whether inside the principal building or in a separate enclosure or location, are regulated through the Town's Land Use Bylaw.

Where an enclosure for a commercial premise is permitted to be attached to or located within a building or structure and is to contain a standard commercial waste or recycling container, the enclosure shall, as a minimum:

- be animal proof (see specifications in Section 11.3 of the EDCG).
- be of similar material and construction as the building or structure it is attached to.
- have a reinforced concrete entrance apron pad (as per Figure EDCG SWS 11.3) at a grade not greater than 2%.
- provide for an adequate approach and turning radius for service vehicles.

If the enclosure for a commercial premise is permitted to be a separate, stand-alone building or structure and is to contain a standard commercial waste or recycling container, final design approval will be subject to the nature of the redevelopment and at the discretion of the Town.

If in-ground containers (i.e. Molok, Earth bins) are proposed, the applicant needs to take into consideration the groundwater levels of the site. If the site is in located within the *High Groundwater Area Overlay*, in ground containers are not permitted. In-ground containers must meet the animal proof specifications in Section 11.3.

11.2.1.2 Container Enclosure and Access

If the waste container to be used at a commercial premise itself is an APW or BCR container that meets the requirements of the Town's *Waste Control Bylaw*, then the container requires screening on three sides as illustrated in Figure EDCG SWS 11.1 Animal Proof Waste Container – Artificial Screen Dimensions and detailed in Figure EDCG SWS 11.2 Animal Proof Waste Container – Artificial Screen Detail for aesthetic purposes only. In addition, a concrete pad shall be constructed as specified in Section 11.6 of the *Engineering Design and Construction Guidelines* (EDCG) and in Figure EDCG SWS 11.3 Animal Proof Waste Container – Pad Construction and Anchor and as illustrated in Figure EDCG SWS 11.4 Animal Proof Waste Container – Double Pad (Large).

Front-loading and side-loading containers shall have sufficient access and an appropriate turning radius for service vehicles to service the containers and enter/exit the property. They should be screened generally as illustrated in Figure EDCG SWS 11.1 and generally detailed in Figure EDCG SWS 11.2.

Enclosures and screening on private sites must comply with the Land Use Bylaw and are subject to approval by the Town's Planning and Development Department.

11.2.1.3 Container Quantity and Size

Commercial premises shall provide the required quantity and size of APW, BCR and FW containers as identified below or otherwise provide for an equivalent waste handling system approved by the Town.

Table 11-1, below, shows the commercial premises guidelines for BCR containers. The guidelines are for number and size of containers and are based on the total floor area measured in square metres.

Table 11-1: Commercial Premises Guidelines for Beyond Curbside Recycling Containers

Commercial Premise Type	Container Size[a)]			
	N/A	**3.0 m^3**	**4.5 m^3**	**4.5 m^3 [b)]**
Retail	< 400 m^2	> 400 m^2	> 600 m^2	600 m^2
Restaurant	< 300 m^2	> 300 m^2	> 600 m^2	600 m^2
Institution	< 400 m^2	> 400 m^2	> 800 m^2	800 m^2
Grocer	< 400 m^2	> 400 m^2	> 800 m^2	800 m^2
Office	< 500 m^2	> 500 m^2	> 750 m^2	750 m^2
Industrial	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2
Visitor Accommodation - Commercial	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2

Notes:
a) Container floor area shall be a minimum of 3.5m^2 per container.
b) One container required for every square metre factor listed.

Table 11-2, below, shows the commercial premises guidelines for Food Waste Carts. The guidelines are for number of carts and are based on the total floor area measured in square metres.

Table 11-2: Commercial Premises Guidelines for Food Waste Carts

Commercial Premise Type	Number of 240-Litre Carts[a)]			
	1-2 carts	**3-5 carts**	**6-8 carts**	**8 carts [b)]**
Retail	N/A	N/A	N/A	N/A
Restaurant	< 300 m^2	> 300 m^2	> 600 m^2	600 m^2
Institution	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2
Grocer	< 400 m^2	> 400 m^2	> 800 m^2	800 m^2
Office	< 900 m^2	900 m^2		
Visitor Accommodation - Commercial	< 500 m^2	> 500 m^2	> 1,000 m^2	1,000 m^2

Notes:
a) Cart floor area shall be a minimum of 0.21m x 0.21m per cart
b) Number of carts required for every square metre factor listed

Table 11-3, below, shows the commercial premises guidelines for waste containers and APW containers. The guidelines are for number and size of containers and are based on the total floor area measured in square metres.

11-3: Commercial Premises Guidelines for Waste and Animal Proof Waste Containers

Commercial Premise Type	Container Size		
	3.0 m^3	**4.5 m^3**	**4.5 m^3 a)**
Retail	< 400 m^2	> 400 m^2	400 m^2
Restaurant	< 200 m^2	> 200 m^2	200 m^2
Office	< 500 m^2	> 500 m^2	500 m^2
Industrial	< 200 m^2	> 200 m^2	200 m^2

Notes:
a) One container required for every square metre factor listed.

11.2.2 Animal Proof Waste Handling Enclosure

Waste handling enclosures/garage systems for containing standard commercial waste or recycling containers shall be animal proof structures constructed of metal or concrete with doors constructed of metal. The exterior service area shall have a separate access person door.

The area for the service vehicles in front of the access door(s) shall have a slope no greater than 2%. Road access to waste containers shall have a sufficient approach and turning radius for service vehicles to service container and enter and exit the property.

The Town must approve site plan, construction, and final location of animal proof waste handing enclosures.

11.2.3 Pedestrian Waste and Recycling Containers

All pedestrian waste and recycling containers located outside a building shall be animal proof to the satisfaction of the Town.

All new and existing commercial premises located outside the downtown core shall provide and locate one pedestrian waste container and one pedestrian recycling container for every 20 parking stalls. A minimum of one pedestrian waste and one recycling container shall be located at the main pedestrian entrance to the commercial premise. The locations for other required containers shall be to the satisfaction of the Town.

The location of pedestrian waste containers shall be within 3m of the public entrance point into a commercial premise. Each pedestrian waste container shall have a minimum clearance radius of 1.5m.

11.2.4 Used Cooking Oil Container Enclosure

Used Cooking Oil Containers must either locate the container inside an animal-proof waste handling enclosure or a used cooking oil container enclosure described below.

Used cooking oil container enclosures shall be fully enclosed (sides and top) structures constructed of wood or alternative materials as approved by the Town. Access to the enclosure will be a person door that can be securely latched, to ensure the door remains closed when not in use. The enclosure must have adequate space to house the used cooking oil container and allow a person to enter and pour used cooking oil into the container. The structure must also allow for access from the service provider to empty the container. The structure must be able to contain any spillage caused from filling or emptying the used cooking oil container.

11.3 Animal Proof Waste Containers Specifications

11.3.1 Animal Proof Requirement

All containers stored outside of an animal proof waste enclosure to be used for the collection of municipal solid waste shall meet the following animal proof specifications:

- No part of the container shall have any spaces or gaps in width exceeding 3.2mm.
- User doors and dumping lids shall be recessed so that they are flush with the top of the container.
- User doors shall be self-closing.
- User doors shall incorporate a covered stainless steel gravity latch system, which prohibits entry of an animal claw from reaching the latch trigger mechanism.

11.3.2 Container Construction

All containers stored outside of an animal proof waste enclosure to be used for the collection of municipal solid waste shall meet the following container construction specifications:

- All metal shall be no less than 12-gauge galvanized steel unless otherwise specified.
- User doors shall be 14-gauge galvanized steel.
- User door dimensions shall be a minimum of 0.450m x 0.550m.
- All fastenings (bolts, nuts and washers) shall conform to ASTM standard A307.
- All hinges and latches shall be stainless steel.
- Container panels shall be riveted together using plated steel rivets.
- Container shall not have any sharp points or corners.

11.3.3 Container Finish

All waste containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be painted using the Town's standard colour, Neufeld Green, or approved equivalent. All container components shall be cleaned and powder painted prior to assembly. A salt spray cabinet test shall be completed for the powder paint finish. The exterior surfaces shall be coated with an anti-graffiti finish on top of powder coat finish.

Containers shall include a stainless steel (or approved equivalent) plaque attached with rivets listing the container manufacturing year and identification code for inventory and insurance purposes. Containers shall be free of manufacturer decals.

11.3.4 Pedestrian Waste Containers

In addition to the pedestrian waste container (PWC) specifications provided in Sections 11.1.2 and 11.2.3, PWCs shall meet the following requirements:

- The container shall conform to a Haul-All Equipment Hyd-A-Bag model or approved equivalent.
- The container volume shall be approximately 0.26m^3.
- The height of the user door shall be between 0.9m and 1.0m from the base of the container.
- The entire back panel of the container shall function as a service door.
- The latch system on the service door shall have a locking device.
- The container shall include an internal frame system for bag support, the top of which is larger than and sits just below the user door opening to ensure all waste is deposited in the bag.
- The frame system shall employ a pivot or sliding mechanism to allow for easy bag removal and replacement from the container's service door.
- The concrete pad shall be reinforced with wire mesh and be Type HE cement with a minimum strength of 30 MPa.
- The concrete pad shall have a minimum thickness of 0.1m.

11.3.5 APW and BCR Waste Containers

In addition to specifications provided in Section 11.2 of the EDCG, APW and BCR containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall meet the following requirements:

- The container shall conform to a Haul-All Equipment Hyd-A-Way model or approved equivalent.
- The container shall be operational with the Town's waste collection vehicles (powered by an external hydraulic system from a side loading service vehicle and dumping into a service vehicle hopper).
- The container shall be able to perform in extremes of weather, from a high of +40°C to a low of -40°C.
- The container shall be moveable with a crane truck.
- The container hopper shall be equipped with a dumping lip that directs waste into the service vehicle hopper.
- The container footprint shall be such that it fits on the concrete pads as specified in Figure EDCG SWS 11.4.
- The container frame shall have two anchor holes in frame tubing at the points identified on drawings Figure EDCG SWS 11.4.
- The container hopper base shall have a platform with 0.01m (minimum) nylon bumpers to cushion the hopper in the resting position.

- The container hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- The dumping lid shall be 16-gauge galvanized steel and have four stiffeners.
- In the dumping position, the dumping lid shall open freely by gravity and the contents shall be protected from the wind by a flexible windscreen.
- The windscreen shall automatically extend when the container is dumped and retract internally when the container is lowered.
- Windscreen materials shall be a minimum of 510g vinyl coated nylon and shall remain flexible within a temperature range of +40°C to -40°C.
- The dumping angle shall be approximately 45°.
- The user step shall be manufactured using Type HE cement with a minimum strength of 30 MPa. The user step shall have a minimum thickness of 0.14m and be a height of 0.2m from ground level.
- The cylinder access door shall open to the left and have a lock that is compatible with all Town APW containers.
- Rear corners shall be skirted with galvannealed steel panels.
- A professional engineer shall stamp design drawings for containers.

Error! Reference source not found., below, shows waste container volumes and the corresponding m inimum weight capacities required.

11-4: Waste Container Volumes and Weight Capacities

Waste Container Size	Volume	Weight Capacity
Large	4.5 Cubic Metres	1,350 Kg

11.3.6 Front Load Waste Containers

In addition to specifications provided in Section 11.2 of the EDCG, front load waste containers (FLWC) shall meet the following requirements:

- Containers shall be one unit comprised of a hopper with side fork mounts.
- User door height shall not exceed 1.3m.
- The hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- Containers shall have one dumping lid and two user doors.
- The dumping lid shall be 16 gauge and have four stiffeners.
- In the dumping position, the dumping lid shall open freely by gravity and the contents shall be protected from the wind by a flexible windscreen.
- The windscreen shall automatically extend when the container is dumped and retract internally when container is lowered.
- Windscreen materials shall be minimum of 510g vinyl coated nylon and shall remain flexible within a temperature range of +40°C to -40°C.
- Large waste containers shall be a minimum of 1.8m wide and 1.8m long.

- Medium waste containers shall be a minimum of 1.8m wide and 1.3m long.

11.4 Beyond Curbside Recycling Container Specifications

11.4.1 Construction

Beyond curbside recycling (BCR) containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be partitioned into three compartments: mixed paper, glass, and plastic and metal. The mixed paper compartment shall be on the right-hand side of the container and the opening shall have a chute with a stainless steel cover. The glass compartment shall be in the middle of the container and the opening shall be a 0.25m diameter circle with rubber flaps. The plastic and metal compartment shall be on the left-hand side of the container and the opening shall be a 0.25m by 0.5m oval with rubber flaps.

Each compartment shall have a separate dumping lid that has a latch to secure it closed when the container is in the dumping position. The mixed paper dumping lid shall have a hinged brace to support the lid open while in the dumping position.

Each compartment shall have the minimum volume as shown in 11-5, below.

11-5: Beyond Curbside Container Compartment Material and Volume Specifications

Compartment Material	Volume (m^3)
Mixed paper	2.25
Glass	0.75
Plastic and Metal	1.5

In addition to the compartment specifications described above, containers shall meet the following requirements:

- All metal shall be no less than 12-gauge galvanized steel unless otherwise specified.
- All fastenings (bolts, nuts and washers) shall conform to ASTM Standard A307.
- All hinges and latches shall be stainless steel.
- Container panels shall be riveted together using plated steel rivets.
- The container shall not have any sharp points or corners.
- The container shall be operational with the Town's waste collection vehicles (powered by an external hydraulic system from a side load service vehicle and dumping into a service vehicle hopper).
- The container shall be able to perform in extremes of weather from a high of +40°C to a low of -40°C.
- The container shall be moveable with a crane truck.

- The container hopper shall be equipped with a dumping lip that directs waste into the service vehicle hopper.
- The footprint of the container shall be such that it fits on the concrete pads as specified in Figure EDCG SWS 11.4.
- The container frame shall have two anchor holes in the frame tubing at the points identified on Figure EDCG SWS 11.4.
- The container hopper base shall have a platform with 0.01m (minimum) nylon bumpers to cushion the hopper in the resting position.
- The container hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- Dumping angle shall be approximately 45°.
- The user step shall be manufactured using concrete with a minimum strength of 30 MPa. The user step shall have a minimum thickness of 0.14m and be a height of 0.2m from ground level.
- The cylinder access door shall open to the left and have a lock that is compatible with all Town APW containers.
- Rear corners shall be skirted with galvannealed steel panels.

11.4.2 Container Finish

Containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be painted using the Town's standard BCR container colour (blue) or approved equivalent. All container components shall be cleaned and powder painted prior to assembly. A salt spray cabinet test shall be completed for the powder paint finish. The exterior surfaces shall be coated with an anti-graffiti finish on top of powder coat finish.

Containers shall include a stainless steel (or approved equivalent) plaque attached with rivets listing the container manufacturing year and identification code for inventory and insurance purposes. Containers shall be free of manufacturer decals.

11.5 Food Waste Collection Container

11.5.1 Communal Residential Food Waste Collection Containers

In addition to specifications provided in Section 11.2 of the EDCG, Food Waste containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall meet the following requirements:

- The container shall conform to a Haul-All Equipment Hyd-A-Way model or approved equivalent.
- The container shall be operational with the Town's waste collection vehicles (powered by an external hydraulic system from a side loading service vehicle and dumping into a service vehicle hopper).
- The container shall be able to perform in extremes of weather, from a high of +40°C to a low of -40°C.
- The container shall be moveable with a crane truck.

- The container hopper shall be equipped with a dumping lip that directs waste into the service vehicle hopper.
- The container footprint shall be such that it fits on the concrete pads as specified in Figure EDCG SWS 11.5 Animal Proof Waste Container – Triple Pad (Large).
- The container frame shall have two anchor holes in frame tubing at the points identified on drawings Figure EDCG SWS 11.5.
- The container hopper base shall have a platform with 0.01m (minimum) nylon bumpers to cushion the hopper in the resting position.
- The container hopper bottom shall have a drain plug with an opening not exceeding 0.03m diameter.
- The dumping lid shall be 16-gauge galvanized steel and have four stiffeners.
- In the dumping position, the dumping lid shall open freely by gravity and the contents shall be protected from the wind by a flexible windscreen.
- The windscreen shall automatically extend when the container is dumped and retract internally when the container is lowered.
- Windscreen materials shall be a minimum of 510g vinyl coated nylon and shall remain flexible within a temperature range of +40°C to -40°C.
- The dumping angle shall be approximately 45°.
- The user step shall be manufactured using concrete with a minimum strength of 30 MPa. The user step shall have a minimum thickness of 0.14m and be a height of 0.2m from ground level.
- The cylinder access door shall open to the left and have a lock that is compatible with all Town APW containers.

Error! Reference source not found., below, shows waste container volumes and the corresponding m inimum weight capacities required.

11-6: Food Waste Collection Container Volumes and Weight Capacities

Waste Container Size	Volume	Weight Capacity
Small	1.5 Cubic Metres	1,350kg

11.5.2 Container Finish

Containers stored outside of an animal proof waste enclosure and serviced by the Town of Canmore shall be painted using the Town's standard Food Waste collection container colour or approved equivalent and be wrapped with the approved artwork. All container components shall be cleaned and powder painted prior to assembly. A salt spray cabinet test shall be completed for the powder paint finish. The exterior surfaces shall be coated with an anti-graffiti finish on top of powder coat finish.

Containers shall include a stainless steel (or approved equivalent) plaque attached with rivets listing the container manufacturing year and identification code for inventory and insurance purposes. Containers shall be free of manufacturer decals.

11.6 Container Concrete Pad Construction

Animal proof waste containers (APW), beyond curbside recycling (BCR) and Food Waste containers shall be located and secured on a concrete pad as per Figure SWS 11.4.

- Site and base preparation for the concrete pad shall conform to the City of Calgary's *Standard Specifications Roads Construction*, Section 311.02.00 and 3.11.03.00.
- The container pad shall have dimensions as described in Figure SWS 11.4
- Finishing and curing of the concrete pad shall be as defined in the City of Calgary's *Standard Specifications Roads Construction*, Section 311.07.00.
- The container pad shall be constructed of concrete with a minimum strength factor of 30 MPa.
- The container pad shall have a 2% grade to road.

A. APPENDIX A: ABBREVIATIONS AND GLOSSARY OF TERMS

Table 1: Abbreviations

Abbreviation	Complete Term
A	
AASHTO	American Association of State Highway and Transportation Officials
AEMA	Alberta Emergency Management Agency
ANSI	American National Standards Institute
APW	animal proof waste (containers)
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing Materials
AWWA	American Water Works Association
B	
BCR	beyond curbside recycling
BMP	best management practices
BP	building permit
C	
CAD	Computer Aided Design
CCC	Construction Completion Certificate
CCTV	closed-circuit television
CMP	construction management plan
CNLA	Canadian Nursery Landscape Association
CSA	Canadian Standards Association
CTS	copper tube sizing
D	
DCC	Development Completion Certificate
DP	development permit
E	
EDCG	Engineering Design and Construction Guidelines
ER	environmental reserves
ESC	erosion and sediment control
F	
FAC	Final Acceptance Certificate
FLWC	front load waste containers
FOS	Facture of Safety
FRP	fiberglass reinforced pipe
FTP	file transfer protocol
H	
HDPE	high-density polyethylene
HVAC	heating, ventilation and air conditioning

Abbreviation	Complete Term
I	
ISA	International Society of Arboriculture
ISO	International Organization for Standardization
ITP	*Integrated Transportation Plan* (Canmore)
L	
LPS	low pressure sanitary (system)
LTF	Lowest Top of Footing
LUB	*Land Use Bylaw* (Canmore)
M	
MDP	*Municipal Development Plan* (Canmore)
MR	municipal reserves
MUTCDC	*Manual of Uniform Traffic Control Devices for Canada*
N	
NTP	notice to proceed
O	
OGS	oil-grit separator
O&M	operation and maintenance
P	
PDF	Portable Document Format
PDI	probability of death of an individual
PLC	programmable logic controller
PLS	pure live seed
PRV	pressure reducing valve
PUL	Public Utility Lot
PVC	polyvinyl chloride
PWC	pedestrian waste container
Q	
QRA	quantitative risk analysis
QRP	qualified registered professional
R	
RDP	Roadside Development Permit
ROW	right-of-way
S	
SCADA	supervisory control and data acquisition
SCRA	steep creek risk assessment
SDR	standard dimension ration
T	
TCA	tangible capital asset
TIA	Transportation Impact Assessment
U	
ULA	utility line assignment
UMP	Utility Master Plan

Abbreviation	Complete Term
URW	utility right-of-way
USCS	Unified Soil Classification System

Table 2: Glossary of Terms

Term	Definition
A	
Active Mitigation	Mitigation measures that directly affect the hazard process by reducing the event magnitude and hence reducing the damage potential; remediating, reducing or eliminating the potential of an event from occurring; or deflection of an event to areas where no adverse effects are expected.
Alluvial Fan	A conical accumulation of sediment deposited where a steep channel flows onto a much lower gradient so that much of the sediment load of the channel is deposited. Alluvial fans form where a mountain tributary enters a main valley.
Animal Proof Waste Container	A waste container for disposing of residential or commercial waste that meets the animal proof criteria set forth in Appendix 'A' - *Criteria For Animal Proof Waste Container*. The container shall be constructed of metal, be designed to be collected by automated means and have a volume of no less than 4.5 m^3.
Artificial Screening	A partition constructed of wood and/or metal for the purposes of obstructing the view of an animal proof waste container or recycling container.
B	
Beyond Curbside Recycling Container	A receptacle for disposing of residential or commercial recyclables. The container shall have three partitioned compartments: one for mixed paper (including cardboard, newsprint and any other paper product), one for plastic and metal food containers, and one for glass. The container shall be designed to be collected by automated means and have a volume no less than 4.5 m^3.
C	
Commercial Premises	A building, structure or premises used for the conduct of some profession, business, manufacturing process or other undertaking. This includes institutional, industrial, commercial, restaurant and retail premises as well as any attached residential dwelling units, and includes areas designated as a Mobile Home Park in accordance with the *Land Use Bylaw*.
Commercial Waste Container	A metal container for the collection of commercial waste that does not meet the requirements of an animal proof waste container, is located on a commercial premise in an approved storage location and has a minimum volume of 2 m^3.
Consequence	The outcomes for elements at risk, given impact by a hazard. In the EDCG, consequences considered include potential loss of life, damage to buildings and infrastructure, loss of usage of critical facilities, and direct interruption of business activity.
Consultant	Professionals registered to practice under their respective Acts or Professional Associations in the Province of Alberta, as Engineers, Architects, Landscape Architects, Planners or Technologists
Consulting Engineer	Professional Engineer registered to practice under the Act in the Province of Alberta

Term	Definition
D	
Debris Flood	Very rapid surging flow of water heavily charged with debris in a steep channel.
Debris Flow	Very rapid to extremely rapid surging flow of saturated, non-plastic debris in a steep channel.
Design Flood	For river flooding, the current design standard in Alberta is the one percent flood, defined as a flood whose magnitude has a one percent chance of being equaled or exceeded in any year. Although it can be referred to as a 100-year flood, this does not mean that it will only occur once every hundred years. For steep creek hazard, the design flood is not based on a fixed return-period and changes based on the risk reduction required. It results from the basin-scale and site-specific hazard and risk assessments. Most creeks will use a 100-year to 300-year flood event as the design flood.
Design Flood Level	The calculated elevation or the modelled water elevations for the design flood. This elevation is used in the calculation of the flood construction level.
Developer	A person or company responsible for the financing and/or construction of a development within the Town.
Development	a. an excavation or stockpile and the creation of either of them; b. a building or an addition to, or replacement or repair of a building and the construction or placing in, on, over or under land of any of them; c. a change of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the use of the land or building; and/or d. a change in the intensity of use of land or a building or an act done in relation to land or building that results in or is likely to result in a change in the intensity of use of the land or building
Dog Bag Dispenser	A container for the dispensing of plastic handbags to collect domestic pet waste. A list of acceptable distributors is available through the Town.
Downtown Core Businesses	A commercial premise that fronts on and provides pedestrian entrance and service on 8th, 9th and 10th Streets between 3rd, 5th, 6th, 7th and 8th Avenues.
E	
Element at Risk	Anything considered of value in the area potentially affected by hazards.
F	
Flood	An overflow of water that submerges land that is usually dry. The amount of suspended sediment is insufficient (less than 10% concentration) to substantially affect how flowing water behaves. Water may appear very muddy; but most of the suspended sediment is transported near the bed.
Flood Construction Level (Minimum Floor Elevation)	The elevation of the underside of a wooden floor system or top of concrete slab for habitable buildings that is calculated from the DFL elevation plus the allowance for freeboard. In the case of a manufactured home, the ground

Term	Definition
	level or top of concrete or asphalt pad on which it is located shall be equal to or higher than the above described elevation. The flood construction level also establishes the minimum crest level of a standard dike for river engineering. Where the DFL cannot be determined or where there are overriding factors, an assessed height above the natural boundary of a water-body or above the natural ground elevation may be used.
Flood Proofing	The alteration of land or structures, either physically or in use, to reduce flood damage. This includes the use of building setbacks from water bodies to maintain a floodway and to allow for potential erosion.
Freeboard	A vertical distance added to the DFL. It is used to establish the flood construction level or minimum floor elevation.
H	
Habitable Space	The floor space both above and below grade, which includes stairways, mechanical equipment rooms, closets, hallways, bathroom(s) and enclosed areas used for storage. It excludes elevators, areas dedicated to the parking of motor vehicles (up to 60 m2) and areas devoted exclusively to the mechanical or electrical equipment servicing the development.
Hazard Scenario (Steep Creeks)	Hazard scenarios describe various ways that a steep creek hazard could occur within a specified frequency class. This could, for example, include the blockage of a culvert or an avulsion associated with a log jam.
Hydrogeomorphic Processes	Processes such as debris flows, debris floods and bank erosion that are examples of the geomorphic interaction with the surface water regime. Referred to as steep creek processes in this document.
L	
Landscaping in Urban Hardscaped Area	Landscaping occurring in a publicly accessible environment where greater than 90% of the surface area is covered by hard surfacing (pavement, masonry, concrete, gravel, etc.). Landscaping may include vegetation such as trees, shrubs and/or planting beds, and may use soil cells to achieve minimum soil depths and volumes.
Lane	Public thoroughfare with a right-of-way width of not greater than 9.0 m and not less than 6.0 m
Linear Park	A municipal reserve parcel with a minimum width of 10 m and a maximum width of 20 m that functions as a linear recreation corridor by providing local or regional pathway links within and between communities.
Local Protection (On-Site)	On-site mitigation measures located on the property lot that do not affect creek and river channels, or water bodies. Small-scale local protection refers to detached, duplex or fourplex lots. Medium-scale protection refers to flood protection of condominium buildings or a conglomeration of townhouses. Large-scale protection refers to whole land-use districts or parts of a district where the layout of a development can have great influence on the hazard situation. Large-scale mitigation is out of scope for the Steep Creeks section (9) of the Engineering Design and Construction Guidelines and must be designed by a qualified registered professional
M	

Term	Definition
Mortality	The number of potential fatalities divided by the number of persons exposed to a hazard, should the hazard occur.
Multi-residential Dwelling	An apartment building, townhouse or condominium complex which contains five or more self-contained residential dwelling units, each having sleeping, cooking and bathroom facilities.
Municipal Improvement	Works that the Town will own, operate and maintain when all the developer's obligations are met
N	
Naturalization	A type of ecological/habitat restoration that involves purposely placing native plants in an area with the purpose of leaving a disturbed site to natural processes and /or activities that are intended to improve and enhance the natural environment. In a general sense, naturalization is the deliberate reintroduction of species that are native to a given areas or are well adapted to the climate circumstance.
Naturalized Zone	A park or portions of parks that have been or intended to undergo the process of naturalization. Vegetative cover includes native grasses, wildflowers and/or trees and shrubs that might support the ecological system. Once established, maintenance must be limited to fire control, weed control, and waste removal.
Neighbourhood Park	A municipal reserve parcel that provides recreational activities intended to serve the immediate neighbourhood. Typical activities include playgrounds, turf rinks, and unstructured play, and may also include off-leash dog parks, and structured sports such as ball diamonds or soccer fields.
O	
Off-leash Dog Park:	A portion of a park designated for dogs to be off-leash. Off-leash dog park classifications include: - Dog-run: up to 0.4 hectares in size - Neighbourhood Park: 0.4 hectares to 1.0 hectare in size - Destination Park: over 1.0 hectare in size
Off-site Mitigation	Mitigation measures that are located on a different lot/parcel than the one being protected. They can be within the bed and shore, or on the bank of a creek or river. Functions of off-site mitigation can be to prevent flow from entering the community, prevent erosion, or reduce the magnitude of an event. All off-site mitigation measures are out of scope of the Steep Creeks section (9) of the Engineering Design and Construction Guidelines and must be designed by a qualified registered professional.
P	
Passive Mitigation	Mitigation measures that do not affect the hazard process itself but that reduce the risk. No attempt is made to prevent, modify or control the hazard, instead hazardous areas are avoided. Passive mitigation can be permanent or temporary.
Pedestrian Waste Container	A receptacle for the disposal of pedestrian waste that is animal proof, constructed of metal and designed to be serviced by manual means.

Term	Definition
Pedestrian Waste/Returnable Container	A receptacle with a partition separating sections for pedestrian waste and refundable containers as defined by the Alberta Bottle Depot Association. The container shall be animal proof, constructed of metal and designed to be serviced by manual means. The container shall be painted two colours: Neufeld Green (or equivalent) on the waste half and Town of Canmore Blue on the refundable half.
Playground	An outdoor area containing a physical structure in a retained protective surfacing area of washed pea gravel (7 mm, free of sharp edges, also known as gyra rock), or various types of recycled tire rubberized surface material for the purpose of unstructured play.
Play Space	An area containing play equipment, a play structure or play structures, protective surfacing etc., that is intended for use by children 18 months to 5 years old, and/or 5 years to 12 years old.
Playground Apparatus - Traditional	Individual units designed for a specific activity and constructed predominantly of steel. Single purpose structures of a simple design such as swings, slides, climbers, teeter-totters, etc. generally made from metals.
Playground Apparatus - Creative	An individual unit designed for a variety of activities and constructed of steel. Multi-purpose structures consisting of a series of interconnected components and decks, made from a variety of materials including metal and plastic
Q	
Qualified Registered Professional (QRP) (Steep Creeks)	A qualified registered professional for steep creek mitigation work is an engineer (geotechnical, structural, civil), or licensee with appropriate education, training and experience in steep creek mitigation, and design of retaining walls, foundations and berms as described in this document. They may be responsible for signing off on documents and/or drawings prepared for an assessment.
R	
Recycling Container	A container for the exclusive use and collection of recyclable material.
Regional Park	A municipal reserve parcel that provides recreational opportunities for multiple neighbourhoods and accommodates a variety of different activities in one location, including structured sport activities, community events, unstructured play, relaxing, and socializing.
Residential Dwelling Unit	A single detached dwelling unit and a self-contained dwelling unit in a duplex, triplex, or four-plex.
Risk	The likelihood of (a) hazard scenario(s) occurring and resulting in some severity of consequences. In the EDCG, risk is defined in terms of safety or damage level. For example, this could include the likelihood of debris-flood impact to a building resulting in destruction of the building.
Risk Tolerance	Risk tolerance defines a specific level of risk (e.g., loss of life, economic or environmental losses, losses to intangible values) that is considered tolerable by the decision-making jurisdiction and its stakeholders. If a

Term	Definition
	specific level of risk tolerance is met, further risk reduction may still be warranted.
S	
Steep Creek Hazard	A hydrogeomorphic process with the potential to result in some type of undesirable outcome. For example, a hazard could include a debris-flood or debris flow into a runout area intersecting the footprint of a developed area. The term hazard refers to the specific nature of the process (type, frequency, magnitude), but not the consequences. Hazards are described in terms of *scenarios*, which define events of a certain frequency and magnitude.
Steep Creek Hazard Area (Zone)	An area subject to steep creek hazards.
Street Block	A distance of 150 m.
T	
Town	The Municipal Corporation of the Town of Canmore and any employee who has been delegated the appropriate decision-making authority, or the area contained within the boundaries thereof, as the context requires.
Training Works	Any wall, dike or protective structure used to prevent a stream from leaving its channel at a given location. This includes any debris flow training structures including basins, trash racks or other works.
V	
Visitor Accommodations—Commercial	A hotel, motel or other accommodation with more than 40 self-contained units to be rented for a period not exceeding 28 days.
W	
Waste Control Bylaw	The Town of Canmore's Waste Control Bylaw as amended from time to time.
Watercourse	Any natural or man-made depression with well-defined banks and a bed 0.6 m or more below the surrounding land serving to give direction to a current of water at least six months of the year or having a drainage area of 2 km^2 or more upstream of the point of consideration.

B. APPENDIX B: SAMPLE LETTERS AND TEMPLATES

B1: Sample Notice of Engagement Letter

Sample "Notice of Engagement" letter

(*date*)

Town of Canmore

Engineering Department

902 – 7th Avenue

Canmore, AB T1W 3K1

Attention: Manager of Engineering

Re.: Notice of Engagement - Consulting Engineering Services

(*insert development name and stage*)

SAMPLE

Dear (*manager of engineering*),

Please be advised that (*insert developers corporate name*) of (*insert developer's complete mailing address*) has retained the services of (*Consulting Engineer's name*) of (*insert Consulting Engineer's complete mailing address*) for the purposes of providing Field Services as defined in the Town of Canmore document entitled "***Engineering Design and Construction Guidelines***".

Sincerely,

ABC Developments (*insert developer's corporate name*)

John Doe (*insert signing authority's name*)

Director (*insert signing authority's title*)

cc. Planning Department

SAMPLE

B2: Construction Completion Certificate Templates

Infrastructure:

Town of Canmore
CONSTRUCTION COMPLETION CERTIFICATE
-INFRASTRUCTURE-

Project:_____ **Submission Dated:**_____
Owner: Town of Canmore **SB or DP #:**_____
Contractor:_____ **Utility:**_____
Consulting Engineer:_____
Boundary of Area: *(see attached map)*

CONSULTING ENGINEER'S CERTIFICATE:

I, _____, Professional Engineer, of the firm of _____, Consulting Engineers, who are engaged by the Developer to design and inspect the construction and installation of Municipal Improvements, do hereby certify that the Municipal Improvements within the area shown on the attached plan have been constructed, installed and inspected, as far as can be practically ascertained, in conformance with the applicable Agreement, the Town of Canmore's Standards & Guidelines, accepted designs or as otherwise required by the Town of Canmore Engineer, and that all defects and deficiencies in work and materials have been reported to the Town of Canmore and have been remedied by the Developer.

I confirm that I have been empowered by the Developer to comply with and perform all of the Consulting Engineer's obligations and to provide all of the Field Services identified in the most recent edition of the Town of Canmore's "Consultant's Guidelines for Subdivisions and Developments".

Inspector: _____ _____
(Type name) *(Signature)*

Consulting Engineer: **Permit to Practice:**
(seal, signature and date)

REJECTION OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE (Manager of Engineering)

Reason:_____

ACCEPTANCE OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE (Manager of Engineering)

SAMPLE

Earliest Warranty Period Expiry Date:_____

Landscaping:

Town of Canmore
CONSTRUCTION COMPLETION CERTIFICATE
-LANDSCAPING-

Project:_____ Submission Dated:_____
Developer:_____ SB or DP#:_____
Contractor:_____ Landscape Development:_____
_____
Consulting Landscape Architect:_____

Boundary of Area: (see attached map)

(type each of the above)

LANDSCAPE ARCHITECT'S CERTIFICATE:

I, _____, Professional Landscape Architect, of the firm of _____, who are engaged by the Developer to design and inspect the construction and installation of the Municipal Improvements within the area shown on the attached plan, certify that the Municipal Improvements have been constructed, installed and inspected, as far as can be practically ascertained, in conformance with the Town of Canmore's Standards & Guidelines, accepted designs, or as otherwise required by the Town of Canmore Representative, and that all defects and deficiencies in work and materials have been reported to the Developer and the Town of Canmore and have been remedied by the Developer.

I confirm that I have been empowered by the Developer to comply with and perform all of the Landscape Architect's obligations and to provide all of the Field Services as identified in the most recent edition of the Town of Canmore's *"Consultant's Guidelines to Subdivisions and Developments"*.

Inspector:_____ **Landscape Architect:**
(signature) (sign, seal and date)

_____
(type name)

REJECTION OF LANDSCAPE ARCHITECT'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Parks

Reason:_____

ACCEPTANCE OF LANDSCAPE ARCHITECT'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Parks

SAMPLE

Earliest Warranty Period Expiry Date:_____

SAMPLE

B3: Final Acceptance Certificate Template

Infrastructure:

Town of Canmore
FINAL ACCEPTANCE CERTIFICATE
-INFRASTRUCTURE-

Subdivision:_____ **Submission Dated:**_____
Owner: Town of Canmore **SB or DP#:**_____
Contractor:_____ **Utility:**_____
Consulting Engineer:_____
Boundary of Area: *(see attached map)*

CONSULTING ENGINEER'S CERTIFICATE:

I, _____, Professional Engineer, of the firm of_____, Consulting Engineers, who are engaged by the Developer to design and inspect the construction and installation of Municipal Improvements do hereby certify that the Municipal Improvements within the area shown on the attached plan, have been constructed, installed and inspected, as far as can be practically ascertained, in conformance with the applicable Agreement, the Town of Canmore's Standards & Guidelines, accepted designs or as otherwise required by the Town of Canmore Engineer, and that all defects and deficiencies in work and materials have been reported to the Town of Canmore and have been remedied by the Developer.

I confirm that I have been empowered by the Developer to comply with and perform all of the Consulting Engineer's obligations and to provide all of the Field Services identified in the most recent edition of the Town of Canmore's "Consultant's Guidelines for Subdivisions and Developments".

Inspector: _____ _____
(Type name) *(Signature)*

Consulting Engineer: **Permit to Practice:**
(seal, signature and date)

SAMPLE

REJECTION OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Engineering

Reason:_____

FINAL ACCEPTANCE OF CONSULTING ENGINEER'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Engineering

Landscaping:

Town of Canmore
FINAL ACCEPTANCE CERTIFICATE
-LANDSCAPING-

Subdivision:_____ **Submission Dated:**_____
Developer:_____ **SB or DP#:**_____
Contractor:_____ **Landscape Development:**_____

_____

Consulting Landscape Architect:_____

Boundary of Area: (see attached map)

(type each of the above)

LANDSCAPE ARCHITECT'S CERTIFICATE:

I, _____, Professional Landscape Architect, of the firm of _____, who are engaged by the Developer to design and inspect the construction and installation of the Municipal Improvements within the area shown on the attached plan, certify that the Municipal Improvements have been constructed, installed and inspected, as far as can be practically ascertained, in conformance with the Town of Canmore's Standards & Guidelines, accepted designs, or as otherwise required by the Town of Canmore Representative, and that all defects and deficiencies in work and materials have been reported to the Developer and the Town of Canmore and have been remedied by the Developer.

I confirm that I have been empowered by the Developer to comply with and perform all of the Landscape Architect's obligations and to provide all of the Field Services identified in the most recent edition of the Town of Canmore's "Consultant's Guidelines for Subdivisions and Developments".

Inspector:_____ **Landscape Architect:**
(signature) (sign, seal and date)

_____
(type name)

REJECTION OF LANDSCAPE ARCHITECT'S CERTIFICATE:

Date:_____ _____
TOWN OF CANMORE
Manager of Parks

Reason:_____

ACCEPTANCE OF LANDSCAPE ARCHITECT'S CERTIFICATE:

SAMPLE

Date:_____ _____

TOWN OF CANMORE
Manager of Parks

SAMPLE

C. APPENDIX C: STEEP CREEK RISK ASSESSMENT

Basin-scale steep creek risk assessments have been completed for all existing development on an alluvial fan within the Town of Canmore municipal boundary. Table C2 below lists all existing assessment reports completed to date.

The site-specific risk assessment process is very similar to basin-scale risk assessment; however, the scope of work is greatly reduced and not all elements of previous basin-scale assessments may apply to site-specific assessments. Therefore, these guidelines provide guidance for site-specific steep creek risk assessment, only to be utilized for proposed development in an existing steep creek hazard zone

C-1 Site-Specific Steep Creek Risk Assessments

At the onset of a steep creek risk assessment (SCRA) related to development permitting, all parties shall be informed about these guidelines and how they apply to the proposed development project. The qualified registered professional (QRP) undertaking the SCRA shall consult with the Engineering Department to:

- clarify the roles and responsibilities of parties involved in the SCRA
- obtain relevant background information
- clarify the application of these guidelines
- clarify the role of standard and non-standard mitigation works
- clarify the role and applicability of a risk assessment
- clarify the requirements for a development approval
- define the level of effort required for assessment.

Risk assessments should also be undertaken in accordance with any provincial guidelines that may apply.

The following section describes project elements that shall be defined during the beginning stages of the study, including project organization, scope of work and anticipated level of effort.

See the Steep Creek Development Flow Chart in the Municipal Development Plan for a flow chart showing the basic decision-making process when development is proposed in a steep creek hazard zone.

C-1.1 Terminology

The appropriate application of these guidelines requires some understanding of hazard and risk terminology as well as the hazard processes that are the focus of these guidelines. Select terms are defined in the Glossary of Terms found in Appendix A, Table 2. Additional terms are defined as they appear in the text.

For the purposes of this document, a qualified registered professional (QRP) is an engineer (geotechnical, geological) or geoscientist (geologist, geomorphologist or hydrologist), or licensee with appropriate education, training and experience to conduct SCRAs as described in this document. The QRP is responsible for signing-off on documents and/or drawings prepared for the assessment.

C-1.2 Risk Management Framework

The basin-scale SCRAs previously completed follow the risk management framework shown Table D1. It encompasses initial hazard identification through to risk analysis and optimization of risk reduction and monitoring measures. Site-specific SCRAs do not encompass all parts of this framework.

Table C1: Risk Management Framework

Risk Communication and Consultation On an ongoing basis the governing body should keep stakeholders informed about the risk management process.	1. Project Initiation a. Recognize the potential hazard. b. Define the study area/boundary and level of effort. c. Define the roles of the parties involved in the project. d. Identify 'key' risks to be considered in the assessment. e. Identify preliminary geohazard risk scenarios.	Monitoring and Review There should be ongoing review of risk scenarios and risk management process.
	2. Risk Identification a. Collect and review background information. b. Hazard assessment: identify and characterize hazards, develop frequency- magnitude relationship, estimate likelihood, extent and intensity parameters for risk analysis, develop hazard maps. c. Exposure assessment: identify and characterize elements at risk with parameters that can be used to estimate vulnerability to geohazard impact. d. Develop geohazard risk scenarios to be considered in risk analysis.	
	3. Risk Analysis a. Develop risk analysis methodology (quantitative or qualitative). b. Estimate risk for geohazard risk scenarios. c. Communicate the results in an appropriate format (e.g., numerical or qualitative estimates, matrices, graphs, maps).	
	4. Risk Evaluation a. Compare the estimated risk against local or other tolerance criteria. b. Prioritize risks for risk control and monitoring.	
	5. Risk Control a. Identify options to reduce risks to levels considered tolerable by the client or governing jurisdiction. b. Select option(s) providing the greatest risk reduction at least cost. c. Estimate residual risk for preferred option(s).	
	6. Action a. Implement chosen risk control options. b. Define and document ongoing monitoring and maintenance requirements.	

C-1.3 Roles

This section describes typical responsibilities of the parties involved in development approval applications. A QRP shall enter into a professional services agreement with their client prior to undertaking work on a project. The following points shall be considered when developing a professional services agreement:

- Geohazards projects inherently have high potential liability. The agreement shall establish appropriate limitation of liability.
- The agreement shall confirm the scope and deliverables of the project.

- The agreement shall establish a budget estimate, either for hourly services, lump sum or otherwise.

The agreement shall also include a clause that deals with potential disclosure issues. In certain circumstances the professional may have to convey adverse assessment findings to parties who may not be directly involved, but who have a compelling need to know.

C-1.3.1 The Town of Canmore as the Approving Authority

The Town of Canmore's Planning or Engineering Department is the approving authority for SCRAs.

As a prerequisite for development in a steep creek hazard area, the Town may require the proponent to obtain a site-specific SCRA report by a QRP. The report may be required for the following reasons:

- to meet the requirements of the Town of Canmore *Municipal Development Plan* (MDP) and *Land Use Bylaw* (LUB) for a complete application for a development permit and to confirm appropriate conditions for any approvals;
- to ensure that the risk is acceptable for the proposed development.

The responsibilities of the Town are defined for each of the five steps of the risk management framework outlined below.

Step 1: Project Initiation

The Town has significant understanding of steep creek geohazards within the municipality. The MDP and LUB define when SCRAs are required. The Town has completed a baseline risk identification study, including steep creek hazard inventory mapping (hazard and study areas as defined in the LUB for areas of existing and potential development), and an inventory and characterization of existing development within these areas. Expectations regarding consideration of climate change in the SCRA are not yet defined and should be discussed.

Steps 2 and 3: Risk Identification and Analysis

The Town has already undertaken basin-scale SCRAs for existing development. These assessments will inform the scope of work and likely reduce the cost of site-specific SCRAs within these areas. The LUB defines steep creek hazard zones with SCRA requirements depending on where the proposed development is located within these areas.

Step 4: Risk Evaluation

The MDP establish risk-tolerance criteria against which the SCRA results can be compared. These policies consider risk-tolerance criteria for existing and proposed development, and how to manage societal risk where existing and proposed development overlap (e.g., densification).

The criteria used to measure risk are related to safety and economic cost.

1) Safety

Two metrics are used to measure safety risk:

a. Individual Risk

Individual Risk is the risk of an individual being killed in an event. Individual Risk can be assessed for persons in any given year. Individual risk takes into account the magnitude and frequency of the hazard, the location of the person exposed to the risk and the structure type for persons within buildings, and the probability of a person being present during an event. The resultant measure is referred to as the annual probability of death of an individual (PDI).

b. Group Risk

Group risk is the potential for multiple deaths in a single event. A greater number of persons exposed to the same hazard results in increased risk. As society has a very low tolerance for group risk, new development needs to be maintained within acceptable thresholds. Group risk has already been determined through the basin-scale studies completed and, therefore, does not need to be re-evaluated.

2) Economic Risk

Economic risk includes damage to building structures and damage to municipal infrastructure including roads and utilities. Other areas of economic risk that may be required to be considered include:

- cost of constructing and maintaining mitigation
- business losses
- franchise utilities
- transportation impacts
- property loss beyond damage to building structures, for example building contents and land improvements.

The Town has not established economic risk tolerance criteria. However, the annualized economic damages to building shall be minimized. Maximum annualized costs of $500/year/dwelling unit are attainable and should be targeted.

Risk analysis, vulnerability and loss estimation are described in Appendix D

Step 5: Risk Control

The Town will help define how responsibilities may be shared between the Town and the proponent in terms of individual and societal risk management. Both the steep creek hazard source and preferred risk control measures may be located upstream and outside the development area, and the risk control measures may reduce risk to a wider area than the proposed development.

Before an SCRA is initiated, the Town of Canmore shall complete the following tasks:

- Inform the proponent why a SCRA is required.
- Inform the proponent of risk-tolerance criteria, as defined in the MDP and these guidelines, that will be used to evaluate the results of the assessment.
- Identify known flood hazard information and reports relevant to the project (such as flood reports and maps) and describe how to access the documents. Provide the proponent the relevant flow data from the basin-scale hazard assessment.
- Provide the proponent with information regarding existing structural mitigation works and input on the need for additional works.

- Advise the proponent of any key policies or procedures that have the potential to affect the outcome of the assessment.
- Provide an indication of any desired interaction with the professional during preparation of the report.

After the assessment is submitted the Town will:

- Review the assessment report.
- If necessary, discuss the report with the proponent and/or professional.
- Outline any applicable next steps in the land development process.

C-1-3.2 The Proponent/Client

The proponent is the applicant for the development permit application (which from a QRP's perspective is typically also the client). The proponent shall provide the QRP with the following information for assessments carried out for development approval applications:

- process, procedures and requirements for the applicable land development application within the area of jurisdiction.
- legal description of the land parcel(s) as registered with the Land Title Office and Survey Authority, and a copy of the current land registration including any relevant restrictive covenants.
- a survey plan of the land parcel(s) and the location of the legal parcel boundary markers on the ground in digital (CAD or GIS) format.
- plans of existing buildings or structures, location of the proposed development and drawings of the proposed development in digital (CAD or GIS) format.
- assessment data about the property as typically collected for appraisal and tax purposes.
- relevant background information (written or otherwise) related to the property and the existing and proposed development, including previous assessment reports conducted for the proponent.
- unrestricted access to the property.

After a SCRA has been completed, the proponent shall complete the following tasks:

- Review the assessment report and understand the limitations and qualifications that apply.
- If necessary, discuss the report with the QRP who prepared the report and seek clarification where needed.
- Direct the QRP to complete an assessment assurance statement and provide the statement and the assessment report to the Town.
- Allow the QRP to confirm that his/her recommendations have been followed.
- Notify the QRP if land use, site development or other conditions change or vary from those described in the report.

C-1.3.3 The Qualified Registered Professional

Prior to carrying out a SCRA, a QRP shall meet the following professional responsibilities:

- Be knowledgeable about any of the applicable approval processes for the proposed land development project.
- Confirm that he/she has appropriate training and experience to carry out the assessment in view of the terrain characteristics, the type of potential flood hazard, and the type of mitigation works potentially needed.
- Understand the roles and limitations of a professional engineer vs. professional geoscientist and understand those tasks that are necessarily overlapping.
- Appropriately educate the client regarding pertinent aspects of SCRAs as clients may not be familiar with such studies.
- Consult with the Town regarding applicable regulations, available information, application of the Guidelines, role of structural mitigation works, applicability of risk assessment and requirements for development approval.
- Consider the need for the involvement of other specialists.
- Establish an appropriate mechanism for internal checking and review.
- Consider the need for independent peer review.
- Obtain a copy of any guidelines or regulations that are pertinent to carrying out an assessment and/or preparing an assessment report.

A QRP shall adhere to the following additional general professional responsibilities when conducting a SCRA:

- If necessary, assist the client in obtaining relevant information.
- Make reasonable attempts to obtain from the client and others all relevant information related to flood hazards on and beyond the property.
- Notify the client as soon as reasonably possible if the project scope and/or budget estimate requires modification.
- Write the report clearly, concisely and completely to conform to applicable guidelines and regulations.
- Ensure that the project work is subject to an appropriate checking and review by qualified personnel.
- Where appropriate, obtain an independent peer review.
- Address any significant comments arising from the reviews.
- Where appropriate, submit a draft report for client review and review by other parties.
- Review the draft report with the Town and the technical advisory staff.
- When a report recommends a significant variance from a guideline (e.g., variance of a bylaw minimum floor elevation that covers a wide area), it is strongly recommended that variance be discussed with the Town prior to final submission.
- When the project work is complete, the QRP must submit a signed, sealed and dated copy of the final report and assurance statement (Appendix D). The final report shall explicitly indicate reviews that were performed.
- Where deliverables include interactive web maps and tools, responsibilities for the format, content, and maintenance of such products will need to be negotiated with the client.

After completing a SCRA, the QRP shall carry out the following steps:

- Clarify questions the client and/or the Town may have with regards to the assessment, report, and/or assessment assurance statement.

- Carry out follow-up work if agreed with the client.

If aspects of a SCRA are delegated, they shall only be carried out under direct supervision of the QRP, who assumes responsibility for all work delegated.

The QRP shall advise the client of the potential implications if recommendations are disregarded. This is especially relevant where the QRP identifies a steep creek hazard that was previously unknown to the Town or provides the first detailed study of a known hazard.

Reviewers

The Town may use in-house experts or retain an independent QRP to provide advisory services during a SCRA, or to review a SCRA report. Such a QRP may provide advice regarding the type of SCRA that is appropriate, may informally review documents submitted by a QRP retained by a project proponent, and may provide advice on improving the local flood management approach and developing new local guidelines and regulations.

The Town or the client may also initiate an independent peer review of a report submitted by a QRP. The need for an independent peer review on behalf of the Town is determined on a case-by-case basis. If an independent peer review is being conducted, the proponent and the QRP responsible for the initial report of the review will be informed of such review. The reasons for the review will be provided and documented.

C-1.4 Common Forms of Project Organization

SCRAs for development permits are, in most cases, initiated by the Proponent. The project proponent typically retains a QRP to carry out a SCRA and prepare a report. The proponent then forwards that report in support of a development application. The SCRA report may be subject to review by the Town, occasionally with assistance by an independent professional.

In most cases the landowner or development consultant is the client, with whom the QRP establishes an agreement for professional services. The QRP should be aware reports will be reviewed by the Town, and possibly other professionals.

The client should be aware that the findings and recommendations of the QRP could result in the refusal of a development permit application by the Town, or a development proposal requiring modification. Therefore, it is more efficient if the SCRA is commenced early in the development planning process.

The role of the QRP in relation to the client and the Town shall be clearly defined. The QRP shall inform the client about land development approval processes and these guidelines, especially if the client has not previously been involved in land development or SCRAs, nor engaged a professional. In such situations, the QRP should consider reviewing with the client the typical responsibilities listed in this document. This will help to establish an appropriate agreement for professional services and to inform the client of the expectation of appropriate and adequate compensation.

C-1.5 Study Boundary

A site-specific SCRA study boundary shall be defined at the onset of a study. It may be further refined (enlarged or contracted) during the study. The initial boundary shall be delineated by a QRP by reviewing existing basin-scale hazard and risk assessment and a field visit. The boundary may need to be expanded to assess the potential for risk transfer associated with any proposed risk control measures.

C-1.6 Scope and Effort

Site-specific SCRAs are required for proposed development in hazard zones that were previously assessed at a basin-scale level of detail. Development proposals within these lands are regulated in accordance with the *Municipal Development Plan* and the *Land Use Bylaw*. These regulations require completion of a SCRA at a level of effort to be determined by a QRP in consultation with the Town and with reference to these guidelines.

Where a steep creek assessment has been prepared for a specific development, it may not be applicable to other development proposals and a higher level of assessment may be required. The assessment is specific to the type of hazard, the proposed development and local site conditions.

Site-specific SCRAs shall follow the risk assessment framework described in these guidelines and shall generally require some of the elements of previous basin-scale assessments. However, as deemed appropriate by the QRP, not all elements of previous basin-scale assessments typically apply to the site-specific assessment. As such, the perspective of the site-specific assessment is different, and the level of effort is usually substantially less than was required for baseline assessment.

When completing site-specific SCRAs, the QRP is reliant upon previous work. The QRP, client and the Town should be aware of the limitations of previous work and this should be taken into consideration when establishing the professional services agreement.

When completing a site-specific SCRA, the QRP shall identify factors that may change the level of hazard and risk compared to previous assessments, or evidence that previous assessment data and results should be updated. The following questions provide examples of factors that should be checked, but is not intended to be an exhaustive list:

- Was/were the previous basin scale SCRA(s) undertaken in accordance with these guidelines? A list of existing steep creek hazard and risk assessment reports is found in Table D2, below.
- Do conditions exist that post-date previous assessments and that necessitate updates to the baseline SCRA (e.g., new geohazard events, geomorphic changes in the upper basin such as landslides, forest fires, beetle infestations, mining activities, new development, construction of risk control measures, etc.)?
- Do site-specific hazard mechanisms exist above, at, or below the proposed development site that were not identified at the scale of previous studies? If so, should such hazard mechanisms be assessed in more detail (e.g., avulsion points or localized bank erosion and instability, encroachment of the receiving creek, or site alterations caused by the proposed development)?
- Do site-specific conditions affect hazard intensity (destructive potential) that were not identified at the scale of previous studies and should be assessed in more detail (e.g., local terrain factors or site-specific alterations that change the path, velocity or depth of flows)?
- For redevelopment of existing buildings, do the renovations change the temporal probability of building occupancy compared to what was assumed in previous studies and used as the basis for risk estimates (e.g., a change from full-time to seasonal occupancy)?
- For redevelopment of existing buildings, do the renovations change the estimated level of building vulnerability to geohazard impact compared to what was assumed in previous studies and used as the basis for risk estimates (e.g., by adding a habitable basement with windows or doors at ground level)?
- Does proposed development densification change the number of people exposed to hazard, with a commensurate increase in group safety risk?

Table C2: Available Hazard and Risk Assessment Reports

Cougar Creek reports	*Cougar Creek Debris Flood Hazard Assessment*. Final report prepared for the Town of Canmore, March 2014. BGC Engineering Inc.
	Cougar Creek Debris Flood Risk Assessment. Final (Revised) report prepared for the Town of Canmore, June 2014. BGC Engineering Inc.
Three Sisters Creek reports	*Three Sisters Creek Debris-Flood Hazard Assessment*. Final report prepared for the Town of Canmore. October 2014. BGC Engineering Inc.
	Three Sisters Creek Debris-Flood Risk Assessment. Final report prepared for the Town of Canmore. January 2015. BGC Engineering Inc.
Stone Creek reports	*Stone Creek Debris-Flow Hazard Assessment*. Final report prepared for the Town of Canmore. January 2015. BGC Engineering Inc.
	Stone Creek Debris-Flow Risk Assessment. Final report prepared for the Town of Canmore. October 2015. BGC Engineering Inc.
Stoneworks Creek reports	*Stoneworks Creek Debris-Flood Hazard Assessment*. Final (Rev A) report prepared for the Town of Canmore. November 2015. BGC Engineering Inc.
	Stoneworks Creek Debris-Flood Risk Assessment. Final report prepared for the Town of Canmore. September 2016. BGC Engineering Inc.
Pigeon Creek reports	*Pigeon Creek Hazard Assessment*. Final report prepared for the Town of Canmore. November 2016. TetraTech EBA Inc.
	Pigeon Creek Debris-Flood Risk Assessment. Final report prepared for the Town of Canmore. September 2017. BGC Engineering Inc.
Stones Canyon report	*Stones Canyon Creek Development*. Level 2 Debris-Flow Risk Assessment. Final report prepared for Hillcroft Developments Ltd. October 2015. BGC Engineering Inc.
Stewart Creek report	*Stewart Creek Hazard and Risk Assessment*. Final report prepared for Three-Sisters Mountain Village Properties Ltd. July 2017. BGC Engineering Inc.

Echo Canyon Creek report	*Steep Creek Hazard and Risk Assessment: Echo Canyon Creek*. Final Report prepared for the Town of Canmore. December 2018. BGC Engineering Inc.
X, Y, Z Creeks (above Peaks of Grassi) report	*Steep Creek Hazard and Risk Assessment: X, Y, and Z Creeks*. Final Report prepared for the Town of Canmore. December 2018. BGC Engineering Inc.

C-1.7 Suggested SCRA Table of Contents

Table C3, below, provides a suggested table of contents for site-specific SCRAs required for development permit applications in hazard zones defined by the Town, based on previous basin-scale SCRAs.

This information is provided to assist a QRP in completing steps of the SCRA but should not preclude the QRP from selecting a different report structure or contents as deemed to be appropriate and acceptable to the Town. Not all items listed in the table may be relevant to all studies.

Table C3: Suggested Table of Contents for Site-Specific SCRAs

Section	Subsection	Key Items to Include
1. Introduction	1.1 Terms of Reference	• client • consultant • current property owner
	1.2 Location	• fan and creek name(s) • street address • legal address, parcel and building ID • map/figure
	1.3. Proposed Development	• Describe the proposed development (i.e., the element at risk and the vulnerability). • Describe site-specific features relevant to the risk assessment (list). • Describe proposed landscape alterations if any
2. Baseline Hazard Assessment	2.1 General	• Describe the hazard related to the site as determined in previous studies. • Assess whether additional baseline hazard assessment is required for the specific development proposal.
	2.2 Methodology	• If additional assessment required, provide hazard scenario descriptions, justification and parameters (probability, mechanisms, destructive potential or intensity). • Describe and assess any additional site-specific factors not captured by previous assessments that have implications for hazard levels and associated risk.

Section	Subsection	Key Items to Include
	2.3 Results	• hazard probability and justification • hazard intensity (destructive potential) • describe limitations and uncertainties.
3. Baseline Risk Assessment	3.1 Methodology	If additional assessment required, provide risk analysis methodology and definition of risk parameters.
	3.2 Risk Parameters	If additional assessment required, provide justifications for values assigned to risk parameters.
	3.3 Results	• individual risk estimate (PDI) • economic risk estimate • comparison to risk tolerance criteria • describe limitations and uncertainties
4. Risk Control	4.1 Proposed Risk Control Measures	If risk control measures are required, provide: • description of proposed mitigation measures; reference EDCG • description of design basis including how the design will achieve the target level of risk reduction and avoid risk transfer • drawings showing details of proposed measures.
5. Residual Risk Assessment for Proposed Development	5.1 Revised Risk Parameters	If required, provide: • hazard probability value and justification • spatial probability value and justification • temporal probability value and justification • vulnerability value and justification • elements at risk value.
	5.2 Risk Evaluation	If required, provide: • individual residual risk estimate (PDI) • economic residual risk estimate • comparison to risk tolerance criteria • describe limitations and uncertainties.
6. Conclusions		• limitations • quality assurance statement • seal and signature
7. References		• as appropriate

D. APPENDIX D: RISK ANALYSIS, VULNERABILITY AND LOSS ESTIMATION FOR SITE SPECIFIC STEEP CREEK RISK ASSESSMENTS

D-1 Introduction

Risk analysis involves estimating the likelihood that potentially damaging events will occur, impact elements at risk, and cause certain types and severities of consequences (such as loss of life or economic losses). Each of these components (event likelihood, elements at risk, consequences) is estimated separately and then combined. Although every assignment requires professional judgement, the objective is to provide a systematic, repeatable assessment with an appropriate level of detail for the information available and decisions required.

