



Township of Clearview

Engineering Design Criteria Standards

October 2025

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Section A – General Information

A1.00 Introduction

The Township of Clearview (Township) Engineering Standards presented herein are intended for use as a guideline in the design of all land development and Township capital projects, to establish a uniform criterion of minimum standards within the Township. While specific design guidelines are provided herein, the Ontario Provincial Standards and Specifications (OPSS) supply the basis for much of the construction activity and shall be always adhered to unless directed otherwise by the Township and this document. Alternatives to these standards, which improve or maintain the quality of the design, will be considered for acceptance subject to the review and acceptance of the Township Public Works Department.

Changes and revisions will be made to these standards from time to time.

It is the responsibility of the Developer and / or the Developer's consulting engineer to obtain and make use of the current version available at the time of engineering design.

The design of all Township services is to be based upon the specifications and standards in effect at the time of design. All drawings are to be accepted by the Township before they are used for the construction of services; however, such approval in no way relieves the Developer's consulting engineer from providing an adequate and safe design. The Township reserves the right to require a review and request possible revisions of previously accepted drawings if five years or more has passed between approval and construction.

It is understood that these standards may be referred to as a schedule in a subdivision agreement and that the current revision of the standards are then considered part of the agreement.

To ensure complete development application submissions are provided, review the Application Guidelines provided by the Planning Department in conjunction with these standards.

A2.00 Familiarization

Prior to the commencement of the engineering design, the Developer's consultant shall obtain copies of the Township's Engineering Standards to familiarize themselves with the Township's requirements for engineering design. Copies can be downloaded from the Township website at www.clearview.ca. Meetings shall be held where necessary

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with the Township's Public Works staff to discuss areas of preliminary concern and other issues prior to commencement of the engineering design.

A3.00 Materials

All proposed construction products and materials shall be Canadian Standards Association (CSA) certified and in accordance with the Township approved materials list, included as an Appendix to this document, as amended from time to time.

A4.00 County of Simcoe

The County of Simcoe (County) is responsible for waste and recycling collection and all County roads within the Township.

The Developer's engineer shall contact the County's Engineering Department to obtain copies of the Design Standards for waste and recycling collection vehicles and County roads.

A5.00 Development Applications

The Developer shall appoint a qualified consulting engineer who is registered and in good standing with the Professional Engineers Ontario (PEO) acceptable to the Township to design, supervise, and certify the construction and installation of the Subdivision Works. This person shall act as the Project Manager for the entirety of the project. The Project Manager shall be the one contact person responsible for providing all information / correspondence related to the development to the Manager of Engineering.

The Township operates under a complete submission process, and the Developer or the Developer's Consulting Engineer is obligated to ensure that all required materials as outlined in this document are included in each submission.

It is required that prior to the first submission, a meeting is held with Township Staff to present the design details of the development. At the pre-submission meeting, the Project Manager shall provide a full set of drawings and a letter outlining all design exemptions from the Township's Engineering Standards Document. The Developer shall ensure that all appropriate Design Consultants are in attendance at the meeting. Final decisions on any exceptions will be made following the meeting and provided to the Project Manager. All issues raised in this meeting are to be resolved as part of the first submission.

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The Developer acknowledges the Township is relying upon the skill and expertise of the Developer's consulting engineer in relation to the design and construction of the Works, including the estimating of costs. As a result, no other engineer will replace the consulting engineer without the written approval of the Township. If other engineers are retained to assist in the design and construction of the Works, such engineers will be duly qualified for the field related to the Work undertaken and shall be acceptable to the Township.

Fees for the review of engineering related matters are to be paid for in accordance with the Township's Development Engineering Review Fee Policy:

<https://www.clearview.ca/file/a09-development-engineering-review-fee-policypdf>

Application fees / deposits are required to be provided to the Township as part of each application submission. The total engineering review fee will be based on 5% of the Estimated Construction Cost provided by the Developer's engineer (including HST), as per the Township's Development Engineering Review Policy.

A6.00 Capital Projects

The Township shall appoint a qualified consulting engineer registered with the PEO, to design, supervise, and certify the construction and installation of the Capital Works, including but not limited to external works to subdivisions, road construction, intersection improvements, and Township underground infrastructure.

Where external works are required related to a Development, depending on the scope and magnitude of the Works, the Township may choose to manage the design, tendering, and inspection of Works on the public right-of-way (ROW), at the Developer's cost. If the Township chooses not to manage the Works themselves, the Developer shall appoint a competent, qualified, professional engineer, acceptable to the Township, to design, administer, and provide full-time inspection for the external Works.

A7.00 Barrier Free Requirements

All design projects throughout the Township must adhere to the requirements of the *Accessibility for Ontarians with Disabilities Act* (AODA) and the Township's "Facility Accessibility Design Standards" (FADS) and shall incorporate ways to remove barriers for the public.

On Township reconstruction projects where the requirements of AODA are not practical or financially feasible, exceptions may be accepted, upon review by the Township,

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providing there is sufficient justification that the existing conditions prohibit proper application of AODA standards.

A8.00 Pre-consultation Meeting

The Consultant should coordinate a meeting with relevant Township staff to discuss the various aspects surrounding the project and establish direction for execution of the project prior to proceeding with design.

A9.00 Engineering Requirements for Draft Plan Approval

For Planning Applications including Official Plan Amendment, Zoning By-law Amendment, and related applications up to and including Draft Plan Approval, the following information shall be submitted for acceptance in general, before submission of the detailed design.

A9.01 Draft Plan of Subdivision

The Draft Plan shall be the most up to date Draft Plan of Subdivision showing all redline revisions and must be in a form acceptable to the Planning Department of the Township. A reduced size (8-1/2 x 11) copy of the Draft Plan as well as a full size copy (folded) shall be included in the Functional Servicing Report (FSR).

A9.02 Functional Servicing Report

A Functional Servicing Report (FSR) must be submitted to the Township for review and acceptance. This report must be presented in a clear, comprehensive, and professional manner. The Developer shall retain a qualified professional engineer to prepare the FSR, which shall, at a minimum, address the proposed servicing of the development, with regard to water supply and distribution, sanitary sewage collection, storm drainage and stormwater management (SWM), and roads, including a review of the existing infrastructure to confirm whether they are sufficiently sized to accommodate the proposed development.

The report shall include a review of current infrastructure and demonstrate how the proposed development can be serviced from the perspectives of water supply and distribution, sanitary sewage collection, storm drainage, SWM, and roadways. It shall include the provision of utilities such as telecommunications, natural gas, and hydro distribution, etc. This report shall identify any improvements to existing infrastructure which may be required to service the proposed development.

The report shall include calculations for water demand, fire flow (per Fire Underwriters Survey (FUS) method) and sewage generation rates, along with the sizing of

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watermains, sewers, SWM facilities, pumping / booster stations, forcemains, etc., as applicable.

A calculation shall be provided that equates the water demand into equivalent Single Detached Units (SDEs). This calculation shall be based on a per SDE 'maximum day' water usage of 2,400 L/day (2.4 m³/day) which is based on the following assumptions:

- 3.0 persons per single-family unit.
- Maximum Day Factor of 2.0.
- 400 L/cap/day.

The following can be used to convert other unit types to SDEs:

Apartment – 0.5 SDEs

Townhouse – 0.8 SDEs

Semi-detached – 1.0 SDEs

The report shall demonstrate how any applicable external areas will be accommodated by the proposed infrastructure.

The method of disposal of sewage shall be provided, and an outline of the actual design shall be presented, including calculations and relative size of the treatment facilities.

This completed and accepted report shall be submitted and form part of the detailed design submission.

This report shall be stamped and signed by a licensed professional engineer and shall be in keeping with the applicable Master Servicing Plan for the area (if available) or identify any exceptions.

A digital copy, along with one hard copy of the FSR, are to be submitted, which shall also contain the following information as a minimum:

A9.03 External Sanitary Drainage Drawing

This drawing must be at a scale of no larger than 1:1,250 showing existing contour lines at sufficient intervals to permit assessment of existing surface drainage patterns. This drawing is to extend to the limits of the drainage area to be served by proposed sanitary sewer systems, including a topographic survey 30 m beyond the boundaries of the subdivision, or as approved by the Township. For large external areas, contour drawings at a larger scale may be provided. All elevations are to refer to Geodetic Datum.

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A9.04 External Stormwater Drainage Drawing

This drawing must be at a scale of no larger than 1:1,250 showing existing contour lines at sufficient intervals to permit assessment of existing surface drainage patterns. This drawing is to extend to the limits of the drainage area to be served by proposed storm sewer systems, including a topographic survey 30 m beyond the boundaries of the subdivision, or as approved by the Township. For large external areas, contour drawings at a larger scale may be provided. All elevations are to refer to Geodetic Datum.

A9.05 General Site Servicing Drawing

This will be a drawing based on the Draft Plan and must schematically show the proposed water, storm, and sanitary sewer systems and their connection to existing systems. This drawing is to be accompanied by preliminary engineering calculations indicating the quantity of flows at the connection to existing systems and / or at proposed outfalls. Consideration must be given to the whole catchment area to be ultimately developed. Blocks and easements for drainage systems shall also be shown. Preliminary road centreline grades must also be identified on this drawing.

A9.06 Water Systems

The FSR shall outline the proposed source and method of water distribution. For groundwater source applications, a hydrogeological report shall be provided which clearly indicates the availability (including quantity and quality data) of water, in compliance with Provincial guidelines and regulations.

For Township systems, the FSR shall provide an overview of the existing water system, its capacities and characteristics, and the needs generated by the new development. Water modeling of the distribution system will be completed in the Township's water distribution model, based on an initial design by the Developer's consulting engineer. The following information shall be provided in the FSR to facilitate the water modelling exercise:

- Water demands including average, maximum, and peak day flows.
- Water demand assumptions.
- Fire flow calculations (using FUS) for all types of usage (residential, commercial, industrial, as applicable) including the 'worst case' for each housing or Industrial, Commercial, and Institutional (ICI) type.
- Elevation data for existing and proposed ground.
- Proposed watermain sizing.

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- Pump curves and duty points (as applicable).

A9.07 Utilities

The FSR shall show that the proponent has had preliminary discussions with the various utility providers and that an appropriate plant is available to service the development lands. Any internal or external upgrades to utilities required shall be identified in the report and drawings.

A9.08 Transportation and Traffic Impact Study

Prior to Draft Plan approval, the Township will require the proponent to prepare and submit supporting traffic studies, for the Township's approval.

The study shall consist of a Traffic Impact Study (TIS) which is a broad-based external transportation study that examines the property boundary conditions and interconnections with adjacent properties (including signalization issues), assessed under existing and future conditions. The study must recommend the phasing of traffic signals and arterial road widenings to match development.

The study shall also consist of an assessment of the internal traffic which balances appropriate urban design guidelines with a detailed assessment of internal transportation and traffic geometric design including off-street or driveway parking issues, signalization warrants, roadway capacity, lane configurations, boulevard requirements (i.e., snow storage and utility corridors), transit and pedestrian requirements, and intersection vehicle sight lines, and medians. The study shall also include recommendations for traffic calming, if deemed appropriate.

The report is to be stamped and signed by a licensed professional engineer.

This study is to be finalized and accepted prior to Draft Plan approval; however, shall be updated if the phases of development take more than five years to build out.

This study shall have regard for the requirement of the Transportation Section of the Township's Official Plan.

A complete guideline for the completion of a Traffic Study can be found in Appendix C.

A9.09 Stormwater Management Report and Drawings

When a natural drainage channel passes through and is affected by the proposed subdivision, drawings must be submitted to indicate the location and typical cross-sections of the existing channel or any proposed changes. A preliminary Stormwater Management (SWM) drawing and report will be required to address SWM planning and

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design issues outlined in Section C of this document to the satisfaction of the Township. Review and inclusion of external contributing drainage areas is required. The Developer is to check with the Township and the Nottawasaga Valley Conservation Authority (NVCA) to determine the current status of master copies of any available stormwater models before proceeding with storm drainage planning or design.

All proposed stormwater controls shall be in accordance with the Township, applicable Road Authority (County and /or Ministry of Transportation of Ontario (MTO)), the Nottawasaga Valley Conservation Authority (NVCA), and Niagara Escarpment Commission (NEC) requirements and their preliminary assessment and approval of the design is required.

A9.10 Geotechnical Report

A soils investigation and report will be required. This report shall provide calculations and recommendations for pavement design, slope stability, pipe bedding, trench backfill requirements, engineered fill requirements, building foundations, retaining walls, soil corrosivity, infiltration rates for percolation, removal and management of excess soil in accordance with O. Reg. 406/19, etc., as necessary. The report is to be stamped and signed by a licensed professional engineer or professional geoscientist.

A complete guideline for the completion of a Geotechnical Study can be found in Appendix C.

A9.11 Hydrogeological Report

A Hydrogeological Report for all proposed projects shall be conducted by a qualified professional engineer and / or geoscientist to characterize the groundwater regime from a site specific and area perspective in order to address issues related to impacts to existing wells, soil permeability, and associated properties, groundwater impact assessment to area aquifers from construction activities, and / or discharge of waste water, impacts to nearby surface water bodies, and specific review of wellhead capture zones.

For general road and servicing construction, the report should consider the depth of services and identify areas where dewatering may be required, the rate of dewatering, requirements for dewatering, permits, and the strategy to achieve the required groundwater levels. Where applicable, the report shall also provide an assessment of the use of sump pumps for building design.

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A complete guideline for the completion of a Hydrogeological Study can be found in Appendix C.

A9.12 Water Balance Report

The Developer's consulting engineers will prepare a Water Balance Report and obtain the Township's approval, along with the NVCA's approval of the report prior to acceptance of the Draft Plan, if the development falls within a regulated area. The report is to reference the completed hydrogeological site investigations and the preliminary geotechnical report also completed for the project. The water balance analysis is to quantify expected changes in evapotranspiration, infiltration, and runoff resulting from development, that may impact natural environmental features or the sources of drinking water and will require mitigation. The report is to conclude if the necessary mitigation measures can be incorporated into the Draft Plan or if off-site mitigation measures are necessary.

Upon approval of the Draft Plan and the project advancing to design and construction, a revised Water Balance Report will be necessary should site conditions change or are determined to be different from the original report.

A9.13 Significant Drinking Water Threat Report

Where the Works have been identified as a significant drinking water threat as defined by the Source Water Protection guidelines, the following is required as specified by the Township's RMO / RMI:

A.9.13.1 General Works

Design Requirements

- Design must include a Source Protection Supplementary Report that demonstrates that the proposed design recognized the significant drinking water threat and has implemented mitigation measures to protect drinking water sources, how the sewage works has met the requirements of the *Clean Water Act (CWA)*, the Township's design and operational requirements and how the Works considered the Ministry of the Environment, Conservation and Parks Risk Management Measures Catalogue (e.g., monitoring, reporting requirements), as amended, to address the risk.
- Designs must be accompanied with a monitoring and reporting Plan.
- Designs must be accompanied with a Spill Prevention and Contingency Plan, covering information requirements as per O. Reg. 224/07 to prevent, eliminate, or ameliorate any adverse drinking water effects that result or may result from spills

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of pollutants. This includes steps taken in the event drinking water sources are contaminated for example, notifying members of the public who may be directly affected by a spill.

Operational Requirements

- The Spill Prevention and Contingency Plans must be kept up to date. This report and associated spill prevention / contingency Plan will require review and acceptance by the RMO (NVCA acts as Township RMO/RMI).
- Regular and annual reports to include maintenance, inspections, and monitoring details.
- All reports are required to be kept on-site (where the reports can be kept on-site) and at the operating authority's office.

All reports are required to be made readily available upon request by Township staff, Source Protection Authority, or any other parties identified in Source Protection Plans.

A.9.13.2 Stormwater Management Works

Design Requirements

- In adherence with the requirements of the CLI-ECA Design Manual.
- Design must be based on providing Enhanced Level water quality control as per the Ministry of the Environment, Conservation and Parks (Ministry) Stormwater Management and Planning Manual, 2003.
- Design must include an additional 20% water quantity control in addition to the requirements of the Ministry's SWM and Planning Manual.
- Design must be accompanied with erosion and sediment control (ESC) measures to cover all phases of construction.

Operational Requirements

- The ESC measures drawing must be kept up to date with records of inspections and maintenance made available for inspection by the Ministry.
- The monitoring and reporting Plan must be kept up to date and on-site or at the operating authority's office.

A9.14 Archaeological Report

The Archaeological Report shall assess any significant historical features on the Site and recommend a mitigation Plan if necessary. The report shall follow the Ontario Ministry of Culture guidelines for determining the archaeological potential of the area impacted by construction. At a minimum, the report shall follow the requirements of a Phase 1 Archaeological survey and proceed with a Phase 2 and 3, if necessary. This

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report shall also consider “Built Heritage” and provide an inventory of any historically or culturally significant structures within the affected area.

A9.15 Phase 1 Environmental Site Assessment

An Environmental Site Assessment (ESA) shall be completed. If required, a Phase 1 ESA shall be undertaken by a “qualified person” as defined in O. Reg. 153/04 (or the latest revision thereof) and a report shall be completed in accordance with the requirements set out in the same regulation as well as the guidelines published by the Canadian Standards Association (CSA).

A9.16 Environmental Impact Study

An Environmental Impact Study (EIS) shall be prepared by a qualified professional and will assess any potential impact of the proposed project upon the natural environment including but not limited to wetlands, woodlots, and natural habitats for threatened and / or endangered species. The study shall also characterize the impact and make recommendations for mitigation, if necessary.

A9.17 Tree Inventory and Preservation Plan

Depending on the nature of the existing site conditions, the Township may require a Tree Inventory and Preservation Report and Plan as part of the Engineering submission. Tree Preservation Drawings are to be completed with inventory data collected by an International Society of Arboriculture (ISA) certified Arborist accessing the project site. Tree Protection Fencing is to be installed as per the Report’s recommendations and / or the Township’s Temporary Tree Protection Fencing Standard Details.

No trees, whether on the road allowance, parkland, or on individual lots, shall be removed without the written permission of the Township.

A complete guideline for the completion of a Tree Inventory and Preservation Plan can be found in Appendix C.

A9.18 Additional Reports

The Developer’s consulting engineer is responsible to identify any and all approvals and reports required by Ontario Provincial regulations (including those that are considered applicable law under the Ontario Building Code (OBC)), as well as the policies of the Township, County, NVCA, as well as provincial and federal governments.

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Additional reports may include studies regarding acoustic / noise and vibration, environmental matters, tree inventory, and assessment and archeological assessments.

A10.00 Subdivision Development Submissions

Engineering submission packages must be complete and shall include a full set of design drawings and reports required for the design. **Complete** engineering submission packages are to be submitted to the Manager of Engineering. A copy of the submission correspondence (i.e., cover letters, etc.) is also to be provided to the Director of Public Works and Director of Planning and Building. Circulation to other approval agencies is the responsibility of the Developer's Consultant.

Incomplete submissions will be returned to the Developer's consultant without comment.

A10.01 Engineering Drawing Requirements

All original drawings and prints shall be neat and legible, using the latest version of AutoCAD or Civil3D, Computer Drafting, and shall be updated for "Record Drawings" in the same manner. Design review submissions shall include hard copies and PDF files. Approved for construction submissions and Record Drawing submissions shall include hardcopies, PDF files, and AutoCAD/Civil3D files.

All drawings are to be prepared in a neat and legible fashion and, in general, shall meet the following criteria:

- All drawings shall be prepared on Metric A1 (595 mm x 841 mm) sheets on bond paper.
- Drawings are to be presented at the following scales.
 - Key Plan (noted on the cover sheet) 1:5,000.
 - General Servicing Drawing and Drainage Drawings (Storm and Sanitary) 1:1,000.
 - Lot Grading Drawing 1:500 or 1:200.
 - Plan and Profiles 1:500 Horizontal and 1:50 Vertical.
- All drawings shall include a complete title block with a revisions block, design engineer's block, the lot and concession numbers, street name, Township name and Township acceptance block, and a drawing number to the satisfaction of the Township.

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- A standardized block location (acceptance block) is to be provided on all submitted drawings, where the Township “Accepted for Construction” stamp will be located.
- All elevation data shall be referred to geodetic datum and at least one benchmark shall be shown on each drawing indicating a geodetic elevation.
- All drawings shall be referenced to X and Y coordinates in accordance with Universal Transverse Mercator (UTM) System, NAD83.
- Plan and profile drawings are to be prepared so that each street can be filed separately. The street names are to be identified on the plan portion of the drawings.
- When streets are of a length that requires more than one drawing, match lines are to be used with no overlapping of information.
- The reference Plan numbers for all intersecting streets and match lines shall be shown on all plan and profile drawings.
- Lot and block numbers on all engineering drawings shall be the same as on the registered Plan.
- All drawings shall include a north arrow in the upper right-hand quadrant. All east-west streets shall generally be drawn with the north arrow pointing to top, all north-south streets with the north arrow generally pointing to the right, and all cul-de-sacs or other roads where this does not apply shall be drawn with the stations numbered from left to right.
- Horizontal control data (beginning and end of curve, radius, length, etc.) shall be shown on appropriate General Drawings and on Plan and Profile drawings.
- Vertical control data (proposed road grade, length of run and percent slope, beginning and ending of vertical curves) shall be shown on Lot Grading Drawings and on Plan and Profile drawings.
- Existing and proposed centerline road grades shall be shown every 20 m with stations shown measured in metres with kilometres separated by a “+” sign on long runs (e.g., STA 0+000, STA 0+020, STA 0+040 to STA 1+020). Stations of interest (curve stations, intersections, end stations, etc.) shall be shown calculated to the nearest millimeter (e.g., BVCSTA 0+041.169, EVCSTA 0+066.169, ENDSTA 0+069.124).
- The intersection of centre lines of streets shall be used as zero chainage. When the drawing must be broken because of curvature, etc., the profile shall be broken as well, so that insofar as possible, chainage points in plan and profile coincide vertically. In general, east-west streets shall have zero chainage at their westerly

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limits, and north-south streets shall have zero chainage at their southerly limits. Chainages on a plan and profile shall increase from left to right.

- All existing utilities, structures, and other features such as trees and hedges shall be shown in grey and identified using a broken line.
- The drawings shall show any required off-street drainage and separate profiles shall be prepared for drainage easements and blocks.
- The beginning and end of curves must be shown on a plan and profile with the radii of curvature shown on the drawing. Chainages of points of curvature shall be calculated from the final drawing. The chainage elevations and names of intersecting streets shall be shown in plan and profile.
- The drawings shall clearly show the proposed profiles, road widths and cross-sections, ditches, ditch gradients, curb and gutter gradients, culvert sizes, gauges and gradients, existing and proposed services, and limits of the proposed work. All details for intersecting streets, including grades, must be shown for a minimum distance of 30 m from the intersection of the intersecting street. All street lines shall be shown as well as all easements for drainage or services. The drawings shall show the lot frontage distances and dimensions of easements and land to be dedicated to the Township.
- All engineering drawings shall be signed and stamped by the appropriate qualified professional (i.e., professional engineer, landscape architect, etc.). The drawings shall be stamped, signed and dated, prior to the issuance of drawings for tendering and signing by the Township.
- The Township Public Works and Planning Departments shall be consulted as to the manner of showing information not set out in these requirements.
- The standard abbreviations, sewer diameter, length and grade, diameter and size of maintenance holes (MHs), inlets, and connections to the sewer shall be shown on appropriate General Drawings. This information plus sewer bedding, type and class of sewer pipe, MH numbers and inverts, flow direction, grate elevations, and drop structures shall be shown on Plan and Profile Drawings. Chainage of MH locations shall be shown in profile.
- The standard abbreviations, watermain diameter, length, type and class of pipe, and the valves, services, hydrants, and connections to the watermain shall be shown on appropriate General Drawings and on Plan and Profile Drawings.
- Other details shall be according to the Township Standard Drawings where applicable or if a Township Standard Drawing is not available in accordance with Ontario Provincial Standards. Township Standards take precedence when

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available. All necessary details shall be included on sheets similar to other drawing sheets, if not already located on relevant drawings. Township Standard Drawings may be printed on these sheets directly. **Township Standards are not to be edited unless agreed to by the Public Works Department.**

A10.02 Submission Requirements

The initial engineering submission shall contain the following information:

1. A cover letter from the Consultant.
2. A declaration from the Developer and their consulting engineer acknowledging that they have been retained as the Project Manager, to design the Works, and have followed the Township's Engineering Standards, as well as confirm that they will supervise and certify the construction and installation of the Works of the proposed subdivision according to the Engineering Standards. See Section A5.00 and Appendix A for details and the declaration form.
3. For second and subsequent submissions, any previous red-lined comments from the Township and any reports requiring revision are to be re-submitted, along with a comment response matrix.
4. The following engineering drawings are to be prepared for each development application, as applicable:
 - a) Cover Sheet: showing subdivision name, application number, key plan showing the subdivision's location relative to nearby major roads, Developer's and Consultants' information, a drawing index, Submission No., and Township File No.
 - b) Draft M-Plan(s) and Draft R-Plan(s): shall be the most up to date Draft M-Plan and R-Plan showing all approved redline revisions.
 - c) Draft Plan of Subdivision: shall be the most up-to-date Draft Plan of Subdivision showing all approved redline revisions.
 - d) General Notes Sheet: showing the approved general notes of the Township, without alteration, any other text based information not included on any other drawing and a list of design exceptions (i.e., cases where the Township's design standards are not strictly adhered to and have been previously approved by the Public Works Department).

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- e) Phasing Drawing (if applicable). Scale 1:1,000.
- f) General Aboveground Services Drawing(s): showing existing and proposed aboveground infrastructure, including external works where applicable. Scale 1:1,000. Including the phasing of the development as applicable.
- g) General Underground Services Drawing(s): showing existing and proposed underground infrastructure including external works where applicable. Scale 1:1,000.
- h) Sanitary Drainage Drawing: showing existing and proposed sanitary sewers, tributary areas to each sewer including areas of future development and external drainage areas. A separate External Sanitary Drainage Drawing may be required to show large external areas. Scale 1:1,000.
- i) Storm Drainage Drawing: showing existing ground contours to a minimum of 30 m beyond the limits of development, existing and proposed storm sewers, channels, overland flow routes, 100-year ponding elevations, tributary areas to each sewer including areas of future development and external drainage areas. A separate External Storm Drainage Drawing may be required to show large external areas. Scale 1:1,000.
- j) Sanitary and Storm Design Sheets (to be full-size sheets, included in drawing set): sanitary and Storm Design Sheets for the Development as outlined in this document, both digital (Excel spreadsheet) and hard copy, computer printouts, and detail calculations for pipe strength and bedding.
- k) Water Distribution System Drawing(s): showing existing and proposed watermains including size and type, proposed watermain elevations at all intersections, and all critical junctions. The drawing shall also include the internal and external demand information, as well as any hydrant flow test or static pressure test results including the test dates and times and fire flow table. Scale 1:1,000. Show individual hydrants coverage based on maximum separation.
- l) Lot Grading Drawings: showing existing contours and minimum 15 m beyond property boundaries, existing elevations, and proposed road, lot, and block elevations, ditch invert elevations every 20 m, soakaway pits / low impact development (LID) features, invert and top of grate elevation for all rear lot

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catchbasins (RLCBs), noise attenuation berms and fences (refer to Section G – Grading for additional information required on the drawing). Scale 1:500.

m) Composite Utility Drawing: showing existing and proposed above ground and below ground utility locations, above ground service locations, road crossings, driveways (refer to Section H – Utilities and Streetlighting for additional information required on the drawing). Scale 1:500. This can be provided as part of the second submission if not available as part of the first submission.

n) Traffic Management Drawing(s): Traffic Management information to be included showing pavement markings, traffic control signage, Canada Post boxes, traffic controls, etc. Scale 1:500.

o) Plan and Profile Drawings: showing detailed alignments and profiles of the roads, sewers, and watermain including pipe material, length, diameter, slope, bedding and strength classification, borehole locations, restraining joints, and bends on watermains. 100-year return storm hydraulic grade lines for the storm sewer shall be plotted. Service easements to be included in Plan and Profile drawings. These drawings are to clearly identify all relevant Township and OPS Drawings not covered in the Township's general notes (e.g., MHs, safety platforms, drop structures, etc.). Horizontal Scale 1:500. Vertical Scale 1:50.

p) SWM Drawing(s): showing the proposed stormwater management facility (SWMF) including the existing and proposed contours, cross-sections, and details of structures and other elements associated with the proposed facilities, as appropriate.

q) ESC Drawing(s): showing temporary ESC measures to be implemented both on the Site and surrounding lands as applicable, including topsoil stockpile location and siltation control pond locations. Refer to Section C – Stormwater Management and Drainage Systems for additional information required on the Drawing. Should also include a schedule for the completion of the restorative works. Temporary construction access location and details are to be provided on this Drawing. Scale 1:1,000.

r) Miscellaneous Detail Drawings: other drawings not specifically noted, including special details, cross-sections, acoustic and privacy fencing, retaining walls, etc.

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- s) Standard Detail Drawing: showing the applicable Township Standard Drawings and Ontario Provincial Standard Drawings (OPSDs), including all drawings and details to be utilized for the construction of the proposed Works. The design standard drawings presented in Township Standards are to be read in conjunction with the balance of the Township Standards. If a standard drawing by the Township is not provided, then the OPSDs are to be consulted. In the event that the OPSD does not have the required standard drawing, the consulting engineer is responsible to provide the Township with a proposed detail in hard copy and digital form, for review. Prior to use of the proposed detail, the consulting engineer must receive written approval from the Township for its use.
 - t) Tree Inventory, Assessment, and Preservation Plan and Details: to be prepared by a qualified arborist or landscape architect and shall at a minimum identify trees to be preserved, including identifying boundary trees, tree protection / hoarding limits and details.
 - u) Landscape and Streetscape Drawings: showing location and species of all plant material, planting details, fencing, decorative features, rehabilitation, and restoration works. Include plantings for SWMF. Scale 1:500.
 - v) Streetlighting Drawings: showing the underground ducts, streetlight schematic, photometric data (point plot), and details. Scale 1:500.
5. The following reports / documents shall be submitted with the above-noted drawings for each development application. In addition, any other reports, as required in the Draft Plan Conditions or deemed necessary by the Township, shall also be submitted for review and acceptance by the Township. All reports and supporting documentation shall be assembled and bound as well as being provided in PDF form, as applicable:
- a) FSR: the FSR shall include all requirements per Section A9.02 and elaborate with further design details, calculations, drawings as needed as the design progresses.
 - b) SWM Report: refer to Section A9.09 and Appendix C.

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- c) SWM Operations and Maintenance (O&M) Manual: refer to Appendix E and the Township's Consolidated Linear Infrastructure – Environmental Compliance Applications (CLI-ECA) for reporting requirements.
- d) Hydrogeological Study: The report shall include all requirements per Section A9.11 and elaborate with further design details, calculations, and drawings as needed as the design progresses. To be conducted by a qualified professional engineer and / or geoscientist to characterize the groundwater regime from a site-specific and regional perspective in order to address issues related to the following (as applicable):
- i. Impacts to existing well water supplies within the project area.
 - ii. Soil permeabilities and associated properties where the design of LID features are concerned.
 - iii. Groundwater impact assessment to area aquifers from construction activities and / or discharge of waste or wastewater.
 - iv. Test wells and associated testing in accordance with Ministry of the Environment, Conservation and Parks (MECP) D-5-5 Guidelines to address water taking impact sustainability.
 - v. Impacts to nearby surface water bodies.
 - vi. Specific technical review of well field or wellhead capture zones.
 - vii. If dewatering is necessary, the study should contain sufficient data on groundwater quality and temperature of the receiving watercourse. Where applicable, the study should also provide an assessment of the use of sump pumps for building design.
- e) Well Impact Report: to identify wells within a 500 m radius of the Site or current MECP requirements and identify the anticipated impact the development will have on the existing wells. Mitigating measures shall be specified, if required. Also, monitoring of the wells will be required before, during, and after construction of deep Township services.
- f) Geotechnical (Soils) Report: the report shall include all requirements per Section A9.10 and elaborate with further design details, calculations, drawings as needed as the design progresses.
- g) Transportation and Traffic Impact Study: the report shall include all requirements per Section A9.08 and elaborate with further design details,

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- calculations, and drawings as needed as the design progresses. A complete guideline for the completion of a Traffic Study can be found in Appendix C.
- h) Noise and Vibration Report: this report shall identify sources of environmental noise and vibration under ultimate conditions and recommend mitigating measures in accordance with MECP Guidelines. Warning clauses shall be included in the report. The report is to be stamped and signed by a licensed professional engineer.
- i) Arborist Report, Tree Inventory and Preservation Plans: this report shall provide an inventory of all existing trees, assessment of their condition, and recommendation of trees for preservation as appropriate, considering the infrastructure requirements and grading design of the proposed development. A complete guideline for the completion of this document can be found in Appendix C.
6. Construction Cost Estimate: at the second submission stage, a detailed cost estimate for the total cost of civil, landscape, utilities, and streetlighting works, for Works both internal and external to the Site, is to be prepared by the consulting team for purposes of calculating fees and financial securities to be held by the Township. Internal and external works to be two separate estimates. A summary sheet shall be submitted in a standard format, supported by a detailed, per item cost breakdown. Estimate to include a 10% contingency and HST.

A11.00 Approvals

A11.01 MECP Consolidated Linear Infrastructure – Environmental Compliance Applications for Sewage Collection and Stormwater Management

The Township is now a municipal partner in the MECP CLI--ECA Program. Projects falling within the scope of the CLI shall be submitted to the Township for approval. Projects that do not fall under the scope of the CLI shall be submitted to the MECP for approval. Projects submitted under the CLI program must be designed, constructed, and tested per the most current version of the Township's Engineering Standards.

The CLI-ECA covers several Works that are of a non-complex or less environmentally sensitive nature. These projects must also fulfill the requirements of the Ministry's Design Criteria Manual. In general, the CLI-ECA includes the following types of Works:

- Storm and sanitary sewers.

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- Sewage pumping stations.
- Forcemains.
- SWM Works limited to Works which control stormwater quantity and / or provide basic quality control only and which discharge to either the existing SWM collection system, an approved SWM Works, a ditch, a swale, or a Township drain.

A CLI-ECA does not apply to the following types of Works:

- Township Sewage Treatment Plants.
- Privately Owned Industrial and Commercial Sewage Collection Systems.
- Privately Owned Industrial and Commercial SWM Systems.