For safety risk (risk of loss of life), risk to life may be estimated for individuals and groups (societal risk). Individual risk considers the probability that a hazard scenario results in loss of life for a single individual, referred to as probability of death of an individual (PDI). Individual risk levels are independent of the number of persons exposed to risk. In contrast, group (societal) risk considers the probability of a certain number of fatalities within the hazard zone. Unlike individual risk, exposing a greater number of people to the same hazard will increase the risk.

This section defines the quantitative approach to risk analysis that has been used in previous basin-scale steep creek risk assessments (SCRAs). This approach should be used for site-specific SCRAs.

D-2 Quantitative Risk Analysis

Quantitative risk analysis (QRA) uses numerical estimates of risk parameters to calculate a probability of some level of damage or loss. Results of a QRA can be presented as a numerical estimate, in a matrix, or graphically as the cumulative probability of consequences.

Quantitative risk analysis is not inherently more accurate than more qualitative methods, and the science underpinning numerical risk estimates requires as much judgement as qualitative estimates. Numerical approaches are also not practical or appropriate in all cases. Quantitative risk analysis is best suited to situations where it is possible to define a logical event chain leading from a hazard occurrence to direct consequences. Moreover, QRA represents a powerful way to consider multiple risk scenarios, evaluate results against adopted risk tolerance thresholds or other types of risks, and measure the effectiveness of measures to reduce risk. It can also allow more transparent communication of uncertainties for each risk parameter (e.g., by the use of uncertainty bounds or ranges). Quantitative risk analysis may also be the most appropriate risk *analysis* tool even when the most appropriate way to *communicate* results is in qualitative terms. It is the preferred risk analysis method for estimating risk to life because the results can be evaluated against quantitative risk tolerance thresholds.

D-3 Geohazard Risk Scenarios

A geohazard is a geological hazard that may lead to widespread damage or risk. For the purposes of the EDCG, geohazards include flood, debris flood and debris flow. Geohazard risk scenarios previously developed during the basin-scale assessment will become the basis for risk analysis. The starting point for QRA scenario development is to divide the geohazard frequency-magnitude relationship into one or more intervals that will represent the range of event magnitudes to be assessed.

Table E1, below, lists typical geohazard scenario return period intervals used in basin-scale assessments. Together, these intervals extend across a frequency-magnitude relationship ranging from <10 to >1,000 years. The justification to assess a higher spectrum of return periods than might be typical for clear-water floods is that their typically high intensity, combined with little warning, has the potential to result in greater risk to life.

For example, the 1:30 – 1:100-year range is the incremental probability of events at least as large as a 1:30 year event, but not as large as a 1:100 year event. The bounds of the range are exceedance probabilities. For a scenario with the annual probability range P_{min} to P_{max}, the probability of events within this range would correspond to Equation D-1, below.

$$P(H)_i = P_{min} - P_{max} \qquad [D\text{-}1]$$

For example, for a 1:30 – 1:100-year hazard scenario range, this would correspond to:

$$P(H)_i = \frac{1}{30} - \frac{1}{100} = \frac{1}{43}$$

When summed, the total probability of all scenarios, including no geohazard event, should equal 1 (certainty).

For the largest event considered, the scenario probability is the probability the event is at least as large as the largest event considered in the hazard analysis. However, to select an event representing the scenario, it is necessary to define an upper magnitude bound

Table D1: Geohazard Scenario Return Periods

Geohazard Scenario (Annual Return Period Interval)[1]	Probability of Scenario	Typical Representative Return Period (Years)[2]
<10	1/1-1/10 = 0.9	5([3])
10-30	1/1 – 1/30 = 0.07	15
30-100	1/30-1/100 = 0.02	65
100-300	1/100 – 1/300 = 0.007	200
300-1000	1/300 – 1/1000 = 0.002	650
1000-3000 (>1000)	1/1000 = 0.001	2000

Notes:

1. These return period intervals are not intended to preclude a Qualified Registered Professional (QRP) or an approving authority from selecting other intervals deemed to be appropriate when their use and application can be supported by a suitable level of analysis and relevant documentation.
2. e.g., return period to be modelled and used to prepare hazard intensity maps.
3. A 5-year event is shown as representative here, but for many debris flow or debris flood SCRAs, no events might be assumed to occur beyond some lower cutoff.

The scenario intervals shown in Table D1 are typical for site specific SCRAs.

Geohazard scenarios and the risk equation can also be shown on an event tree, as shown in Figure D1, below . The partial risk that a geohazard occurs, reaches the element(s) at risk when they are present in the hazard zone, and

results in consequences, can be calculated from each branch of a tree. Summing the partial risk for each branch (p_E) yields the total risk (P_E) expressed as a probability.

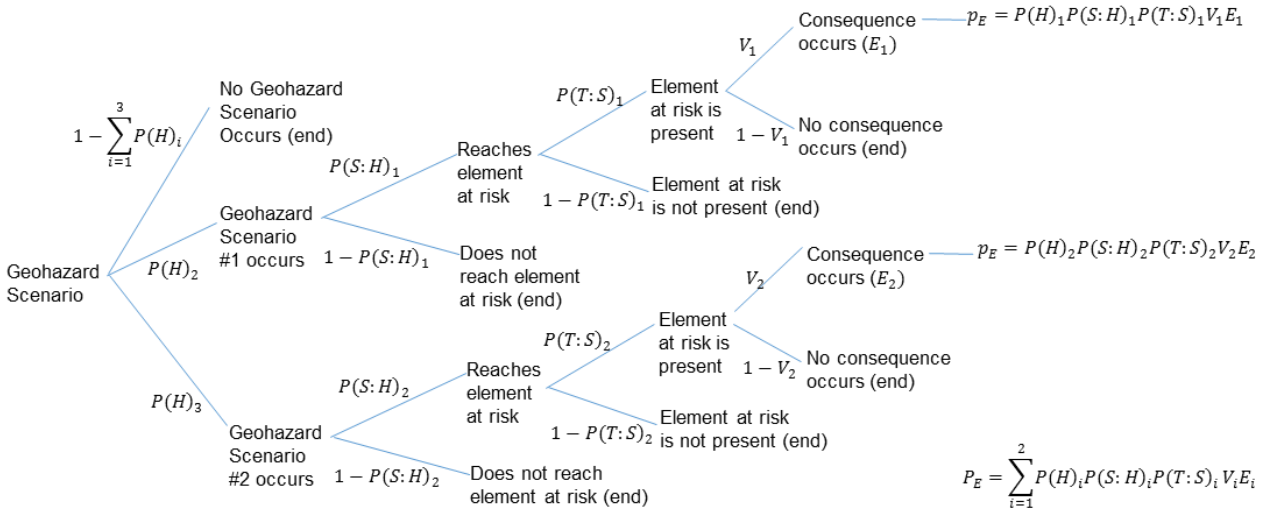


Figure D1: Generic Event Tree Showing Probability of Consequences for Two Geohazard Scenarios

D-4 Risk Equation

Risk can be quantified in terms of the following equation [D-2]:

$$P_E = \sum_{i=1}^{n} P(H)_i P(S:H)_i P(T:S)_i \, V_i E_i \qquad \text{[D-2]}$$

The product of the first three parameters define the encounter probability with elements at risk, where:

$P(H)_i$ is the incremental hazard probability of geohazard scenario i of n, where n is the total number of scenarios. It addresses the question, "how likely is the event"? Geohazard scenarios are commonly defined as annual frequency ranges where the bounds of a given range are exceedance probabilities (Table E1). When summed, the total probability of all scenarios, including no geohazard event, should equal 1 (certainty).

$P(S:H)_i$ is the spatial probability that, given occurrence, the geohazard would reach the element at risk. Spatial probability may need to be considered in up to 3 dimensions depending on the assessment. In the horizontal plane, it could consider the exceedance probability the hazard reaches at least as far as the element at risk (longitudinal axis) and conditional probability that, given it reaches this far, it impacts the element or passes to either side (lateral axis). In the vertical plane, it could consider the exceedance probability the process reaches at least down to a buried element such as a utility (e.g., by channel scour).

SCRAs that require analysis of spatial probability along more than one dimension can be tricky to set up, particularly for group safety risk estimation and moving elements (e.g., vehicles). Even one dimension can be challenging (e.g., when plotting debris flow runout exceedance probability contours with spatially distributed elements at risk). In relative risk analyses considering only one geohazard risk scenario, spatial probability may also be implicitly assumed in the choice of hazard probability, such as by choosing the most frequent event assumed to result in impact. The use of event trees can help identify and avoid logical errors. This component of risk analysis requires careful review.

$P(T:S)_i$ is the temporal probability that the element at risk would be in the impact zone at the time of impact. Note that this variable considers temporal components of the element at risk, not the hazard. It answers the question, "what is the chance of someone or something being in the area affected by the hazard when it occurs"? For example, it could quantify the proportion of time a person occupies a building, the probability that oil will be present within a pipeline, or the probability that moving vehicle(s) will be present in the hazard zone.

For assessment of permanent structures that are certain to be present, this variable equal 1 and may be omitted from the calculation. For non-permanent elements at risk, temporal probability may be considered from two different perspectives: the chance that a *particular* element at risk is present, or the average chance that element(s) (E_i) are present. This has bearing on analysis of individual or societal (group) safety risk, which consider risk for a particular individual or groups of (e.g., 1 or more) individuals, respectively. For example, analysis of individual safety risk for persons within buildings might assign a higher value of $P(T:S)_i$ to an individual most-at-risk (e.g., elderly or very young) who occupies the building most of the time. For analysis of group risk, an average value for building occupants could be used.

The last two parameters describe the consequences (N), where:

V_i is the vulnerability, which is the probability elements at risk will suffer consequences given hazard impact with a certain severity. For example, vulnerability for persons is defined as the likelihood of fatality given geohazard impact. For buildings, it could be defined as the level of damage, measured as a proportion of the building replacement cost or as an absolute cost.

Vulnerability estimates are typically based on criteria relating hazard intensity to a certain severity of damage or loss. Damage may have spatial or temporal components, or both (e.g., destruction level or duration of loss of function). Vulnerability criteria may be related to direct impact, or indirect outcomes of event occurrence. For example, vulnerability of persons within buildings may be estimated as an indirect outcome of building damage or collapse, using criteria related to building damage level. Vulnerability and loss estimation is further described in a section below.

Estimation of vulnerability can be subject to high levels of uncertainty, and some types of vulnerability cannot be assessed quantitatively. Consequently, the QRP should calibrate vulnerability criteria based on historic events with known damage levels at the site of assessment, if possible, or on comparable sites elsewhere. In this process, the ideal comparison is to damage generated from the same hazard type, although where not possible, known damage from another hazard type may be used as a proxy. The QRP should also document limitations on the use of vulnerability estimates. For example, criteria used to estimate average damage levels for multiple buildings may not be appropriate for site-specific vulnerability assessment of a single building.

E_i is a measure of the elements at risk, quantifying the value of the elements that could potentially suffer damage or loss (e.g., number of persons, value of infrastructure, value of loss of function, or level of environmental loss).

Risk (P_E) is determined by calculating the partial risk for each individual geohazard scenario (i) and summing the results.

The results of Equation [E-2] may be also be presented graphically on an F-N curve. The Y-axis shows the annual cumulative frequency,f_i, of each hazard scenario, and the X-axis shows the estimated consequences, N_i, where:

$$f_i = \sum_{i=1}^{n} P(H)_i P(S:H)_i P(T:S)_i \quad \text{[D-3]}$$

where the value of $P(T:S)_i$ is estimated for group (not individual) risk

and N_i is the product of two factors as follows:

$$N_i = V_i E_i \quad \text{[D-4]}$$

F-N curves are developed by assembling $f_i - N_i$ pairs sorted in order of increasing N, and then calculating cumulative frequency (F) to arrive at F-N pairs to be plotted.

D-5 Encounter Probability

Encounter probability is the cumulative probability that geohazard(s) occur and reach elements at risk at the time they are present:

$$P_E = \sum_{i=1}^{n} P(H)_i P(S:H)_i P(T:S)_i \quad \text{[D-5]}$$

Note that temporal probability ($P(T:S)_i$) may not be included for assessment of permanent structures, where it is equal to 1.

Estimating encounter probability may be helpful where:

- It can be used to demonstrate that encounter probability (and therefore risk) is negligible. For example, elements at risk could be located outside the reach of the maximum credible hazard

($P(S:H)_i \approx 0$). Or, elements at risk could be extremely unlikely to be present at the time of an event ($P(T:S)_i \approx 0$), such as for a life safety risk assessment of a very rarely occupied building.

- For relative risk estimation where vulnerability and consequences are assumed to be similar between sites. For example, this could include risk-based prioritization of different steep creek hazard areas along the same road.
- Where event impact can be assumed to cause loss of facility function, and facility function is the over-riding consideration for risk reduction. For example, debris flood impact to a critical facility, such as a care facility, could be assumed to result in closure irrespective of the destructive potential of the geohazard.

If it is demonstrated that geohazards do pose a credible threat to elements at risk, or vulnerability and consequences cannot be assumed to be similar between sites, then formal estimation of risk is preferred over estimates of encounter probability.

D-6 Vulnerability and Loss Estimation

Vulnerability is defined in the EDCG as the degree of loss of a given element at risk that results from geohazards with a certain level of destructive power. For human life loss it addresses the question, "what is the chance of fatality for persons within buildings, should the building be impacted by a geohazard?" For development, it addresses the question, "what level of direct damage will occur if the development is impacted by a debris flood or debris flow?"

Developing vulnerability criteria is a challenging component of SCRA. This section describes vulnerability criteria for buildings and persons within buildings, based on estimated levels of destructive power and resistance to impact. Description of methods to assess the vulnerability of roads and utility systems (e.g., buried infrastructure) is outside the scope of this document. Methods to assess economic vulnerability for the local or regional economy, or for temporary closure of transportation corridors, are also outside the scope of this document.

Applying vulnerability criteria requires estimates of peak flow velocity and depth during a geohazard scenario. This section refers to debris flood "intensity", I_{DF} as a proxy for destructive power related to flow velocity and depth, calculated as follows:

$$I_{DF} = (d)(v^2) \qquad \text{[D-6]}$$

where:

I_{DF} is the intensity index.

d is the modelled flow depth.

v is the modelled flow velocity.

Values of I_{DF} are typically reported without units given that it represents a proxy for intensity. Note that the above approach represents the destructive potential for only direct flow impact. It does not include other possible mechanisms of damage such as bank erosion, which may also need to be considered when estimating vulnerability.

D-7 Buildings and Occupants

The following sections describe vulnerability criteria applicable for lower and higher intensity flows. Both approaches may be required to assess hazard areas subject to variable flow intensities (e.g., debris flows on the upper fan that transform to watery after-flow and backwater flooding on the distal fan).

Low Intensity Flows (IDF<1)

Lower intensity flows are defined in these guidelines as flows on steep creeks where the intensity index (IDF) is less than one. Damages associated with these low intensity flows is typically limited to flood damage. While the possibility of fatalities can never be entirely ruled out, it may be negligible for persons within buildings except where site-specific conditions result in higher vulnerability (e.g., habitable basements, or still-water inundation at depths well exceeding a building first floor elevation). Low intensity flows are typical for low steep creek hazard zones. Therefore, flood damage can be limited by applying the design and engineering principles outlined in Section 9.3 of the EDCG.

Higher Intensity Flows (IDF>1)

Higher intensity flows are defined in these guidelines as modelled flows where IDF is greater than 1. These flows have the potential to result in structural building damage due to dynamic and static impact pressure and are considered to have credible potential to cause loss of life. Vulnerability ratings for these flows consider the likelihood of fatalities as an indirect consequence of building damage or collapse, given that persons are within the building. Intensity flows (IDF) of 1 to 10 are typical for moderate steep creek hazard zones.

Table E2 shows ranges in building structure vulnerability criteria applied in existing basin-scale SCRAs in Canmore. Table E3 shows ranges of criteria applied to estimate the vulnerability of persons within buildings to fatalities, where vulnerability is primarily an indirect outcome of building damage or collapse. These criteria are approximate averages applied to assessments completed at an alluvial fan level of detail. Unlike depth-damage curves, all building types are represented in a single set of criteria. For re-enforced concrete buildings, the lower vulnerability range is likely more appropriate. For standard wood-frame buildings and mobile homes, the mid to upper vulnerability range is likely more appropriate. The upper end of the range may also be more applicable for debris flow processes, which typically contain a higher proportion of bouldery debris than debris floods.

Group safety risk analyses of multi-unit, multi-story residential buildings should consider the difference in vulnerability for units on the ground floor versus upper floors, depending on the intensity of flow impact. For example, consider a scenario where hazard intensity is too low to result in credible life safety risk to occupants in the second or higher floor units, but there is credible threat to ground floor residents. Individual risk would consider the occupant most at risk on the ground floor. Group risk would consider the number of elements at risk on the ground floor (E_i), not the entire building population.

This simplified approach reflects uncertainties in debris flood or debris flow modelling and factors that are typically poorly known in a study, such as variations in the structure of a given building. For human vulnerability, the location and behavior of persons within the building at the time of impact is also typically not known (except for basic assumptions that may be made for populations within multi-unit buildings). These may strongly influence the actual level of vulnerability, particularly for moderate intensity debris flows (IDF = 1 to 10) that have the highest variability in building damages (Table D2).

Building structure damage and life loss vulnerability criteria due to debris flows or debris floods should be calibrated by the QRP for a given SCRA. Ranges in vulnerability estimates may be carried through the risk analysis to account for uncertainty. Comparison of risk analysis results within basin-scale assessments can help determine whether the vulnerability criteria are reasonable. For building- specific assessments, the QRP should check whether site-specific factors exist that would justify more conservative criteria, such as bedroom windows at ground floor on the upstream side of the building

Table D2: Debris Flow and Debris Flood Vulnerability Criteria for Buildings

Hazard Intensity Index (Range)	Canmore Steep Creek Hazard Zone	Building Damage Description		Building Structure Vulnerability Range[1] (Approx. Average)
		Categor	Description	
<1	Low	Slight	Low likelihood of building structure damage due to impact pressure. High likelihood of major sediment and/or water damage. Damage level and cost primarily a function of flood-related damages.	n/a[2]
1-10	Moderate	Moderate	High likelihood of moderate to major building structure damage due to impact pressure. Certain severe sediment and water damage. Building repairs required, possibly including some structural elements.	0.25 – 0.75 (0.5)
10-100	High/Extreme	Severe	High likelihood of major to severe building structure damage due to impact pressure. Certain severe sediment and water damage. Major building repairs required including to structural elements.	0.75 - 0.9 (0.8)
>100	High/Extreme	Complete	Very high likelihood of complete building structure damage or collapse. Complete building replacement required.	0.9 – 1.0 (1.0)

Notes:

1. Values indicate estimated proportion of building replacement value.
2. Stage-damage criteria are typically a more appropriate measure of damage at low flow intensities.

Table D3: Debris Flood and Debris Flow Vulnerability Criteria for Persons Inside Buildings

Hazard Intensity Index (Range)	Canmore Steep Creek Hazard Zone	Human Vulnerability Range[1] (Approx. Average)
<1	Low	~0
1-10	Moderate	~0 – 0.1 (0.05)
10-100	High/Extreme	0.1 – 0.5 (0.3)
100+	High/Extreme	0.5 – 1 (0.8)

[1]Vulnerability ratings indicate the estimated likelihood of fatalities as an indirect consequence of building damage or collapse, given that persons are within the building.

D-8 Business Activity

In many cases, it will be very difficult to determine the vulnerability of businesses to loss of function, and associated economic losses as a result of event impact. For example, a retail store could suffer loss of inventory and business function, whereas a business generating revenue elsewhere could suffer office-related damages without necessarily losing their source of revenue.

While more sophisticated models of direct and indirect economic losses are commonly developed for large scale flood assessments, such work is rarely undertaken for SCRAs due to the effort involved in relation to the relatively limited areas of impact. In the simplest case, the annual revenue of businesses potentially impacted by a geohazard scenario can be either estimated at time of development proposal or obtained from commercial data providers for existing businesses and used as a relative proxy for the "importance" of economic activity in these areas.

E. APPENDIX E: QUALITY ASSURANCE STATEMENT FOR SITE-SPECIFIC STEEP CREEK RISK ASSESSMENTS

To: The Town of Canmore
902 7th Ave, Canmore, AB
T1W 3K1

Date: _____

For the Development[1]:

_____

Legal description and civic address of the Development, and creek name

The undersigned hereby gives assurance that he/she is a *Qualified Registered Professional* and is a *Professional Engineer* or *Professional Geoscientist*.

I have signed, sealed and dated, and thereby certified, the attached *SCRA* report on the Development in accordance with the SCRA guidelines. That report must be read in conjunction with this Statement. In preparing that report I have carried out a study which has been approved by the local jurisdiction as being appropriate for the SCRA in this case.

As part of this study, I (our firm) have (check to the left of applicable items)

☐ 1. Collected and reviewed appropriate background information on the hazard and potential consequences as appropriate for this level of study

☐ 2. Reviewed the proposed development plans on the fan or the Development

☐ 3. Conducted field work on and, if required, beyond (fan/watershed) the Development

☐ 4. Reported on the results of the field work on and, if required, beyond the Development

☐ 5. Considered any changed conditions on and, if required, beyond the Development

☐ 6. Included aspects of climate change where appropriate

7. For the SCRA I have:

☐ 7.1 reviewed and characterized, as commensurate with this level of study, any hydrogeomorphic hazard that may affect the Development

☐ 7.2 quantified the hydrogeomorphic hazard as appropriate for this level of study

☐ 7.3 identified existing and anticipated future elements at risk on and, if required, beyond the Development/Fan/Channel

☐ 7.4 estimated the potential consequences to those elements at risk

8. Regarding the level of life loss risk tolerance, I have:

☐ 8.1 compared the level of risk tolerance adopted by the Town with the findings of my investigation

☐ 8.2 found that (mark as indicated)

Individual risk is: acceptable ☐, unacceptable ☐

Group risk is: acceptable ☐, tolerable☐, unacceptable ☐, N/A ☐

☐ 8.3 made recommendations to reduce hydrogeomorphic hazard risks *(where applicable as part of the scope)*

☐ 9. Reported on the requirements for future inspections of the Development/Fan/Watershed and recommended who should conduct those inspections.

I hereby give my assurance that, based on the conditions contained in the attached SCRA report, the hydrogeomorphic hazards and risks potentially subjecting the development have been appropriately and adequately characterized and quantified.

Name (print): _____ Date: _____

Signature: _____

Address: _____

_____

(Affix Professional seal here)

Telephone: _____

If the *Qualified Professional* is a member of a firm, complete the following.

I am a member of the firm _____

and I sign this letter on behalf of the firm. _____

F. APPENDIX F: PLANT SPECIES LIST

Tables F1 – F5 (inclusive) list acceptable trees, shrubs and wildflowers for landscape planting for all areas in the Town of Canmore. Plants marked with an asterisk (*) are non-native and are included due to being drought tolerant, or WildSmart-friendly, or both.

Table F6 lists plants that are prohibited for being a fruit bearing plant and/or a wildlife attractant, particularly palatable to bears. Please note all fruit bearing trees are prohibited in Canmore, regardless of not specifically being listed in Table 6.

Table F7 lists the acceptable trees for boulevard and/or median planting. The species on this list have been selected due to form, root structure, salt/pollution tolerance, and maintenance requirements.

Table F8 lists the acceptable trees and shrubs for private properties/development. The plants included in this list are in addition to those provided in Tables F1-F5 (inclusive). Town of Canmore Parks may consider plants listed in Table F8 to be included within specific public spaces in the downtown area (plazas, main street) and/or in specific public spaces identified in area structure plans or conceptual schemes.

If a plant is a wildlife attractant, the comments section of the table includes information (in brackets and marked with a double asterisk) about the species that is/are attracted to the plant. The fruit, seeds, foliage and the bark of the plant material that is a designated wildlife attractant are palatable to bears, birds and ungulates (deer/elk). These identified wildlife attractant plants should be used on a site-specific basis for remediation, reclamation, habitat enhancement and strategic planning to discourage the likelihood of human and wildlife interactions.

Table F1: Coniferous (Evergreen) Trees

The following coniferous trees are acceptable for landscape planting in all areas of the Town of Canmore provided they are located in FireSmart appropriate locations. Contact Town of Canmore Parks for more information: parks@canmore.ca.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Lodgepole Pine	*Pinus contorta latifolia*	High	Low	Generally found in Sphagnum (peat) covered bogs to montane dry or moist areas. Elk may harm saplings during rutting season & during winter. (**Wildlife Attractant – Ungulates)
Limber Pine	*Pinus Flexilis*	High	Low	Generally found forming open forests in the sub alpine to alpine zones, often in semi-arid areas. Usually found on dry rocky ridges and peaks. Established plants tolerate drought. A fairly wind-resistant species, the plants often colonize exposed mountain slopes in the wild, their deep taproot anchoring them firmly. Long living species, generally not available through Nurseries. Suitable for Xeriscape.

Common Name	*Scientific Name*	Flammability	Palatability (Ungulates)	Comments
Engleman Spruce/ aka Mountain Spruce	*Picea engelmannii*	High	Low	Generally found in the montane regions to the treeline, especially by swamps. Often found on poor, thin rocky soils, though the best specimens are growing in deep, well-drained clay-loam soils. Young growth is occasionally browsed by ungulates but is not an important food item and is probably eaten as a last resort. (**Wildlife Attractant – Ungulates)
White Spruce	*Picea glauca*	High	Low	Generally found in forested areas with good soils, along streams and lakes, and on rocky hills and slopes, succeeding in a variety of soil conditions. A fairly wind-resistant tree, it can be grown as part of a shelterbelt planting. Trees should be planted into their permanent positions when they are quite small, between 30 and 90 cm. Larger trees will check badly and hardly put on any growth for several years. This also badly affects root development and wind resistance.
Black Spruce	*Picea Mariana*	High	Low	Generally found on cool slopes and bogs. Found on well-drained soils in the north of its range and swamps in the south. Found on a variety of soil types, it grows best in those that are moist and acidic. Moose occasionally browse saplings, but White-Tailed Deer eat it only under starvation conditions. (**Wildlife Attractant – Ungulates)
Douglas Fir	*Pseudotsuga Menziesii var.Glauca*	Medium	Medium	Generally found in moist to very dry areas from sea level to near the treeline. The best specimens are found on well-drained deep loamy soils with plenty of moisture. May be browsed when young and flexible. (**Wildlife Attractant – Ungulates)

Table F2: Coniferous (Evergreen) Shrubs

The following coniferous shrubs are acceptable for landscape planting in all areas of the Town of Canmore provided they are located in FireSmart appropriate locations. Contact Town of Canmore Parks for more information: parks@canmore.ca.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Common Juniper	*Juniperus communis*	High	Medium	More prickly than Creeping Juniper. Suitable for Xeriscape.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Creeping Juniper	*Juniperus horizontalis*	High	Medium	Many cultivars are available. Suitable for Xeriscape.
Rocky Mountain Juniper	*Juniperus scopulorum*	High	Low	Plants have a vertical growth pattern vs. horizontal. Suitable for Xeriscape.

Table F3: Deciduous Trees

The following deciduous trees are acceptable for landscape planting in all areas of the Town of Canmore.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Rocky Mountain Maple	*Acer glabrum*	Low	Medium	A very attractive species. It should be available in the near future from native nurseries.
River Birch	*Betula occidentalis*	Low	Low	Tough, smaller multi-branched small tree or tall shrub.
Paper Birch	*Betula papyrifera*	Low	Low	Tree has delicate bark and needs lots of water. It is currently not available from native plant nurseries
Alpine Larch	*Larix lyallii*	Low	Low	Tree is found at tree line elevations.
Western Larch	*Larix occidentalis*	Low	Medium	This tree is native to Kananaskis. It should be available in the near future from native nurseries.
Balsam Poplar	*Populus balsamifera* (male only)	Low	High	Ungulates eat the bark of this tree. (**Wildlife Attractant – Ungulates)
Trembling Aspen	*Populus tremuloides*	Low	High	This tree is more resistant to ungulate browsing. (**Wildlife Attractant – Ungulates)
Green Ash (*)	*Fraxinus pensylvanica Lanceolata*	Low	High	Deer will browse on this tree and tend to over-browse when other preferred species are unavailable. (**Wildlife Attractant – Ungulates)
Brooks #6 Poplar (*)	*Opulus X* "Brooks #6"	Low	High	If possible, avoid non-native varieties – there is a high potential for genetic contamination of native poplars.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Patmore Ash (*)	*Fraxinus pensylvanica 'Patmore'*	Low	High	Full sun. Soil: fertile and moist Drought tolerant once established Tolerant of salt and pollution Shade tree
Prairie Spire Ash (*)	*Fraxinus pensylvanica 'Rugby'*	Low	High	Full sun Soil: fertile and moist Drought tolerant once established Tolerant of salt and pollution Shade tree
Patmore Elm (*)	*Ulmus 'Patmore'*	Low	Medium	Full sun or partial shade Adaptable to most soil types, but prefers fertile and moist Tolerant of salt, pollution and drought once established Shade tree
American Elm (*)	*Ulmus Americana*	Low	Medium	Full sun or partial shade Adaptable to most soil types, but prefers fertile and moist Tolerant of salt, pollution and drought once established Shade tree
Night Rider Elm (*)	*Ulmus 'Night Rider'*	Low	Medium	Full sun or partial shade Adaptable to most soil types, but prefers fertile and moist Tolerant of salt, pollution and drought once established Shade tree
Dropmore Linden (*)	*Tillia x flavescens*	Low	Low	Full sun Soil: average to fertile, moist and well-drained Tolerant of salt, pollution and drought once established Shade tree
American Linden (*)	*Tilia americana*	Low	Low	Full sun Soil: average to fertile, moist and well-drained Tolerant of salt, pollution and drought once established Shade tree

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Littleleaf Linden (*)	*Tilia cordata*	Low	Low	Full sun Soil: average to fertile, moist and well-drained Tolerant of salt, pollution and drought once established Shade tree
Ivory Silk Lilac (*)	*Syringa reticula 'Ivory Silk'*	Low	Low	Full sun, but can tolerate light shade Soil: average, medium moisture, well drained Tolerant of salt, pollution and drought once established Shade tree
Spring Snow Flowering Crab (Non-fruiting)	*Malus 'Spring Snow'*	Low	Low	Full sun. Soil: well drained, moderate moisture.
Manitoba Maple / Box-elder	*Acer negundo*	Low	Medium	Full sun to part shade. Soil: moist, well drained, but tolerates any soil type. Native, but can be invasive. Should be used sparingly. Shade tree

Table F4: Deciduous Shrubs

The following deciduous shrubs are acceptable for landscape planting in all areas of the Town of Canmore.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Green Alder	*Alnus crispa*	Low	Medium	This shrub prefers moister sites.
Labrador Tea	*Ledum groenlandicum*	Low	Medium	This shrub has white flowers and evergreen leaves. It grows in boggy wet areas.
Mountain Rhododendron	*Rhododendron albiflorum*	Low	Low	This shrub is a very attractive specimen, but very toxic to ungulates and humans.
Bebb's Willow / Beaked Willow	*Salix Bebbiana*	Low	High	This plant grows as a large shrub or tall tree.
Pussy Willow	*Salix discolor*	Low	High	This is an attractive larger shrub.
Smooth Willow / Gray-leaved Willow	*Salix glauca*	Low	High	This erect shrub prefers moist areas.

Common Name	Scientific Name	Flammability	Palatability (Ungulates)	Comments
Shrubby Cinquefoil	*Potentilia fruiticosa*	Low	Low	This shrub produces attractive yellow flowers. It is the best choice of all the shrubs to grow in the Bow Valley area. It is not attractive to ungulates or bears and many cultivars are available. The native species has silver leaves as opposed to shiny green leaves for the cultivars.
Spirea various varieties (*)	*Spiraea var.*	Low	Low	Full sun, but tolerates light shade Soil: fertile, moist, well-drained Regular pruning recommended.
Meadowsweet / Birch Leaved Spiraea / White Spiraea	*Spiraea betulifolia*	Low	Low	This shrub is found on stream banks/ lake shores, open to wooded valleys and hillsides often in rockslides from the foothills to subalpine zones. It has showy white flowers.
Forsythia Northern Sun (*)	*Forsythia x f. northern sun*	Low	Low	Full sun, tolerates light shade. Soil average fertility, moist and well drained.
Ninebark (*)	*Physocarpus opulifolius var.*	Low	Low	Full sun or partial shade. Soil, fertile, moist and well drained. These shrubs adapt well to alkaline soil.
Double Flowering Plumb - Non fruiting (*)	*Prunus triloba 'Multiplex'*	Low	Low	Full sun. Soil: average moisture. Attracts pollinators.
Mock Orange (*)	*Philadelphus P. x Galahad*	Low	Low	Full sun and will tolerate part shade. Soil: average fertility, humus rich, moist, well drained. Somewhat drought tolerant one established.

Table F5: Wildflowers

The following wildflowers are acceptable for landscape planting in all areas of the Town of Canmore.

Common Name	Scientific Name	Comments
False Dandelion	*Agoseris glauca*	This plant has a yellow flower and looks like a Dandelion with long narrow leaves. It blooms mid-summer. It prefers full sun and a sandy or gravelly loam low in nutrients.
Nodding Onion	*Allium cernuum*	This plant cannot grow in the shade. It requires moist soil and can tolerate drought. (Deer-resistant; members of this genus are rarely if ever troubled by browsing deer.)

Common Name	Scientific Name	Comments
Wild Chives	*Allium schoenoprasum*	An easily grown plant, it prefers a sunny position in a rich moist but well-drained soil, though it succeeds in most soils. It can grow in semi-shade (light woodland) or no shade. (A good bee plant, members of this genus are rarely if ever troubled by browsing deer.)
Pearly Everlasting	*Anaphalis margaritacea*	This plant prefers a light, well-drained soil and a sunny position. It succeeds in most soils, including poor ones. (Plants seem to be immune to the predations of rabbits.)
Fairy Candelabra / Pygmy Flower	*Androsace septentrionalis*	This plant has white flowers and blooms very early.
Cut-leaved Anemone / Wind Flower	*Anemone multifida*	This plant succeeds in ordinary garden soil but prefers a moist, well-drained woodland peaty soil in some shade. It tolerates drought during its summer dormancy. A greedy plant, it inhibits the growth of nearby plants, especially legumes. (Plants seem to be immune to the predations of rabbits.)
Prairie Crocus / Pasque Flower	*Anemone patens*	This plant requires a well-drained, humus-rich, gritty soil and a sunny position and is lime-tolerant. It is a very ornamental plant. Large plants transplant badly. A greedy plant, it inhibits the growth of nearby plants, especially legumes. It cannot grow in the shade. It requires moist soil.
Lowly Everlasting / Small-Leaved Everlasting / Nuttal's Pussytoes	*Antennaria parvifolia* *Aka : nitida*	This plant has white flowers and grows as an herb mat. It blooms early summer.
Showy Everlasting	*Antennaria pulcherrima*	This plant has white flowers and blooms mid-summer.
Rosey Everlasting / Rosey Pussytoes	*Antennaria rosea*	This plant has pink flowers and blooms mid-summer.
Blue Columbine	*Aquilegia brevistyla*	This plant succeeds in ordinary garden soil, preferring a moist but not wet soil and a sunny position. A greedy plant, it inhibits the growth of nearby plants, especially legumes. (Plants seem to be immune to the predations of rabbits.)
Yellow Columbine	*Aquilegia flavescens*	This plant succeeds in ordinary garden soil, preferring a moist but not wet soil and a sunny position. It is intolerant of heavy clay. It is a very ornamental plant. A greedy plant, it inhibits the growth of nearby plants especially legumes. (Plants seem to be immune to the predations of rabbits.)
Heartfelt Arnica	*Arnica cordifolia*	This plant is found in woodland garden setting with sunny edges. It prefers a moist, well-drained, humus-rich soil, preferably lime-free, and prefers a mixture of sand, loam and peat. It can grow in semi-shade (light woodland) or no shade. The whole plant is toxic.
Pasture Sagewort / Fringed Wormwood	*Artemisia frigida*	This plant requires a sunny position and a well-drained soil that is not too rich. Established plants are very drought tolerant. Plants are longer lived, hardier and more aromatic when they are grown in a poor dry soil. It is a very ornamental plant. (Members of this genus are rarely if ever troubled by browsing deer.)

Common Name	Scientific Name	Comments
Prairie Sage	*Artemisia ludoviciana*	This plant requires sun and dry soil conditions. It shows silvery, silky foliage
Alpine Aster	*Aster alpinus*	This plant has purple flowers and blooms in the late summer.
Smoothing Aster	*Aster laevis*	This plant has purple flowers and blooms in the late summer.
Arctic Aster	*Aster sibiricus*	This plant has purple flowers and blooms in the late summer. Although basically an alpine plant, Arctic Aster can be found on gravely river flats and other rocky areas.
Indian Milk Vetch	*Astragalus aboriginum*	This plant has yellowish white flowers and blooms in the early summer. It requires a dry, well-drained soil in a sunny position. Plants are intolerant of root disturbance and are best planted in their final positions whilst still small. This species has a symbiotic relationship with certain soil bacteria. Many members of this genus can be difficult to grow; this may partly be due to a lack of their specific bacterial associations in the soil. This plant can fix Nitrogen.
Timber Milk Vetch	*Astragalus Miser a.k.a - A. decumbens*	This plant has purplish flowers and blooms mid-summer. It is very common in Lodgepole Pine forests. (It is very toxic to ungulates.)
Ascending Purple Milk Vetch / Standing Milk Vetch	*Astragalus striatus a.k.a. – A. adsurgens*	This plant has purple flowers and blooms early June.
Bluebells / Harebells	*Campanula rotundifolia*	A very easily grown plant, it succeeds in most fertile, well-drained soils though it prefers a moist but well-drained rich sandy loam and a neutral or alkaline soil in sun or partial shade. It succeeds in poor soils. (Members of this genus are rarely if ever troubled by browsing deer or rabbits.)
Yellow Indian Paintbrush	*Castilleja accendalis*	Paintbrush (Castilleja) is one of the most abundant and variable plants within the Canadian Rockies. The much-branched rootstock is a root-parasite, which makes transplanting the Paintbrush to a home garden almost impossible. There are at least ten species of Paintbrush in the southern Canadian Rockies. Their identification can be frustrating even for botanical experts. The many hues of the Paintbrush dominate well-drained slopes and rocky edges, from low elevations to alpine meadows. This plant species prefers acid, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil. The Red Indian Paintbrush is the Town of Canmore's Official Flower.
Red Indian Paintbrush	*Castilleja mineata*	Paintbrush (Castilleja) is one of the most abundant and variable plants within the Canadian Rockies. The much-branched rootstock is a root-parasite, which makes transplanting the Paintbrush to a home garden almost impossible. There are at least ten species of Paintbrush in the southern Canadian Rockies. Their identification can be frustrating even for botanical experts. The many hues of the Paintbrush dominate well-drained slopes and rocky edges, from low elevations to alpine meadows. This plant species prefers acid, neutral and basic (alkaline)
Pink Indian Paintbrush	*Castilleja c. raupii*	
Alpine Paintbrush	*Castilleja rhexifolia*	

Common Name	Scientific Name	Comments
		soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil. The Red Indian Paintbrush is the Town of Canmore's Official Flower.
Field Chickweed / Mouse eared Chickweed	*Cerastium Arvense*	This is an abundant species that grows in meadows, sandy or gravely places and on rocky slopes scattered across the boreal forest.
Golden Aster	*Chrysopsis villosa*	This plant prefers dry sandy soil with full exposure to the sun.
Blue Clematis	*Clematis accidentalis*	This plant likes shade to part sun, and moist to well-drained soil. It produces blue flowers with a vine that creeps up trellis or tree or spreads on the ground.
Bunchberry	*Cornus canadensis*	This plant succeeds in any soil of good or moderate fertility. It prefers a damp soil and can grow in semi-shade (light woodland) or no shade. It is a good dense ground cover plant, growing well in light woodland.
Low Larkspur	*Delphinium bicolor*	Growing from prairie meadows to alpine ridges, this strikingly handsome plant blooms from May to July, depending on elevation. Low Larkspur is poisonous to cattle, particularly in early spring.
Tall Larkspur	*Delphinium glaucum*	This plant prefers a rich moist but well-drained soil and dislikes waterlogged soils. It requires an open sunny position. A greedy plant, it inhibits the growth of nearby plants especially legumes. The plant prefers acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It requires moist soil.
Mountain Shooting Star	*Dodecatheon conjugens*	This plant prefers a moist, rich, well-drained soil and some shade. It prefers woodland conditions or a cool moist shady border. Plants prefer a dry period when dormant in the summer. Shooting Star grows easily from seed and it will readily seed itself in future years.
Shooting Star	*Dodecatheon pulchellum*	This plant prefers a moist, rich, well-drained soil and some shade. It prefers woodland conditions or a cool moist shady border. Plants prefer a dry period when dormant in the summer. Shooting Star grows easily from seed and it will readily seed itself in future years.
Yellow Mountain Avens / Yellow Dryad	*Dryas drummondii*	This plant is a common pioneer on gravel flats, rocky slopes, and roadsides in the montane zone. It flourishes in sunny, well-drained situations and makes an interesting and unusual rock garden plant. It is suitable for groundcover and Xeriscape.
White Mountain Avens	*Dryas octopetala a.k.a. hookeriana*	This plant is easily grown in ordinary gardening soil, preferring a sunny position and limestone soils. It prefers a gritty well-drained peaty soil. It is a good plant for a rock garden, and it succeeds on banks and on walls. A very ornamental plant is suitable for groundcover and Xeriscape.
Fireweed	*Epilobium angustifolium*	This easily grown plant prefers a well-drained but moisture retentive soil in a sunny position, though it succeeds in most soils. It spreads vigorously by means of a creeping rhizome, and often forms large patches. It is apt to become a weed especially through its seed, which is very light and capable of travelling long distances in the wind. It is a good bee plant.

Common Name	Scientific Name	Comments
Mountain Fireweed / River Beauty	*Epilobium latifolium*	This plant prefers a well-drained but moisture retentive soil in a sunny position but succeeds in most soils. The roots are somewhat spreading and can become invasive.
Tufted Fleabane	*Erigeron caespitosus*	This plant grows in rocky soils from moderate elevations to the alpine zone.
Cut-Leaved Fleabane / Compound–Leaved Fleabane / Daisy Fleabane	*Erigeron compositus*	This plant grows in rocky soils from moderate elevations to the alpine zone.
Smooth Fleabane	*Erigeron glabellus*	This plant is generally found in moist prairies, meadows and open woods. It prefers a moderately fertile well-drained soil in a sunny position and does best in a sandy dry soil but will succeed in fairly heavy soils. It is a good butterfly and moth plant. It succeeds in very exposed positions. There are some named varieties selected for their ornamental value. Very few members of this genus will hybridize with other members of the genus. This plant does well in the border areas or in a rock garden.
Umbrella Plant / Sulphur Buckwheat	*Eriogonum umbellatum*	The plant is widely distributed on exposed sites from low elevations to alpine ridges.
Gaillardia / Indian Blanket / Blanket Flower / Brown-Eyed Susan	*Gaillardia aristata*	This plant requires a position in full sun and will succeed in any moderately fertile well-drained soil. It performs well in poor soils and copes well with hot dry conditions. It requires winter protection, especially in areas experiencing heavy snows. Covering the plants with brush wood should be enough. (Members of this genus are rarely if ever troubled by browsing deer.)
Northern Bedstraw	*Gallium boreale*	This plant prefers a loose moist leafy soil in some shade. It tolerates dry soils but the leaves quickly become scorched when growing in full sun. This species does not thrive in a hot climate. The seed can be sown in spring though it may be very slow to germinate. This plant does not really need any help to reproduce itself. Division can be done in spring or throughout the growing season if the plants are kept well-watered. This is a very easy plant, larger clumps can be replanted direct into their permanent positions, though it is best to pot up smaller clumps and grow them on in a cold frame until they are rooting well and then plant them out in the spring.

Felwort / Northern Gentain	*Gentianella amarella*	This plant requires a damp humus-rich soil and should be planted in a situation approaching its native habitat. An aggregate species, individual plants may show unusual features and determinations should be based on small samples of the population. The plant prefers acid, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil.
Fringed Gentian	*Gentianella crinata*	This plant is found in moist meadows, shores and calcium-rich ferns, occasional in southern boreal forest and parkland of prairie provinces. It grows best in moist areas, blooms in the late summer with purple flowers and is difficult to propagate.
Wild White Geranium	*Geranium richardsonii*	This is one of the most appealing plants found in aspen glades along the lower slopes of the mountains. It succeeds in any moderately fertile retentive soil in a sunny position. It tolerates a wide range of soil types, succeeding in dry soils. It grows well on woodland edges. The whole plant has an unpleasant aroma; the foxy smell is particularly pronounced after rain. (Members of this genus are rarely if ever troubled by browsing deer or rabbits.)
Sticky Purple Geranium	*Geranium viscosissimum*	This plant is found in open woods and meadows. It is plentiful in medium-dry to moist or even wet soils of open woods, roadsides, creek banks and meadows to an elevation of 2,700 m. It succeeds in any good soil in sun or partial shade. Plants are hardy to about -25°C. (Members of this genus are rarely if ever troubled by browsing deer or rabbits.)
Prairie Smoke / Old Man's Whiskers / Three-flowered Avens	*Geum triflorum*	This plant is easily grown in any moderately good garden soil that is well drained. It prefers a soil rich in organic matter and a rather damp soil. Plants are hardy to about -20°C. This plant hybridizes freely with other members of this genus.
Alpine Hedysarum	*Hedysarum alpinum*	This plant is easily grown in ordinary garden soil in a sunny position, preferring a deep well-drained sandy loam. Plants strongly resent root disturbance and should be placed in their permanent positions as soon as possible. This plant has poisonous seeds.
Northern Hedysarum / Sweet Vetch	*Hedysarum boreale*	This plant is easily grown in ordinary garden soil in a sunny position, preferring a deep well-drained sandy loam. Plants strongly resent root disturbance and should be placed in their permanent positions as soon as possible. Great care is needed if moved since the plant dislikes root disturbance.
Beautiful Sunflower	*Helianthus laetiflorus*	This plant likes sun to light shade and well-drained soil.
Richardson's Alumroot	*Hencheria richardsonii*	This plant prefers sun to light shade and well-drained soil. It produces pink/purple flowers.
Cow Parsnip	*Heracleum lanatum*	This plant is found in areas of rich damp soils of prairies and mountains, especially along streams and in open woods. This species does best in woodland gardens with dappled shade, at a shady edge or in deep shade. It succeeds in any ordinary garden soil, doing best in moist soils or deep woodland.

Yellow Peavine / Cream Coloured Vetchling	*Lathyrus ochroleucus*	This plant prefers areas of dry or moist woods, slopes and rocky banks. An easily grown plant, it succeeds in any moderately good garden soil but prefers a position in full sun. The plant prefers well-drained acidic, neutral and basic (alkaline) soils. It can grow in semi-shade (light woodland) or no shade. It requires moist soil. It may not transplant well so care should be taken when moving it.

Common Name	*Scientific Name*	Comments
Western Wood Lily / Tiger Lily	*Lilium philadephicum*	This lily prefers heavy, often somewhat alkaline, meadows to montane forest. It is usually found in drier woodlands on acid sandy loams and requires a well-drained humus-rich soil and a cool moist root run. It likes a warm position with moisture in summer. Plants are rather difficult to establish. A very ornamental plant, it requires protection from rain in winter. The plant should be protected against rabbits and slugs in early spring. If the shoot tip is eaten out, the bulb will not grow in that year and will lose vigor.
Twinflower	*Linnaea borealis*	This plant prefers acid soils and can grow in very acid soil. It can grow in full shade (deep woodland) or semi-shade (light woodland) and requires moist soil. It prefers a rather shaded position in a rock garden in a moist peaty soil. It grows well in pine woods. Plants can be rather difficult to establish.
Wild Blue Flax / Western Blue Flax	*Linum lewisii*	This plant is found in calcareous grassland and prairies to alpine ridges, usually on dry well-drained soils in western North America. It prefers a light, dry, well-drained, moderately fertile, humus-rich soil in a sunny sheltered position. It prefers an alkaline soil. It is a very ornamental plant that is not generally very long-lived, though it normally self-sows freely. Established plants are drought tolerant and suitable for Xeriscape.
Yellow Puccoon / Woolly Gromwell / Western	*Lithospernum ruderale*	This plant is found in open, fairly dry places from the foothills to moderate elevations. It prefers a sunny position in a moderately fertile, well-drained soil. It does well in cultivated beds. I should be planted out into permanent positions in late spring or early summer, after the last expected frosts.
Silky Lupine	*Lupinus sericeus*	This plant grows in many types of habitat, including forests, woodlands, sagebrush, and grasslands. It often grows on dry, rocky slopes, and does best in open meadows and forest openings or sites without shade. It can be found at low and high elevations, up to 3,000 m or more. It can often be found in recently burned sites. The inflorescence of this plant is a raceme of many flowers, usually in shades of purple or blue, but sometimes white or yellowish. It often grows in dense clumps or bunches. Like many other lupines, this species is very toxic, but it does not appear to be toxic to wild animals such as white-tailed deer, which often consume it. (**Wildlife attractant – Ungulates, Birds & other small mammals)

Silvery Lupine	*Lupinus argenteus*	This plant is native to much of western North America. It grows in several types of habitat, including sagebrush, grassland, and forests. The plants favour dry soil and prefer sun, part shade or shade conditions and will thrive with minimal water. It contains toxic alkaloids, especially in the seeds, which can be toxic to humans and animals if ingested. The flowers of silver-stem lupine are sometimes pink and rarely white. This species spreads quickly to form colonies. Silvery Lupine is an important food source for butterflies. (**Wildlife attractant – Ungulates Birds&, Hummingbirds)

Common Name	*Scientific Name*	Comments
Wild Mint / Field Mint / American Wild Mint	*Mentha arvensis*	Wild Mint is found in moist places at low to moderate elevations. An easily grown plant, it succeeds in most soils and situations so long as the soil is not too dry. This species tolerates much drier conditions than other members of the genus. It prefers a slightly acid soil. Most mints have fairly aggressive spreading roots and, unless you have the space to let them roam, they need to be restrained by some means such as planting them in containers that are buried in the soil. (Members of this genus are rarely if ever troubled by browsing deer and helps to deter insect pests.)
Red Monkey Flower	*Mimulus lewisii*	This is an alpine to subalpine species that needs well-drained sandy soils (both in cultivation and propagation). It is found in alpine and subalpine meadows with vernal run-off. It grows along small streams as well, but the water must be cold and clear (well-oxygenated). This species works best in a woodland garden, at a sunny edge, in dappled shade or around a pond area. (Bees and hummingbirds are frequently attracted to these flowers.)
Yellow Monkey Flower	*Mimulus guttatus*	This plant is found near streams and wet places below 3,000 m elevation. It prefers rather moist places such as damp borders, margins of streams and boggy spots. It thrives in full sun so long as the soil does not dry out, otherwise it is best grown in partial shade. It grows well in shallow water, but it can be invasive. This species works best around a pond or bog garden.
Blunt- Leaved Sandwort	*Moehringia lateriflora*	This plant is found in moist meadows, shorelines, thickets and woods.
Wild Bergamot / Horse Mint / Bee-Balm	*Monarda fistulosa*	This plant is found in dry thickets, clearings and woodland edges. It is easily grown in ordinary garden soil so long as it is not too dry, it also grows well in heavy clay soils. It generally requires a moist soil and a sunny position, though it also succeeds in light shade. This species will thrive when grown in a dry soil. It is a very ornamental plant and a good bee plant.

Alpine Forget-me-not	*Myosotis alpestris*	This plant is generally found growing in damp woodlands and meadows, usually on basic rock formations. It prefers a well-drained, gritty soil. The flowers are deliciously fragrant in the evening and nighttime though there is little or no scent in the daytime. It can be used in a woodland garden along the sunny edge and can tolerate dappled shade or be placed along a shady edge or within a bog garden. (Members of this genus are rarely if ever troubled by browsing deer.)
Reflexed Locoweed	*Oxytropis deflexa*	This plant is found in open woods, moist thickets, banks, shores and gravel bars. Many Locoweeds including Reflexed Locoweed have nodules on their roots that contain bacteria capable of fixing nitrogen even in cold climates. It is a highly circumpolar species that has been divided into many subspecies and varieties by taxonomists.

Common Name	*Scientific Name*	Comments
Early Yellow Locoweed / Silk Locoweed	*Oxytropis sericea*	This plant is found in dry prairies, calcareous gravels and bluffs. It is easily grown in an ordinary garden soil but prefers a sandy loam. It does best in a deep, gritty perfectly drained soil in full sun and can be used in cultivated beds. The plant strongly resents winter wet. It is a very ornamental and variable plant.
Showy Oxytropis / Showy Locoweed	*Oxytropis splendens*	This plant is generally found in open woods, clearings and riverbanks common in prairie and parkland, occasional in boreal forest. An attractive legume, this boldly handsome plant is widely distributed throughout low-elevation grasslands.
Late Yellow Oxytropis / Late Yellow Locoweed	*Oxytropis campestris [O. monticola*	This is a highly variable species and is common on the prairies and in open woodland. Many Locoweeds including Late Yellow Locoweed have nodules on their roots that contain bacteria capable of fixing nitrogen even in cold climates. It is a highly circumpolar species that has been divided into many subspecies and varieties by taxonomists.
Viscid Locoweed	*Oxytropis viscida*	This is a highly variable species and is common on the prairies and in open woodland. Many Locoweeds including Viscid Locoweed have nodules on their roots that contain bacteria capable of fixing nitrogen even in cold climates. It is a highly circumpolar species that has been divided into many subspecies and varieties by taxonomists.
Silky Scorpionweed / Silky Phacelia / Mountain Phacelia	*Phacelia sericea*	This perennial graces open slopes, screes and rock crevices at high altitudes.
Shrubby Beardtongue	*Penstermon fruiticosus*	This plant likes the sun and is found on dry gravely slopes or rocky sites. It grows as a dense shrub that creeps across the ground. Penstemon species are often used in xeriscape landscaping, as many are native to desert or alpine regions and thus quite hardy.

Yellow Beardtongue / Yellow Penstemon	*Penstemon confertus*	This plant is found in fairly moist, open or wooded places, often in meadows or by streams, in lowland and foothills to moderate elevations in the Rockies. It succeeds in ordinary rich garden soil so long as it is well-drained. It succeeds in dry soils and requires a position in full sun. It is very cold hardy, but some protection from winter wet is beneficial for this plant. Plants are evergreen in mild winters. This plant is recommended to be used in cultivated beds.
Slender Penstemon	*Penstemon procerus*	This plant is native to western North America where it grows in mountain habitat such as meadows, often in alpine climates. It likes sun and prefers dry to well-drained soil. The plant's inflorescence is made up of one or more clusters of tubular flowers with lipped, lobed mouths. Each flower is no more than one centimeter long and is purple to blue in color, often with a white throat.

Common Name	*Scientific Name*	Comments
Jacob's Ladder	*Polemonium pulcherrimum*	A very easily grown plant, it prefers a moist, well-drained, fertile soil in sun or semi-shade. Plants are fairly short-lived in cultivation unless they are divided regularly and moved to fresh soil. (Cats are strongly attracted by the smell of this plant and will frequently roll on it and injure it.)
White Cinquefoil	*Potentilla arguta*	This plant thrives in full sun to partial shade. It is drought tolerant but will tolerate seasonal moisture in a well-drained site. It produces pale yellow flowers throughout the summer that resemble strawberry blossoms. It is preferred by butterflies. The plant has great fall colours. (**Wildlife attractant – Ungulates)
Silverweed	*Potentilla anserina*	Silverweed is found at lakeshores, riverbanks and damp meadows in ditches and moist calcareous soils. It is a common weed of cultivation. It can be utilized in woodland gardens along the sunny edge and can handle dappled shade. I can also be sown into lawns and open meadows and can be used in cultivated beds. These attractive perennials transplant well to rock gardens and borders but are notorious for reaching out to cover new ground.
Graceful Cinquefoil	*Potentilla gracilis*	This plant is found in open woods, grasslands and waste places. It is widespread across southern boreal forest and parkland.
Yellow Rattle / Rattlebox	*Rhinanthus minor a.k.a R. crista-galli*	This plant can be grown in a meadow and is useful when establishing wildflower meadows. If planting wildflower plugs into existing grass, success is improved by reducing immediate competition while the wildflower establishes itself. This can be achieved by raking Yellow Rattle seed (Rhinanthus minor) into the grass in spring or autumn. This plant is a semi-parasite on grass and once established it will reduce the vigor of the original grass by up to 50%. All ancient meadows have this plant.

Spotted Saxifrage	*Saxifrage bronchialis*	This plant grows in rocky openings on cliffs, scree, crevices, in subalpine and alpine areas. It likes sun to part shade and dry soil conditions. It is a great plant for rock gardens.
Lance Leaved Stonecrop	*Sedum lanceolatum*	This plant is native to western North America and is found throughout western Canada and the United States. It grows in exposed, rocky mountainous habitat at moderate and high elevations, up to 4,048 m in the Rocky Mountains. The plant's inflorescence is made up of one or more erect arrays of several flowers. The flowers have yellow petals sometimes tinged with red, each lance-shaped petal just under a centimeter long. It likes sunny, dry, rocky sites.
Groundsel	*Senecio spp.*	This plant is often found growing in loose sprawling clumps on scree slopes of the alpine or subalpine zones.
Prairie Groundsel / Woolly Groundsel	*Senecio canus*	Although this plant is typical of the prairies, it may be found in dry and exposed sites almost to timberline.

Common Name	*Scientific Name*	Comments
Balsam Groundsel / Canadian Groundsel / Canadian Butterweed	*Senecio pauperculus*	This plant is found in moist open woods, meadows, stream banks, lake shores and roadsides. It is widespread across boreal forest and parkland. It generally grows on shores, in moist to dry meadows or open coniferous forest.
Moss Campion	*Silene acaulis*	This plant is generally found in Arctic regions and is also found further south on mountains in North America, situated on mountain ledges and scree. It is easily grown in a light soil in full sun, doing best on a moraine. It prefers a cool climate and plants can be difficult to bring into flower in the garden. Plants form a rooting carpet and can be grown as a ground cover when planted about 25 cm apart each way. Established plants are drought tolerant and good for Xeriscape.
False Solomon's-Seal / False Spikenard	*Smilacina racemosa*	This lovely plant is found in moist to dry open woodlands, open meadows, riverbanks and lakeshores. Widespread across the Bow Valley region.
Star-Flowered False Solomon's Seal	*Smilacina stellata*	Found in moist to dry open woodlands, open meadows, riverbanks and lakeshores. It is widespread across the Bow Valley region.
Canadian Goldenrod	*Solidago canadensis*	This plant is generally found in dry to damp thickets, on roadsides, slopes and clearings. It avoids acid soils and succeeds in any moderately fertile, moisture retentive soil in sun or semi-shade. It grows well in heavy clay soils. A rather greedy plant, it is apt to impoverish the soil. The flowers attract butterflies and moths. The plant also attracts various beneficial insects such as ladybirds, lacewings and hoverflies to the garden, these insects will help to control insect pests in the garden. It can be used in a woodland garden at the sunny edge with moderate dappled shade.

Missouri Goldenrod / Low Goldenrod /Prairie Golden Rod	*Solidago missouriensis*	This plant is found in the dry prairies, gravels and rocky slopes. It succeeds in any moderately fertile, moisture retentive soil in sun or semi-shade. It grows well in heavy clay soils. A rather greedy plant, it is apt to impoverish the soil. The plant attracts various beneficial insects such as ladybirds, lacewings and hoverflies to the garden, these insects will help to control insect pests in the garden.
Mountain Goldenrod / Spike–like Goldenrod / Coast Goldenrod	*Solidago spathulata a.k.a S. deumbens*	This plant succeeds in any moderately fertile moisture retentive soil in sun or semi-shade. It grows well in heavy clay soils. A rather greedy plant, it is apt to impoverish the soil. The plant attracts various beneficial insects such as ladybirds, lacewings and hoverflies to the garden, these insects will help to control insect pests in the garden.
White Meadowsweet	*Spirea betulifolia*	This plant is found in open, dry to moist forests and rocky slopes. It is easily grown in average, medium, well-drained soils in full sun. It tolerates a wide range of soils. Specimen or group plant for rock gardens. Mass or group plant in shrub borders. It can be grown as a low hedge for paths and walkways. It incorporates well into foundation plantings.

Common Name	***Scientific Name***	**Comments**
Long-stalked Chickweed / Long-stalked Starwort	*Stellaria longipes*	This plant is generally found in dry to moist open areas and woodlands. It is widespread throughout the Bow Valley region, northwards and upwards (elevation) into tundra and is circumpolar. This plant inhabits exposed rocky ridges and slopes within the alpine zone. Several species of Chickweed are found in the Canadian Rocky Mountains. They are not always easily identified because they tend to be highly variable.
Blue-Eyed Grass	*Sisyrinchium montanum*	This plant is generally found on moist slopes and meadows. It is widespread across the Bow Valley region. It prefers a moist but well-drained, humus-rich, loamy soil and a position in full sun, though it will tolerate part-day shade.
Western Meadow Rue	*Thalictrum occidentale*	Western Meadow Rue is common and widely distributed in moist woods, thickets, meadows and along streams.
Veiny Meadow Rue	*Thalictrum venulosum*	This Rue is generally found in moist prairies, thickets and open woods. It is fairly common across the Bow Valley region.
Golden Bean	*Thermopsis rhombifolia*	This is one of the most striking and colourful early spring flowers. It usually grows in large patches from running rootstock. The plant is common in dry, sandy grasslands.
Wild Vetch	*Vicia americana*	This plant is generally found in damp or gravelly slopes, thickets and meadows. It succeeds in any well-drained soil in a sunny position if the soil is reliably moist throughout the growing season, otherwise it is best grown in semi-shade. It is a climbing plant that attaches itself to supports by means of tendrils. This species has a symbiotic relationship with certain soil bacteria; these bacteria form nodules on the roots and fix atmospheric nitrogen. Some of this nitrogen is used by the growing plant but some can also be used by other plants growing nearby. It can be used in cultivated beds.

Early Blue Violet	*Viola adunca*	This plant is found on damp banks and edges of meadows in most forest communities, at elevations of 1,500 to 2,400 m. It prefers a cool, moist, well-drained, humus-rich soil in partial or dappled shade and protection from scorching winds. It tolerates sandstone and limestone soils but becomes chlorotic if the pH is too high and prefers a pH between 6 and 6.5. It works well in a woodland garden along the sunny edge but will tolerate dappled shade and will also do well at the shady edge of the garden.
Western Canada Violet	*Viola Canadensis a.k.a V. rugulosa*	This plant is found in rich soils in deciduous woods and forests in the mountains. It is easily grown in any fertile soil in full sun or partial shade. It prefers a cool position in a moist, well-drained, humus-rich soil in partial or dappled shade and protection from scorching winds. It tolerates sandstone and limestone soils but becomes chlorotic if the pH is too high and prefers a pH between 6 and 6.5. It works well in a woodland garden along the sunny edge but will tolerate dappled shade and will also do well at the shady edge of the garden.

Common Name	*Scientific Name*	Comments
White Camas / Mountain Death Camas	*Zigadenus [Zygadenus] elegans*	This plant is generally found in open woods and damp open meadows from low elevations to alpine areas and is widespread across the Bow Valley region. Like other members of this genus, White Camas contains an alkaloid and all parts can be poisonous to humans and grazing animals.
Heart-Leaved Alexander / Meadow Parsnip	*Zizia aptera*	This member of the carrot family is most likely found in damp/moist meadows, stream banks, and low ground areas up to timberline across the Bow Valley region. It requires a moist soil and a position in full sun. It is suitable for the wild garden and other informal plantings as well as collections of native wildflowers and can be utilized in a woodland garden placed along the sunny edge.
Slender Penstemon	*Penstemon procerus*	This plant is native to western North America where it grows in mountain habitat such as meadows, often in alpine climates. It likes sun and prefers dry to well-drained soil. The plant's inflorescence is made up of one or more clusters of tubular flowers with lipped, lobed mouths. Each flower is no more than one centimeter long and is purple to blue in color, often with a white throat.
Jacob's Ladder	*Polemonium pulcherrimum*	A very easily grown plant, it prefers a moist, well-drained, fertile soil in sun or semi-shade. Plants are fairly short-lived in cultivation unless they are divided regularly and moved to fresh soil. (Cats are strongly attracted by the smell of this plant and will frequently roll on it and injure it.)
White Cinquefoil	*Potentilla arguta*	This plant thrives in full sun to partial shade. It is drought tolerant but will tolerate seasonal moisture in a well-drained site. It produces pale yellow flowers throughout the summer that resemble strawberry blossoms. It is preferred by butterflies. The plant has great fall colours.

		(**Wildlife attractant – Ungulates)
Silverweed	*Potentilla anserina*	Silverweed is found at lakeshores, riverbanks and damp meadows in ditches and moist calcareous soils. It is a common weed of cultivation. It can be utilized in woodland gardens along the sunny edge and can handle dappled shade. I can also be sown into lawns and open meadows and can be used in cultivated beds. These attractive perennials transplant well to rock gardens and borders but are notorious for reaching out to cover new ground.
Graceful Cinquefoil	*Potentilla gracilis*	This plant is found in open woods, grasslands and waste places. It is widespread across southern boreal forest and parkland.
Yellow Rattle / Rattlebox	*Rhinanthus minor a.k.a R. crista-galli*	This plant can be grown in a meadow and is useful when establishing wildflower meadows. If planting wildflower plugs into existing grass, success is improved by reducing immediate competition while the wildflower establishes itself. This can be achieved by raking Yellow Rattle seed (Rhinanthus minor) into the grass in spring or autumn. This plant is a semi-parasite on grass and once established it will reduce the vigor of the original grass by up to 50%. All ancient meadows have this plant.

Common Name	*Scientific Name*	Comments
Spotted Saxifrage	*Saxifrage bronchialis*	This plant grows in rocky openings on cliffs, scree, crevices, in subalpine and alpine areas. It likes sun to part shade and dry soil conditions. It is a great plant for rock gardens.
Lance Leaved Stonecrop	*Sedum lanceolatum*	This plant is native to western North America and is found throughout western Canada and the United States. It grows in exposed, rocky mountainous habitat at moderate and high elevations, up to 4,048 m in the Rocky Mountains. The plant's inflorescence is made up of one or more erect arrays of several flowers. The flowers have yellow petals sometimes tinged with red, each lance-shaped petal just under a centimeter long. It likes sunny, dry, rocky sites.
Groundsel	*Senecio spp.*	This plant is often found growing in loose sprawling clumps on scree slopes of the alpine or subalpine zones.
Prairie Groundsel / Woolly Groundsel	*Senecio canus*	Although this plant is typical of the prairies, it may be found in dry and exposed sites almost to timberline.
Balsam Groundsel / Canadian Groundsel / Canadian Butterweed	*Senecio pauperculus*	This plant is found in moist open woods, meadows, stream banks, lake shores and roadsides. It is widespread across boreal forest and parkland. It generally grows on shores, in moist to dry meadows or open coniferous forest.
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Heart-Leaved Alexander / Meadow Parsnip	*Zizia aptera*	This member of the carrot family is most likely found in damp/moist meadows, stream banks, and low ground areas up to timberline across the Bow Valley region. It requires a moist soil and a position in full sun. It is suitable for the wild garden and other informal plantings as well as collections of native wildflowers and can be utilized in a woodland garden placed along the sunny edge.

Wildflower Notes:

- Flammability: Most wildflowers have a low flammability rating.
- Wildlife: Many wildflowers are eaten by ungulates. Fruits may be eaten by birds, rodents or bears. Bears will dig up roots and corns of some members of the pea, lily and Purslane families.
- Deer Resistant Wildflowers: If deer are very hungry, they will eat just about anything. This is especially true during extreme weather conditions such as droughts or severe winters. The identified deer-resistant plants are very low on their list of favourite foods.

Table 6: Prohibited Plant List

The following plants are prohibited in all areas of the Town of Canmore.

Common Name	Scientific Name	Comments
Apple	*Malus spp.*	Wildlife Attractant – Bears
Crabapple	*Malus spp.*	Wildlife Attractant – Bears
Western Chokecherry	*Prunus virginiana melancarpa*	Wildlife Attractant – Bears
Plum	*Prunus spp.*	Wildlife Attractant – Bears
Western Mountain Ash	*Sorbus scopulinia*	Wildlife Attractant – Bears & Birds
Canadian Buffalo Berry aka: Soap Berry & Russet Buffalo Berry	*Shepherdia canadenis*	Primary Food Source for Bears Wildlife Attractant: Bears
Silver Buffalo Berry	*Sheperdia argentea*	Primary Food Source for Bears **Wildlife Attractant – Bears
Common Snowberry	*Symphoricarpos albus*	**Wildlife Attractant – Bears, Ungulates and Birds
Western Snowberry / Wolfberry	*Symphoricarpos occidentalis*	**Wildlife Attractant – Bears
Pincherry	*Prunus pensylvanica*	Wildlife Attractant – Bears
Wild Strawberry	*Fragaria virginiana*	**Wildlife Attractant – Bears & Birds
Saskatoon	*Amelanchier alnifolia*	Wildlife Attractant - Bears
Red Osier Dogwood	*Cornus stolonifera*	**Wildlife Attractant – Bears & Ungulates
Wolf Willow	*Elaeagnus commutata*	**Wildlife Attractant – Bears
Common Wild Rose aka: Western Wild Rose	*Rosa woodsii*	**Wildlife Attractant – Bears
Prickly Rose	*Rosa acicularis*	**Wildlife Attractant – Bears
Twining Honeysuckle	*Lonicera dioica*	**Wildlife Attractant – Bears & Hummingbirds)
Bracted Honeysuckle	*Lonicera involucrata*	**Wildlife Attractant – Bears

Common Name	Scientific Name	Comments
Yellow Hedysarum / Yellow Sweet-vetch	*Hedysarum sulphurescens*	**Wildlife Attractant – Bears
False Salomon Seal	*Maianthemum stellatum*	**Wildlife Attractant – Bears, Ungulates and Birds
Tall Bluebell Lungwort	*Mertensia paniculata*	**Wildlife attractant – Grizzly Bears & Ungulates
Hawthorn	*Crataegus spp.*	**Wildlife Attractant – Bears
Buckthorn	*Rhamnus carthartica*	**Wildlife Attractant – Bears
Gout Weed/ Ground Elder	*Aegopodium podagraria*	**Wildlife Attractant – Bears
Wild Red Raspberry	*Rhubus idaeus*	**Wildlife Attractant – Bears
Alpine Currant	*Ribes alpinum*	**Wildlife Attractant – Bears
Golden Flowering Currant	*Ribes aurem*	**Wildlife Attractant – Bears
Bristly Black Currant	*Ribes lacustre*	**Wildlife Attractant – Bears
Highbush Cranberry/Cranberry Viburnum	*Virburnum trilobum*	**Wildlife Attractant – Bears
Cottoneaster	*Cotoneaster lucidus*	**Wildlife Attractant – Bears
Peking Cottoneaster	*Cotoneaster acutifolius*	**Wildlife Attractant – Bears
Wild/Northern Gooseberry	*Ribes oxycanthoides*	**Wildlife Attractant – Bears
Elderberry	*Sambucus canadensis*	**Wildlife Attractant – Bears
Note: This is not an exhaustive list. All fruit trees and any plant considered palatable to bears are prohibited.		

Table 7: Boulevard Trees

The following trees are acceptable for boulevard and/or median planting in the Town of Canmore.

Common Name	Scientific Name
Deciduous Trees	
Balsam Poplar	*Populus balsamifera* (male only)
Green Ash (*)	*Fraxinus pensylvanica Lanceolata or Foothills*

Common Name	Scientific Name
Deciduous Trees	
Patmore Ash (*)	*Fraxinus pensylvanica 'Patmore'*
Prairie Spire Ash (*)	*Fraxinus pensylvanica 'Rugby'*
Patmore Elm (*)	*Ulmus Americana 'Patmore'*
American Elm (*)	*Fraxinus pensylvanica 'American'*
Night Rider Elm (*)	*Ulmus 'Night Rider'*
Dropmore Linden (*)	*Tillia x flavescens*
American Linden (*)	*Tilia americana*
Littleleaf Linden (*)	*Tilia cordata*
Ivory Silk Lilac (*)	*Syringa reticula 'Ivory Silk'*
Coniferous Trees (boulevards >6m)	
Limber Pine	*Pinus Flexilis*
White Spruce	*Picea glauca*
Engleman Spruce/ aka Mountain Spruce	*Picea engelmannii*
Black Spruce	*Picea Mariana*
Douglas Fir	*Pseudotsuga Menziesii var.Glauca*

Table 8: Private Property – Additional Planting

The following trees and shrubs are acceptable for private properties/development. These species are in addition to those listed in Tables F1-F4 (inclusive).

Deciduous Trees	
Common Name	**Scientific Name**
Amur Maple (seedless cultivar only)	*Acer ginnala*
Silver Cloud Maple	*Acer Sccharinum 'Silver Cloud'*
Clump Paper Birch	*Betula papyrifera 'clump'*
Cutleaf Weeping Birch	*Betula pendula 'Dalecarlica'*
Calypso White Ash	*Fraxinus americana*
Manchurian Ash	*Fraxinus mandshurica 'Mancana'*
Fallgold Black Ash	*Fraxinus nigra 'Fallgold'*
Northern Gem Ash	*Fraxinus 'Northern Gem'*
Northern Treasure Hybrid Ash	*Fraxinus 'Northern Treasure'*
Weeping Larch	*Larix decidua 'Pendula'*
Siberian Larch	*Larix sibirica*
Assiniboine Poplar	*Populus 'Assiniboine'*
Byland Green Poplar	*'Populus x 'Byland Green'*
Prairie Sky Poplar	*Populus 'Prairie Sky'*

Deciduous Trees	
Common Name	**Scientific Name**
Sargents Poplar	*Populus sargentii*
Tower Poplar	*Populus x canescens 'Tower'*
Swedish Columnar Aspen	*Populus tremula 'Erecta'*
Trembling Aspen	*Populus tremuloides*
Sharpleaf Willow	*Salix acutifolia*
Golden Willow	*Sailx alba 'Vitellina'*
Laurel Leaf Willow	*Salix pentandra*
Marquette Pussy Willow	*Salix x 'Marquette'*

Deciduous Shrubs	
Common Name	**Scientific Name**
Dwarf Birch	*Betula Nana*
Annabelle Hydrangea	*Hydrangea arborescens 'Annabelle'*
Pee Gee Hydrangea	*Hydrangea paniculata 'Graniflora'*
Waterton Mockorange	*Philadelphus lewisii 'Waterton'*
Minnesota Snowflake Mockorange	*Philadelphus x virginalis 'Minnesota Snowflake'*
Potentilla	*Potentilla fruticosa, hardy varieties*
Blue Fox Willow	*Salix brachycarpa 'Blue Fox'*
Hakura Nishiki Tricolour Willow	*Salix integra 'Albomaculata'*
Dwarf Arctic Willow	*Salix purpurea 'Gracilis'*
Creeping Willow	*Salix repens 'Var. argentea'*
American McKay Willow	*Salix rigida 'American McKay'*
Polar Bear Willow	*Salix salicola 'Polar Bear'*
False Spirea	*Sorbaria sorbifolia*
Sem False Spirea	*Sorbaria sorbifolia 'Sem'*
Lilacs	*Syringa x hyacinthiflora, hardy varieties*
	Syringa x meyeri, hardy varieties
	Syringa x prestoniea, hardy varieties
	Syringa vulgaris, hardy varieties

Coniferous Trees ***Please note coniferous plants should only be considered in FireSmart appropriate locations. Contact Town of Canmore Parks for more information: parks@canmore.ca**	
Common Name	**Scientific Name**
Weeping White Spruce	*Picea glauca 'Pendula'*
Colorado Spruce	*Picea pungens*

Coniferous Trees ***Please note coniferous plants should only be considered in FireSmart appropriate locations. Contact Town of Canmore Parks for more information: parks@canmore.ca**	
Common Name	**Scientific Name**
Bakeri Blue Spruce	*Picea pungens 'Bacheri'*
Upright Colorado Spruce	*Picea pungens 'Fastigiata'*
Fat Albert Blue Spruce	*Picea pungens 'Fat Albert'*
Hoopsii Spruce	*Picea pungens 'Hoopsii'*
Montgomery Blue Spruce	*Picea pungens 'Montgomery'*
Bristlecone Pine	*Pinus aristata*
Swiss Stone Pine	*Pinus cembra*
Ponderosa Pine	*Pinus ponderosa*
Scotch Pine	*Pinus sylvestris*
Mountain Pine	*Pinus uncinata*

Coniferous Shrubs ***Please note coniferous plants should only be considered in FireSmart appropriate locations. Contact Town of Canmore Parks for more information: parks@canmore.ca**	
Common Name	**Scientific Name**
Effusa Juniper	*Juniperous communis 'Effusa'*
Blue Chip Juniper	*Juniperus horizontalis 'Blue Chip'*
Hughes Juniper	*Juniperus horizontalis 'Hughes'*
Icee Blue Juniper	*Juniperus horizontalis 'Icee Blue'*
Savin Juniper	*Juniperus sabina*
Creeping Blue Spruce	*Picea pungens 'Glauca Prostrata'*
St. Mary's Broom Creeping Blue Spruce	*Picea pungens 'St. Mary's Broom'*
Big Tuna Mugo Pine	*Pinus mugo 'Big Tuna'*
Dwarf Mugo Pine	*Pinus mugo 'var. pumilio'*
Mops Mugo Pine	*Pinus mugo 'Mops'*
Mugo Pine	*Pinus mugo 'Mughus'*
Slowmound Mugo Pine	*Pinus mugo 'Slowmound'*
Dwarf Blue Scotch Pine	*Pinus sylvestris 'Glauca Nana'*
Globe Blue Spruce	*Picea pungens 'Globosa'*

G. APPENDIX G: CONSTRUCTION MANAGEMENT PLAN

Construction Management Plan (CMP) Guidelines

(As a reference source to developers and builders)

When a construction management plan (CMP) is required as part of a subdivision servicing agreement or development agreement or development permit application (in which case the CMP is to be **provided prior to construction**), it must be specific to the proposed development and address the following issues, as applicable:

Outlining how the developer proposes to mitigate the adverse effects of construction and deal with such items as:

1) the stockpiling and temporary storage of excavation materials;
2) stockpiling and laydown areas for construction materials;
3) parking for contractor and employee vehicles;
4) access for construction vehicles and/or equipment;
5) access for emergency vehicles;
6) permanent location of disposal of excess excavation materials (if any);
7) dewatering and disposing of groundwater (if required);
8) controlling storm water runoff, minimizing erosion and off-site transport of sediment and deposition of sediment in storm sewers;
9) screening and storage of supplies and building materials;
10) site fencing and access control to protect public safety;
11) fencing or other approved methods of preservation of existing vegetation within setback and non-disturbance areas;
12) noise, litter, dust and mud control and mitigation, including vehicle baths at the site entrance (see: Erosion and Sediment Control plan below);
13) Spill response plan;
14) weed control (if the project is of sufficient duration);
15) reduction of construction waste through segregation, re-use and recycling;
16) haul routes to maximize use of established truck routes (see Figure A) and to minimize impact on adjacent streets;
17) methods to prevent access and damage to adjacent municipal properties (i.e. parks, municipal and environmental reserves, PUL's);
18) signage to indicate 24/7 emergency contact telephone numbers;
19) management of concrete truck wash-out;
20) demonstrate that Provincial and Federal regulations in regards to Migratory Birds are respected when tree clearing is proposed;
21) dedicated animal proof waste containers for food waste;
22) management of wildlife encounters;
23) sanitary facilities;
24) muster stations;
25) Contact list including contractor, Engineer and Emergency contacts.
26) identification and location of overhead cranes, their swing radius and crane swing limitations (No Fly Zones);
27) location of limits of excavation adjacent to roads or laneways and proposed means of protection (i.e. concrete Jersey barriers or engineered extensions of the shoring piles)
28) location of street and sidewalk closures expected to last longer than three weeks

SAMPLE

Prior to Construction, the Developer shall submit a comprehensive and detailed photo record of existing Municipal Infrastructure including the date of capture. This record will be used to resolve disputes regarding damage to existing infrastructure.

In addition, the Developer, should provide a written commitment by signing below, to indicate that they have read and understand the related articles of the Development Agreement or Subdivision Servicing Agreement as applicable to the development, and the contents of Bylaw 15-2001, and will not:

a) place any building materials, building tools, machinery, or construction device on;
b) park, leave, stand or station a mobile crane or other mobile building construction machine on;
c) load or unload material, machinery or equipment of any kind used in connection with a building operation of any nature upon; or
d) leave standing a portable garbage container on any portion of a Public Roadway or Public Lands unless separate application has first been made to, and approval has been granted by the Town for a Road Use or Excavation & Road Use Permit in accordance with Bylaw No. 2020-03.

and

Submit Erosion and Sediment Control documentation in accordance with the City of Calgary standards.

and

No Person shall, during the process of Construction Activities at a Construction Site or demolition at a Demolition Site, cause or allow to be caused, any damage to Municipal Improvements or Municipal Lands.

No Person shall operate, or allow to be operated, a Vehicle on any street, lane, sidewalk or Municipal Lands, as part of Construction Activities or demolition, in a manner that causes, or allows the causing of damage to Municipal Improvements or Municipal Lands.

Any work or works conducted on Municipal Improvements or Municipal Lands (including service connections, extensions, installations, repairs, upgrades and rehabilitation of Municipal Lands) as part of Construction Activities approved by the Town through a Development Permit or Building Permit, shall be done to the satisfaction of the Town and in accordance with the Town of Canmore Engineering Design Guidelines, Construction and Landscaping Standards, or other directions that may be provided in writing by the Town.

SAMPLE

The Construction Management Plan submitted shall be followed through all stages of construction. If Town Bylaws are being violated or if the accepted Construction Management is not being adhered to, a Stop Work order will be delivered without warning and all construction shall cease until all violations have been rectified to the satisfaction of the Town of Canmore.

I have read and understand the above requirements and will abide by these requirements:

_____	_____	_____
Signed	Name	DP Number
_____	_____	
Phone Contact	Date	

_____

Agent for:

_____

Site Address and Legal Description

SAMPLE

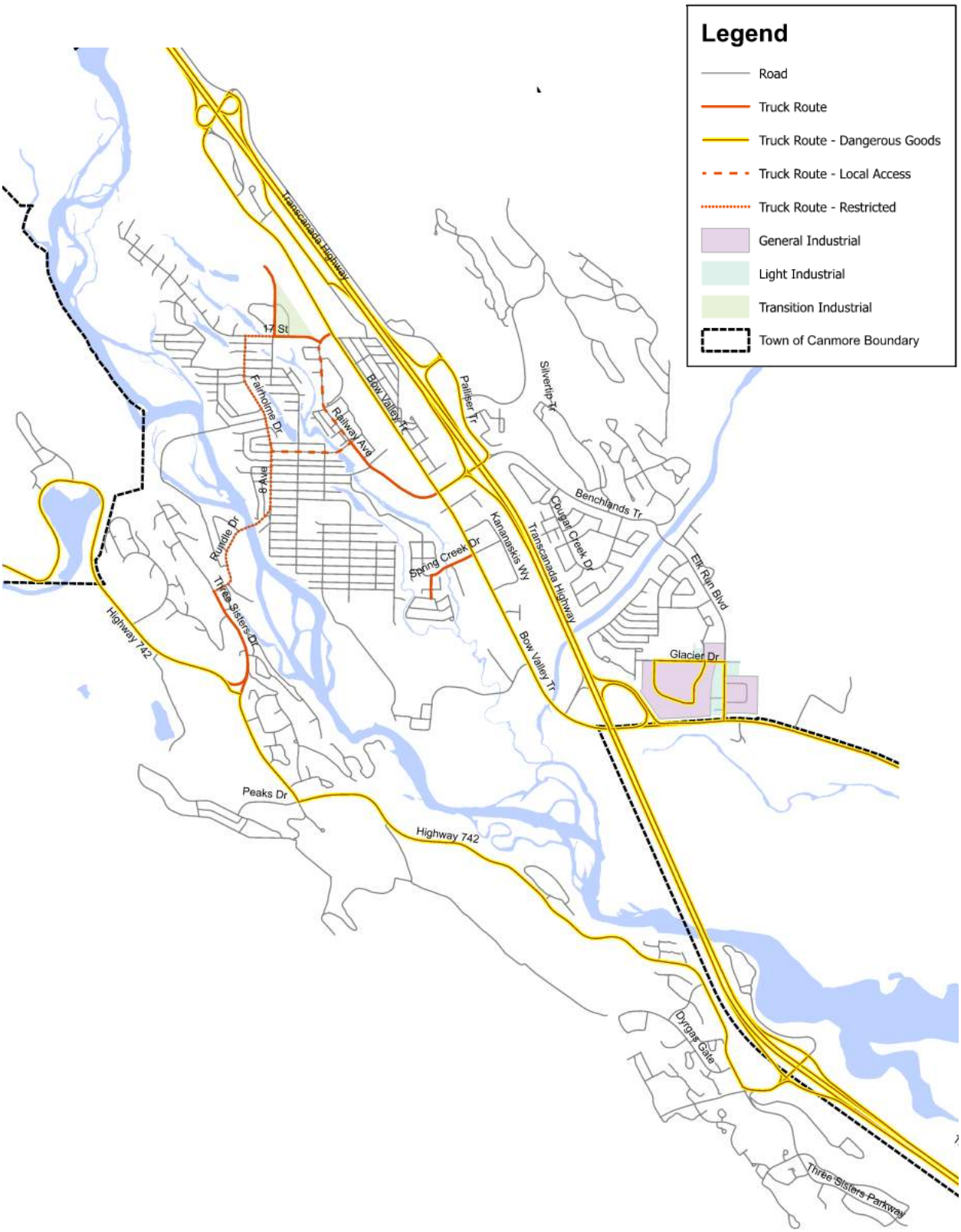


Figure A: Truck Routes and Dangerous Goods Movement Routes

H. APPENDIX H: FIGURES

LIST OF FIGURES

1. INTRODUCTION

No Figures

2. APPLICATIONS AND PERMITS

3. SITE GRADING AND DRAINAGE

4. WATER SYSTEM

5. SANITARY SYSTEM

6. STORMWATER

7. TRANSPORTATION SYSTEMS

8. SHALLOW UTILITIES

9. HAZARDS AND LOCAL CONDITIONS

10. LANDSCAPE DESIGN GUIDELINES

11. SOLID WASTE

GRADING PLAN REQUIREMENTS

ITEM REQUIRED	SIZE OF DEVELOPMENT		
	SMALL	MED & LARGE	LARGE SUBDIVISION
LAND USE	REQUIRED	REQUIRED	–
LOT #	REQUIRED	REQUIRED	N/A
CIVIC ADDRESS	REQUIRED	REQUIRED	N/A
LEGAL FOOTPRINT OF EXISTING LOT SHOWING SETBACKS (TO SCALE)	REQUIRED	REQUIRED	N/A
LEGAL FOOTPRINT OF PROPOSED LOTS (TO SCALE)	REQUIRED	N/A	REQUIRED
LEGAL FOOTPRINT OF PROPOSED/EXISTING ROW'S (TO SCALE)	REQUIRED	REQUIRED	REQUIRED
AREA OF BUILDING FOOTPRINT	REQUIRED	REQUIRED	N/A
AREA OF HABITABLE BUILDING SPACE	REQUIRED	REQUIRED	N/A
EXISTING AND PROPOSED GRADES ALONG PROPERTY LINES – MIN. EVERY 5m	REQUIRED	REQUIRED	REQUIRED
EXISTING AND PROPOSED GRADES ALONG BUILDING FACES – MIN. EVERY 5M	REQUIRED	REQUIRED	N/A
AVERAGE LOT ELEVATION – PRE DEVELOPMENT	REQUIRED	REQUIRED	REQUIRED
AVERAGE LOT ELEVATION – POST DEVELOPMENT (SEE NOTE 1)	REQUIRED	REQUIRED	REQUIRED
MAIN FLOOR ELEVATION (SEE NOTE 2)	REQUIRED	REQUIRED	REQUIRED
LOWEST GARAGE/PARKADE ELEVATION (IF APPLICABLE)	REQUIRED	REQUIRED	REQUIRED
100 YEAR GROUNDWATER ELEVATION (SEE NOTE 4)	REQUIRED	REQUIRED	REQUIRED
LOWEST TOP OF FOOTING	REQUIRED	REQUIRED	REQUIRED
FILL BEARING CERTIFICATE – LETTER FROM GEOTECHNICAL ENGINEER	REQUIRED	REQUIRED	REQUIRED
WEEPING TILE REQUIRED – LETTER FROM GEOTECHNICAL ENGINEER	REQUIRED	REQUIRED	REQUIRED
LOWEST INVERT OF WEEPING TILE – AT FOOTING	REQUIRED	REQUIRED	N/A
LOWEST INVERT OF WEEPING TILE – AT DISCHARGE	REQUIRED	REQUIRED	N/A
SANITARY INVERT AT PROPERTY LINE (SEE NOTE 3)	REQUIRED	REQUIRED	REQUIRED
SANITARY INVERT AT BUILDING FACE	REQUIRED	REQUIRED	N/A
STORM INVERT AT PROPERTY LINE (SEE NOTE 3)	REQUIRED	REQUIRED	REQUIRED (IF APPLICABLE)
STORM INVERT AT BUILDING FACE	REQUIRED	REQUIRED	N/A
WATER SERVICE – LOT(S) PRE SERVICED (YES/NO)	YES/NO	YES/NO	YES/NO
CC IN PLACE (YES/NO)	YES/NO	YES/NO	YES/NO
DIAMETER OF WATER SERVICE	REQUIRED	REQUIRED	REQUIRED
GROUNDWATER CONTOUR ELEVATIONS 0.5m ELEVATIONS	NO	NO	IF APPLICABLE

NOTE 1 – FOR BUILDING FOOTPRINT, TAKE ELEVATION OF UNDERSIDE OF LOWEST SLAB

NOTE 2 – MAIN FLOOR ELEVATION WILL BE DICTATED AT SUBDIVISION STAGE, GRAVITY SERVICING WILL BE REQUIRED FOR THIS ELEVATION

NOTE 3 – SUBDIVISIONS WILL BE REQUIRED TO PROVIDE INVERTS AT SERVICE STUB LOCATION FOR ALL LOTS, DEVELOPMENTS WILL BE REQUIRED TO REFERENCE SUBDIVISION PLAN

NOTE 4 – ALL PLANS (ARCH, CIVIL AND LEGAL), MUST BE CLEAR WHEN SPECIFYING THE 100 YEAR GWL. THE DRAWING REFERENCED SHOULD BE STATED

All dimensions in Metric meters unless otherwise noted

SCALE: N/A	FIGURE NO.: AP 2.1	GRADING PLAN REQUIREMENTS					
3	01/27/25	2D25 EDCG	BWM	BK	BK	PERMIT	SEAL
2	10/23/23	2D23 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE 95819 RM APEGA ID# DATE Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2D19 EDCG	BWM	BB	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

CANMORE

FEB. 28, 2025

SAMPLE ELEVATIONS

- ℄ REAR ELEVATION
- LAND USE
- LOT #
- CIVIC ADDRESS
- MAXIMUM BUILDING HEIGHT ELEVATION AS CALCULATED USING TOWN LAND USE BYLAW (F = FRONT, R = REAR) }

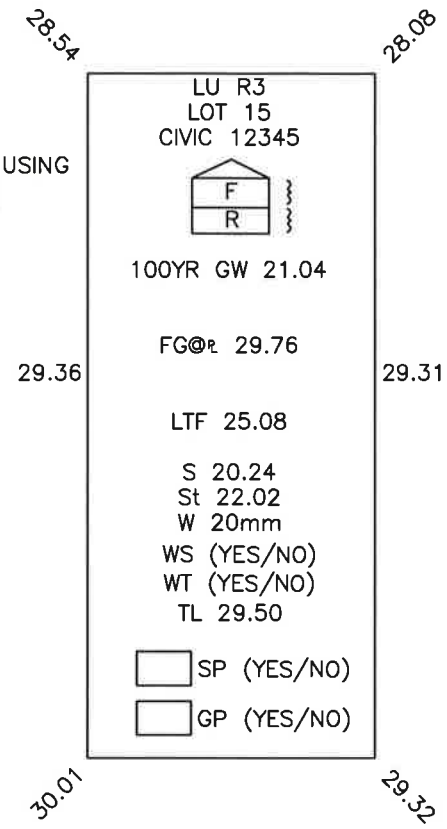
- 100YR GROUNDWATER ELEVATION
- GRADES AT CORNERS OF PROPERTY AND AT MIDPOINTS WHERE LENGTHS GREATER THAN 10M
- RECOMMENDED FRONT GRADE AT HOUSE
- MID–LOT GRADE AT PROPERTY LINE

- LOWEST TOP OF FOOTING

- SANITARY INVERT AT STUB
- STORM INVERT AT STUB (IF APPLICABLE)
- DIAMETER OF WATER SERVICE (SEE NOTE 1.)
- WATER SERVICE (COILED & BOXED) (Y OR N)
- WEEPING TILE TO STORM (IF APPLICABLE)
- TRAPPED LOW MAX. ELEVATION (IF APPLICABLE)

- SUMP PUMP REQUIRED (Y OR N)
- SANITARY GRINDER PUMP REQUIRED (Y OR N)

- DRAINAGE FEATURES (BERMS, SWALE, ETC)
- DRIVEWAY LOCATION
- FRONT ELEVATION (IF APPLICABLE)



NOTES

1. LOTS REQUIRING PRESSURE REDUCTION TO BE DESIGNATED BY ADDING P.R. IMMEDIATELY AFTER THE SERVICE SIZE (I.E. W 20 MM P.R.).
2. LETTER FROM GEOTECHNICAL ENGINEER WILL BE REQUIRED IF WEEPING TILE IS NOT INSTALLED.
3. FILL BEARING CERTIFICATE REQUIRED FOR ALL LOTS.
4. DEVELOPERS ARE ENCOURAGED TO ADD ADDITIONAL INFORMATION WHERE NEEDED FOR GUIDANCE AND CLARITY.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: AP 2.2	BUILDING GRADE PLAN - MINIMUM REQUIREMENTS					
3	01/27/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
2	10/23/23	2023 EDCG	BWM	BK	BK			
1	04/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

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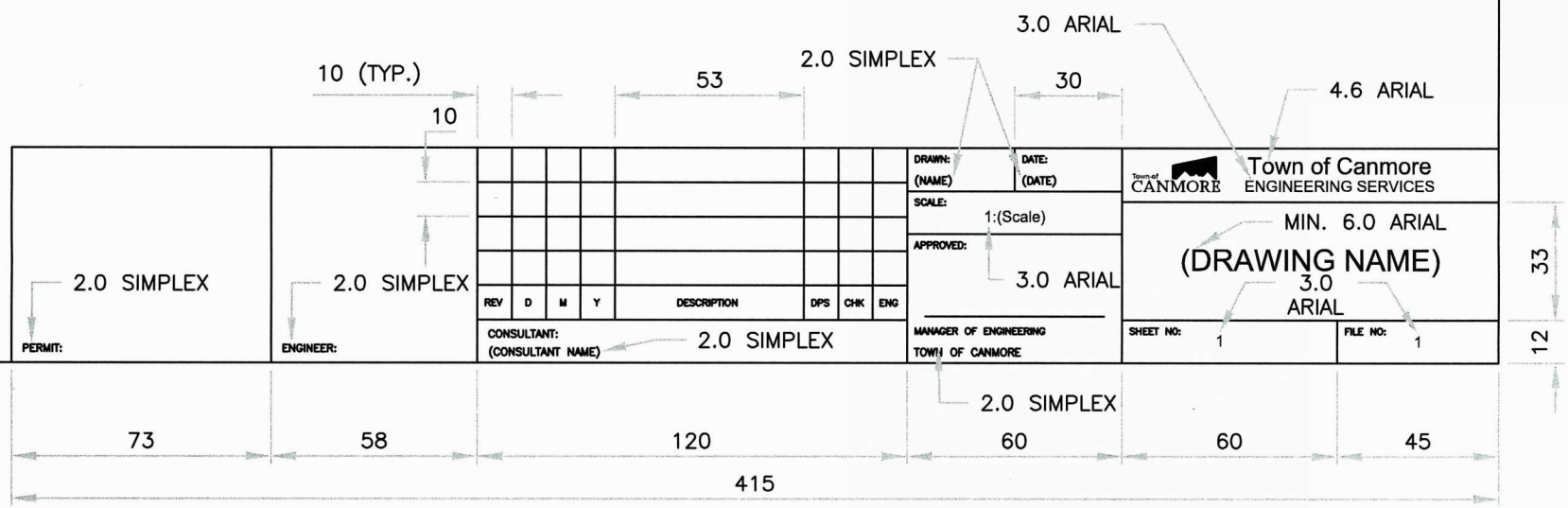

NOTES

1. ALL TEXT TO BE SIMPLEX STYLE, HEIGHT 1.8 EXCEPT WHERE NOTED. DIMENSIONS IN MILLIMETRES.
2. DIGITAL COPIES IN AUTOCAD FORMAT CAN BE OBTAINED BY CONTACTING THE ENGINEERING DEPARTMENT AT 403 678 1548

All dimensions in Metric meters unless otherwise noted

SCALE: 1:2	FIGURE NO.: AP 2.3	DRAWING TITLE BLOCK SPECIFICATIONS - HORIZONTAL LAYOUT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3	01/27/25	2025 EDCG	BWM	BK	BK
2	08/14/19	2019 EDCG	BWM	BB	BB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

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BRIAN KINZIE
ID 66135

Town of CANMORE

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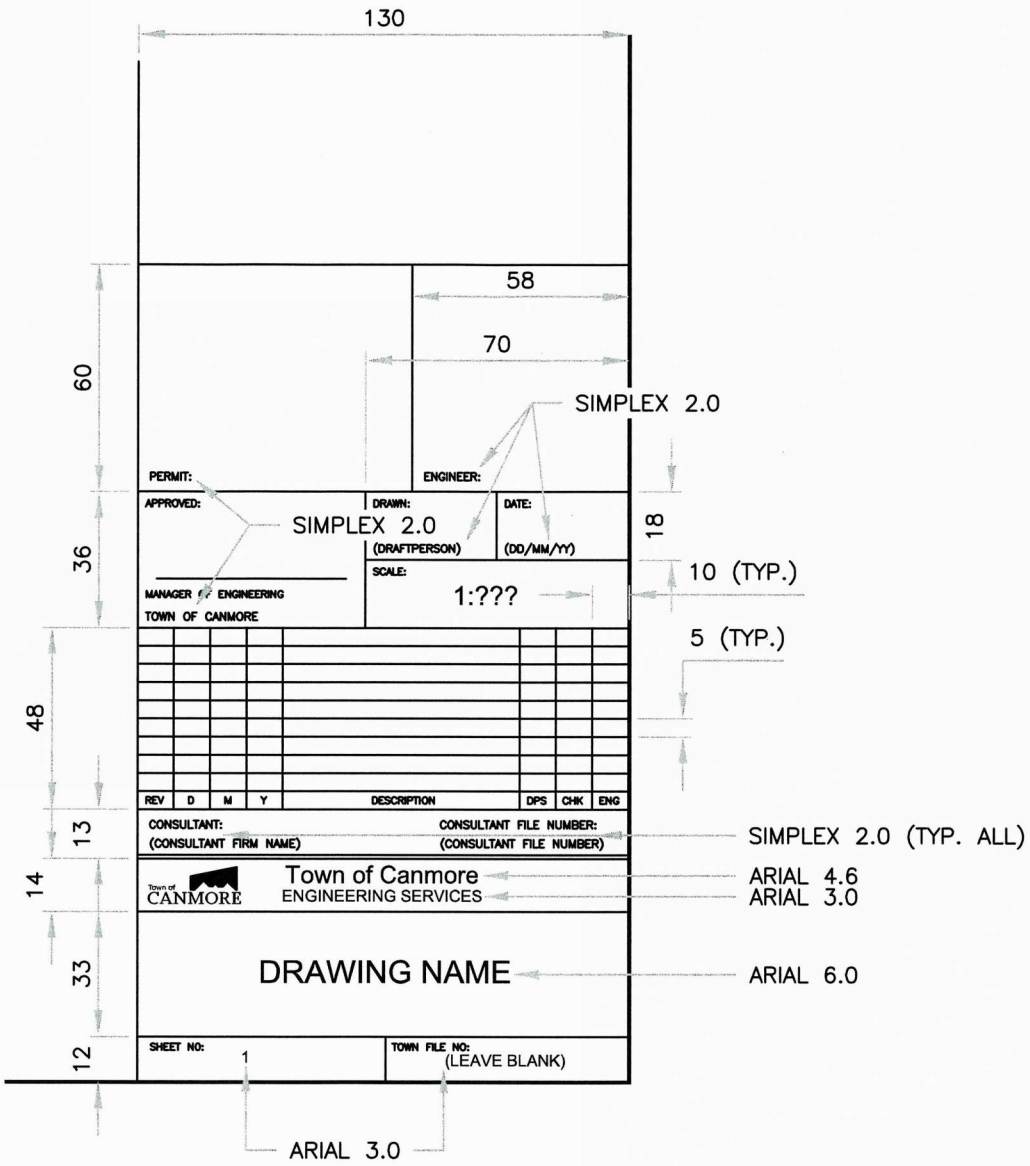

NOTES

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2. DIGITAL COPIES IN AUTOCAD FORMAT CAN BE OBTAINED BY CONTACTING THE ENGINEERING DEPARTMENT AT 403 678 1548

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SCALE: 1:2		FIGURE NO.: AP 2.4	DRAWING TITLE BLOCK SPECIFICATIONS - VERTICAL LAYOUT				
3	01/27/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	08/14/19	2019 EDCG	BWM	BB	CB		
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE

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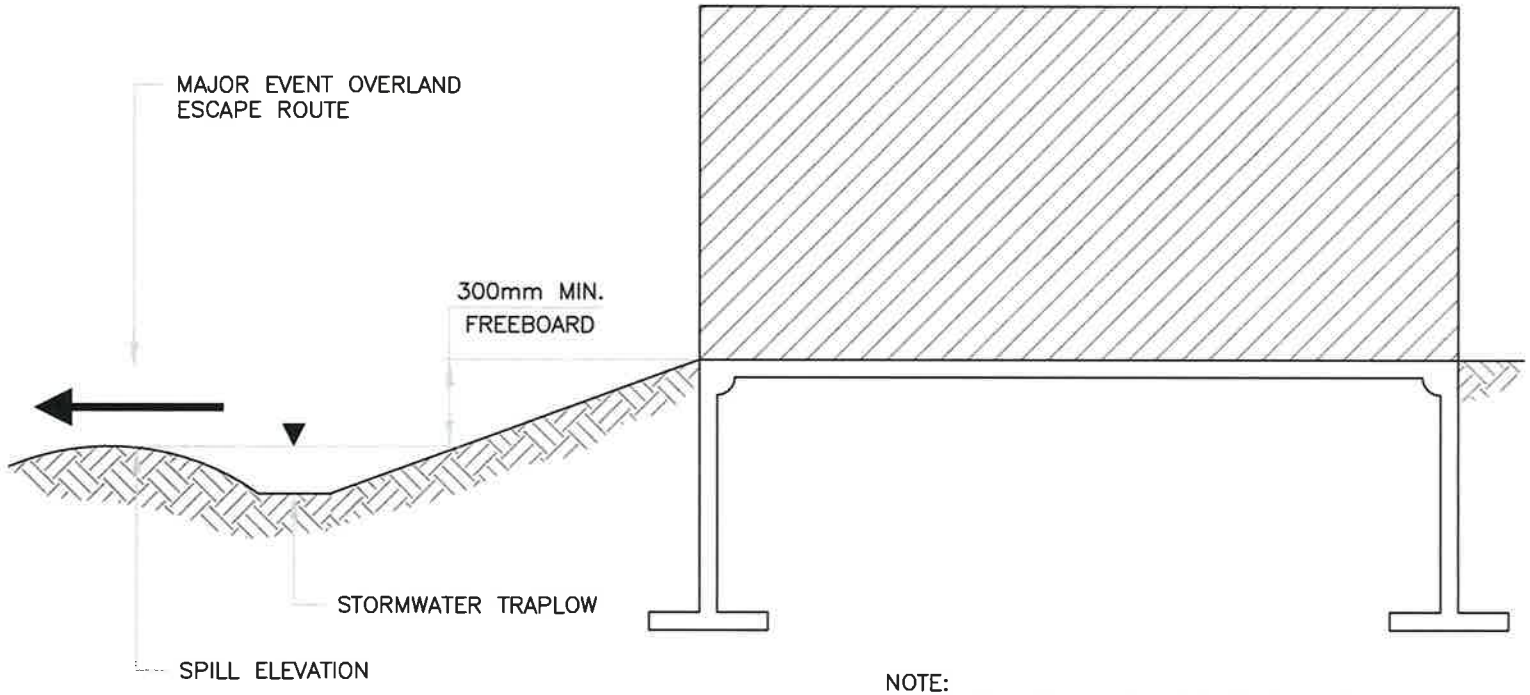

NOTE:
REFER TO CITY OF CALGARY STORMWATER MANAGEMENT GUIDELINES FOR MINIMUM FREEBOARD REQUIREMENTS. MINIMUM FREEBOARD FOR OVERLAND FLOW ROUTES IS 300mm, HOWEVER 150mm MAY CONSIDERED IN EXTENUATING CIRCUMSTANCES AND ONLY WHERE OVERLAND FLOW IS CONVEYED VIA HARD SURFACING.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: GRD 3.1	OVERLAND ESCAPE ROUTE					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT	SEAL
2	10/23/23	2023 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	BK	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

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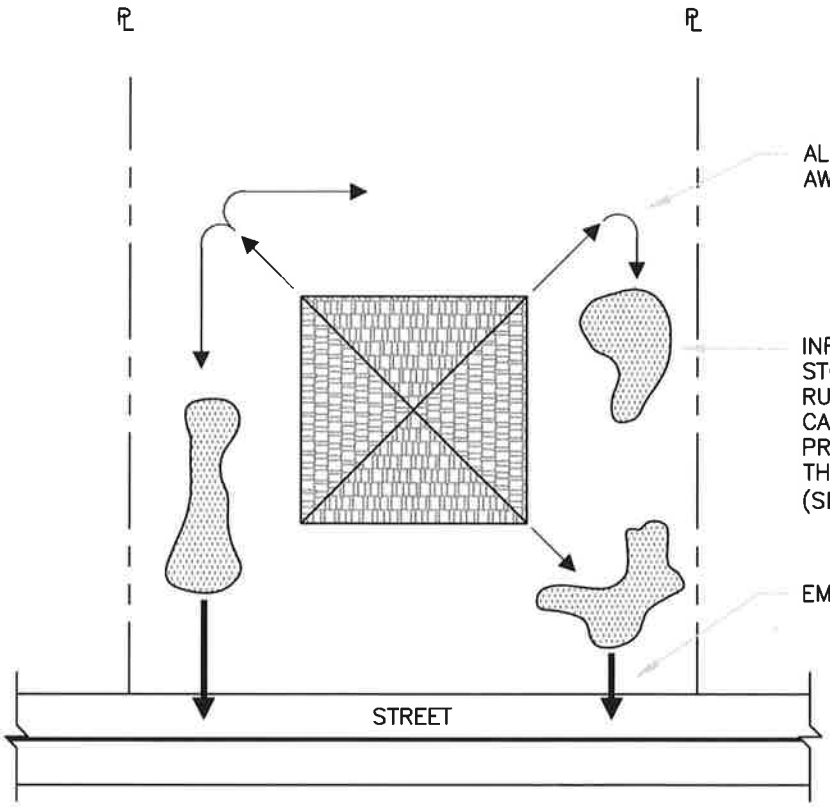

ALL OVERLAND DRAINAGE TO BE DIRECTED AWAY FROM FOUNDATIONS

INFILTRATION GARDENS TO CATCH SMALLER STORMS – TO BE PLACED PRIOR TO RUNOFF REACHING MOTOR VEHICLE CARRIAGE WAY. PLACEMENT DEPENDS ON PRACTICALLY AND EXISTING VEGETATION THAT WILL REMAIN.
(SEE STORM WATER SECTION FOR DETAILS)

EMERGENCY (MAJOR EVENT) ESCAPE ROUTE

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: GRD 3.2	LOTS IN VALLEY BOTTOM - GENERAL GRADING					
3						PERMIT	SEAL	
2	D1/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE 95819 DATE Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
1	D8/14/19	2D19 EDCG	BWM	BK	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

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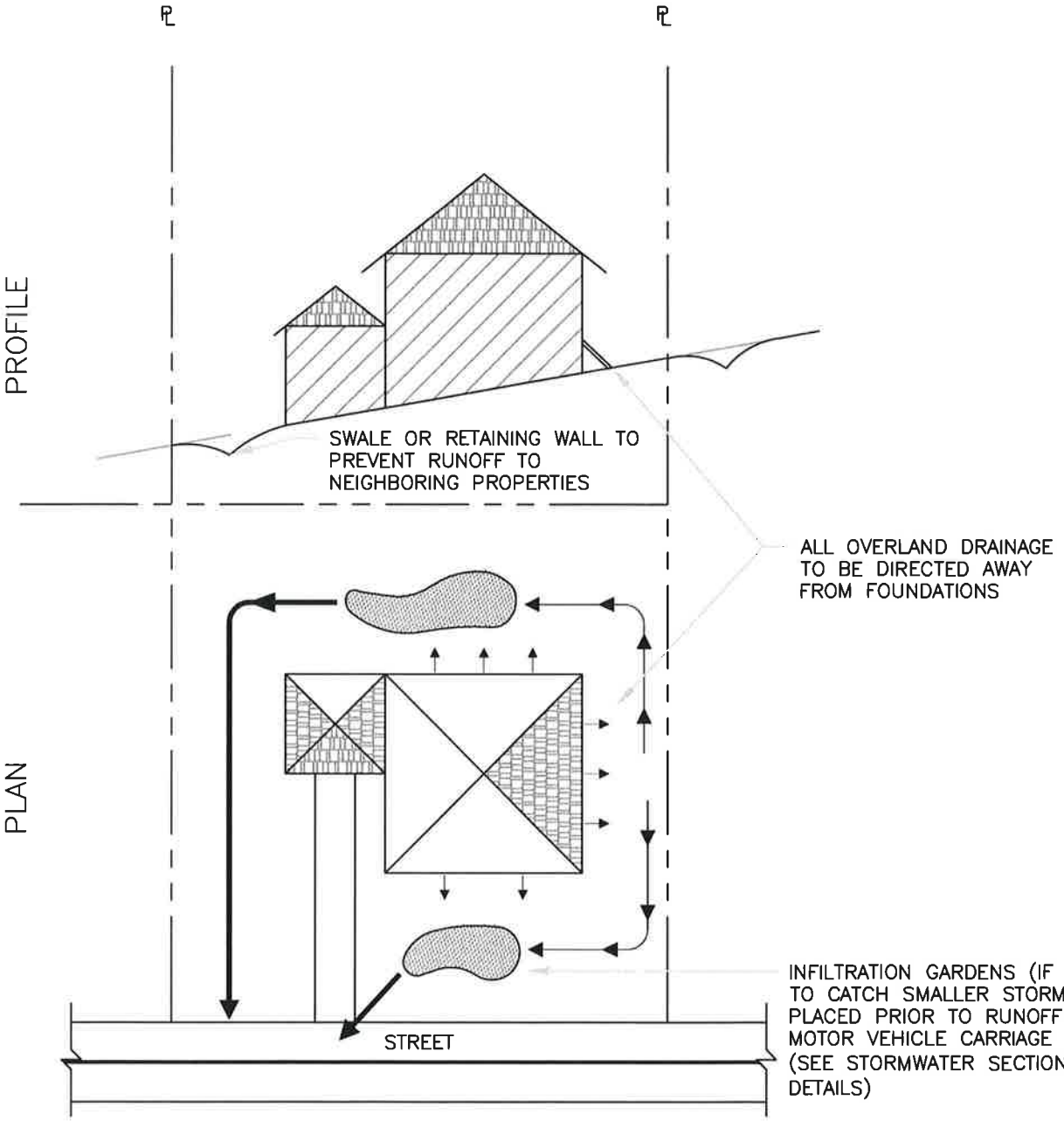

All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: GRO 3.3	LOTS ON SLOPES - GENERAL GRADING

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	BK	BK
1	08/14/19	2019 EDCG	BWM	BK	CB

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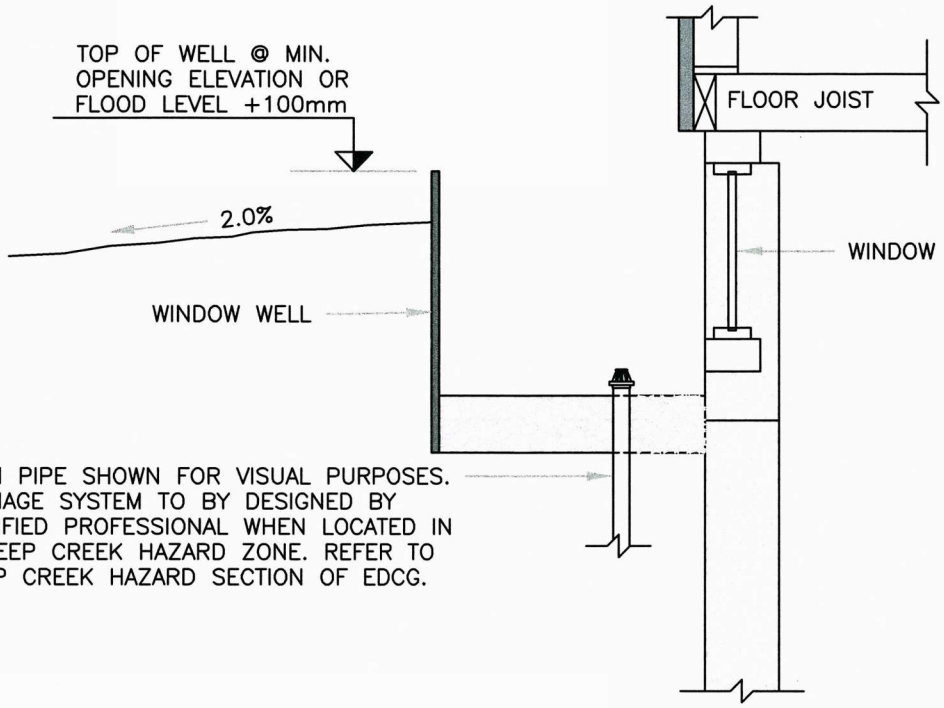
BRIAN KINZIE
ID 66135

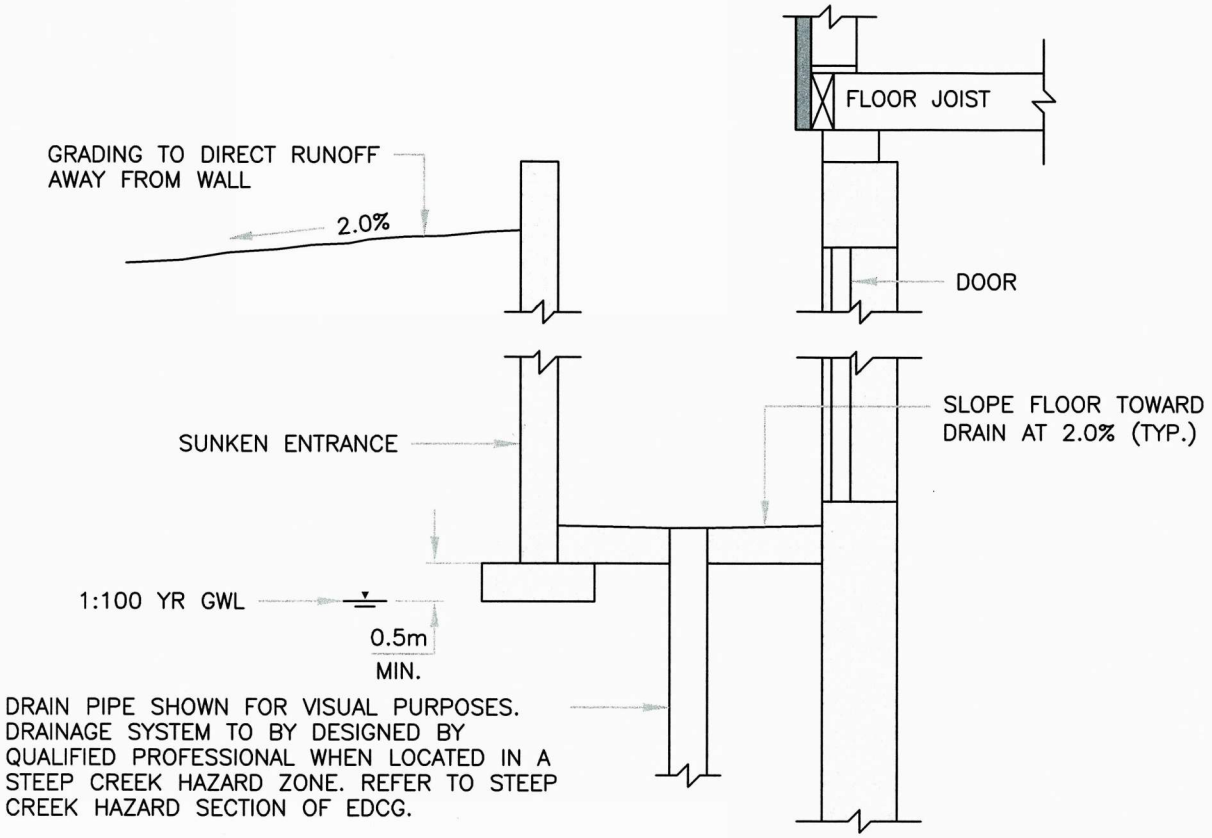
Town of CANMORE

FEB. 28, 2025



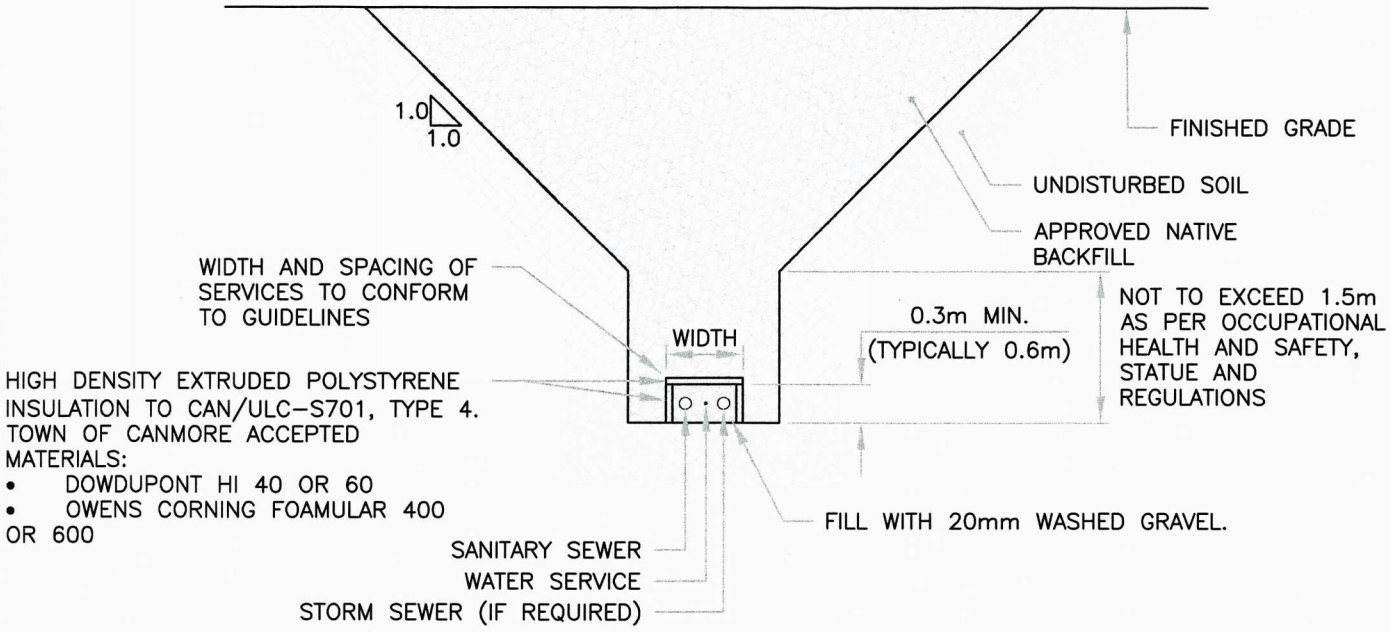
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: GRD 3.4	WINDOW WELL DRAIN					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: [signature] RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA FELIX CAMIRE ID 155442 [signature] FEB 28, 2025	Town of CANMORE
2	10/23/23	2023 EDCG	BWM	FC	BK			
1	08/14/19	2019 EDCG	BWM	FC	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: GRD 3.5	SUNKEN ENTRANCES					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA FELIX CAMIRE ID 155442 Feb 28, 2025	Town of CANMORE
2	10/24/23	2023 EDCG	BWM	FC	BK			
1	08/14/19	2019 EDCG	BWM	FC	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