Approvals for the above will require direct submission to the Ministry.

As part of the second engineering submission, the Developer is to submit a digital copy of the completed Application for ECA and all required documents to the Township for review.

If the Township has comments related to the approval process, they will be sent to the Developer's engineer, as the Township will not recommend approval until all comments are addressed.

A11.02 Water System Approvals

For new water distribution systems which will be connected to existing Township residential drinking water systems, the Developer's engineer will be required to submit a "Form 1 – Record of Watermains Authorized as a Future Alteration" and all required documents, to the Township for approval.

A11.03 Other Approvals

The Developer's consulting engineer is required to make all submissions and representations necessary to obtain approvals from all other applicable authorities / agencies (County of Simcoe, Ministry of Transportation, NVCA, Canada Post Corporation, Hydro, Telecommunications, Enbridge, MECP, MNRF, DFO, etc.). The Township shall be provided with a list of all other applications being made and shall be kept informed of the progress of these submissions by copies of all correspondence.

A12.00 Final Drawings

After all approvals have been received from all applicable authorities / agencies, the final drawings shall be submitted to the Township. These drawings will be signed and

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dated by the Township, "Accepted for Construction", and returned to the Developer's consulting engineer for their action.

Should the Developer fail to enter into a Subdivision Agreement with the Township within two years of the date of the acceptance of the drawings by the Township, the Township reserves the right to revoke any or all approvals related to the engineering drawings.

Accepted for Construction drawings will not be provided to the Developer's engineer until both the Township and Developer have executed a Subdivision Agreement.

A13.00 Securities

Securities shall be based on the submitted construction cost estimate. This estimate shall reflect current unit prices and quantities and shall include all Works to be constructed. These shall include, at a minimum:

- General Items (i.e., mobilization, site trailer, traffic control, etc.).
- Siteworks, grading, and ESC.
- SWMFs.
- Watermain, sanitary, and stormwater servicing, testing, and commissioning.
- Roads (including granular, asphalt, curbs, sidewalks).
- Streetlighting and Utilities.
- Landscaping.
- Contingency Allowance (10%).
- HST.

The value of securities shall be as per the Agreements. However, in general, the requirements are as follows:

Table 1: Value of Securities Requirements

Development / Agreement Type	Internal Works Secured	External Works Secured
Site Plan	25%	110%
Earthworks	50%	N/A
Pre-servicing	100%	N/A
Subdivision	100%	110%

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Please refer to the Development Agreements for details on security release and associated requirements and process.

A14.00 Mandatory Pre-construction Meeting

Following the execution of the subdivision agreement and issuance of the Accepted for Construction (AFC) drawings, a mandatory pre-construction meeting shall be held, at which time the Developer's consulting engineer / project manager shall submit the following information to the Township:

- The names of the proposed contractor and any subcontractors.
- The contractor's list of suppliers.
- Proof of insurance in a format acceptable to the Township and listing both the Township and the Township engineers as co-insured.
- Proposed schedule for construction of Works.
- Notice of Project.
- WSIB Insurance.
- Any other information as required by the Township or as specified in the Subdivision Agreement, or Pre-servicing Agreement.

A15.00 "Record" Drawing Requirements

A15.01 General

The Township will require stamped Record drawings as part of the submission package for the following milestones.

- Acceptance of Underground Works (Initial Acceptance)
- Acceptance
- Assumption
- Security Release Requests

Applications for the above will not be accepted without the inclusion of Record drawings.

For capital works projects, Record drawings will be required 90 days after project completion.

For any projects that include new or updated watermain or water services, stamped "Record" information for the water system and water services shall be provided within 90 days of connection to the Township water system.

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Record drawings can be submitted digitally as the project progresses. For the final Record drawing submission before the expiration of the maintenance or warranty periods, three sets of Record printed drawings, one set of digital drawings in PDF and AutoCAD, and GIS data are to be submitted to the Township Public Works for review and comments. Revisions must have been made to the drawings to reflect any changes to the grading, roadways, below and above ground infrastructure, and to incorporate all the grading modifications resulting from final lot grading. All valves, curb stops, and service connections shall be properly tied into fixed reference points. Service record sheets to be provided. Drawings to be most recent version of CADD. GIS files to be compatible with the most recent version of ArcGIS, in NAD_1983_UTM_ZONE_17N projection, and in a *.gdb Drawing submission shall be accompanied by revised storm and sanitary drainage calculation design sheets which confirm the capacity of the constructed sewers based on as-built slopes and inverts.

A15.02 "Site" Drawings

The Consultant shall keep one set of the Accepted for Construction drawings solely for recording purposes. The Consultant shall record any deviations from the AFC drawings on the site drawings as the Work is performed. A neat, clean working version of these drawings shall be available to the Township at any point in the project.

Deviations shall include changes, additions, deletions, and different site conditions encountered. All deviations shall be recorded, including (where applicable):

- Storm and sanitary sewer information to include: swing ties and top elevations for all MHs, CBs, DIs, RLCBs, headwalls, and services; inverts for all MHs, CBs, DIs, RLCBs, headwalls, and services; diameter, material, class of pipe, distances, and pipe slopes between all MHs (to centre of structure).
- Watermain information to include: location and swing ties to all valve boxes, chambers, hydrants, service connections, bends, restrainers, and other watermain appurtenances. Elevations of the top of watermain every 20 m, and at all deflection points.
- Rural road information to include: swing ties and elevations for all culvert inverts, (including material / gauge), storm outlets, riprap, driveways, guiderail (including start and end) at 20 m intervals, ditch inverts at 20 m intervals, revised horizontal curve information, and final centreline of road, as well as edge of travelled lane elevations every 20 m.

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- Urban road information to include: revised horizontal curve information and final centreline of road and edge of pavement elevations every 20 m, sidewalks and driveways (including lengths, widths).
- Hydro, telecommunication, and natural gas information to include: location of transformers, pedestals, drop / secondary terminations, conduit sizing, road crossing locations, number of ducts, concrete encased locations, etc.
- Streetlight information to include: location of light standards.

The Site drawings shall be kept in the field office, or in the Consultant's possession if no field office was required. The Record drawings shall be available for review immediately upon request by the Township throughout the duration of construction. Failure to record changes promptly may result in security reduction delays.

A15.03 "Record" Drawings

At the required development milestones, and completion of the project, final stamped "Record" drawings are required. An underground set of stamped Record drawings must be provided as part of the certification of underground works such that the operators of the system have the information on hand, as is required as a condition of the MECP and an additional, final stamped Record drawing package must be provided at the completion of the project.

The Township will not consider Record drawing submissions without the details noted in this Section. Failure to deliver Record drawings upon request will result in a delay to security reductions.

A post-construction field survey is required to update the AutoCAD drawings including centerline of road, curb line / edge of travelled lane, ditch line, culvert location and inverts, all structures (CBs, MHs, valves, hydrants, transformers, streetlights, traffic signs, etc.).

The Record AutoCAD drawings will incorporate all changes, additions, deletions, and different site conditions encountered and variances found during the post-construction field survey and to provide GPS coordinates and additional information to readily locate all underground and above ground items and services along with the following:

- Location of all structures (CBs, MHs, valves, hydrants, transformers, streetlights, traffic signs, etc.) including top elevations.
- Location of all service connections to all lots and blocks.
- Traffic signs (including type, location, year installed, etc.).
- Benchmarks as outlined below, Section A15.03.2.

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- Elevations of the final lot grades for all lot corners for the entire Plan of subdivision.
- All sewer inverts, sewer grades, MH tops, CB tops, and road grades are to be recalculated to two decimal places.
- Watermains are to be shown based on top of pipe elevations and GPS coordinates obtained at 20 m intervals.
- All house numbers are to appear on all Record drawings.
- All street names, lot numbering, and block identification shall be checked against the Registered Plan and corrected if necessary.
- A Record revision note shall be placed on all drawings in the revision block and dated based on the date the drawings were completed. All CCTV inspections of all storm and sewer lines and services are required including colour video record on USB and a printed report.
- Itemized list with the type, quantity and GIS coordinates of all new assets and infrastructure (i.e., hydrants, valves, MHs, roads, etc.) in Excel format. This is used to support the Township's asset management program.

The information on the Record drawings may be checked by the Township at any time up to two years after final acceptance of the subdivision. If any discrepancies are found, then the drawings shall be returned to the Developer's consultant for rechecking and further revision.

The Developer's consultant shall be required to explain in writing any major difference between the design and the record data and to provide verification that the alteration does not adversely affect the function of the subdivision services.

The following are a list of the requirements to be met when Record drawing packages are to be submitted:

- Three complete sets of bound, stamped Record drawings.
- One paper and electronic (Excel worksheet) copy of the Record sanitary and storm sewer design sheets.
- One complete set of Record digital drawings exported in most recent version of AutoCAD format, or a .dxf format where the consultant uses a CAD platform different from AutoCAD. All necessary external references should be bound to the project drawing file. The drawing should be purged of all redundant blocks, layers, etc. No object shall be on layer '0', no working layers or layers with unnecessary objects shall be contained in the digital file.
- Service record sheets in PDF format (see below Section A15.03.1)

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Record Drawing Packages shall be submitted in complete sets. The files must be labeled with submission date and latest revision number, Township project number or ID, project or subdivision name, and drawing format.

The submission of the stamped Record drawing package, in paper and digital format, to the Township must be completed before “Assumption” of the subdivision will be given.

A.15.03.1 Service Record Sheets

A complete set of service records sheets shall be submitted to the Township for review and comment, identifying the location, GPS coordinates, size, material, and invert elevation of the sanitary and water services, tied to the house foundation, or other acceptable above-ground utility furniture (i.e., streetlight, transformers, etc.).

Each sheet must clearly identify the registered Plan number, lot number, roll number, and Township street address.

Upon acceptance of all service record sheets by the Township, the Developer’s consultant shall submit one hard copy and one digital copy of all service record sheets for that phase of the development.

The standardized Service Record Sheet shall be requested from the Township’s Public Works Department.

A.15.03.2 Survey Control Monuments

Prior to the assumption of the subdivision, the Developer’s surveyor shall establish a network of second order horizontal control monuments, as set out in “Ontario Specifications for Horizontal Control Surveys (OS 79)”, as well as a network of vertical control benchmarks, as set out in “Ontario Specifications for Vertical Control Surveys (OS 79)”.

The same monument may be used as both a horizontal and vertical control monument / benchmark. The horizontal control monuments and the vertical control benchmarks shall be established at approved locations to the satisfaction of the Township, using the following criteria:

- Two horizontal control monuments and two vertical control benchmarks for the first 10 ha or less subdivided by the drawing, and one additional horizontal control monument and vertical control benchmark for every additional 10 ha or less subdivided by the drawing.

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- In addition, every existing horizontal control monument and vertical control benchmark destroyed during subdivision or site drawing construction must be replaced.
- The new horizontal control monuments and vertical control benchmarks (including replacements) shall be installed by an Ontario Land Surveyor. A certificate by an Ontario Land Surveyor shall be provided stating that the horizontal control monuments and vertical control benchmarks were installed as set out by the "Ontario Specifications for Horizontal Control Surveys (OS 79)" and the "Ontario Specifications for Vertical Control Surveys (OS 79)", respectively, and confirmation from the Ministry of Natural Resources (MNR) that the horizontal control monuments and vertical control benchmarks have been accepted into their Cosine Database.
- The horizontal control monument shall be a round iron bar (0.025 m x 1.22 m) with brass cap, or any monument approved by the "Ontario Specifications for Horizontal Control Surveys (OS 79)". Township to supply brass cap.
- The location, description, and pertinent information with respect to the monuments shall be indicated on all engineering drawings and on the Township's Survey Monument Record Sheet.
- A monument is to be placed in each phase of a development, to establish both vertical and horizontal control.
- Locations to be as directed by the Township. Township confirmation required prior to construction of concrete monument.
- Work to be 2nd order vertical and 2nd order horizontal surveying, with closure between two known benchmarks, using double-closure method.
- Plaques to be used as stipulated by the Township and have an identification number stamped on them as directed by the Township. Numbers are to be stamped prior to final installation.
- Submissions to be made in the format indicated by the Township, stamped / sealed by the OLS. Supporting calculations, leveling, and adjustment sheets to be provided verifying the methodology and calculations.
- Monumentation to be constructed on publicly owned lands in accordance with the Township's Standard Details, unless directed otherwise.
- Horizontal control points are to be established using UTM, NAD83, Zone N17.

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A16.00 Earthworks / Site Preparation Requirements

The following will be required in order to undertake rough grading operations, including clearing, grubbing, and topsoil stripping in advance of a registered Subdivision Agreement:

A16.01 Technical Requirements

- Archaeological Clearance.
- Reviewed and satisfactory approval of Phase 1 ESA and any other environmental studies as may be required.
- Accepted ESC Drawing(s).
- Accepted Tree Inventory and Tree Preservation Plan(s).
- Accepted Grading Control Drawing(s).
- Clearance and necessary permits issued by the NVCA.
- Well Monitoring Report.

A16.02 Administrative Requirements

- Certificate of Insurance from Developer (\$5,000,000).
- Executed Earthworks Agreement between Township and Developer.
- Letter of Credit or Certified Cheque for securities.
- Certificate of Insurance from the Contractor(s) (\$5,000,000).
- Pre-construction meeting with the Township.
- Tree Compensation satisfactory to the Township.

A17.00 Pre-servicing Requirements (Internal Works Only)

The following shall be required in order to install underground services and roadworks in advance of a registered Subdivision Agreement:

A17.01 Technical Requirements

- All of the technical requirements of Earthworks (noted above).
- All Engineering drawings, including Servicing Drawings, Composite Utility Drawings to be accepted by the Township.

A17.02 Administrative Requirements

- Certificate of Insurance from Developer (\$5,000,000).
- Executed Pre-servicing Agreement between Township and Developer.
- Letter of Credit or Certified Cheque for securities.
- Certificate of Insurance from the Contractor(s) (\$5,000,000).

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- MECP or CLI-ECA Approvals, as applicable.
- NVCA and any other Agency Approval, as applicable.
- Pre-construction meeting with the Township.

A18.00 Inspections

The construction of all Works within the development lands and Work within the Township ROW shall be subject to full-time inspection, which is the responsibility of the Developer's consulting engineer.

The Developer's consulting engineer shall provide necessary inspection reports upon request by the Township.

A19.00 Acceptance of Underground Works (Initial Acceptance), Acceptance, and Assumption

Acceptance of Underground Works (Initial Acceptance), Acceptance of "All Works" (start of 2-year Maintenance Period) and Final Acceptance / Assumption shall be in accordance with the Terms and Conditions of the Subdivision and / or Development Agreement.

Itemized checklists for each milestone are located in Appendix A.

A20.00 Security Reduction

Under the conditions of the Development Agreement, as the Works proceed, the Developer, upon application to the Township with a Statutory Declaration regarding payment of accounts, may, at the discretion of the Township, have securities of cash or letters of credit reduced in amounts of not less than 10%.

These reductions are typically provided upon completion of underground and above-ground infrastructure. Acceptance of Underground Works (Initial Acceptance) is required prior to any security reduction.

Prior to a request to reduce securities, an inspection is to be completed with the Developer's consulting engineer and Township Public Works staff. The following items must be completed prior to any inspection:

- Video inspection of all underground infrastructure and review report.
- Consultant letter certifying that all Works conform to provincial and Township design, construction, and testing standards.
- Sign off from Public Works staff, including passing of the required testing.

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- Deficiency list provided by consulting engineer which includes a monetary holdback for the full cost of any deficient item. Securities will not be released for any observed deficiencies or uncompleted Works.

A21.00 Site Plan Development Submissions

The review and approval process of Site Plan Submissions is to ensure the urban environment is developed in a suitable manner.

A complete Site Plan Application submission shall be submitted to the Township Planning Department. The drawings and reports shall be in conformance with the Township Engineering Standards. For further information on the Site Plan Submission process, refer to the Site Plan Submission Guidelines included in Appendix D.



CLEARVIEW
TOWNSHIP

Section B – Roadways

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Section B – Roadways

B1.00 General

This Section outlines requirements for design, construction, and restoration of roadways and driveways.

All roadway design shall meet the minimum requirements of all applicable current industry standards and specifications set out by the Transportation Association of Canada (TAC), OPS, Ontario Traffic Manual (OTM), CSA, and the ESA regulations and shall apply together with the following Township Standards.

The designer shall use the best judgment to find innovative solutions when abnormal design conditions are encountered. Deviations from standards may be permitted when site constraints prohibit the application of the prescribed requirements. Deviations shall be reviewed on a case-by-case basis. All deviations shall be approved by the Township at the preliminary design stage.

B1.01 Roadway Phasing and Implementation

The Township will require that the collector road network be in place early in the development process to preserve the capacity of the local roads and to provide alternative travel routes for residents and businesses in new growth areas. In some cases, the collector roads may need to be planned and constructed before the adjacent local development is ready to proceed. The Township's general requirement is that two collector road connections to the existing road network for each phase of development, where feasible. The full extent of the collector road system in each phase is to be constructed. Roadway phasing and implementation is to be discussed with the Township early in the development process.

B2.00 Roadway Classifications

All existing roadways shall be classified according to the Township's Official Plan Schedule G according to the traffic volume expected and the intended use of the roadway. The proposed classification of all roads in a development shall be confirmed with the Township prior to the commencement of the design. The Township's roadway classifications include the following: Provincial Highway, Arterial, Collector, and Local.

All Township roads within urban boundaries are to be designed and built to an urban standard and all roadways outside urban boundary are to be constructed to a rural standard unless otherwise directed by or approved by the Township.

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B2.01 Arterial Roads

Arterial roads are roads of two to four lanes which are designed to carry large volumes of traffic between major traffic generating areas and other Arterial roads. Access to Arterial roads from abutting properties shall be discouraged and shall only be considered where alternate access to Collector or Local roads is not possible. Access to the Arterial road will only be considered if the impacts to Arterial road traffic flows are minimal. Access types may be restricted such as right-in and right-out and will be at the discretion of the Township, Province (MTO), or County as applicable.

B2.02 Collector Roads

Collector roads are roads which are designed to collect and carry local traffic to Provincial Highways and Arterial roads and distribute traffic to Local roads. Access to Collector roads from abutting properties shall be kept to a minimum and shall only be considered where alternate access to Local roads is not possible.

B2.03 Local Roads

Local roads are roads of two lanes which are designed to provide access to abutting properties. Local roads shall be designed to discourage the movement of through traffic and generally function as distributor roads.

B2.04 Provincial Highways and County Roads

Provincial Highway 26 is under the jurisdiction of the MTO with the exception of a connecting link designation in Stayner. Access to a Provincial Highway from abutting properties will require the approval of the MTO and shall only be permitted where alternate access to Arterial, Collector, or Local roads is not possible.

All development abutting Provincial Highways or County roads shall comply with the standards and requirements of the MTO and / or the County and no entrances shall be permitted unless an access / entrance permit has been obtained from the Ministry or County.

Where a development adjoins or incorporates an existing County Road or Provincial Highway, the Developer shall deed to the County or Province any required widening which may be greater than Township standards.

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For the purposes of these standards, all roads under the jurisdiction of the County shall be considered Arterial roads and all designs must be approved by the County.

B2.05 Supporting Traffic Studies

A guideline for the preparation of the traffic studies can be found in Appendix C.

B2.06 Township Roads Design Elements

The geometric design of Township roadways shall follow the latest edition of the TAC Geometric Design Guide for Canadian roads. Geometric design parameters specific to urban and rural design situations in the Township are provided in **Table 1**.

Table 1: Roads Design Elements

	Local (Rural)	Local (Urban)	Urban Collector (Minor / Major)	Industrial
Standard Drawing	B101	B102	B103/B104	B105
ROW Width (m) (Min)	20	20	23/26	23
Design Speed (km/hr)	50	50	60	60
K-Sag Min. (m)*	6/12**	6	12	12
K-Crest Min. (m)*	8	8	15	15
Minimum Centreline Radii	90	90	130 Per TAC Table 3.2.8	TAC Table 3.2.8
Minimum Grade	0.5%	0.5%	0.5%	0.5%
Desired Maximum Grade	6.0%	6.0%	6.0%	3.0%
Minimum Tangent Length Between Reverse Curves	30	30	45	45
Maximum Grades for Through Roads at Intersections	3.5	3.5	3.0	3.0
Intersection Angle	90°	90°	90°	90°
Minimum Tangent	30	30	45	45
Sidewalk Width	-	1.5	1.5 m sidewalk and 3.0 m multi-use trail	1.5

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*Grade changes in excess of 1% shall be designed using vertical curves. Vertical grade breaks of 1% or less are acceptable but successive grade breaks must be spaced min. 20 m apart.

**If streetlight illumination is not provided, then a K of 12 or greater must be used.

The typical road allowance cross-sections shall be developed based on the appropriate standard drawings. Details shall be provided for any special provisions required due to unique physical conditions on-site or for existing or future design conditions. Such conditions include slope protection, culverts, bridges, or special crossfall conditions.

Laneways shall be considered for review by the Township on a case-by-case basis.

Road widening / tapering at the intersection of industrial and / or collector roads with arterial roads may be required depending on the findings and conclusions of the supporting traffic study. To accommodate turning lanes and / or intersection widenings, additional ROW may be required. Where additional ROW is required, the boulevard width shall be consistent with the Townships Standard cross-sections. Intersection design criteria and requirements are discussed in these standards.

The following are general requirements for the design of roads and ROWs unless otherwise approved by the Township:

- On all fill sections requiring guide rails, the shoulder widths shall be widened by 0.6 m. Guide rails shall be one of the following types:
 - M30 Guide Rail adjacent to curb or sidewalk.
 - M20 Guide Rail with standard posts or 2.438 m long posts adjacent to 2H:1V slopes.
 - Ezy Guard 4 with standard posts or as per 2H:1V slopes.
 - End Treatments shall be MASH Sequential Kinking Terminal System.
- Roads are to be extended to the limit of the subdivision boundary and shall terminate at a turning "T" or cul-de-sac when not connecting to an existing road, at the discretion of the Township. This also applies at a phase boundary where a road will be continued in the future. Temporary easements and a "Hold" over lots that are at a phase boundary may be required to facilitate the turnaround until the road is built out in future phases.
- The configuration of rural side entrances in earth cut or fill must conform to OPSD 300.010 and 300.020.
- All new urban collector roads shall have a sidewalk on one side, and a multi-use trail on the other side of the road. Active transportation facilities

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shall be incorporated into all new urban and collector roads. Sidewalks are required on at least one side of the street in all new developments.

B2.07 Road Drainage / Conveyance

See Section C – Stormwater Management and Drainage Systems.

B3.00 Intersections**B3.01 Location and Spacing of Intersections**

Location and spacing of intersections shall be as per TAC Section 9.4.2. Minimum intersection spacing for four-legged intersections shall be 60 m for local and collector roads.

B3.02 Stop or Traffic Signal Control

Curb radii or curb return radii for urban intersections under traffic signal or stop control shall be designed based on the highest classification of each intersecting road at a given intersection. Radii are measured from edge of pavement. Minimum curb radii are shown below; however, larger radii may be required if directed by the Township on specific bus or truck routes.

Property daylighting triangles at all intersection quadrants shall be included in the road allowances to be shown on the drawings, as follows:

- Local Roads – 3 m daylighting, 9 m minimum curb radii.
- Collector Roads – 7.5 m daylighting, 9 m minimum curb radii.

Such daylighting shall be shown on the proposed Draft Plan for registration and on all applicable engineering drawings.

Daylight requirements for County and Provincial roads shall be confirmed by the applicable Road Authority and shall be measured from the limit of any required ROW widening.

Road widening or tapering at intersections may be required depending on the findings and recommendations of the TIS. If a widening / tapering is required at the intersection, the boulevard width shall be maintained.

Transition treatments (i.e., lane widening or narrowing to introduce turning lanes) shall be as specified in the TAC Geometric Design Guide for Canadian Roads, Sections 9.13, 9.14, and 9.17.

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B3.03 Roundabout Control

Roundabouts shall be designed in accordance with good geometric design principles, including development of appropriate speed control and accommodation of a design vehicle. Design guidance shall be in accordance with the National Cooperative Highway Research Program (NCHRP) Report 672, Roundabouts: An Informational Guide, Second Edition. Design vehicles shall be confirmed with the Township prior to design. Buses and emergency vehicles shall be accommodated without use of the central island truck apron on collector and arterial road roundabouts. All daylighting requirements for roundabouts will be determined based on the sightline requirements and the need to accommodate utilities, sidewalks, and active transportation facilities.

B3.04 Backfall at Intersecting Streets

At all street intersections, the normal crossfall of the major street shall not be interrupted by the crown line of the minor street. A 2% or 3% back slope shall be provided on the minor street at all street intersections, except those controlled by traffic signals. This back slope shall continue to the end of the curb return radii to facilitate proper drainage of the intersection.

B3.05 Traffic Signals

The need and justification for traffic signals will be determined through a TIS and will require approval from the Township. The assessment should include a warrant analysis and include a review of the County, MTO, and Township Master Plans.

Traffic signal design is to be prepared in accordance with MTO Traffic Manual Book 12 and the appropriate MTO and electrical design codes. All Work shall be performed in accordance with the current edition of the Ontario Electrical Code, including all appending bulletins issued by the ESA which are applicable to the Work. All Work shall be governed by Federal, Provincial, and Local laws and by-laws pertaining to the Work, as well as by the latest issue of CSA Standards pertinent to the Work. All electrical work is subject to inspection by the ESA. In the event of a conflict between regulations, the strictest regulation shall apply.

In addition to accommodation of traffic flow, the signalized intersection design shall include pedestrian requirements and accessibility features. All signalized crossings must be designed in accordance with the TAC "Guidelines for the Understanding, Use, and Implementation of Accessible Pedestrian Signals".

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Accessibility features must include gentle grades for sidewalks, drop curbs, and tactile indicator plates in the sidewalk to provide guidance for the visually impaired and be AODA compliant. Pedestrian crosswalk features shall include single head “walk / don’t walk” heads, countdown heads, and audible pedestrian heads with tactile push button. For all new traffic signal designs or modifications to existing signals the need for pre-emption detection should be determined through consultation with Emergency Services and the Township.

B4.00 Location of Utilities

The location of utilities within the road allowance shall be as detailed on the Township’s Typical Road Cross-section Details. A Utility Coordination Drawing shall be submitted to the Township for approval of the proposed utility locations and shall have a signature block provided for approval of each Utility, which shall be signed and dated by the applicable Utility, prior to submission to the Township.

Refer to Section H – Utilities and Streetlighting.

B4.01 Community Mailbox Requirements

In general, community mail centres and / or individual super mailbox sites shall be placed in locations approved in consultation with the Township and Canada Post. These locations are to be indicated on the accepted Utility Coordination Drawing and the applicable Canada Post Design Details for their concrete pads shall also be included within the design drawing set. The community mail centres, or super mailboxes shall be identified on the engineering drawings and will be subject to the review and acceptance of both the Township and Canada Post. The Developer shall be responsible for constructing community mailbox locations within residential subdivisions, prior to first occupancy.

B5.00 Pavement Design**B5.01 Road Base Preparation**

The sub-grade shall be excavated or filled to the required grade for the required width of surface plus shoulders or curbs plus 500 mm behind the curbs. Where earth fill is required, it shall be placed in lifts not exceeding 300 mm in depth and each lift shall be thoroughly consolidated.

All vegetation, boulders over 150 mm in diameter, topsoil, and organic or frost susceptible materials, shall be removed from the road base to a depth of at least 1.2 m below finished grade and replaced with suitable material. In areas

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where the material at this depth is unsuitable, such treatment as required by the soils report, or as the Township Public Works Department may direct, shall be carried out. Additional geotechnical review and recommendations may be requested by the Township.

The sub-grade shall be shaped to conform to the required longitudinal grade and cross-section and shall have a crossfall of 3% from the centerline of roadway to each side.

The sub-grade shall be compacted with suitable mechanical compaction equipment as required to achieve 98% Standard Proctor Modified Dry Density. All soft spots shall be excavated and backfilled with granular base material.

No granular base shall be placed until the base on which it is to be laid has been inspected and approved by a geotechnical engineer and the Township. Proof rolling of the sub-grade shall be witnessed by the geotechnical engineer and Township staff prior to placement of the granular bases.

B5.02 Road Pavement Design

All pavement designs shall be supported by a geotechnical report prepared by a professional engineer. The report shall include results from soil testing of the existing sub-grade and recommend a pavement design required to support the anticipated traffic loading in accordance with the Transportation Association of Canada publication "A Guide to the Structural Design of Flexible and Rigid Pavements in Canada".

The following table provides the Township's minimum pavement structure requirements by road classification. Where the minimum recommended pavement design indicated in the geotechnical report exceeds the minimum requirements in the table below, the designer shall specify the higher strength pavement structure. Where asphaltic treatment is not warranted (e.g., gravel roads), the road structure is to be specified by a geotechnical engineer.

The Geotechnical report must consider local soil conditions, water table, anticipated traffic loading, and design pavements to avoid load restrictions on collector or industrial roadways.

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Table 2: Minimum Road Granular and Asphalt Base Depth

Road Class	Surface Asphalt	Base Asphalt	Base Course	Subbase Course
Rural	40 mm HL3	60 mm HL8	150 mm Granular 'A'	350 mm Granular 'B'
Local	40 mm HL3	60 mm HL8	150 mm Granular 'A'	350 mm Granular 'B'
Minor Collector	40 mm HL3	60 mm HL8	150 mm Granular 'A'	400 mm Granular 'B'
Major Collector	40 mm HL3	100 mm HL8	150 mm Granular 'A'	450 mm Granular 'B'
Industrial	40 mm HL3	110 mm HL8	150 mm Granular 'A'	500 mm Granular 'B'

See standard road cross-sections for additional details.

Superpave is an acceptable alternative for surface or base course asphalt. Surface course to be 12.5 mm 'Cat C' Superpave. Base course to be 19 mm 'Cat B' Superpave, in the same thickness as is specified for asphalt in **Table 2** above.

Asphalt work shall conform in all respects to OPSS.

Copies of all test results and proposed road designs shall be submitted with the Engineering Drawings. In no case, will a pavement design less than the minimum Township Standard, be considered acceptable.

Testing and approval of all granular materials at the designated pits, prior to placement, and subsequent in situ verification tests shall also be performed by the Developer's geotechnical consultant.

Prior to the placement of asphalt pavement, the consulting engineer must submit to the Township for approval, the asphalt pavement mix designs.

B5.03 Permeable Pavers

Permeable pavers are encouraged for use to reduce stormwater runoff and promote infiltration but will only be considered for Township Projects in downtown areas and Site Plan Developments. Alternative types of driveway materials such as paving stones, concrete, etc., will be subject to review and acceptance by the Township.

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B6.00 Concrete Curb and Gutter

Concrete curb and gutter conforming to 600.070 (barrier, two stage), or OPSD 600.010 (barrier) curb is generally acceptable. The curb shall be dropped at all entrances and walkways. Terminations at the limits of the subdivision shall be either joined to existing concrete curbs or terminated as per OPSD 608.010. Curb construction shall conform to OPSS 353. Concrete shall have a minimum compressive strength of 32 MPa at 28 days, maximum 0.45 w/cm. Class C-2 and air entraining agent to provide 5% to 8% air entrainment.

Curbs shall be bedded on the granular base construction and upon completion of the curbs, Granular 'A' backfill shall be placed behind the curb and thoroughly compacted to prevent the displacement of the curb by the subsequent Granular 'A' and asphalt operations.

The minimum longitudinal gradient along the gutter line shall be 0.5%. Additionally, the gradient shall be 0.5% for the outside radius of 90° crescents.

B7.00 Subdrains

Continuous 150 mm diameter subdrains shall be provided under all curbs and gutters, for all roads with curbs and gutters. Subdrains shall be perforated, corrugated, plastic pipe wrapped with filter fabric in conformance with OPSS 405, and shall be connected to CBs or other suitable outlets. The 2 m section immediately upstream of the structures (CBs or other outlets) shall be solid pipe. The trench for the subdrain shall be a minimum 300 mm below the road subgrade and there shall be a minimum of 50 mm of Granular 'A' bedding below the subdrain.

Asphalt gutters per OPSD 601.010 are to be used on rural roads when the road grade is greater than 5%. For lengths greater than 60 m, gutter outlets are required every 60 m.

B8.00 Sidewalks

The following guidelines shall be used to determine the sidewalk construction within new subdivision developments, unless determined otherwise by the Township:

Sidewalks shall be installed on one side of Local and industrial roads.

Sidewalks shall be installed on one side of Collector roads, with a multi-use trail on the other side.

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Sidewalks shall be installed in any other location deemed necessary by the Township.

The sidewalk shall conform in details and dimensions to the current Township Standard Detail Drawings and shall be installed at locations as shown on the typical road cross-sections.

Concrete sidewalks shall be located in accordance with the applicable typical road cross section and be 1.5 m wide conforming to OPSD 351.09. Minimum thickness shall be 150 mm except at driveways where the thickness shall be 200 mm. Concrete strength shall be 32 MPa at 28 days with entrained air at 5% to 8% per OPSS tolerances, maximum water to cement ratio (W/CM) of 0.45, Class C-2.

The sidewalk subgrade shall be graded to the specified tolerances and compacted to 98% Standard Proctor Maximum Dry Density (SPMDD). All sidewalks shall be placed on a minimum 150 mm of Granular 'A' that has been compacted to 100% SPMDD.

Sidewalks to be continuous through all driveways including industrial, commercial and institutional driveways.

All sidewalks shall have a minimum crossfall of 2.0% and a maximum crossfall in accordance with AODA and shall have no steps.

At street intersections, the curb and the sidewalk shall be depressed to meet the roadway elevations as shown on the standard drawings.

Tactile plates as per OPSD 310.039 shall be installed at all road crossing locations for the total width of the sidewalk ramp. All sidewalk ramps shall be as per OPSD 310.030, 310.031, or 310.33.

Public sidewalks and ramps shall be in accordance with the Township's Facility Accessibility Design Standards (FADs) document.

B8.01 Street Access Points, Access Walkways, and Subdivision Walkways

Refer to Section J – Parklands.