BOX (INVERTED 'U') INSULATION REQUIREMENTS

GRAVITY SEWER SERVICES INDEPENDENT OF OTHER SERVICES TO BE INSULATED AS FOLLOWS			
Depth of Cover	Insulation Width (m)	Vertical Leg Height (m)	Insulation Thickness (mm)
1.00 - 1.149	1.8	0.6	100
1.150-1.299	1.8	0.6	100
1.300-1.449	1.2	0.6	100
1.450-1.599	1.2	0.6	75
1.600-1.749	0.8	0.6	75
1.750-1.899	0.8	0.6	50
1.900-2.049	0.8	0.6	50
2.050-2.199	0.8	0.6	50
2.200-2.349	0.8	0.6	50
2.350-2.499	0.6	0.6	50

COMBINED SERVICES: WATER, GRAVITY SEWER AND LOW PRESSURE SEWER TO BE INSULATED AS FOLLOWS			
Depth of Cover	Insulation Width (m)	Vertical Leg Height (m)	Insulation Thickness (mm)
1.00 - 1.149	2.4	0.6	100
1.150-1.299	2.4	0.6	100
1.300-1.449	2.4	0.6	100
1.450-1.599	1.8	0.6	100
1.600-1.749	1.8	0.6	100
1.750-1.899	1.8	0.6	100
1.900-2.049	1.8	0.6	75
2.050-2.199	1.8	0.6	50
2.200-2.349	1.8	0.6	50
2.350-2.499	1.2	0.6	50
2.500-2.649	1.2	0.6	50
2.650-2.799	0.6	0.6	50
2.800-2.949	0.6	0.6	50
2.950-3.099	0.6	0.6	50
3.100-3.249	0.6	0.6	50
3.250-3.399	0.6	0.6	50

NOTES

1. FOR SERVICES LARGER THAN 150mm, SITE SERVICING PLANS AND INSULATION DETAILS TO BE IN ACCORDANCE WITH CITY OF CALGARY, STANDARD SPECIFICATIONS. WATERWORKS CONSTRUCTION EXCEPT INSULATION MATERIALS TO BE AS NOTED ABOVE.
2. WHERE THE MINIMUM FROST PROTECTIVE COVERS CANNOT BE ACHIEVED, THE TOWN MAY ALLOW AN EXEMPTION IF AN ENGINEER CAN DEMONSTRATE INCORPORATION OF APPROPRIATE SPECIAL PRECAUTIONS IN THE SELECTION OF PIPE, BEDDING AND INSULATION MATERIAL.
3. AN ALTERNATIVE INSULATION DETAIL TO THE INVERTED "U" SHOWN IS A HORIZONTAL LAYER OF INSULATION TO THE SAME THICKNESS SHOWN AND WIDTH EQUAL TO THE INSULATION WIDTH PLUS TWO TIMES THE VERTICAL LEG HEIGHT SHOWN IN THE TABLES ABOVE.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.2	BOX INSULATION REQUIREMENTS - SERVICES & MAIN 150mm & SMALLER					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT	SEAL	
2	08/14/19	2019 EDCG	BWM	BB	CB	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
1	05/04/10	2010 EDCG	SP	PN	PN			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

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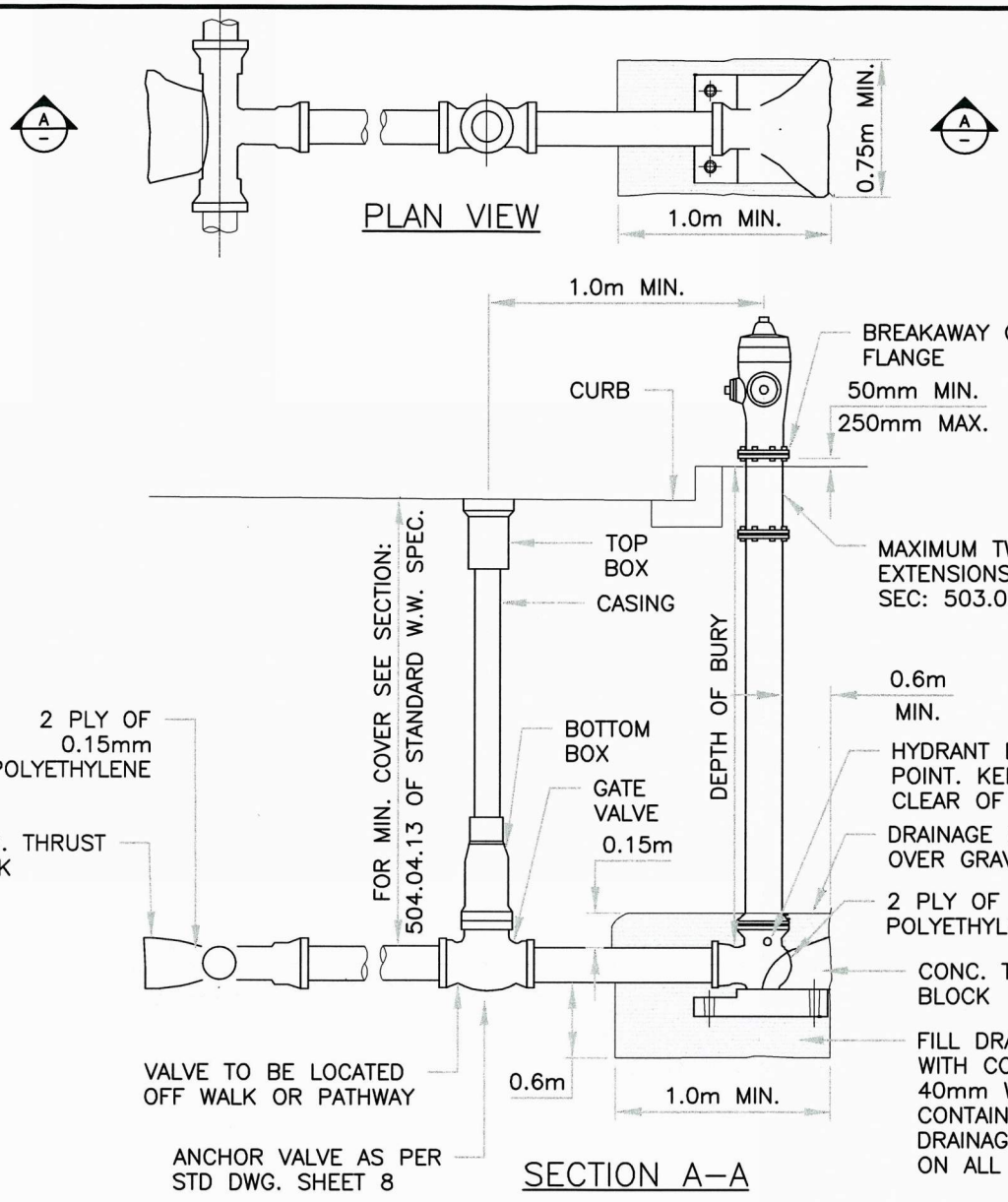

NOTES

1. THE EXTERIOR OF THE HYDRANT SHALL BE COATED AS SPECIFIED IN SECTION 503.02.00.
2. HYDRANTS IN HIGH WATER TABLE REQUIRED TO HAVE DRAINS PLUGGED. BE PAINTED RED AND MARKED. "FOR FIRE USE ONLY"
3. THE HYDRANT SHALL BE PLACED ON A CONCRETE PAD AS SHOWN IN DRAWING 453.1002.002.
4. DRAINAGE MEMBRANE SHALL BE PLACED OVER THE TOP OF THE STONES TO PREVENT THE SPACES BETWEEN THE STONES FROM BEING FILLED WITH
5. NON PERMEABLE MATERIAL.
6. PLACE 2 PLY OF 0.15MM POLYETHYLENE BETWEEN PIPE AND POURED CONCRETE.
7. CONCRETE SHALL BE SULFATE RESISTANT, 20 MPA @ 28 DAYS.
8. DRAINAGE MEMBRANE, SEE SEC. 319.00.00, STD. SPEC. ROADS CONSTRUCTION.
9. FOR CATHODIC PROTECTION REQUIREMENTS SEE SECTION 504.07.00.
10. REFERENCE TO SECTIONS AND STD. DWG. IS CITY OF CALGARY, STANDARD SPECIFICATIONS, WATERWORKS CONSTRUCTION, LATEST EDITION.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: WAT 4.4	HYDRANT DETAILS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	BK	BK
1	08/14/19	2019 EDCG	BWM	BB	CB

PERMIT

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The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

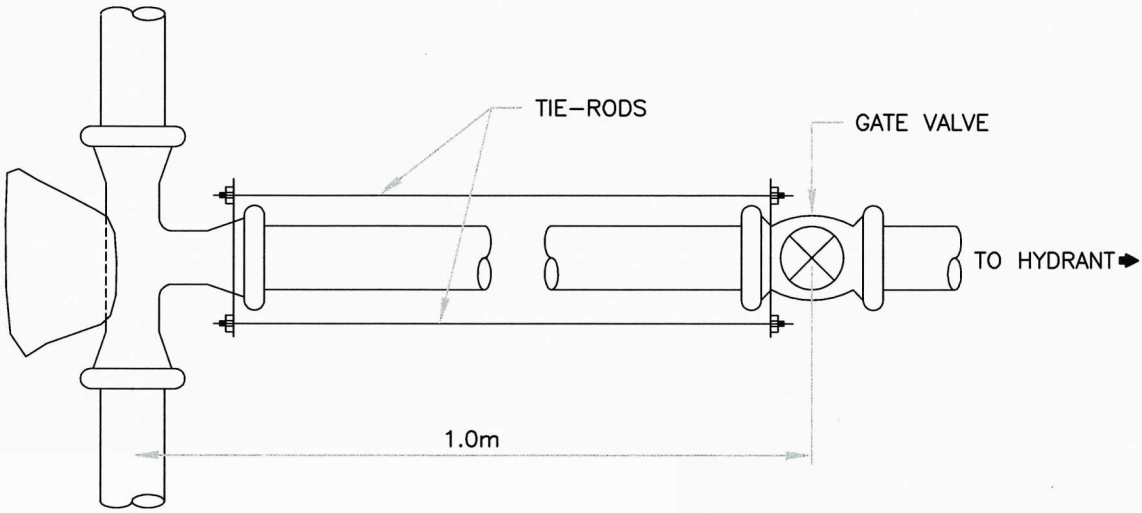
SEAL

PROFESSIONAL ENGINEER ALBERTA
BRIAN KINZIE
ID 66135

FEB. 28, 2025

Town of CANMORE

MODIFY CITY OF CALGARY DRAWING FILE NO.: 453.1002.001
TO INCLUDE THE FOLLOWING TIE BACK DETAIL FOR ALL HYDRANT VALVES:



NOTES

1. HYDRANT TEE TO BE CAST IRON, DUCTILE OR APPROVED EQUIVALENT.
2. TIE–BACK RODS, WASHERS AND HEXAGONAL NUTS TO BE FABRICATED FROM HIGH STRENGTH, LOW ALLOY STEEL IN ACCORDANCE WITH ANSI/AWWA C111/A21.11
3. COAT AND WRAP THE COMPLETED TIE–ROD AND COMPRESSION SLEEVE COUPLING INSTALLATION WITH DENSO MASTIC AND TAPE TO ENSURE ALL METAL COMPONENTS COVERED.
4. TYPICAL DETAIL FOR INSTALLING TEE AND GATE VALVE (HYDRANT LEAD) IN EXISTING WATER MAIN.

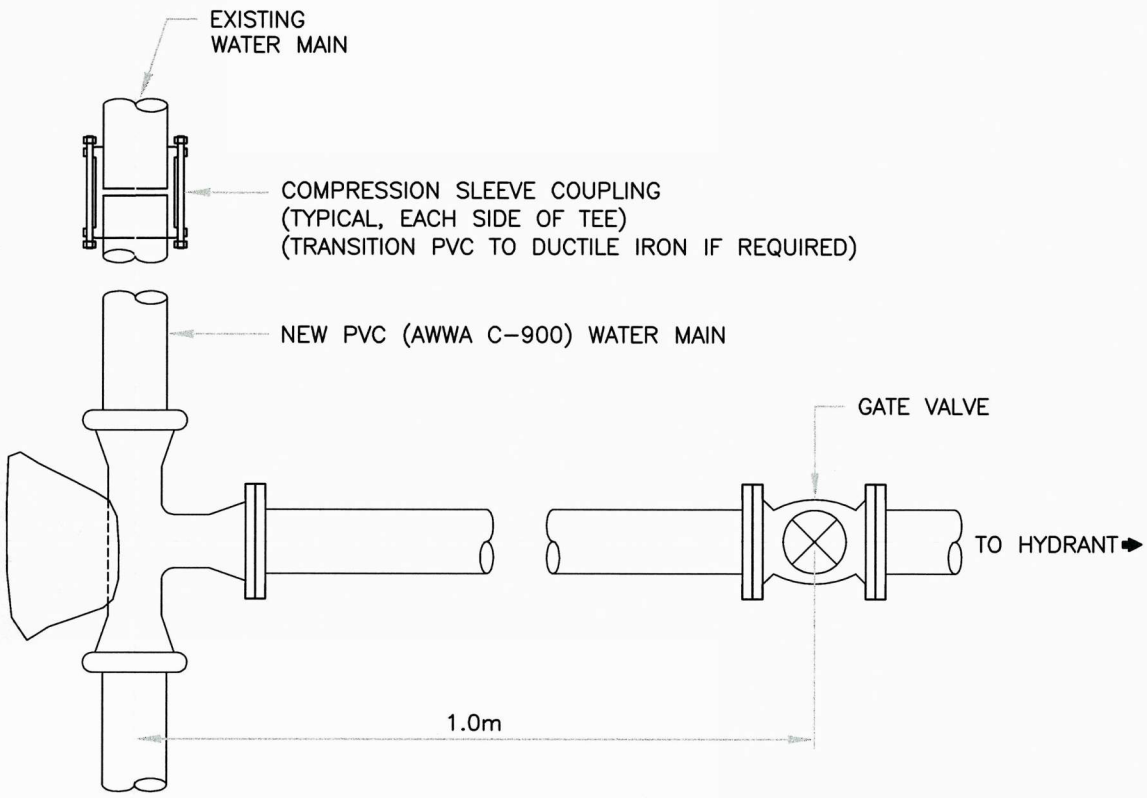
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.5	HYDRANT VALVE TIE-BACK				
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	BB	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE

FEB. 28, 2025

MODIFY CITY OF CALGARY DRAWING FILE NO.: 453.1002.001
TO INCLUDE THE FOLLOWING TIE BACK DETAIL FOR ALL
HYDRANT VALVES:
(ALTERNATIVELY, FLANGED VALVE TO FLANGED TEE)



NOTES

1. HYDRANT TEE TO BE CAST IRON, DUCTILE OR APPROVED EQUIVALENT.
2. TIE-BACK RODS, WASHERS AND HEXAGONAL NUTS TO BE FABRICATED FROM HIGH STRENGTH, LOW ALLOY STEEL IN ACCORDANCE WITH ANSI/AWWA C111/A21.11
3. COAT AND WRAP THE COMPLETED TIE-ROD AND COMPRESSION SLEEVE COUPLING INSTALLATION WITH DENSO MASTIC AND TAPE TO ENSURE ALL METAL COMPONENTS COVERED.
4. TYPICAL DETAIL FOR INSTALLING TEE AND GATE VALVE (HYDRANT LEAD) IN EXISTING WATER MAIN.

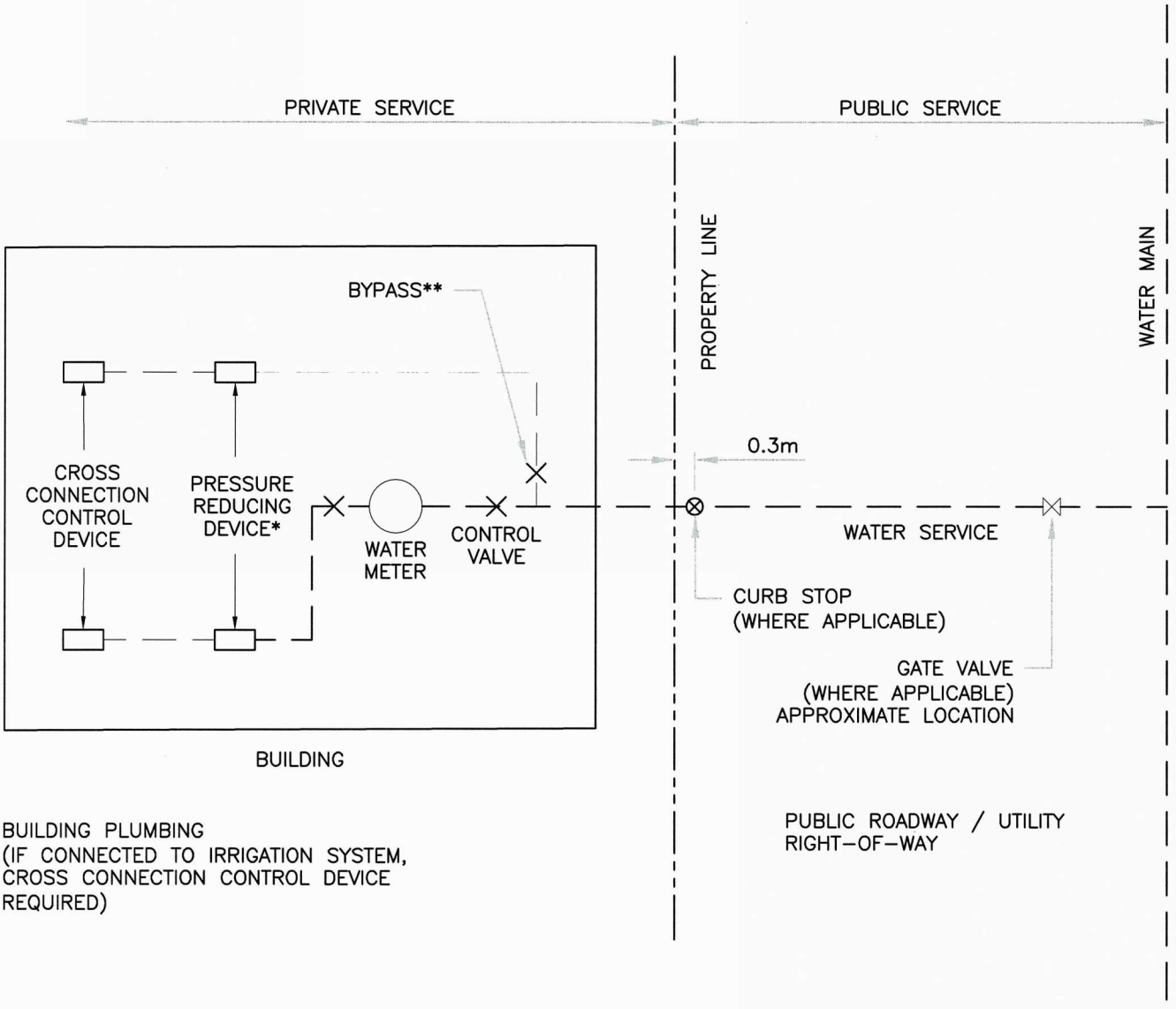
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.6	HYDRANT VALVE TIE-BACK - FLANGED VALVE TO FLANGED TEE					
3						PERMIT	SEAL	
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

BYLAW

TOWN OF CANMORE – WATER BYLAW

SCHEDULE 3 – WATER SERVICE

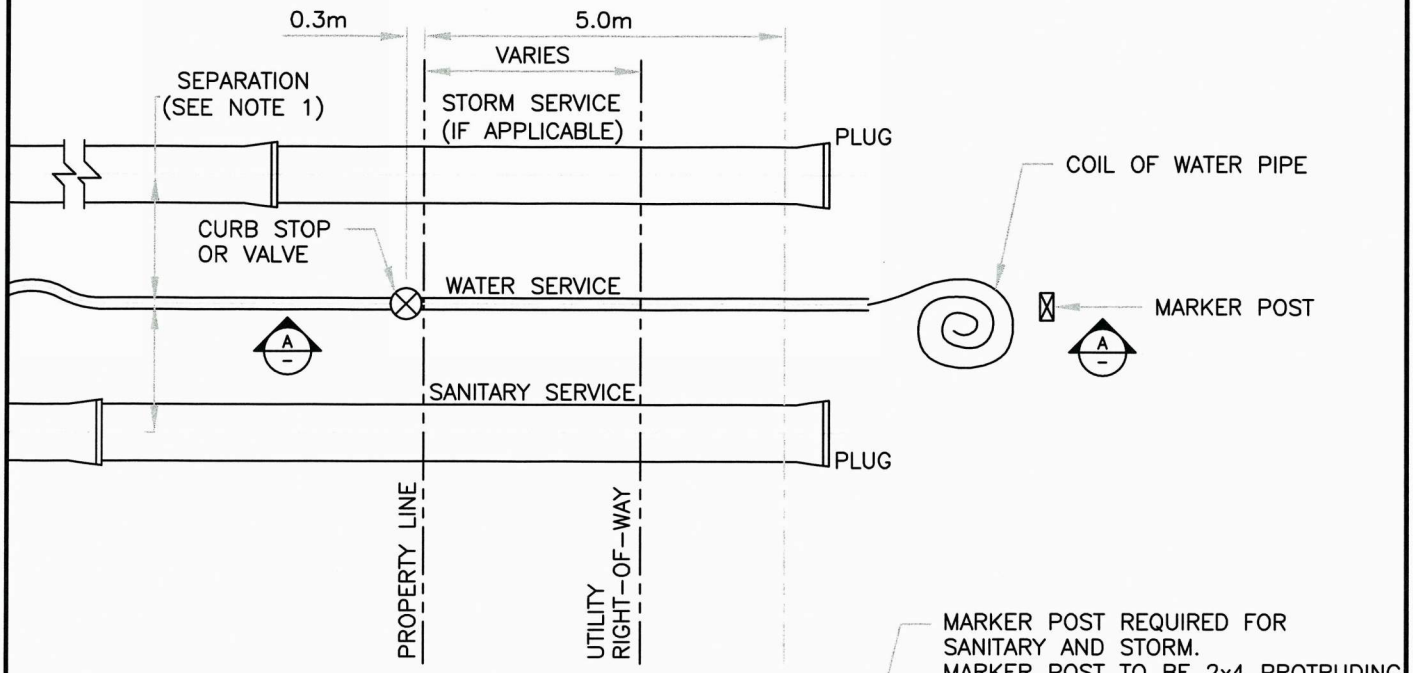


* IF REQUIRED BY TOWN

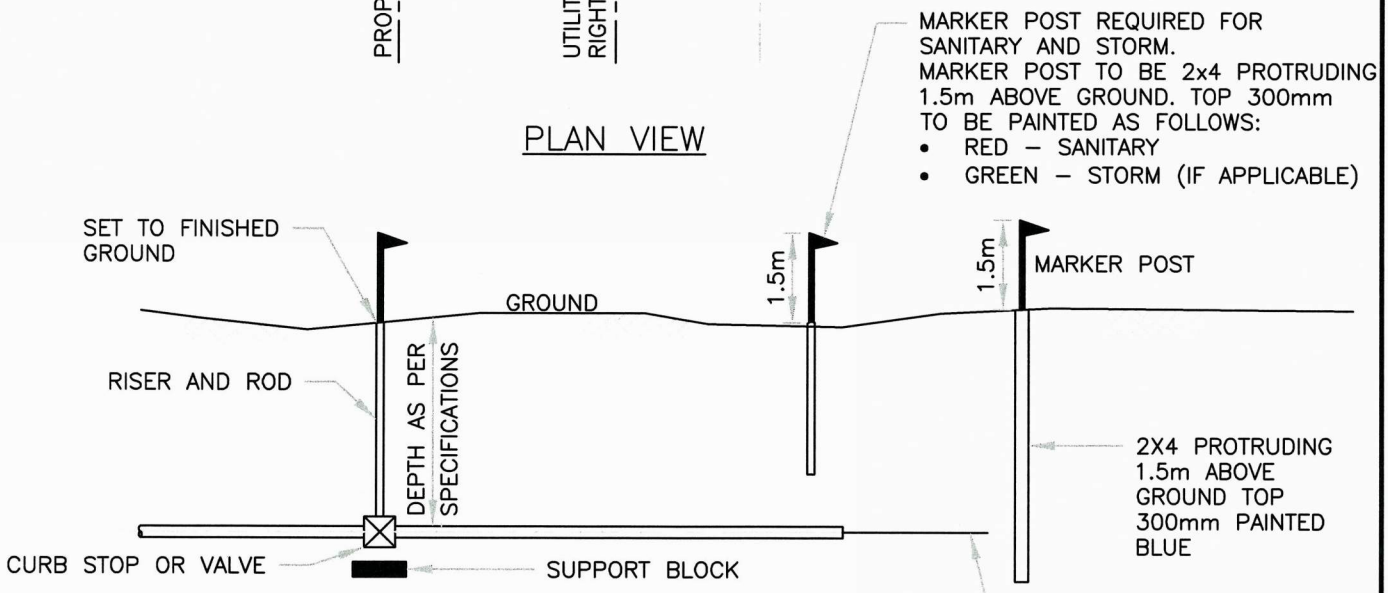
** AS PERMITTED BY TOWN (FOR FIRE PROTECTION SYSTEM)

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.7	WATER SERVICE OWNERSHIP			
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE; RM SIGNATURE: [signature]; RM APEGA ID #: 95819; DATE: Feb. 28, 2025; PERMIT NUMBER: P006522; The Association of Professional Engineers and Geoscientists of Alberta (APEGA)
2	01/28/25	2025 EDCG	BWM	BK	BK	SEAL: PROFESSIONAL ENGINEER ALBERTA, BRIAN KINZIE, ID 66135
1	08/14/19	2019 EDCG	BWM	BB	CB	Town of CANMORE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG	



PLAN VIEW



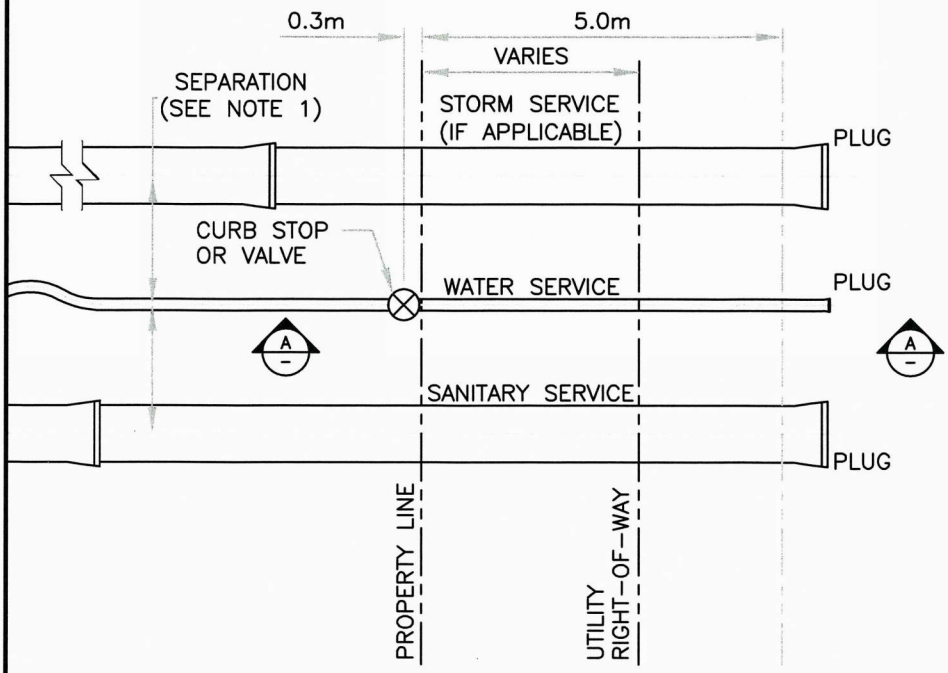
SECTION A–A
(WATER SERVICE)

NOTES

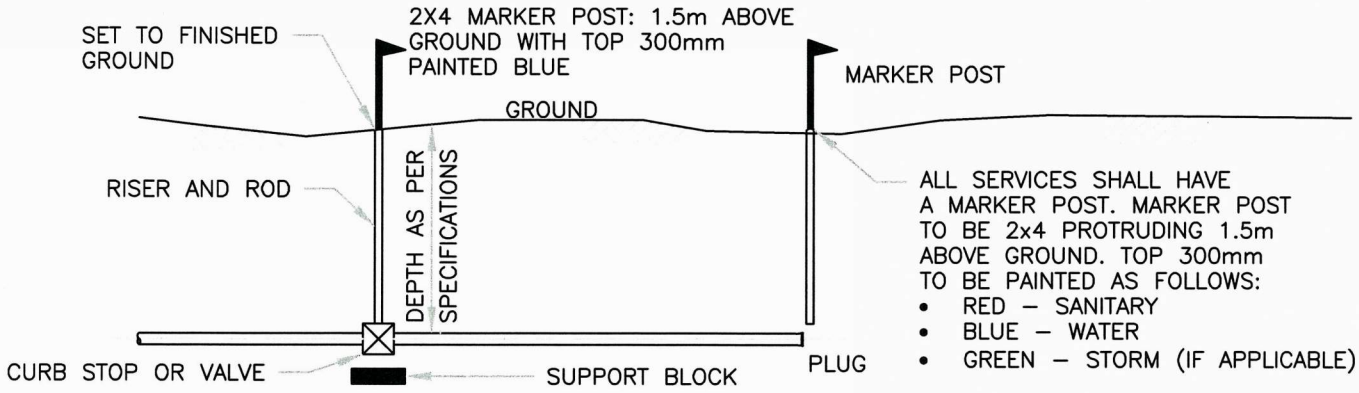
1. SERVICE MAY BE IN A COMMON TRENCH EXCEPT WHERE WATER SERVICE IS BELL AND SPIGOT PIPE THEN SEPARATION TO BE AS PER ALBERTA ENVIRONMENT STANDARDS AND GUIDELINES.
2. REFER TO CITY OF CALGARY STANDARD SPECIFICATIONS, WATERWORKS CONSTRUCTION, LATEST EDITION, FIGURES 23 TO 26 INCLUSIVE FOR GENERAL DETAILS.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.8	PRE-SERVICE CONNECTION DETAIL - FLEXIBLE PIPE					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95879 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
2	10/24/23	2023 EDCG	BWM	BB	CB			
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



PLAN VIEW



SECTION A–A
(WATER SERVICE)

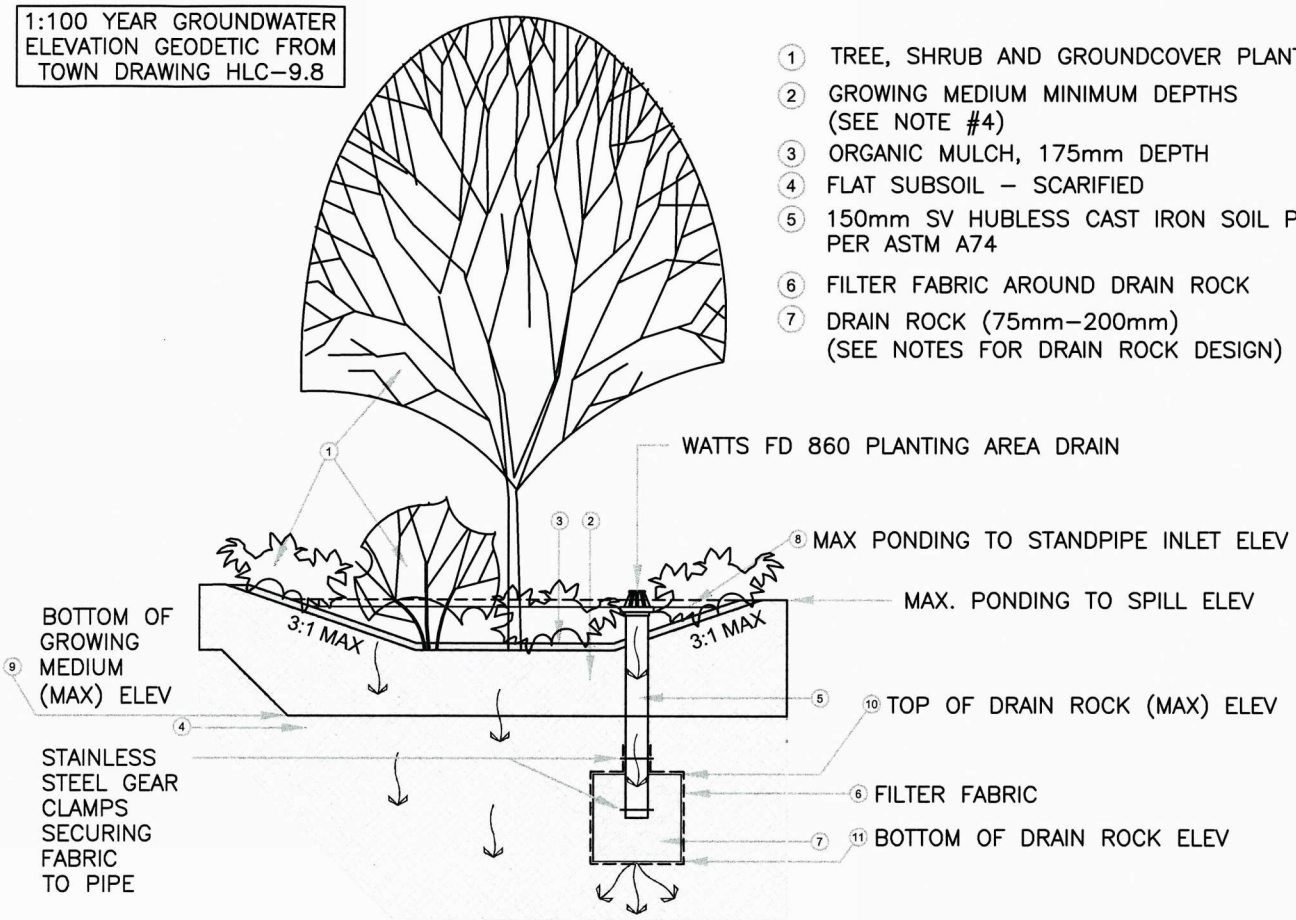
NOTES

1. SERVICE MAY BE IN A COMMON TRENCH EXCEPT WHERE WATER SERVICE IS BELL AND SPIGOT PIPE THEN SEPARATION TO BE AS PER ALBERTA ENVIRONMENT STANDARDS AND GUIDELINES.
2. REFER TO CITY OF CALGARY STANDARD SPECIFICATIONS, WATERWORKS CONSTRUCTION, LATEST EDITION, FIGURES 23 TO 26 INCLUSIVE FOR GENERAL DETAILS.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: WAT 4.9	PRE-SERVICE CONNECTION DETAIL - NON-FLEXIBLE PIPE					
3						PERMIT	SEAL	
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

1:100 YEAR GROUNDWATER ELEVATION GEODETIC FROM TOWN DRAWING HLC–9.8



1. TREE, SHRUB AND GROUNDCOVER PLANTINGS
2. GROWING MEDIUM MINIMUM DEPTHS (SEE NOTE #4)
3. ORGANIC MULCH, 175mm DEPTH
4. FLAT SUBSOIL – SCARIFIED
5. 150mm SV HUBLESS CAST IRON SOIL PIPE PER ASTM A74
6. FILTER FABRIC AROUND DRAIN ROCK
7. DRAIN ROCK (75mm–200mm) (SEE NOTES FOR DRAIN ROCK DESIGN)

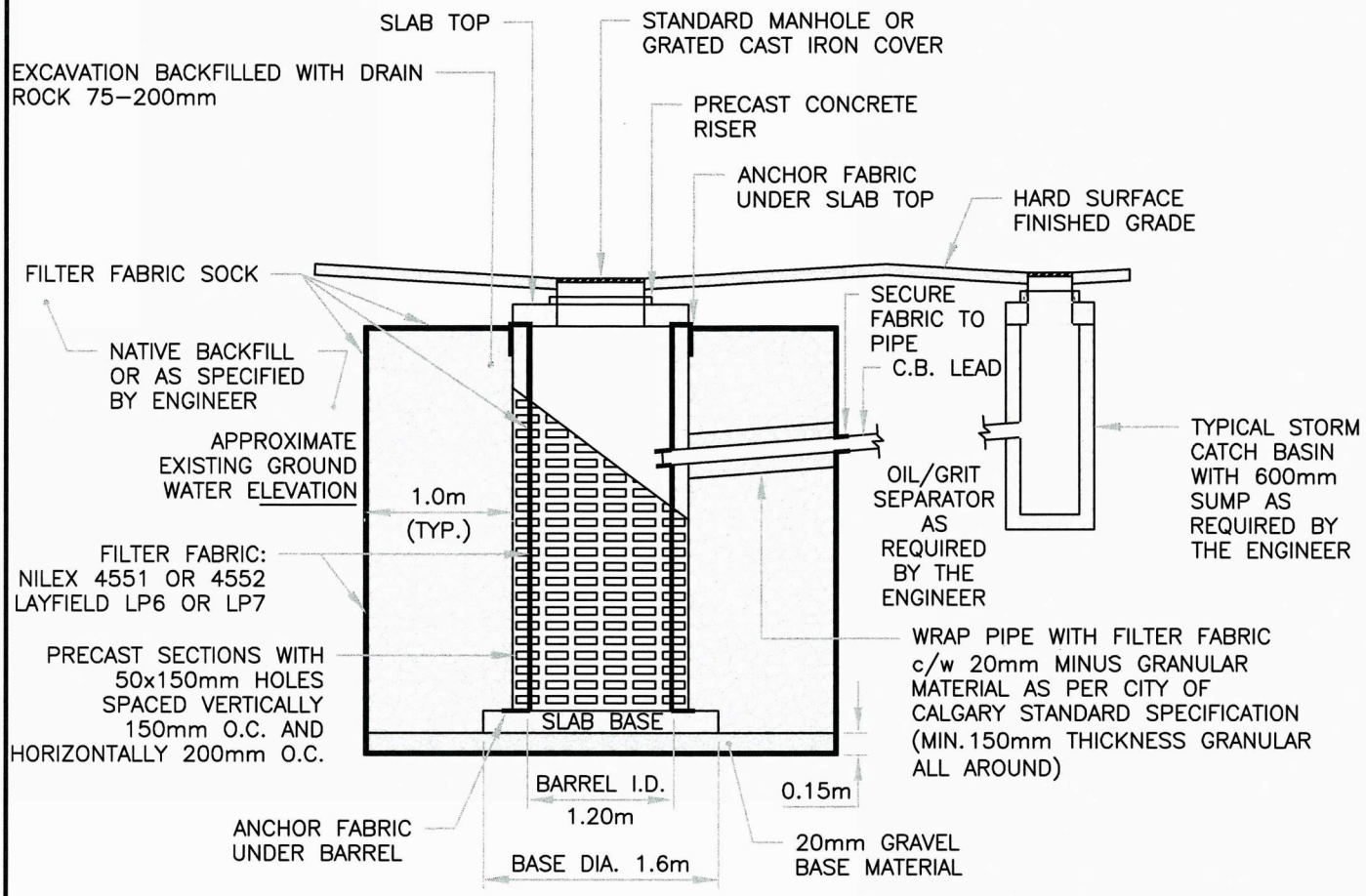
NOTES

1. INFILTRATION AS SHOWN ON THIS DETAIL SHALL ALWAYS BE THE PRIMARY CHOICE OF RUNOFF DISPOSAL, PARTICULARLY FOR ALL LOW LYING AREAS CANMORE (TEE PEE TOWN, SOUTH CANMORE, RUNDLE, LARCH ETC). OTHER AREAS WHERE THE GEOTECHNICAL PROPERTIES OF THE SOIL PREVENT INFILTRATION WILL BE HANDLED ON A CASE BY CASE BASIS.
2. ALL EFFORTS ARE TO BE MADE TO SEPARATE ROOF AND LANDSCAPING RUNOFF FROM RUNOFF THAT HAS TRAVELED ACROSS A VEHICLE CARRIAGE WAY.
3. ALL LAND AREAS THAT SLOPE TOWARDS THE PROPERTY OR CONTRIBUTE RUNOFF TO THE SITE ARE TO BE TAKEN INTO ACCOUNT FOR DRAINAGE CALCULATIONS.
4. GROWING MEDIUM (SHOWN IN ILLUSTRATION AS #2):
   a. 300MM DEPTH FOR ALL LANDSCAPE AND ROOF ONLY RUNOFF (1 DRIVEWAY ACCEPTABLE, BUT NOT DESIRABLE).
   b. 450MM DEPTH FOR ALL RUNOFF INCLUDING VEHICLE CARRIAGE WAYS AND MULTIPLE DRIVEWAYS.
5. ELEVATIONS ARE REQUIRED FOR ALL INDIVIDUAL RAIN GARDENS.
6. DRAIN ROCK TO BE 75mm–200mm WASHED STONE.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: STM 6.2	RAIN GARDEN - FULL INFILTRATION (TYPICAL SECTION)				
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE; RM SIGNATURE: [signature]; RM APEGA ID #: 95819; DATE: Feb 28, 2025; PERMIT NUMBER: P006522; The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA, BRIAN KINZIE, ID 66135	Town of CANMORE
2	10/24/23	2023 EDCG	BWM	BK	BK			
1	08/14/19	2019 EDCG	BWM	BB	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

FEB 28, 2025



NOTES

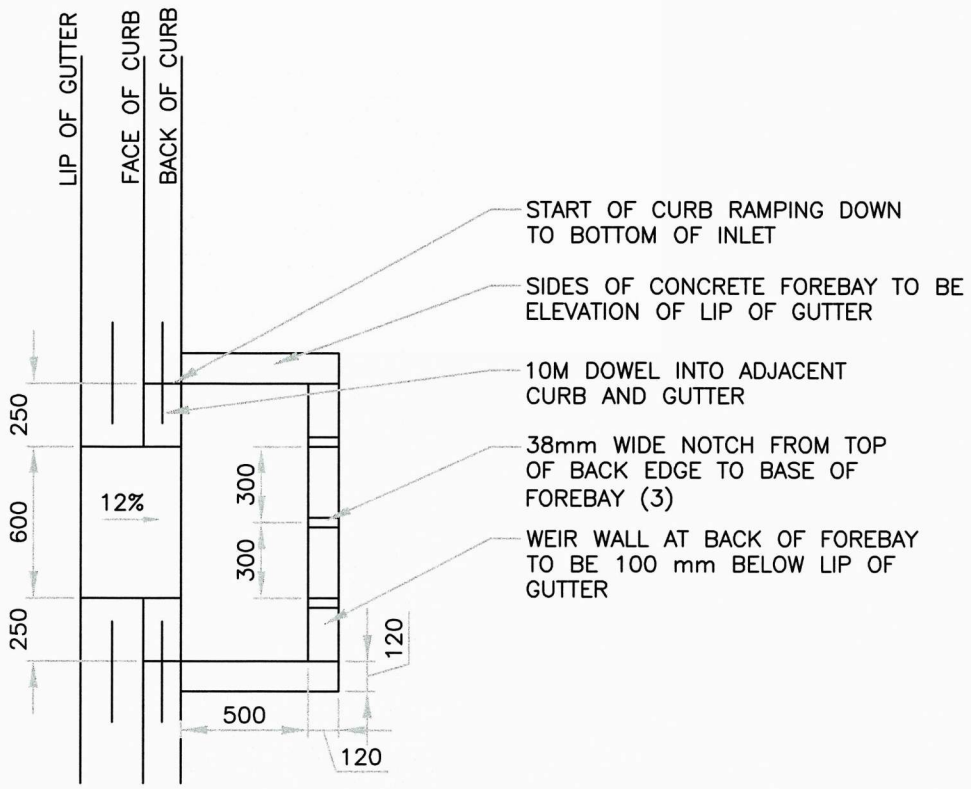
1. DRYWELL IS PERFORATED, AND MAY BE USED WITH OR WITHOUT CATCHBASIN.
2. DRYWELL DEPTH, DRAIN ROCK DIAMETER AND PERFORATED PIPE LENGTH TO BE CALCULATED FOR SPECIFIC SITE RUNOFF, NATIVE SOIL INFILTRATION RATE AND GROUNDWATER ELEVATION. CALCULATIONS TO BE SUBMITTED TO ENGINEER FOR ACCEPTANCE AND APPLIED TO DESIGN DRAWINGS.
3. FILTER FABRIC SOCK INSIDE PRECAST BARREL TO BE ANCHORED TOP AND BOTTOM BETWEEN CONCRETE SLAB AND BARREL UNITS.
4. FABRIC TO BE OVERLAPPED AT SEAMS AND STITCHED TOGETHER TO PREVENT MATERIAL AND DEBRIS BYPASSING THE FABRIC.
5. SECURE FABRIC TO PIPE WITH STAINLESS STEEL STRAP OR CLAMP.

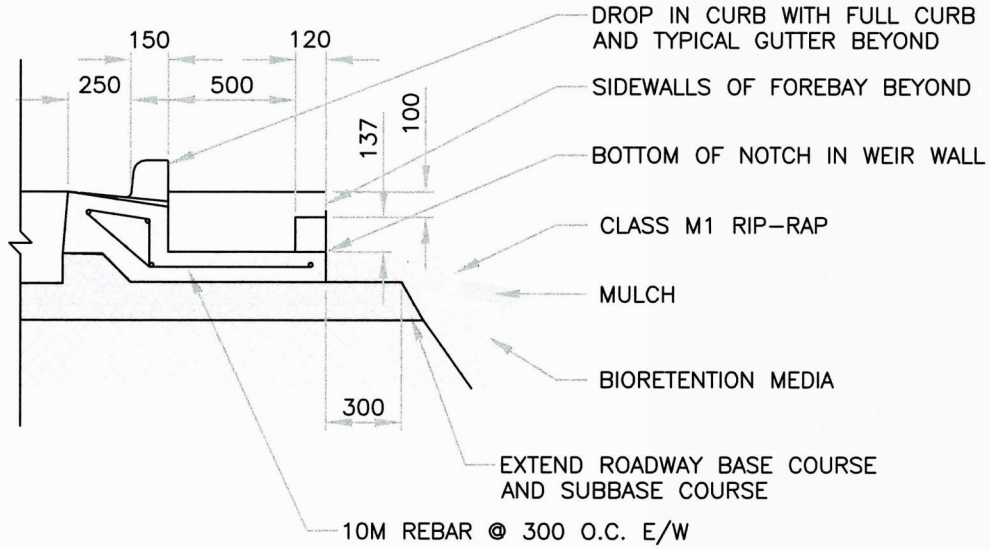
All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: STM 6.3	TYPICAL DRAINAGE WELL				
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	BB	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of Canmore

FEB. 28, 2025





All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: STM 6.4	BIORETENTION/BIOSWALE INLET DETAIL					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	10/24/23	2023 EDCG	BWM	BK	BK		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of Canmore

DESIGN ELEMENTS FOR URBAN THOROUGHFARES

TOWN OF CANMORE CLASSIFICATIONS:	LOCAL	COLLECTOR	ARTERIAL
GENERAL			
SHEET NO.	STR 7.3	STR 7.5	STR 7.6
DESIGN/POSTED SPEED (km/h)	30	30	50
TAC CLASSIFICATION	ULU 30	-	UAD 50
BASE CROSS-SECTION			
BASIC ROW WIDTH (m)	15.30	22.00	30.00
NUMBER OF LANES	2	2	2
DRIVING SURFACE WIDTH (m) (1)	6.00	7.10 (6)	7.10 (6)
TRAVEL LANE WIDTH (m) (2)	3.00	3.25 - 3.55 (7)	3.25 - 3.55 (7)
MEDIAN WIDTH (m)	-	-	3.90
PARKING	PARKING BOTH SIDES (IN BAYS)	PARKING BOTH SIDES (IN BAYS)	NO PARKING
PARKING LANE WIDTH (m) (3)	1.95	1.95	-
STANDARD CURB AND GUTTER WIDTH (m)	0.415	0.415	0.415
CONC. INVERT CROSSING WIDTH (m) (4)	0.415 - 0.525	0.415 - 0.525	0.415 - 0.525
SIDEWALK STYLE	BOULEVARD	BOULEVARD	BOULEVARD
SIDEWALK WIDTH (m)	1.8	1.80 - 2.50	1.80 - 3.00
HORIZONTAL ALIGNMENT			
MINIMUM RADIUS (m) (5)	30	30 (8)	80 (8)
MINIMUM STOPPING DISTANCE - ssd (m)	35	35	65
MAXIMUM SUPERELEVATION - e (m/m)	+0.02	+0.02	+0.04
VERTICAL ALIGNMENT			
MAXIMUM GRADE (%)	8.00	8.00	7.00
MINIMUM RATE OF VERTICAL CURVATURE - K	2	2	7

Notes:

1. EXCLUDING TURN BAYS AND PARKING BAYS AS MEASURED FROM FACE OF CURB.
2. TRAVEL LANE MEASURED FROM FACE OF CURB. TRAVEL LANES MAY REQUIRE WIDENING ON CURVES.
3. BACK OF CONCRETE INVERT CROSSING TO FACE OF CURB.
4. INVERT CROSSING WIDTH MAY VARY TO MATCH WIDTH OF ADJACENT CURB TYPE:
   - 0.415m FOR STANDARD CURB
   - 0.525m FOR ROLLED CURB
5. MINIMUM RADII SHOWN ARE CALCULATED BASED ON +0.04 SUPERELEVATION. MINIMUM RADII AND SUPERELEVATION TO BE DETERMINED BY DESIGNER FOR EACH CASE TO ENSURE APPROPRIATE VEHICLE SPEED.
6. 6.00m WHERE A MEDIAN EXISTS.
7. 3.25 WHERE A MEDIAN EXISTS.
8. A MINIMUM RADIUS OF UNDER 150m WILL REQUIRE BUFFER AREAS OR MEDIANS THAT MAY NECESSITATE LOCALIZED WIDENING OF ROAD RIGHT-OF-WAY.

SCALE: NTS	FIGURE NO.: STR 7.1	DESIGN ELEMENTS FOR URBAN THOROUGHFARES

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/09/19	2019 EDCG	BWM	CE	CB

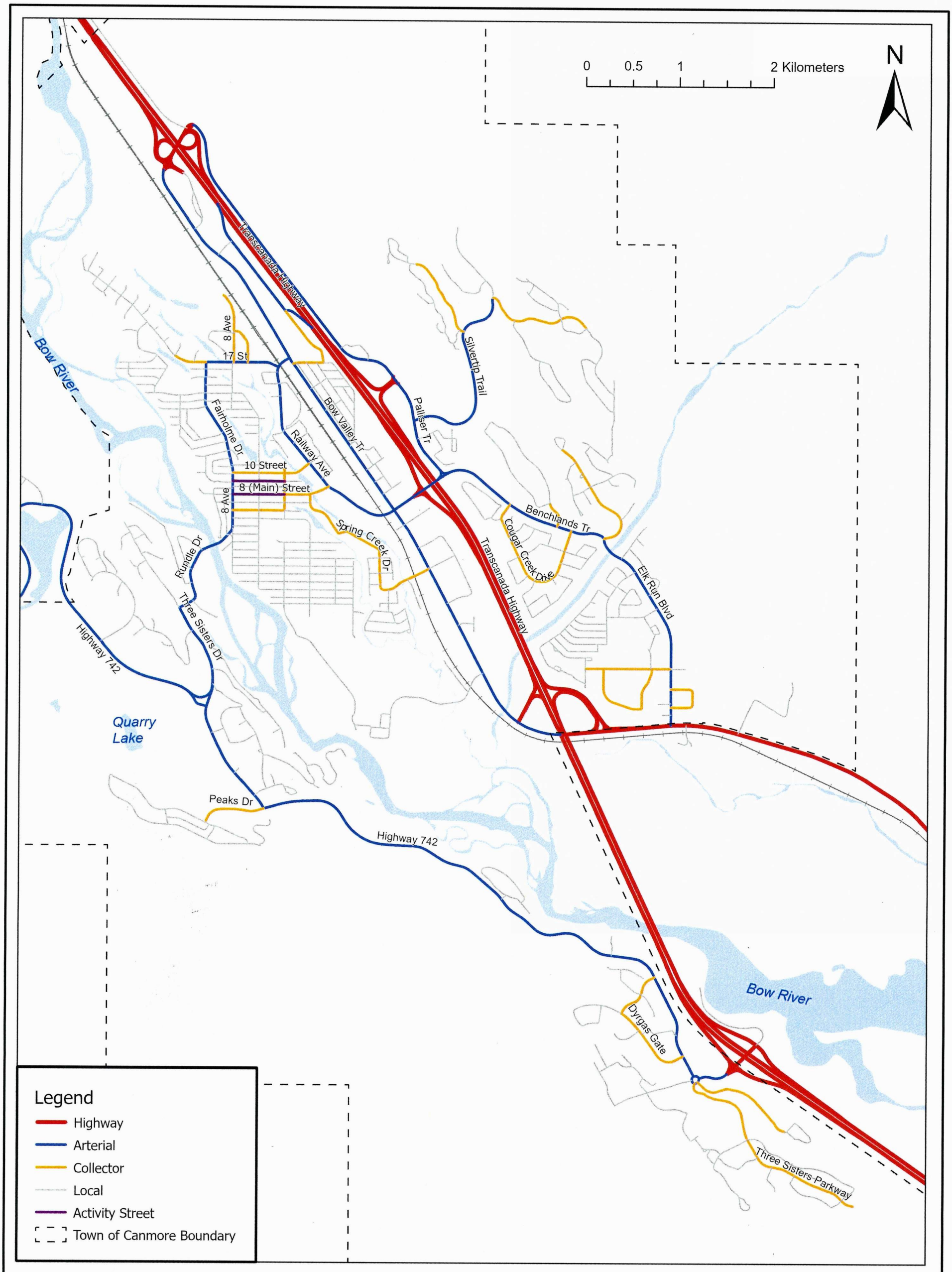
PERMIT

PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL

PROFESSIONAL ENGINEER ANDY ESARTE PROVINCE OF ALBERTA
Feb 28, 2025
ID 95819

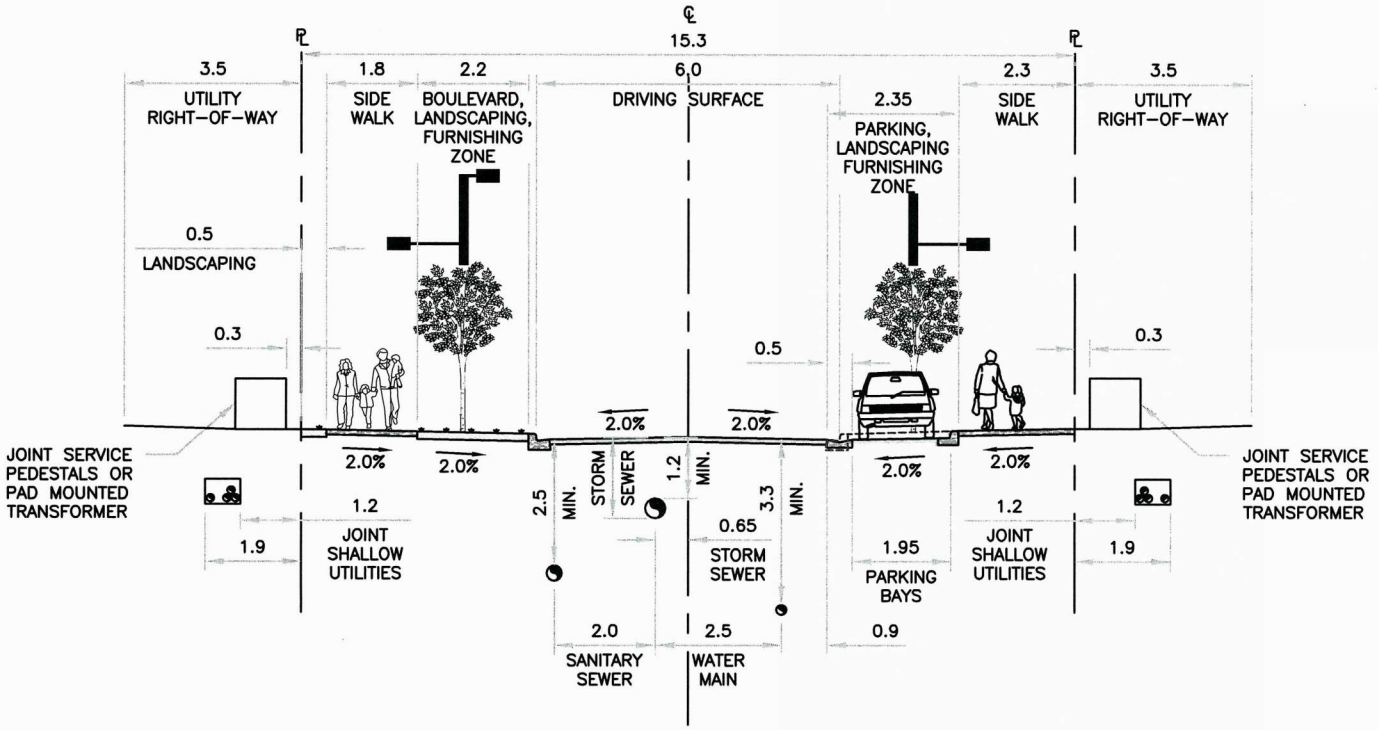
Town of CANMORE



All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: STR 7.2	ROAD CLASSIFICATION					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	ISL	CE	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA CLAIRE ELLICK ID 70445 Feb. 28 2025
1	12/10/19	2019 EDCG	BWM	CE	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM FACE OF CURB.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES OR MEWS WHEN PROVIDED.
4. BOULEVARD INCLUDES PARKING BAYS, LANDSCAPING AND FURNISHING ZONE.
5. SEE STR 7.7 FOR PARKING BAY DETAIL.
6. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
7. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
8. WHERE SIDEWALK IS NOT ADJACENT TO A PARKING BAY, A 1.8m SIDEWALK WIDTH IS TO BE APPLIED, WITH A SMOOTH TRANSITION FROM THE 2.3m WIDTH.
9. ROLLED CURB MAY BE PROVIDED IN PARKING BAYS AND MAY BE CONSIDERED ADJACENT TO BOULEVARD SIDEWALK.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.3	LOCAL (ULU 30) PARKING BOTH SIDES - CROSS SECTION

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/10/19	2019 EDCG	BWM	CE	CB

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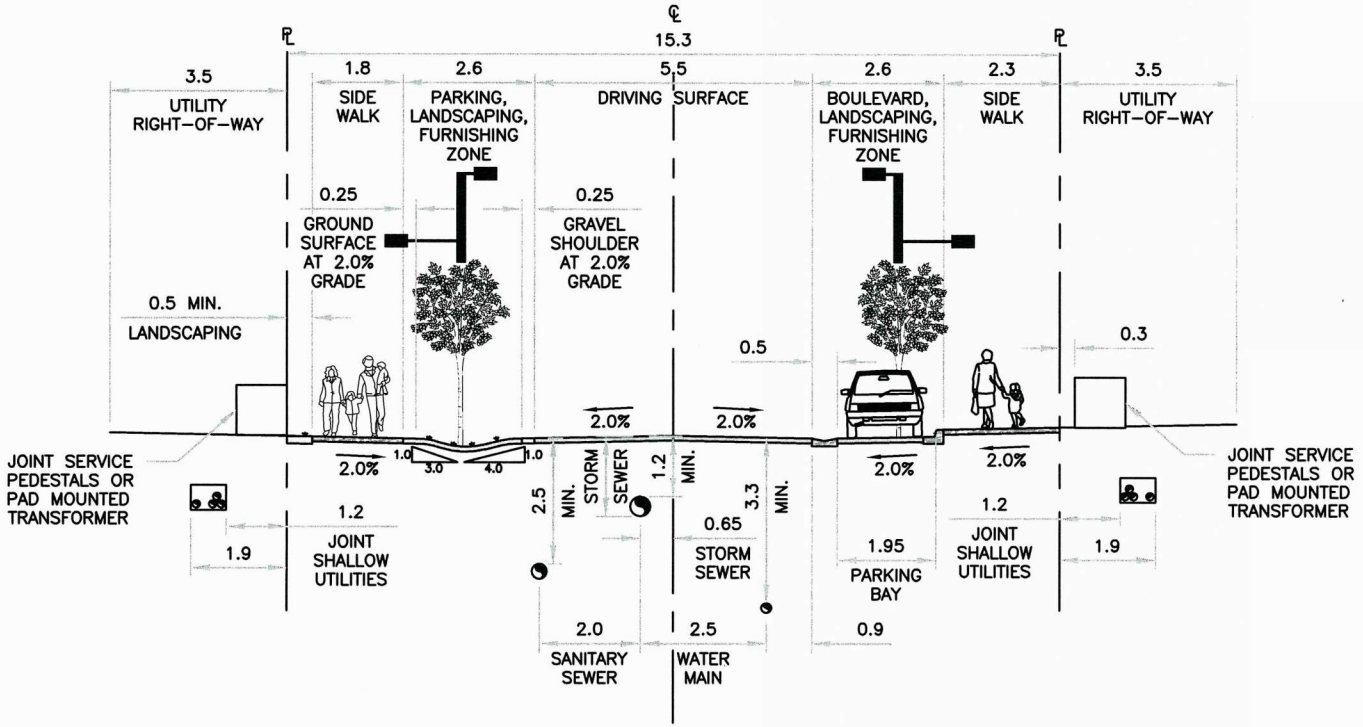
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ANDY ESARTE ALBERTA

Feb. 28, 2025
ID 95819

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM EDGE OF PAVEMENT.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR OR MEWS LANES WHEN PROVIDED.
4. BOULEVARD INCLUDES PARKING BAYS, LANDSCAPING AND FURNISHING ZONE.
5. SEE STR 7.7 FOR PARKING BAY DETAIL.
6. GRAVEL SHOULDER TO BE CONSTRUCTED TO A LOAD–BEARING CAPACITY OF 38,556kg (85,000lbs).
7. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
8. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
9. WHERE SIDEWALK IS NOT ADJACENT TO A PARKING BAY, A 1.8M SIDEWALK WIDTH IS TO BE APPLIED, WITH A SMOOTH TRANSITION FROM THE 2.3M WIDTH.
10. ROLLED CURB MAY BE PROVIDED IN PARKING BAYS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.4	LOCAL RURAL PARKING BOTH SIDES - CROSS SECTION

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/11/19	2019 EDCG	BWM	CE	CB

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TOWN OF CANMORE
RM SIGNATURE:
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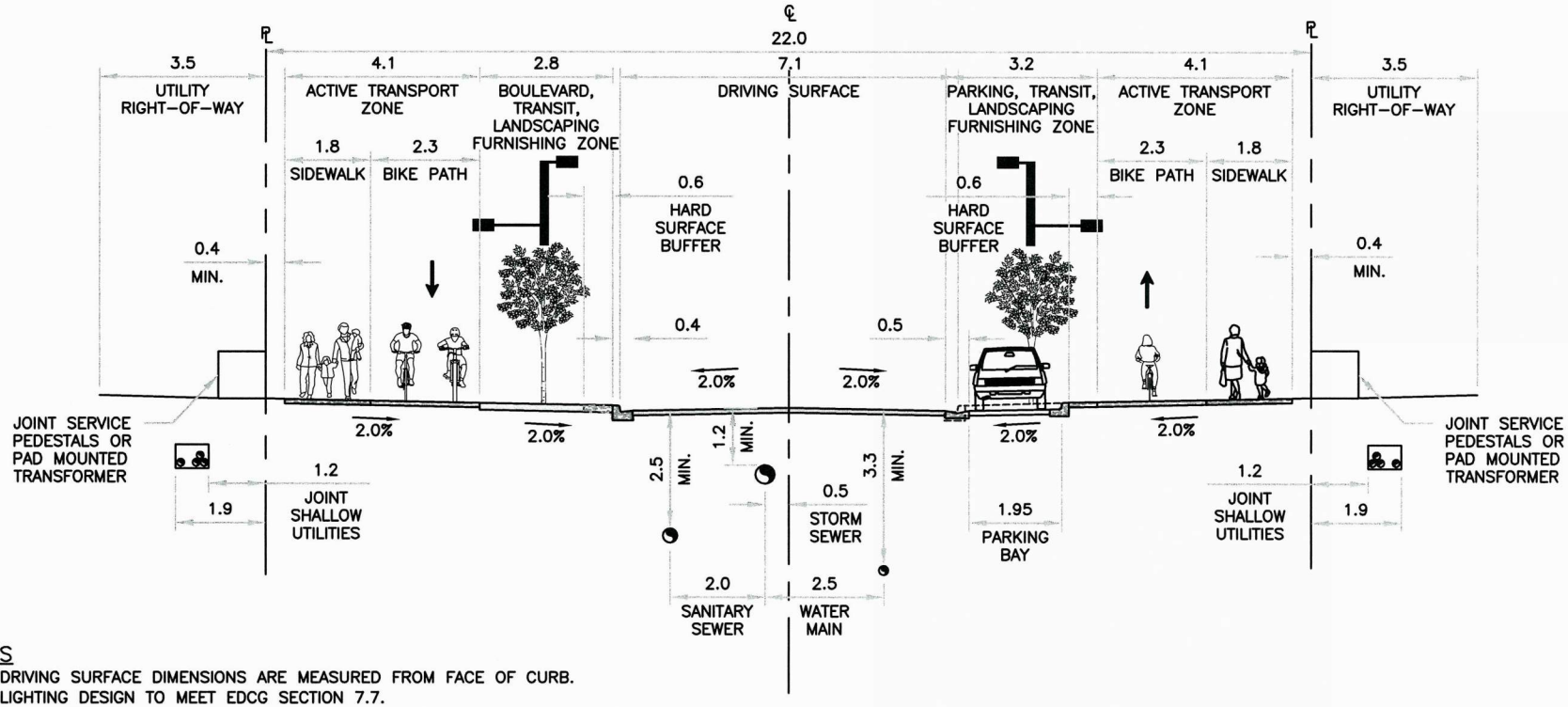
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE

Feb 28 / 2025
ID 95819

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM FACE OF CURB.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. ACTIVE TRANSPORTATION FACILITY WIDTHS TO BE DETERMINED BASED ON CONTEXT.
4. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES WHEN PROVIDED.
5. BOULEVARD INCLUDES PARKING BAYS, LANDSCAPING AND FURNISHING ZONE.
6. SEE STR 7.7 FOR PARKING BAY DETAIL.
7. POCKET EASEMENTS AND RIGHT–OF–WAY ADJUSTMENTS MAY BE REQUIRED TO ACCOMMODATE TRANSIT INFRASTRUCTURE, AS DETERMINED BY THE TOWN OF CANMORE.
8. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
9. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
10. ADJACENT TO TRANSIT STOPS, THE ACTIVE TRANSPORT ZONE MAY BE SHIFTED CLOSER TO THE PROPERTY LINE TO ALLOW A FULL 3.0m TRANSIT ZONE. OUTSIDE OF TRANSIT ZONES, THE ACTIVE TRANSPORT ZONE SHOULD OTHERWISE FOLLOW THE ALIGNMENT SHOWN IN THE FIGURE ABOVE.
11. ROLLED CURB MAY BE PROVIDED IN PARKING BAYS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.5	COLLECTOR PARKING BOTH SIDES - CROSS SECTION

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDITS	BWM	ISL	AE
1	12/10/19	2019 EDCG	BWM	CE	CB

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TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

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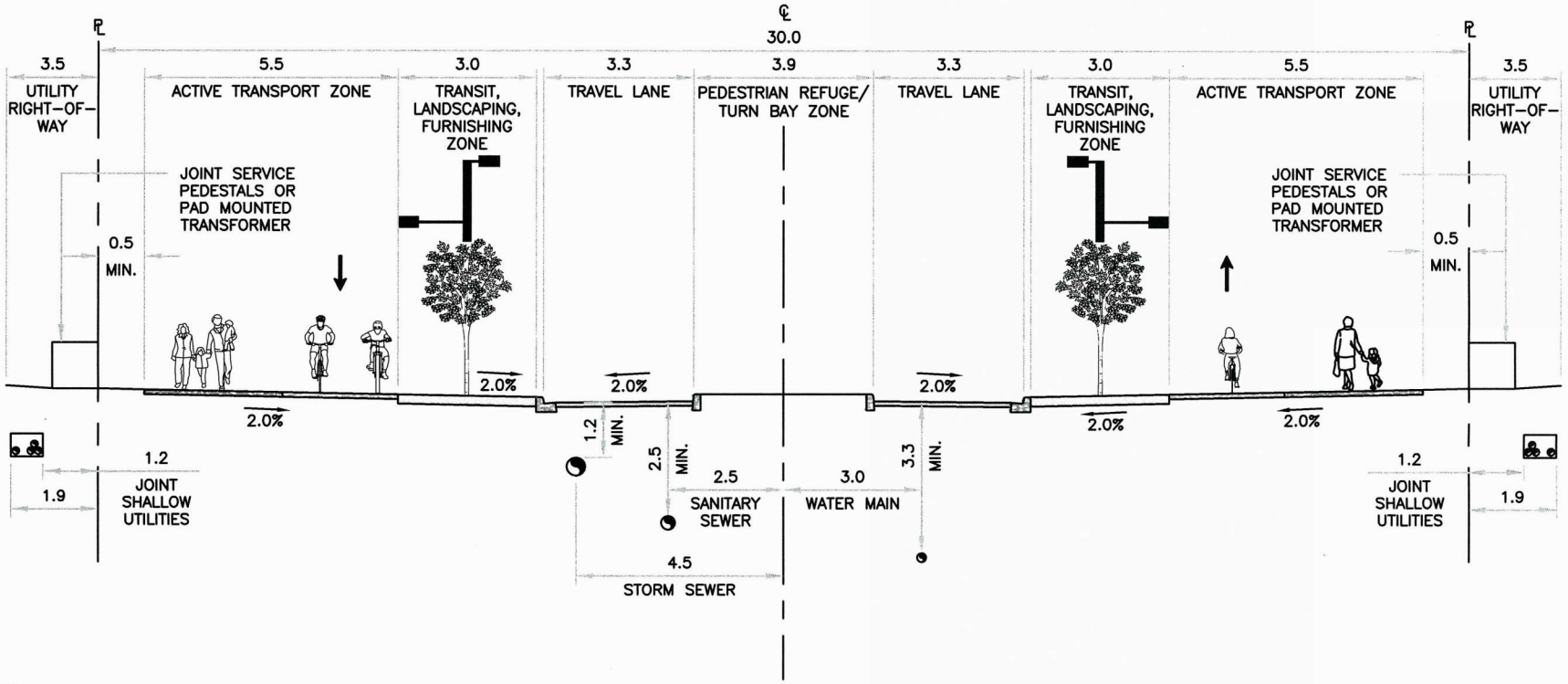
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE
Feb 28, 2025
ID 95819

Town of CANMORE



NOTES

1. DRIVING SURFACE DIMENSIONS ARE MEASURED FROM FACE OF CURB.
2. LIGHTING DESIGN TO MEET EDCG SECTION 7.7.
3. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES WHEN PROVIDED.
4. ACTIVE TRANSPORTATION FACILITY WIDTHS TO BE DETERMINED BASED ON CONTEXT. REFER TO TABLE 7–5.
5. OVERALL R.O.W. WIDTH MAY BE ADJUSTED BASED ON WIDTH OF SIDEWALK FACILITIES, AS DETERMINED BY THE TOWN OF CANMORE.
6. POCKET EASEMENTS MAY BE REQUIRED TO ACCOMMODATE TRANSIT INFRASTRUCTURE, AS DETERMINED BY THE TOWN OF CANMORE.
7. UTILITY RIGHT–OF–WAY TO BE ESTABLISHED BASED ON UTILITY AND ROAD DESIGN.
8. SEPARATE POLES MAY BE REQUIRED FOR PEDESTRIAN AND ROADWAY LEVEL LIGHTING ALONG THE SAME ALIGNMENT.
9. MEDIAN CURB TYPE AND FILL TO BE DETERMINED ON A PROJECT TO PROJECT BASIS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.6	ARTERIAL (UAD 50) NO PARKING - CROSS SECTION

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/10/19	2019 EDCG	BWM	CE	CB

PERMIT

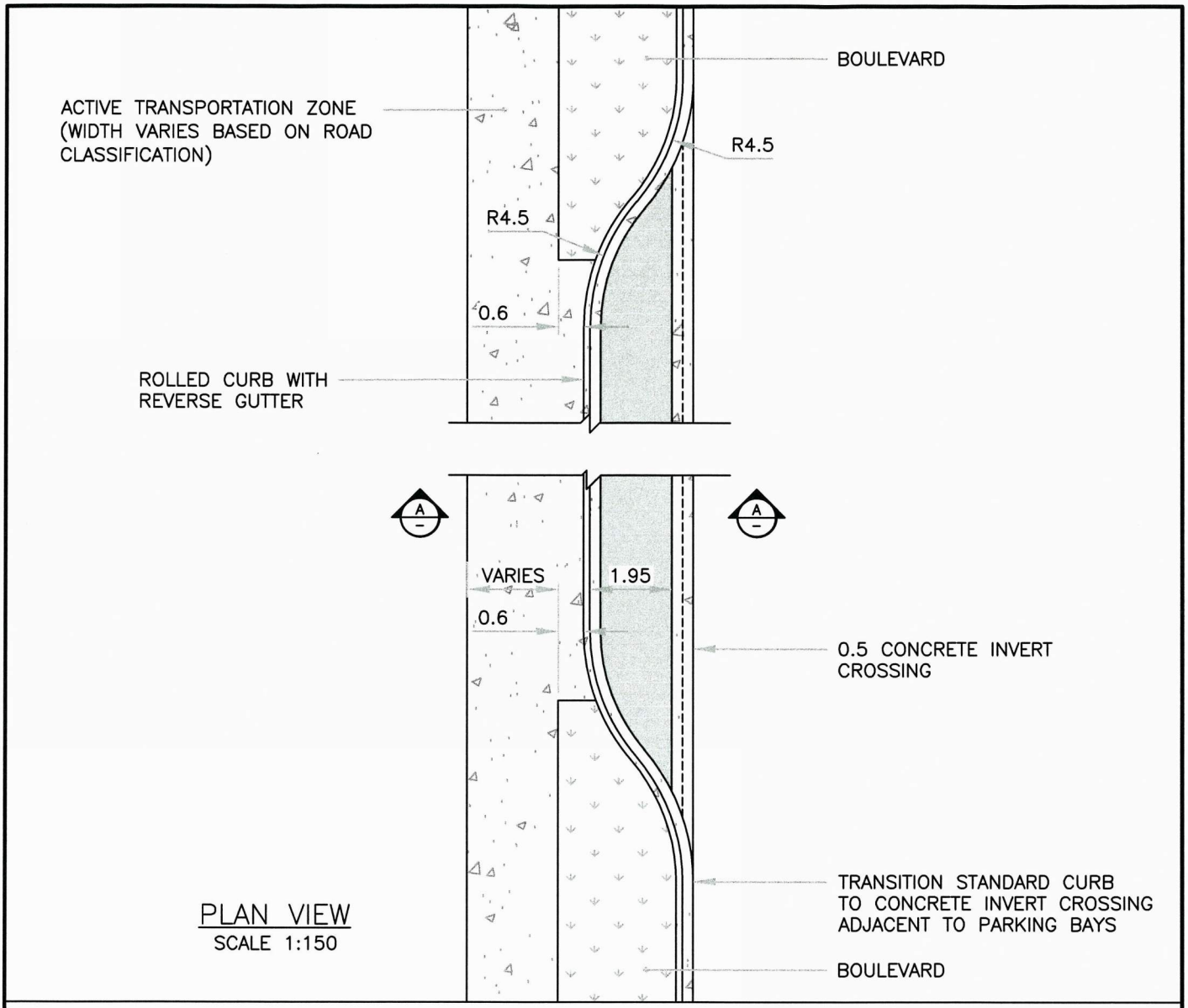
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE: Cindy Esarte
RM APEGA ID #: 95819
DATE: Feb 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL

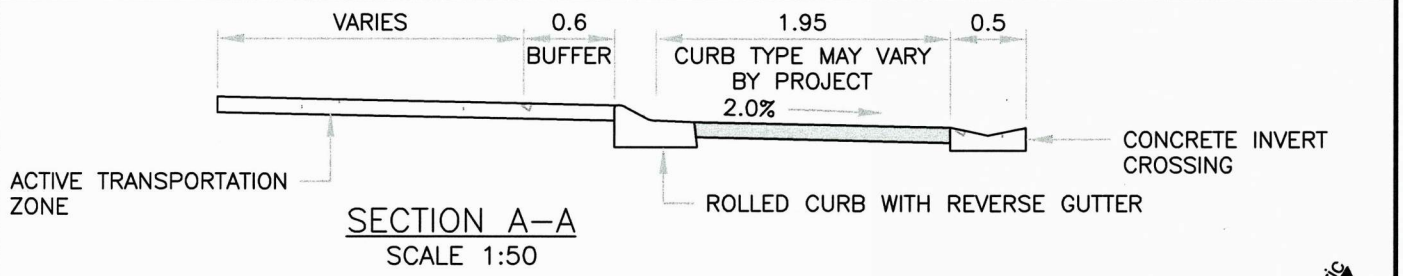
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE

Town of CANMORE

Feb. 28, 2025
ID 95819



PLAN VIEW
SCALE 1:150

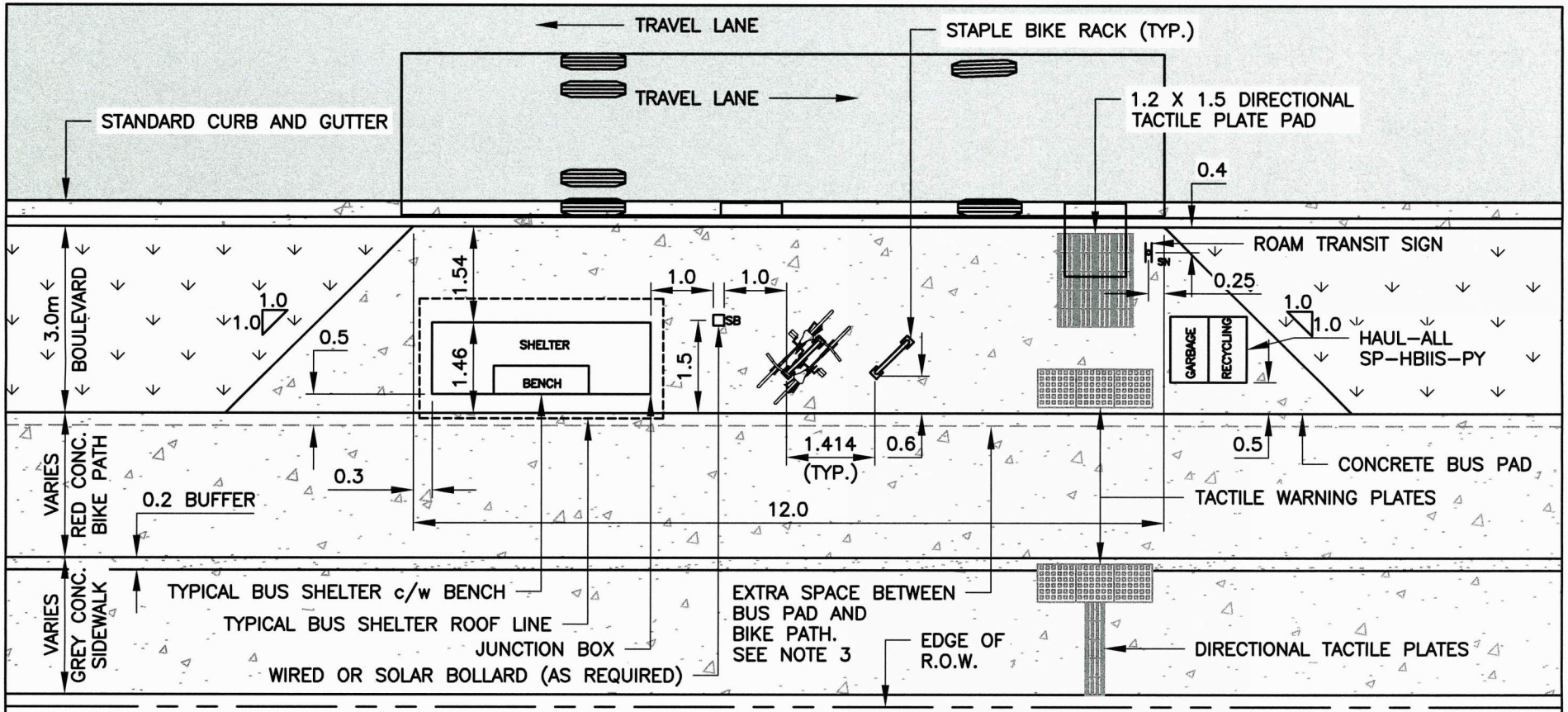


SECTION A–A
SCALE 1:50

All dimensions in meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.7	PARKING BAY					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	ISL	CE	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER CLAIRE ELLICK ID 70445 ALBERTA Feb. 28, 2025
1	12/09/19	2019 EDCG	BWM	CE	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



NOTES

1. ELECTRICAL CONNECTION FOR BUS STOP HEATER OR BOLLARD LIGHT MAY BE REQUIRED DEPENDING ON STOP LOCATION, AT THE DISCRETION OF THE TOWN. IF REQUIRED, PROVIDE 32MM HDPE CONDUIT FROM NEAREST POWER SUPPLY TO JUNCTION BOX IN BUS SHELTER AND BOLLARD. CONDUIT UNDER THE ROADWAY AND BUS STOP SHALL BE RUN THROUGH A 100MM DB2 CONDUIT.
2. SHELTER DIMENSIONS MAY VARY BASED ON MANUFACTURERS SPECIFICATIONS.
3. ADDITIONAL LOCALIZED WIDENING OF ROAD ROW MAY BE NECESSARY TO ACCOMMODATE FULL–SIZE BUS STOP AND ACTIVE TRANSPORTATION FACILITIES. WIDENED AREA TO BE CONSTRUCTED IN THE SAME MATERIAL AS ADJACENT ACTIVE TRANSPORTATION FACILITY
4. WIDTH OF SIDEWALK AND BIKE PATH VARY BASED ON ROADWAY CLASSIFICATION.

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	
1:100	STR 7.8	BUS STOP LAYOUT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	CE
1	12/09/19	2019 EDCG	BWM	CE	CB

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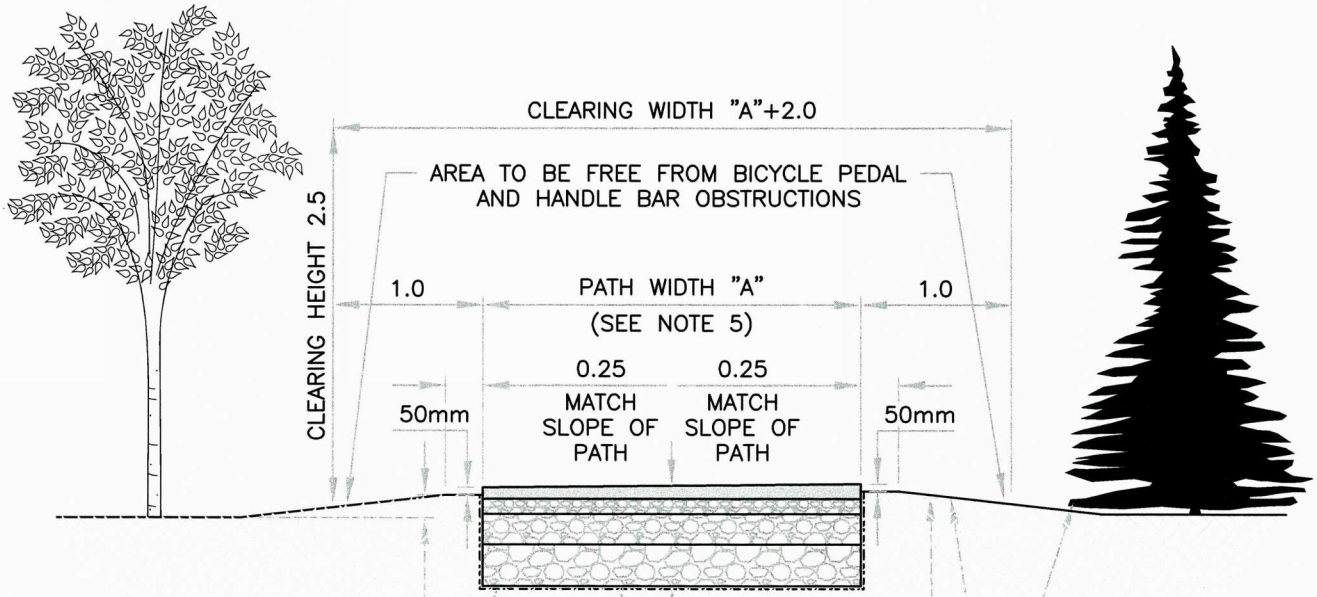
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95817
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
CLAIRE ELLICK
ID 70445
Feb. 28, 2025

Town of CANMORE



MIN. 150mm ABOVE SURROUNDING GRADES (TYP. BOTH SIDES)

INSTALL POLYSPUN 300 ROOT BARRIER (BOTH SIDES AND BOTTOM) EXTRA ROOT BARRIER CAN BE BURNED FLUSH WITH GROUND FOLLOWING PAVING, AND PRIOR TO SEEDING

REMOVE ORGANIC MATERIAL TO 500mm DEPTH. REPLACE WITH 275mm OF 75mm PITRUN WHERE OVER EXCAVATED BEYOND STRUCTURE DEPTH.

5:1 MAX. GRADE (TYP. BOTH SIDES) SEE NOTE 11

DO NOT DISTURB EXISTING VEGETATION (TYP. BOTH SIDES)

BLEND EXISTING TOPSOIL INTO EXISTING VEGETATION AT A GRADE OF 5:1. TOPSOIL AND SEED ALL DISTURBED AREAS (TYP. BOTH SIDES)

- 75mm ASPHALT SURFACE HOT MIX "B"
- 100mm BASE OF 25mm CRUSHED GRAVEL COMPACTED TO 95% S.P.D.
- 200mm SUB-BASE OF 75mm MINUS PITRUN COMPACTED TO 95% S.P.D.
- PITRUN (ADDITIONAL LIFT(S) MAY BE REQUIRED BASED ON GEOTECHNICAL CONDITIONS)
- ROOT BARRIER

NOTES

1. 2% CROSS-SLOPE ORIENTED TOWARDS THE SUN OR DOWNHILL SLOPE, ON PATH AS DIRECTED BY THE TOWN, EXCEPT WHERE SUPERELEVATION IS REQUIRED ON A CURVE BASED ON SITE SPECIFIC CONSTRAINTS.
2. THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE ENGINEER FOR THE TRAIL ALIGNMENT AND SUB-BASE (IE: COMPACTION AND DEPTH OF GRAVEL) PRIOR TO SURFACING WITH ASPHALT.
3. USE EXISTING SITE SOIL OVER IMPORTING NEW SOIL WHERE POSSIBLE. COBBLES, DEBRIS AND ROOTS MUST BE REMOVED FROM EXISTING SOIL IF BEING REUSED.
4. IF NEW TOP SOIL IS USED, IT MUST BE WEED-FREE.
5. PATH WIDTH "A" SHALL BE A MINIMUM OF 3.5m FOR BIDIRECTIONAL FACILITIES, AND WIDER WHERE HIGH VOLUMES OF WALKING AND CYCLING ARE EXPECTED.
6. MODULAR TREE ROOT BARRIER PROTECTION PANELS (2mm THICK POLYPROPYLENE, OR EQUIVALENT) MAY BE INSTALLED ON BOTH SIDES OF PATHWAY AS AN ALTERNATE MEANS OF INHIBITING ROOT DAMAGE.
7. POLYSPUN 300 ROOT BARRIER TO BE INSTALLED IN AREAS WHERE POPLARS, WOLF WILLOW AND OTHER SUCKERING VEGETATION ARE PRESENT.
8. SALVAGED BOULDERS ARE TO BE SET ASIDE FOR USAGE ONSITE AS DIRECTED BY THE ENGINEER.
9. MODULAR TREE ROOT BARRIER PROTECTION PANELS (2MM THICK POLYPROPYLENE, OR EQUIVALENT) MAY BE INSTALLED ON BOTH SIDES OF PATHWAY AS AN ALTERNATE MEANS OF INHIBITING ROOT DAMAGE.
10. CLEAR ZONES MAY BE REDUCED FROM 1.0M TO 0.5M MINIMUM CLEARANCE FOR SITE SPECIFIC CONSTRAINTS.
11. A SLOPE OF 3:1 MAY BE CONSIDERED BASED ON SITE SPECIFIC CONSTRAINTS, AND AS DEEMED APPROPRIATE BY GEOTECHNICAL ENGINEER.

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	TYPICAL MULTI USE PATHWAY CROSS SECTION - ASPHALT SURFACE
1:50	STR 7.9	

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/09/19	2019 EDCG	BWM	CE	CB

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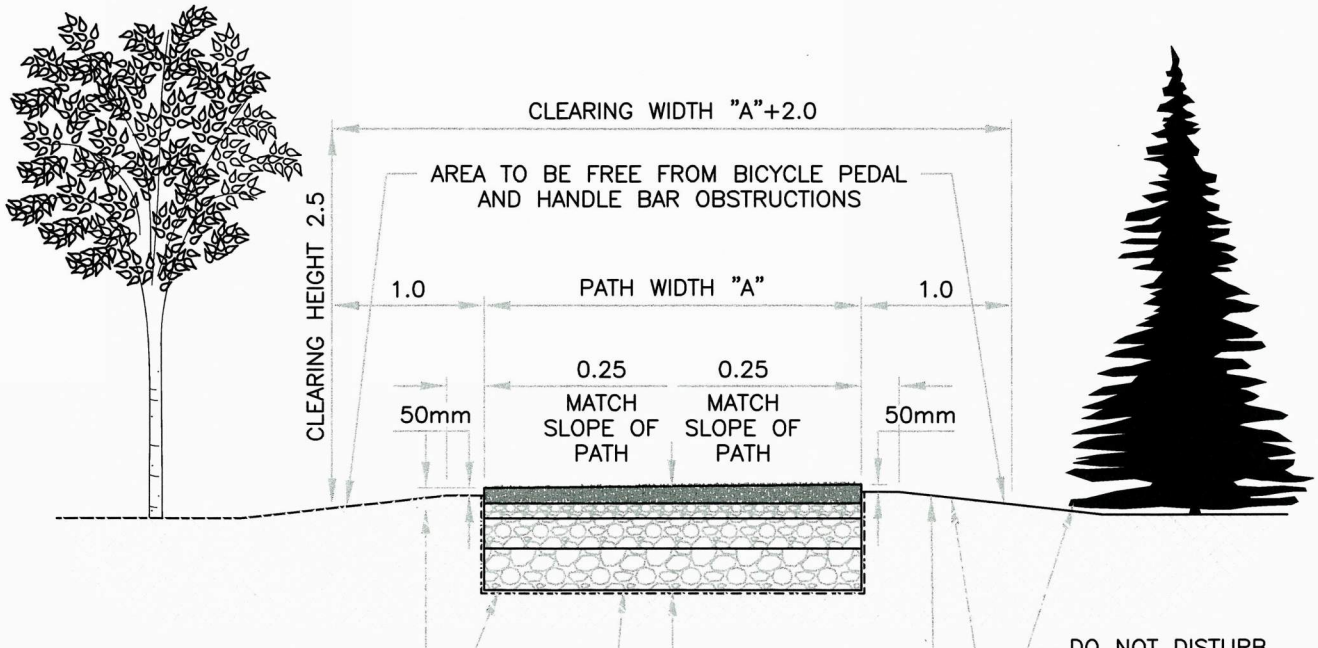
SEAL

PROFESSIONAL ENGINEER ALBERTA ANDY ESARTE

Feb. 28, 2025
ID 95819

Town of CANMORE



MIN. 150mm ABOVE SURROUNDING GRADES (TYP. BOTH SIDES)

INSTALL POLYSPUN 300 ROOT BARRIER (BOTH SIDES AND BOTTOM) EXTRA ROOT BARRIER CAN BE BURNED FLUSH WITH GROUND FOLLOWING PAVING, AND PRIOR TO SEEDING

REMOVE ORGANIC MATERIAL TO 500mm DEPTH. REPLACE WITH 275mm OF 75mm PITRUN WHERE OVER EXCAVATED BEYOND STRUCTURE DEPTH.

5:1 MAX. GRADE (TYP. BOTH SIDES) SEE NOTE 11

DO NOT DISTURB EXISTING VEGETATION (TYP. BOTH SIDES)

BLEND EXISTING TOPSOIL INTO EXISTING VEGETATION AT A GRADE OF 5:1. TOPSOIL AND SEED ALL DISTURBED AREAS (TYP. BOTH SIDES)

- 100mm TRAIL MIX (see note 2)
- 100mm BASE OF 25mm CRUSHED GRAVEL COMPACTED TO 95% S.P.D.
- 200mm SUB-BASE OF 75mm MINUS PITRUN COMPACTED TO 95% S.P.D.
- PITRUN (ADDITIONAL LIFT(S) MAY BE REQUIRED BASED ON GEOTECHNICAL CONDITIONS)
- ROOT BARRIER

NOTES

1. SAMPLE OF THE PROPOSED TRAIL MIX TO BE PROVIDED TO THE CONSULTANT 7 DAYS PRIOR TO DELIVERY ON SITE FOR ACCEPTANCE. UPON DELIVERY ON SITE THE TRAIL MIX IS TO BE VERIFIED BY THE ENGINEERING SERVICES TO BE IN COMPLIANCE TO THE STANDARDS AND THE SAMPLE PROVIDED PRIOR TO PLACEMENT.
2. 100MM DEPTH TRAIL MIX: CITY OF CALGARY PARKS GRAVEL TRAIL MIX PRODUCED AT LAFARGE SPYHILL. MOISTURE CONTENT AND TIMELY COMPACTION ARE IMPORTANT WHEN PLACING THIS MATERIAL
3. 2% CROSS SLOPE ORIENTED TOWARDS THE SUN OR DOWNHILL SLOPES.
4. USE EXISTING SITE SOIL OVER IMPORTING NEW SOIL WHERE POSSIBLE. COBBLES, DEBRIS AND ROOTS TO BE REMOVED FROM EXISTING SOIL IF BEING REUSED.
5. POLYSPUN 300 ROOT BARRIER TO BE INSTALLED IN AREAS WHERE POPLARS, WOLF WILLOW AND OTHER SUCKERING VEGETATION ARE PRESENT.
6. NEW SOIL IF USED MUST BE WEED-FREE.
7. PATH WIDTH "A" TO BE DETERMINED BASED ON SECTION 7.5 OF THE EDCG.
8. SALVAGED BOULDERS ARE TO BE SET ASIDE FOR USAGE ONSITE AS DIRECTED BY THE ENGINEER.
9. MODULAR TREE ROOT BARRIER PROTECTION PANELS (2MM THICK POLYPROPYLENE, OR EQUIVALENT) MAY BE INSTALLED ON BOTH SIDES OF PATHWAY AS AN ALTERNATE MEANS OF INHIBITING ROOT DAMAGE.
10. CLEAR ZONES MAY BE REDUCED FROM 1.0M TO 0.5M MINIMUM CLEARANCE FOR SITE SPECIFIC CONSTRAINTS.
11. A SLOPE OF 3:1 MAY BE CONSIDERED BASED ON SITE SPECIFIC CONSTRAINTS, AND AS DEEMED APPROPRIATE BY GEOTECHNICAL ENGINEER.

Metric
All dimensions in meters unless otherwise noted

SCALE: 1:50	FIGURE NO.: STR 7.10	TYPICAL MULTI USE PATHWAY CROSS SECTION - GRAVEL/CLAY SURFACE

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	ISL	AE
1	12/09/19	2019 EDCG	BWM	LG	CB

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TOWN OF CANMORE
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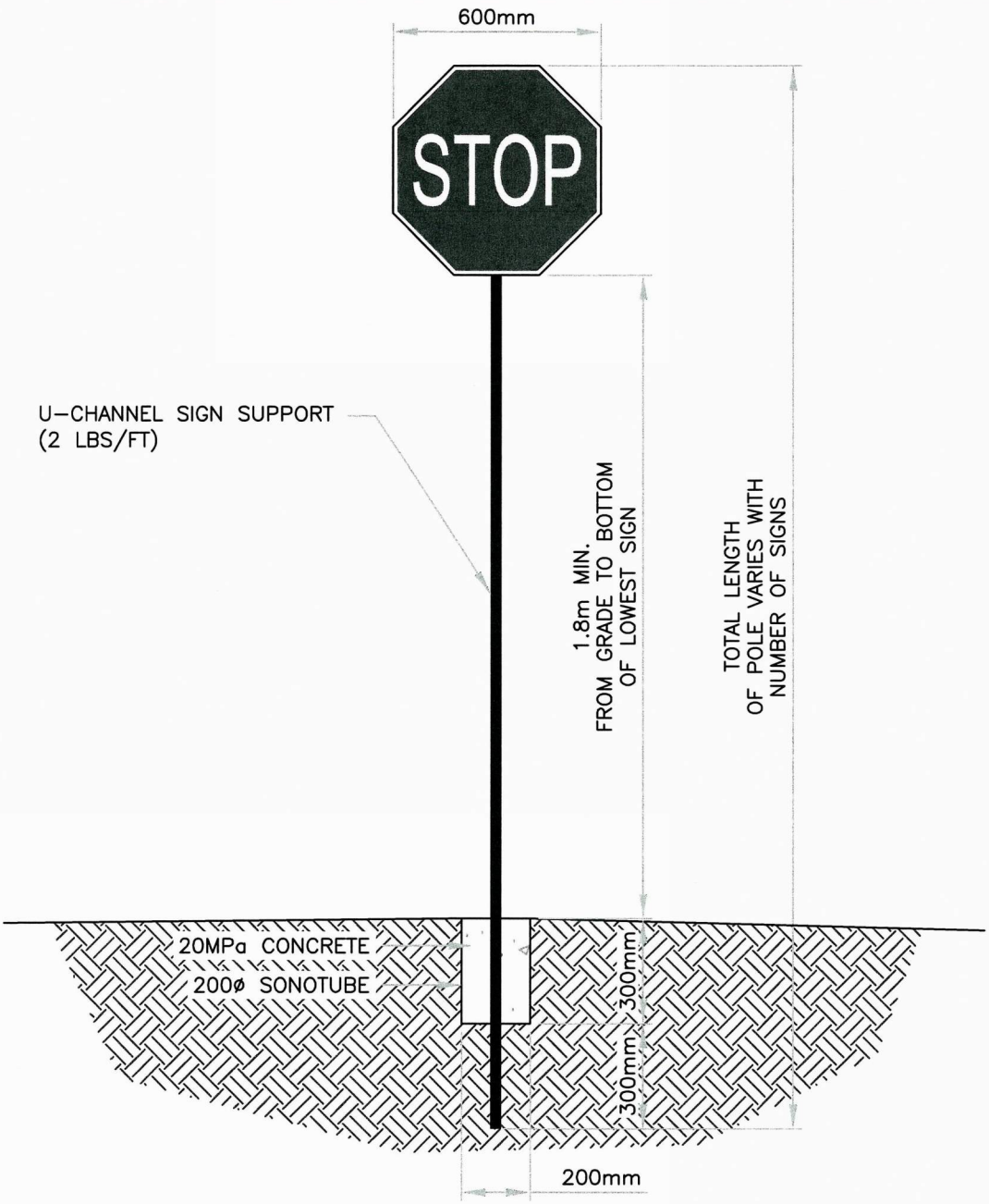
SEAL
PROFESSIONAL ENGINEER ANDY ESARTE ALBERTA
[signature]
Feb. 28, 2025
ID 95819

Town of CANMORE



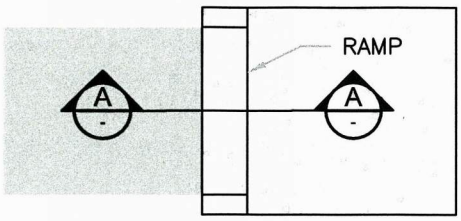
NOTES

1. ALL SIGNS TO BE ORIENTED AND INSTALLED IN ACCORDANCE WITH TAC AND MUTCDC GUIDANCE.
2. AN ALTERNATE FLUSH MOUNT BASE FOR U–CHANNEL SIGN SUPPORT MAY BE CONSIDERED FOR MOUNTING ON 100mm CONCRETE SIDEWALK. CONTACT ENGINEERING DEPARTMENT FOR APPROVAL AND DETAILS.
3. CROSSWALK SIGNS SHALL BE FITTED WITH REFLECTIVE PANELS, BRITESIDE MODEL BSX–372DGFYG DIAMOND GRADE 4083 YELLOW OR APPROVED EQUAL TO SUIT MOUNTING ON BOTH SIDES OF POST.
4. MINIMUM 0.5m OFFSET FROM EDGE OF ANY SIDEWALK, CYCLING FACILITY OR CURB RAMP.

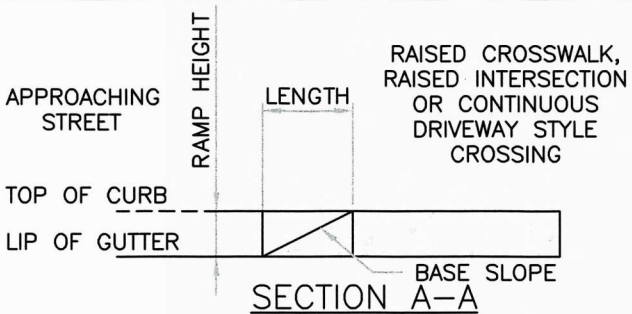
All dimensions in Metric meters unless otherwise noted

SCALE: 1:20	FIGURE NO.: STR 7.11	TYPICAL STREET SIGN INSTALLATION					
3						PERMIT	SEAL
2	01/28/25	2025 EDCG	BWM	ISL	AE	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95519 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ANDY ESARTE ALBERTA Feb. 28, 2025 10 95819
1	05/10/10	2010 EDCG	SP	PN	PN		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



PLAN VIEW
SCALE 1:200

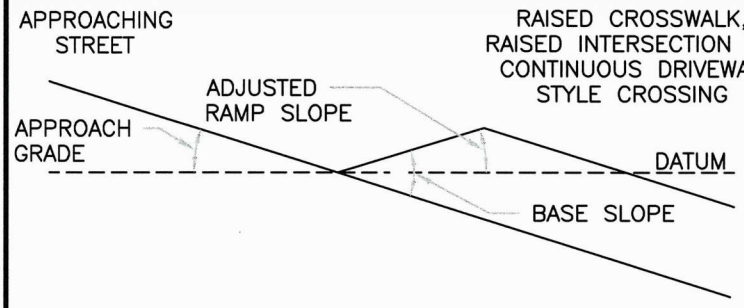


SECTION A–A
SCALE H 1:100
V 1:25

RAMP DESIGN SPEED OF 20km/h			
CURB TYPE	RAMP HEIGHT (m)	LENGTH (m)	BASE SLOPE
LOW PROFILE ROLLED CURB WITH 250mm GUTTER	0.08	0.80	10.0%
STANDARD CURB WITH 250mm GUTTER	0.12	1.20	10.0%

RAMP DESIGN SPEED OF 30km/h			
CURB TYPE	RAMP HEIGHT (m)	LENGTH (m)	BASE SLOPE
LOW PROFILE ROLLED CURB WITH 250mm GUTTER	0.08	1.00	8.0%
STANDARD CURB WITH 250mm GUTTER	0.12	1.50	8.0%

RAMP DESIGN SPEED BY CLASSIFICATION	
TOWN OF CANMORE CLASSIFICATION	RAMP DESIGN SPEED (km/h)
LOCAL (RESIDENTIAL)	20
COLLECTOR	30



EXAMPLE CALCULATION

ADJUSTED RAMP SLOPE = BASE SLOPE + APPROACH GRADE

ADJUSTED RAMP SLOPE = 8.0% + −2.0%

ADJUSTED RAMP SLOPE = 6.0%

RELATIVE RAMP GRADE ADJUSTMENT

NOTES
1. RAMP MATERIAL TO BE CONCRETE.
2. CONSTRUCT ALL RAMPS TO THEIR ADJUSTED RAMP SLOPE USING THE CALCULATION SHOWN ABOVE. APPROACH GRADE IS NEGATIVE FOR A DOWNHILL APPROACH AND POSITIVE FOR AN UPHILL APPROACH.
3. RAMP DESIGN SPEED DOES NOT MATCH THE DESIGN SPEED OF THE STREET. RAMPS ARE INTENDED TO PROVIDE ADDITIONAL TRAFFIC CALMING EFFECTS AND SHOULD BE PLACED AT THE DISCRETION OF THE ENGINEER.

All dimensions in Metric meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.12	RAMP LAYOUT			
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG

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ANDY ESARTE
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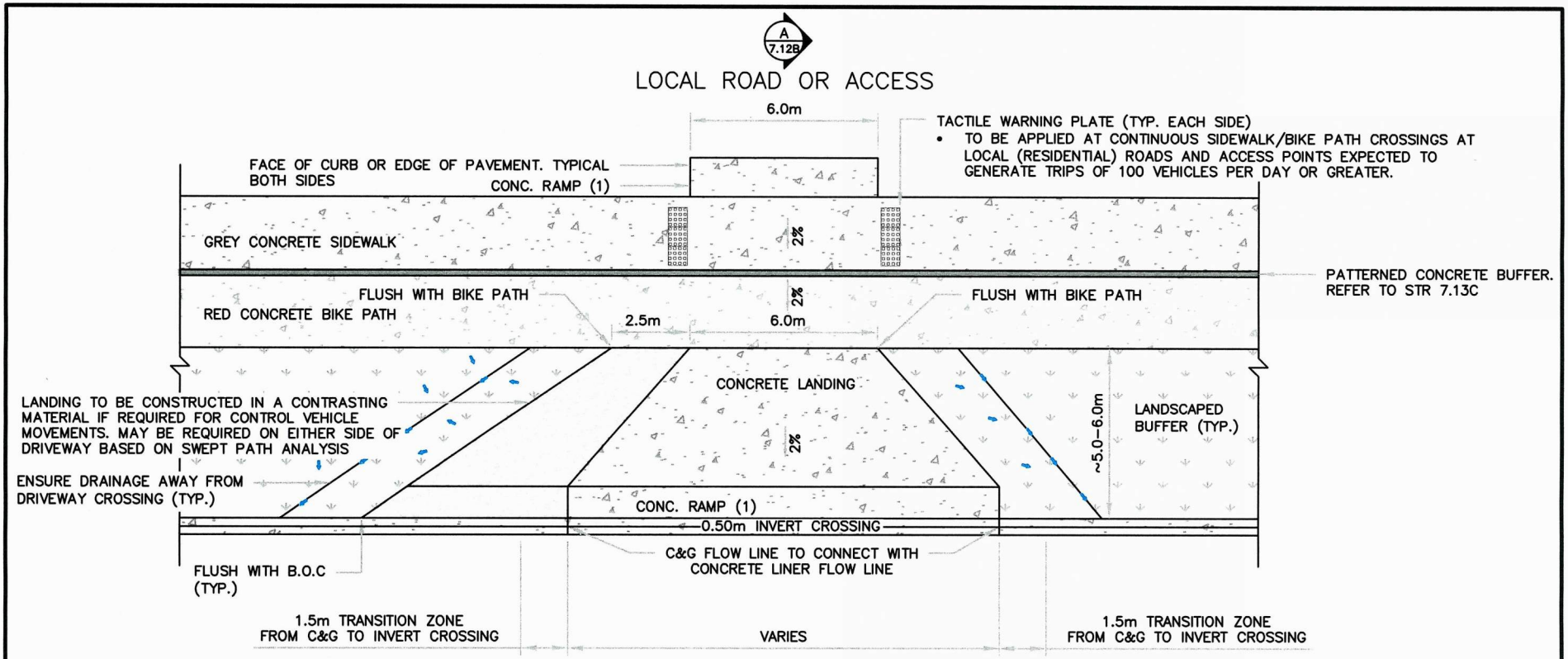
Town of CANMORE



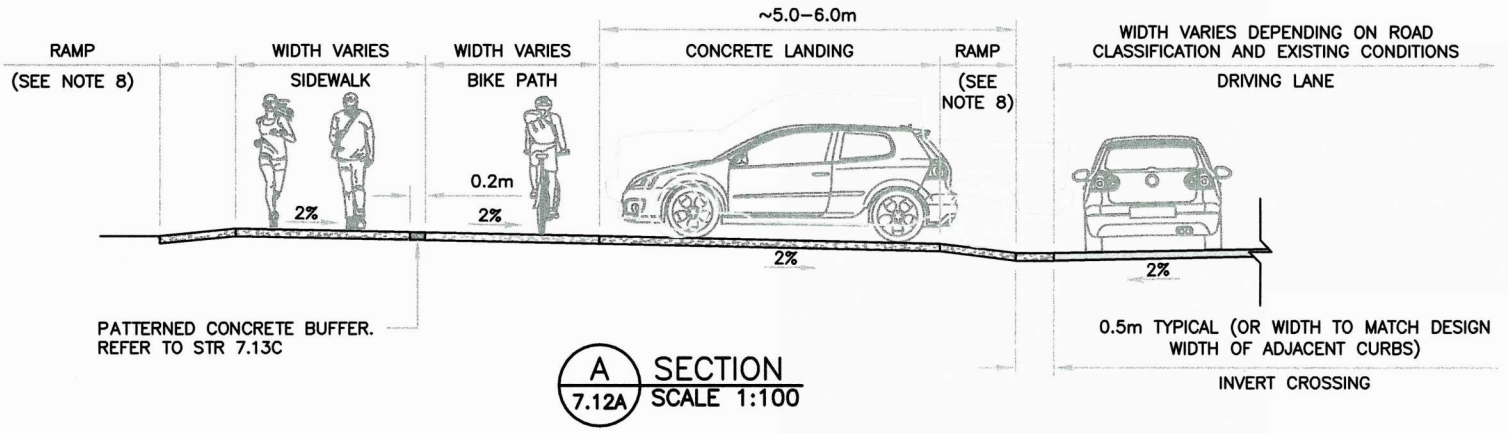
NOTES

1. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.12A	BEND OUT DRIVEWAY CROSSING - PLAN VIEW				PERMIT	SEAL	
3						PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA ANDY ESAAU	Town of CANMORE
2								
1	01/28/25	2025 EDCG	BWM	ISL	AE			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			

Feb. 28, 2025
ID 95819



A / 7.12A SECTION
SCALE 1:100

NOTES

1. ROAD AND PATH STRUCTURE TO MATCH EXISTING, OR TO MATCH CITY OF CALGARY STANDARD SPECIFICATIONS, BASED ON SITE SPECIFIC GEOTECHNICAL RECOMMENDATIONS AND ENGINEERING DESIGN DRAWINGS. ROAD AND PATH STRUCTURE MAY VARY BASED ON EXISTING CONDITIONS AND ROAD CLASSIFICATION.
2. PRIVATE DRIVEWAY REINFORCED CONCRETE THICKNESS 100mm, UNLESS SPECIFIED OTHERWISE.
3. COMMERCIAL DRIVEWAY REINFORCED CONCRETE THICKENESS 150mm, UNLESS SPECIFIED OTHERWISE.
4. TYPICAL STRUCTURES SHOWN BELOW ARE FOR A COMMERICAL DRIVEWAY CROSSING ON A CANMORE ARTERIAL ROAD CLASSIFICATION.
5. BIKE PATH AT DRIVEWAY CROSSING
   - RED CONCRETE FOR BIKES TO BE BROOM FINISHED WITH SAWCUT CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm RED FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm. COLOR INTERSTAR SEDONA JO–6435R @ 2 BAGS PER CUBIC YARD.
   - 100mm OF 25mm MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80mm MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
6. PEDESTRIAN SIDEWALK AT DRIVEWAY CROSSING
   - GREY CONCRETE FOR PEDESTRIANS TO BE BROOM FINISHED WITH TOOLED CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm.
   - 100mm OF 25MM MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80MM MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
7. RAMPS AND CONCRETE LANDING TO MATCH PEDESTRIAN SIDEWALK STRUCTURE, UNLESS SPECIFIED OTHERWISE.
8. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:100	FIGURE NO.: STR 7.12B	BEND OUT DRIVEWAY CROSSING - SECTION VIEW

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/14/25	2025 EDCG	BWM	ISL	AE

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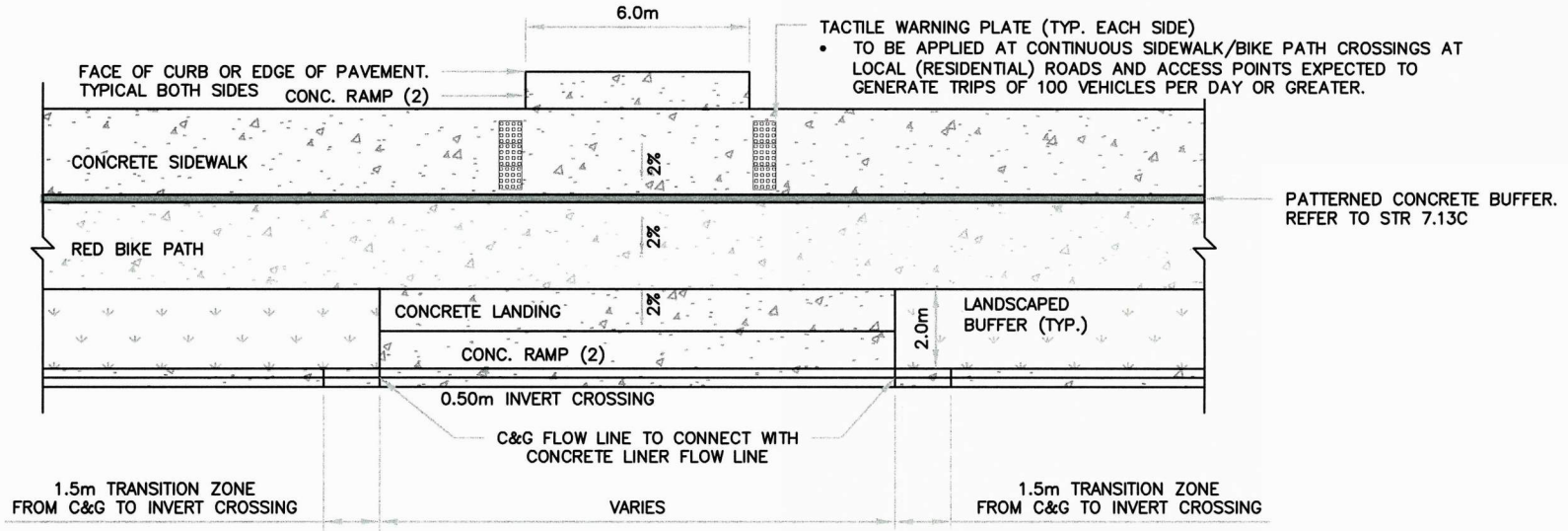
Town of CANMORE

A
7.13B

LOCAL ROAD OR ACCESS



DRIVING LANE

A
7.13B

PLAN VIEW
SCALE 1:200

NOTES
1. SURFACE DRAINAGE SHALL BE MANAGED WITH CATCH BASINS ADJACENT TO THE RAMP. A BREAK IN THE RAMP ADJACENT TO THE CURB AND COVERED WITH A PLATE IS DISCOURAGED DUE TO THE MAINTENANCE BURDEN.
2. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.13A	BEND IN DRIVEWAY CROSSING - PLAN VIEW

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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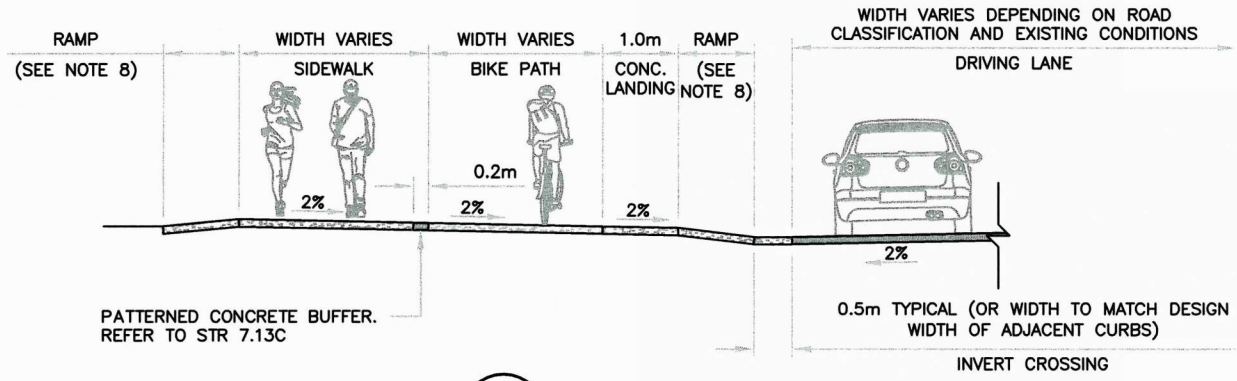

A / 7.13A SECTION
SCALE 1:100

NOTES

1. ROAD AND PATH STRUCTURE TO MATCH EXISTING, OR TO MATCH CITY OF CALGARY STANDARD SPECIFICATIONS, BASED ON SITE SPECIFIC GEOTECHNICAL RECOMMENDATIONS AND ENGINEERING DESIGN DRAWINGS. ROAD AND PATH STRUCTURE MAY VARY BASED ON EXISTING CONDITIONS AND ROAD CLASSIFICATION.
2. PRIVATE DRIVEWAY REINFORCED CONCRETE THICKNESS 100mm, UNLESS SPECIFIED OTHERWISE.
3. COMMERCIAL DRIVEWAY REINFORCED CONCRETE THICKENESS 150mm, UNLESS SPECIFIED OTHERWISE.
4. TYPICAL STRUCTURES SHOWN BELOW ARE FOR A COMMERICAL DRIVEWAY CROSSING ON A CANMORE ARTERIAL ROAD CLASSIFICATION.
5. BIKE PATH AT DRIVEWAY CROSSING
   - RED CONCRETE FOR BIKES TO BE BROOM FINISHED WITH SAWCUT CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm RED FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm. COLOR INTERSTAR SEDONA JO–6435R @ 2 BAGS PER CUBIC YARD.
   - 100mm OF 25mm MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80mm MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
6. PEDESTRIAN SIDEWALK AT DRIVEWAY CROSSING
   - GREY CONCRETE FOR PEDESTRIANS TO BE BROOM FINISHED WITH TOOLED CONTROL JOINTS AT 1.5m ON CENTERS. EXPANSION JOINTS PER CITY OF CALGARY REQUIREMENTS AT EVERY INTERSECTION AND AT 75m MAXIMUM INTERVALS BETWEEN INTERSECTIONS.
   - 150mm FIBER REINFORCED CONCRETE PER ASTM C1116, 4.1.3, TYPE III AND SHALL BE OLEFIN MACRO FIBERS. FIBER CONTENT TO BE 1–2kg/m³ WITH FIBER LENGTH 38–50mm.
   - 100mm OF 25MM MINUS CRUSHED GRAVEL @ 98% SPMDD.
   - 200mm OF 80MM MINUS PIT RUN GRAVEL @ 98% SPMDD.
   - SUBGRADE COMPACTED TO 98% SPD AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF ROAD/PATH STRUCTURE ABOVE.
7. RAMPS AND CONCRETE LANDING TO MATCH PEDESTRIAN SIDEWALK STRUCTURE, UNLESS SPECIFIED OTHERWISE.
8. REFER TO STR 7.12 FOR RAMP HEIGHTS, GRADES AND DIMENSIONS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:100	FIGURE NO.: STR 7.13B	BEND IN DRIVEWAY CROSSING - SECTION VIEW

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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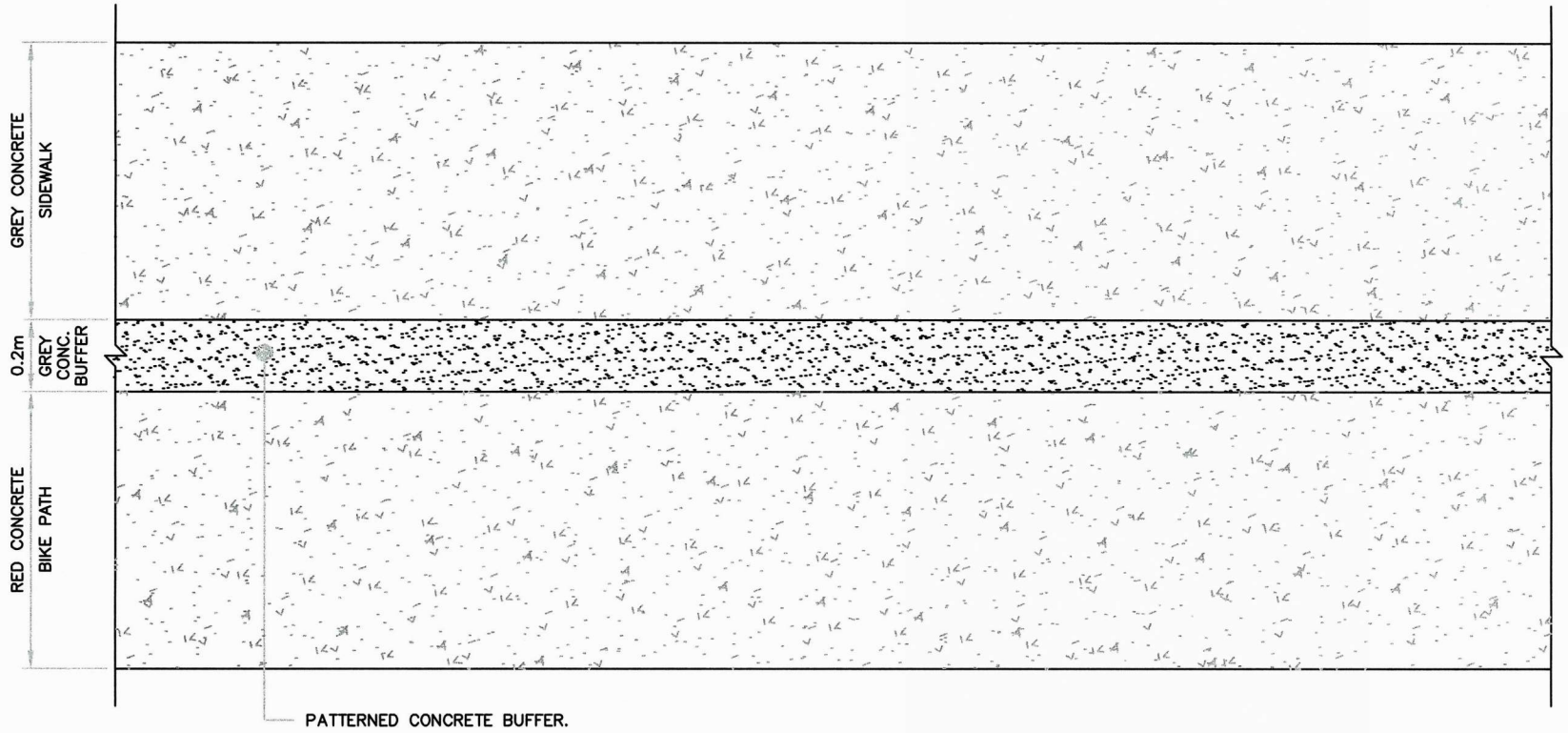

NOTES

1. TEXTURED CONCRETE BUFFER IS PART OF GREY CONCRETE SIDEWALK.
2. TEXTURED CONCRETE BUFFER TACTILE DELINEATION BETWEEN GREY CONCRETE SIDEWALK AND RED CONCRETE BIKE PATH TO CONSIST OF 200mm WIDE BUFFER WITH SEALED 10mm AGGREGATE SANDBLASTED TO EXPOSE THE AGGREGATE.
3. SURFACE TO HAVE SKID RESISTANCE EQUIVALENT TO BROOM FINISHED CONCRETE TO AVOID THE CREATION OF A SLIP HAZARD IN ICY CONDITIONS.
4. SANDBLASTED AREA TO BE SEALED WITH SIKAGARD A-50 LO-VOC IN CONCRETE GREY COLOR.
5. RED CONCRETE BIKE PATH COLOUR TO BE: INTERSTAR SEDONA JO-6435R @ 2 BAGS/CUBIC YARD.