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B9.00 Minimum Driveway Design**Table 3: Driveway Pavement Design**

Driveway Class	OPSS Granular 'B' Sub-base (mm depth)	OPSS Granular 'A' Base (mm depth)	HL8 Asphalt (Base) (mm depth)	HL3 Asphalt Surface Course (mm depth)
Residential	N/A	200	N/A	50
Light Industrial, Commercial, Apartment, Residential / Condo	225	150	50	40
Heavy Industrial	300	150	75	40

B9.01 Driveway Grades

The maximum grade for access driveways shall be 8% (shown on drawings) except in site-specific cases. This maximum grade is not recommended and should be employed only in exceptional cases where conditions prohibit the use of lesser grades. The minimum driveway grades permissible are 2%. Maximum grade change shall be 4% at curb or sidewalk. All grades are to be shown on Record drawings.

All access driveways shall be located a minimum of 1.5 m from utility poles, street lights, hydro transformers, CBs, hydrants, watermain valves, sanitary laterals, Bell MHs, Bell and Cable TV junction boxes, water service valve boxes, side lot lines, trees, and other driveways. Where frontage limitations interfere with standard locations, site-specific solutions shall be detailed in the Plan and Profile and Lot Grading Drawings.

In areas with roadside ditches, the Developer shall install driveway entrance culverts for each lot.

Entrances will be restricted to one per residential property within a plan of subdivision.

B9.02 Driveways and Entrances

The standards for driveways and entrances shall be reviewed in conjunction with the Township's Zoning By-law.

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All residential driveways shall be hard surfaced from the back of curb to the garage face in new urban developments, by the Developer.

The width of the depressed curb at the driveway shall conform to the Zoning By-law for each development. In areas of curb, driveways shall be as follows:

- Single Driveway – 3.0 m max drop curb plus 1.0 m transitions to barrier curb.
- Double Driveway – 6.0 m max drop curb plus 1.0 m transitions to barrier curb.

A minimum separation between adjacent driveways shall be consistent with the Township's Zoning By-law. Driveway locations at cul-de-sacs and at bends shall be shown on the Draft Plan of Subdivision and all applicable engineering drawings.

Driveways should generally be perpendicular to the curb and shall be a straight run from the face of the garage to the curb. Exceptions to this may be proposed in unusual circumstances, subject to review and acceptance by the Township. Driveways shall not cross the projection of lot lines on bends or cul-de-sacs.

Driveways along rural roads should match the shoulder with a 3.0 m radius. If the driveway access is for farm uses the radius shall be 5.0 m.

Driveway edging with materials such as armourstone, curbing, etc., shall not be permitted within the Township ROW to avoid damage resulting from winter maintenance. Where sidewalks exist, driveway edging must be flush with the driveway surface for a minimum of 500 mm beyond the back of the sidewalk.

The location of driveway depressions for commercial industrial and apartment driveways shall be detailed in accordance with OPSD 350.010.45

Driveways shall be located a minimum of 6 m past the end of the curb radii or daylight triangle (whichever is larger) at intersections for local roads. This distance is to be increased to 10m for minor collectors and 20m for major collectors.

B10.00 Boulevards

All boulevard areas are to be graded to a minimum of 2% and a maximum of 5% towards the road. The grade of the boulevard is to be constant from the back of the curb to the property line and in no case will terracing be permitted. The final grade of the sod shall match the finished grade of the top of the concrete curb and sidewalk.

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All debris and construction materials shall be removed from the boulevard area upon completion of the base course asphalt and shall be maintained in a clean state until the roadway section is completed.

Topsoil that meets the requirements in Section I1.01, shall be placed on all boulevard areas that are to be sodded. The minimum depth of topsoil shall be 150 mm.

No. 1 Nursery Sod shall be used for all areas that are to be sodded.

In industrial areas, rural and open space areas, hydro-seeding of the boulevards on a minimum 150 mm topsoil may be permitted at the discretion of the Township.

B10.01 Bicycle Lanes and Multi-use Trails

The requirements for bicycle lanes and multi-use trails are to be discussed at the planning stage and within the TIS for the development. The designer shall confirm with the Township if there will be any requirements for the provision of bicycle lanes and / or multi-use trails prior to the commencement of the engineering design.

B10.02 Bus Bays / Shelters

The designer shall confirm with the Township if there will be any requirements for the provision of public transit facilities within the development prior to the commencement of the engineering design.

At a minimum, collector roads are to be designed to accommodate the potential installation of concrete bus stop pads between the sidewalk and curb on both sides of the road.

The transit shelter concrete pad size should extend 300 mm on all sides beyond the shelter footprint, or a total of 600 mm larger than both the length and width dimensions of the shelter.

Base material shall be constructed with a minimum 150 mm thickness Granular 'A' bedding, compacted to a minimum 95% standard proctor maximum dry density prior to pouring concrete.

Concrete pads shall be:

- 200 mm thick concrete.
- Concrete to be reinforced with fiberglass mesh screen or steel rebar as approved by the Township.

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- A minimum 28-Day Compressive Strength of 32 MPa.
- Broom finished.
- On urbanized roads, the pad for the shelter as described above shall be located behind the sidewalk, and a concrete pad shall extend from the sidewalk to the back of curb for connectivity from the shelter to the bus stop location.

All bus shelter pads are to be sloped 2% towards the road unless otherwise noted.

Where an edge(s) of a concrete shelter pad is adjacent to a curb and / or sidewalk, an expansion joint shall be used.

- Public transit bus shelters shall be as detailed in the Approved Materials list complete with:
 - All glass walls.
 - Clear polycarbonate multi-wall (cellular) roof material.
 - Double sided display.
 - 44" (L) easy access bench complete with arm rests.

All transit shelter designs must satisfy the requirements of the AODA and the Township's FADs document.

B10.03 Special Considerations

Details shall be provided for any special provisions required due to unique physical conditions on the Site, or for existing or future design conditions, prior to commencement of the detailed engineering design. Such conditions may include retaining walls, slope protection, culverts, bridges, or special crossfall conditions (reverse crown or superelevation).

B11.00 Temporary Conditions**B11.01 Temporary Access Road**

A temporary road will be required where a secondary access to the subdivision will not be available until additional development occurs. The maximum number of residential units serviced by a single temporary access shall be 40.

In cases where parallel streets temporarily terminate at a subdivision limit property boundary, or subdivision phase limit (until development of the adjacent lands occurs), the roads shall be connected by a temporary roadway. The pavement structure is to be consistent with that of an urban road based on Township minimum standards or as per geotechnical recommendations

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(whichever provides higher structural support), with the exception that surface course asphalt is not required.

B12.00 Transportation and Traffic Control**B12.01 Traffic Control and Advisory Signage**

The proposed location of all traffic and advisory signs and pavement markings are to be clearly identified on the Traffic Management Plan, which shall form part of the complete engineering drawing set and shall be accepted for construction by the Township.

All traffic signs shall be provided and installed by the Developer at the cost of the Developer. The signs are to be of a standard type approved and installed as per the OTM and shall be located as identified on the Pavement Marking and Signage drawing.

All signs shall be installed upon completion of the base course asphalt and maintained by the Developer in a good condition until assumption. The shape, colour, height, and location of traffic signs shall be in accordance with the OTM as published by the MTO. All regulatory traffic signs shall be manufactured using "High Intensity" sheeting conforming to ASTM D4956-90 Type III or Type IV material. All regulatory signage shall meet provincial regulations with regard to reflectivity.

Permanent signs and posts must be installed prior to the start of the maintenance period.

B12.02 Street Name Signs

Proposed street names shall be subject to the approval of the Township.

Street name signs shall be double-sided and shall be installed at every intersection.

Temporary road name signs and posts, approved by the Township, or permanent signs mounted on temporary posts, must be erected at intersections upon completion of the base course asphalt and prior to the first occupancy. These signs must be maintained in good condition by the Developer. Permanent signs and posts must be maintained in good condition prior to the start of the maintenance period and until assumption by the Township.

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B12.03 Unassumed Subdivision Signage

Unassumed road signs shall be installed at all entrances to new subdivisions, in a location satisfactory to the Township, and as per the Standard Details. This signage shall be maintained in good condition by the Developer, until assumption of the subdivision, or specific phase of the subdivision by the Township.

B13.00 Sign Materials**B13.01 Rural Street Signs with 911 Indicators**

- To be 200 mm (8") x 900 mm (36") in size.
- 1.25 mm minimum thickness of extruded exterior grade aluminum.
- Background to be 3M engineering grade reflective "green" sheeting to show same colour by night as by day.
- Lettering to be 3M engineering grade reflective "white/silver" sheeting.
- Font to be "Helvetica Medium".
- 100 mm (4") lettering for street name: 50 mm (2") lettering for suffix (i.e., ST., RD., "ND" for 2nd, "RD" for 3rd, etc.); 50 mm (2") lettering for 911 address; 50 mm (2") for Township name (i.e., Clearview).
- No holes are to be on sign, extruded.
- Street name to be on top line; 911 address and Township name to be on bottom line.

B13.02 Urban Street Signs

- To be 150 mm (6") height x 900 mm (36") in length.
- 1.25 mm minimum thickness of extruded exterior grade aluminum.
- Background to be 3M engineering grade reflective "green" sheeting to show same colour by night as by day.
- Lettering to be 3M engineering grade reflective "white / silver" sheeting.
- Font to be "Helvetica Medium".
- 100 mm (4") lettering for street name: 50 mm (2") lettering for suffix (i.e., ST., RD., "ND" for 2nd, "RD" for 3rd, etc.).
- No holes are to be on sign, extruded.
- Blade length should be kept to a minimum and not to exceed 900 mm (3').
- Where applicable, street name signs and posts shall conform to the Township 911 standards.

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B13.03 Traffic and Street Signposts

Signposts for street name signs and traffic signs to be heavy duty wooden posts, 150 mm (6") x 150 mm (6") in rural applications and 100 mm (4") x 100 mm (4") in urban applications.

Posts are to be 3.6 m in total length and are to be buried 1.2 m in the ground.

B13.04 Temporary Traffic and Street Signposts

Signposts for street name signs and traffic signs to be heavy duty wooden posts, 150 mm (6") x 150 mm (6") in rural applications and 100 mm (4") x 100 mm (4") in urban applications.

Posts are to be 3.6 m in total length and are to be buried 1.2 m in the ground.

B13.05 SWM Pond Advisory Signage

SWMF warning signage to be as per the Township Standard Detail C102.

B14.00 Pavement Markings

Pavement Markings for traffic control shall be provided and conform to the current standards of the OTM. All markings are to be completed with approved materials in accordance with OPSS.

Pavement markings shall be indicated on the drawings for all stop bars, pedestrian crossings, center and lane lines, etc., as may be required for the subdivision streets and as recommended within the TIS for the development. Such markings are to be shown on a Pavement Markings and Signage drawing.

Temporary pavement markings are to be laid immediately following the paving of base asphalt and shall be maintained as required by the Developer, to the satisfaction of the Township, until top course asphalt.

Durable pavement markings shall be laid immediately following the paving of top asphalt and shall be maintained by the Developer, to the satisfaction of the Township until final assumption.

Lane markings are to be organic, solvent based, or water borne traffic paint complete with glass beads. All lane marking applications to new asphalt require two applications of paint. The second application shall not be applied until the first is tack free. Pavement markings are to conform to OPSS 710 and OPSS 1712.

Section B – Roadways

Traffic lane symbols, stop bars and pedestrian crosswalks are to be durable pavement markings or field reacted polymeric pavement markings in accordance with OPSS 710, OPSS 1713, and OPSS 1714.

All pavement marking removal required to prepare the area for final pavement marking shall be done by abrasion.

Local streets do not require centreline pavement marking but stop bars are required with a minimum of 10 m of centreline marking (15m preferred).

B15.00 Other Requirements

Prior to the placement of asphalt after October 15 of any calendar year, the Developer shall obtain specific approval from the Public Works Department on a day-to-day basis.

B15.01 Road Occupancy Permit

A Road Occupancy Permit is required from the Township whenever it is necessary to perform excavations or any construction works on an existing Township ROW, unless the work is covered under a Subdivision or Site Plan agreement. All Work shall be done in accordance with the instruction and direction provided in the Road Occupancy Approval from the Township.

B16.00 Traffic Control Plan During Construction

For all Work on existing roadways, a Traffic Control Plan prepared in accordance with the OTM Book 7 – Temporary Conditions and O. Reg. 213/91 shall be required as part of the Township's Road Occupancy Permit. The Traffic Control Plan is to be submitted for review and acceptance to the Township's Public Works Department prior to issuance of a Road Occupancy Permit and / or start of any Works.

B17.00 Traffic Calming Measures

For traffic calming measures refer to Township Traffic Calming Policy 2019 (as amended).

B18.00 Inspection and Testing

Full-time inspection is required while the construction of roads is occurring. Materials testing reports and other reports as applicable shall be provided to the Township to ensure compliance with the recommendations of the geotechnical report.

Section B – Roadways

The following minimum testing shall be completed for new roads:

- Air test.
- Slump test.
- Concrete Cylinders.
- Compaction test.
- Material samples.
- Proof roll of subgrade (under supervision of the geotechnical engineer, with Township staff in attendance).
- Geotechnical engineer is to submit a final report including all test results and sign off that the subgrade meets requirements.



Section C – Stormwater Management and Drainage Systems

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Section C – Stormwater Management and Drainage Systems

C1.00 Stormwater Policies

The Township has prepared a detailed set of design criteria and applicable parameters for the design of minor and major storm drainage facilities. These policies are to be adhered to in the production of all stormwater control facilities.

C1.01 Design Criteria

The Township operates under a CLI-ECA for the approval of qualifying SWM projects and is thus the approval authority. For all projects that do not fall under the CLI-ECA, the MECP continues to be the approval authority. The Developer shall design stormwater infrastructure in accordance with the most current version of the Township's CLI-ECA and associated design requirements. If the design does not fulfill these requirements, an application to the MECP for a Schedule C amendment to the CLI-ECA will be required.

The Developer is responsible for obtaining and reviewing the CLI-ECA documents and design requirements from the Township to ensure adherence.

The most current version of the following MECP, NVCA guidelines, policies, and standards apply to the design of storm drainage facilities in the Township.

- Ministry of the Environment, Conservation and Parks (i.e., Stormwater Management Planning and Design Manual, March 2003).
- Design Criteria for Sanitary Sewers, Storm Sewer, and Forcemains for Alterations Authorized under Environmental Compliance Approval.
- NVCA Natural Hazards Technical Guide (December 2013), NVCA.
- NVCA Stormwater Technical Guide (December 2013), NVCA.
- **Or the most up-to-date version of the above, or any new documents issued by these agencies.**

Development proponents are also required to confirm design criteria and obtain approvals from any other relevant ministries or agencies (i.e., MTO, MNRF, DFO, etc.). The most current version of OPSD shall also apply to design and construction of storm drainage facilities as determined by the Township.

The consulting engineer responsible for the design of SWMFs shall consult with the Township and the NVCA early in the process to confirm / clarify issues, policies and design requirements, and shall focus on minimizing the number of pond facilities. Master Servicing Plans (where available) for the various Community Planning Areas layout the general location of all planned SWMFs.

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Water quality and quantity control in new development areas are to be provided in Township-owned Township blocks.

LID techniques in lieu of and / or in combination with end-of-pipe designs where reasonable / feasible will be considered by the Township in consultation with the NVCA on a case by case basis. In the case of infilling proposals, on-site SWM concepts may be considered by the Township in conjunction with any potential off-site storm drainage improvements.

Redundancy to protect for blockage or plugging of LIDs and sequential runoff events is to be provided.

The design of each SWMF shall also focus on opportunities to integrate the SWMF with the surrounding topography and land uses. SWMFs are to be created as public amenity features and are to be, when possible, visible to the general public. Opportunities for linkages through the use of trails to larger open space, parkland areas, or other SWMFs are to be maximized.

The design of SWM works is to have full regard for riparian rights of both upstream and downstream landowners. Any change in flow rates, or water levels, that would occur as a result of the development, SWM drainage areas, and / or in-stream works to neighboring private properties must be adequately addressed. Written permission from affected landowners must be sought prior to final design submissions, in cases where acknowledged impacts are proposed, and any governing legislation, in this regard, must be adhered to.

C1.02 Water Balance Report

See Section A of these standards for submission requirements.

C1.03 Significant Drinking Water Threat Report

See Section A of these standards for submission requirements.

C1.04 Low Impact Development Design

LID measures may be required based on the results of the accepted Water Balance Report. The planning and preliminary design of LID measures is to be documented in the Preliminary FSR and accepted by the Township and the NVCA prior to approval of the Draft Plan. The final design and details of the LID system is to be documented in the SWM and LID Design Reports.

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The Township may limit LID measures on private residential lots in urban areas due to conditions which may exist, the increasing density and coverage on residential lots and the expected use and enjoyment by homeowners of private residential lots.

The Developer's engineers may consider the use of LID measures in lieu of, and / or in combination with, end of pipe designs where reasonable / feasible and supported through geotechnical review. LID measures will be considered by the Township in consultation with the NVCA on a case by case basis, particularly with regard to the downstream receiving Township-owned property's capacity to convey stormwater flows in the event of LID measures failing. In the case of a residential development with multiple LID structures proposed, the design engineer shall be required to demonstrate conveyance to and the impact on the downstream receiver, should 50% of the LID structures fail, to the satisfaction of the Township, before being accepted by the Township.

LID measures to be considered shall include but not be limited to underground pipe storage, infiltration galleries, low gradient grassed infiltration swales, bio-retention swales, rain gardens, permeable pavers / surfaces, and / or other industry standard / acceptable means of lot level control for stormwater quantity and quality. The designer should review the Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation Authority (CVCA) LID SWM Planning and Design Guide, along with the NVCA's Stormwater Technical Guide for LID design considerations.

Non-residential developments are to investigate the suitability of private LID measures within each development block, subject to discussions with the Township and the NVCA at the time of the pre-consultation meeting and submission of supporting documentation.

C1.05 Levels of Service

The level of service to be provided by the storm drainage infrastructure is listed in the following table, unless stipulated otherwise. The planning of access routes for emergency services (i.e., police, fire, and ambulance) may result in higher levels of service as determined by the Township.

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Table 1: Levels of Service for Major and Minor Systems

Item	Level of Service	Comments
Storm Sewers	1:5 Year Storm	Use CB inlet controls (as required), to meet hydraulic grade line (HGL) elevation criteria. Storm sewers shall be required in all new developments.
Hydraulic Grade Line (HGL)	1:100 Year Storm	Subject to pre-design confirmation with Township staff, HGL analysis is required (for both 5-year and 100-year storms). Confirm there is no surcharging under the 5-year storm event.
Major System	1:100 Year Storm	Overland flow cannot exceed width or flow capacity of ROW or 0.3 m depth.
Major System	Regional Storm Level of Control	Safe conveyance of the Regional Storm through to the SWMF, or a positive outlet via overland flow routes including drainage blocks and / or municipal ROWs, unless otherwise directed by the NVCA or Township Public Works department.
Culverts	Per Highway Drainage Design Standards (March, 2024)	Refer to current MTO standards.
Bridges	Per Highway Drainage Design Standards (March, 2024)	Refer to current MTO standards

C2.00 Stormwater Management**C2.01 General**

Urban development alters the hydrology of the land surface, altering the quality and quantity of surface runoff. The storm drainage system is to be designed to convey surface runoff from residential, commercial, industrial, and roadway areas to an adequate outlet.

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Surface runoff is to be conveyed by a dual drainage system (minor / major) comprised typically of an underground storm sewer and a continuous, overland flow route within a ROW, drainage block, or open channel.

Ultimately, surface runoff is to be conveyed to natural receiving waters, following treatment, and control to prevent the impairment of water quality and degradation of natural streams, rivers, and ecosystems. The overall purpose of SWM is to provide a feasible and continuous system to protect property, assets, and the environment.

Where development proposals include any sort of alterations to a municipal drain, the laws, regulations, and specifications of the *Ontario Municipal Drainage Act* shall be strictly adhered to, and the design specified for the municipal drain shall be met.

The purpose of this section is to outline the minimum design requirements for the construction of municipal and private services related to stormwater drainage systems and SWMFs in the Township. These requirements are general in nature and do not relieve the Developer of the responsibility to submit a completed product demonstrating competent engineering design in full compliance with all applicable legislation. Any deviation from the minimum Township standards shall be identified by the Developers and / or their consultant, submitted to the Manager of Engineering for review and approval, prior to the first engineering submission.

Stormwater ponds / facilities are required to meet provincial SWM prerequisites as set out by the MNR, MECP, and the NVCA. SWM pond / facilities locations, functions, and design criteria shall be confirmed through consultation with the NVCA and the Township. Where Stormwater Master Plans have been completed, the design criteria shall follow the approved Master Plan.

In general, an SWM report will be required for all development applications. The SWM report shall consider all relevant environmental and flood protection guidelines including water quantity control, erosion control, flood susceptibility, and water quality control requirements.

End-of-pipe facilities are acceptable to the Township when the designs meet the Preferred Criteria as set by the MECP, are maintainable, integrated with the surrounding landscape, and aesthetically pleasing. All SWM ponds / facilities

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shall meet the most current version of the Preferred Criteria – SWM Planning and Design Manual.

The Township requires the overall design requirements to the most recent provincial direction, as is acceptable to the NVCA. Exceptions to this are in circumstances that involve:

- Matters of public safety and aesthetics.
- Maintenance requirements.
- Protecting the riparian rights of private landowners.
- Protection of municipal infrastructure and maintaining an acceptable level of protection to residents whose homes drain into a municipal drainage system.
- Conflicts with land use.

In these cases, the Township may invoke additional release rate stipulations and design requirements over and above those required by other agencies.

The Township requires integration of SWM pond / facility grading design with the surrounding landscape. The design is to consist of varied contour grading, provide improved aesthetics, support a variety of plantings and vegetation and provide passive recreational activities (i.e., walking trails, bike paths, vistas, etc.). This includes identifying the use of gentle slopes in areas where passive recreation takes place, an increasing density of appropriate plantings and vegetation on steeper slopes, handrails / guardrails at headwalls and placing signs which inform of the function and potential hazards of SWM ponds / facilities.

C2.02 Service Area

Storm drainage systems and the SWM Plan shall be designed to service all upstream drainage areas within the development boundary, as well as any external areas tributary to the system. The external area may be determined by referencing the appropriate sub-watershed study or master drainage plan for the area, where applicable. In the absence of such reports, the consulting engineer shall delineate the pre-development contributing area using appropriate topographical data.

Storm drainage systems and the SWM Plan shall be designed considering interim and ultimate conditions in accordance with the Official Plan. Development applications must take into account surface runoff on a

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sub-watershed basis. Consideration shall be given to the effect of upstream future development on the storm drainage system design.

Connections to existing storm sewers shall be approved by the Township. Discharge of the storm drainage system to a natural receiving system must be approved by the Township and the NVCA, as applicable. In some instances, the Township may request that existing receiving storm drainage systems be upgraded to meet current standards or improve functionality.

C2.03 Minor Storm System

The minor system is typically comprised of underground pipes and structures to quickly and efficiently convey stormwater from the surface to an outlet such as a SWMF or natural watercourse, from relatively minor (more frequent, less intense) rainfall events. Storm sewers are to be designed to convey a 5-year return frequency storm without surcharge where adequate overland drainage capacity exists to satisfy the major system requirements.

Storm sewers shall be of adequate size and depth to provide service for the development of lands within the upstream watershed and / or for the drainage of any areas designated by the Township. Stormwater pumping or siphons are not acceptable; storm sewers must drain by gravity.

C2.04 Major Storm System

The major storm drainage system is typically comprised of a surface network of roadways and / or overland drainage channels designed to convey stormwater runoff from extreme (less frequent, more intense) rainfall events. The major system is designed to function when the minor system capacity is exceeded, or a component of the minor system fails.

The major system must be designed for the 100-year return frequency storm and shall convey these overland flows within the roadway or overland drainage channel to an outlet considered adequate in the opinion of the Township and the NVCA, such as a SWMF or natural watercourse corridor.

A preferred route for overland flow generated by an event greater than the 100-year design storm shall be identified to a receiving system (i.e., SWMF or natural watercourse).

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C2.05 Hydrology and Hydrologic Modeling

Pre-development peak flows shall be computed by a method such as the Rational Method or by an approved computer model. Watershed definition and pre-development flows must be reviewed and accepted by the Township Public Works Department.

Preliminary estimates of post-development flow rates may be computed using a method such as the Rational Method.

For all systems and for the design of surcharged sewers and detention facilities, the latest version of the computer model OTTHYMO or PCSWMM is recommended. Other hydrograph methods may be considered if it is demonstrated that the results are comparable to those from OTTHYMO. Post-development design flows may be determined using the Rational Method only where the design area is less than 40 ha and SWMFs are not considered.

Rainfall intensity-duration-frequency (IDF) equations or their curves and design storm hydrographs must be approved by the Township Public Works Department. The Township requires use of the online MTO IDF Curve lookup tool. Based on a review of literature regarding projected climate change scenarios, the IDF intensity values from the MTO IDF Curve lookup tool are to be increased by 15% to account for future climate change impacts.

Where the first leg of a residential storm sewer system is sized using the Rational Method, the initial inlet time shall be 15 minutes for the 5-year storm. This shall apply where the upstream drainage area does not include large open space areas. Where peak flows from external areas enter a subdivision sewer system, the more critical case based on either the time of concentration including the external area or the time of concentration excluding the external area shall be used. Actual velocities of computed peak flows shall be used to estimate time of concentration.

A design evaluation of inlet times shall be submitted to justify inlet times different from those specified above, especially in the cases where the sewer is designed for certain surcharge levels for larger storms and where the sizing is optimized for both situations. Such an evaluation shall be approved by the Township Public Works Department prior to submission of design drawings.

Please refer to the NVCA Design Criteria and CLI-ECA Design Criteria for runoff coefficients. Provide justification for the selection of the runoff coefficients.

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Runoff coefficients for higher return period storms shall be modified by the Antecedent Precipitation Factor "Ca" to account for saturated ground conditions, reduced depression Storage and infiltration capacity during these events. The following factors shall be applied to the extent that the product of C x Ca does not exceed 1.00.

Table 2: Runoff Coefficient Modification Factors

Design Storm Return Period	Runoff Coefficient Modification Factor (Ca)
5-year	1.00
25-year	1.10
50-year	1.20
100-year	1.25

Manning's Formulae shall be used to determine the capacity of the sewers. The following roughness coefficients shall be used. Polyvinyl chloride (PVC) pipe and Concrete pipe: 0.013. Corrugated pipe: 0.024.

In general, a storm sewer system shall be designed to convey not less than the 5-year return frequency storm without surcharge. Surcharged design may be considered for higher design levels where suitable methods are used, subject to the approval of the Township Public Works Department.

The Township or NVCA may request other design storm lengths and distributions for evaluation during the pre-consultation process.

C2.06 Stormwater Management Facility Design Requirements

Where deemed necessary by the Township to reduce runoff increases and to meet identified downstream flow constraints, detention and / or retention facilities shall be provided for both the major and minor systems.

Land area set aside expressly for SWMFs where it is not part of a privately-owned facility (i.e., roof top storage or otherwise incorporated into industrial / commercial lands) shall be designated as a "stormwater detention / retention site" and dedicated by the Developer to the Township. It shall not be considered as part of the park system.

All SWMFs shall be provided with an outlet (overflow spillway) designed to accommodate the regional storm flow without failure. Freeboard shall be 0.3 m from high water level (HWL) to the top of the outlet berm. Suitable erosion

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protection shall be provided downstream of the outlet for all flow conditions. Operation during spring snow melt or freezing conditions shall be investigated, and any required changes shall be incorporated.

SWMFs to be assumed by the Township must include aesthetic considerations to achieve a visually pleasing final constructed form. Undulations to be incorporated into pond perimeter grading to achieve an “organic” pond shape; no box-shaped ponds. Pond landscaping should be visually pleasing and long-term, low maintenance. Pond layout and design shall be approved by the Public Works Department.

If an SWMF contains a permanent pool, a minimum 1.5 m high chain link fence shall be required for the “block” that the facility is located within, where the block is adjacent to residential property lines, or as directed by the Township.

Grading to provide gentle slopes to the permanent pool shall follow the most current MECP preferred criteria SWM guidelines. Planting techniques should also follow the current MECP SWM guidelines.

Table 3: Wet Pond Design Criteria Permanent Pool

Slope / Depth	Measurement
Maximum Slopes	7:1 near normal water level (NWL) plus use of 0.3 m steps
Maximum Slopes	4:1 elsewhere
Average Depth	1.0 to 2.0 m
Maximum Depth	2.5 m

Extended Detention

Slope / Depth	Measurement
Maximum Slopes	7:1 near NWL plus use of 0.3 m steps
Maximum Slopes	4:1 to top of extended detention
Maximum Depth	1.0 m

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Flood Storage

Slope / Depth	Measurement
Maximum Slopes	4:1 above the maximum extended detention level up to 2 m beyond the HWL
Maximum Depth	2.0 m for combined Extended Detention and Flood Storage

Other

Slope / Depth	Measurement
Maximum Slopes	3:1 from 2.0 m beyond HWL as required

Design Criteria
Design of sediment forebays at each inlet to the pond, meeting MECP design guidelines in order to maximize sedimentation in the forebays.
A minimum 3.0 m wide platform at a maximum cross slope of 4% provided around the property boundary of the SWM block for the purposes of grass cutting and set back from any residential properties.
A horizontal terrace of 3.0 m required for continuous slope changes in elevation greater than 3.0 m.
Freeboard to top of pond of 0.3 m above the HWL (based on routing of Regional Storm flow). (HWL = maximum water level to convey the Regulatory event through pond).
Emergency overflow weir (to pass the Regulatory event) with capacity of no less than 0.1 m ³ /s/ha.
Signage (with one sign located at each entrance of the pond and any other locations identified by the Township) shall be placed to educate and advise the public of the purpose, characteristics, and dangers associated with the facility. See Township detail for signage.

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Design Criteria
Bollards or gates to discourage vehicular access to the maintenance road.
Pond inlet and outlet pipes are to be equipped with grates per the OPSDs.
Maintenance vehicle access roads shall be paved. Asphalt and granular make up to be suitable to support municipal equipment. See detail for Asphalt Trail.
Berms constructed of suitable material, inspected by a geotechnical engineer and compacted to a minimum 95% Standard Proctor density.
The need for pond liners to be reviewed by a geotechnical engineer and recommendations and liner specifications provided. The Township requirement for pond liner material is geosynthetic. Native clay for the use of pond liners is not permitted.

C2.07 Quality and Quantity Control**C.2.07.1 Quantity Control**

Where there is an increase in runoff rates due to new development or an increase in impervious area, pre- to post development control of stormwater shall be provided as required by the Township. Post-development flows from the 2- to 100-year storm events shall not exceed the pre-development flow rates. More stringent downstream constraints may exist as established by the Township or the NVCA. The capacity of the existing downstream system should be reviewed to the extent that it can be proven that the receiving downstream system (sewer, pond, ditch, etc.) has sufficient capacity to ensure a sufficient downstream outlet exists to receive the stormwater runoff from the development and no new negative downstream effects will be experienced as a result of this development. The SWM report shall speak to the downstream constraints and demonstrate how runoff rates will be controlled to satisfy the constraints.

The Township requires on-site stormwater quality and quantity control measures on Industrial, Commercial, Institutional (ICI) developments or re-development projects as part of a "Treatment Train" approach. Consultants

Section C – Stormwater Management and Drainage Systems

shall specify in FSRs and in detailed designs the required level of quality and quantity control and how it is achieved through appropriate SWM controls.

Backflow preventors on any part of the storm system will not be accepted.

Rooftop Storage

See Site Plan Design Guide in Appendix D.

Parking Lot Storage

Parking lot storage within residential or institutional developments is not permitted.

See Site Plan Design Guide in Appendix D.

Underground Storage

The use of underground storage will be considered by the Township subject to the results and recommendations of a geotechnical investigation. Underground storage systems that incorporate infiltration measures into the design shall be required to complete in-situ infiltration testing to confirm that the infiltration rate of the native soil is adequate. Safety factors are to be applied to the infiltration rate as per the LID SWM Planning and Design Guide prepared by CVCA and TRCA, 2010 – Version 1, or most recent version.

A minimum of 1.0 m separation from the invert of the system to the seasonally high groundwater table is required for systems incorporating infiltration measures into the design. For any underground storage system, approval of the design from a geotechnical perspective (infiltration rates, hydrostatic uplift, cover requirements, etc.) is required from a geotechnical engineer.

Operation and Maintenance (O&M) requirements shall be included in an O&M manual.

C.2.07.2 Quality Control

The selection of Best Management Practices (BMP) for water quality control shall be provided as per the most current NVCA and / or MECP guidelines. The SWM report and design drawings must demonstrate how the required level of water quality control is to be achieved. The BMP selection process shall review all environmental constraints and provide rationale for the selection of alternatives for a specific site.

In all cases, infiltration of stormwater shall be the primary consideration for stormwater quality control. Infiltration areas shall be subject to the

Section C – Stormwater Management and Drainage Systems

recommendations of a hydro-geological and soils investigation report. Runoff from roadways and parking lots must be treated prior to infiltration or discharge to a watercourse. Where infiltration is not possible or limited, wet ponds shall be considered.

Oil and Grit Separator (OGS) units may be considered as part of a treatment train approach or where it has been demonstrated that other forms of water quality control are not practical. OGS units are to be tested and certified under the Canadian Environmental Technology Verification (ETV) program and follow the most recent CLI-ECA criteria. The OGS design shall be provided and include the contributing catchment area, the percentage of impervious area to size the unit and the particle size distribution (PSD) used to determine the TSS removal rate. The operation and maintenance manual shall be provided for the OGS unit as part of the SWM submission.

Where used as an outlet control, orifice plates shall be stainless steel and a minimum diameter of 75 mm. However, a 100 mm diameter or greater orifice is preferred.

C2.08 Submission Requirements for SWM Design Reports

As a minimum the following list of documentation should be included within SWM design reports submitted to the Township for review. These reports are submitted to support the final design of quality and / or quantity control facilities. These reports shall clearly identify how applicable recommendations from Master Servicing, Functional Servicing, Geotechnical, Environmental, or Hydrogeological Reports have been incorporated into the final design of the facility.

1. Site Location Drawing.
2. Existing and proposed catchment area drawing which delineates internal and external drainage areas, labels areas, applicable coefficients, and catchment reference numbers.
3. Engineering drawings for stormwater facility which should identify the following:
 - a) Permanent (normal water level), extended detention level, and highest water level on drawing view and include all ponding levels for various return periods (modeled storm events) in tabular form.

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- b) Section and details of major overland flow routes.
 - c) Section and details of maintenance access roads.
 - d) Section and details of inlet and outlet structures.
 - e) Section and details of erosion protection at inlet and outlet structure and on spillways.
 - f) Section and details of sediment forebay and berm, including lining.
 - g) Location of facility signage.
 - h) Borehole locations, vertical soil logs (shown on sections) and existing seasonal high groundwater elevation.
 - i) Existing and proposed grading, and spot elevations and transition slopes.
 - j) Limits of construction and grading.
 - k) Details of sediment drying area and / or by-pass pipe for cleaning purposes.
 - l) Fencing limits.
4. Landscaping / restoration drawings and details.
 5. Erosion and sediment control drawings and details.
 6. Excerpts from Master and Functional Studies which outline requirements for quantity / quality control and any facility design requirements.
 7. Identify any deviations from the Township Engineering Standards including an explanation based on site specific conditions.
 8. Pre- and post-development hydrologic modeling schematic to illustrate all components of each model.
 9. Table summarizing pre- and post-development catchment parameters (i.e., catchment number, area, percent impervious, curve number (CN) value, etc.).

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10. Table summarizing stage, storage and discharge characteristics of the facility.
11. Table summarizing pre and post development peak flows and storage volumes based on output from hydrologic modeling or comparison to volumes and target peak flows identified in Master and Functional Servicing Studies.
12. Table to summarize and compare required permanent pool and extended detention storage requirements to volumes provided in the facility.
13. Table to compare calculated 100-year HGL elevations within storm sewer system to identify if there will be any surcharging of the system.
14. Sample or supporting calculations for the following:
 - a) Sediment forebay sizing. Length and width in conformance with MECP manual and estimate of required cleanout frequency.
 - b) Extended detention drain down time (hours).
 - c) Major system overland flow and velocity to confirm conveyance within ROW and / or defined flow routes.
 - d) Erosion control sizing and flow velocity at inlet and outlet structures and spillways.
 - e) Overflow spillway capacity.
 - f) Outlet control calculations (i.e., orifice sizing, weir sizing, etc.).
 - g) Major system inlet capacity (assuming 50% blockage of grating).
15. Hard and digital copies of input / output files from hydrologic modeling (digital files may be provided via e-mail or through a shared file link).
16. Identify erosion and sediment control methods to be implemented before, during, and after municipal servicing construction up to the end of servicing maintenance period, including schedule for implementation / decommissioning and maintenance requirements.
17. Construction sequencing and calculations for sizing of temporary sediment control ponds.

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18. Operations and maintenance requirements in accordance with the CLI-ECA (see section below).

C2.09 Operations and Maintenance Manual

A SWMF O&M Manual is to be prepared for the Township by proponents of new SWMFs. O&M activities to be in accordance with the Township's CLI-ECA.

The manual is to describe how each facility operates, and the short-term and long-term inspection and maintenance requirements of the facilities. Any collection system SWM components, such as OGS, infiltration galleries, or infiltration trenches, etc. are to be included in the manual. The manual is to focus on the expected frequency and method of maintenance that will be required in the following specific areas:

- Facility inspection / monitoring program (outline seasonal and annual tasks based on Master / Functional Studies or Draft Plan Approval Conditions).
- Grass cutting.
- Weed control.
- Plantings.
- Trash removal.
- Sediment testing, removal, and disposal.

The SWMF O&M Manual is also to include cost estimates (including labour, equipment, and materials) for the operations and activities described above.

C2.10 Report Format

Once the reports have been reviewed and accepted by the Township, separate digital and hard copies of the report shall be provided. The SWM Design Report and the O&M Manual shall be separate documents, bound with front / back covers, the Development / Subdivision name shall be included on the front covers. ARCH D size drawings included within the reports shall be folded and included in the back of the report in appropriate sleeves.

C2.11 Operational and Maintenance Features

O&M of SWM ponds is to be in accordance with the Township's most current CLI-ECA requirements. The SWM pond designs are to incorporate features that allow the Township to operate and maintain the facility. It is strongly recommended that the design engineer arrange a pre-consultation meeting with the Township once a preliminary pond design has been prepared in order to

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discuss maintenance operations and features, specifically clean-out procedures, and sediment management and removal. These features include:

- Provide a primary maintenance access to the facility (minimum 4 m in width of access road, and an additional minimum 3.0 m buffer where adjacent to residential properties) suitable for municipal equipment. Maintenance access to be asphalt with a composition of 50 mm HL4, 150 mm Granular A, and 250 mm Granular B.
- Maintenance vehicle access roads and turn-around areas at sediment forebays, outlet pools, and control structures having a maximum gradient of 10%, minimum width of 4 m, a minimum inside turning radius of 14 m, and including a 10 m long loading platform at the forebay and outlet pool locations. Maintenance roads may be required to other locations within the pond block as determined by the Township. Maintenance roads should have maximum crossfall of 2%. Provide a minimum of 3 m offset of clear space between the maintenance road and any property lines.
- All maintenance vehicle access roads construction shall be structurally designed to support municipal equipment.
- Provision of a drain down pipe leading from the permanent pool to an MH with dewatering sump, if a gravity outlet is not available.
- In order to facilitate sediment removal operations, either of the following may be proposed, and are subject to review and approval of the overall approach to sediment management and removal:
 - A sediment drying space, suitable to contain the volume of sediment and water remaining (after completing pond drain down procedures) shall be provided. Calculations to be provided with assumptions for the volume of sediment removal and area calculations for appropriate drying area sizing.
OR
 - Provision of a pond by-pass sewer (sized based on the minor system design criteria) between the inlet and the outlet in order to divert incoming flows around the pond for the duration of clean-out operations (allows for sediment drying in situ).
- The sediment drying area should be sized to provide sufficient storage space for the volume of sediment accumulated over a 10-year period. This can be calculated using the MOE Stormwater Management Planning and Design Manual – Table 6.3. The sediment drying area is to be provided above the extended detention level in the facility. Drainage from the sediment drying

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area should return to the pond. Area to be sloped towards the pond at 2% to 5% grade. The drying space is to be designed based on a maximum sediment depth of 0.5m.

- A minimum 3 m wide platform at a maximum cross slope of 4% is to be provided around the property boundary of the stormwater block for the purposes of grass cutting.
- Use of a reverse sloped control pipe, which reduces thermal impacts (wet pond application).
- Provision of flow control devices in maintenance hole structures located in a berm for easy access, maintenance, and cleaning as opposed to a vertical pipe structure located in the pond.
- Minimum orifice size of 75 mm diameter. Orifice plates to be stainless steel. Use of a screened orifice plate or weir plate fixed to a permanent structure to achieve extended detention.
- A gate valve and valve box to enable the normal pond outlet to be closed in case of chemical spills where applicable.
- Provide the following table in the SWM Report, as required in the CLI-ECA

Table 4: Sample Table for SWM Report

Location	Latitude and Longitude or Physical Address (UTM Coordinates can be Provided in Addition)
Watershed / Subwatershed	E.g., Mad River
Receiver of Discharge	E.g., Surface discharge to "Mad River"
Outlet Location	E.g., Latitude and longitude (UTM coordinates can be provided in addition)
Catchment Area	E.g., 10 ha
Level of Treatment for Suspended Solids	E.g., Level 1 or 2 (80 or 70%) Long-term suspended solids removal or specify if other treatment level
Treatment for Other Contaminants, As Required	E.g. Phosphorus, water temperature
Level of Volume Control	E.g., Local 90 th percentile rainfall event or local water balance (X mm)
Design Storm	E.g., Quantity: X-year storm; Quality: X-year storm

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Location	Latitude and Longitude or Physical Address (UTM Coordinates can be Provided in Addition)
Brief Description	Include model number if equipment is used (E.g., OGS/filters)
Receive Emergency Sanitary Overflows	Y/N; briefly describe
Notes / Additional Information	Provide any additional information relevant to this facility not captured above

C2.12 Landscaping

Landscaping shall be used to enhance the aesthetics and functional aspects of stormwater ponds. Native, non-invasive trees, shrubs, and ground cover are required in a low maintenance landscape design. NVCA policies are to be consulted for a listing of acceptable planting species, topsoil depths and composition and appropriate seed mixtures and application methods.

A detailed outline of landscaping requirements is provided in Section I – Landscaping.

A planting and landscaping drawing prepared by a registered landscape architect is to be submitted to the Township and the NVCA for review and approval. The design is to ensure a minimum 2 m separation from the edge of trails or walkways to trees or shrubs. The drawing is to address the following objectives:

- Provide shade to areas of the permanent pool (minimize thermal impacts).
- Propose vegetation which has high nutrient uptake capability and is planted in shallow ponding areas in the extended detention zones.
- Provide outlooks or viewing features with space suitable for installation of benches and use of asphalt paths to link viewing areas with local walkway or trail systems.
- Provide a low maintenance ground cover that minimizes the area to be mowed on a regular basis.

The Township requires the following minimum standards for trees and shrubs:

- Deciduous trees – minimum 60 mm diameter caliper.
- Coniferous trees – minimum 1.8 m in height.
- Deciduous or coniferous shrubs – minimum 0.9 m in height.

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Where tree planting is required, the density of planting is to be such that there is a minimum of one tree per 50 m². The selection of shrub species and the proposed density of plantings shall be used to discourage public access where appropriate. These locations include areas of steeper slopes around the edge of the permanent pool and headwalls.

C3.00 Inlets, Outfalls, and Special Structures

Inlet and outfall structures, including headwalls, shall be in accordance with the OPSDs and specifications. Said structures are to be designed, detailed, and stamped by a structural engineer whenever required.

Grates will be provided on all inlet and outlet structures and shall be designed and detailed when standard drawings are not appropriate. Outlet grates will consist of horizontal bars or rods. Spacing of bars or rods shall not exceed 150 mm clear. All metal parts will be adequately protected against rusting.

All drainage works will require sediment control during construction periods, and permanent installations may be required. Facilities shall be located for easy access by maintenance vehicles, and sediment shall be removed whenever the storage volume is reduced to 40% of required volume.

All drainage works shall be designed to control erosion and the impairment of water quality on receiving streams as a result of urban stormwater runoff.

C3.01 Inlets

Inlet structures must be fully designed and detailed on the Engineering Drawings. Inlet grates shall generally consist of inclined parallel bars or rods set in a plane at approximately 18° with the top away from the flow.

Gabions, riprap (underlain with geotextile fabric), or concrete shall be provided at all inlets to protect against erosion and to channel flow to the inlet structure.

Precaution must be taken in the design of grating for structures to minimize the risk of entanglement or entrapment of a person.

C3.02 Outlets

The OPSD 804.030 standard headwall shall be used for all storm sewers up to 900 mm in diameter. For sewers over 900 mm in diameter, the headwall shall be OPSD 804.040 or individually designed. All headwalls shall be equipped with a grating over the outlet as per OPSD 804.05.

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Gabions, riprap (underlain with geotextile fabric), concrete, or other erosion protection shall be provided at all outlets to prevent erosion of the watercourse and the area adjacent to the headwall.

C3.03 Safety Railings

Safety railings, in the form of Ontario Building Code (OBC) Compliant railings / guards shall be provided for any headwall exceeding 1.0 m of exposed height. Fencing in the form of a 1.2 m high continuous black vinyl chain link fencing shall be provided along the top of all headwalls over 0.6 m in height but less than 1.0 m. Posts shall be cored into the concrete headwall and / or wing walls. Railings may also be required along shorter headwalls where a risk to pedestrian safety has been identified. The site-specific conditions must be reviewed in determining the requirement for safety railings and must have due regard to public health and safety and shall be at the Township's discretion.

C4.00 Stormwater Conveyance

C4.01 General

Urban stormwater conveyance systems may include open channels and swales, storm sewers, MHs and CBs, roadways, and road allowances. The design of stormwater conveyance systems shall follow "dual drainage" principles, which consist of:

- The minor drainage system which conveys runoff from the 5-year return period storm.
- The major drainage system which conveys runoff from storms greater than the 5-year return period up to the 1:100-year storm.

The design of the minor drainage system shall provide unsurcharged conditions up to the 1:5-year storm.

The use of sump pumps is permitted; however, they must discharge over the foundation wall onto a splash pad. The use of direct connections to the storm sewer, or storm services is not permitted.

The design of the major system shall be such that runoff is conveyed within the boundaries of municipal road allowances, or blocks. A continuous overland flow route is to be identified on the engineering drainage drawings, and a suitable outlet is to be identified.

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During preparation of the Preliminary Functional Servicing Study prior to Draft Plan approval, the maximum ponding elevations in SWM blocks and the resulting HGL in the storm sewer system is to be determined with sufficient level of detail. An HGL analysis is required to protect structures from flooding and damage during 100-year design storm events. The analysis shall demonstrate that the HGL will not cause unreasonable operating conditions during the 1:100-year design storm conditions, i.e., uplift of MH lids, extended flooding of road base via subdrains, etc.

C4.02 Minor Drainage System Design

The design of the storm sewers shall be computed and shall be included in the drawing set on ISO A1 (594 mm x 841 mm) sheets. A digital (Microsoft Excel or as applicable) version shall also be included in the submission. All storm sewer minor system designs shall be based on a 5-year frequency unless otherwise directed by the Township.

1. All storm sewers shall be designed according to the rational formula where:

$$Q = 2.778 (ACi)$$

Where: Q = Runoff quantity in m³/sec.

A = Area in hectares (ha)

C = Runoff coefficient

i = Average rainfall intensity in mm/hr.

2. The value for rainfall intensity shall be calculated using the MTO IDF Lookup Tool, with IDF intensity values increased by 15% to account for climate change, as described in Section C2.05.
3. Values for the runoff coefficient "C" shall be per the NVCA guidelines and the CLI-ECA Design Criteria.
4. The design for minor water courses, associated culverts, and structures will be designed to a 25-year storm frequency unless otherwise directed by the Township or NVCA.

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C.4.02.1 Manning's Formula

Designers shall reference this section of the standards to establish an appropriate inlet time (typically minimum of 15 minutes in small urban areas).

Manning's formula is to be used as a basis for sewer design.

C.4.02.2 Pipe Capacity

The hydraulic capacity of sewers shall be designed according to the Manning equation (for pipes flowing full):

$$Q = 1.00/n \times R^{2/3} \times S^{1/2} \times A$$

and

$$V = 1.00/n \times R^{2/3} \times S^{1/2}$$

Where: Q = flow m³/sec.

A = Nominal cross-sectional area of the sewer (m²)

R = Hydraulic radius (m)

S = Slope of pipe (m/m)

n = Roughness coefficient as noted below

C.4.02.3 Roughness Coefficients

The roughness coefficients to be used for storm sewer pipes will be:

- a) Concrete pipe: n = 0.013 for all sizes of pipes.
- b) PVC pipe: n = 0.013 for all sizes of pipes.
- c) Corrugated metal (culverts only): n = 0.024 for all sizes of pipes.
- d) HDPE: n = 0.021.

C4.03 Major Drainage System Design

A continuous overland flow drainage route is to be identified on the engineering drawings and grading drawings. The extent of any overland ponding at low points is also to be shown on the grading drawings. The maximum allowable flow depth where vehicle or pedestrian traffic takes place or may be expected is 0.30 m. A minimum freeboard of 0.3 m is also required between overland

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flow and the lowest building opening elevation. Any inlet grating associated with the major drainage system is to include a 50% blockage factor in its design.

Overland flow must be limited to road ROWs, SWM blocks, and designated overland flow routes, free of fences and other impediments to flow.

C5.00 Storm Sewer Pipe Design

All storm drainage infrastructure, including sewers, maintenance holes, CBs, etc., are to conform to the design standards outlined herein. Should any provincial standards (i.e., MECP) exceed the Township's standards, those provincial standards shall dictate.

Ditch inlet grate capacities are to be checked against design flows.

Storm service laterals are not permitted. Private direct connections to the storm sewer will not be permitted.

Culvert capacity shall be checked against inlet and outlet control hydraulics and the potential effects of backwater to upstream properties. See further sections for culvert design specifications.

Connection of residential roof leaders to the storm sewer system is not permitted and shall be directed overland. Splash pads must be provided at the discharge location for all roof leaders.

C5.01 Minimum Pipe Sizes

The minimum pipe size for a storm sewer main in residential areas shall be 300 mm in diameter. The minimum size for CB leads including RLCBs is 250 mm.

The minimum pipe size diameter for a storm sewer in industrial and commercial areas shall be 375 mm.

C.5.01.1 Velocity

Minimum = 0.75 m per second

Maximum = 4.5 m per second

Additional protection against erosion, scouring, and pipe displacement must be provided by a licensed engineering practitioner where flow velocities exceed 4.5 m/s.

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C5.02 Changes in Pipe Size

Decrease of pipe size from a larger upstream to a smaller downstream will not be allowed regardless of the increase in grade. Exceptions may be considered for Capital Works Projects where the downstream sewer is scheduled for future replacement.

C5.03 Location

The storm sewers shall be located as shown on the standard Township cross-section drawings. Any sewers which are situated in off-road locations shall be contained within blocks.

C5.04 Sewer Alignment

All storm sewers shall be laid in a straight line between MHs unless radial pipe is required.

The minimum diameter for radial pipes, where approved by the Township, shall be 900 mm. A MH is required at the beginning and end of the radial section. The minimum centre line radius allowable shall be in accordance with the minimum radii table as provided by the pipe manufacturers. Curve data must be shown on the drawings.

C5.05 Depth

The minimum depth of cover for frost protection shall be 1.5 m from the springline to the centreline of road. Under certain conditions where sufficient cover is not feasible, shallow insulated pipes may be permitted subject to review by the Township's Public Works Department, in accordance with the OBC, or any other applicable standard.

C5.06 Limits of Construction

All storm sewers shall be terminated at the subdivision limits with an MH when external drainage areas are considered. Provisions in the design (depth, alignment, and slope) shall be made to allow for the future extension of the sewer.

Provision for future extension of the sewer (any oversizing) will only be considered for lands which are within the limits of the current urban boundary.

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C5.07 Pipe Crossings

All sewers and connections shall have a minimum horizontal separation of 2.5 m, where running parallel, and a vertical clearance at crossings of 0.5 m from all watermains and appurtenances. A minimum clearance of 0.25 m shall be provided between the outside of pipes barrels at all points of sewer crossings. In any event, the minimum separation distance requirements shall comply with the current MECP policy. Where clearances cannot be achieved between sewers and watermains the design shall be completed in accordance with MECP Procedure F-6-1.

In cases where the storm sewer crosses a recent utility trench at an elevation higher than the elevation of the utility, a support system shall be designed to prevent settlements of the storm sewer, or alternatively the utility trench is to be excavated and backfilled with compacted crushed stone or concrete to adequately support the storm sewer. When the storm sewer passes under an existing utility, adequate support shall be constructed to prevent damage to that utility.

A minimum clearance of 0.5 m between the obvert of a sanitary sewer and the invert of a storm sewer shall be provided if the sanitary sewer connections are required to go under the storm sewer. The minimum horizontal clearance between the outside walls of adjacent sewer pipes shall be 0.8 m.

C5.08 Pipe Bedding and Backfill

The classes of pipe and the types of bedding shall be selected to suit loading and proposed construction conditions. Details and types of bedding and backfill are illustrated in OPSD 802.01 with Granular A bedding and 802.03 Class "B" with Granular A bedding for concrete pipes unless otherwise recommended by the geotechnical engineer.

Bedding and trench compaction shall be carried out in conformance with OPSS.MUNI 501. The width of trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless additional bedding or higher strength pipe is used. The recommendations of a geotechnical engineer will be required in determining strength of pipe required and construction methods to be used.

Fill beneath sewers is to be approved fill compacted to 95% Standard Proctor as directed by a geotechnical engineer.

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C5.09 Materials

The type and classification of all storm sewer pipe and the sewer bedding type shall be clearly indicated on all profile drawings for each sewer length. Concrete or plastic pipe will be permitted for storm sewers 375 mm in diameter and smaller. All storm sewer mains 450 mm diameter and over shall be constructed with reinforced concrete pipe.

Concrete pipe shall conform to the requirements of CSA Specification A257-M 1982 for the particular classes as shown below:

- Pipes up to 375 mm – Non-reinforced Concrete Pipe, CSA Standard A257.1 M1982, Classes 1, 2, and 3.
- Pipes 450 mm or greater – Reinforced Concrete Pipe, CSA Standard A257.2-M1982, Strength Classification 50-D, 65-D, 100-D, and 140-D.

All concrete pipes shall be supplied from a pre-qualified plant registered with the Ontario Concrete Pipe Association (OCPA).

PVC pipe is permitted for sewers up to 375 mm diameter. PVC products shall conform to the requirements of CSA B182.1, CSA B182.2, ASTM D3034, ASTM F1760, and ASTM F1336.

All PVC pipes and rubber gasketed joints shall conform to the requirements of OPSS 1841, OPSDs 806.040, and 806.060 (with regard to maximum fill / cover). The allowable maximum joint deflection and minimum curve radius recommended by the manufacturer shall not be exceeded.

The pipe must be manufactured with factory assembled spigot gasket and integral bell joints. Externally ribbed pipe will not be permitted. PVC pipe for storm sewers shall be any colour except green.

High density polyethylene (HDPE) pipe is acceptable for use for all development areas (residential and ICI) upon the Township's approval. HDPE pipe shall conform to the requirements of CSA Specification B182.6 with rubber gasketed bell and spigot joints, OPSS 1840 and OPSD 806.020, and shall have a smooth inside and outside wall with minimum pipe stiffness of 320 kPa.

Storm sewer leads from CBs shall be constructed with PVC DR35, HDPE, or concrete pipe. All RLCB leads, if not concrete, shall be concrete encased.

Watertight bell and spigot connections will be required for all pipe joints.

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C6.00 Ditches and Culverts

Ditches and culverts shall be sized to take the total expected storm runoff calculated by a recognized design method. Acceptable methods for culvert calculations and ditch sizing are detailed in the MTO Drainage Design Manual. Where tailwater elevations impact hydraulic capacity, the method used must respect this tailwater condition. Acceptable hydrologic calculations include, Rational Method, SWMHYMO, OTTHYMO, SWMM5, as appropriate based on the assumptions of the method.

C6.01 Ditches

Where permitted, open ditches shall be graded to the alignment and grades as shown on the plan and profile drawings.

The area between the edge of the road shoulder and the street line shall be graded and the ditches cut with side slopes of 3:1 from the edge of the shoulder to the bottom of the ditch and from the bottom of the ditch to the original ground. In fills over 1.5 m, measured vertically from the edge of shoulder to the toe of slope, the fill slope shall not be steeper than 2:1. The ditch shall be located at the toe of the fill slope. In fills over 3.0 m, measured vertically from the edge of boulevard to the toe of slope, guide rails shall be installed conforming to the OPSD and MTO protection warrants.

Ditches shall be constructed as follows:

1. Distance centre to centre of ditches to be as required for the depth of ditch and side slopes.
2. Depth below finished centerline grade:
Maximum 1.20 m (or as approved by the Township)
Minimum 0.75 m
3. Ditch Grade:
Maximum 6.0%
Minimum 0.5%

Where needed, sub-drains shall be bedded in a 300 mm x 300 mm clear stone trench below the swale and shall conform to OPSS 405. Sub-drains shall be installed a minimum of 0.5 m below C/L of ditch to avoid maintenance damage

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and must have a positive outlet to a ditch or storm drainage structure. Sub-drains are to be inspected post-utility installation.

Where drainage is conveyed from the roadside ditch to a suitable outlet through a block, it shall be piped using ditch inlets and grates. Storm sewer pipe material shall be concrete or PVC or PE, minimum size 300 mm diameter. Concrete pipe material must be ES or Class III. PVC or PE pipe material must be 320 kPa pipe stiffness complete with bell and spigot connections.

The minimum ditch protection on all ditches shall be 150 mm of topsoil with No. 1 nursery sod, staked when slopes are 3:1 in residential, commercial, or industrial areas. In rural reconstruction areas, ditch back slopes may exceed 3:1 and must be protected for erosion. Erosion protection methods (e.g., erosion mats, etc.) along with seeding may be considered by the Township as an alternative to sod in rural areas. All topsoil shall be from a source approved by the Township Public Works Departments.

C6.02 Culverts

C.6.02.1 Entrance Culverts

Refer to MTO standards for culvert sizing.

Normal entrance culverts shall be installed where required as follows:

1. Length: Minimum length of 7.5 m.
2. Size: Minimum of 450 mm diameter.
3. Material: BOSS 2000 HDPE preferred; standard galvanized corrugated steel pipe (CSP) will be considered in cases where HDPE is not an option.
4. Gauge: As recommended by manufacturer for CL-625 ONT loading, minimum 2.0 mm thickness for CSP.
5. Joining systems shall only be used where the length of proposed culvert exceeds the shippable length of pipe. Joining systems shall be water-tight, Type 1 (75 kPa) joints as per CSA B182.8.
6. Cover: 450 mm minimum at the shoulder of the road.

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7. Bedding: Culverts to be bedded and backfilled with granular material in accordance with OPSS.
8. End Protection:
 - a) In subdivisions and areas where the posted speed limit is 50 km/hr or less, all road driveway and walkway culvert ends shall be protected with prefabricated concrete stone block walls and filter cloth as per Township Standard Details.
 - b) In areas where the posted speed limit is greater than 50 km/hr, culverts shall have sufficient length to provide a minimum 5.0 m entrance width plus stable side slopes (minimum 2:1). Riprap to be provided where steep slopes may make erosion a concern.
9. Where it is necessary to construct culverts under roadways or driveways larger than the minimum size, the culvert shall be designed in accordance with a method recognized by the MTO. Detail drawings and calculations shall be submitted for review and acceptance to the Township's Public Works Department.
10. Driveway entrance culverts for each residential lot shall be installed by the Developer, minimum size 450 mm diameter HDPE, minimum 320 kPa stiffness and minimum length 7.5 m. No driveway or culvert shall be placed closer than 1.5 m to any water valve, curb stop, lot line, transformer, or utility pole.
11. Where culvert ends are spaced less than 3 m, they shall be joined as one, having regard for maximum length of pipe.
12. Where culvert ends are spaced more than 3 m, they shall not be joined as one.
13. Culverts are to be installed at all fire hydrants, Hydro transformer pads, and community mailboxes in rural areas.
14. Where fill depth over the culvert exceeds 4 m, concrete pipe material is required.

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15. In locations where the culvert acts as a fish barrier, an effort shall be made to eliminate the fish barrier in consultation with NVCA.
16. Notwithstanding the specification of minimum sizes, culverts shall be designed to convey the minor storm peak flow rate in accordance with the provisions of these standards.

C.6.02.2 Road Crossing Culverts

Road crossing culverts shall be installed where required as follows:

1. Length: Minimum required from centre of ditch to centre of ditch.
2. Size: Minimum of 600 mm diameter.
3. Material: BOSS 2000 HDPE preferred; standard galvanized corrugated pipe (CSP) will be considered in cases where HDPE is not an option.
4. Gauge: As recommended by manufacturer for CL-625 ONT loading, minimum 2.0 mm thickness for CSP.
5. Joining systems shall only be used where the length of proposed culvert exceeds the shippable length of pipe. Joining systems shall be water-tight, Type 1 (75 kPa) joints as per CSA B182.8.
6. Cover: 450 mm minimum at the shoulder of the road.
7. Bedding: Culverts to be bedded and backfilled with granular material in accordance with OPSSs.
8. Where it is necessary to construct culverts under roadways larger than the minimum size, the culvert shall be designed in accordance with a method recognized by the MTO. Detail drawings and calculations shall be submitted for review and acceptance to the Township Public Works Department.
9. The Township Public Works Department shall require guide markers to be placed to mark the ends of road crossing culverts.
10. Where fill depth over the culvert exceeds 4 m, concrete pipe material is required.

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11. In locations where the culvert acts as a fish barrier, an effort shall be made to eliminate the fish barrier in consultation with NVCA.
12. Notwithstanding the specification of minimum sizes, culverts shall be designed to convey the 25-year storm peak flow rate in accordance with the provisions of these standards.

C7.00 Maintenance Holes**C7.01 Location**

MHs (including CBMHs where applicable) shall be located at each top end or dead end of a sewer line, each change in alignment, slope or pipe material, at all pipe junctions and at intervals along the pipe to permit entry for maintenance. Radius pipe sections shall be designed with an MH at the beginning and end of the curvilinear section. MHs shall be located as per Township Standard Road Cross-section Drawings.

MHs located outside of the roadway should be provided with an MH identification sign for locating purposes.

C7.02 Maximum Spacing of Maintenance Holes

Spacing of MHs shall be in accordance with the following table:

Table 5: Maintenance Hole Spacing

Pipe Diameter	Desirable Spacing	Maximum Allowable Spacing
300 mm to 975 mm inclusive	100 m	110 m
1,050 mm to 1,350 mm inclusive	120 m	130 m
1,500 mm and above	150 m	160 m

C7.03 Maintenance Hole Types

The minimum size for an MH shall be 1200mm in diameter.

All MHs are to be supplied as precast concrete structures. The type, size, and depth of all MHs shall be indicated on the plan and profile engineering drawings. The standard MH details as shown on the OPS Drawings shall be used for MHs.

All standard specified MHs, up to 3600mm in diameter, to be pre-cast as per latest OPSD 701.010 to 701.015 and OPSD 701.030 to 701.080. MH sizing shall be based on pipe opening and benching, as per latest OPSD 701.021.

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In cases where the standard drawings are not applicable, the MHs shall be individually designed and detailed. The consulting engineer shall analyze individually each application of the standards related to soil conditions, loading, and other pertinent factors to determine structural stability. Shop drawings shall be stamped by a structural engineer and submitted to the Township for review and approval.

Precast MHs shall conform to CSA A257.4 specifications.

C7.04 Maintenance Hole Design

The direction of flow in any MH shall not be permitted at acute interior angles. The maximum change in direction of flow shall be 90° for sewers up to 900 mm in diameter and 45° for sewers over 900 mm in diameter.

Safety gratings shall be provided in all MHs in accordance with OPSD 404.020, when the depth of the MH exceeds 5.0 m. The maximum spacing between safety gratings shall not exceed 4.5 m. Detailed base designs shall be provided when the MH depth exceeds 9.0 m.

When the difference in elevation between the invert of the inlet and outlet pipes exceeds 0.9 m, a drop structure shall be placed on the inlet pipe, as per OPSD 1003.030 or 1003.031 and Township's approval.

All storm sewer MHs shall be full height benched in accordance with current OPSD.

Frost straps are to be provided between the upper section through to the base of the MH section as per OPSD 701.100. All holes in concrete are to be rotary drilled and sealed watertight using a polyurethane or silicone caulking.

C7.05 Grades for Maintenance Hole Frames and Covers

All MHs located within the travelled portion of a roadway shall have the rim elevation set flush with the surface of the base course of asphalt. A maximum of three concrete modular rings to a maximum total thickness of 300 mm shall be permitted on MHs in new subdivisions.

The concreting and setting of the frame and cover shall be in accordance with OPSS and OPSD details. Prior to the placement of the surface course asphalt the MH frame shall be adjusted to the finished grade of asphalt using concrete modular rings. Steel and / or plastic adjusting rings may be permitted on a case

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by case basis with consultation and approval by the Township. No concrete shall extend over the edge of the MH.

C7.06 Head Losses Through Maintenance Holes

Suitable drops shall be provided across all MHs to compensate for the loss of energy due to the change in flow velocity and for the difference in the depth of flow in the sewers.

The minimum drops across MHs shall be as follows:

Table 6: Minimum Maintenance Hole Drops

Change of Direction	Minimum Drop
Straight Run	0.030 m
1° to 45°	0.050 m
46° to 90°	0.080 m

C8.00 Catchbasins**C8.01 Location and Spacing**

CBs shall be selected, located, and spaced in accordance with the conditions of the design. The design of CB locations and type shall take into consideration the lot areas, the lot grades, pavement width, road grades, and intersection locations. The maximum ponding depth at CBs in sag points of the roadway shall not exceed 0.3 m or impact private property under any circumstances.

CBs shall be generally located upstream of sidewalk crossings at intersections and upstream of all pedestrian crossings. CBs shall not be located in driveway or sidewalk curb depressions. Additional CBs may be required at road intersections, curves, and cul-de-sacs to facilitate satisfactory drainage. Double CBs shall normally be required when the CB intercepts flow from more than one direction and at sag points.

Table 7 summarizes the recommended maximum spacing for CBs:

Table 7: Maximum Catchbasin Spacing

Road Grade	Maximum Spacing
0.5% to 3.0%	90 m
3.1% to 5.0%	75 m
5.1% to 6.0%	60 m

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All CBs at street intersections shall be located on the tangent of the curb at a minimum of 0.6 m distance from the beginning or the end of the radial portion of the curb.

The maximum drainage area for any CB shall be 2,000 m² of paved area or 5,000 m² of grassed area.

C8.02 Catchbasin Types

CB design shall be per the OPSDs using precast type. Single CBs shall be 600 mm x 600 mm complete with cast iron frame and grate (OPSD 705.01). Double CBs shall be 600 mm x 1,450 mm completed with cast iron frame and grate (OPSD 705.020).

Special CBs and inlet structures shall be fully designed and detailed by the consulting engineer. Shop drawings shall be stamped by a structural engineer and submitted to the Township for review and approval.

C8.03 Catchbasin Connections

All CB connections are to have a minimum of 1.2 m cover over the pipe barrel.

Table 8: Catchbasin Connections

Type of Connection	Minimum Size of Connection	Minimum Grade
Single CB	250 mm	1.0%
Double CB	300 mm	1.0%
Rear Lot CB	250 mm	1.0%

C8.04 Catchbasin Frame and Grate

Standard single CB grate as per OPSD 400.010 and double CB grate as per OPSD 400.020 are required.

In general, "bike-proof" CB grates shall be used in the roadway or walkway areas. Frames shall be set to finished grade and ramped with asphalt such that drainage to the CB is not prevented, until the top course of asphalt is placed.

In cases where CB inlet capacity is a special consideration, grates may be proposed which provide increased capture of stormwater and are suitable for traffic loading, subject to the Township's review and approval.

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Design capacity is to be as per the MTO Drainage Maintenance Manual (Design Chart 4.04, 4.14, 4.19) for CBs including those on continuous grade and on sag points. 50% blockage of the inlets is to be considered for capacity calculations at sag points.