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	PATTERNED CONCRETE BUFFER DETAIL
1:20	STR 7.13C	

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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ANDY ESARTS

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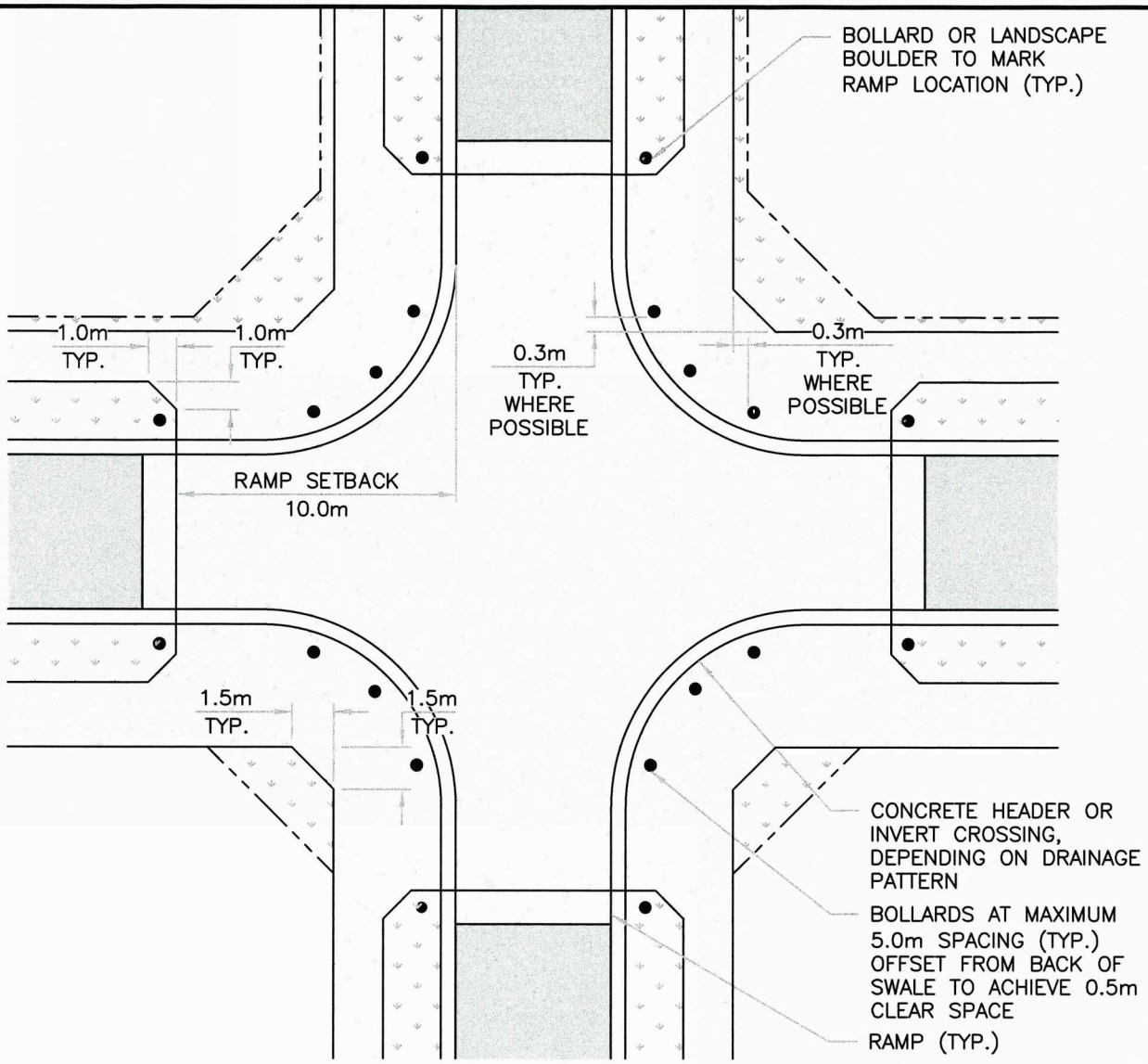

NOTES

1. REFER TO STR 7.12 FOR RAMP DIMENSIONS.
2. TYPICAL RAMP SETBACK SHALL BE 10.0m FROM EDGE OF INTERSECTING STREET. EXTEND RAMP SETBACK AROUND CURVES AS NEEDED TO ACHIEVE A CLEAR LINE OF SIGHT FROM APPROACHING ROAD.
3. SIDEWALK SHALL BE DIRECTLY ADJACENT TO RAISED INTERSECTION, UNLESS APPROVED BY THE TOWN TO ACCOMMODATE DRAINAGE OR LANDSCAPING.
4. MINIMUM 1% SLOPE REQUIRED FOR DRAINAGE ON ALL AREAS OF THE RAISED INTERSECTION.
5. RAMP AND RAISED INTERSECTION MATERIAL SHALL BE CONCRETE.
6. BOLLARD PLACEMENT SHOULD NOT IMPEDE PRIMARY TRAVEL LINES FOR WALKING.
7. TACTILE WARNING PLATES TO BE PROVIDED AT THE INTERFACE BETWEEN EXCLUSIVE PEDESTRIAN ZONE AND THE SHARED WALKING/DRIVING SURFACE.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:250	FIGURE NO.: STR 7.14	TYPICAL RAISED INTERSECTION - LOCAL ROADS					
3						PERMIT	SEAL
2						PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA ANDY ESARTE
1	01/28/25	2025 EDCG	BWM	ISL	AE		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Feb 28, 2025
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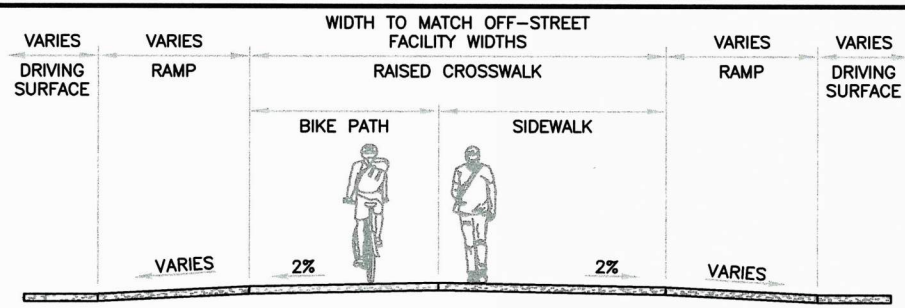
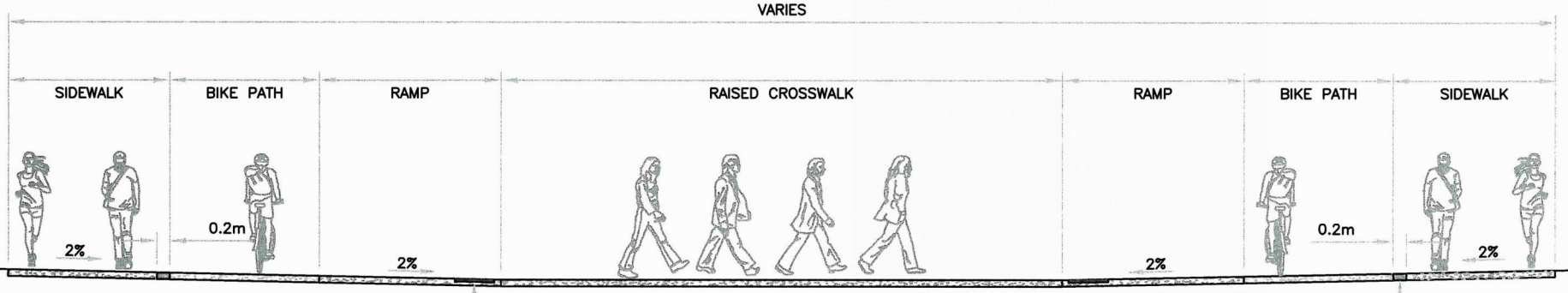


NOTES

1) A 2% CROSSFALL FOR BIKE PATH AND SIDEWALK ARE REQUIRED FOR A LEVEL ROAD PROFILE. IF CROSSWALK IS TO BE ADDED TO A ROAD WITH A >2% GRADE, THE CROSSWALK SURFACE CAN BE PARALLEL TO THE ROAD PROFILE.

VIEW PARALLEL TO DRIVING DIRECTION



TACTILE WARNING PLATES. (TYP. BOTH SIDES)

VIEW PERPENDICULAR TO DRIVING DIRECTION

PATTERNED CONCRETE BUFFER. REFER TO STR 7.13C (TYP. BOTH SIDES)

SECTION
SCALE 1:100

All dimensions in Metric meters unless otherwise noted

SCALE:	FIGURE NO.:	RAISED CROSSWALK - SECTION VIEW
1:100	STR 7.14A	

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	CE

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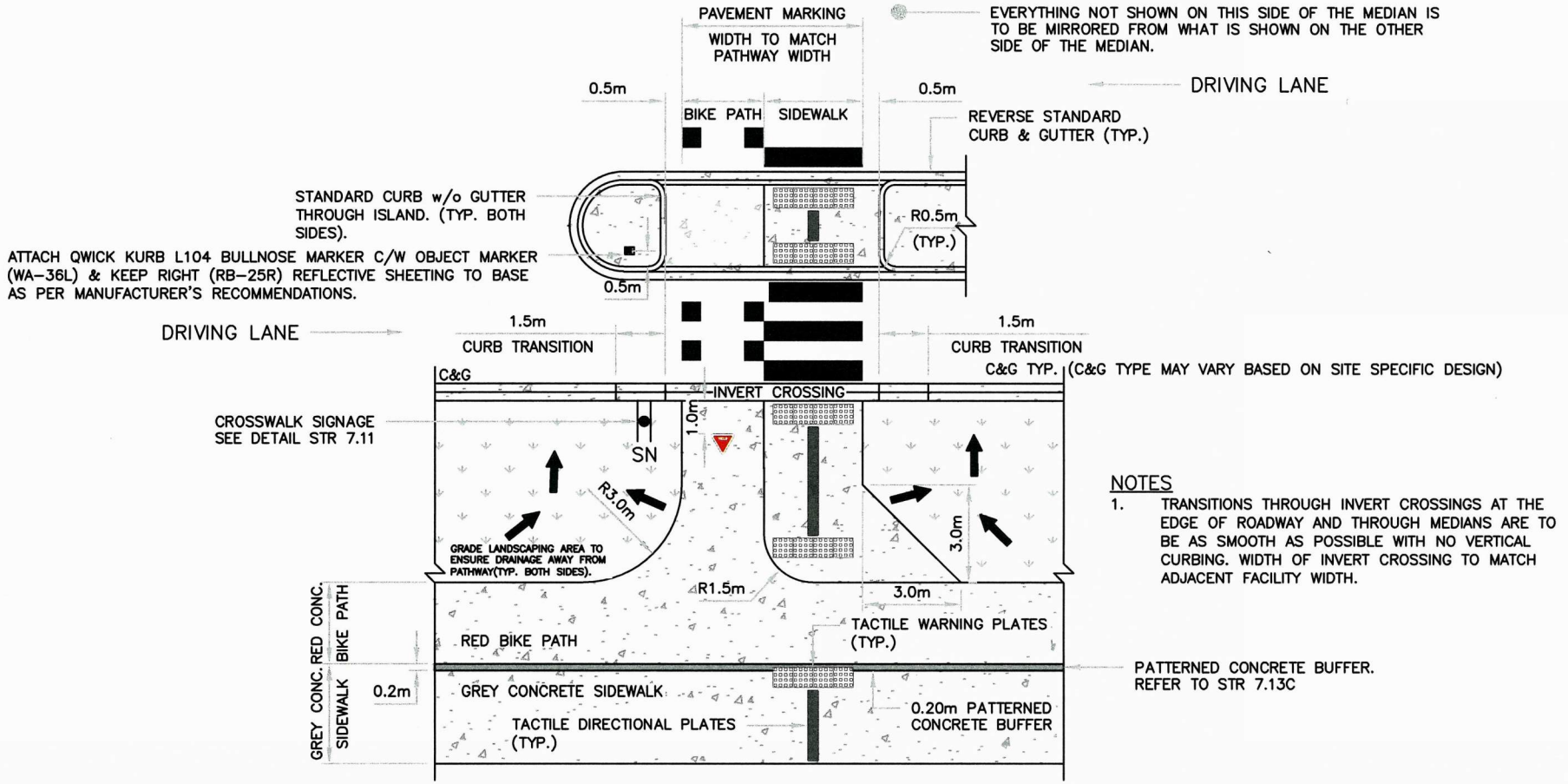

PLAN VIEW
SCALE 1:200

NOTES
1. TRANSITIONS THROUGH INVERT CROSSINGS AT THE EDGE OF ROADWAY AND THROUGH MEDIANS ARE TO BE AS SMOOTH AS POSSIBLE WITH NO VERTICAL CURBING. WIDTH OF INVERT CROSSING TO MATCH ADJACENT FACILITY WIDTH.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.15	ARTERIAL AT GRADE CROSSING WITH MEDIAN REFUGE

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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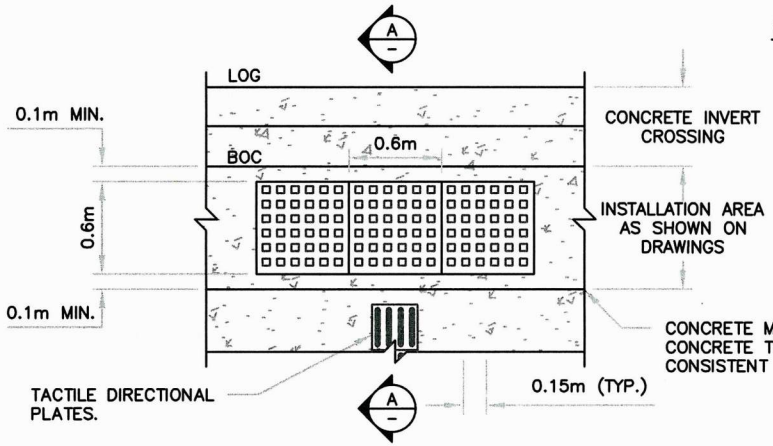
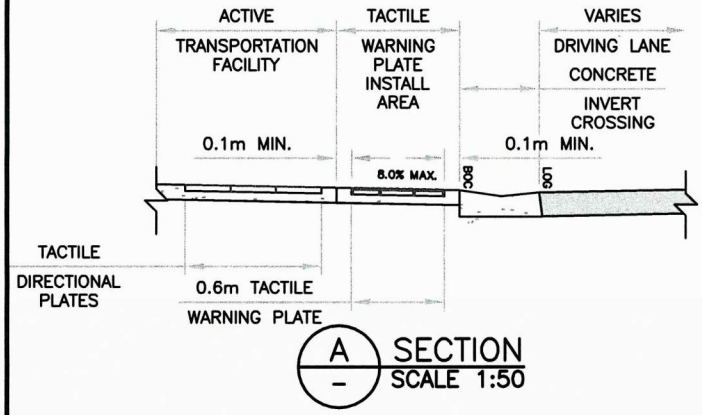
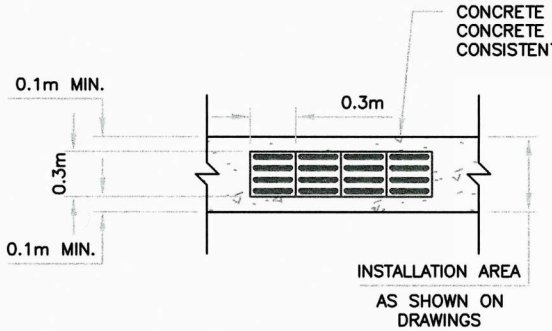


PLAN VIEW
SCALE 1:50



A – SECTION
SCALE 1:50

NOTES
1) TACTILE HAZARD PLATES TO BE TROJAN INDUSTRIES DURALAST DETECTABLE CAST IRON WARNING PLATE OR APPROVED EQUIVALENT. TACTILE HAZARD PLATES MUST HAVE ANCHOR TABS ON BOTTOM OF PLATE.
2) TACTILE GUIDANCE PLATES TO BE KINESEK ENGINEERED PRODUCTS ADVANTAGE BAR CAST IRON 295MM X 295MM (AVAILABLE FROM COMPLIANCE SOLUTIONS CANADA) OR APPROVED EQUIVALENT. TACTILE GUIDANCE PLATES MUST HAVE ANCHOR TABS ON BOTTOM OF PLATE.
3) ALL TACTILE PLATES TO BE INSTALLED WITH MINIMUM 100MM CLEARANCE TO EDGE OF CONRETE PANEL(S) THEY ARE INSTALLED IN. REFER TO MANUFACTURER'S INSTALLATION RECOMMENDATIONS.
4) TRANSITIONS THROUGH INVERTS CROSSINGS AT THE EDGE OF ROADWAY AND THROUGH MEDIANS ARE TO BE AS SMOOTH AS POSSIBLE WITH NO VERTICAL CURBING. WIDTH OF INVERT CROSSING TO MATCH ADJACENT CURB WIDTH.
5) CERTAIN SITUATIONS DO NOT REQUIRE AN INVERT CROSSING, REFER TO SITE SPECIFIC DRAWINGS.



PLAN – **TACTILE DIRECTIONAL PLATES**
SCALE 1:50

NOTES
1) TACTILE PLATE TO BE CAST IRON KINESEK ENGINEERED PRODUCTS ADVANTAGE BAR CAST IRON 295mm X 295mm (AVAILABLE FROM COMPLIANCE SOLUTIONS CANADA OR APPROVED EQUIVALENT). SUPPLY SAMPLE FOR APPROVAL PRIOR TO INSTALLATION MOCK–UP. PLATES COMPLETE WITH ANCHOR TABS ON BOTTOM OF PLATE.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:50	FIGURE NO.: STR 7.16	TACTILE WARNING PLATES (AT CURB RAMPS)

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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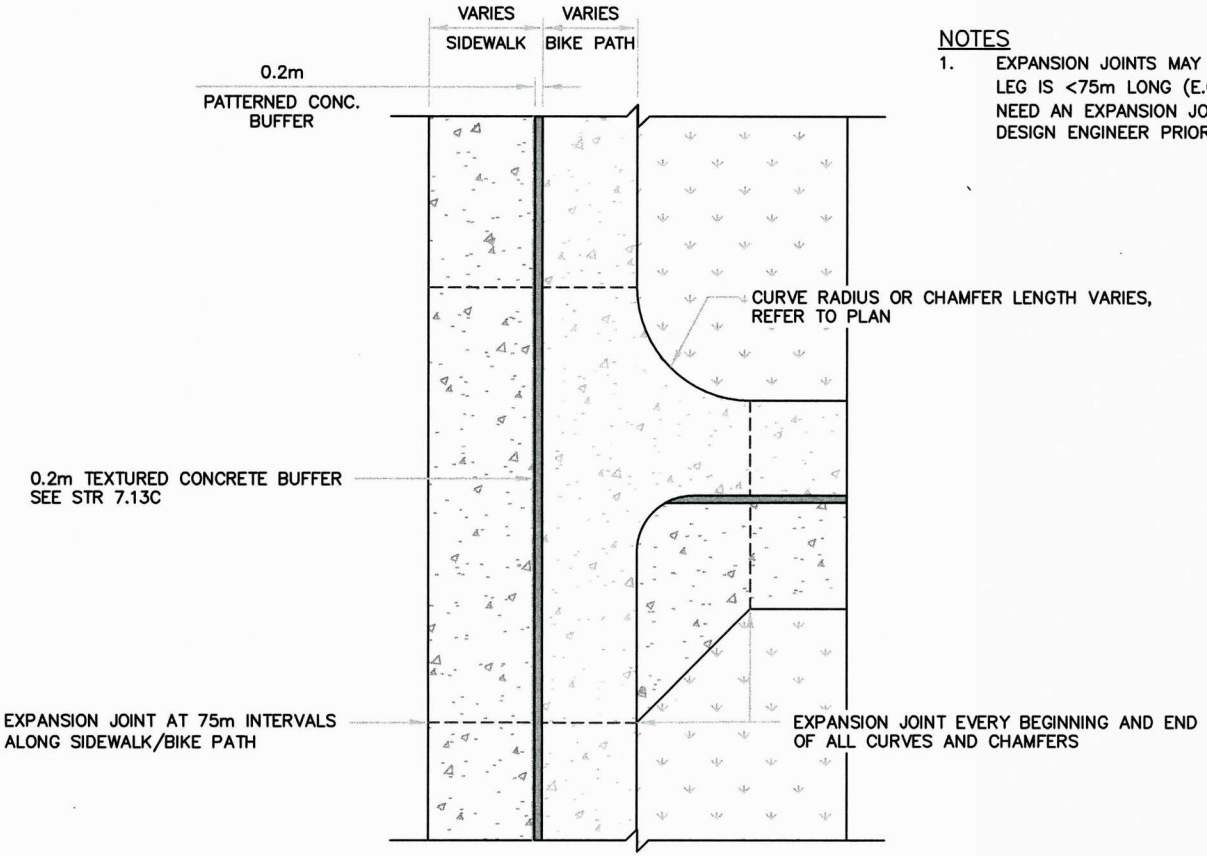

PLAN VIEW
SCALE 1:200

NOTES

1. EXPANSION JOINTS MAY NOT BE NEEDED ON ALL LEGS OF PATHWAY INTERSECTIONS IF ONE LEG IS <75m LONG (E.G. – A CROSSWALK CONNECTION A FEW METRES LONG WOULD NOT NEED AN EXPANSION JOINT). CONTRACTOR TO REVIEW EXPANSION JOINT LOCATIONS WITH DESIGN ENGINEER PRIOR TO INSTALLATION.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.17	EXPANSION JOINT LAYOUT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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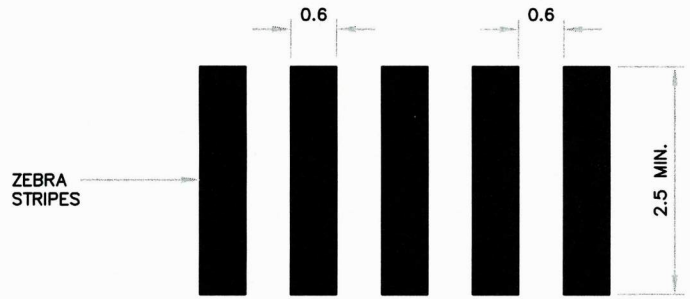
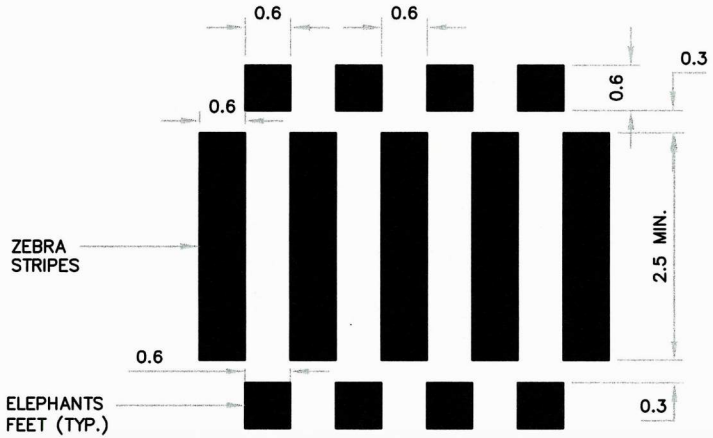
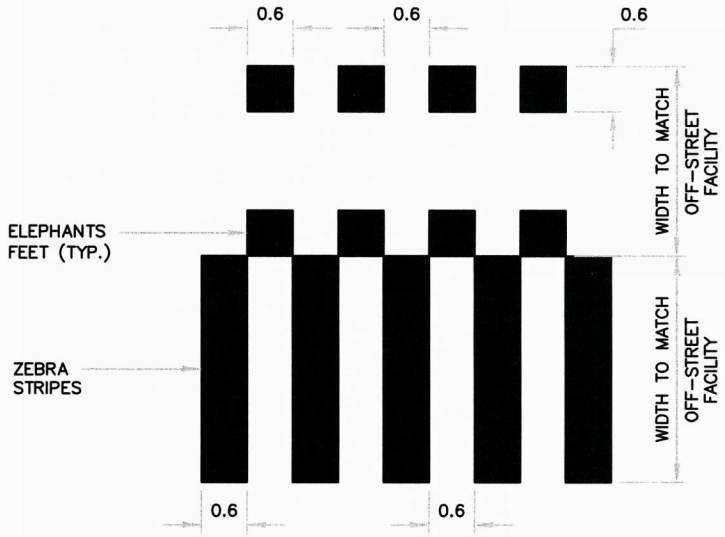


SIDEWALK CROSSING



MULTI USE PATHWAY CROSSING
(SEE NOTE 2)



SIDE BY SIDE SIDEWALK/BIKE PATH CROSSING

NOTES

1) ALL PAVEMENT MARKINGS TO BE CONSTRUCTED WITH SURFACE APPLIED THERMOPLASTIC OR MMA.
2) WHERE APPLIED ON RAISED CROSSINGS, WIDTH OF CROSSING SURFACE SHOULD BE WIDE ENOUGH TO ACCOMMODATE MARKINGS AS SHOWN.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:100	FIGURE NO.: STR 7.18	CROSSWALK AND ELEPHANTS FEET PAVEMENT MARKINGS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	CE

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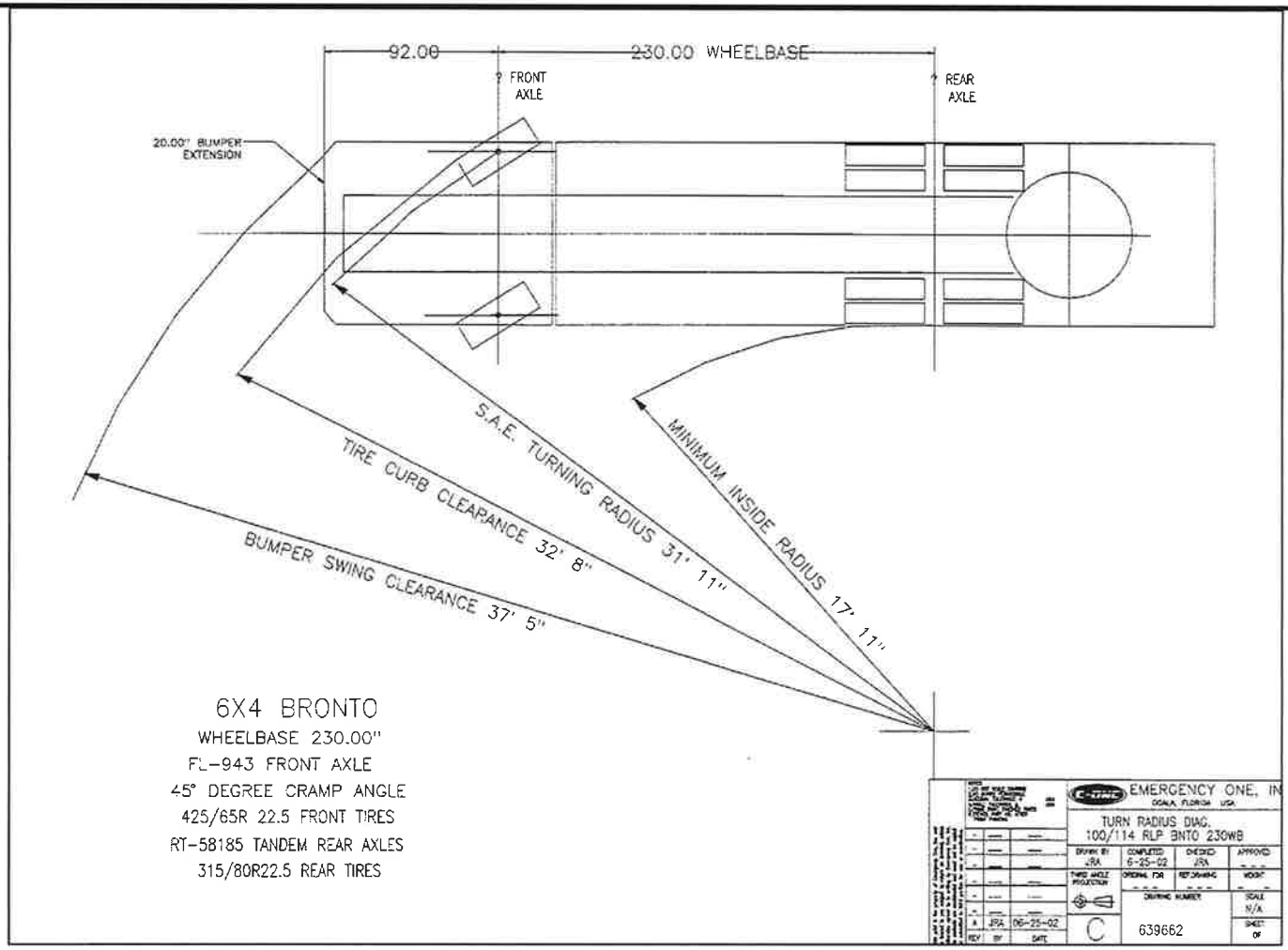

All dimensions in Metric meters unless otherwise noted

SCALE: 1:200	FIGURE NO.: STR 7.19	RLP BRONTO 230WB - TURN RADIUS DIAGRAM

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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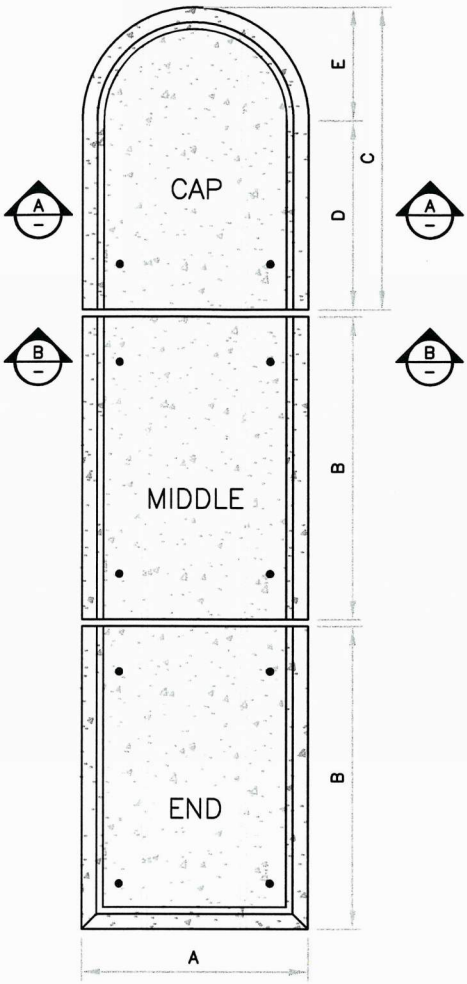
	A	B	C	D	E
600	600	1200	1200	900	300
1000	1000	2000	2000	1500	500
1500	1500	2000	2000	1250	750



PLAN
1:50

GENERAL NOTES

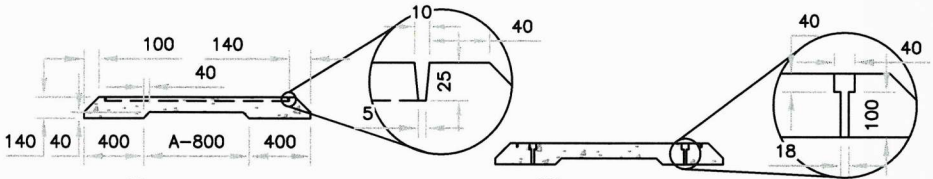
1. THE ELEMENTS ARE DELIVERED WITH:
   – ATTACHED LIFT DEVICES: SCREW SLEEVES SUITABLE FOR M20 HOISTING RINGS.
   – FIXING HOLES FOR ANCHORING WITH RECESS FOR SCREW BOLT M16.
   – PLASTIC SEALING CAPS FOR SCREW SLEEVES.
   – PLASTIC SEALING CAPS FOR MOUNTING HOLES.
   – 4 RUBBER GU GRANULATE ADHESIVE STRIPS FOR POSSIBLE UNEVENNESS IN ASPHALT.
2. OPTIONALLY TO BE APPLIED IN ELEMENTS:
   – ANCHOR ANCHORS 4xM10 FOR ATTACHMENT COLUMN AND TRAFFIC SIGN D2.
   – AFTER APPROVAL DRAWING.

PRECAST CONCRETE NOTES

1. CONCRETE MATERIALS, QUALITY. MIXING, PLACING, FORM WORK AND OTHER PRECAST CONCRETE CONSTRUCTION PRACTICES TO CONFORM TO CSA–A23.1.
2. PRECAST CONCRETE COMPONENTS TO BE MANUFACTURED AND SUPPLIED BY A MANUFACTURER QUALIFIED IN ACCORDANCE WITH CSA–A23.4.
3. MATERIALS AND METHODS OF CONSTRUCTION TO CONFORM TO CSA–A23.4.
4. SUPPLY CONCRETE USING TYPE GU CEMENT THAT MEETS EXPOSURE CLASS C–1 HAVING A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 35 MPa, MAXIMUM AGGREGATE SIZE OF 20mm, AND MAXIMUM WATER–TO–CEMENTING MATERIALS RATION OF 0.40.
5. MAXIMUM FLY ASH CONTENT NOT TO EXCEED 15% OF TOTAL CEMENTING MATERIAL.
6. DO NOT USE ADMIXTURES CONTAINING CALCIUM CHLORIDE.

PRECAST CONCRETE NOTES

1. REINFORCEMENT STEEL TO CONFORM TO CSA–G30.18, GRADE 400.
2. DO NOT WELD REINFORCEMENT UNLESS SPECIFICALLY NOTED. REINFORCEMENT TO BE WELDED TO CONFORM TO CSA–G30.18, GRADE 400W. WELDING ONLY PERMITTED BY AN ORGANIZATION CERTIFIED TO CSA–W186.
3. CLEAR CONCRETE COVER TO REINFORCEMENT:
   a. LONGITUDINAL BARS HAVING 60mm UNLESS NOTED OTHERWISE, OR
   b. STIRRUPS AND TIES HAVING 40mm UNLESS NOTED OTHERWISE.
4. USE STANDARD END HOOK LENGTHS FOR REINFORCEMENT UNLESS NOTED OTHERWISE.
5. USE REINFORCEMENT SPLICES UNLESS NOTED OTHERWISE.
6. WELDED WIRE MESH TO CONFORM TO ASTM A497/A497M.



A SECTION
1:50

B SECTION
1:50

All dimensions in Metric meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.20A	PRECAST CONCRETE MEDIAN - 600mm-1500mm			
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG

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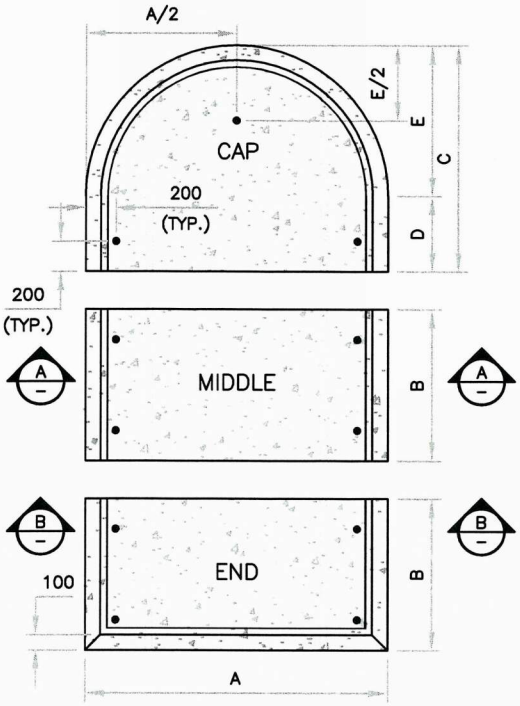


PLAN
1:50

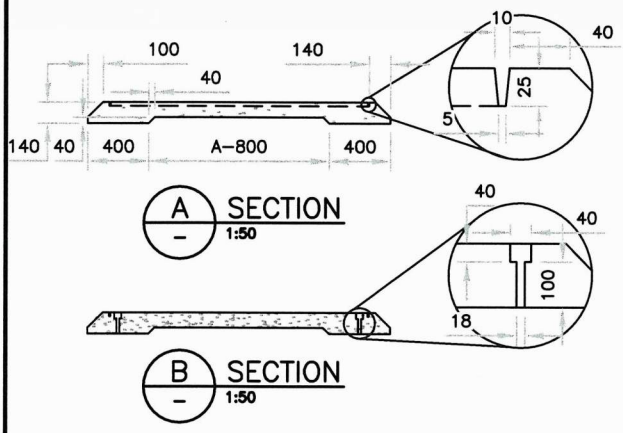
	A	B	C	D	E
2000	2000	1000	1500	500	1000
2500	2500	1000	1500	250	1250
3000	3000	1000	1500	–	1500

GENERAL NOTES

1. THE ELEMENTS ARE DELIVERED WITH:
   - ATTACHED LIFT DEVICES: SCREW SLEEVES SUITABLE FOR M20 HOISTING RINGS.
   - FIXING HOLES FOR ANCHORING WITH RECESS FOR SCREW BOLT M16.
   - PLASTIC SEALING CAPS FOR SCREW SLEEVES.
   - PLASTIC SEALING CAPS FOR MOUNTING HOLES.
   - 4 RUBBER GU GRANULATE ADHESIVE STRIPS FOR POSSIBLE UNEVENNESS IN ASPHALT.
2. OPTIONALLY TO BE APPLIED IN ELEMENTS:
   - ANCHOR ANCHORS 4xM10 FOR ATTACHMENT COLUMN AND TRAFFIC SIGN D2.
   - AFTER APPROVAL DRAWING.

PRECAST CONCRETE NOTES

1. CONCRETE MATERIALS, QUALITY. MIXING, PLACING, FORM WORK AND OTHER PRECAST CONCRETE CONSTRUCTION PRACTICES TO CONFORM TO CSA–A23.1.
2. PRECAST CONCRETE COMPONENTS TO BE MANUFACTURED AND SUPPLIED BY A MANUFACTURER QUALIFIED IN ACCORDANCE WITH CSA–A23.4.
3. MATERIALS AND METHODS OF CONSTRUCTION TO CONFORM TO CSA–A23.4.
4. SUPPLY CONCRETE USING TYPE GU CEMENT THAT MEETS EXPOSURE CLASS C–1 HAVING A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 35 MPa, MAXIMUM AGGREGATE SIZE OF 20mm, AND MAXIMUM WATER–TO–CEMENTING MATERIALS RATION OF 0.40.
5. MAXIMUM FLY ASH CONTENT NOT TO EXCEED 15% OF TOTAL CEMENTING MATERIAL.
6. DO NOT USE ADMIXTURES CONTAINING CALCIUM CHLORIDE.



A – SECTION
1:50

B – SECTION
1:50

PRECAST CONCRETE NOTES

1. REINFORCEMENT STEEL TO CONFORM TO CSA–G30.18, GRADE 400.
2. DO NOT WELD REINFORCEMENT UNLESS SPECIFICALLY NOTED. REINFORCEMENT TO BE WELDED TO CONFORM TO CSA–G30.18, GRADE 400W. WELDING ONLY PERMITTED BY AN ORGANIZATION CERTIFIED TO CSA–W186.
3. CLEAR CONCRETE COVER TO REINFORCEMENT:
   a. LONGITUDINAL BARS HAVING 60mm UNLESS NOTED OTHERWISE, OR
   b. STIRRUPS AND TIES HAVING 40mm UNLESS NOTED OTHERWISE.
4. USE STANDARD END HOOK LENGTHS FOR REINFORCEMENT UNLESS NOTED OTHERWISE.
5. USE REINFORCEMENT SPLICES UNLESS NOTED OTHERWISE.
6. WELDED WIRE MESH TO CONFORM TO ASTM A497/A497M.

All dimensions in Metric meters unless otherwise noted

SCALE: AS NOTED	FIGURE NO.: STR 7.20B	PRECAST CONCRETE MEDIAN - 2000mm-3000mm

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

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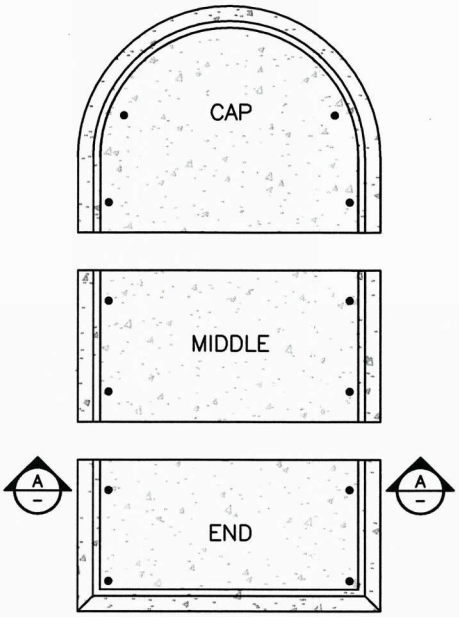


PLAN VIEW
SCALE 1:50

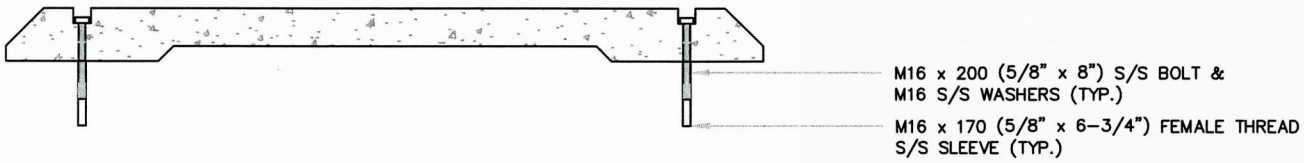
ANCHOR NOTES

REQUIRED MATERIALS AND TOOLS:

- M16X170 (5/8" x 6–3/4") STAINLESS STEEL FEMALE THREAD SLEEVE.
- M16X200 (5/8" x 8") STAINLESS STEEL BOLTS.
- M16 (5/8") STAINLESS STEEL WASHERS.
- M20 (3/4") STAINLESS STEEL HOISTING RINGS OR SLINGS.
- MOUNTING MORTAR (FOR EXAMPLE HILTI TYPE HY–200).
- CAULKING SYRINGE AND MIXING NOZZLES.
- BATTERY OR ELECTRIC DRILL SUITABLE FOR DRILLING IN ASPHALT.
- ATTACHMENT FOR DRILLING DIAMETER 18mm AND DEPTH 170 MM.
- BLOW PUMP OR COMPRESSED AIR.
- ALLEN KEY FOR SCREWING IN INNER THREADED SLEEVE M16.
- MIXING NOZZLES SUITABLE FOR CASSETTE.
- COPPER GREASE (WHEN REMOVING THE SCREWS, IT IS EASIER TO LOOSEN THEM).

METHOD:

- PLACE THE ELEMENT AND MARK THE CIRCUMFERENCE AND BOLT HOLE LOCATIONS.
- CHECK WHETHER THE CENTER GUIDE IS STABLE. APPLY THE SUPPLIED RUBBER STRIPS IF NECESSARY.
- PRE–DRILL THE DRILLING POINTS AND RE–INSERT THE ELEMENT.
- DRILLING DIAMETER OF 18 MM AND A DEPTH OF 170 MM.
- REMOVE THE DUST FROM THE DRILL HOLES BY MEANS OF A BLOW PUMP OR COMPRESSED AIR.
- PLACE THE FIXING MORTAR IN THE DRILL HOLES.
- SCREW THE INNER THREADED SLEEVE INTO THE BOREHOLE WITH FIXING MORTAR.
- REPLACE THE CENTER GUIDE IN THE MARKED AREA.
- CHECK THAT THE HOLES OF THE CENTER CONDUCTOR ARE PROPERLY ALIGNED WITH THE MOUNTING HOLES IN THE ASPHALT.
- TIGHTEN SCREW BOLTS WITH WASHER. USE COPPER GREASE ON THE END OF THE SCREW BOLT.
- SEAL THE MOUNTING HOLES AND LIFTING DEVICES WITH THE PLASTIC CAPS.



A – SECTION
SCALE 1:20

All dimensions in Metric meters unless otherwise noted

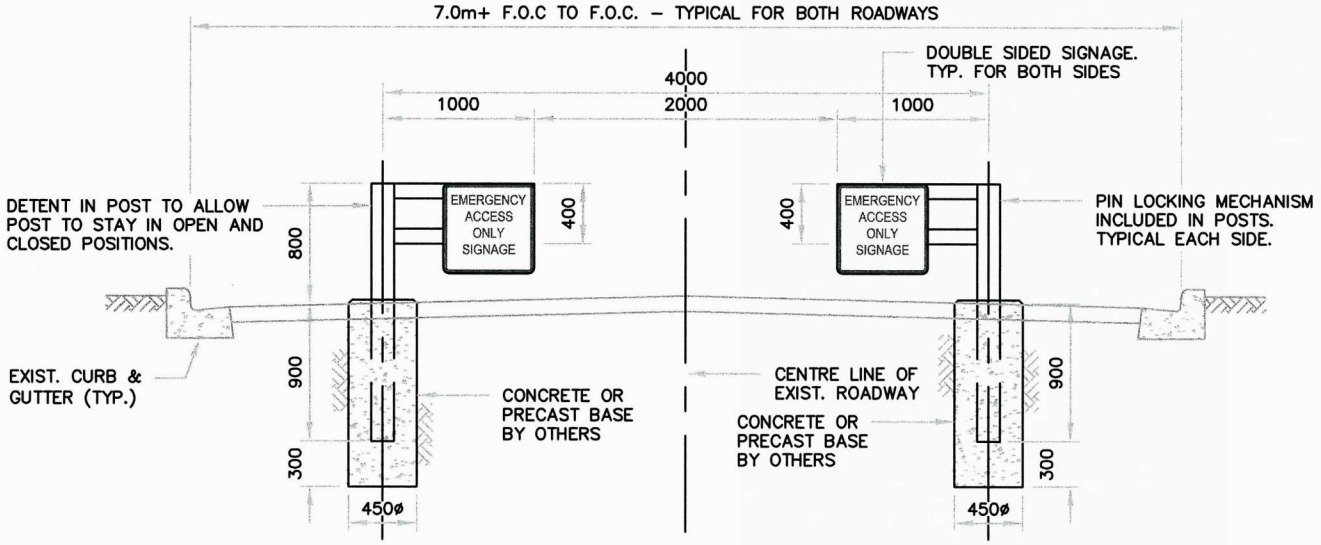
SCALE: AS NOTED	FIGURE NO.: STR 7.20C	PRECAST CONCRETE MEDIAN - ANCHORING DETAILS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	AE

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE: [signature]
RM APEGA ID #: 95819
DATE: Feb 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
ANDY ESARTE

town of CANMORE



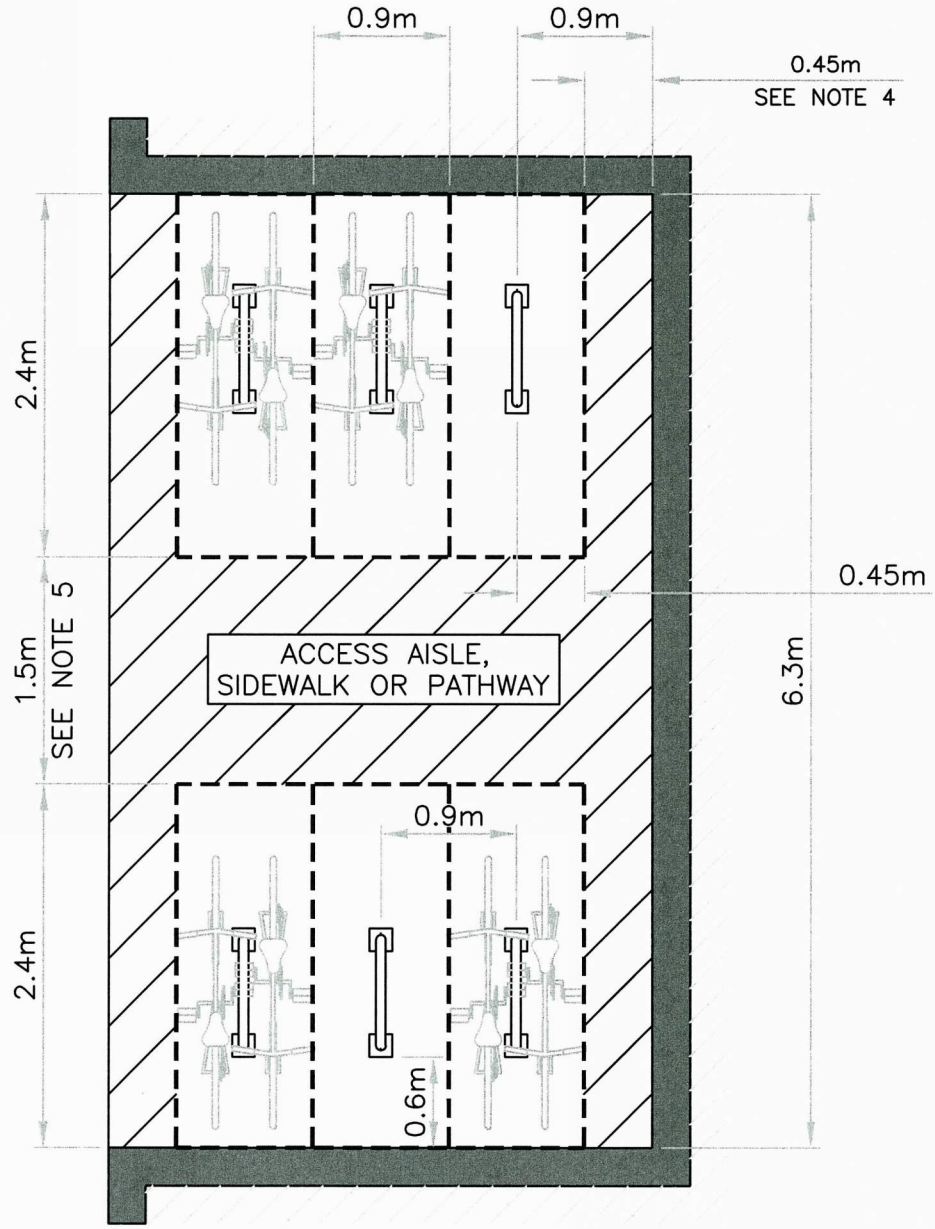
NOTES

1. DIMENSIONS ARE SHOWN IN MILLIMETRES.
2. SWINGING GATE AND POST MATERIAL TO BE POWDER COATED BLACK SQUARE TUBING, GALVANIZED STEEL. DIMENSIONS AND WALL THICKNESS TO BE DETERMINED BY A STRUCTURAL ENGINEER.
3. LOCKING MECHANISM ON EACH POST TO INCLUDED.
4. LOCK TO BE PROVIDED BY THE TOWN OF CANMORE.
5. ABILITY TO LOCK GATE IN PERPENDICULAR AND PARALLEL POSITIONS TO ROADWAY.
6. CONCRETE BASES SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa AT 28 DAYS.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:50	FIGURE NO.: STR 7.21	SWINGING EMERGENCY GATE ACCESS					
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA ANDY EDARTE
2							
1	01/28/25	2025 EDCG	BWM	ISL	AE		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Feb. 28, 2025
ID 95819



NOTES

1. ALL DIMENSIONS ARE TYPICAL UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS SHOWN ARE THE MINIMUM DIMENSIONS REQUIRED.
3. BICYCLE PARKING LAYOUT IS APPLICABLE TO BOTH INTERIOR AND EXTERIOR BICYCLE PARKING AREAS.
4. A BUFFER WIDTH OF 0.15m FROM THE EDGE OF THE BICYCLE PARKING ENVELOPE TO A WALL/VERTICAL OBSTRUCTION MAY BE CONSIDERED IN CONSTRAINED SCENARIOS. SPACING BETWEEN ALL OTHER BIKE RACKS SHOULD BE MAINTAINED AT A MINIMUM OF 0.9m, INCLUDING UNDER CONSTRAINED SCENARIOS.
5. A MINIMUM WIDTH OF 1.2m MAY BE CONSIDERED IN CONSTRAINED SCENARIOS.

All dimensions in Metric meters unless otherwise noted

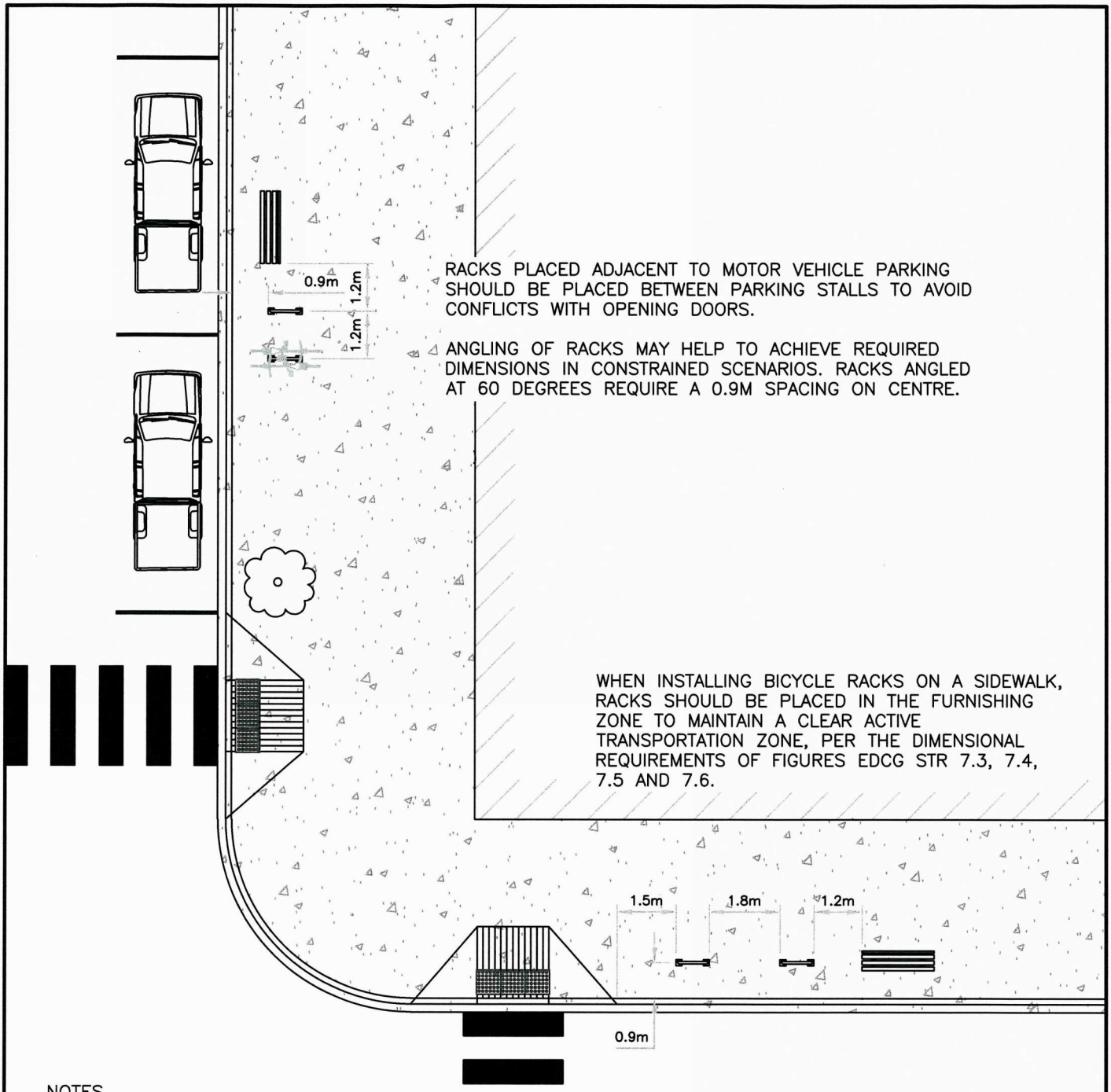
SCALE: 1:50	FIGURE NO.: STR 7.22	LONG/SHORT TERM BICYCLE PARKING DIMENSIONS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2					
1	01/28/25	2025 EDCG	BWM	ISL	CE

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb. 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
CLAIRE ELLICK
ID 70445
Feb. 28, 2025

Town of CANMORE



RACKS PLACED ADJACENT TO MOTOR VEHICLE PARKING SHOULD BE PLACED BETWEEN PARKING STALLS TO AVOID CONFLICTS WITH OPENING DOORS.

ANGLING OF RACKS MAY HELP TO ACHIEVE REQUIRED DIMENSIONS IN CONSTRAINED SCENARIOS. RACKS ANGLED AT 60 DEGREES REQUIRE A 0.9M SPACING ON CENTRE.

WHEN INSTALLING BICYCLE RACKS ON A SIDEWALK, RACKS SHOULD BE PLACED IN THE FURNISHING ZONE TO MAINTAIN A CLEAR ACTIVE TRANSPORTATION ZONE, PER THE DIMENSIONAL REQUIREMENTS OF FIGURES EDCG STR 7.3, 7.4, 7.5 AND 7.6.