C8.05 Rear Lot Catchbasins (RLCBs)

The use of RLCBs is not preferred and is to be avoided by way of appropriate lot grading design (rear to front lot grading design). The use of rear lot systems will only be considered by the Township when alternate drainage solutions are not feasible. Where more than four lots are draining to a common swale, a RLCB and piped system is required. A maximum of eight lots may drain to one RLCB.

RLCBs and associated leads shall be located entirely within one lot, with the lead offset of 0.5 m from the property line, within a minimum 3.0 m wide side or rear lot easement. See Township Standard Details. House footings are to be extended to below the level of the sewer adjacent to the dwelling. All in accordance with OPSDs.

RLCBs shall be per OPSD 705.030 without sumps and shall be connected to the trunk storm sewer by a maintenance hole structure, except where the trunk sewer size exceeds 450 mm diameter, in which case the lead may be connected directly to the main sewer with manufactured tees. RLCBs are to be sumpless. RLCB grates to be 'bird cage' style as per OPSD 400.120.

The lead shall be 250 mm minimum in diameter and concrete encased or concrete pipe from the RLCB to the street line.

It is noted that RLCBs and their leads are located on private property within easements in favour of the Township and shall not be assumed by the Township as a municipal service. They are to be maintained by the respective property owners.

C9.00 Easements and Blocks

Where underground services, drainage, or utilities are placed outside road allowances or blocks of land under the ownership of the Township, permanent easements or blocks are required. All municipal infrastructure shall be located in blocks. Local overland drainage such as rear yard and side yard swales that

Section C – Stormwater Management and Drainage Systems

do not contain below ground subdrain or pipes do not require an easement. Major overland flow routes such as a pond outlet are to be located in blocks.

Rear yard drainage systems, particularly those requiring piping and structures, shall be avoided by using back to front lot drainage in lieu of split drainage, wherever possible. Rear yard drainage systems will only be accepted if back to front lot drainage is not possible.

The Developer will obtain at no expense to the Township a block for drainage through lands other than its own. The Township shall be protected or indemnified by the Developer from all claims or actions arising from the use of such lands until such time as the services installed become assumed by the Township. Apart from easements required for RLCBs and associated leads, any easements or blocks proposed for utilities, storm sewers, sanitary sewers, and watermains shall be reviewed with the Township prior to the first submission. Where they cannot be avoided, piped rear yard drainage systems shall be in an easement. All other infrastructure including storm sewers, sanitary sewers, and watermains shall be within appropriately sized blocks.

C9.01 Rear Yard Catchbasin Leads

Easements will be required for all RLCB leads. All CB leads and the RLCB are to be located on one lot. Easement widths shall be a combined minimum of 3.0 m wide, 1.5 m on each property for leads with a maximum cover of 2.7 m. "Hourglass easements" will be permitted with the width of the easement decreasing between the dwellings based on the side yard setbacks permitted for the dwellings (typically 1.5 m minimum). The easement width beyond the house envelope based on minimum front and rear yard setbacks shall be the standard 3.0 m width. See Township Standard Details.

For leads being constructed with cover deeper than 2.7 m, the easement widths shall be increased based on consultation with the Township.

C9.02 Storm Sewer Blocks

All pipes with a diameter of less than 900 mm constructed within blocks between side lot lines shall be concrete encased, or concrete pipes, as set out below. All pipes 900 mm or larger in diameter constructed between side lot lines shall be increased in strength by one class from that required based on the earth loading.

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The bearing capacity of native soils must be preserved for all pipes being constructed between proposed buildings. This shall be achieved by:

- Extending the building foundations to the depth of the underside of pipe adjacent to the building.
- Placing the pipe in a sleeve constructed by tunneling.
- Installing the pipe by vertical trenching with steel sheeting left in place and cut off 0.3 m above the building foundation. The depth of the steel sheeting below the pipe invert is to be determined by a geotechnical engineer. Sufficient struts are to be left in place to ensure that the steel sheeting does not move during the backfilling operation.

The trench excavation and reinstatement or tunneling operation is to be monitored by a geotechnical engineer and certification will be required that the soils have the required bearing capacity to support the building being proposed adjacent to the pipe installation.

C9.03 Concrete Encasement

Concrete encasement shall have a square cross-section with a concrete thickness of not less than 0.150 m. The concrete shall be 15 MPa strength and vibrated in place.

C10.00 Service Connections

C10.01 Residential

Storm services for single family, semi-detached, and townhouse units are not permitted. Direct connections to foundation drains are not permitted. Sump pumps shall discharge over the foundation wall to a splash pad, and conveyed overland through side yard swales to an appropriate outlet.

C10.02 Industrial / Commercial / Institutional

Storm service connections for ICI will be considered on an individual basis by the Township. Non-standard locations are subject to the Township's approval and must be detailed on the plan and profile and utility coordination drawings.

The service connections for ICI areas shall be sized individually according to the intended use. The minimum size of service pipe shall be 200 mm in diameter. The minimum grade is to be 2%. The minimum cover at the street line shall

Section C – Stormwater Management and Drainage Systems

be of sufficient depth to permit servicing of buildings by gravity, wherever possible.

Storm service connections to ICI blocks shall require the installation of an inspection MH located on private property immediately adjacent to the property line.

C11.00 Testing

The following sections outline the testing requirements applicable to all developments upon completion of the storm drainage system including MHs, roadway CBs, RLCBs and leads, and ICI service connections. Testing must be completed prior to the placement of concrete curb and gutter and base course asphalt. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Township.

All testing must be witnessed by Township Public Works staff. Pre-testing by the Developer is recommended prior to contacting Township staff to attend for witnessing. A minimum of 48 hours' notice (working days) is to be provided to ensure Township staff's availability.

C11.01 Deflection Testing

All newly installed PVC and Polyethylene storm sewers shall be subjected to deflection testing in accordance with OPSS 410. Deflection testing is not required for concrete storm sewers.

The deflection test by the Developer shall not be conducted until the system has been thoroughly flushed and cleaned and a minimum of 30 days following backfill of pipe as per OPSS 410.07.15.05. Any deficiencies must be rectified prior to the commencement of the maintenance period.

C11.02 CCTV Inspection

All newly constructed storm sewers, CB leads, rear lot systems, and storm laterals shall undergo a Closed Circuit Television (CCTV) inspection in accordance with OPSS 409 following satisfactory completion of all other testing, prior to the Township's issuance of Acceptance of Underground Works (Initial Acceptance) and prior to the placement of surface course asphalt.

A permanent record in colour video form shall be supplied, illustrating a continuous record of the sewer installations, service connection, MHs, etc. A

Section C – Stormwater Management and Drainage Systems

report, which shall identify any unusual or substandard conditions shall also be submitted including recommendations on how issues identified have or will be rectified and associated timelines.

All CCTV work shall be performed by a Township approved video camera testing company, with a camera equipped with a full-swivel head capable of examining lateral connections, MH interiors, and other key features of the sewer installation.

The Township will require certification from the Developer's consulting engineer that they have reviewed the videos and have found the sewers to be acceptable and free of all defects. Any deficiencies should be clearly identified in the engineer's letter and confirmation that all deficiencies have been rectified must be included with the certification.

The CCTV inspection shall be carried out by an operator certified by NAAPI (or equivalent to the satisfaction of the Township), and shall be carried out in accordance with OPSS 409.

All video records, reports, and data provided from these inspections shall become the property of the Township.

An additional video inspection and report shall be required prior to assumption.

If Work is being carried out in an existing ROW, with existing storm or sanitary infrastructure that is to remain in place, CCTV inspection of the existing infrastructure is required before and after construction, to confirm the existing infrastructure has not been damaged during construction.

C11.03 Visual Inspection

All storm sewer structures shall be visually inspected by the Township for deficiencies. The visual inspection by the Township shall not be conducted until the system has been thoroughly flushed and cleaned and a minimum 30 days following backfill of pipe as per OPSS 410.07.15.05. Any deficiencies identified must be rectified prior to the commencement of the maintenance period for the applicable phase or the overall development.



Section D – Watermains and Appurtenances

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Section D – Watermains and Appurtenances

D1.00 General

Water distribution systems shall be designed as a network system to meet the water demand for each area or subdivision. Oversizing of watermains will be required to provide for adjacent areas where service is expected to be extended. Long dead end mains and single supply systems are to be avoided.

All watermains, appurtenances, and service connections shall be installed at the minimum covers specified in this section. In areas where the minimum cover cannot be achieved, special provisions shall be considered to protect the pipe from live loading and freezing.

All watermains shall be sized to meet the greater of the maximum day demand plus fire flow or the peak hour demand. Mains in subdivisions shall have a minimum of two connections to the existing water network. Privately-owned systems are to have a maximum of one connection to the municipal system.

In general, the Township will complete the hydraulic modelling for the development in their overall system model; however, the Township may require a computer analysis for all or any phased portion of the proposed watermain systems.

Hydrant testing shall be completed by the Developer and provided to the Township to confirm assumed boundary conditions before and after the development is completed.

With the Township's Drinking Water Works Permits, most alterations of the Township's water systems, by addition, modification, replacement, or extension must satisfy the requirements of the specific permit. Accordingly, watermain designs shall comply with the MECP Design Guidelines for Drinking Water Systems and must be reviewed and approved by the Township, in accordance with the Township's Drinking Water Works Permits.

Final approval by the Township to construct the Works will not be given until the Township and the Township's consulting engineers have accepted the Works. "Form 1" in accordance with the Township's Drinking Water Works Permit shall be completed by the design engineer and submitted to the Township as part of the first engineering submission.

Record Drawings of the watermain system shall be provided to the Township within 90 days of the watermain being placed in service.

Section D – Watermains and Appurtenances

D1.01 Confirmation of Available Capacity

As part of the pre-consultation process and prior to the commencement of any design, the Developer and / or designer must contact the Township and confirm that there is adequate capacity in the system, as well as the water treatment facility, to accommodate the proposed project.

D1.02 Service Area

Systems shall be designed to service all areas within the development area to their maximum future development in accordance with the Official Plan.

D1.03 Limits of Construction

All watermains shall be terminated at the subdivision limits with a closed valve, cap, and thrust block when future extension is considered. Where a dead end watermain is included at a phase boundary or subdivision limit, a temporary or permanent hydrant or blow off is required.

Provision for future extension of the watermain (any oversizing) will only be considered for the lands which are within the limits of the current urban settlement boundary.

D1.04 Reporting Requirements

Reporting requirements are outlined in Section A for Development Applications.

D1.05 Verification Report (Flow Testing)

After the watermain system is constructed and commissioned, all hydrants within the development shall be flow tested and the results provided to the Township. The flow tests results shall include the actual or interpolated hydrant flow at 140 kPa (20 psi) residual pressure.

If the hydrant testing results for fire flows are less than the fire flow requirements for the Development based on the FUS flow calculations, the Township shall be advised, along with a proposed plan on how the Developer will rectify this issue.

D1.06 Fire Flow

Fire flows are to be determined based on the most recent publication of the FUS of the Insurance Bureau of Canada. Detailed calculations are to be submitted for the 'worst case' for each housing type in the development, including any ICI blocks.

Section D – Watermains and Appurtenances

In general, the minimum fire flow requirement for a particular structure or area of the Township shall be as follows:

- 100 L/s – Single-family and Semi-detached Residential Dwellings.
- 133 L/s – Townhouses (maximum 2.5 storey).
- 225 L/s – Institutional / Convenience Commercial.
- 350 L/s – Industrial / Commercial (minimum 250 L/s, when approved by the Township).

D1.07 System Pressures

The maximum sustained operating pressure shall not exceed 550 kPa (80 psi). If pressure in a localized area is above this level, a pressure-reducing valve shall be installed on each service to protect plumbing within the building, within that area in accordance with the OBC.

Under normal conditions of maximum day demand, the pressure shall not drop below 345 kPa (50 psi) at any point in the water system.

Under conditions of peak hour demand, the pressure shall not drop below 275 kPa (40 psi) at any point in the water system.

Under conditions of simultaneous maximum day and fire flow demands, the pressure shall not drop below 140 kPa (20 psi) at any point in the water system.

D1.08 Flow Design

The Hazen-Williams formula in accordance with the current MECP design criteria shall be used for the design of water distribution systems.

The Hazen-Williams equation is as follows:

$$Q = 0.84918 (C) (A) (R)^{0.63} (S)^{.054}$$

Where C = Coefficient of Roughness:

- C = 100 for 150 mm watermain and smaller.
- C = 110 for 200 mm and 250 mm watermain.
- C = 120 for 300 mm watermain and bigger.
- A = Cross-section Flow Area.
- R = Hydraulic Radius (m).
- S = Slope of Energy Grade Line (mm).

Section D – Watermains and Appurtenances

D1.09 Domestic Demand

Domestic water demand shall be calculated on the basis of an average day consumption rate of 400 L/cap/day, or as directed by the Township.

Maximum Daily demand factor shall be determined from the current MECP design guidelines; however, a minimum of 2.0 is to be used.

The following densities should be used for determining expected populations in residential developments.

- Single Detached Dwellings = 3.0 ppu.
- Semi-detached Dwellings = 3.0 ppu.
- Townhouses = 2.4 ppu.
- Apartments = 1.6 ppu.

A density of 3.0 ppu shall be used for determining expected populations in residential developments where unit types are not yet known.

A peak hour demand factor shall be determined on an individual basis and approved by the Township; however, a minimum of 3.0 is to be used.

In the absence of sufficiently detailed development concepts, unit densities shall be used per the Official Plan or a Secondary Plan.

A calculation shall be provided in the Functional Servicing Report to convert the water demands into equivalent single detached equivalents (SDEs) per the methodology in Section A.

D1.10 Industrial, Commercial, and Institutional (ICI) Water Demands

Where details of the development are known, calculated demand based on actual projected usage, fixture units, or historical records of similar sites shall be used.

In the absence of this information, the following minimum average daily demand rates shall be used (based on gross developable area) for planning purposes, in conjunction with MECP Guidelines. Fire flows shall also be considered:

- Commercial – 0.28 L/s/ha.
- Light Industrial – 0.4 L/s/ha.
- Heavy Industrial – 0.64 L/s/ha.
- Institutional – per MECP Guidelines or specific usage.

Section D – Watermains and Appurtenances

The Maximum Day factor shall be 2.0 to 4.0, or as recommended by the MECP. Peak flows shall be determined on an individual basis and approved by the Township.

The Township reserves the right to allow or impose alternative standards or require site-specific studies.

D2.00 Watermain Design**D2.01 General**

The standard drawings depict in part the Township's requirements for services, locations, and methods of construction. These standards will form part of the engineering drawings. The Township must approve any variation from these standards.

D2.02 Location in ROW

Watermains shall be located as shown on the Township's standard roadway cross-sections. This location shall normally be on the north and west sides of the street. The watermain shall not be located on the same side as the sidewalk, except where there are sidewalks on both sides of the street.

Placement of valves in the wheel track of a travel lane shall be avoided, whenever possible. At intersections, the preference is to have valves located in the boulevards and out of the asphalt.

D2.03 Location Outside the ROW

Any watermains which are situated outside of the ROW shall be contained within a block. Where watermains are located in blocks, the block width shall be 3.0 m for watermain at a depth less than 2.0 m and 6.0 m for watermains greater than 2.0 m depth, unless depth or size of watermain dictates a larger width necessary for maintenance. Watermain to be centered within block. Additional depth of footings for houses adjacent to the watermain block shall be considered in the design.

D2.04 Material Specifications

Watermain pipe shall be C900 Class 235 rated PVC pipe with rubber gasket joint fittings. Push-on PVC rubber gasket joint fittings are not to be used on any hydrant lead, elbow, or tee. All materials that come into contact with potable

Section D – Watermains and Appurtenances

water shall conform to NSF 61 and the latest American Water Works Association (AWWA) Standards. All fittings are to be ductile iron AWWA C110.

The type and material classification of all watermains and bedding types shall be clearly identified on all profile drawings.

PVC is acceptable for use in all development projects (residential and ICI).

D2.05 Bedding

Watermain bedding shall be constructed with bedding as per OPSD 802.010 (Granular "A" embedment material) or high-performance bedding for flexible pipes and OPSD 802.030 or 802.031 Class "B" (Granular "A" bedding material, Granular "A" or select native cover material) for rigid pipe unless otherwise approved by the Township.

Alternative embedment material shall be sand meeting gradation requirements of OPSS 1004.05.05 compacted to 98% Standard Proctor Density. Geotechnical certification of alternative material must be provided every 150 m and approved by Township prior to installation. The compaction testing must include the entire envelope (haunches, bedding, and top of pipe).

D2.06 Depth of Cover

- Curb and Gutter Roads – 1.80 m minimum cover.
- Open Ditch Roads – 2.2 m minimum cover.
- Unbuilt future Roads – 1.80 m minimum cover measured from ultimate design grade.
- Road crossings – 2.2 m minimum cover.
- Watercourse, Creeks – 2.0 m minimum cover.

In areas where the Township allows a watermain to be installed with less than a minimum cover, the contractor is to supply and install insulation as directed by the Township to protect watermains, hydrant leads, and appurtenances.

D2.07 Horizontal Separation Between Sewers and Watermains

Watermains shall be designed to have a minimum clear distance of 2.50 m from any sewer, forcemain, or MH.

Where clearances cannot be achieved, the design shall be completed in accordance with MECP Procedure F-6-1.

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D2.08 Watermain Crossing Sewers and Other Utilities

Watermains shall normally cross above sewers with sufficient vertical separation to allow for proper bedding of the watermain (minimum 0.5 m).

When it is not possible for a watermain to pass over a sewer, the watermain passing under the sewer shall have a vertical separation of 0.5 m below the sewer and the top of the watermain. The sewer must be adequately supported to prevent settling and displacement of the joints.

Watermains crossing over or under other utilities must be designed with a vertical separation of 0.5 m between the outside edges of the watermain and the utility.

D2.09 Dead Ends

The watermain distribution system shall be designed in grid patterns and looped. For the purposes of water quality, all new pipe systems must be looped and connected to the existing municipal water distribution system at a minimum of two locations. Dead end sections are not acceptable.

Where dead ends cannot be avoided, a fire hydrant or flushing hydrant for flushing purposes shall be installed at the end of the watermain.

Temporary dead ends on watermains that are to be extended in the future shall be equipped with a temporary fire hydrant or flushing hydrant at the end of the watermain.

At cul-de-sacs, a local 50 mm dia. pipe loop connected to a minimum of four individual services is required to maintain constant flow and satisfactory water quality within the system.

All below ground infrastructure, including watermains, are to be extended to the subdivision limits for future connection.

D2.10 Minimum Sizes

For all watermains designed to carry fire flows, the minimum sizing of watermains shall be as follows:

- Residential – 150 mm diameter, 200 mm for single feeds.
- Commercial – 200 mm diameter.
- Industrial – 200 mm diameter.
- Institutional – 300 mm diameter.

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D2.11 Tracer Wire

Tracer wire shall be installed on all watermains, and hydrant leads to permit field tracing of the watermain, without loss or deterioration of signal using industry standard locating equipment. The wire is to be secured to the top of the watermain with mastic tape, at every fitting and valve and at intervals not to exceed 300 m. All tracing wires shall be 12 gauge stranded copper wire complete with outer plastic coating. The wire shall be protected from damage during the installation of Works. Breaks / cuts in the tracer wire will only be permitted at hydrant laterals, water services, tees, and crosses.

Tracing wire shall be brought up and looped inside each valve box so that continuity of the wire shall be maintained.

Tracer wire shall be installed with watermain and services that are directionally drilled by pulling the wire into place with the pipe.

Where directed by the Township, utility location markers shall be placed for specific features as directed by the Township. Continuity testing is required. A certificate of continuity, from the Developer's consulting engineer, will be required at time of Acceptance of Underground Works (Initial Acceptance).

D2.12 Corrosion Protection

For any installation of water pipe systems, an investigation of the soils conditions shall be undertaken to determine the corrodibility of the native soils and to provide recommendations with regard to corrosion protection.

Sacrificial caps are to be provided on every bolt of all mechanical joints and restrainers. The bolt lengths shall be sufficient to accommodate the caps. Zinc anodes or other corrosion protection measures may also be required as directed by the Township.

Cathodic protection shall be provided for all tracer wires on PVC watermains.

As a minimum, 175 gram zinc caps or approved equivalent shall be installed on each bolt of any mechanical connection. Additionally, a 5.4 kg (12 lb) packaged zinc anode shall be installed on each hydrant and all valves.

D2.13 Caution Tape

When the watermain is installed in non-standard locations, blue caution tape shall be installed along its length, between 0.3 m and 0.5 m above the watermain.

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D2.14 Joint Restraint

Mechanical joint restraints and concrete thrust blocks are to be installed at all tees, horizontal bends, vertical bends, hydrants, end of mains, and valves. Watermain to be fully restrained at all joints in all areas of disturbed non-native backfill material and shall conform to the latest OPSS and pipe / restrainer manufacturer requirements.

The contractor shall provide a Restrainer Plan indicating all mechanical restrainers and fittings to the Township for review and acceptance prior to construction of the watermain.

The minimum length of restrained pipe beyond the fitting is to be in accordance with manufacturer's recommendations. All mechanical restraint systems shall be installed with cathodic protection.

When approved by the Township, joint deflection is permitted as per manufacturer's recommendations for bends 11.25° and less.

D3.00 Valving Requirements**D3.01 Type**

Unless specified or approved by the Township, all valves shall be resilient wedge gate valves. Valves shall have a non-rising stem and a 50 mm square operating nut, opening counter-clockwise.

All valves at points of termination of a stage of construction shall be braced with two additional lengths of watermain pipe beyond the gate valve and a temporary flushing hydrant installed. Where watermain valves are located under traveled road surfaces, the top of the operating box shall be set 50 mm below road grade for gravel surfaces and flush with road grade for paved surfaces. Valve stem extensions are required for valves at a depth of more than 2.0 m below finished grade.

D3.02 Size

In all cases, the size of the line valves shall be the same size as the watermain diameter.

D3.03 Number, Location, and Spacing

Valves shall generally be located along the projection of side lot lines, at intersections, and as required for spacing.

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At cross intersections, four valves are required. At tee intersections, three valves are required.

Maximum spacing shall be 200 m or 40 units on all distribution mains and 400 m on trunk supply mains, or as directed by the Township.

Valve boxes shall be located in the boulevards behind the curb radius and out of the pavement areas wherever possible. Valves are not permitted in sidewalks.

D3.04 Valve Boxes and Chambers

All valves on watermains less than 300 mm in diameter shall have three piece, sliding type, Type 'D' valve boxes. Valve boxes are required on 150 mm dia. to 375 mm dia. watermains, except at high points where a chamber is required complete with an air release valve. The top of the valve box is to be set at the finished grade elevation. All valve stems must be within 1.6 m of finished grade. A valve stem extension shall be required where necessary to meet this criterion.

On watermains greater than 600 mm dia., drain valves in chambers are required.

Watermains crossing watercourses, railways, and provincial highways shall have a valve installed on each side of the crossing. No services shall be connected to the main between the valves isolating the crossing.

D3.05 Air Release Valves

High points of all trunk watermains shall have air release valves and isolation valves in a valve chamber.

As an alternative to air release valves, where appropriate, fire hydrants may be located at or near high points in the system to achieve the same purpose.

D3.06 Pressure Reducing Valves and Chambers

Where confirmed by the water modelling calculations, pressure reducing valves complete with chamber must be installed. Detailed requirements will be confirmed by the Township at the time of completion of the water modelling calculations.

D3.07 Drain Valves and Chambers

Drain valves shall be provided at low points of all trunk watermains and, where possible, installed together with valves in valve chambers. Drain chambers

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should, when possible, be connected to a storm sewer MH or another technically feasible outlet point.

D4.00 Fire Hydrants**D4.01 Installation**

Hydrants shall be installed in accordance with OPSD 1105.010, as amended and shall generally be located as follows:

- Residential areas – Along the projection of lot lines.
- Industrial areas – Centrally along lot frontages.
- Maximum spacing for all areas is 150 m.
- Hydrants shall be mounted with break-away flange at a maximum height of 100 mm above finished grade.
- At the end of dead end mains, either temporary or permanent.
- At high points along the watermain system, as an alternative to air release valves.
- All joints shall be mechanically restrained and braced with concrete thrust blocks.
- 100 mm Storz pumper port facing the street. Side ports to be 65 mm.
- Hydrant leads are to be 150 mm diameter and have shut-off valves placed 900 mm from the hydrant.

The spacing and location of hydrants on private property is governed by the OBC.

D4.02 Markers

Hydrant markers shall be yellow, 1.2 m high, FH-800 Series Canadian, and connected to the side port.

D4.03 Painting

Hydrants shall be painted with rust proof paint prior to final acceptance in accordance with National Fire Protection Association (NFPA) 291 as follows:

1. All hydrant bodies or “barrels” are to be chrome yellow.
2. Side ports and top / bonnet to be painted to indicate capacity:
 - a) Light Blue for Class AA (= to or > than 5,680 L/min or 1,500 GPM).

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- b) Green for Class A (3,785 to 5,675 L/min or 1,000 to 1,499 GPM).
- c) Orange for Class B (1,900 to 3,789 L/min or 500 to 999 GPM).
- d) Red for Class C (<1,900 L/min or 500 GPM).

Private hydrants barrel to be painted red.

D4.04 Location of Hydrants

Hydrants shall be 1.5 m minimum distance from the edge of any driveway or house service location. Other above-ground utilities such as light standards, transformers, or street signs shall not be located any closer than 3.0 m to a hydrant.

D4.05 Bedding Requirements

All hydrants shall be installed in accordance with OPSD 1105.010, have open drainage holes and be installed with mechanically restrained joints. The hydrant base is to be installed in clear stone enclosed with a geotextile fabric to ensure free draining of the boot.

D5.00 Service Connections**D5.01 General**

A single water line shall be installed to service each residential property. Services for other uses are to be adequately sized and identified on the engineering drawings. Services shall be installed according to OPSD 1104.010 and 1104.020.

It is the Township's policy to allow a single water service and single water meter per property.

Disconnection of abandoned / decommissioned water services shall be at the main stop valve at the main line unless approved by the Township.

D5.02 Material and Sizing

Each housing unit shall have a separate 25 mm diameter (minimum) 1,300 kPa rated high density polyethylene (HDPE/PEX) water service.

Service connections to watermains shall be broadband stainless steel saddles on PVC.

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D5.03 Large Diameter Connections to Supply Main

New water service connections 50 mm in diameter and larger, including testing and commissioning procedures, shall be made to the satisfaction of the Township.

D5.04 Location of Curb Stops and Control Valves

Water service connections are to be located at a minimum of 1.5 m from the edge of the driveway and at a depth of 1.9 m for cover, as per Township Standard Drawings.

The curb stop / control valve on all water service connections shall be located at the property line. Curb stops shall not be located in driveways. Water services shall be installed to the property line with a main stop, non-draining curb stop, and service box or approved equal to the center of the property line. All water services shall be installed in conjunction with watermain construction and in advance of road construction.

D5.05 Backflow / Cross connection Valves

Private connections to the water system including ICI and agricultural properties, and condominium developments shall have a backflow device installed prior to any upstream connections, such as tees. The type of backflow valve shall be determined based on the hazard level of the Site, as dictated by Township staff. The backflow device shall be in a heated mechanical room of a building. Backflow devices shall be as per CSA and OBC Standards.

Backflow devices shall be installed downstream of the water meter. There shall be no connection to the watermain prior to the backflow valve.

Backflow flow devices shall have a double check valve in low risk settings and a reduced pressure backflow in high-risk settings such as industrial or commercial sites that could pose a risk to the safety of the water system.

Reduced pressure backflow preventors must be certified annually by a qualified person, and a copy of the certification provided to the Township.

Removal of backflow preventors without the Township's written permission is prohibited.

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D5.06 Park Service Connections

A minimum 50 mm dia. water service, complete with curb stop shall be installed to the street line of all park blocks. The location along the frontage of the park block shall be determined in consultation with the Township during pre-submission consultations.

A 150 mm dia. water supply line, complete with valve at street line, may be required at the direction of the Township for community parks.

D5.07 Private Wells

Private wells are only permitted in rural areas outside of the urban settlement boundary. New private wells and private wells being removed from service shall be abandoned following the requirements in the "Water Supply Wells: Requirements and Best Practices" MECP manual, following Regulation 903, as amended under the *Ontario Water Resources Act* R.R.O. 1990.

D6.00 Miscellaneous Fixtures**D6.01 Sampling and Flushing Stations**

Blow Off Hydrants are to be installed on a separate 50-mm water service in locations as determined necessary to ensure sufficient flow of water in the distribution system. Said devices are generally required in each phase of a development where there are permanent dead ends and any temporary dead ends within a water distribution system that the Township does not expect to be extended within two years, or in areas of low flow (i.e., as a result of an insufficient number of dwellings).

Water sample stations are to be installed on a separate 25 mm (minimum) water service. In general, one sampling station is required at a rate of 1 per 300 residential units. The sampling station is to be located within the municipal ROW, or in a park or other public blocks, as directed by the Township.

Maintaining regulatory compliance for municipal water systems, ensuring safe and clean drinking water is integral to the overall Municipal Drinking Water System. Any requirements to maintain distribution water quality will be performed by the Township at the Developer's expense, as per the Subdivision Agreement, until such time as the Township deems that there is sufficient draw to maintain water quality that meets or exceeds legislation and is comparable to that of the existing system.

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The program will be implemented immediately following the system being connected to the municipal system.

D6.02 Water Meters

All residential, ICI, or any other water usage directly from the municipal drinking water system, shall be metered, backflow protected, cross-connection protected, and unauthorized use protected.

The installation and use of water meters shall meet all requirements of, and are subject to, all applicable Township water distribution specifications and by-laws.

Water meters located in a crawl space, or other inaccessible areas will not be accepted. The Developer shall keep the water meters accessible, clean, dry, and protected from freezing.

The meter is to be located in the house at an accessible location.

The Township shall supply and install water meters up to and including 25 mm. The Developer shall pay for the water meter, along with inspection fees and other associated fees, at the building permit stage.

All meters greater than 25 mm shall be confirmed and paid for in advance of ordering by the Township, by the Developer. The Township shall supply the water meter. Water meters greater than 25 mm shall be installed by a licensed plumber.

Larger ICI installations will require a meter sized according to the intended use, of a make and type as specified by the Township. The actual size of the water meter is to be generally one size smaller than the water service connection.

D6.03 Pressure Reducing Valve

Where static pressures in the main are in excess of 550 kPa (80 psi) an individual pressure reducing valve shall be required to protect plumbing within the building.

D7.00 Watermain Testing

D7.01 Construction Sequence

All water services, hydrants, and other works on any section of watermain shall be installed in conjunction with watermain construction at a time stipulated by the Township and shall be completed prior to construction of finished roads and / or ditches.

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Backfill to watermains and services across roadways shall be approved granular material thoroughly compacted. The mains and services shall not be backfilled until approval from the Township has been given.

D7.02 Commissioning Watermain

Commissioning of the watermain shall follow the Township's Commissioning and Connecting New Watermain Policy, current AWWA Standards, OPSS, MECP, and Ontario Safe Drinking Water Act. Where discrepancies exist between the standards, the most stringent requirement shall be used.

The Developer's consultant shall provide a comprehensive written Watermain Commissioning Plan and Final Connection Plan proposal of how the testing is to be conducted and by whom. Plans are to be submitted prior to the start of the watermain construction for acceptance by the Township. The consultant shall witness all testing and provide certification of compliance.

D7.03 Testing

Prior to any testing, the Developer's consultant shall obtain and review the most current version of the Township's testing and commissioning checklist and submit the required documentation.

All swabbing, pressure testing, disinfection, flushing, and dechlorination is to be completed by an accredited third-party company and certified water operator or as agreed upon in advance at the discretion of the Township.

Testing of the system shall conform to Ontario Watermain Disinfection Procedure.

The Township's representative shall be on-site for all testing and to record results per the Township's Drinking Water Quality Management System procedures. No connections to the existing water distribution system shall be allowed until all parties have signed the Subdivision Agreement. Final connections will not be permitted until all testing and sampling has been completed to the satisfaction of the Township. When all the above conditions are met, the new system may be connected to the existing system.

D7.04 Acceptance of Water System

Generally, the Township shall accept the watermains for operating purposes as soon as the supply and distribution system has been constructed, tested, and disinfected to the satisfaction of the Township and connection has been made

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to the existing system. Once accepted, the Township shall be the Operating Authority and shall operate and control the system.

Notwithstanding the above, assumption of the water system by the Township shall be subject to and in accordance with the Subdivision Agreement for the Development.

D7.05 Decommission of Services

Where existing services are to be removed, the service is to be removed completely to the watermain, including the main stop valve. For services 50 mm and under, it is to be plugged with a proper (brass, copper) plug. For services over 50 mm, they will be disconnected by removing the tapping sleeve and valve, or tee and valve, or both from the main and a fill piece shall be installed.

D7.06 Decommission of Watermain

Where existing watermain is to be abandoned, the main is to be capped, complete with mechanical restraints. Valve stems and hydrants are to be removed and the remaining watermain is to be capped.

D7.07 Temporary Connection

The new watermain shall be completely isolated, physically separated from the existing water distribution system until satisfactory bacteriological testing has been completed and accepted by the Township. Water required to charge the new main shall be supplied through a temporary connection between the existing water system and the new main. The temporary connection shall incorporate a CSA-certified reduced pressure principle (RP) backflow preventer that has been selected and field tested in accordance with CSA Standards B64.10 and B64.10.1. The cross-connection control device is to be certified by a qualified person, 72 hours prior to use on Township watermains. The cross-connection control device shall be disconnected (physically separated) from the new main during hydrostatic testing and reconnected afterwards.

D7.08 Swabbing and Preliminary Flushing

Each section of the new watermain shall be cleaned with a minimum of two clean new wet swabs supplied by the contractor. The swabs shall be numbered, and Township Staff is required to witness the installation of swabs by the contractor. A swabbing schedule shall be prepared by the Developer's

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consultant and approved by the Township in advance of the swabbing taking place. The swabbing schedule shall indicate where the swabs are to be installed and removed. All swabs shall be accounted for and removed from the system prior to pressure testing the system. Any swabs that are not accounted for must be located and removed from the watermain section. All costs including material, labour, equipment, and excavation shall be borne by the Developer with no cost to the Township. Additional swabbing is required if the water is not clear after the second swab has passed through the watermain. Swab length shall be 1.5 x swab diameter. Swab diameter shall be 50 mm greater than the inside diameter of the watermain. Swab density to be 1.5 lb/board ft (high memory foam).

The flow rate for swabbing / flushing should be sufficient to maintain the velocity in the main in order to keep particles in suspension. Swabbing shall continue until the water runs clear for ten seconds and turbidity measurement is less than 1 Nephelometric Turbidity Unit (NTU) after the last swab exits the watermain. Preliminary flushing of the main shall immediately follow the swabbing operation.

D7.09 Hydrostatic Leakage Test

The test pressure shall be 1,035 kPa (150 psi) which shall be maintained continuously for the duration of the two hour test with zero leakage and zero pressure drop for the entirety of the watermain. If the pressure test meets this criterion, the system as a whole, shall be accepted.

If the above criterion is not met, the system will be divided into sections no greater than 305 m in length. Each section will be tested individually and will be required to meet the allowable leakage and test pressure criteria, as outlined in the AWWA Specification C605 "Hydrostatic Testing" and "Pressure and Leakage Test".

Hydrostatic leakage testing shall be undertaken in accordance with OPSS 701.07.22 under the supervision of the Township. Prior to commencing the hydrostatic test, all primary line valves shall be operated and verified that they are in the open position. The criteria for hydrostatic testing in this section pertain to all pipe materials, except PE. Refer to OPSS 701.07.22.02 for PE pipe testing criteria.

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D7.10 Disinfection

Testing of the system shall conform to Ontario Watermain Disinfection Procedure.

Watermains, services and all appurtenances shall be disinfected in accordance with the current version of the Ontario Watermain Disinfection Procedure. The entire main shall be filled with heavily chlorinated water, the minimum concentration of chlorine is to be 50 mg/L to a maximum of 200 mg/L. The chlorinated water shall be retained in the main for a minimum 24 hours to a maximum of 72 hours, during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenance. At the end of the disinfection period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L, or not less than 40% of the original free chlorine residual. If the chlorine residual is less than 10 mg/L of free chlorine in any portion of the test section, the disinfection procedure shall be repeated. The target maximum concentration of chlorine is 150 mg/L to 200 mg/L.

During the disinfection process, the hydrants should be open and the leads and barrels treated the same as the watermain.

All chemicals used for disinfection shall meet the requirements of both the AWWA and American National Standards Institute (ANSI) safety criteria standards NSF/ANSI/CAN 60 and documentation of such shall be provided to the Township.

It is the responsibility of the Contractor, during charging, swabbing, chlorination, and flushing of the system, to supply a means for the water to escape without causing damage / erosion to the existing grade of the property or any adjacent property.

D7.11 Final Flushing and Dechlorination

After the requirements of the disinfection section have been met, heavily chlorinated water shall be completely flushed from the watermain, hydrant leads and all services until chlorine levels in the watermain are no higher than levels generally prevailing in the distribution system. Levels must be within 20% of the free chlorine level in the supply water.

The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause

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damage to the environment, then a neutralizing chemical such as sodium thiosulfate shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine.

The discharge of chlorinated water directly to receiving waters can be detrimental to aquatic life; therefore, should not be considered as an option. A storm sewer should be considered directly connected with the receiving water which eliminates it as an option in most cases. Discharge to an open ditch or a vegetated field are good alternatives, especially if the point of discharge is a considerable distance from the receiving water and the ditch is unlined, heavily vegetated, and overrun with organic materials. Sunshine and high temperatures aid in dissipation of the chlorine. Slow discharge to a sanitary sewer, if approved by the Township, may be an option. In order to avoid upsetting the biological processes at the wastewater treatment facility, the distance between the point of discharge and the treatment facility must be taken into account along with the rate of discharge in order to sufficiently dilute the chlorinated water before it reaches the facility.

If dechlorination is necessary, there are several chemicals which can be used effectively. Adequate dosage of the chemical and mixing with the chlorinated water must be ensured.

D7.12 Sampling and Bacteriological Testing

Sufficient blow offs / sampling ports (including their eventual removal) should be provided to accommodate the sampling requirements detailed herein. Sample points shall be from a clean area to the satisfaction of the Township. After the requirements of previous sections have been met, two consecutive sets of water samples shall be collected at the ends of all branches, stubs, and not more than 350 m apart along the length of the watermain in accordance with the Ontario Disinfection Procedure. In addition, it is recommended that the existing distribution system be sampled for testing as well. The watermain shall not be flushed or disturbed during the minimum 24 hour period between sets of samples. Samples shall be taken by Township staff using bottles provided by a provincially accredited laboratory, at the Developer's expense.

Section D – Watermains and Appurtenances

Table 13: Microbiological Standards for Drinking Water

Microbiological Parameter	Standard (Expressed as a Maximum)
Escherichia Coli (E. Coli)	Not detectable
Total Coliforms	Not detectable
General bacteria population expressed as background colony counts on the total coliform membrane filter	20 colony forming units (CFU) per 100 mL
General bacteria population expressed as colony counts on a heterotrophic plate count	50 CFU per mL
Turbidity	Greater to or less than 1 NTU unit or equivalent to the existing system

All samples from both sets of samples shall meet the above bacteriological testing criteria before the granting of approval for the connection of the new watermain to the active distribution system.

D7.13 Continuity Test

The Township shall do a continuity test on the watermain or tracer wire during the test procedures. Should the Township find a problem with continuity or installation of the tracer wire, the contractor will **not** be allowed a final connection to the system. The contractor / Developer shall be responsible for the repair, at no cost to the Township.

D7.14 Final Connection / Commissioning

The final connection will be allowed between the new watermain and the existing distribution system once the Township has granted its approval. The removal of the temporary connection apparatus and the installation of the final connection piping must be witnessed by the Township.

At the discretion of the Township, the contractor may be permitted to do the connection. A Township representative (certified water distribution operator) must be present when the contractor performs the final connection, and mainline valves may only be operated by Township Staff. When the contractor is **not** granted permission to do the connection, the Township will coordinate to complete the

Section D – Watermains and Appurtenances

connection by others at the Developer's sole cost including but not limited to all labour and materials. The contractor shall provide assistance as required by the Township's representatives.

All piping and appurtenances utilized in completing the final connection must be thoroughly disinfected with a 1% sodium hypochlorite solution (or equivalent) and the final connection distance, is to be limited to one pipe length.

The excavation must be maintained in a dry state in order to eliminate the possibility of trench water entering the watermain when the final connection is being made. The contractor shall ensure that no foreign material whatsoever enters the watermain at this time. Should trench water or foreign material enter the watermain, the entire disinfection / sampling procedure shall be repeated.

In the event that the final connection is not completed within ten days of receiving the test results, the Township will require additional testing of the system.

D8.00 Hydrant Fire Flow Testing

For all new hydrants installed, the Developer shall be responsible for completing flow testing, and painting the hydrant ports the appropriate colour, as per Section D4.03. Fire flow testing shall be in accordance with NFPA 291. Testing to be coordinated with the Township and supervised by a Township certified water operations staff.

Contractors performing the test should consider the following practice:

- Conduct the flow test during peak hours in the morning to reflect the worst-case scenario.
- While some flow tests can involve many hydrants flowing at the same time to achieve the minimum pressure drop or the desired flow, for a typical single fire flow test, the closest hydrant downstream of the building supply line or future tie in point should be the Test Hydrant or Residual Hydrant where system pressures are taken, and the subsequent downstream hydrant will be the flowing hydrant to obtain pitot pressure reading.
- Ensure that the test is not performed below 0° Celsius.

Section D – Watermains and Appurtenances

- Upon completion of the Fire Flow Test Report, it is to be submitted to the Township's Public Works Department. At minimum, this report shall include the following information:
 - Test date and time including both start time when the valve of the flow hydrant was open and end time when the last flow hydrant valve was closed.
 - Location description including a key map that shows adjacent streets and hydrant info (ID, residual, flow hydrant).
 - Name of the Township's Public Works staff that was present.
 - Name of company that conducted the test.
 - A statement from a qualified professional confirming the test has been conducted in accordance with the NFPA Guidelines.
 - Table showing the following information: Static Pressure, Watermain Size, Test No., No. of Outlets, Outlet Inside Diameter (IN), Discharge Coefficient, Residual Pressure (pounds per square inch (psi)), Pitot Pressure (psi) Flow (US gallons per minute (GPM)). A minimum of two sets of flow data are to be obtained during the test.
 - Confirmation on whether or not the test was able to achieve a 25% pressure drop from observed static level or if the test achieved the desired flow (i.e., maximum day plus fire flow).
 - Test readings should be plotted on a Pressure vs. Flow Graph.
 - Extrapolation to predict flow volumes at 20 psi residual pressure.

D8.01 Service Record Sheets

Upon completion of the Work, Standard Service Record Sheets (one for each lot) shall be prepared by the Developer's engineer and turned over to the Township's Public Works Department. The sheets shall show clearly:

1. Lot, lot number, and street lines.
2. Ties from the end of the service to the lot lines.
3. North arrow.
4. Type, diameter, and elevation of each service. Elevations required at the tie-in to the main, as well as at the property line.
5. Any other pertinent information.

Section D – Watermains and Appurtenances

The Township reserves the right to order field revisions, as deemed required by the Township's representative, at the expense of the Developer. The standard service record sheet template is available by request to the Public Works Department.



Section E – Force mains and Appurtenances

Section E – Force mains and Appurtenances

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Section E – Force mains and Appurtenances

E1.00 General

Force mains are a part of the wastewater collection system designed to meet the wastewater flow requirements for each area or subdivision. The design of force mains needs to consider current collection requirements as well as future, where collection network extensions are made to accommodate adjacent or external areas.

All force mains and appurtenances shall be installed at the minimum covers specified in this section. In areas where the minimum cover cannot be achieved, special provisions shall be considered to protect the pipe from live loading and freezing.

The force main shall be sized to accommodate the peak design flow produced by the pumping station pumps and be designed in accordance with MECP guidelines.

Where applicable, force mains shall be designed in accordance with the latest edition of the Design Criteria for Sanitary Sewers, Storm Sewers, and Force mains for Alterations Authorized under an Environmental Compliance Approval, MECP.

Final approval to construct the Works will not be given until the Township and the Township's consulting engineers have accepted the Works.

Record Drawings of the force main shall be provided to the Township within 90 days of the force main being in service.

E1.01 Confirmation of Available Capacity

As part of the pre-consultation process and prior to the commencement of any design, the Developer and / or Designer must contact the Township and confirm if there is adequate capacity in an existing pumping station and the associated force main or receiving wastewater treatment plant to accommodate the proposed project.

E1.02 Service Area

Systems shall be designed to service all areas within the catchment area to the maximum future development in accordance with the Official Plan.

E1.03 Force main Pressures

The maximum sustained operating pressure shall not exceed 700 kPa (100 psi).

Section E – Force mains and Appurtenances

E2.00 Force main Design**E2.01 General**

The standard drawings depict, in part, the Township's requirements for locations and methods of construction. These standards will form part of the engineering drawings. The Township must approve any variation from these standards.

E2.02 Location in Right-of-way

Depending on the location of the pumping station and the discharge location of the force main, the force main may be located within ROWs similar to the water mains shown on the Township's standard roadway cross-section drawings. The force mains may also run within blocks depending on station and discharge locations.

Force mains shall be installed as per OPSS 412.

E2.03 Material Specifications

Force main pipes up to and including 600 mm diameter shall be C900 Class 235 rated PVC pipe with rubber gasket joint fittings, manufactured in accordance with the latest edition of AWWA C900. Pipe fittings shall be cast or ductile iron, cement lined manufactured to AWWA C110. All fittings shall be supplied with mechanical joint ends.

In environmentally sensitive locations including well head protection areas, preference for a fused pipe material shall be considered.

During installation, the force main pipe shall be appropriately identified as the materials used can sometimes be confused with water mains. This is especially critical at locations where force mains and water mains cross to avoid cross-connections. Green pipe or green stripes on the force main pipe are required.

E2.04 Bedding

Force main bedding and cover shall be installed as per OPSD 802.010 using Granular "A" embedment material or high-performance bedding for flexible pipes.

Alternative embedment material shall be sand meeting gradation requirements of OPSS 1004.05.05 compacted to 98% Standard Proctor Density. Geotechnical

Section E – Force mains and Appurtenances

certification of alternative material must be provided every 150 m and approved by the Township prior to installation. The compaction testing must include the entire envelope (haunches, bedding, and top of pipe).

E2.05 Depth of Cover

Curb and Gutter Roads	1.80 m minimum cover.
Open Ditch Roads	2.2 m minimum cover.
Unbuilt Future Roads	1.80 m minimum cover measured from ultimate design grade.
Road Crossings	2.2 m minimum cover.
Watercourse, Creeks	2.0 m minimum cover.

In areas where the Township allows a forcemain to be installed with less than a minimum cover, the contractor is to supply and install insulation as directed by the Township to protect force mains and appurtenances.

E2.06 Horizontal Separation Between Sewers and Water mains

Force mains shall be designed to have a minimum clear distance of 2.50 m from water mains.

Where clearances cannot be achieved, the design shall be completed in accordance with MECP Procedure F-6-1.

E2.07 Forcemain Crossing Water mains and Other Utilities

Water mains shall normally cross above sewers and force mains with sufficient vertical separation to allow for proper bedding of the water main (minimum 0.5 m).

When it is not possible for a water main to pass over a sewer / forcemain, the water main can pass under the sewer / forcemain provided a vertical separation of 0.5 m is maintained between the sewer / forcemain and the top of the water main. The sewer / forcemain must be adequately supported to prevent settling and displacement of joints.

Force mains crossing over or under other utilities must be designed with a vertical separation of 0.50 m between the outside edges of the forcemain and the utility.

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E2.08 Minimum Sizes and Velocity

The minimum diameter for a forcemain conveying raw sewage shall not be less than 100 mm, unless otherwise approved by the Township.

Depending on the design pumping rates, a forcemain shall be designed to have a self-cleansing velocity of at least 0.6 m/s with the maximum velocity not to exceed 3.0 m/s.

The need for dual forcemains shall be reviewed with Township Public Works staff at the design phase.

E2.09 Tracer Wire

Tracer wire shall be installed on all forcemains to permit field tracing of the pipe, without loss or deterioration of signal using industry standard locating equipment. The wire is to be secured to the top of the forcemain with mastic tape, at every fitting and valve and at intervals not to exceed 30 m. All tracing wires shall be No. 12 gauge stranded copper wire complete with an outer plastic coating. The wire shall be protected from damage during the installation of Works.

Tracing wire shall be connected to valves in chambers and extended along the bottom of the chamber, up the chamber wall and securely fastened to the top rung of an access ladder with fiberglass tape. The tracer wire is to be continuous with no joints. Where joints are required (i.e., between rolls) they are to be soldered together and wrapped in dielectric tape and overwrapped with vinyl tape.

Where directed by the Township, utility location markers shall be placed for specific features. A certificate of continuity from the Developer's consulting engineer will be required at the time of commissioning.

E2.10 Corrosion Protection

For any installation of forcemains, an investigation of the soil conditions shall be undertaken to determine the corrodibility of the native soils and to provide recommendations with regard to corrosion protection.

All ferrous forcemains, fittings, and tracer wire connections shall have corrosion protection provided by sacrificial anodes. Cathodic protection shall be provided for all tracer wires on PVC forcemains. Sacrificial caps are to be provided on

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every bolt of all mechanical joints and restrainers. The bolt lengths shall be sufficient to accommodate the caps.

Zinc anodes or other corrosion protection measures may also be required as directed by the Township. The location of anodes shall be shown on the Record Drawings.

E2.11 Caution Tape

When the forcemain is installed in non-standard locations, green caution tape shall be installed along its length, between 0.3 m and 0.5 m above the forcemain.

E2.12 Joint Restraint

Mechanical joint restraints and concrete thrust blocks are to be installed on bell and spigot joints for all force mains constructed in fill material and at horizontal bends, vertical bends, tees, end of force mains, connections for all force mains, and valves and all areas of disturbed non-native backfill material and shall conform to the latest OPSS and pipe / restrainer manufacturer requirements.

The contractor shall provide a Restraint Plan prepared by a licensed engineering practitioner indicating all mechanical restrainers and fittings to the Township for review and acceptance prior to construction of the forcemain. All mechanical restrainers shall be identified on plan and profile drawings.

The minimum length of restrained pipe beyond the fitting is to be in accordance with the manufacturer's recommendations. All mechanical restraint systems shall be installed with cathodic protection.

E2.13 Termination

All force mains shall be discharged to MHs. The forcemain shall enter the MH with a smooth flow transition at a point no more than 0.3 m above the flow line.

For flows greater than 30 L/s, transition MHs shall be provided at forcemain discharge points to provide smooth flow into the receiving gravity sewer. The transition MH shall be designed based on the pipe size, alignment and inspection, and maintenance needs. The sewer connecting the transition MH to the downstream MH shall be sized to flow at half depth to ensure a smooth flow.

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Depending on the nature of the wastewater being collecting in the area and time it spends in the forcemain, consideration shall be given to corrosion protection within the receiving MH to prevent degradation from the release of hydrogen sulfide or other corrosive chemicals.

E3.00 Valving Requirements

E3.01 Type

Unless specified or approved by the Township, resilient seat gate valves shall be used on force mains 600 mm in diameter and smaller. The valves are to have mechanical joint ends and be installed with cathodic protection. The valves shall have a non-rising stem and a 50 mm square operating nut, opening counterclockwise. For valves on deep force mains, a valve extension stem may be required.

For force mains larger than 600 mm in diameter, the valves shall be housed within a chamber. The frame and cover of the chamber shall be flush with finished grade, with the top of the chamber roof slab at least 0.6 m below the profile of the finished pavement. The chamber is to be fully waterproofed.

Where forcemain valves are located under traveled road surfaces, the top of the operating box shall be set 50 mm below road grade for gravel surfaces and flush with road grade for paved surfaces.

E3.02 Size

In all cases, the size of the valves shall be the same size as the forcemain diameter.

E3.03 Emergency Valve Connections

An emergency valve connection shall be installed on all force mains immediately downstream of the sewage pumping station to allow for the connection of discharge pipes from portable pumps to bypass the sewage pumping station for maintenance or emergency purposes. This allows for the station to be isolated and bypassed while still making use of the forcemain. The standard method of emergency connection to a vacuum truck shall include the required isolation valves and quick connection point at or near the pumping station wet well.

Other valving on force mains is generally discouraged as it can cause damage to pumping station pumps if the valves are left in the closed position.

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E3.04 Valve Boxes and Chambers

All valves on force mains 600 mm in diameter and less shall have three piece, sliding type, Type 'D' valve boxes. Valve boxes are required on force mains 600 mm diameter or less, except at high points where a chamber is required complete with an air release valve. The top of the valve box is to be set at the finished grade elevation. All valve stems must be within 1.6 m of finished grade. A valve stem extension shall be required where necessary to meet this criterion.

On force mains greater than 600 mm dia., valves in chambers are required as noted previously.

E3.05 Air Relief, Vacuum Relief, or Combination Valves

A combination of sewage air and vacuum relief valves shall be installed at all high points of the force main route as required to prevent air locking and negative pressure.

Air / vacuum relief valves shall conform to the latest version of AWWA Standard C512 Air Release, Air / Vacuum, and Combination Air Valves for Water and Wastewater Service.

All air / vacuum relief valves will be installed with a ball valve of the same size as the air / vacuum relief valve for isolation purposes.

Fully waterproof chambers are to be provided to house the valves.

E4.00 Force main Testing

The integrity of all force mains is to be evaluated and confirmed with both pressure and leakage testing. Flexible pipe material may also be tested with a deflection test.

Consideration of pipe swabbing facilities with mandrel launchers and catchers may be required in special instances.

E4.01 Construction Sequence

The force main shall be installed at a time stipulated by the Township and shall be completed prior to construction of finished roads and ditches.

Backfill of force mains across roadways shall be approved granular material thoroughly compacted. The force main shall not be backfilled until approval from the Township has been given.

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Any bypass pumping required shall be approved by the Township in advance of the start of construction, including a bypass pumping drawing to be submitted to the Township for review and approval.

E4.02 Commissioning Force main

The Developer's consultant shall provide a comprehensive written Force main Commissioning Plan and Final Connection Plan proposal of how the testing is to be conducted and by whom. Plans are to be submitted prior to the start of the force main construction for acceptance by the Township. The consultant shall witness all testing and provide the Township with certification of compliance.

E4.03 Hydrostatic Leakage Test

Prior to any testing, the Developer's consultant shall obtain and review the most current version of the Township's testing and commissioning checklist and submit the required documentation.

All force main piping shall be cleaned and flushed prior to commencing the leakage testing process. Testing shall be completed with potable water and shall be completed in sections not exceeding 1,000 m in length unless otherwise noted.

The section of force main being tested shall be sealed off and slowly filled with water. The pipe shall remain filled for not less than 24 hours prior to the pressure test. Air shall be removed from the section of pipe being tested. Air release taps shall be installed to remove air from the pipe section prior to pressure testing. When air has been removed from the pipe, necessary gauges can be connected. The line shall stay pressurized for two continuous hours. Leakage shall be defined as the quantity of water that must be supplied into the newly installed pipe, or the section being tested, to maintain a specified hydrostatic test pressure after the air has been removed. Pipe installation will not be accepted if leakage is greater than 0.082 L/mm of pipe diameter per kilometer for the two hours test.

If the pipe section does not pass the leakage test, repairs to the pipe shall be completed prior to restarting the test.

For PVC pipe, leakage testing shall be in accordance with OPSS No. 412 and tested to a pressure of 1,034 kPa (150 psi) or the maximum rated working pressure of the pipe, whichever is less.

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E4.04 Acceptance of Force main

Generally, the Township shall accept the force main for operating purposes as soon as the system has been constructed and tested to the satisfaction of the Township. Once accepted, the Township shall be the Operating Authority and shall operate and control the system.

Notwithstanding the above, the assumption of the wastewater system by the Township shall be subject to and in accordance with the Subdivision Agreement for the development.

E4.05 Decommission of Force main

Where an existing force main is to be abandoned, the pipe is to be removed, or capped and grouted, complete with mechanical restraints, and valve stems are to be removed. The method of decommissioning is to be confirmed with the Township during the design phase of the project.

E4.06 Continuity Test

The Township shall do a continuity test on the force main or tracer wire during the test procedures. Should the Township find a problem with continuity or installation of the tracer wire, the contractor will not be allowed a final connection to the system. The contractor / Developer shall be responsible for the repair, at no cost to the Township.



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Section F – Sanitary Sewers and Appurtenances

F1.00 Hydraulic Design**F1.01 Confirmation of Capacity**

Prior to commencement of any design for sanitary sewage works within the township, the Developer shall contact the Township to ensure that adequate external trunk sewer and treatment plant capacity is available for the proposed development.

If the Township does not have a confirmed capacity within the downstream system, the Developer's engineer shall undertake an assessment to the nearest downstream trunk sewer, or at the discretion of the Township. In the event that the Township does not have sufficient system records or an understanding of the available reserve capacity, then the Township and the Developer will agree to a scope of work for determining available capacity. The costs associated with undertaking a comprehensive reserve study will be determined through the pre-consultation process, prior to commencing any design work.

The system shall be designed to service all areas within the subdivision to their maximum future development potential and must take into consideration external flows within the drainage area, in accordance with the Township's Official Plan. Allowance shall be made for inflows from the appropriate adjacent subdivisions or areas and shall meet with the approval of the Township's Public Works Department. Discharges of the system are to be connected into appropriate sewers and are to be approved by the Township's Public Works Department. The exact location for connecting to sewers in adjacent subdivisions or areas shall be as approved by the Township's Public Works Department.

In accordance with MECP guidelines and Township policy, all urban and hamlet developments are to be serviced by municipal wastewater systems. Individual septic systems are only permitted in estate lot developments and where approved by the Planning Department, MECP, and the NVCA.

F1.02 Sanitary Drainage Drawing

The sanitary drainage drawing shall be drawn to a scale suitable to show all the tributary areas that are being used to determine the design flows.

The design flow in each MH and length of sewer shall be computed on the sanitary design sheets and shall be included in the drawing set. Excel files or similar to be provided for review. For each area entered on the design sheet, the MH numbers, the size and grade of the sewers, and the number of the detailed drawing and profile for each section of the sanitary sewer shall be shown.

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F1.03 Residential Sewage Flows

Peak domestic sewage flows are to be calculated using the following formula:

$$Q(d) = \frac{PqM}{86.4} + IA$$

Where:

Q(d) = Peak domestic sewage flows (incl extraneous flows in L/s)

P = Design population, in thousands

Q = Average daily per capita domestic flow in L/cap/day (exclusive of extraneous flows).

M = Peaking factor

I = Unit of peak extraneous (infiltration) flows in L/ha/s

A = Gross tributary area in hectares

The peaking factor shall be calculated based on the Harmon formula:

$$M = 1 + \frac{14}{4 + p^{0.5}}$$

Where:

P = Population, in thousands

Maximum M = 4.0

Minimum M = 1.5

The design population shall be derived from the drainage area and expected population based on the Official Plan and the most current Master Servicing Study and FSR. The following design populations should be used:

- Single Detached Dwellings = 3.0 ppu.
- Semi-detached Dwellings = 3.0 ppu.
- Townhouses = 2.4 ppu.
- Apartments = 1.6 ppu.

In the absence of sufficiently detailed development concepts, unit densities shall be used per the Official Plan or a Secondary Plan.

An average daily per capita flow of 400 L/cap/day shall be used. In the absence of a proposed Plan of Subdivision, populations should be estimated based on drainage areas and the land uses identified in the Township's Official Plan or Master Servicing Studies.

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A wet weather infiltration rate of 20,000 L/d/ha (0.23 L/s/ha) is to be applied for all lands tributary to the sewer system. To satisfy self-cleansing requirements in sanitary sewers, assume dry weather infiltration reduces to zero for several days during dry months.

F1.04 Industrial, Commercial, and Institutional Sewage Flows

In accordance with the Township's CLI-ECA, a minimum design flow of 28 m³/ha/day plus allowances for infiltration shall be used for the design of sewers on commercial sites, unless better information is available and approved by the Township Public Works Department prior to design. The area shall be based on the gross developable area. Maximum Day and Peak factors shall be generally in accordance with MECP Guidelines and shall be confirmed with the Township.

Industrial sewage flows shall be determined in consultation with the Township and MECP Guidelines. Generally, an average design of 0.40 to 0.64 L/s/ha plus allowances for infiltration shall be used for the design of sewers on industrial sites.

A peaking factor shall also be incorporated into the design based on the gross development area as follows:

$$M_i = 6.6604 \times \text{Area}^{-0.1992}$$

Where:

M_i = industrial peaking factor

A = gross lot area (ha)

At a minimum, a peaking factor of two should be used.

Institutional sewage flows shall be designed per MECP Guidelines or specific usage, plus allowances for infiltration, unless better information is available and approved for use by the Township.

The area shall be based on the gross area of the institutional site, unless more accurate information is available at the time of development.

F2.00 Sanitary Sewer Design**F2.01 General**

For subdivisions in which sanitary sewers are required, the sewer system shall be designed to carry domestic, commercial, and industrial sewage for each area or subdivision under consideration. Flow is to be by gravity and pumping will be

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considered only where other alternatives are not possible and only with the approval of the Township's Public Works Department.

If the need for a pumping station is approved by the Township, it shall be designed in accordance with the Township's Sewage Pumping Station (SPS) Design Guide, MECP Guidelines including standby power, and to the satisfaction of the Township's Public Works Department.

The Developer shall design sanitary infrastructure in accordance with the most current version of the Township's CLI-ECA and associated design requirements. If the design does not fulfill these requirements, an application to the MECP for a Schedule C amendment to the CLI-ECA will be required.

New sanitary sewers shall be plugged at the point of connection to the existing sanitary sewer system throughout construction, until all of the new sewer has been installed and successfully passed all required testing. The location of the plug shall be reviewed with the Township prior to installation. The plug shall remain in place and shall not be removed until that phase of the development has received the Certificate of Acceptance of Underground Works (Initial Acceptance) of all underground and above ground infrastructure works. Prior to the removal of the plug, the contractor shall be required to remove all debris in the pipe behind the plug.

F2.02 Drains

All floor drains are to be connected to the sanitary sewer. Foundation drains, sump pumps, and roof water leaders **are not** to be connected to the sanitary sewer.

F2.03 Location

All sanitary sewers shall be located as per the standard Township road cross-section detail drawings. Placement of MHs in the wheel track of a travel lane shall be avoided whenever possible.

Any sewers which are situated in off-road locations, shall be contained within a block. Where sanitary sewers are located in blocks, the block width shall be 3.0 m for sewers at a depth less than 2.0 m and 6.0 m for sewers greater than 2.0 m depth, unless depth or size of sewer dictates a larger width necessary for maintenance. Sewer to be centred within the block. Additional depth of footings for houses adjacent to the sanitary sewer block shall be considered in the design.

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F2.04 Pipe Capacities

The allowable sanitary sewer capacities and gradients to be as per MECP and CLI-ECA design criteria. In the case of partial pipe flow, the actual velocity is to be checked against the minimum allowable velocity at the design flow rate. Pipes are designed to be a maximum of 80% full before increasing to the next pipe size.

F2.05 Pipe Strength

Pipe strength design calculations shall be provided to the Township's Public Works Department for approval. Sewer pipe shall be minimum strength PVC-DR 35 with rubber gasket joints as approved for use by the MECP and shall be a minimum diameter of 200 mm. Plastic pipe shall be green in colour.

F2.06 Flow Velocities

Minimum acceptable velocity = 0.6 m/s. For rehabilitation / replacement of an existing sewer where deepening of individual sewer section will not be possible, design flow velocities of less than 0.6 m/s may be considered by the Township's Public Works Department. Maximum acceptable velocity = 3.0 m/s.

F2.07 Minimum Size

The minimum allowable size for a sanitary sewer shall be 200 mm in diameter. Except for special cases, the downstream pipe diameter shall always be greater than or equal to the upstream pipe diameter.

F2.08 Minimum Grade

The minimum and maximum grades for pipes shall be the grade necessary to meet the minimum and maximum velocity requirements; however, the absolute minimum grade for sanitary sewers is 0.3% subject to achieving minimum acceptable velocity at the design flow and acceptance shall be at the sole discretion of the Township. The minimum desirable grade for sanitary sewers is 0.5%. The minimum grade for the first upstream leg of any sewer shall not be less than 1.0%.

F2.09 Depths

The depth of the sewer shall be measured from the final centreline finished road elevation to the top of the sanitary sewer. The minimum depths of sewers for residential areas shall be 2.8 m or sufficient depth for basement floor drains and frost cover shall be provided. Where sewers are located within a block, a minimum frost cover of 1.5 m may be used, provided such sewers cross below watermains.

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The installation of an additional local sewer will be required for service connections when the depth of the sanitary sewer main is 6.5m or greater in order to provide a standard sanitary service lateral.

F2.10 Radius (Curved) Sewers

Radius (Curvilinear) pipe shall be allowed for sanitary sewers 600 mm in diameter and greater, provided that an MH is located at the beginning and end of the radial section. Curve data must be shown on the design drawings. Properly deflected sewer lines are allowed with the approval of the Township's Public Works Department.

F2.11 Limits

All sewers shall be terminated at the subdivision limits when external drainage areas are being considered in the design with suitable provision in the design (depth, alignment, and slope) of the terminal MHs to allow for future extension of the sewer.

Provisions for future extension of the sewer (any oversizing) will only be considered for lands which are within the limits of the current urban boundary.

F2.12 Storm Sewer and Watermain Crossings

Generally, a minimum clearance of 0.25 m shall be provided between the outside of the pipe barrel at the point of crossing for storm and sanitary sewers. A minimum clearance of 0.5 m shall be provided when the sewer crosses over the watermain.

Sanitary sewers, forcemains, and all associated appurtenances and structures shall be designed with provisions to provide the required protection for drinking water supply systems in accordance with:

1. The MECP's F-6-1 Procedures to Govern Separation of Sewers and Watermains.
2. Section 15 of the MECP's Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit.

In the event the minimum clearances cannot be obtained, then the Work is to comply with MECP guidelines, and the pipes shall be concrete-encased to ensure that the pipes are properly bedded.

F2.13 Protection of Drinking Water Sources

An assessment of the proposed works shall be completed to determine if the Works pose a Significant Drinking Water Threat and if they are, the design shall incorporate

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features that mitigate the threat to sources of drinking water, such as those included in:

1. Ministry's Standard Operating Policy for Sewage Works as amended from time to time.
2. Source Protection Plan policies pertaining to the Works.

F2.14 Head Losses

The minimum drop for inverts in any MH shall be 0.030 m, to allow for hydraulic losses incurred at sewer MHs. Drops shall be as per MECP Design Guidelines.

In order to reduce the amount of drop required, the designer shall, wherever possible, restrict the change in velocity between the inlet and outlet to 0.6 m/sec.

Hydraulic calculations shall be submitted for all junction and transition MHs on sewers where the outlet is 1050 mm in diameter or greater. In addition, hydraulic calculations may be required for MHs where the outlet pipe is less than 1050 mm in diameter if, in the opinion of the development engineer, there is insufficient invert drop provided across any MH.

Regardless of the invert drop across an MH, as required by calculations, the obvert of the outlet pipe shall not be higher than the obvert of the inlet pipes at any MH location.

Drop structures shall be used when drops of more than 0.61 m are necessary. Only external drop structures are permitted.

F2.15 Changes in Pipe Size

No decrease of pipe size from a larger upstream to a smaller downstream will be allowed, regardless of the increase in grade.

F2.16 Pipe Bedding

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions, as recommended by the geotechnical engineer. Standard details of the types of bedding are illustrated in OPSD 802.010 and 802.030. The width of the trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless additional bedding or higher pipe strength pipe is used. Any special conditions should be reviewed by a qualified engineer and appropriate recommendations made with respect to the class / type of bedding and pipe strength.

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In order to mitigate infiltration at MH junctions and groundwater flow along pipe bedding, “clay plugs” shall be incorporated into the trench bedding. Clay materials shall be used in the trench and be placed 2 m to 3 m upstream from any MH where groundwater is suspected, with intermediate plugs, where deemed appropriate.

F3.00 Maintenance Structures**F3.01 Location**

MHs shall be located at each change in alignment, grade, or pipe material, at all pipe junctions, and at intervals along the pipe to permit for maintenance of the sewer.