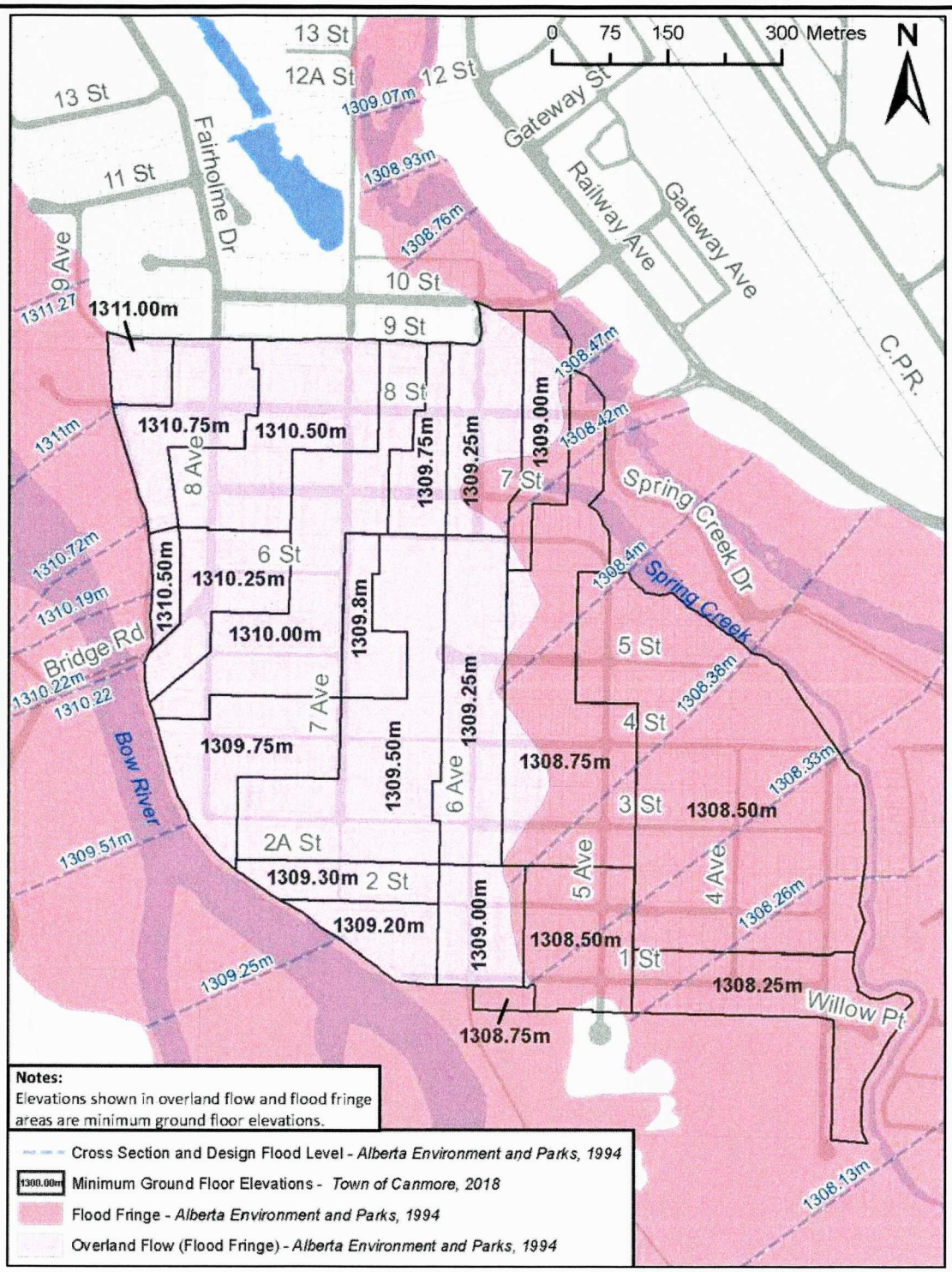
NOTES

1. OTHER CONFIGURATIONS MAY BE CONSIDERED, SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEERING DEPARTMENT.
2. PLACEMENT OF SIDEWALK RACKS VARIES FROM PLACEMENT OF RACKS WITHIN AN INDOOR OR OUTDOOR BIKE PARKING NODE, AS SHOWN IN EDCG FIGURE STR 7.22.

All dimensions in Metric meters unless otherwise noted

SCALE: 1:150	FIGURE NO.: STR 7.23	ON STREET BICYCLE PARKING					
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA CLAIRE ELLICK ID 70445 Feb. 28, 2025
2							
1	01/28/25	2025 EDCG	BWM	ISL	CE		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of CANMORE



Notes:
Elevations shown in overland flow and flood fringe areas are minimum ground floor elevations.

- Cross Section and Design Flood Level - *Alberta Environment and Parks, 1994*
- 1300.00m Minimum Ground Floor Elevations - *Town of Canmore, 2018*
- Flood Fringe - *Alberta Environment and Parks, 1994*
- Overland Flow (Flood Fringe) - *Alberta Environment and Parks, 1994*

All dimensions in Metric meters unless otherwise noted

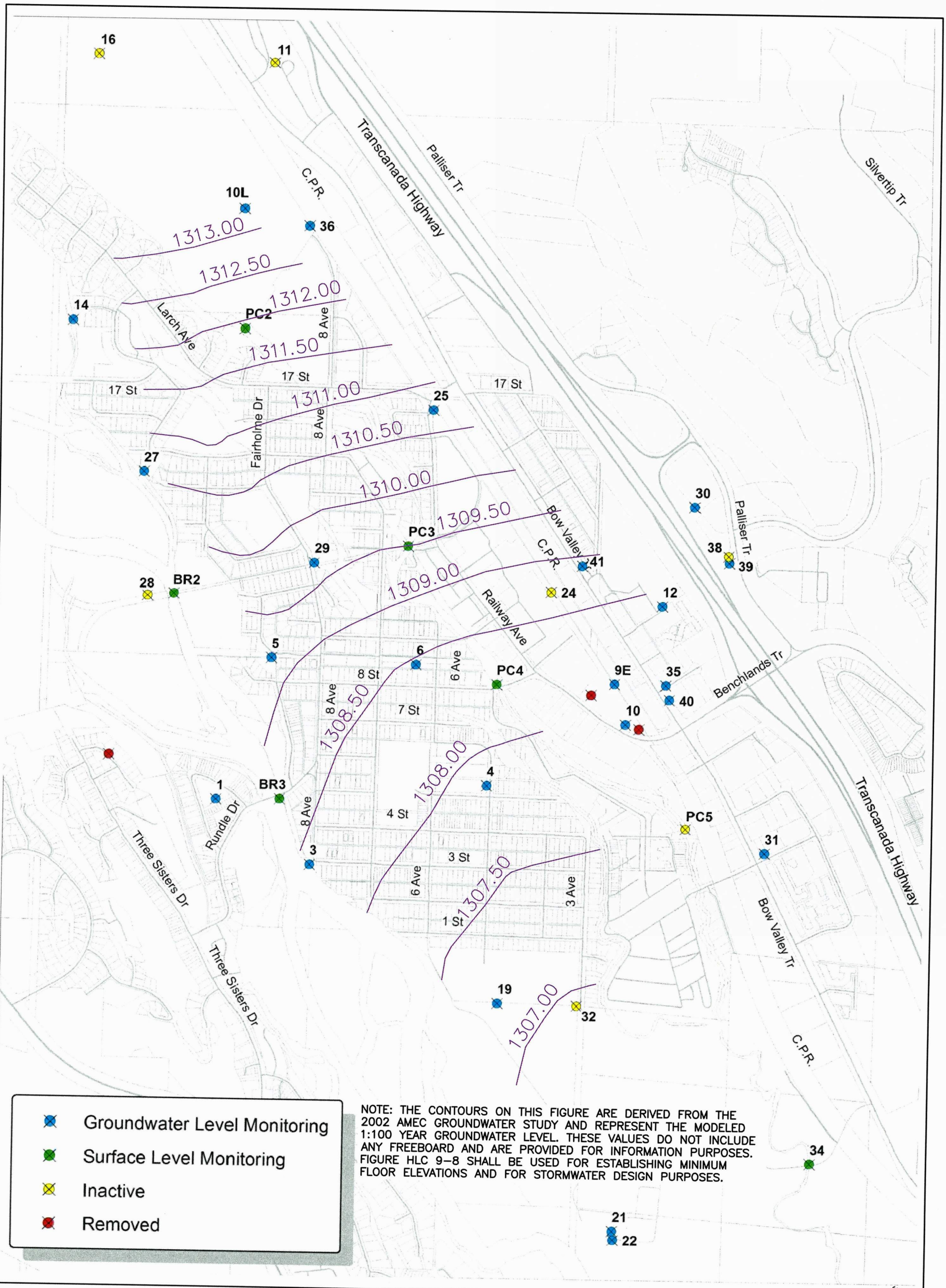
SCALE: NTS	FIGURE NO.: HLC 9.3	OVERLAND FLOW ELEVATIONS

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
3					
2	01/28/25	2025 EDCG	BWM	BK	BK
1	12/13/19	2019 EDCG	BWM	CB	CB

PERMIT
PERMIT TO PRACTICE
TOWN OF CANMORE
RM SIGNATURE:
RM APEGA ID #: 95819
DATE: Feb 28, 2025
PERMIT NUMBER: P006522
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
BRIAN KINZIE
ID 66135
FEB. 28/2025

Town of CANMORE

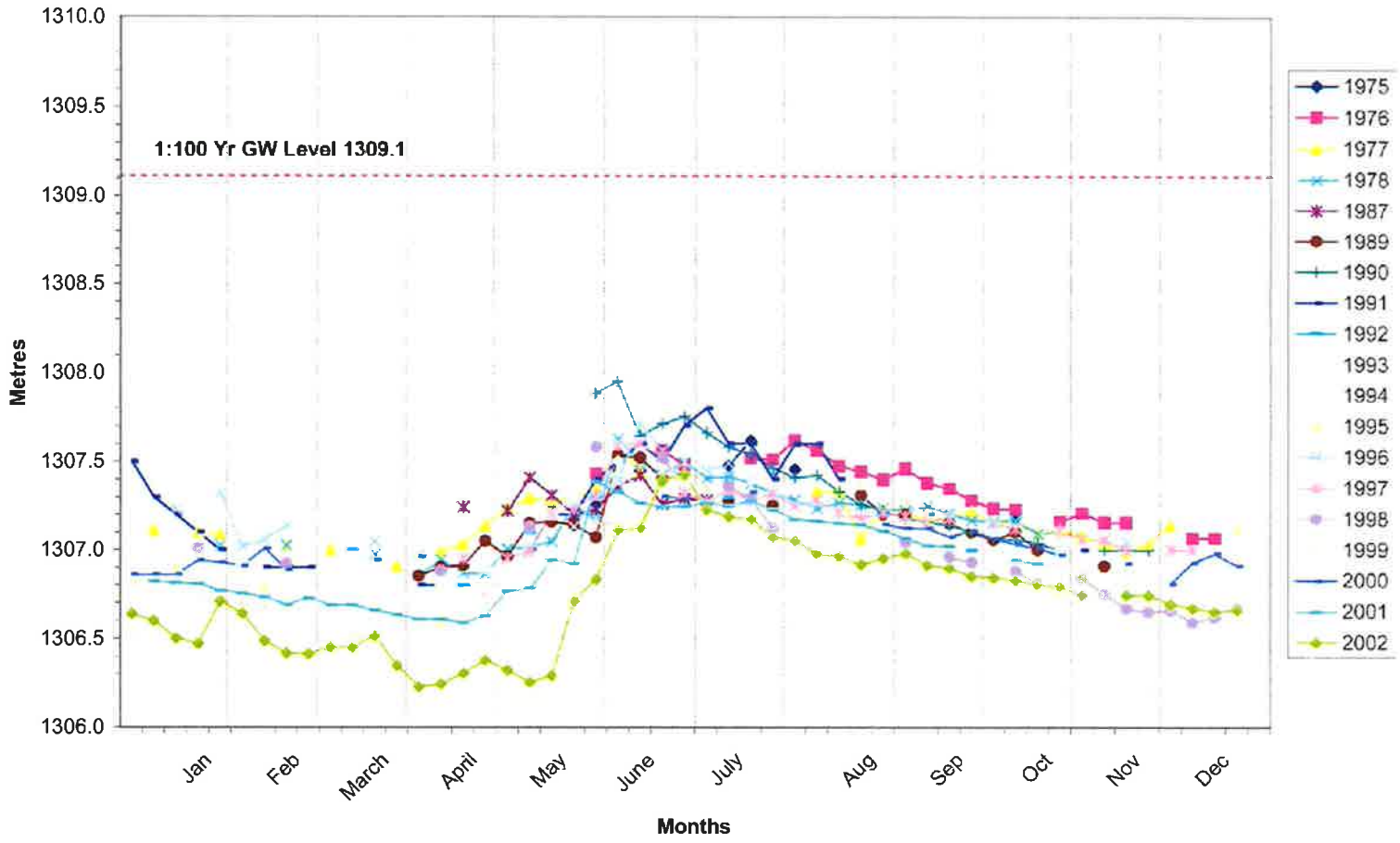


All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: HLC 9.6	PEIZOMETER AND STAFF GAGE LOCATION					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT TO PRACTICE TOWN OF CANMORE	SEAL
2	10/27/23	2023 EDCG	BWM	FC	BK	PM SIGNATURE: PM APEGA ID #: 95819 DATE: Feb. 28, 2025	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZEL ID 66135
1	08/14/19	2019 EDCG	BWM	FC	CB	PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	Town of CANMORE
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

FEB. 28, 2025

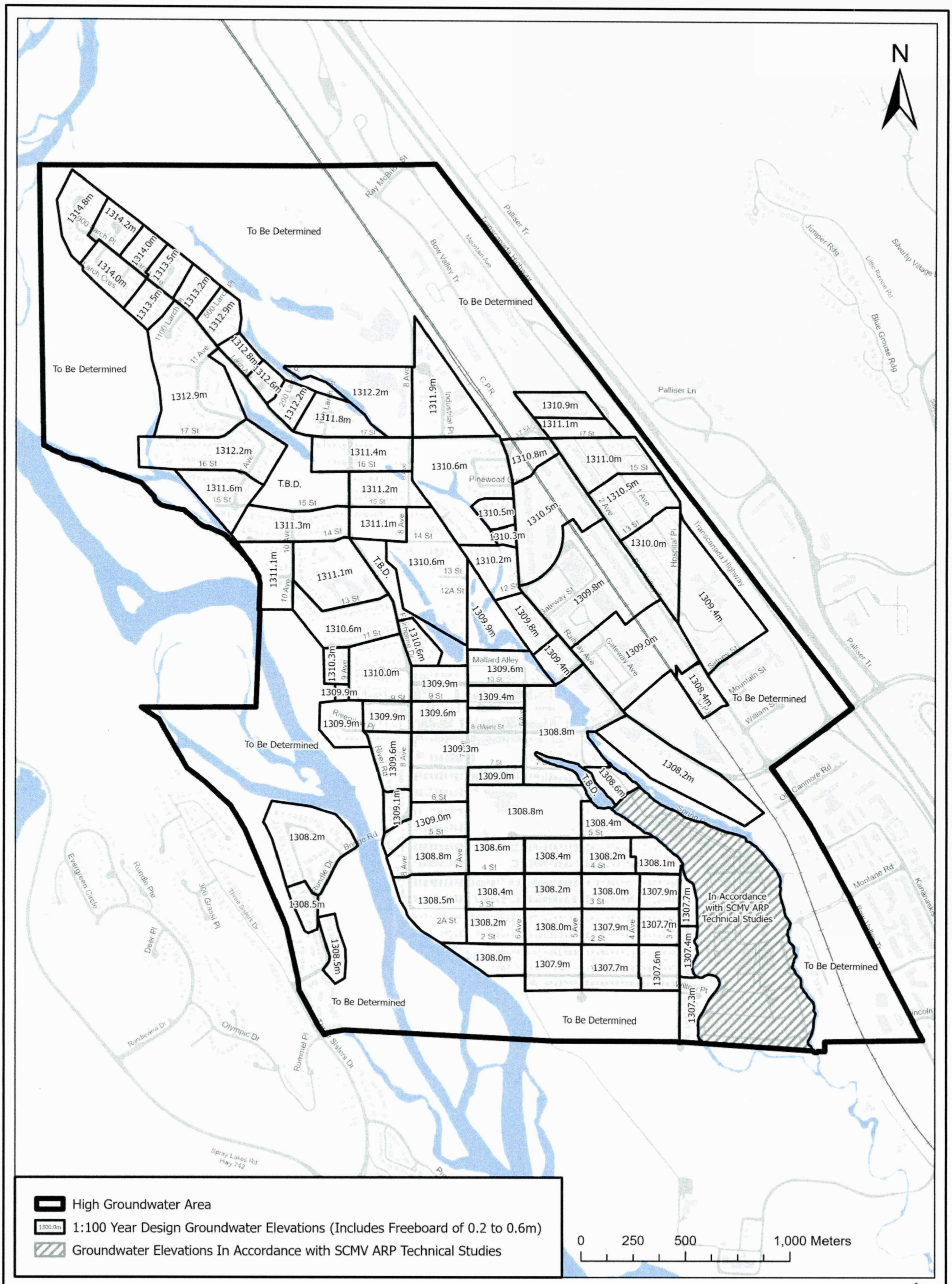
Piezometer #12 - TeePee Town (Panorama Plaza)



All dimensions in Metric meters unless otherwise noted

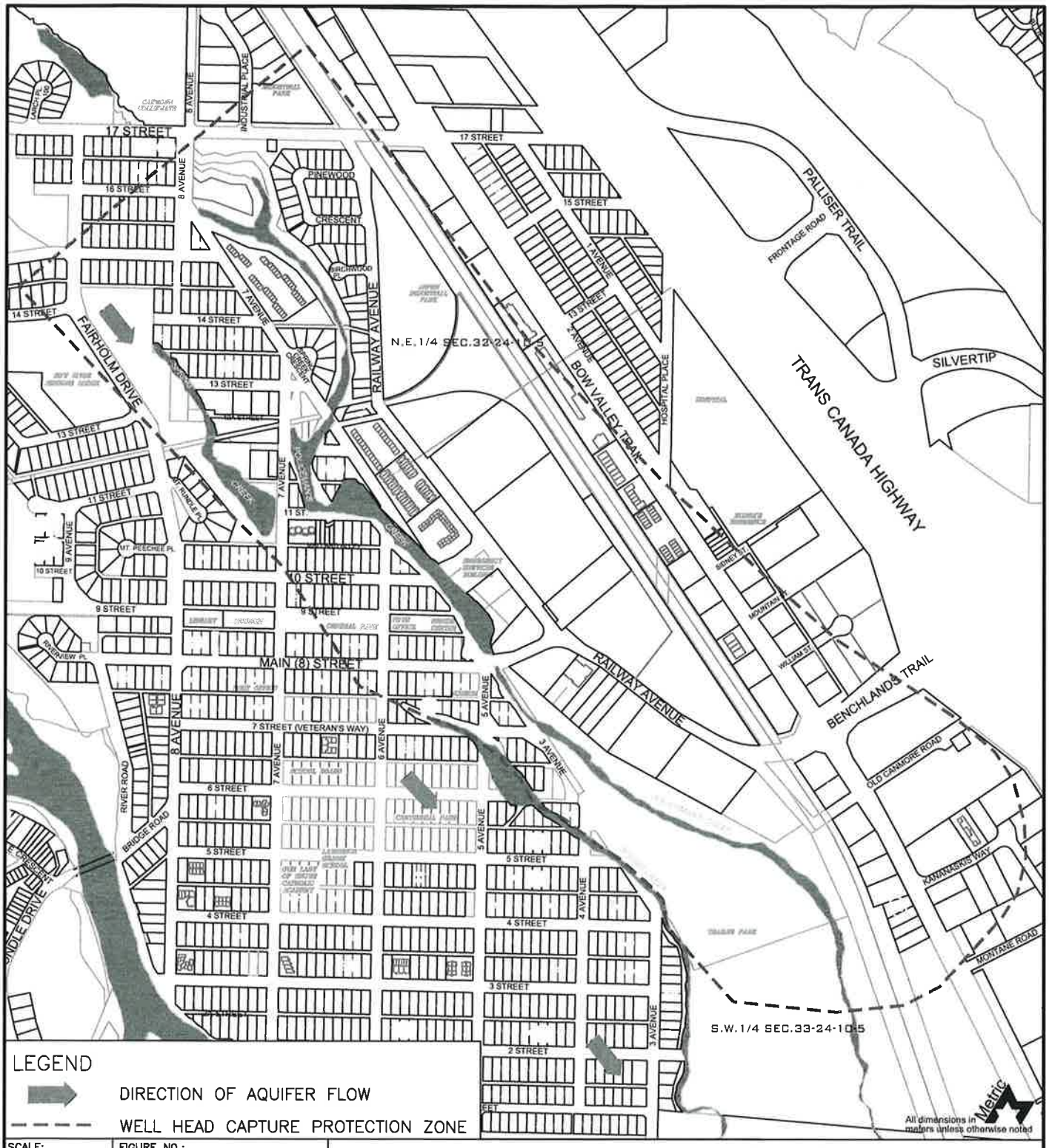
SCALE: NTS	FIGURE NO.: HLC 9.7	TYPICAL WATER LEVEL FLUCUATION					
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE 95819 RM APEGA ID# DATE: Feb 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	01/28/25	2025 EDCG	BWM	BK	BK		
1	08/14/19	2019 EDCG	BWM	FC	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

CANMORE

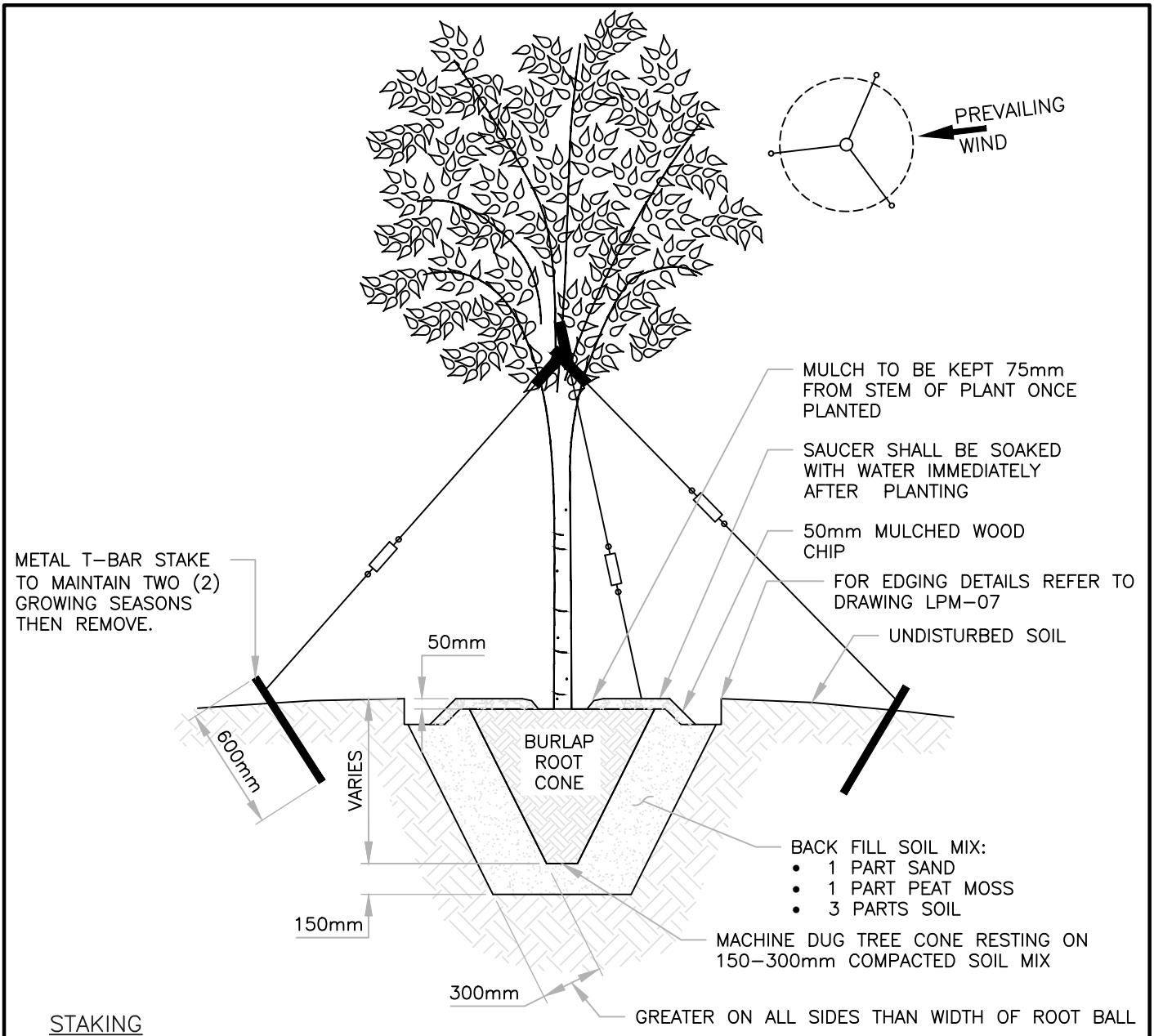


All dimensions in Metric meters unless otherwise noted

SCALE: NTS	FIGURE NO.: HLC 9.8	1:100 YEAR DESIGN GROUNDWATER ELEVATIONS					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT	SEAL
2	10/27/23	2023 EDCG	BWM	FC	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95879 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135 FEB. 28, 2025
1	08/14/19	2019 EDCG	BWM	FC	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		



SCALE: NTS		FIGURE NO.: HLC 9.9	WELLHEAD CAPTURE PROTECTION ZONE					
3	01/28/25	2025 EDCG	BWM	BK	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA # 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	CANMORE
2	08/14/19	2019 EDCG	BWM	FC	CB			
1	05/10/10	2010 EDCG	SP	PN	PN			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			



STAKING

- (3) EACH 12mmø BLACK RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3-4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE – TO BE PLACED AT SAME LOCATION ON ALL 3 WIRES.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

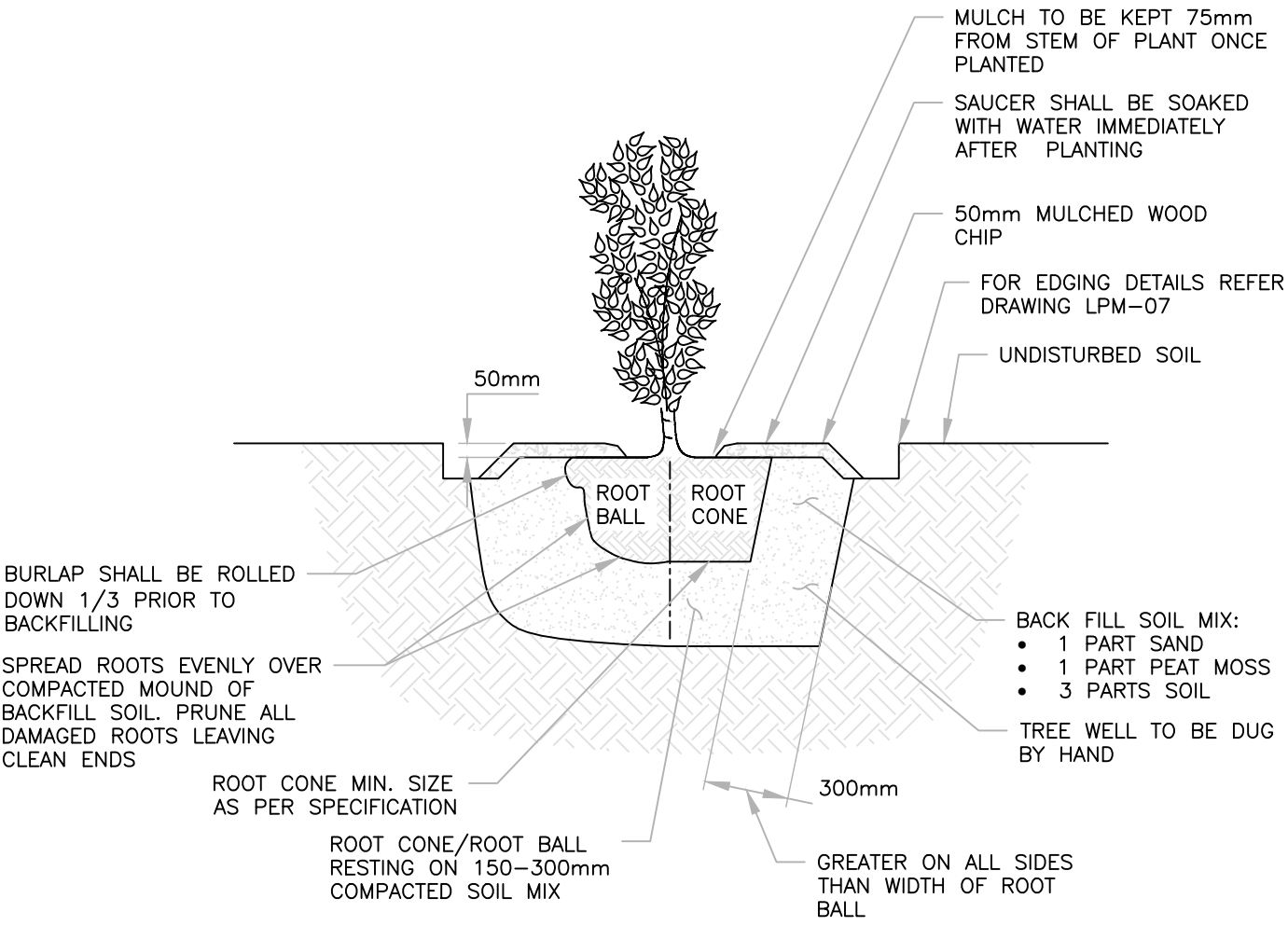
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

DECIDUOUS PLANTING MACHINE DUG

SCALE: 1:30 | FIGURE NO.: LSC 10.1



NOTES

1. PRUNE BRANCHES AND TWIGS BY 1/3 RETAINING NORMAL TREE SHAPE.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. CONTAINER STOCK PLANTED IN SAME MANNER AS ABOVE DETAIL. CONTAINER IS TO BE CUT CAREFULLY AWAY FROM ROOT SYSTEM SO AS TO NOT DISTURB THE PLANT. SHRUB SHALL NOT BE PULLED FROM THE CONTAINER.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

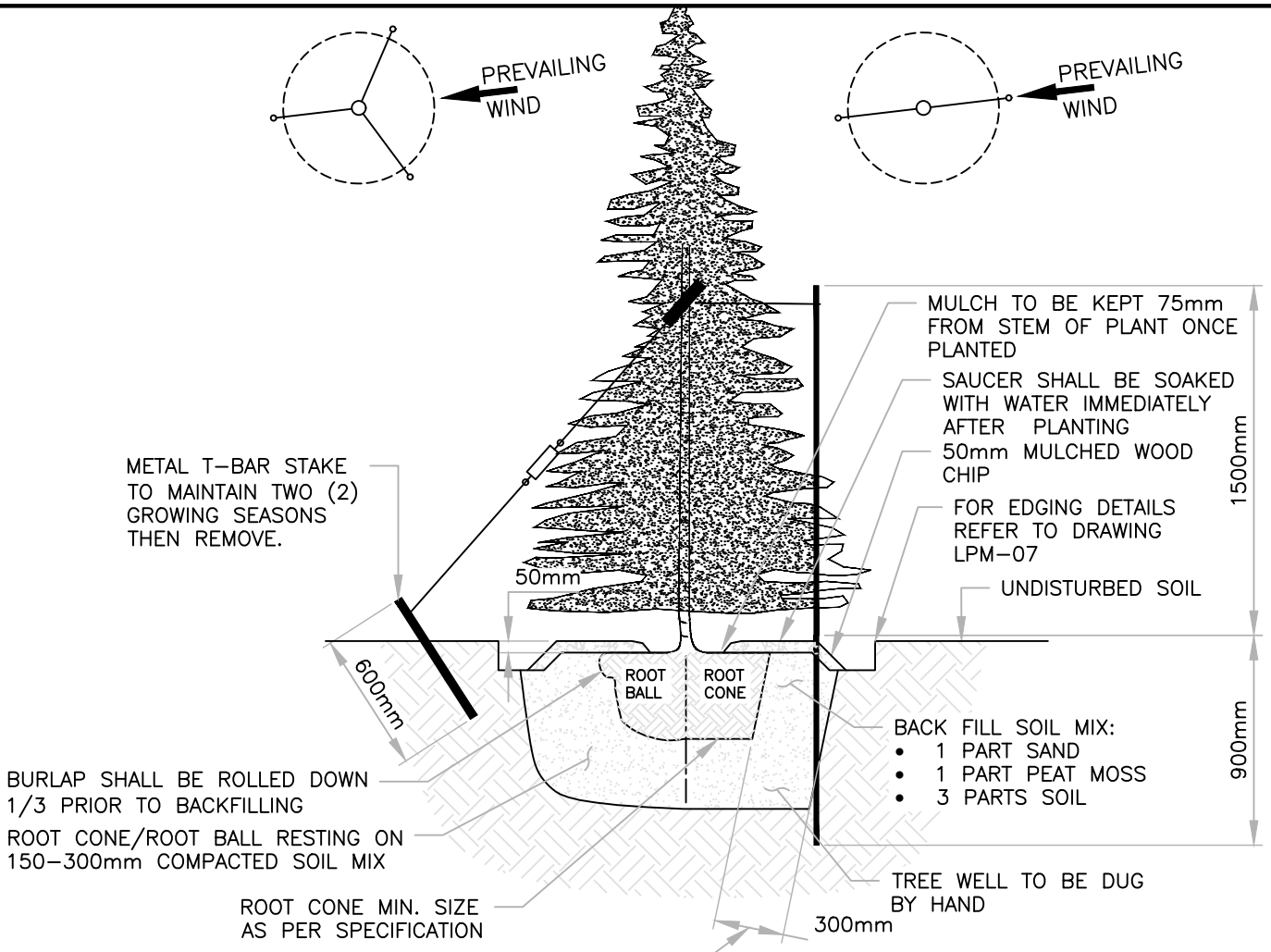
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:

MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

SHRUB PLANTING

SCALE: 1:25
FIGURE NO.: LSC 10.2



STAKING OPTION #1

- METAL POST 2400mm PAINTED TWO (2) COATS OF FLAT BLACK PAINT PRIOR TO INSTALLATION AND EXTENDED INTO UNDISTURBED SOIL.
- BLACK RUBBER HOSE 12mm DOUBLE STRAND No. 10 WIRE, ATTACHE IN UPPER HALF OF TREE.
- MINIMUM OF TWO (2) STAKES PER TREE.
- ONE (1) STAKE PER STEM IN CLUMP MATERIAL.

STAKING OPTION #2

- (3) EACH 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3-4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS EITHER T-BAR POST OR GUY STAKE SYSTEM.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

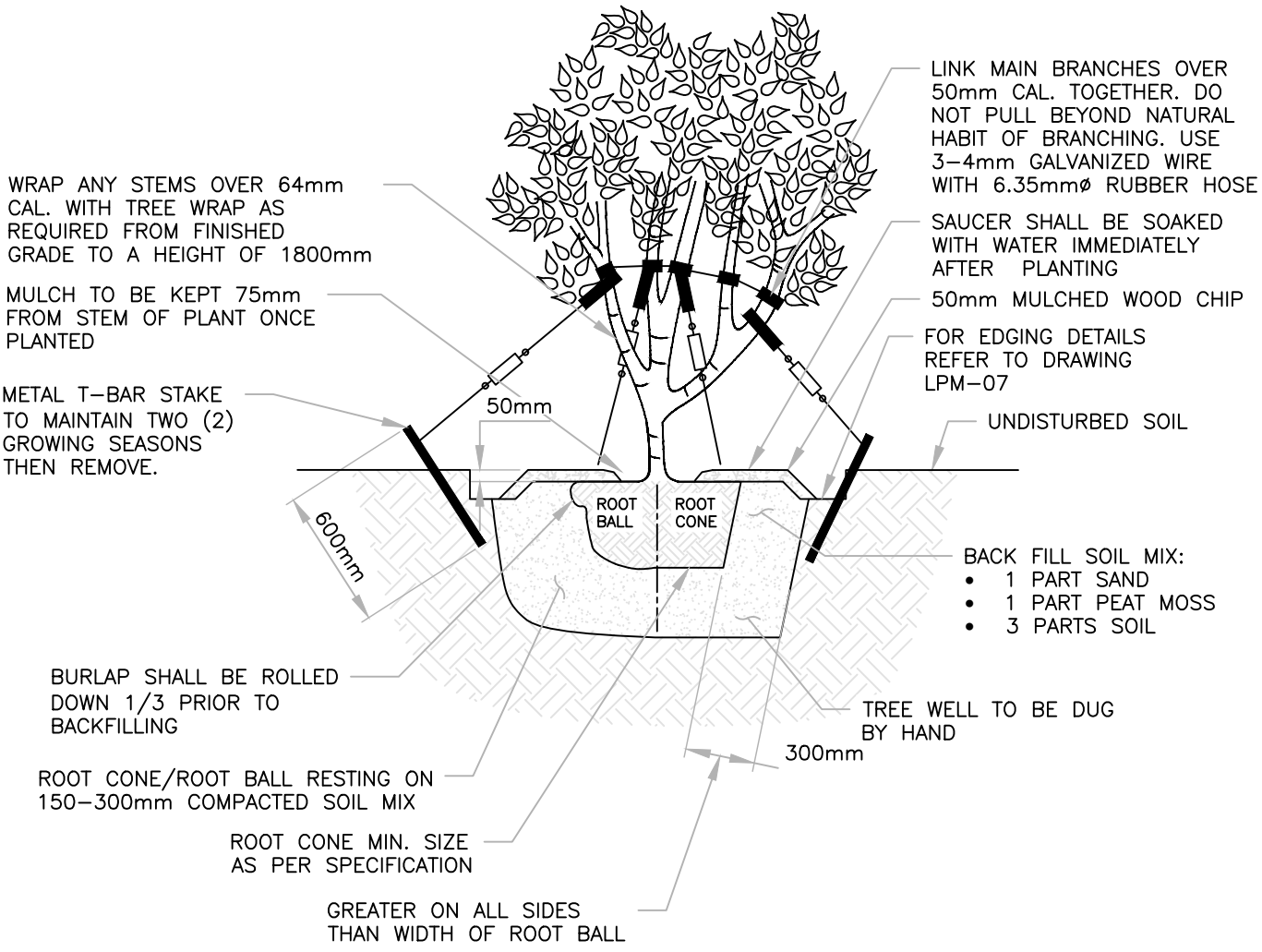
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

CONIFEROUS PLANTING HAND DUG

SCALE: 1:30
FIGURE NO.: LSC 10.3



STAKING

- MINIMUM FOUR (4) EACH, TWO (2) ON MAIN BRANCHES
- 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 HEIGHT OF THE TREE.
- LOOP BRANCHES TOGETHER TO MAINTAIN PLANT SHAPE.
- DOUBLE STRAND 3–4mm MALLEABLE GALVANIZED WIRE FOR GUYING.
- ORANGE FLUORESCENT GALVANIZED WARNING TAGS 1/3 HEIGHT OF TREE.
- GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE, ON EACH GUY.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS EITHER T–BAR POST OR GUY STAKE SYSTEM.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

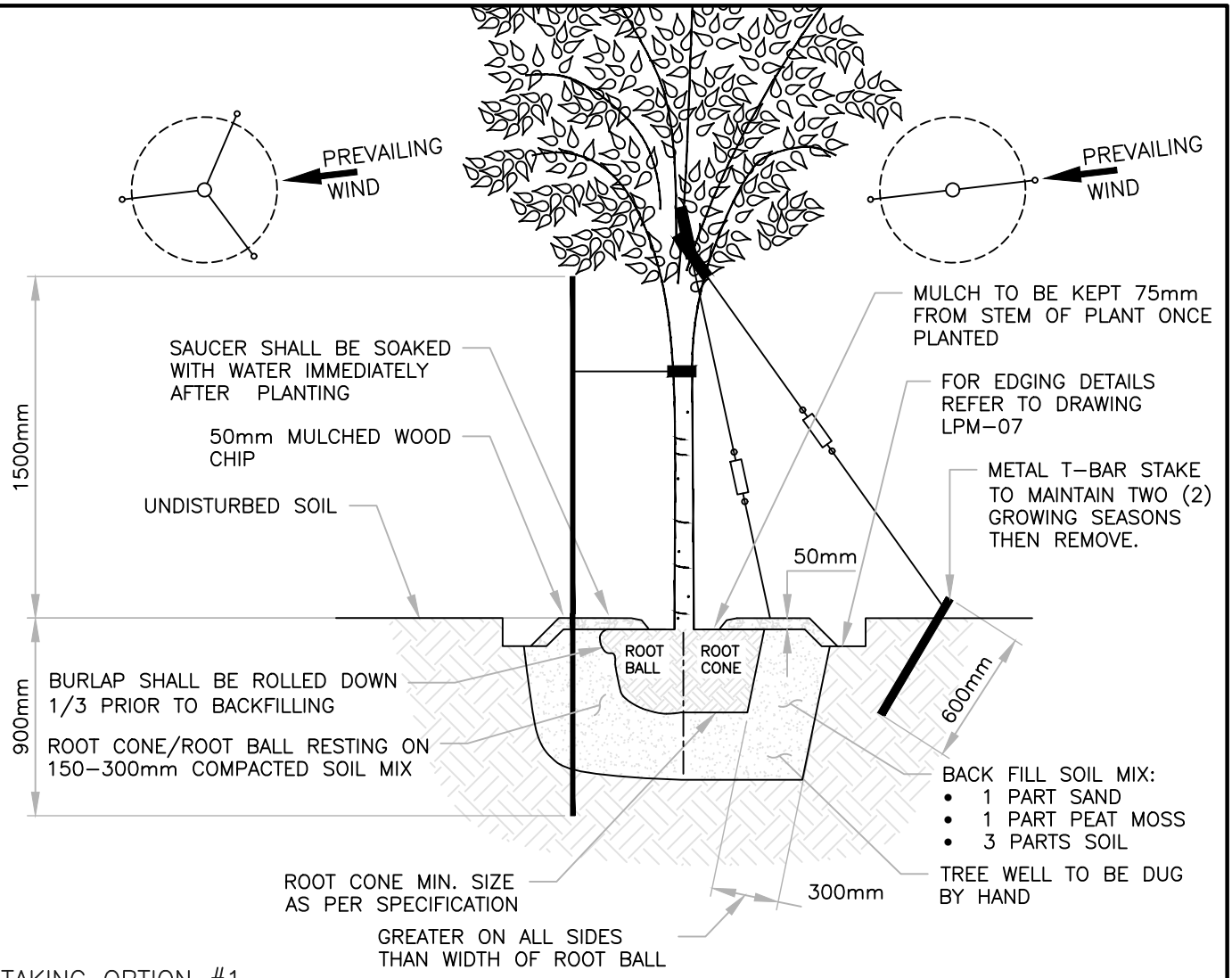
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

MULTI STEM TREE PLANTING

SCALE: 1:30 | FIGURE NO.: LSC 10.4



STAKING OPTION #1

- METAL POST 2400mm PAINTED TWO (2) COATS OF FLAT BLACK PAINT PRIOR TO INSTALLATION AND EXTENDED INTO UNDISTURBED SOIL.
- BLACK RUBBER HOSE 12mm DOUBLE STRAND No. 10 WIRE, ATTACHE IN UPPER HALF OF TREE.
- MINIMUM OF TWO (2) STAKES PER TREE.
- ONE (1) STAKE PER STEM IN CLUMP MATERIAL.

STAKING OPTION #2

- (3) EACH 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3–4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE.

NOTES

All dimensions in Metric meters unless otherwise noted

1. PRUNE BRANCHES BY 1/3 RETAINING NORMAL PLANT SHAPE AND REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS T–BAR POST WHEN PLANTING IS IN NEW SOD, GUY STAKE SYSTEM IN PRE–EXISTING ESTABLISHED CONDITIONS.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

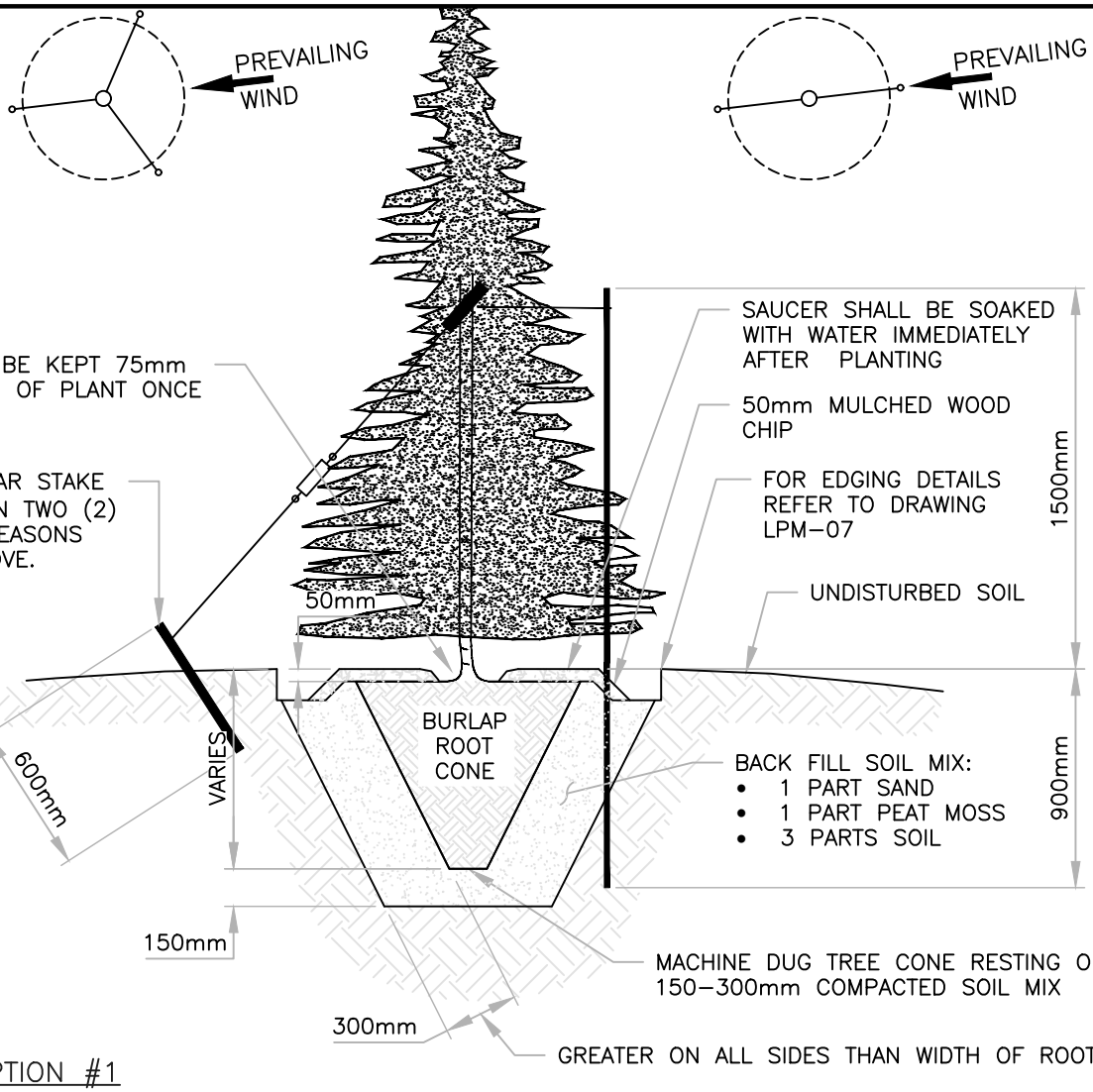
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:

MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

TREE PLANTING IN SOD CONIFEROUS/DECIDUOUS

SCALE: 1:30
FIGURE NO.: LSC 10.5



STAKING OPTION #1

- METAL POST 2400mm PAINTED TWO (2) COATS OF FLAT BLACK PAINT PRIOR TO INSTALLATION AND EXTENDED INTO UNDISTURBED SOIL.
- BLACK RUBBER HOSE 12mm DOUBLE STRAND No. 10 WIRE, ATTACHE IN UPPER HALF OF TREE.
- MINIMUM OF TWO (2) STAKES PER TREE.
- ONE (1) STAKE PER STEM IN CLUMP MATERIAL.

STAKING OPTION #2

- (3) EACH 6.35mmø RUBBER HOSE LOOPED AROUND A STRONG BRANCH APPROX. 2/3 OF TREE HEIGHT.
- (3) EACH DOUBLE STRAND 3–4mm WIRE FOR GUYING.
- (3) EACH ORANGE FLUORESCENT GALVANIZED WARNING TAGS AT 1/3 HEIGHT OF TREE.
- (3) EACH GALVANIZED TURNBUCKLE ON TWISTED DOUBLE STRAND WIRE.

NOTES

1. PRUNE ONLY TO REMOVE ALL DEAD, DAMAGED, INTERFERING AND DISEASED WOOD FORM THE PLANT.
2. CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING THE TREE.
3. RESTRAINING SYSTEM IS T–BAR POST WHEN PLANTING IS IN NEW SOD, GUY STAKE SYSTEM IN PRE–EXISTING ESTABLISHED CONDITIONS.
4. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in Metric meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	08/14/19	2019 EDCG	BWM	TR	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
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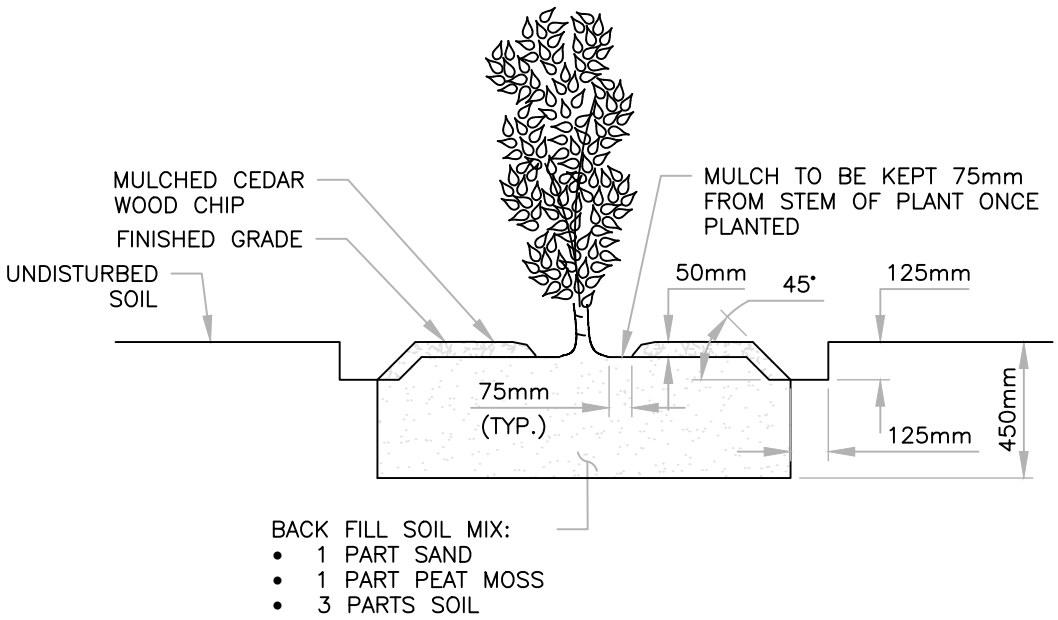
Town of CANMORE

CONIFEROUS PLANTING MACHINE DUG

SCALE: 1:30
FIGURE NO.: LSC 10.6



NOTES

1. THIS DESIGN CAN BE USED WITH OR WITHOUT LANDSCAPING FABRIC.
2. IF LANDSCAPING FABRIC IS USED, IT NEEDS TO BE ATTACHED TO THE GROUND NEATLY AT THE BOTTOM OF THE GUTTER SLOPED (BED) SIDE.
3. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".

All dimensions in meters unless otherwise noted

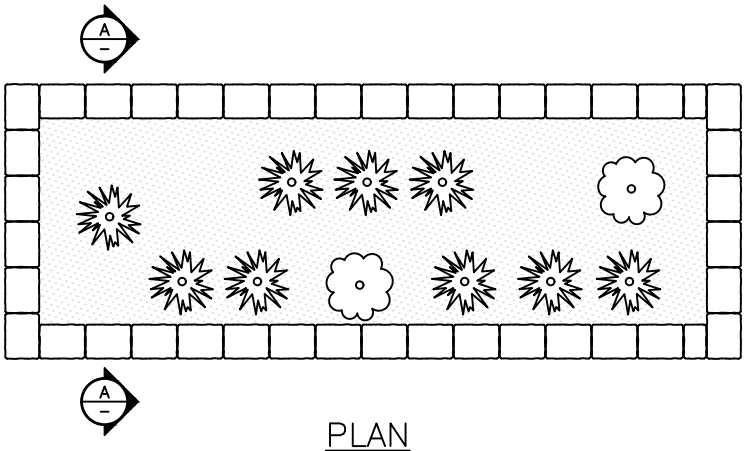
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	TR	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: T. RIVA
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

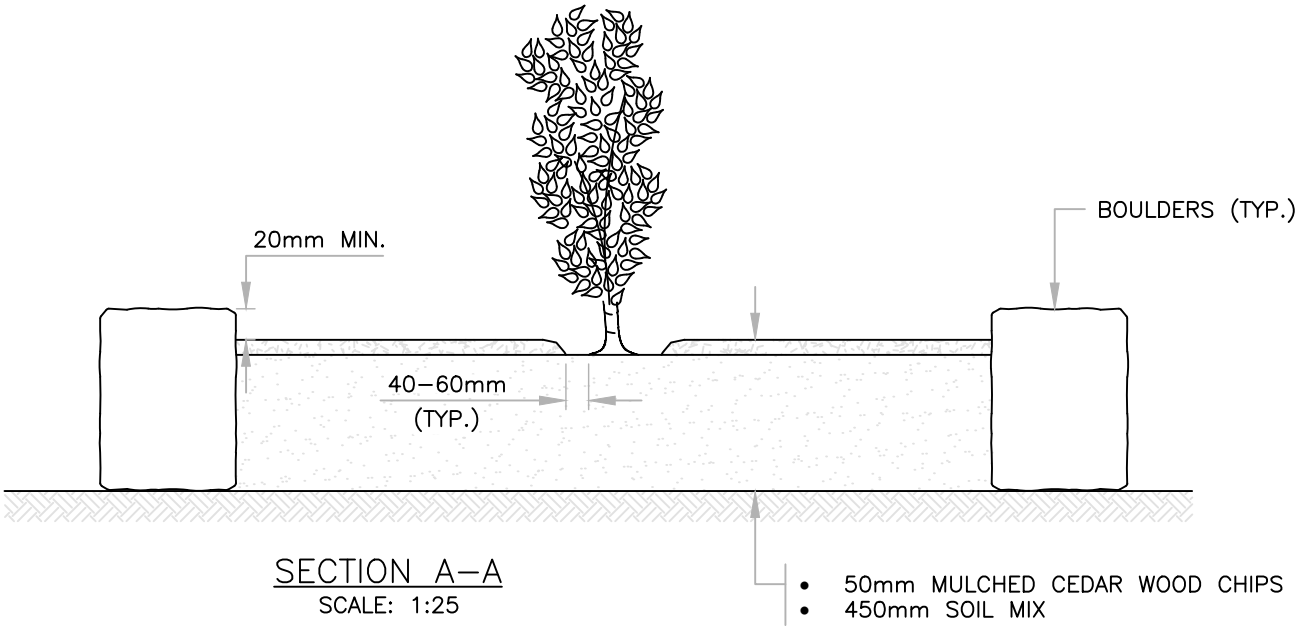
Town of CANMORE

SHRUB PLANTING GROUND BED

SCALE: 1:25
FIGURE NO.: LSC 10.7



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:25

NOTES

1. ROCK TO BE CUT RUNDLE STONE IN BLOCKS OF SLIGHTLY VARIABLE SIZES BUT CONSISTENT.
2. ROCK SIZE WILL VARY PENDING ROCK BED LOCATION, INTENT, LOOK AND FEEL OF SPACE.
3. ROCK TO BE HELD TOGETHER WITH MORTAR.
4. LANDSCAPE FABRIC TO BE ATTACHED TIGHT AT ROCK EDGE EVERY 300mm WITH SPIKES.
5. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
6. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
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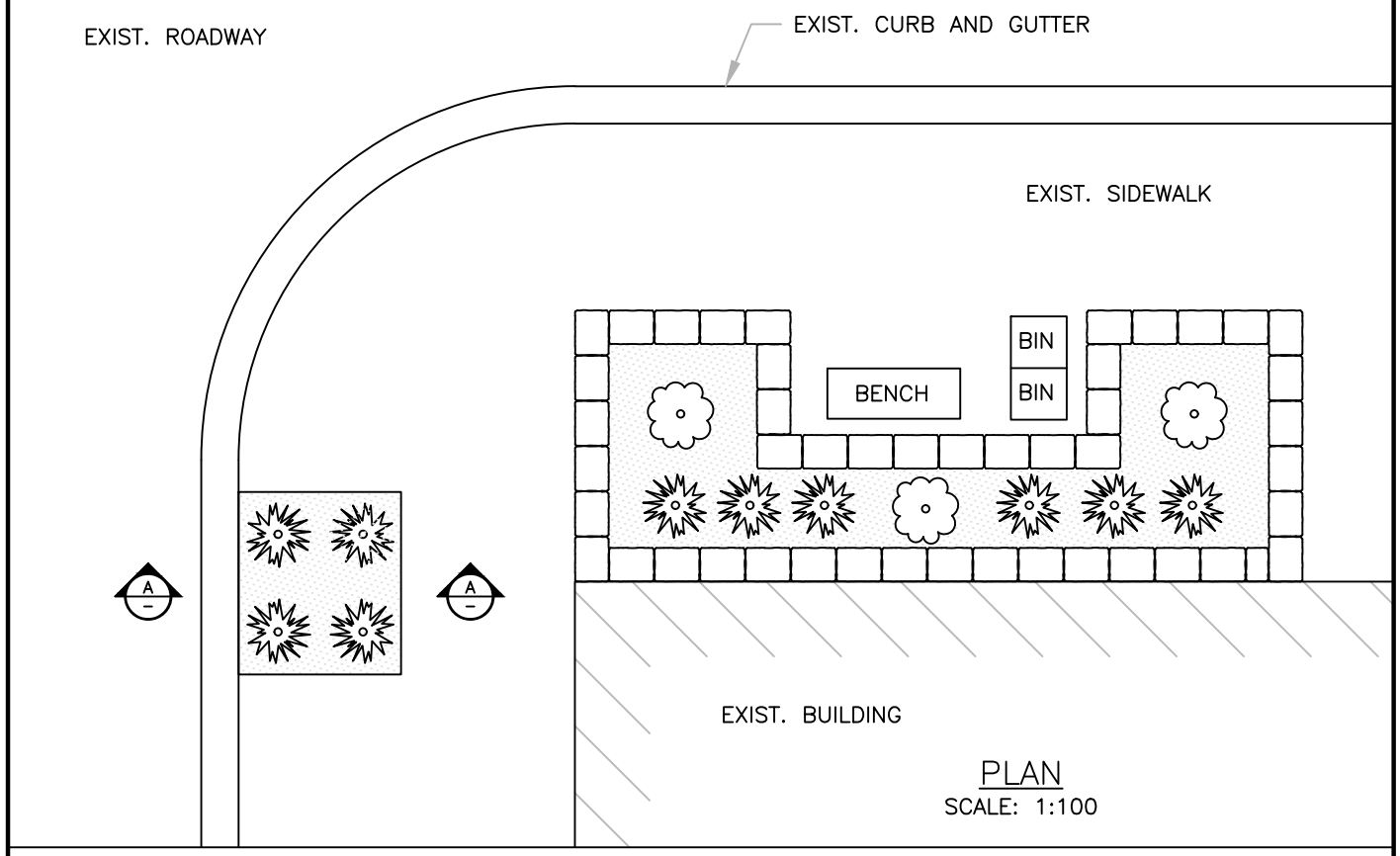
TOWN OF CANMORE

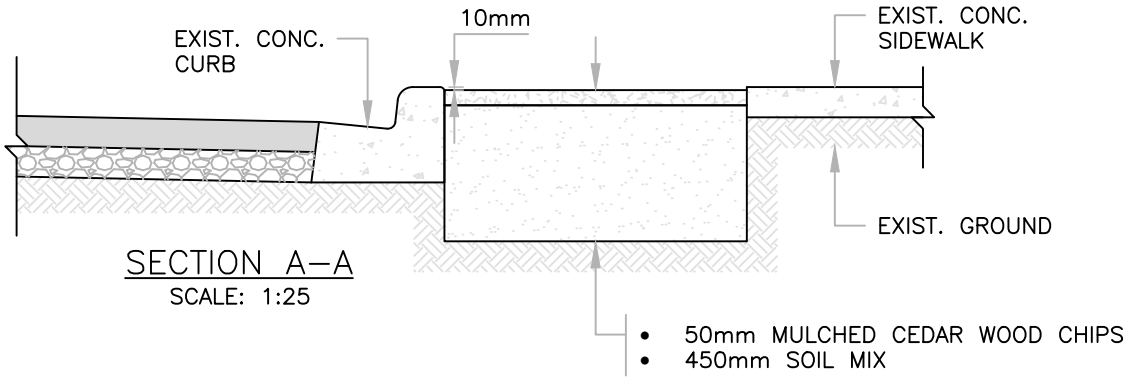
Town of CANMORE

MULCH BED BORDERED BY ROCK SCAPING

SCALE: AS NOTED
FIGURE NO.: LSC 10.8



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:25

NOTES
1. NO LANDSCAPING FABRIC.
2. IF LANDSCAPING FABRIC IS USED, IT MUST BE ATTACHED DOWN EVERY 300mm AND AT EACH CORNER.
3. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
4. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