A MH will be required on the private property side for sanitary services to ICI properties.

F3.02 Maximum Spacing

The maximum spacing between MHs shall be 120 m for pipe up to 400 mm and 150 m for 450 mm to 750 mm in size.

F3.03 Maintenance Holes

MHs shall be constructed of precast concrete and shall conform to CSA A257.4.

MH types and sizes shall be in accordance with MECP Guidelines and shall conform to all relevant OPSS and OPSD standards. In all cases where the standard drawings are not applicable, the MHs shall be individually designed and detailed.

MH benching and pipe opening details shall conform to OPSD 701.021.

Minimum MH size to be 1200 mm diameter.

Frost straps are to be provided between the upper section through to the MH base section, as per OPSD. Frost straps (internal or external) shall be provided to hold MH sections together (at least two between each section). External straps to extend vertically from top to bottom and for deep MHs extended at least 1 m below frost depth.

A waterproof membrane to prevent groundwater infiltration such Blueskin or approved equal shall be required on all MH joints, including any riser rings and adjustment units.

A reference shall be made on all profile drawings to indicate the type and size of all sanitary MHs.

All MH chamber openings shall be located on the side of the MH parallel to the flow for straight run MHs, or on the upstream side of the MH at all junctions.

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The maximum change in the direction of flow in any sanitary sewer MH shall be 90%. A change of flow direction at acute interior angles will not be permitted.

Safety platforms shall be required in all MHs greater than 5.0 m in depth. Safety platforms shall not be more than 5.0 m apart and shall be constructed in accordance with the OPSD details.

All pipe connections at MHs shall be completed using Kore-N-Seal or an approved watertight rubber gasket assembly.

F3.04 Maintenance Hole Frame and Covers

All MHs located within the travelled portion of the roadway shall have the rim elevation initially set flush with the base course asphalt. A minimum of 100 mm and a maximum of 300 mm height of concrete modular adjustment rings shall be used on all MHs in new subdivisions.

Prior to the placement of the final course asphalt, the MH frame shall be adjusted to suit the final surface asphalt elevation. Steel and / or plastic MH adjustment rings may be permitted to adjust the MH to final grade on a case by case basis, with consultation and approval by the Township.

As per the CLI-ECA Design Criteria, MHs shall be located away from any flow route or ponding area. In the case where they cannot be located away from the overland flow route for the 25-year storm event, an analysis shall be completed to verify if the overland flow route will submerge the sanitary MHs. If the MH is submerged, design to be watertight including water-tight covers. Where more than one consecutive sanitary MH requires sealing, appropriate ventilation shall be provided.

Watertight lids shall be provided per “No Flo In Flow” or equivalent approved product.

F4.00 Sanitary Service Connection

F4.01 General

All sanitary sewer service connections for single detached, semi-detached, or linked / townhouse dwellings shall be single service connections and generally located as per Township Standard Drawings. Non-standard locations are subject to the Township’s approval and must be detailed on the Plan and Profile and Utility Coordination Drawings.

Connections for commercial, institutional, or multiple-use properties will be considered by the Township on an individual basis.

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Park blocks within new subdivisions may require a sanitary service at the discretion of the Township.

F4.02 Size

Sewer service connection details as per Township Standard Drawings. Service connections for single-family, semi-detached, and linked / townhouse units shall be 125 mm in diameter PVC-DR 28 with an end cap braced at the property line.

Service connections for multiple family blocks and ICI areas will be considered separately and generally shall be 150 mm minimum diameter with an end cap; however, should be sized based on their specific use and sanitary flow rates.

F4.03 Connection To Main

The connection to the main sewer shall be made with an approved manufactured tee. Approved saddles shall be used for connecting to existing sewer mains.

A 125 mm or 150 mm service connection will be permitted to connect to a 200 mm and 250 mm main sewer providing an approved manufactured tee is installed and providing the invert of the service connection is above the spring-line of the main sewer.

No service connection of a size greater than half the diameter of the main shall be cut into the main sewer.

Individual service connections shall not be permitted to connect directly into an MH.

F4.04 Depth

The depth of the service connections for single-family, semi-detached, and link / townhouse units at the property line measured from the finished centreline road elevation shall be a minimum depth of 2.7 m, unless circumstances require otherwise and it can be demonstrated that the dwellings can be fully serviced by gravity. All locations of service connections with less than 2.7 m cover shall be identified on the profile drawings along with their invert elevations.

Risers shall be used when the obvert depth of the sewer main exceeds 4.5 m. The riser section shall not exceed 3.0 m in depth. Service connections are not to cross under any watermains.

The service termination shall be marked by a 2 x 4 wooden stake, projecting 1.0 m above ground, with the top painted green.

Section F – Sanitary Sewers and Appurtenances

F4.05 Grade

Size of Service (mm)	Minimum Grade	Maximum Grade
125	2%	8%
150	1%	6%

F4.06 Connection to Multiple-family and Other Blocks

An inspection MH shall be required on the private property immediately inside the property line located 1.5 m from the property line to the centre of the rim on all connections to multiple-family and other blocks.

F4.07 Connection to Commercial / Industrial / Institutional Blocks

The service connections for ICI areas shall be sized individually according to the intended use. The preferable minimum grade is 2%. The absolute minimum grade shall be 1%. The minimum cover at the street line shall be of sufficient depth to allow servicing of the building(s) by gravity, wherever possible.

An inspection MH shall be required on private property located 1.5 m from the property line to the centre of the rim.

F4.08 Service Connection Material

Sanitary service connection pipes shall only be green in colour. All service connections shall be PVC unless site specific circumstances dictate otherwise, then concrete pipe shall be used. Pipe and fittings shall be manufactured to the latest edition of CSA Standard B-182.1 (ASTM Specification D 3034) with rubber gasketed bell and spigot joints.

All service connections shall be constructed to be watertight.

Backflow valves shall be provided on the sanitary services in existing areas where basements could be susceptible to overflow, based on the hydraulic grade line analysis.

In new developments, basements shall be located a minimum 0.5 m above the highest hydraulic grade line elevation and thus backflow protection will not be necessary.

F4.09 Standard Service Record Sheets

Upon completion of the Work, Standard Service Record Sheets (one for each lot) shall be prepared by the Developer's engineer and provided to the Township. The sheets shall show clearly:

1. Lot, lot number, and street lines.

Section F – Sanitary Sewers and Appurtenances

2. Tie from the end of the service to the lot lines. Tie / distance in meters to the nearest MH.
3. North arrow.
4. Type, diameter, and depth below-grade at the end of each service.
5. Any other pertinent information.

Standard Service Record Sheet is provided by the Township's Public Works Department upon request. Service record sheets shall be provided within 90 days of connection to the system.

F5.00 Inspection and Testing

F5.01 General

The complete sewer system including service connections to the property line and MHs shall be tested in accordance with MECP Guidelines, OPS specifications (OPS 410, 411), and to the satisfaction of the Township. Testing shall also be in accordance with the most current version of the York Region "Sanitary Sewer System Inspection, Testing, and Acceptance Guideline".

Inspection and testing Plans including procedure, equipment, schedule, safety requirements, and emergency response Plan shall be submitted to the Township at least two weeks prior to the inspection or testing. Plans must be accepted by the Township prior to proceeding with the inspection or testing.

All testing shall be done in the presence of Township staff and in accordance with the Township's CLI-ECA. The Township requires a minimum of five business days' notice to arrange to be present for testing.

Pre-testing is to be completed by the Developer, prior to attendance by Township staff to witness any required testing.

F5.02 Infiltration / Exfiltration Testing

Upon completion of the system, but prior to the placement of concrete curb and gutter and base course asphalt, an infiltration or exfiltration test, in accordance with MECP Design Criteria, York Region "Sanitary Sewer System Inspection, Testing, and Acceptance Guideline", and OPSS 410 shall be completed on all sewers, services, and MHs. The most stringent requirement of the listed standards will apply.

The Township shall be the sole judge of which test is to be undertaken.

Section F – Sanitary Sewers and Appurtenances

F5.03 Deflection Test

All newly installed PVC sanitary sewers shall be subjected to deflection testing in accordance with OPSS 410.

The deflection test by the Developer shall not be completed until the system has been thoroughly flushed and cleaned and a minimum of 30 days following backfilling of pipe.

F5.04 CCTV Inspection

All newly constructed sanitary sewers, service laterals and MHs shall be CCTV inspected in accordance with OPSS 409, upon satisfactory completion of all other testing, at the following milestones:

- Prior to the Township's issuance of Acceptance of Underground Works (Initial Acceptance).
- Prior to the placement of top course asphalt.
- Prior to Assumption of the Phase or Subdivision.
- Anytime at the Township's discretion.

A permanent record in high quality colour MPEG-2 or higher saved on a DVD or USB 2.0 or higher compatibility form shall be supplied, illustrating a continuous record of the sewer installations, service connection, MHs, etc. A report identifying any unusual or substandard conditions will be produced using NASSCO observation and defect coding and recommendations on how these issues will be rectified shall also be submitted. All CCTV work shall be performed with a colour camera equipped with a full-swivel head capable of examining lateral connections, MH interiors, and other key features of the sewer installation. The camera must maintain a speed, orientation, and proper lighting that will allow for the defects to be observed clearly.

The Township will require certification from the Developer's consulting engineer that they have reviewed the videos and have found the sewers to be acceptable and free of all defects. Any deficiencies should be clearly identified in the engineer's letter and confirmation that all deficiencies have been / shall be rectified must be included with the certification.

Any sections of sewer or service connections, which fail to meet the requirements, shall be repaired or replaced at the direction of the Township's Public Works Department. Only chemical pressure grouting repair techniques will be considered acceptable.



Section G – Grading

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Section G – Grading

G1.00 General

The grading of all lots and blocks in new subdivisions must be carefully monitored by the consulting engineer in order to provide sites that are suitable for the erection of buildings and to provide satisfactory drainage from all lands within the development.

Lot grading shall be contained within the subdivision limit, site plan and individual lot wherever possible. Grading onto adjacent lands shall only be permitted in exceptional cases and at the discretion of the Township, with written consent from the neighbouring property owner.

Properties shall be graded to drain water away from buildings and neighboring properties and conveyed to an adequate outlet in a public ROW. Drainage solutions such as French drains, soak away pits, etc., will only be considered if it can be demonstrated there is no other viable solution. These drainage features must include an emergency overland flow route in the event that they do not function as designed.

Drainage from external areas shall be captured within the grading strategy. Blocking of external drainage is not permitted. Any sheet flow, swales, outlets, etc., shall be directed to an adequate outlet. An adequate outlet would include storm sewers, municipal ditches, municipal drain, SWMFs, waterways (streams, creeks, rivers) or any other outlet approved by the Township and NVCA. Regardless of ownership, drainage cannot be discharged onto adjacent properties, unless a formalized outlet or legal agreement to drain in perpetuity is in place.

Major drainage system design depths shall follow the requirements of the NVCA Natural Hazards Technical Guide.

Grading for infill development shall be in accordance with the Township's Lot Grading and Drainage Policy (as updated from time to time), in conjunction with these standards. The Township Lot Grading and Drainage Policy can be found on the Township's website.

All importation and exportation of fill shall adhere to O. Reg 406/19.

Section G – Grading

G1.01 General Overall Lot Grading Drawings

All general lot grading drawings for new development in the Township shall be prepared in accordance with the criteria contained in this section and shall, at a minimum, contain the following information and detail:

- Drawing scale 1:500, or as necessary to sufficiently detail the design.
- North arrow and key drawing.
- Grading design shall refer to a Township Geodetic benchmark.
- Show existing contours at a maximum 0.5 m interval within the subdivision and 30 m beyond the subdivision limits.
- Show all existing features including buildings, driveways, individual trees (10 cm diameter at breast height (DBH) and greater).
- Indicate any trees which are to be preserved, including Tree Preservation Zones and limits of Tree Preservation Fencing.
- Show existing and proposed elevations at lot corners and proposed elevations at grade changes.
- Show proposed elevation of the front and rear of the dwelling at the building envelope.
- Show location and grade of swales and direction of overland flow on the roads.
- Identify all existing and proposed lot numbers, blocks, and municipal numbers.
- Show all proposed RLCB locations including top of grate elevation, outlet pipe invert elevation, and underside of footing elevation for affected and adjacent lots.
- Show proposed centerline of road elevations every 20 m, every 5 m for vertical curves, and at all grade changes. Length and slope of road between grades to be labelled.
- Show gutter grades at all intersections, bends, and cul-de-sacs.
- Show location of service connections (at street line), driveways, hydrants, valves, MHs, building envelopes (based on zoning), CBs, proposed fencing, community mailbox locations, and street furniture (transformers, streetlights, etc.)
- Indicate house type (i.e., standard, deck / lookout, walkouts).
- Specify minimum house grades (including apron elevation, underside of footing, underside of basement floor, top of foundation wall, lowest opening, first floor elevations, and rear grade for walk-outs, etc.)

Section G – Grading

- Specify minimum basement slab and / or minimum opening elevation where required for flood protection purposes.
- Show all proposed retaining walls including top and bottom of wall elevations.
- Indicate lots that require engineered fill.
- Grades of the subdivision shall meet grades of the adjacent lands for a minimum distance of 3 m.
- Proposed elevations along the boundary of all blocks abutting single-family and semi-detached lots in the subdivision.
- Direction of the surface run-off by means of arrows and % grades.
- All proposed easements required for registration.
- Drainage over abutting lands will only be allowed in exceptional cases and only at the discretion of the Township.
- Groundwater investigations are required to confirm the highest seasonal groundwater level. Water levels shall be recorded in either spring or fall, in periods of high groundwater. Borehole locations, water level, existing ground level, and date of level recording shall be shown on the grading drawings.
- The Consultant shall confirm site elevations and groundwater conditions prior to construction. The following note shall be adhered to and added to all Grading and Lot Grading Drawings.

"The top of basement floor slab shall be located a minimum of 0.5 m above the observed Seasonal High Groundwater Elevation identified in the accepted Hydrogeological Report submitted in support of the design. If, during construction, the Seasonal High Groundwater Elevation is observed to be higher than the previously recorded elevation, then all other construction elevations, including basement floor, shall be raised to maintain the required separation. The High Groundwater Elevation shall be the highest documented groundwater observation."

- External drainage from adjacent sites shall not be blocked by grading, berms, etc. The amount of external drainage shall be determined and considered in the grading and SWM design of the Site and conveyed to an adequate outlet.
- All surface drainage shall be conveyed to an adequate, positive outlet to the satisfaction of the Township and NVCA.

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G2.00 Grading Design Criteria**G2.01 Gradients and Slopes**

Back-to-front drainage on lots shall be implemented wherever possible to avoid the use of rear yard swales and piped systems. Split drainage will only be approved on a case-by-case basis where no other alternatives are possible.

Generally, the lots shall be graded to maximize usable land area, minimize tree disturbance, and direct flows away from the house structure.

Wherever reasonably possible, the whole of the lot area shall drain from the rear of the lot to the street line.

Grading around dwellings and buildings shall direct water away from the structure. All boulevards are to be graded with a constant slope from the property line (ROW limit) to the curb. (Minimum slope to be 2% and the maximum slope to be 5%.) All grassed lot surfaces shall be constructed to a minimum grade of 2% and a maximum grade of 5% to the front or rear lot lines, and a maximum average slope of 8% from side lot to side lot line.

Drainage flows adjacent to dwellings are to be conveyed in defined swales located a minimum of 1.5 m from the dwelling.

At least 75% of the yard shall consist of a “flat” area, which has a gradient between 2% and 5%, except for larger lots, where this requirement can be reduced. Slopes outside of the useable “flat” area shall not exceed 3H:1V. The maximum slope between houses in any direction shall be 4H:1V. The maximum slope on all embankments and terraces shall be 3:1 for slopes up to 1 m high; slopes shall be 4:1 if greater than 1 m. The average gradient of a rear yard shall not exceed 10% as measured from the rear of the dwelling to the rear lot line or swale.

G2.02 Swales

Swale grades shall be a minimum of 2.0% and a maximum of 5.0% except on back-to-front lots, where the minimum grade shall be 2.5%.

All drainage swales shall be located on the common lot line between adjacent lots.

Swales shall have a maximum side slope of 3H:1V, a minimum depth of 0.15 m at the high end and a maximum depth of 0.3 m.

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The grade adjacent to the dwelling shall follow the grade of the swale to maintain a constant depth and shall be a minimum of 0.15 m below the top of foundation wall.

A 0.9 m wide strip shall be provided along at least one side of the dwelling, having a maximum slope of 2%

Swales shall not drain from one lot to another where the property lines are offset by more than 1.0 m or the drainage swale alignment deviates by more than 45°.

The maximum flow to a side or rear yard swale shall be from four lots or six townhouse units. Where split draining lots drain to front draining lots, roof leaders are to outlet at the front of the split draining lot and be directed to the street.

The maximum length of a rear yard swale without an outlet shall be the least of:

- 60 m.
- Six lot widths.
- Eight townhouse lot widths.

The maximum length of a rear yard swale discharging to the road allowance is 60 m if the drainage does not flow over a sidewalk, or 30 m if a sidewalk is within the drainage path. Swale discharge over sidewalks is to be avoided where possible. If unavoidable, the Township may require a landscape CB or similar structure to convey the flow underneath the sidewalk.

When it is unavoidable to design swales with gradients less than 1%, the Township will require a 150 mm diameter pipe subdrain to be provided. Subdrains shall be perforated, corrugated, plastic pipe with geotextile placed at 0.5 m offset to the property line (centerline of swale). Sub-drains shall be bedded in a 300 mm x 300 mm clear stone trench below the swale and shall conform to OPSS 405. In such cases, the subdrain is to connect to a positive outlet (i.e., RLCB, CB, etc.).

Clear stone (19 mm gradation) at a minimum depth of 100 mm may be placed inside yard areas between houses with a distance less than 1.2 m from the dwelling face to the lot line, in place of sod. A transition runoff area to drain the subgrade shall be provided at the stone / sod interface. This shall be detailed on the grading drawings.

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A minimum 0.6 m wide strip must be maintained along the edge of lots abutting other lands, having the same grade as the existing lands.

Eavestroughs are to be directed toward the front of the house; all downspouts are to be directed down to a prefabricated concrete 'splash pad'.

G2.03 Catchbasins (CBs) / Rear Lot Catchbasins (RLCBs)

RLCBs and leads are to be constructed as per Township Standard Details. RLCB leads are to be concrete pipe or concrete encased. RLCB leads are to be offset from property lines to avoid conflicts with fencing. RLCBs are to be sumpless. RLCB grates to be 'bird cage' style as per OPSD 400.120.

3.0 m wide easements in favour of the Township shall be required over all RLCBs and leads.

An overland flow route is required for all RLCBs to ensure the maximum ponding depth at the structure does not exceed 0.3 m. The maximum ponding depth shall not be within 0.15 m of any adjacent top of foundation wall, or unprotected opening to a dwelling.

The minimum size of the RLCB lead shall be 250 mm diameter, and the minimum slope shall be 0.5%. No inlet control devices shall be used in locations where the RLCB is connected to the road CB or maintenance structure.

G2.04 Driveways

The minimum driveway longitudinal gradient shall be 2%, and the maximum longitudinal gradient shall be 8%, or as otherwise accepted by the Township.

Minimum driveway width is 3.0 m.

The maximum driveway width and lot coverage shall be as per the most current version of the Township's Zoning By-law, or per the zoning in place for the subdivision lands.

G2.05 Retaining Walls

The use of retaining walls in new developments is discouraged. Specific permission from the Township will be required for any retaining walls being proposed. All reasonable alternatives must be investigated prior to the use of retaining walls.

Where retaining walls are necessary and agreed to by the Township, the structures shall be free-standing gravity walls constructed of reinforced poured

Section G – Grading

concrete, large size heavy precast concrete blocks (135 kg sections) or armour stone. No wood or gabion basket retaining walls will be permitted. Tie-back systems are to be avoided in all applications. If, in the sole opinion of the Township, tie-backs cannot be avoided, the tie-backs are to be located entirely on the same property as the retaining wall. In addition, a restrictive covenant will be required over the installed tie-backs to protect its structural integrity, resulting from the potential alteration of grading, planting of trees and vegetation, proposed swimming pool installation, etc.

All retaining walls 0.6 m and higher must include a railing or guard. The guard must meet the structural requirements of the OBC. All retaining walls 1.0 m and higher must include an engineering drawing or shop drawing stamped by a registered professional structural engineer for any structure not covered under OPSDs. Building permits for the construction of retaining walls that fall into the category of designated structures within the scope of the OBC will be required. Final post-construction certification from a professional structural engineer will be required for each wall constructed 1.0 m or higher, clearly stating that the wall has been designed to suit the site conditions, that construction of the wall has been inspected by the engineer, and that it has been constructed in accordance with the design.

Where there are no other viable alternatives, a retaining wall may be considered provided the following conditions are met:

- Retaining walls between residential lots shall be located entirely (including footings) on the higher lot to ensure tie-backs do not cross property boundaries.
- Walls exceeding 1.0 m in height must be designed by a structural engineer and provided with details including cross-sections and longitudinal sections indicating location of weeping tile, backfill requirements, and certification that the wall(s) has / have been designed in accordance with accepted engineering principles and are suitable for the geotechnical condition of the Site and for the type of loading.
- Walls must be concrete or concrete products (alternative products may be considered, subject to approval by the Township).
- Exposed wall heights that exceed 0.6 m will require a protective fence or handrail at the top of the wall in accordance with the OBC.
- No surface drainage over the top of a retaining wall will be permitted.

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- All retaining walls exceeding 1.0 m in height shall have their construction certified by the design engineer prior to the release of grading securities and to commence the maintenance period.

G2.05.01 Certification and Approvals

Prior to the release of any holdbacks, securities, or lot from the conditions of a Subdivision Agreement, the engineering consultant shall provide certification to the Township that the retaining walls have been constructed as per the accepted design(s). A certificate will be required for each lot with retaining walls.

If retaining walls meet the criteria for “Designated Structures” as defined by the OBC, they shall be inspected every two years, and an inspection report shall be provided to the Township.

See Appendix A for details.

G2.06 Park, Institutional, Commercial, and Industrial (ICI) Blocks

All park and ICI blocks shall be graded so that they are generally flat and are to have positive drainage to a suitable outlet on public lands. Drainage of private lands onto these blocks is not permitted. Blocks are to be provided with a minimum of 150 mm topsoil and seeded. Park blocks shall be graded as per the requirements of the park design. Where fill is required to meet grading / drainage requirements, it shall be engineered fill compacted to 95% SPMDD under the supervision of, and certified by, a geotechnical engineer.

G3.00 Individual Lot Grading Plans (Plot Plans)

After approval of the general lot grading drawing and prior to the issuance of building permits, the Developer is required to submit to the Township’s Public Works Department, for approval, the proposed lot development drawing for those particular lots for which a building permit is desired. That submission would be accompanied by a letter, which would express the consulting engineer’s approval. The details and content of the lot development drawing and the design criteria for lot grading and drainage are outlined in the following section as well as the Township’s Lot Grading and Drainage Policy.

It is expected that the proposed lot development drawings will conform to the General Overall Lot Grading Drawing(s). Any deviations, which are certified by the consulting engineer and subsequently accepted by the Township, will require a revision to the General Overall Lot Grading Drawing.

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All elevations should be to geodetic datum where possible. If not possible, then the point of reference (temporary benchmark), which is to be identified, shall be a fixed object in the immediate area.

The individual grading drawing shall contain the following information and details:

1. A north arrow shall be shown. All drawings received shall be to scale, Metric 1:200 or 1:250 and drawn in ink. **Freehand drawings are not acceptable.**
2. Name of street, municipal address, lot number, and plan or concession number, plus sufficient detail to describe the location. Label streets adjacent to the lot.
3. Indicate the dwelling type (standard, deck / lookout, walkout).
4. Identify lots with engineered fill.
5. A key plan detailing the general location of the subject property is to be included on the drawing.
6. A site Plan or legal survey showing distances around the perimeter of the property. Distances are to be labelled.
7. The location of the buildings, existing and / or proposed, including those on adjacent lands. Show all lot dimensions and setbacks.
8. The location of all downspouts, sump pump, and other drainage discharge points. The piping and direct discharge of sump pump flows over sidewalks and curbs is unacceptable.
9. The locations of all municipal watermain, storm, and sanitary sewers as well as utilities within the adjacent municipal ROW are to be shown and labeled accordingly.
10. Existing elevations on the road, ditch, boulevards, curbs, subject lot, and adjoining lands. Sufficient existing grades on adjacent properties must be shown to indicate the drainage pattern.

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11. The existing and proposed grade elevations at all lot corners of the lot and the dwelling, and significant changes in grades along property lines, shall be clearly indicated. Proposed ground elevation adjacent to the buildings, at all house corners, and at ground elevation for all exterior stairs. (These elevations shall be a minimum 0.15 m below the brick line.)
12. Provide a Building Elevation Table, which specifies the following proposed elevations:
 - a) Apron Elevations.
 - b) Top of Garage Floor (FGF).
 - c) Underside of Garage Floor (UGF).
 - d) Top of Finished First Floor (FFF).
 - e) Top of Foundation Wall (TFW).
 - f) Top of Basement Slab (minimum 500 mm above observed "seasonal high groundwater elevation / high groundwater table elevation").
13. Show locations and proposed elevations on the swales where the grade changes and elevations adjacent to the building corners. Side yard swales shall have a minimum 2% slope, or 2.5 % slope if a back-to-front draining lot. 150 mm dia. sub-drains shall be provided under all swales with gradients of less than 1.0%.
14. Locations of all house entrances, including the number of risers / steps required.
15. A connection from the front entrance / steps to the driveway and manufactured / hard surface landings at all egresses.
16. All downspout locations, with requirement for splashpad noted as required.
17. Location of proposed RLCBs and top of grate elevations (if applicable).
18. Easements on property (if applicable).
19. Locations of sidewalks (if applicable), storm, sanitary, and water services (including inverts of sewer pipes) at property line (sanitary invert to be minimum 300 mm below the storm sewer service invert), CBs, hydrants,

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valves, maintenance structures, fencing, community mailbox pads, streetlights, transformers, utility pedestals, etc.

20. Any porches, decks, terracing, or retaining walls.
21. Show proposed centreline of road elevations adjacent to the lot at 20 m intervals.
22. Identify edge of asphalt, shoulder, ditch, curb, and gutter as applicable.
23. Top and bottom elevations of all terracing or retaining walls, plus the type of structure, cross-section drawings, longitudinal sections and manufacturer's specifications.
24. Direction of surface flow.
25. Specify underside of footing elevations for footings adjacent to RLCBs or leads (if applicable). The footings shall be a minimum 150 mm below the invert of the CB lead.

In all cases, the plot Plans should reflect the elevations of the General Overall Grading Drawing and shall be stamped and signed by the Developer's consulting engineer and control architect, where required, prior to submission to the Township for building permits. Any substantive changes to the General Overall Grading Drawings will require prior acceptance from the Township Public Works Department.

The following general notes shall be included on every lot grading drawing:

1. ESC measures shall be implemented to prevent migration of silt and sediment from the subject lot to any adjacent lot, including municipal ROW. Special care shall be taken to ensure that silt and sediment laden surface water does not enter any watercourses or environmentally sensitive areas, either overland or through the storm drainage system.
2. Minimum cover on watermains, water services, and hydrant branches under ditches shall be 1.8 m (when applicable to the design).
3. All downspouts, sump pump, and other drainage discharge points shall discharge onto a splash pad or approved equivalent.

Section G – Grading

4. The Developer is responsible for obtaining utility and servicing locates prior to any Works being undertaken.
5. The top of the floor slab shall be located at a minimum of 0.5 m above the observed high groundwater elevation identified in the accepted Hydrogeological Report submitted in support of the design. If, during construction, the seasonal high groundwater elevation is observed to be higher than the previously recorded elevation, then all other construction elevations, including basement floor, shall be raised to maintain the required separation. The high groundwater elevation shall be the highest documented groundwater observation.
6. All disturbed areas are to be reinstated with sod, over a minimum of 150 mm of topsoil or approved alternative ground cover.
7. A copy of the "Accepted for Construction" Lot Grading and Drainage Drawing is always to be on-site for reference during construction.
8. All Work within the Township ROW must be restored to equal or better condition.

The following general notes are to be included on the drawing as required:

1. CBs shall be constructed in accordance with Township's Engineering Standards. Construction of CBs are to be confirmed by the designer / engineer that is to sign the Lot Grading Certificate. (To be reviewed on-site by the professional engineer prior to backfill or submission of photographs from the contractor may be sufficient).
2. Retaining walls are to be constructed of acceptable architectural block or approved equivalent. Filter cloth shall be placed behind all retaining walls to prevent the migration of fines. Retaining walls are not to encroach into the municipal road allowance.
3. When applicable, the weeping tile elevation is to be confirmed in writing by the professional engineer to the Township prior to the construction beyond foundation.

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G3.01 Construction

All lots are to be excavated or filled such that the final elevations conform to the accepted Grading Drawings. All lots are to be completed with a minimum thickness of 150 mm of topsoil plus nursery sod and paved driveways to the face of the garage.

Within one year of occupancy of 75% of the dwellings within the Plan of Subdivision, any lots which have not been constructed upon shall be graded in compliance with the General Overall Grading Drawing and hydroseeded or sodded to ensure positive drainage and provide stabilization of the Site.

G4.00 Certification

Prior to sodding, the Developer's consulting engineer shall complete a visual inspection of the lots to confirm the grading functions in accordance with the accepted individual plot Plan / lot grading drawing. Any corrections shall be repaired prior to the builder placing sod. A final inspection will be completed with Township staff once the lots have been sodded, following which the consulting engineer shall issue the Lot Grading Certificate along with the Lot Grading Certification Checklist.

Township staff / engineers involved with site reviews for Lot Grading Certification are provided with the authority / power of entry onto the lands for the purposes of Lot Grading Certification and review of associated deficiency corrections.

Upon completion of site grading and prior to landscaping, including fencing, the Developer shall be required to submit two copies of the Lot Grading Certificate, which has been certified by a professional engineer to the Township. The Certificate is to be confirmed / accepted by Township staff and / or the Township's engineering consultant. The Lot Grading Certificate will confirm that the lot grading and drainage works have been completed in conformance with the design accepted by the Township and with reference to the Checklist (see Township's Lot Grading Policy Manual for checklist).

A Lot Grading Certificate must be provided and accepted by the Township. This includes that prior to acceptance of the Certificate by the Township, the sufficient establishment of ground cover shall be required. Minor adjustments may be accepted on the condition that the Developer's professional engineer

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certifies that the resultant change will not adversely impact the drainage of the individual lot, the adjoining properties, or the municipal roadway.

The Lot Grading Certification shall also include the surveyed basement slab elevation, the high groundwater elevation, and calculated separation, with Certification that the requirements for groundwater separation are met.



Section H – Utilities and Streetlighting

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Section H – Utilities and Streetlighting

H1.00 Utilities

A Composite Utility Drawing is to be submitted to the Township for review at the second engineering submission to ensure that conflicts between utilities, municipal services, and driveways are avoided.

The General Service Drawing shall also indicate the proposed utility locations. The Composite Utility Drawing will indicate the location of all underground and all above-ground services and utilities. The Developer's consulting engineer is expected to enable the coordination of all utilities and municipal services.

All utility providers are to be contacted at the initiation of a project to ensure service capacity is available and provide written proof (i.e., email correspondence) of confirmation that utilities are aware of the development and have plant capacity or require upgrades. This is to be provided at the Draft Plan submission stage.

All locations must be established and resolved by the Developer's engineer in conjunction with the utility companies and following the locations shown on the Township's typical cross-sections.

The hierarchy of municipal servicing and utilities shall generally apply when determining installation locations and, in descending order are municipal sewers / watermains including appurtenances, hydro, gas, telephone, cable, and others.

All utility surface features are to be installed, wherever possible, at projections of lot property lines. A clustered location for utility pedestals and transformers is preferable.

Utilities (telephone, hydro, cable, gas, etc.) shall be underground and shall be installed by the utility or an approved contractor. The Developer must bear the cost of any surcharges for underground installation made by the utility and must grant the utility any necessary easements for their services.

Hydro kiosks, switch gear, Outside Plant Interface (i.e., OPI unit per Bell Canada) or other infrastructure larger than standard low-profile transformers or junction boxes are to be installed in easements located outside of road allowances. The locations of these structures are to be discussed with the Township early in the design process in order to obtain specific approvals for these sitings.

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Municipal Consent (MC) drawings are required for all utility installations proposed for existing road allowances.

H2.00 Information Required on Composite Utility Drawing

The following utilities, services, and appurtenances shall be clearly shown, with dimensioned offsets or cross-sections, on the Composite Utility Drawing:

- **Underground:**
 - Any utility trench location (hydro, gas, telephone, and cable) as per the location indicated on the standard ROW cross-section drawings.
 - Utility trench cross-section and installation details including depth of cover, cross-sections, and details.
 - Sewer and water service connection locations.
 - RLCB leads (if applicable).
 - Any watermain, sanitary, or storm sewer infrastructure crossing boulevards.
 - All road crossings including concrete encasement.
- **Aboveground:**
 - Curb and gutter.
 - Driveway locations.
 - Watermain valves (in boxes and / or chambers).
 - Fire hydrants.
 - Sewer MHs.
 - Road CBs and RLCBs (if applicable).
 - Sidewalks, trails, and walkways.
 - Easements.
 - Hydro transformers.
 - Streetlight standards.
 - All pedestals (telephone, cable, and lighting).
 - All utility road crossings.
 - Traffic and advisory signs.
 - Mailbox pads.
 - Canada Post community mailboxes.
 - Bus stop pads and shelters (if applicable).
 - Fencing.
 - Street trees and landscaping.
 - Any other features as directed by the Township.

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In addition to the aforementioned information, each Composite Utility Drawing shall have a signature block provided for approval of each of the utilities listed below and shall be signed and dated by the applicable utility provider, confirming the drawing reflects their design and that there are no conflicts with drainage or other design components.

Accepted By	Name	Date
Hydro-electrical Authority		
Gas Authority		
Telecommunications Authorities x3		
Canada Post		
Transit Authority (where applicable)		

All primary hydro, telephone cable, gas lines, and cable TV shall be placed in a common trench, underground in locations as shown on the Township's Standard Details. Design of these utilities shall conform to the regulations of the respective utility authority.