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DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
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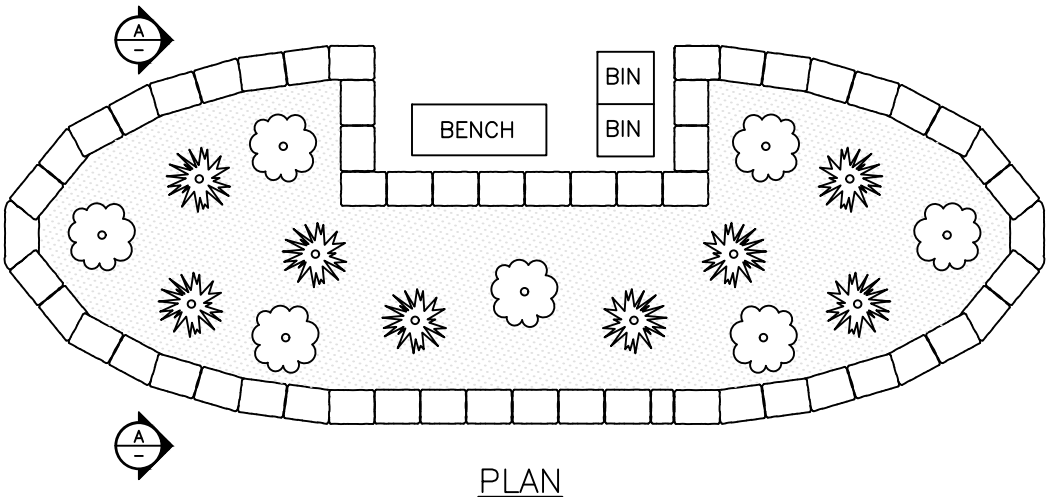
TOWN OF CANMORE

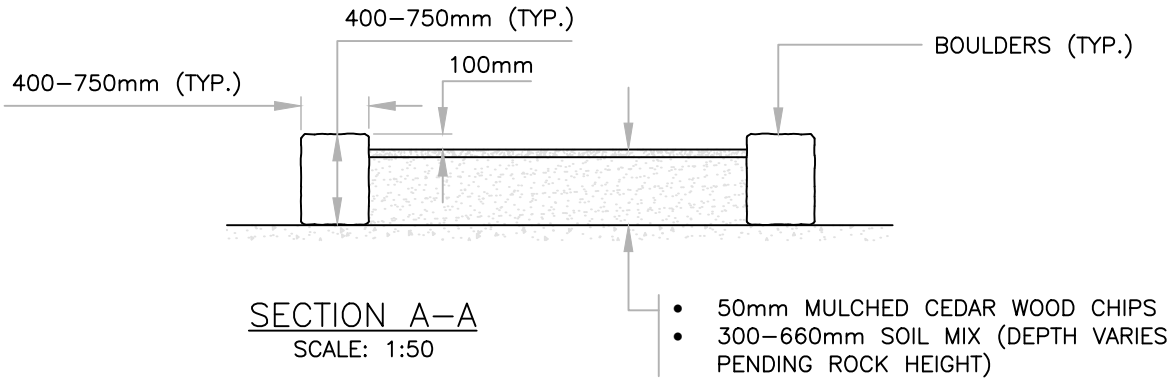
Town of CANMORE

MULCH BED WITHIN A CONCRETE SIDEWALK
BED NEXT TO ROADWAY

SCALE: AS NOTED
FIGURE NO.: LSC 10.9



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:50

NOTES
1. ROCK TO BE CUT RUNDLE STONE IN BLOCKS OF SLIGHTLY VARIABLE SIZES BUT CONSISTENT.
2. ROCK SIZE WILL VARY PENDING ROCK BED LOCATION, INTENT, LOOK AND FEEL OF SPACE.
3. ROCK TO BE HELD TOGETHER WITH MORTAR.
4. LANDSCAPE FABRIC TO BE ATTACHED TIGHT AT ROCK EDGE EVERY 300mm WITH SPIKES.
5. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
6. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

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DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
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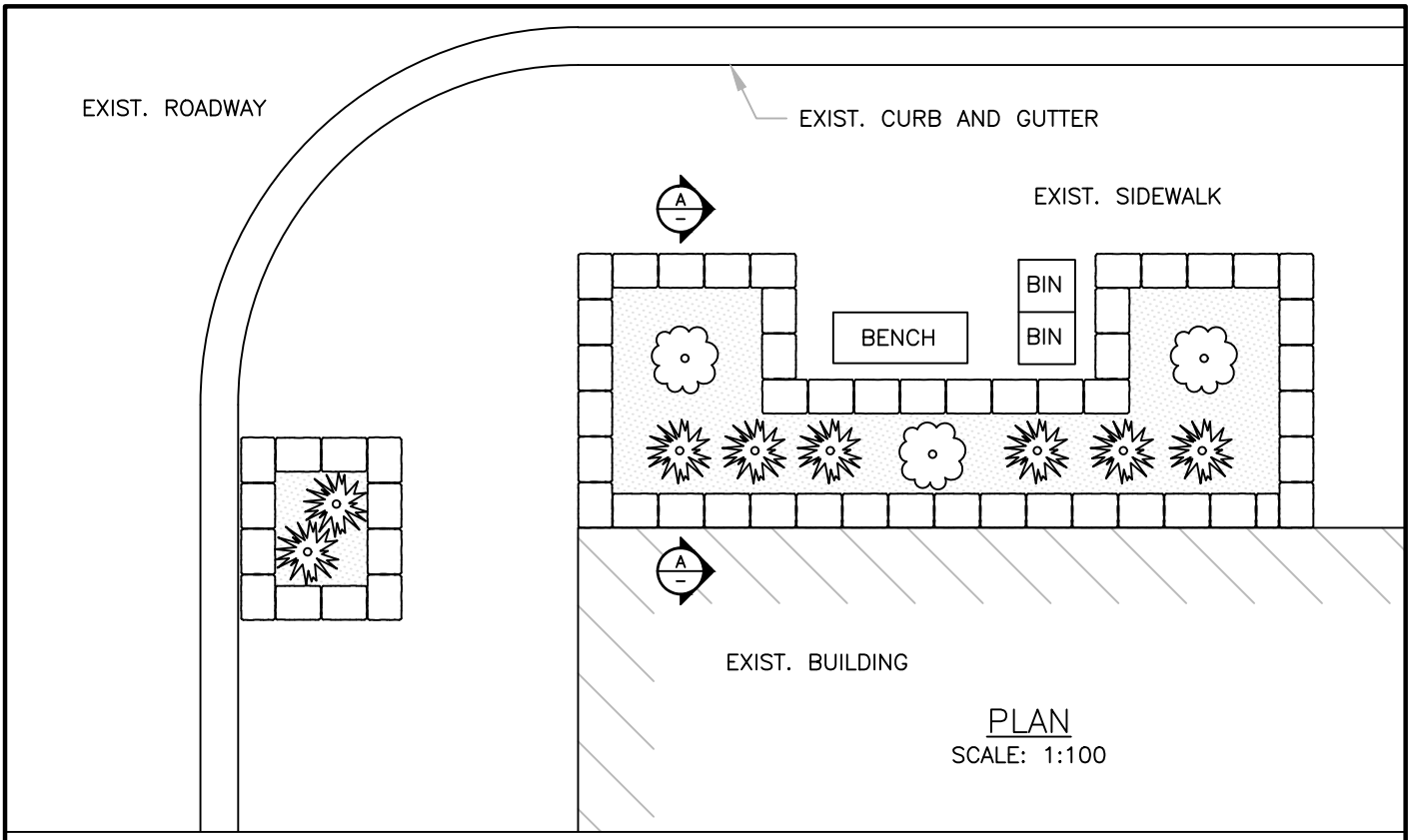
TOWN OF CANMORE

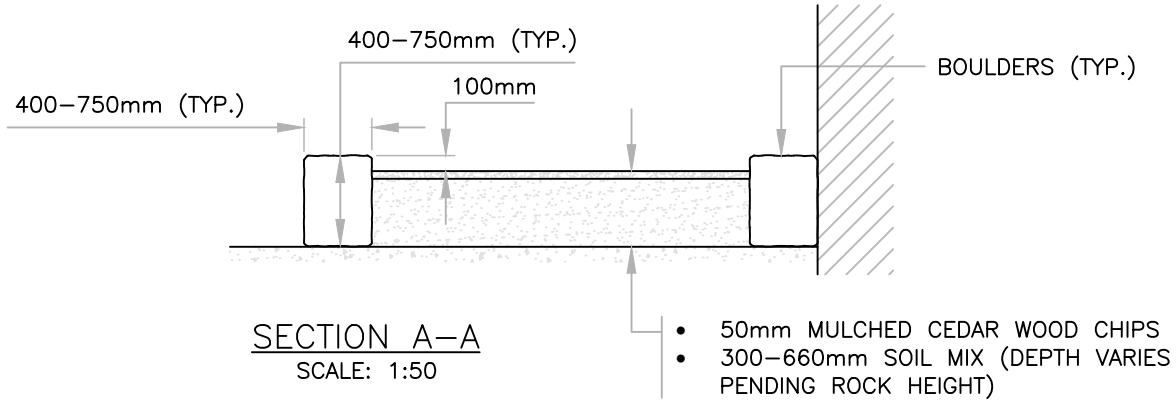
Town of CANMORE

PLAZA RAISED ROCK FEATURE BED

SCALE: AS NOTED
FIGURE NO.: LSC 10.10



PLAN
SCALE: 1:100



SECTION A–A
SCALE: 1:50

- 50mm MULCHED CEDAR WOOD CHIPS
- 300–660mm SOIL MIX (DEPTH VARIES PENDING ROCK HEIGHT)

NOTES

1. ROCK TO BE CUT RUNDLE STONE IN BLOCKS OF SLIGHTLY VARIABLE SIZES BUT CONSISTENT.
2. ROCK SIZE WILL VARY PENDING ROCK BED LOCATION, INTENT, LOOK AND FEEL OF SPACE.
3. ROCK TO BE HELD TOGETHER WITH MORTAR.
4. LANDSCAPE FABRIC TO BE ATTACHED TIGHT AT ROCK EDGE EVERY 300mm WITH SPIKES.
5. MULCH TO BE "FOOTHILLS PREMIUM CEDAR MULCH".
6. MULCH TO BE KEPT 40–60mm FROM STEM OF PLANTS.

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

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DATE: AUG 2018
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APPROVED:
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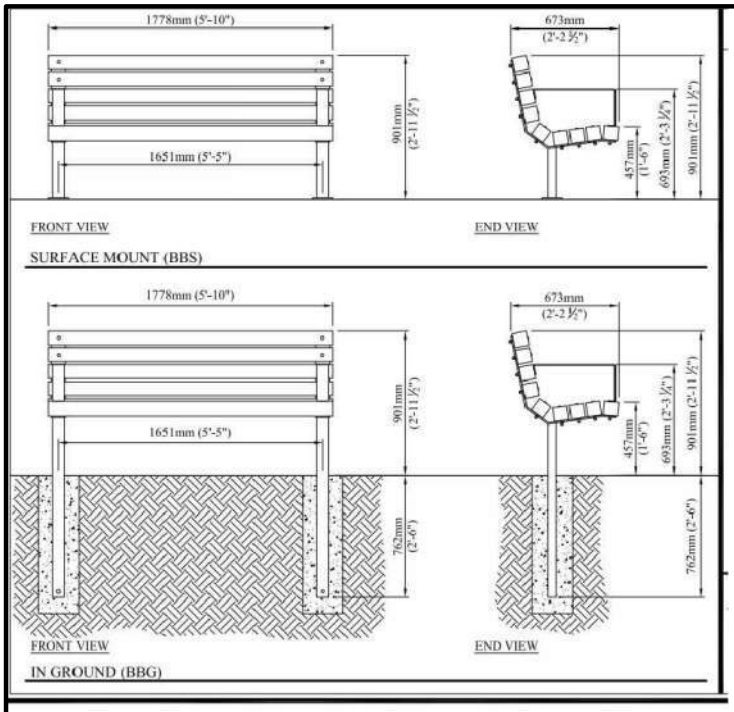
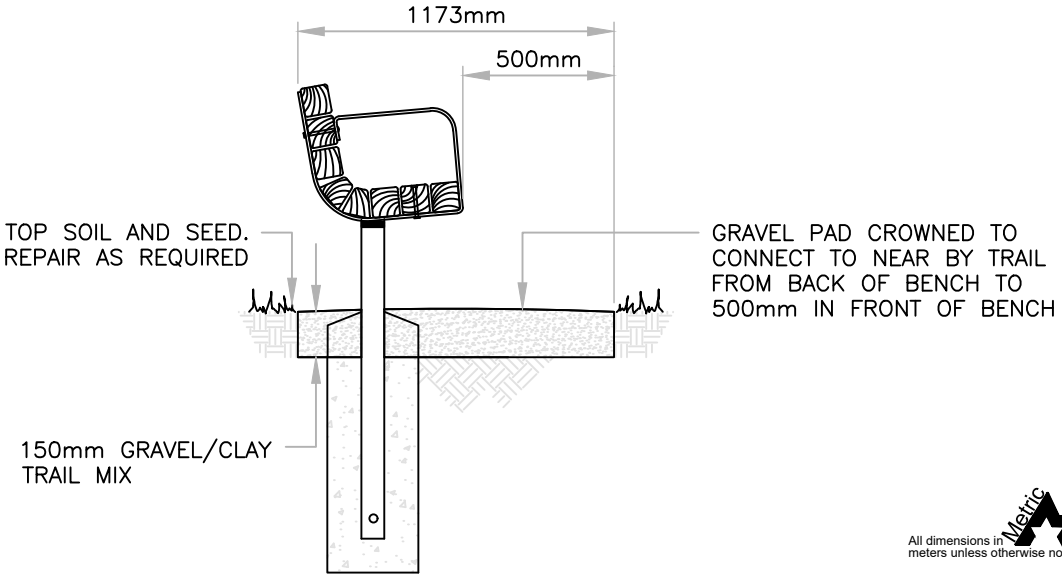
TOWN OF CANMORE

Town of CANMORE

SIDEWALK RAISED ROCK FEATURE BED

SCALE: AS NOTED
FIGURE NO.: LSC 10.11





All dimensions in Metric meters unless otherwise noted

PARK BENCH	WOOD	STEEL FINISH	FASTNERS	TYPE	MOUNT
SERIES "B" PARK BENCH BY CUSTOM PARK & LEISURE OR APPROVED EQUIVALENT	88.9 x 88.9 x 1178.0mm (3–1/2" x 3–1/2" x 70") #1 GRADE CLEAR CEDAR	3 STEP POWDER COAT PROCESS 1–SURFACE PREP(SANDBLAST) 2– PRIME COAT (ZINCPRIMER) 3– TOP POWDER COAT COLOUR: CHESTNUT BROWN	9.5mm PLATED CARRIAGE BOLTS. COLOUR MATCHED TO STEEL FRAME	1778mm IN LENGTH WITH BACK AND ARM RESTS	BOLT DOWN MOUNT IN–GROUND MOUNT FREE STANDING MOUNT

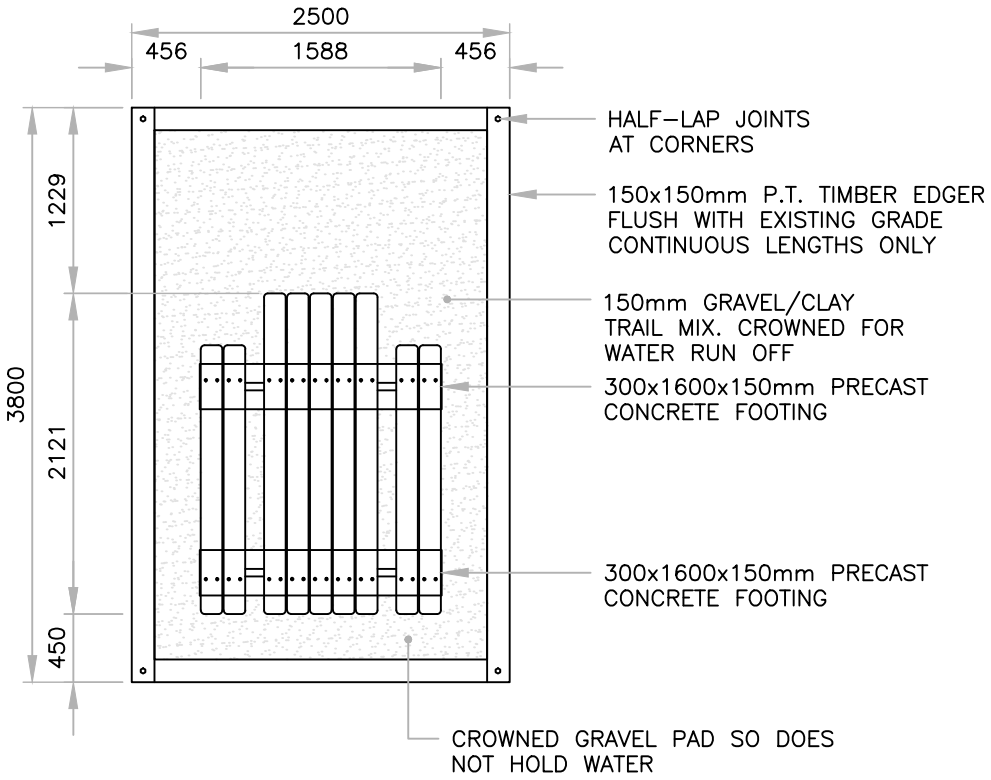
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

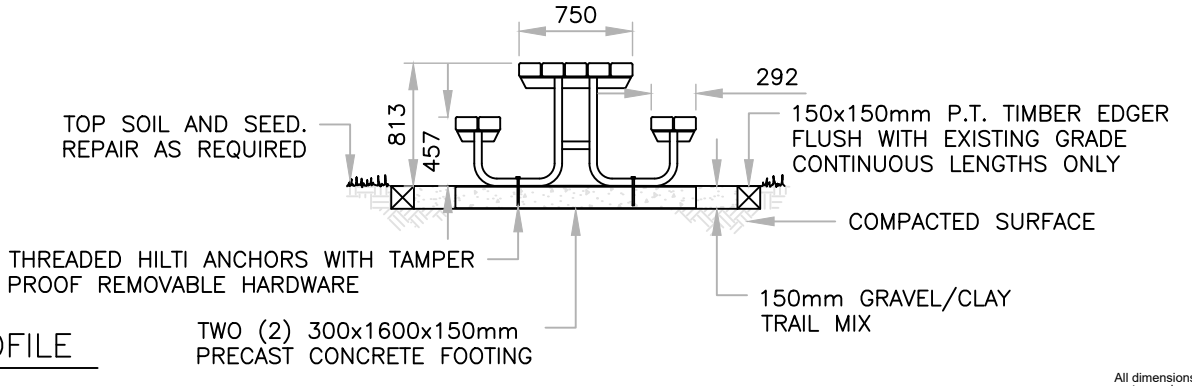
PARK BENCH TYPE AND INSTALLATION DETAILS

SCALE: NTS
FIGURE NO.: LSC 10.12



PLAN

1:50



PROFILE

1:50

All dimensions in meters unless otherwise noted

PICNIC TABLE	WOOD	STEEL TYPE	FASTNERS	STEEL FINISH	WOOD FINISH
SERIES "B" SURFACE MOUNT (PBS) BY CUSTOM PARK & LEISURE OR APPROVED EQUIVALENT	88.9 x 139.7 x 1778.0mm (3 1/2" x 5 1/2" x 70") # 1 GRADE SELECT CEDAR	101.6 x 76.2mm (4" X 3") ANGLE IRON WOOD SUPPORTS 50.8 x 50.8mm (2" x 2") SQUARE TUBE FRAME	9.5mm (3/8) PLATED CARRIAGE BOLTS COLOUR MATCHED TO STEEL FRAME	3 STEP POWDER COAT PROCESS 1–SURFACE PREP (SANDBLAST) 2– PRIME COAT (ZINC PRIMER) 3– TOP POWDER COAT COLOUR: CHESTNUT BROWN	OPTIONAL SIKKENS STAIN

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN

DATE: AUG 2019

CHECKED BY: L. GUEST

APPROVED:

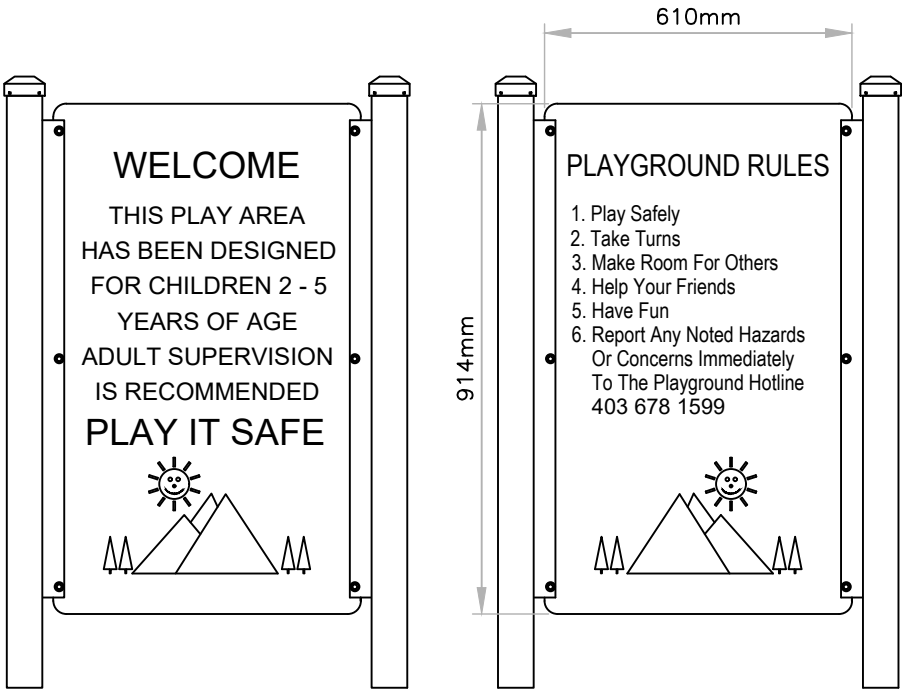
MANAGER OF ENGINEERING
TOWN OF CANMORE

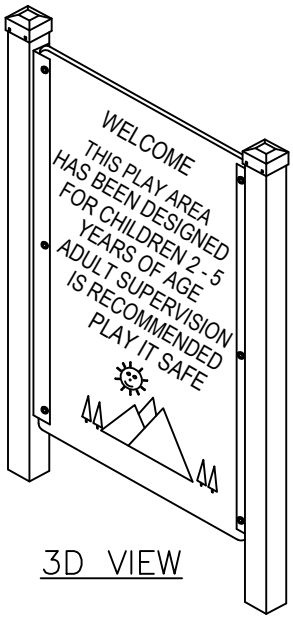
Town of CANMORE

PICNIC TABLE TYPE AND INSTALLATION DETAILS

SCALE: NTS

FIGURE NO.: LSC 10.13





3D VIEW

All dimensions in Metric meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

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DATE: AUG 2019
CHECKED BY: L. GUEST
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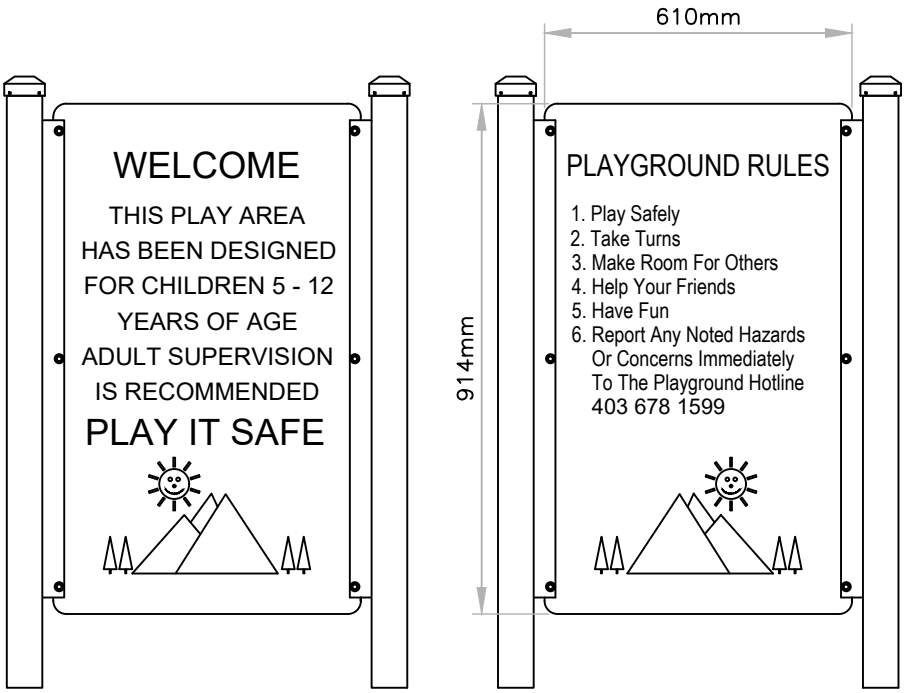
TOWN OF CANMORE

Town of CANMORE

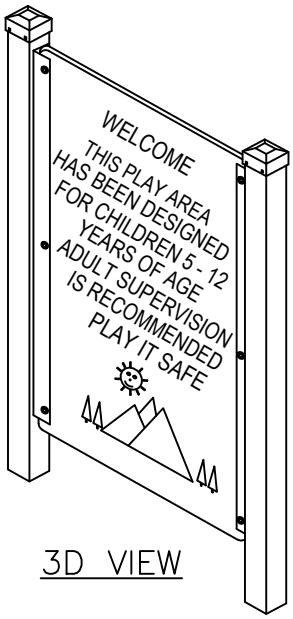
PLAYGROUND SIGN AGE 2 - 5 YEARS

SCALE: NTS
FIGURE NO.: LSC 10.14



FRONT VIEW

BACK VIEW



3D VIEW

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

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DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
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TOWN OF CANMORE

Town of CANMORE

PLAYGROUND SIGN AGE 5 - 12 YEARS

SCALE: NTS
FIGURE NO.: LSC 10.15

All dimensions in Metric meters unless otherwise noted

TRAIL SIGNAGE TABLE

ALL SIGNAGE INDICATED ON PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

TRAIL SIGNAGE TYPE (TOWN OF CANMORE DESIGNATION)	STOCK NUMBER (ATSL)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
"A"	CUSTOM	TRAIL c/w T.O.C. SYMBOL	AL1	RECTANGULAR	30 x 45 cm	W/BR	VIN	TO IDENTIFY PUBLIC TRAILS

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

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DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
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TOWN OF CANMORE

Town of CANMORE

TYPE "A" TRAIL SIGNAGE

SCALE: NTS
FIGURE NO.: LSC 10.16

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–01 T.O.C. DESIGNATION	CUSTOM	PARK CLOSURE SIGN WITH DESIGNATED HOURS c/w T.O.C. LOGO	AL–.081	RECTANGLE c/w ROUNDED CORNERS	76.2cm X 60.96cm	WHITE BACKGROUND, BLACK LETTERS AND BLACK BORDER LINE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES THE TIME THE PARK IS CLOSED TO THE PUBLIC

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

THIS PARK IS CLOSED TO THE PUBLIC

SCALE: NTS | FIGURE NO.: LSC 10.18

All dimensions in meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS-03	CUSTOM	NO PETS c/w T.O.C. LOGO	AL-.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOLS RED CIRCLED	REFLECTIVE DG c/w 3M ANTI-GRAFFITI COAT	DESIGNATES A NO PETS ALLOWED LOCATION/AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
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TOWN OF CANMORE

Town of CANMORE

NO PETS

SCALE: NTS | FIGURE NO.: LSC 10.19

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS-04	CUSTOM	NO PETS WITHIN 20m OF PLAY APPARATUS c/w T.O.C. LOGO	AL-.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOLS RED CIRCLED	REFLECTIVE DG c/w 3M ANTI-GRAFFITI COAT	NO PETS WITHIN 20m OF PLAY APPARATUS. DESIGNATES NO PETS ALLOWED IN AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
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TOWN OF CANMORE

Town of CANMORE

NO PETS WITHIN 20 METRES OF PLAY APPARATUS

SCALE: NTS
FIGURE NO.: LSC 10.20

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–04 T.O.C. DESIGNATION	CUSTOM	PETS ON LEASH SYMBOL c/w T.O.C. LOGO & BYLAW TEXT	AL–.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOL GREEN CIRCLE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES A PETS ON LEASH ALLOWED LOCATION/AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

PETS ON LEASH

SCALE: NTS | FIGURE NO.: LSC 10.21

All dimensions in Metric meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS-02	CUSTOM	NO BICYCLES c/w T.O.C. LOGO	AL-.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK TRIM AND LETTERS/SYMBOLS RED CIRCLED	REFLECTIVE DG c/w 3M ANTI-GRAFFITI COAT	DESIGNATES A NO BICYCLES ALLOWED IN THAT AREA

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

DRAWN: B. MORVAN | DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

NO BICYCLES

SCALE: NTS | FIGURE NO.: LSC 10.22

All dimensions in meters unless otherwise noted

REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–07 T.O.C. DESIGNATION	CUSTOM	DAY USE ONLY c/w T.O.C. LOGO	AL–.081	RECTANGLE c/w ROUNDED CORNERS	81.28cm X 45.72cm	TOP RED BACKGROUND w/ WHITE LETTERS. BOTTOM WHITE BACKGROUND w/ BLACK & RED LETTERS BLACK TRIM LINE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES THAT A PARKING LOT IS FOR DAY USE ONLY

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

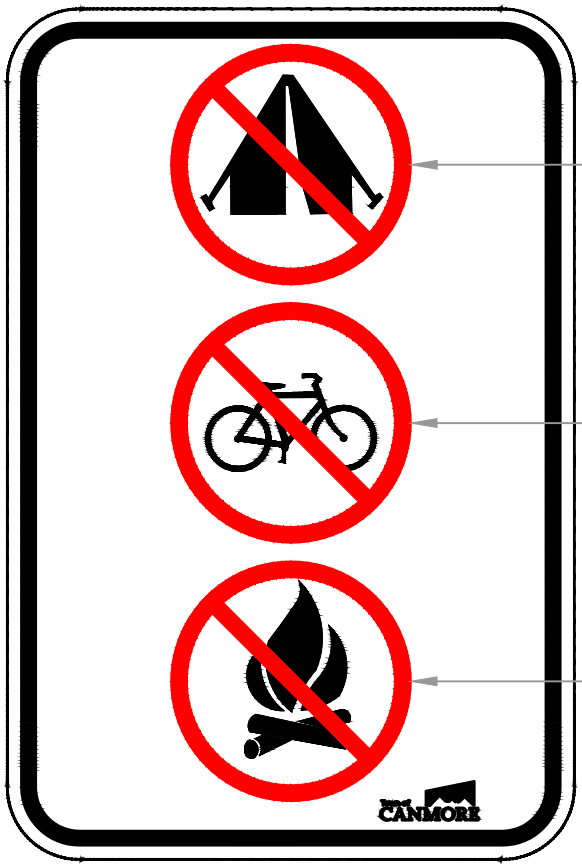
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

DAY USE ONLY
PARKING LOT SIGNAGE

SCALE: NTS
FIGURE NO.: LSC 10.23

All dimensions in Metric meters unless otherwise noted



REGULATORY SIGNAGE TABLE

ALL SIGNAGE INDICATED ON THE PLANS TO CONFORM TO THE SPECIFICATIONS BELOW

SIGNAGE TYPE	STOCK # (ATSL *)	ITEM DESCRIPTION	BACKING	SHAPE	SIZE	COLOUR	FACE	DESCRIPTION
LRS–06 T.O.C. DESIGNATION	CUSTOM	NO CAMPING, BICYCLES OR FIRES SYMBOLS c/w T.O.C. LOGO & BYLAW TEXT	AL–.081	RECTANGLE c/w ROUNDED CORNERS	30.0cm X 45.0cm	WHITE BACKGROUND, BLACK SYMBOLS, RED CIRCLES & BLACK TRIM LINE	REFLECTIVE DG c/w 3M ANTI–GRAFFITI COAT	DESIGNATES THAT THE NOTED ACTIVITIES ARE NOT ALLOWED IN THAT LOCATION

* ALBERTA TRAFFIC SUPPLY LTD. OR APPROVED EQUIVALENT

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2					
1	08/14/19	2019 EDCG	BWM	LG	CB

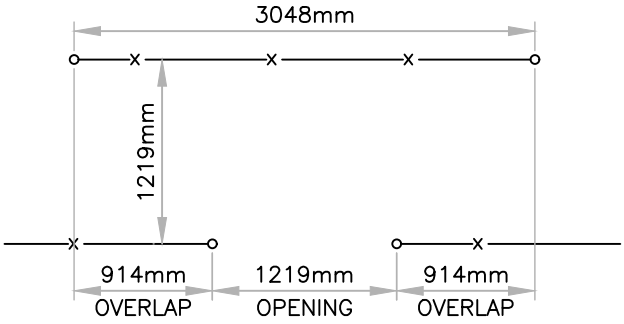
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

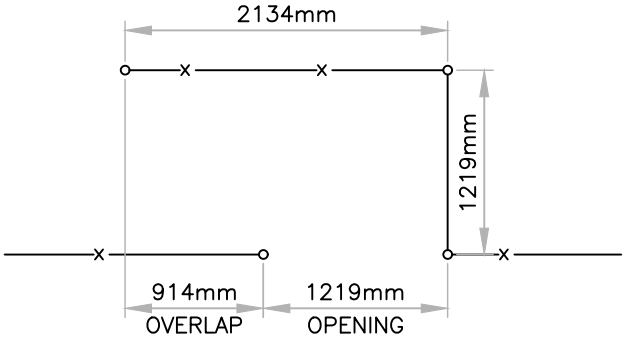
NO CAMPING
NO BICYCLING
NO CAMP FIRES

SCALE: NTS
FIGURE NO.: LSC 10.24

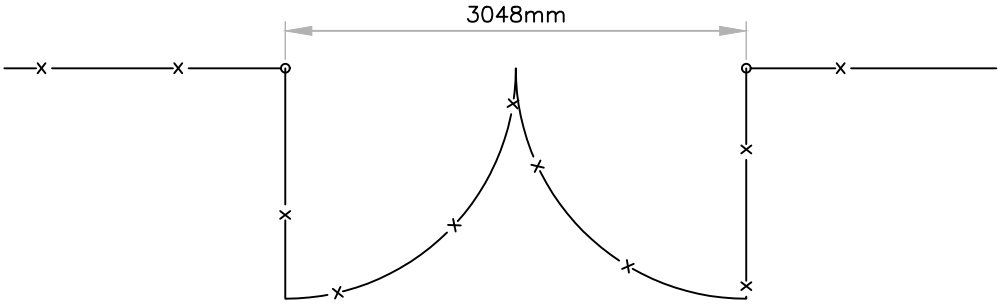
PEDESTRIAN ACCESS – OPTION A



PEDESTRIAN ACCESS – OPTION B



MAINTENANCE ACCESS



All dimensions in Metric meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4					
3					
2	08/14/19	2019 EDCG	BWM	LG	CB
1	03/15/14	REVISED TITLE BLOCK	PL	TR	BB

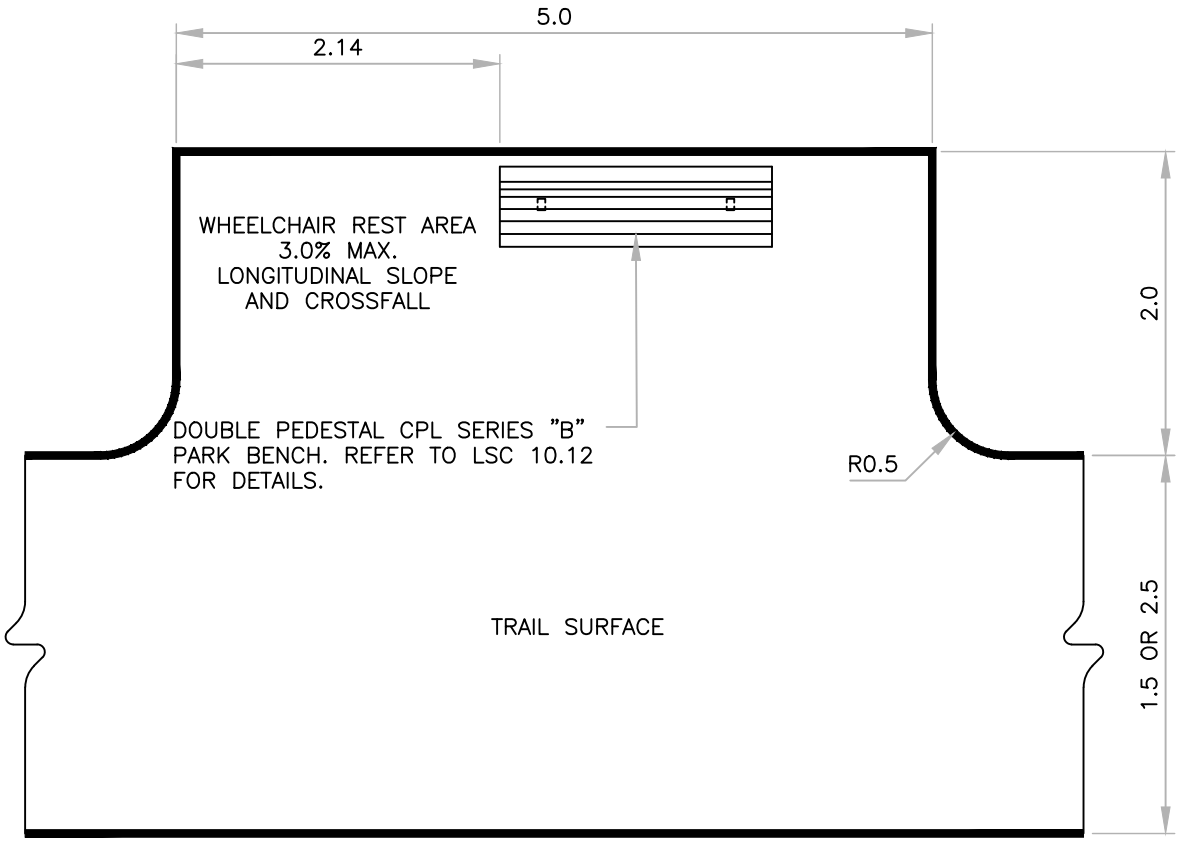
DRAWN: B. MORVAN
DATE: AUG 2019
CHECKED BY: L. GUEST
APPROVED:

MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

PEDESTRIAN AND MAINTENANCE ACCESS GATES

SCALE: 1:50
FIGURE NO.: LSC 10.25



NOTES

1. 1.0m CLEARING WIDTH AT BACK AND SIDES OF REST AREA.

All dimensions in meters unless otherwise noted

REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG
5					
4	12/09/19	2019 EDCG	BWM	LG	CB
3	03/15/14	REVISED TITLE BLOCK	PL	TR	BB
2	03/17/00	2000 ENGINEERING DESIGN STANDARDS	MAR	DAB	DAB
1	05/05/98	1998 ENGINEERING DESIGN STANDARDS	KRB	KRB	DRJ

DRAWN: B. MORVAN | DATE: DEC 2019

CHECKED BY: L. GUEST

APPROVED:

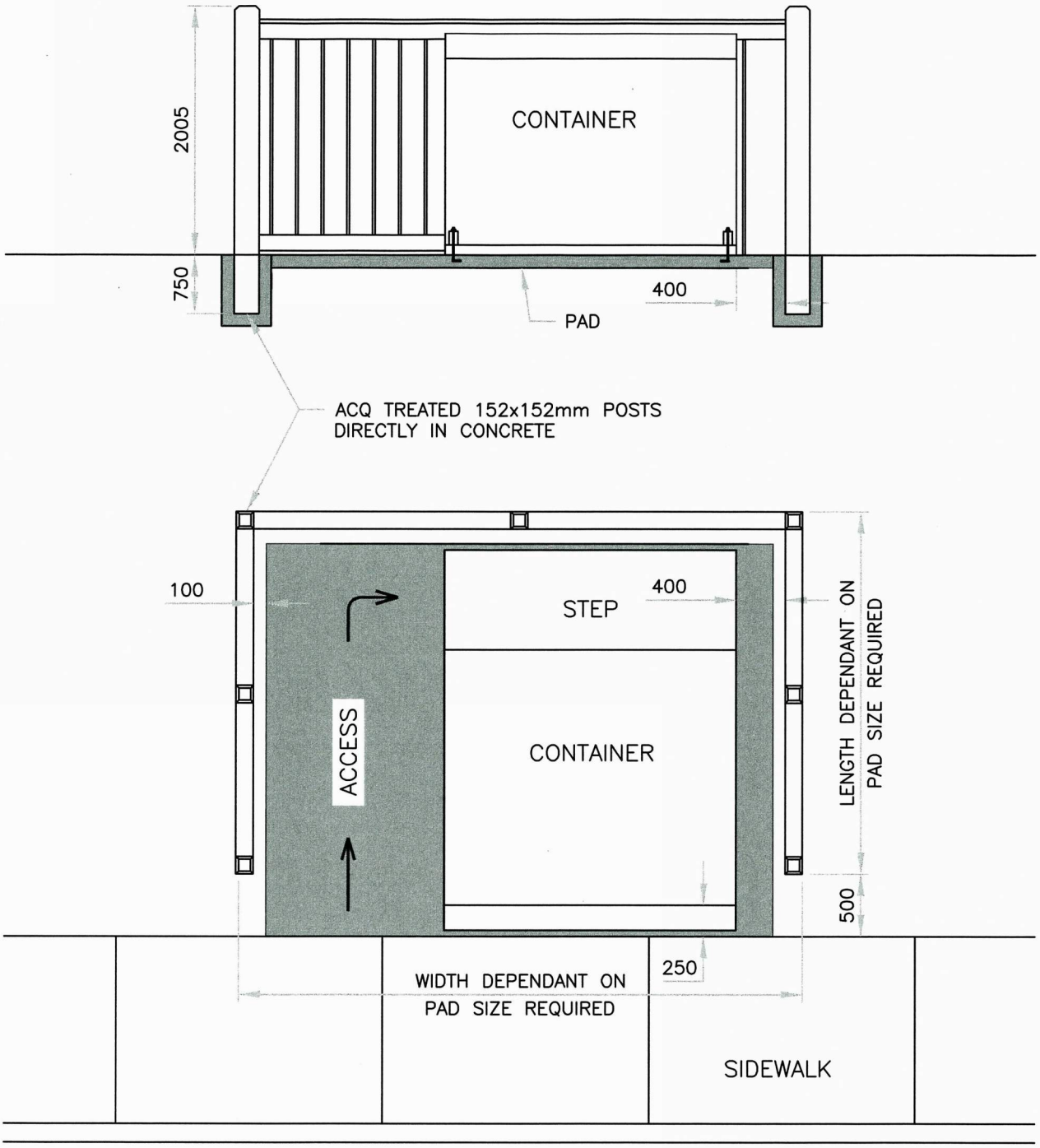
MANAGER OF ENGINEERING
TOWN OF CANMORE

Town of CANMORE

TRAIL SIDE REST AREA

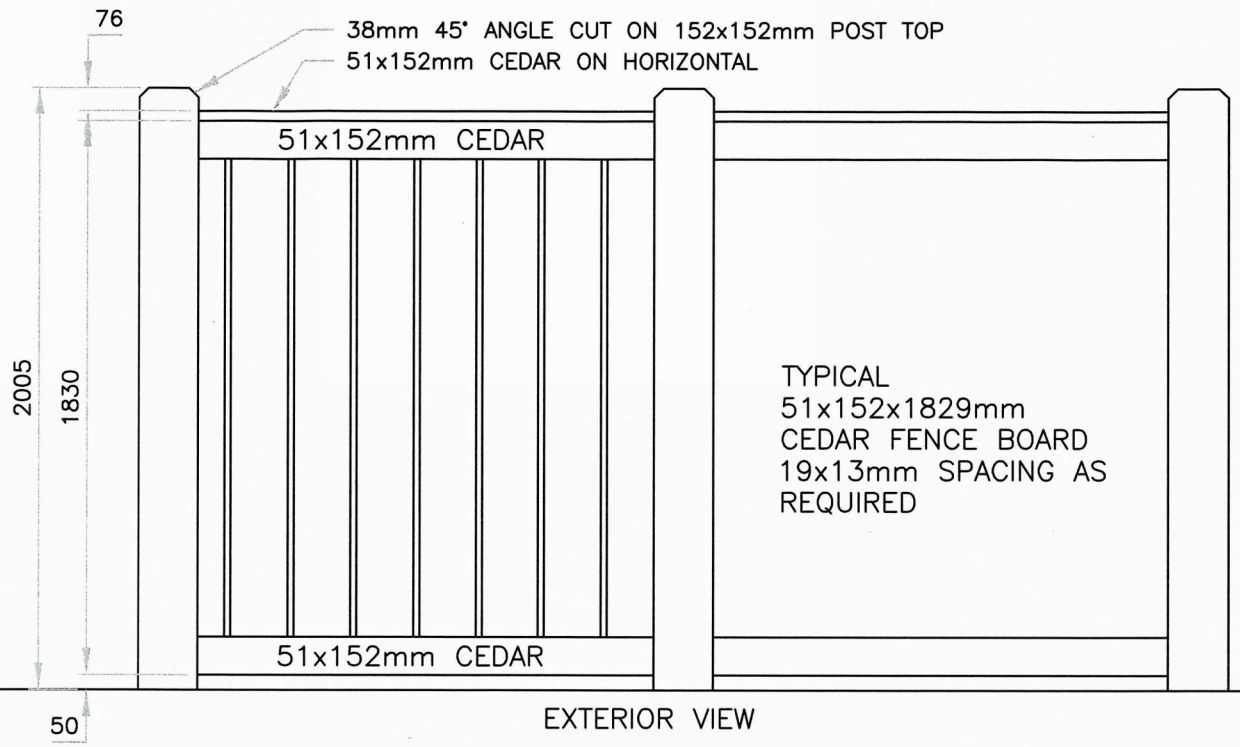
SCALE: 1:50

FIGURE NO.: LSC 10.26



All dimensions in Metric meters unless otherwise noted

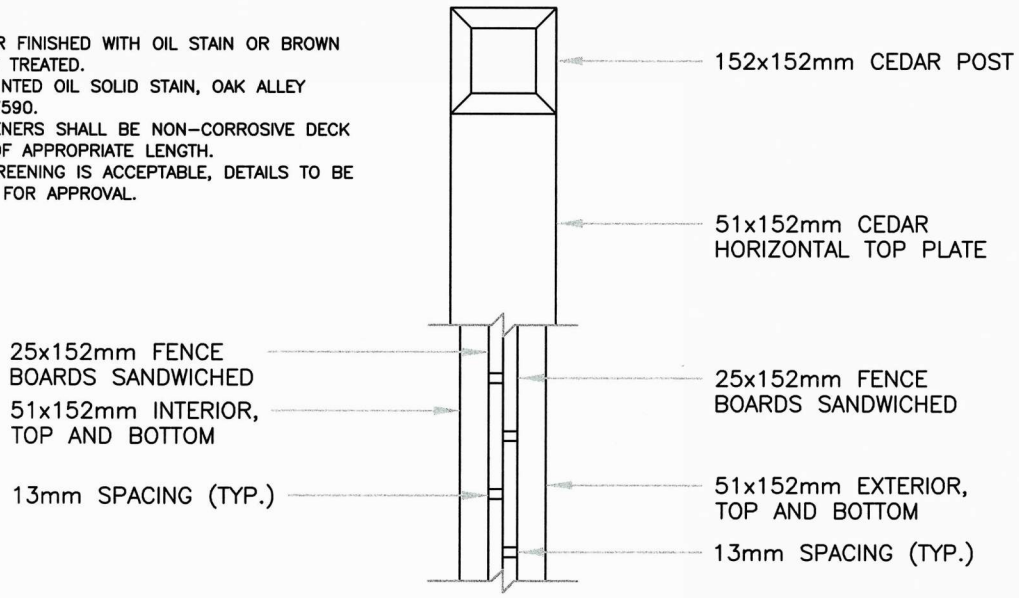
SCALE: NTS		FIGURE NO.: SWS 11.1	ANIMAL PROOF WASTE CONTAINER - ARTIFICAL SCREEN DIMENSIONS				
3	01/28/25	2025 EDCG	BWM	SR	BK	PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: 95819 RM APEGA ID #: DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	10/30/2023	2023 EDCG	BWM	SR	BK		
1	08/14/19	2019 EDCG	BWM	SR	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		



EXTERIOR VIEW

NOTES

1. ALL CEDAR FINISHED WITH OIL STAIN OR BROWN PRESSURE TREATED.
2. POSTS PAINTED OIL SOLID STAIN, OAK ALLEY COLOUR 7590.
3. ALL FASTENERS SHALL BE NON-CORROSIVE DECK SCREWS OF APPROPRIATE LENGTH.
4. METAL SCREENING IS ACCEPTABLE, DETAILS TO BE PROVIDED FOR APPROVAL.



TOP PANEL DETAIL

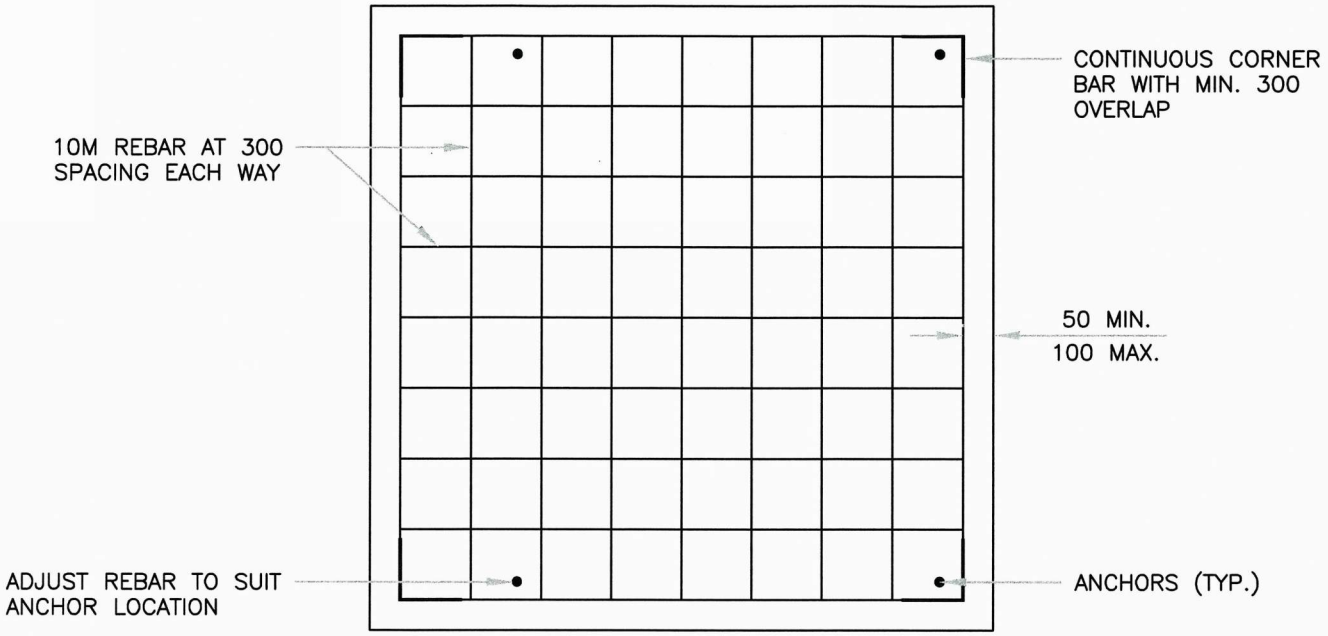
All dimensions in Metric meters unless otherwise noted

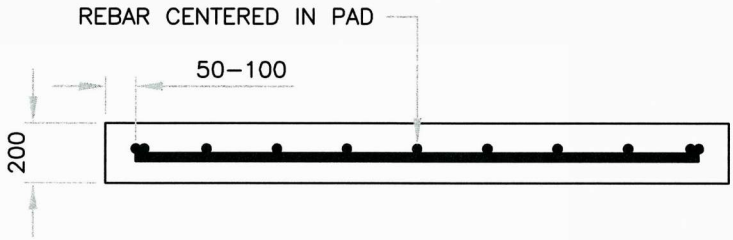
SCALE: NTS		FIGURE NO.: SWS 11.2	ANIMAL PROOF WASTE CONTAINER - ARTIFICAL SCREEN DETAIL				
3	01/28/25	2025 EDCG	BWM	SR	BK	PERMIT	SEAL
2	10/30/23	2023 EDCG	BWM	SR	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
1	08/14/19	2019 EDCG	BWM	SR	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		

Town of Canmore

FEB. 28, 2025

REINFORCING



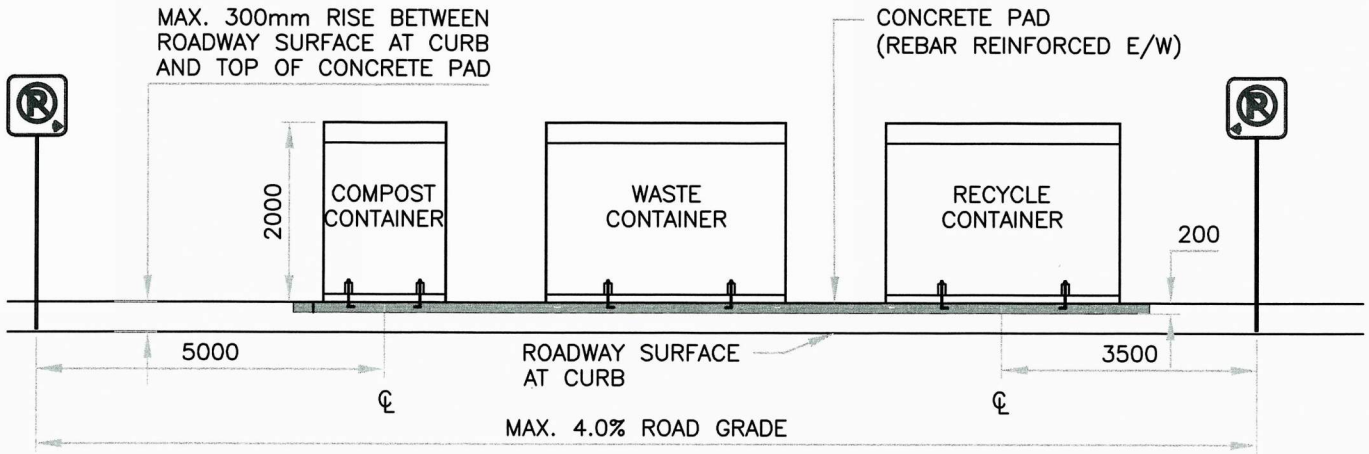


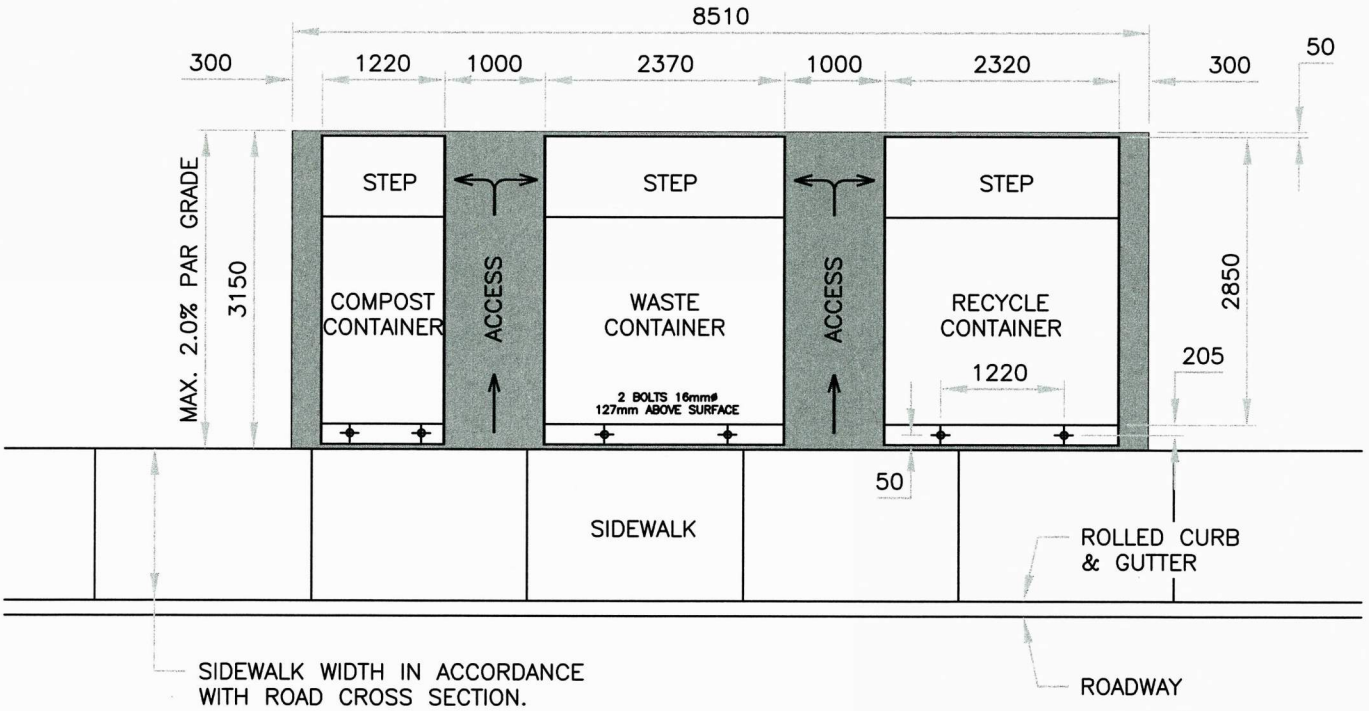
ANCHOR NOTES

1. CONCRETE 75MM STAINLESS STEEL ANCHOR BOLTS SET IN TWO PART EPOXY OR ACRYLIC BONDING AGENT.
2. ANCHORS TO BE HILTI, RED HEAD OR APPROVED EQUAL.
3. ANCHORS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
4. MINIMUM TEMPERATURE FOR INSTALLATION IS 4° C. CONCRETE SHALL BE HEATED FOR
5. BONDING AGENT CURING TIME IF TEMPERATURES ARE LESS THAN 4°C.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: SWS 11.3	ANIMAL PROOF WASTE CONTAINER - PAD CONSTRUCTION AND ANCHOR				
3						PERMIT: PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95819 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	SEAL: PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135
2	01/28/25	2025 EDCG	BWM	SR	BK		
1	08/14/19	2019 EDCG	BWM	SR	CB		
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG		





NOTES

1. CONCRETE PAD TO BE REINFORCED AS PER DRAWING SWS 11.3.
2. SIDEWALK ALIGNMENT AND WIDTH TO BE REVIEWED WITH ENGINEERING AT TIME OF DEVELOPMENT PERMIT APPLICATION.
3. CONSULT WITH ENGINEERING FOR PLACEMENT OF BINS ON COLLECTOR AND ARTERIAL ROADS.

All dimensions in Metric meters unless otherwise noted

SCALE: NTS		FIGURE NO.: SWS 11.5				ANIMAL PROOF WASTE CONTAINER - TRIPLE PAD (LARGE)		
3	01/28/25	2025 EDCG	BWM	SR	BK	PERMIT	SEAL	
2	10/31/23	2023 EDCG	BWM	SR	BK	PERMIT TO PRACTICE TOWN OF CANMORE RM SIGNATURE: RM APEGA ID #: 95879 DATE: Feb. 28, 2025 PERMIT NUMBER: P006522 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	PROFESSIONAL ENGINEER ALBERTA BRIAN KINZIE ID 66135	Town of CANMORE
1	08/14/19	2019 EDCG	BWM	SR	CB			
REV	M/D/Y	DESCRIPTION	DPS	CHK	ENG			