H2.01 Trenches, Crossings, and Backfilling

Trench locations are to be as per the Township Standard Road cross-sections. Any proposed non-standard locations are to be reviewed and accepted by the Township. Common trench installation for hydro, gas, cable, and telephone shall be implemented as per Township Standard Details.

Utility crossings on existing roads shall not be carried out until approved by the Township.

Open cut utility crossings for new subdivision roads shall be installed prior to base curb construction and base asphalt placement. The crossings are to be concrete encased and installed perpendicular to the roadway (i.e., 90°) and opposite lot property lines wherever possible. A minimum clearance of 1.0 m to any MH or road CB must be maintained.

Open cut utility crossings on existing roads shall have the asphalt surface saw cut for the width of the trench plus a minimum of 0.3 m out from each side of the trench walls. Reinstatement tape (or approved equivalent) shall be applied to the vertical face of the existing asphalt at all lateral and longitudinal joints on surface asphalt where new asphalt matches existing, including all road cuts.

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Frost tapers with a 10:1 slope to the 1.5 m depth frost line shall be constructed. The frost tapers shall begin at a point 0.3 m out from each side of the trench wall.

A minimum depth of cover for any utility installation is 1.0 m.

The backfill for the utility crossings on new roads shall be Granular A up to the road subgrade and compacted to a minimum of 98% SPMDD or as specified by the geotechnical engineer. All granular material shall conform to OPSS 1010.

Utility crossings on existing roads shall be backfilled with unshrinkable fill to the subgrade level (conforming to OPSS 1359), the granular reinstated and properly compacted, and asphalt binder applied to the saw cut edges prior to placing the hot mix asphalt. All asphalt restoration shall be in compliance with OPSS 310. All hot mix material shall conform to OPSS 1150 and 1154.

For existing roads, where the curb has been undermined to facilitate the utility installation, the curb shall be removed and replaced. Curb restoration shall be a minimum length of 2.0 m or shall extend a minimum of 0.5 m beyond the outer trench edges, whichever is greater. All concrete to be 32 MPa as per OPSS 351. The minimum length of curb between cut locations shall be 1.0 m.

Compaction of backfill for utility trenches within boulevards shall be 98% Standard Proctor Density and 100% for driveways and travelled roads. Granular materials shall be reinstated and properly compacted. Alternatively, unshrinkable fill may be utilized in areas where proper compaction will be difficult to achieve. For directional drill installations, a minimum 1.0 m bore depth must be provided for utilities under roadways.

All utility wiring is to be installed underground. Hydro transformers are to be housed in suitable utility approved enclosures and mounted on transformer pads installed at the final elevation of the adjacent ground. The location of transformer pads shall be as detailed on the Township's Standard Details and / or cross-sections. Telephone and cable junction boxes shall be installed in approved standard enclosures.

H2.02 Minimum Clearances

A minimum horizontal clear separation of 1.5 m between transformers and driveway edges and other street furniture shall be maintained.

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The following chart represents the minimum clear separation between public utilities and municipal sewers and appurtenances unless otherwise approved by the Township:

Table 1: Minimum Utility Clearances (Preferred)

Condition	Minimum Preferred Horizontal Distance	Minimum Preferred Vertical Distance
Minimum clearance between utilities (hydro, gas, cable, telephone) and mainline municipal services (separation distance to be measured from pipe obvert).	3.0 m	1.0 m
Minimum clearance between streetlights and transformers.	3.0 m	n/a
Minimum clearance between streetlights and fire hydrants.	3.0 m	n/a
Minimum clearance between streetlights and side lot line adjacent to RLCB leads.	1.0 m	n/a
Minimum clearance between transformers and community mailbox pads.	3.0 m	n/a

Clearance from other boulevard features not listed in the above table shall be reviewed on a case-by-case basis. Generally, a minimum of 1.0 m should be maintained between utilities and other boulevard features.

For any proposed construction work in the boulevard of existing roads, the corresponding representatives for the hydro, gas, cable, and telephone companies, along with Township Public Works Operations Staff must be contacted for field locates before any digging can commence.

H2.03 Community Mailbox Requirements

Community mailbox sites shall be placed in locations approved by the Township. Community mail centres shall be located in a Plan of subdivision in consultation with Canada Post. The design of the community mail centre must incorporate such criteria as pedestrian access, traffic flow, and aesthetics.

Details associated with community mailboxes are to be identified on the Engineering Drawings. The Developer will be responsible for constructing community mailboxes within residential subdivisions prior to the first occupancy.

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Generally, community mailboxes shall be located on flankage lots, near the rear lot line, on concrete pads, as per Canada Post design. The locations shall in no way restrict sight lines at intersections. As part of the streetlight design, the electrical engineer shall consider placement of a streetlight adjacent to the community mailbox locations. Lay-by areas shall also be located adjacent to community mailboxes to ensure continuous traffic flow. The length of bays will generally be governed by the number of mailboxes.

See Section J – Parklands for details on mailboxes located within park areas.

H3.00 Streetlighting Design

The streetlighting system shall be designed by a qualified electrical consulting engineer in accordance with the Illuminating Engineering Society (IES) latest edition standards and accepted by the Township. Streetlighting layout and design shall adhere to the Township's standards in terms of materials, locations, levels of lighting, and absence of conflict and shall meet the requirements of the power authority.

The Developer shall arrange for the connection of the lighting system through the appropriate power authority.

Streetlight designs to be provided complete with streetlighting layout, streetlight and fixture details, and photometric analysis, along with a construction cost and security estimate which shall include streetlighting and associated cabling, power pedestals, etc., all to be submitted to the Township, through the Developer's engineering consultant as part of the complete submission package.

H3.01 Definitions (from IES)

These definitions are for the purposes of lighting design only.

1. Roadway Classifications

- a) Arterial (Major) – The part of the roadway system that serves as the principal network for through traffic flow. The routes connect areas of principal traffic generation and important rural highways entering the city.
- b) Collector – The roadways serving traffic between arterials and local roadways. These are roadways used mainly for traffic movements within residential, commercial, and industrial areas.

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- c) Local – Roadways used primarily for direct access to residential, commercial, and industrial areas. They do not include roadways carrying through traffic. Long local roadways will generally be divided into short sections by a system of collector roadway systems.

2. Pedestrian Conflict Classifications

- a) High – Areas with significant numbers of pedestrians expected to be on sidewalks, walkways or crossing the streets during darkness. Examples are downtown office areas, near theaters, concert halls, stadiums, and transit terminals.
- b) Medium – Areas where fewer numbers of pedestrians utilize the streets at night. Typical are downtown office areas, blocks with libraries, apartments, neighborhood shopping, industrial, older city areas, and streets with transit lines.
- c) Low – Areas with very low volumes of night pedestrian usage. These can occur in any of the cited roadway classifications but may be typified by suburban single-family streets, very low-density residential developments, and rural or semi-rural areas.

Guidelines for possible conflict classifications, based on one hour pedestrian counts of a typical street block or 200 m section, are as follows:

- High – Over 100.
- Medium – 11 to 100.
- Low – 10 or fewer.

These volumes represent the total number of pedestrians walking on both sides of the street plus those crossing the street at non-intersection locations.

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The objective in designing streetlighting is to provide a uniform distribution of lighting at a level that is adequate for the intended use of the roadway. Roadway and subdivision lighting shall be designed using the values found in the IES Reference Guide and abbreviated in the following tables:

Table 2: Luminance Method Lighting Design Criteria for Roadways and Sidewalks

Street Classification	Pedestrian Area Classification	Avg. Luminance L_{avg} (cd/m^2)	Avg. Uniformity Ratio L_{avg}/L_{min}	Max. Uniformity Ratio L_{max}/L_{min}	Max. Veiling Luminance Ratio LV_{max}/L_{avg}
Major	High	1.2	3.0	5.0	0.3
Major	Medium	0.9	3.0	5.0	0.3
Major	Low	0.6	3.5	6.0	0.3
Collector	High	0.8	3.0	5.0	0.4
Collector	Medium	0.6	3.5	6.0	0.4
Collector	Low	0.4	4.0	8.0	0.4
Local	High	0.6	6.0	10.0	0.4
Local	Medium	0.5	6.0	10.0	0.4
Local	Low	0.3	6.0	10.0	0.4

L_{avg} – Minimum Maintained Average Pavement Luminance.

L_{min} – Minimum Pavement Luminance.

LV_{max} – Maximum Veiling Luminance.

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Table 3: Illumination for Intersections: Average Maintained Illumination at Pavement by Pedestrian Area Classification in lux/fc

Functional Classification	High	Medium	Low	E_{avg}/E_{min}
Major / Major	34.0/3.4	26.0/2.6	18.0/1.8	3.0
Major / Collector	29.0/2.9	22.0/2.2	15.0/1.5	3.0
Major / Local	26.0/2.6	20.0/2.0	13.0/1.3	3.0
Collector / Collector	24.0/2.4	18.0/1.8	12.0/1.2	4.0
Collector / Local	21.0/2.1	16.0/1.6	10.0/1.0	4.0
Local / Local	18.0/1.8	14.0/1.4	8.0/0.8	6.0

H3.02 Pedestrian Walkways

The illuminance calculation is the primary method used to establish lighting levels for pedestrian walkways. The Township's Department of Parks and Recreation is to be contacted specifically regarding lighting requirements for walkways within municipal parks.

In cases where the security of pedestrians and cyclists is of concern, a minimum illumination level of 10.0 lux (1.0 fc) with an average-to-minimum uniformity ratio no greater than 4:1 will apply. The application of this criteria will be determined by the Township. Alternatively, the following illumination lighting shall apply:

Table 4: Recommended Maintained Illuminance Values for Walkways in High Pedestrian Conflict Areas

	E_{avg} (lux/fc)	E_{Vmin} (lux/fc)	E_{avg}/E_{min}*
Mixed Vehicle and Pedestrian	20.0/2.0	10.0/1.0	4.0
Pedestrian Only	10.0/1.0	5.0/0.5	4.0

E_{avg} – Minimum Maintained Average Horizontal Illuminance at Pavement.

E_{Vmin} – Minimum Vertical Illuminance at 1.5 m Above Pavement.

E_{min} – Minimum Horizontal Illuminance at Pavement.

*Horizontal Only.

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Table 5: Recommended Maintained Illuminance Values for Walkways in Medium Pedestrian Conflict Areas

	E_{avg} (lux/ft)	EV_{min} (lux/ft)	E_{avg}/E_{min}*
Pedestrian Areas	5.0/0.5	2.0/0.2	4.0

E_{avg} – Minimum Maintained Average Horizontal Illuminance at Pavement.

EV_{min} – Minimum Vertical Illuminance at 1.5 m Above Pavement.

E_{min} – Minimum Horizontal Illuminance at Pavement.

*Horizontal Only.

Table 6: Recommended Maintained Illuminance Values for Walkways in Low Pedestrian Conflict Areas

	E_{avg} (lux/ft)	EV_{min} (lux/ft)	E_{avg}/E_{min}*
Rural / Semi-rural Areas	2.0/0.2	0.6/0.06	10.0
Low Density Residential (Two or fewer dwelling units per acre)	3.0/0.3	0.8/0.08	6.0
Medium Density Residential (2.1 to 6.0 dwelling units per acre)	4.0/0.4	1.0/0.1	4.0

E_{avg} – Minimum Maintained Average Horizontal Illuminance at Pavement.

EV_{min} – Minimum Vertical Illuminance at 1.5 m Above Pavement.

E_{min} – Minimum Horizontal Illuminance at Pavement.

*Horizontal Only.

Lighting materials for walkways is to be the same style and colour as the surrounding development, with adjusted lighting levels as per the overall lighting design. Bollard style lighting is not permitted.

H3.03 Design Requirements

A photometric layout must include the following information:

1. The photometric layouts shall be prepared using an approved computer lighting program such as AGI32.
2. A summary table of the illumination and uniformity values resulting from the design in accordance with parameters indicated in the above table (i.e., average, average to minimum, etc.). In addition to the above noted requirements, the table must show the Light Loss Factor (LLF) used when calculating the proposed lighting levels. Lighting drawings and photometric

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analysis including statistical data shall be designed / reviewed / approved by a professional electrical engineer.

3. Lighting levels extending past the property line to the nearest building (light trespass on adjacent residential properties) is to be zero utilizing full cut-off flat lens luminaires and house-side shields, if required.
4. Average Maintained, Average to Minimum, and Maximum to Minimum calculations taken between at least four lighting poles on the roadway portion of the photometric calculations are to be provided.
5. In the longitudinal direction, the distance between grid lines should be 1/10 of the spacing between luminaires, or 5.0 m, whichever is smaller. At intersections, the grid spacing is 2.0 m throughout the calculation area.
6. Design shall specify type of pole, conduit, luminaire, lamp wattage, and size of conductor being used. Details shall be provided for pole installation and luminaire(s) wiring. The engineer shall include specification sheets on luminaires, arms, and poles to be installed as part of submission, which shall be in keeping with Township Standards.

Pole spacing shall be supported by detailed photometric calculations. Maximum spacing shall not exceed 50 m.

When establishing the spacing of streetlighting within a residential subdivision, consideration must be given for the placement of a streetlight adjacent to the location of community mailboxes and at access to pedestrian walkways. In determining the position of a light standard, the designer shall take into consideration the location of driveways, and other aspects of the Site. The objective is to provide a sense of security and to minimize light spill and other disturbances within the development Plan and to adjacent properties. Pole spacing shall be supported by detailed photometric calculations.

The streetlighting design submission package is to be submitted to the Township and shall include a cost estimate for the proposed streetlighting installation works (including wiring, poles, pedestals, etc.) and a summary of the illumination and uniformity values resulting from the design in accordance with parameters indicated in the above table (i.e., average, maximum to minimum, etc.). The Developer's consulting engineer shall also be responsible for the review / approval of any required shop drawings submitted by the

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contractor / supplier for verification or compliance to the lighting design and Township specifications, which shall then be forwarded to the Township for final approval.

The designer shall submit to the electrical distribution operating authority a copy of the layout prior to construction to confirm voltage, method of control protection, and the power supply to each light standard.

Designer shall specify on drawings the location of transformers, means of disconnects, power and control centers, and other related infrastructure.

The Developer shall provide all labour, equipment, material, and supervision necessary to complete streetlighting installation in all respects as shown on the Accepted for Construction drawings and specifications.

The Developer shall provide one complete spare (pole, arm, luminaire) for each phase of the development.

All drawings must be sealed by a registered professional electrical engineer, licensed to practice in the province of Ontario. Any attachments to hydro poles must have hydro authority approval and comply with O. Reg. 22/04 (or the latest revision thereof). All roadway lighting design and construction is subject to ESA inspection and approval.

These standards are based on recommended practices for street and roadway lighting published by the IES RP-8-21 and the TAC "Guide for Design of Roadway Lighting", Volumes 1 and 2. The consultant shall state in the submission that the lighting design has been completed based on ANSI/IES RP-8-21, or any revised edition.

The consultant is to employ only the luminance design method. However, where ANSI/IES RP-8-21 allows for use of illuminance methodology in specific cases, the consultant shall state these instances in the lighting design submission.

Each streetlight power pedestal is to be energized at 240 volts split neutral. The main breaker is to be 60 amp, full-size neutral, with up to four individual circuits, 120 volt, 40 amp single pole breakers. Each 120 volt, 40 amp breaker is to feed a circuit in each direction to a maximum of six streetlights.

All materials must be CSA approved.

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All streetlighting cabling, power supply, layout, and installation shall be in accordance with the current Ontario Electrical Safety Code.

The objective in designing streetlighting is to provide a uniform distribution of lighting at a level that is adequate for the intended use of the roadway. Roadway lighting shall be designed using the values found in the IES reference guide.

H3.04 Streetlight Poles and Arms

The material specifications are based on products supplied by StressCrete / King Luminaire. Equivalent alternatives will be considered by the Township upon request.

See road cross-section details for location of streetlights within the ROW.

H.3.04.1 Poles and Arms for Residential Areas

- Poles shall be StressCrete, spun concrete model, "Octagonal" Model No. E-300-BPO-G-E11 S/F 120.
- Colour permeated throughout with etched finish. Colour shall be Eclipse Black.
- Poles shall be direct bury type and shall have a height of 9.14 m above grade and 1.5 m to 2.0 m below grade. They shall be designed to support the loadings imposed by the selected luminaire and arm for the local wind conditions. Access handholes shall be oriented toward the street.
- Arms shall be StressCrete, of the following specifications:
 - Arm to be KA120.
 - Colour and finish shall be powder-coated Black to match pole.
 - 1.2 m or 1.8 m length to place luminaire at or near curblin.
 - All hardware, fittings, and anchors shall be stainless steel.

H.3.04.2 Poles and Arms for Industrial Areas

- Poles shall be StressCrete, spun concrete, Model No. E-300-BPR-G-MOO S/F 120.
- Colour shall be mold finish Grey.
- Poles shall be direct bury type and shall have a height of 9.14 m above grade and 1.5 m to 2.0 m below grade. They shall be designed to support the loadings imposed by the selected luminaire and arm for the local wind conditions. Access handholes shall be oriented toward the street.
- Arms shall be StressCrete, of the following specifications:
 - Arm to be KA120.

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- Colour and finish shall be Grey to match pole.
- 1.2 m or 1.8 m length to place luminaire at or near curblin.
- All hardware, fittings, and anchors shall be stainless steel.

Pole style for commercial areas is to be determined in consultation with the Township.

H3.05 Streetlighting Luminaires

H.3.05.1 Luminaires for Residential Areas

The same product must be used throughout the development, with appropriate variations in height, spacing, or wattage to meet required illumination levels.

Luminaires shall be one of the following models:

- Current Evolve ERLC, ELR1, or ERL2 Series.

Colour shall be Black to match the pole and arm.

The distribution pattern shall be IES Type II or III with full cutoff optics to reduce light pollution and meet DarkSky compliance.

Luminaires shall meet the following minimum requirements:

1. Electrical
 - a) All electrical components CSA approved.
 - b) LM79/LM80 Compliant.
 - c) The luminaire shall contain a surge protection device (SPD) to protect all electrical components from harmful line transient voltage surges as a result of utility line switching, lightning strikes, or other electrical supply system disturbances. The SPD shall meet a 6 kV, 3 kA surge level and meet application and testing requirements as per ANSI/IEEE C.62.41.2 for Category C-Low operation and ANSI/IEEE C62.45. The SPD shall be mounted such that it is easily accessible and replaceable.
 - d) The luminaire shall be IP 66 optics and enclosure, 3G vibration test. Luminaire should have a glass lens that will not attract dirt, withstand outdoor weather and ultraviolet stabilized with smooth outside surface.
 - e) Warranty to be a minimum of five years.

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- f) Operating voltage shall be 120 volts.
 - g) LED with a CCT of 3000K (to be DarkSky compliant).
 - h) Photo-electric Controllers shall be Model ELL-124-CUL with electronic twist lock photo controllers with:
 - i. A filtered (human eye spectral response) silicon light sensor with infrared blocking filter.
 - ii. 40,000 amperes (amp) 640 joules (J) metal-oxide varistors (MOV) surge protection.
 - iii. Rated for 120 volts.
 - iv. Load rating: 1,000 watts (W), 1,800 volt-amperes (VA) ballast.
 - v. Turn on level at 16 lux and turn off at 1.5 times turn on.
 - vi. 10-year Warranty.
 - vii. Operating temperature range from -40°C to 70°C.
 - viii. Must be manufactured using non-hazardous materials.
 - ix. Must meet CSA specifications and are subject to ESA inspection and approval.
 - i) Ground terminal or lug.
 - j) Wattage to be adjustable.
2. Mechanical
- a) Toolless access for lamp and driver service.
 - b) Die cast aluminum housing.
 - c) Stainless steel hardware.
 - d) Twist lock time delayed photocell controller.
3. Marking
- a) Exterior nameplate indicating manufacturer, catalogue number, wattage
 - b) Interior label indicating LED optics position for various light distributions.

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- c) Interior label indicating supply voltage, frequency, input current, lamp voltage.
- d) Interior driver label with wiring diagram.

H.3.05.2 Luminaires for Industrial Areas

The same product must be used throughout the area, with appropriate variations in height, spacing, or wattage to meet required illumination levels.

Luminaires shall be the following model:

- Current Evolve ERLC, ELR1 or ERL2 Series.

Colour shall be Grey to match the pole and arm.

The distribution pattern shall be IES Types II or III with full cutoff optics to reduce light pollution and meet DarkSky recommendations.

Luminaires shall meet the following minimum requirements:

1. Electrical
 - a) All electrical components CSA approved.
 - b) LM79/LM80 Compliant.
 - c) The luminaire shall contain an SPD to protect all electrical components from harmful line transient voltage surges as a result of utility line switching, lightning strikes, or other electrical supply system disturbances. The SPD shall meet a 6 kV, 3 kA surge level and meet application and testing requirements as per ANSI/IEEE C.62.41.2 for Category C-Low operation and ANSI/IEEE C62.45. The SPD shall be mounted such that it is easily accessible and replaceable.
 - d) The luminaire shall be IP 66 optics and enclosure, 3G vibration test. Luminaire should have a glass lens that will not attract dirt, withstand outdoor weather and ultra-violet stabilized with smooth outside surface.
 - e) Warranty to be a minimum of five years.
 - f) Operating voltage shall be 120 volts.

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- g) LED with a CCT of 3000K (to be DarkSky compliant).
 - h) Photo-electric Controllers shall be Model ELL-124-CUL with electronic twist lock photo controllers with:
 - i. A filtered (human eye spectral response) silicon light sensor with infrared blocking filter.
 - ii. 40,000 amp 640 J MOV surge protection.
 - iii. Rated for 120 volts.
 - iv. Load rating: 1,000 W, 1,800 VA ballast.
 - v. Turn on level at 16 lux and turn off at 1.5 times turn on.
 - vi. 10-year Warranty.
 - vii. Operating temperature range from -40°C to 70°C.
 - viii. Must be manufactured using non-hazardous materials.
 - ix. Must meet CSA specifications and are subject to ESA inspection and approval.
 - i) Ground terminal or lug.
 - j) Wattage to be adjustable.
2. Mechanical
- a) Toolless access for lamp and driver service.
 - b) Die cast aluminum housing.
 - c) Stainless steel hardware.
 - d) Twist lock time delayed photocell controller.
3. Marking
- a) Exterior nameplate indicating manufacturer, catalogue number, and wattage.
 - b) Interior label indicating LED optics position for various light distributions.
 - c) Interior label indicating supply voltage, frequency, input current, and lamp voltage.

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- d) Interior driver label with wiring diagram.

H3.06 Luminaires for Commercial Areas

Luminaires for commercial areas are to be determined in consultation with the Township.

H3.07 Cabling

Cabling to be installed as per the Ontario Electrical Safety Code and shall be reviewed and accepted by the ESA Inspector.

H3.08 Power Panel Pedestal

Power panels shall be provided to control and protect streetlight circuits.

Individual power panels shall consist of a weatherproof load centre, approved by the electrical distribution operating authority, complete with a 60 amp, 2-pole main circuit breaker, a 40 amp single pole circuit breaker for each streetlight circuit, and a lockable, hinged, access cover.

Supply conductors from the transformer to the power panel shall be stranded copper + ground, RWU90 placed inside PVC conduit.

H3.09 Streetlight Energization and Certification Procedure

The Township requires the following procedure regarding the commissioning of streetlights:

1. The agreement between the Developer and hydro authority to energize the streetlighting system is to be executed and a copy provided to the Township before the Township will issue the first Building Permit.
2. The electrical consultant is required to inspect and certify all equipment and works associated with streetlight construction including but not limited to underground wiring, streetlight pole and installation, fixture, and installation and connections.
3. Once the streetlight construction is complete, the electrical consultant is required to provide a Letter of Certification, signed and stamped by a professional electrical engineer, stating that the consultant has reviewed and inspected the streetlight equipment and installation and certifies that same has been supplied and constructed in general accordance with the design and drawings.

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4. Prior to energization of the streetlight and electrical distribution system, the Developer shall schedule the ESA for the inspection of the streetlight and electrical distribution system works.
5. The Developer shall provide a copy of the ESA's "Connection Authorization" to the Township and arrange for the hydro authority to provide the Township with 48 hours' notice of the intent to energize the streetlight and electrical distribution system. Energy charges for the streetlights will be paid by the Developer upon energization. At the time of the first occupancy, the Developer shall notify both the hydro authority and the Township, at which time the energy charges for the streetlights for the Phase in which the occupancy shall be located, shall become the responsibility of the Township.
6. The streetlight system shall be energized prior to issuance of Initial Acceptance.
7. The Developer must guarantee and maintain the lighting system until assumption of the subdivision by the Township.
8. The Developer shall provide one complete spare (pole, arm, luminaire) for each phase of the development prior to the release of any lighting related securities.



Section I – Landscaping

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Section I – Landscaping

I1.00 General

Landscape drawings are to be prepared by a certified professional Landscape Architect who is a member in good standing with the Ontario Association of Landscape Architects (OALA). The landscape architect shall coordinate and liaise with all other consulting engineers to ensure accurate information is provided on the landscape drawing(s).

The landscape drawing(s) shall include at a minimum, the following information:

- All base information coordinated with engineering drawings and site plans to ensure consistency.
- Adjacent lands and roads provided with spot elevations to show the slope of land based upon the Overall Grading Drawing(s).
- Walkways, parking areas, exterior lighting, street furniture, hydrants, boulevard trees, transformers and utility boxes, community mailboxes, curbs, signage, etc.
- Location of all surrounding boundaries, property lines, and limits of the proposed development including easements, daylight triangles, reserves, etc.
- Location of underground services, above ground utilities, roadways, buildings, or existing features.
- Location of all proposed plant material, planting beds, and sodded areas.
- Location of existing vegetation to be retained / protected or removed.
- Location and type of protection measures for the existing vegetation retained / protected.
- Location of all existing natural features such as top of bank and watercourses.
- A plant list including full botanical name, common name, quantity, caliper, height, spread, nursery conditions, container type, and general remarks.
- Location, height, and material of all fences, screen walls, and retaining walls (as applicable).
- Location of SWM features.
- Any other landscape element that contributes to site development.

All plants, materials, and structures placed on municipal lands shall be designed and constructed with the intent of being low maintenance for the Township.

The Developer will be required to plant trees on all streets and blocks in accordance with the specifications established by the Township and as shown in the "Accepted for Construction" landscaping drawings.

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Landscape drawings must take into account adjacent lands. Buffer requirements will be determined by the Township and may include any combination of the following: landscape planting buffer strip with minimum width, screen plantings, fencing, and / or berming. In addition to the aesthetic qualities that soft landscaping presents, fencing and / or berming may be required to serve as a noise reduction and / or privacy enhancing element.

I1.01 Topsoil

Topsoil shall be natural, fertile, loamy agricultural soil capable of sustaining plant growth with sufficient water retention capacity to help promote water conservation by reducing the need for lawn watering.

All topsoil must be tested for suitability with reference to the specifications of the Nursery Sod Growers Association of Ontario and Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) fact sheet for "Lawn Establishment". Soil testing shall be completed by an OMAFRA accredited soil testing laboratory. Best Management Practices shall be used to determine the suitability of topsoil proposed to be applied. Prior to placement, a letter from the Developer's geotechnical consultant verifying that the topsoil is suitable to support healthy turf growth, does not contain pesticides nor industrial contaminants, and meets OMAFRA criteria is to be provided to the Township.

Native on-site topsoil material may be used subject to the recommendations of the geotechnical consultant. The quality of topsoil material is to be confirmed through laboratory testing. The consultant shall take samples from at least three random locations from the stockpiles and tests shall be conducted on a combined mixture of the three samples. Testing shall include gradation, organic matter, pH value, and levels of phosphorus (P) and potassium (K). If native site topsoil material does not meet the above requirements, the geotechnical consultant may make recommendations for amendments and / or blending of topsoil with imported material to provide a final product that is acceptable to the Township.

Prior to placement of topsoil, the subgrade must be graded to eliminate low / uneven areas to ensure consistent topsoil thickness and provide positive surface drainage. Topsoil is to be placed no longer than seven days prior to sodding or seeding. A pre-sod inspection is to be completed by the Developer's engineer and Township staff prior to the placement of sod.

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The Developer shall coordinate with civil engineering and site works operations to ensure the minimum depth of topsoil is applied on-site.

Topsoil depth requirements are as follows:

Table 1: Topsoil Depth Requirements

Placement Location	Depth
Boulevards	Minimum 150 mm
Shrub Planting Beds	Minimum 500 mm
Tree Planting Pits / Beds	Minimum 500 mm
Sodded / Seeded Areas (non-boulevard areas)	Minimum 150 mm

I1.02 Sod

All lots are to be completely sodded unless otherwise indicated on the “Accepted for Construction” drawings. Any park or open space block less than 0.4 ha in size, and all swales, are to be sodded. All sodded areas are to be provided with a minimum thickness of 150 mm of topsoil that meets the above-mentioned criteria. The topsoil shall be screened clear of all stones, debris, and woody material and shall be free of noxious weeds, to the satisfaction of the Township.

Sod shall be Kentucky Bluegrass (*Poa pratensis*) nursery sod containing 60% to 70% Kentucky Bluegrass and 30% to 40% Creeping Red Fescue (*Festuca rubra*), Chewings Fescue (*Festuca rubra* subsp. *commutata*), or Hard Fescue (*Festuca ovina*) as specified by the Nursery Sod Growers Association of Ontario (NSGAO) and in accordance with OPSS.MUNI 803. Sod shall be placed with sufficient density such that surface soil is not visible and shall be placed to match existing adjacent elevations at all edges.

Sod to be uniform in texture, free of weeds, and in a good healthy condition, and contain sufficient moisture to maintain its vitality during transportation and placing. In designated slope areas, sod will require pegging by a system acceptable to the Township. The Developer shall be responsible for proper turf maintenance up to the time of assumption, to the satisfaction of the Township.

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Scheduling of sod laying is to coincide with topsoil operations. Installation of sod is not to take place without Township inspection and approval of topsoil preparation first.

Sodding during dry weather is acceptable only if sufficient and continuous watering is assured. Sod is to be laid, even with adjoining landscape areas. The rows shall have staggered joints. Sections are to be butted closely without overlapping or leaving gaps between sections. Irregular or thin sections are to be cut out. A light roller is to be used to provide close contact between sod and soil. Heavy rolling to correct irregularities in grade is not permitted.

Sod is to be watered immediately after laying to obtain moisture penetration through sod into top 150 mm of topsoil. Adequate protection of sodded areas is to be provided to protect against erosion and other damage. Protection is to be removed once sod has become established.

It is the Developer's responsibility to maintain the sodded areas in good condition until assumption of the phase of the development. Maintenance includes but is not limited to weeding, fertilizing as required by soil tests, cutting as required to maintain sod at a maximum height of 60 mm, and watering.

Sodded areas are to be watered as needed to sustain its prosperous growth and prevent deterioration. The Developer is responsible for supplying water to the Site for sod watering. Hydrant use will be at the Township's discretion, and must be coordinated through the Public Works Department.

I1.03 Mechanical Seeding, Hydro-mulching

All areas that are to be provided with hydraulic seed and mulch in accordance with the Accepted for Construction drawings shall be an all-purpose lawn seed mix applied in conformance with the supplier's specifications and recommendations and shall be in accordance with OPSS.MUNI 804.

Native seed mixes for naturalization or SWMFs shall be applied using terra-seeding or hydro-seeding and shall include a cover crop as per the supplier's specifications and recommendations.

Grass seed shall be a Canada No. 1 Seed Mixture for park or athletic turf, and as per OPSS 804. The recommended seeding rate is approximately 140 kg/ha. No area shall be seeded, hydro-mulched, nor sodded until the Township has approved the surface preparation.

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12.00 Tree Locations

Boulevard Tree Planting Drawings for subdivisions shall identify one tree per lot, with additional trees provided along the side yards / flankages of corner lots. Boulevard trees shall also be provided for boulevards flanking stormwater facilities, parks, open space, etc. at a rate of one tree for every 7 to 12 m.

Trees are to be planted so as not to interfere with other street functions or services when the trees mature. Trees shall be planted as indicated on the Township's standard road cross-sections and in keeping with the Electrical Safety Authority (ESA) "Planting Under or Around Powerlines & Electrical Equipment".

At a minimum, the following minimum setback distances from the items listed below, are to be maintained:

Items from which Trees are to be Set Back	Distance
Face of warning signs	10.0 m
Face of regulatory signs	3.0 m
Fire Hydrants	3.0 m
Water Service	1.0 m
Hydro Vault	2.0 m (sides) 3.0 m (front)
Hydro Poles	3.0 m
Light Poles	4.5 m
Utility Pedestals	2.0 m
Community Mailbox	2.0 m
Driveways	1.5 m

13.00 Tree and Shrub Species

Trees and shrubs shall be selected from species that are native to the township of Clearview area and are appropriate to the region's Planting Zone. Additional species and varieties may be planted subject to written approval from the Township. Where possible, narrow (columnar) species of taller trees should be utilized instead of small trees.

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Appropriate species for parks, open space, stormwater facilities, and naturalization areas shall be determined on a site-specific basis. Species should be non-invasive, hardy, and tolerant of the proposed conditions.

To promote species diversity, where more than 30 trees are proposed, a maximum of 20% of one family, 10% of any genus, and 5% of any species shall be used. When less than 30 trees are proposed, there should be no more than 40% of one genus and 20% of one species. The largest continuous grouping of any one species shall be eight (8).

The following list of trees includes, but does not limit, those that are acceptable for this purpose and includes native and non-native (non-invasive) species that are acceptable for Zones 5 and 6.

I3.01 Deciduous Trees

Common Name	Scientific Name
Silver Maple (Softwood, restoration areas only)	<i>(Acer saccharinum)</i>
Red Maple	<i>(Acer rubrum)</i>
Sugar Maple	<i>(Acer saccharum)</i>
Brandywine Red Maple	<i>(Acer rubrum 'Brandywine')</i>
Autumn Fest Sugar Maple	<i>(Acer saccharum 'Autumn Fest')</i>
Celebration Maple	<i>(Acer x freemanii 'Celebration')</i>
Burr Oak	<i>(Quercus macrocarpa)</i>
Red Oak	<i>(Quercus rubra)</i>
Basswood	<i>(Tilia americana)</i>
Serviceberry (Tree form only)	<i>(Amelanchier canadensis)</i>
Cumulus Serviceberry	<i>(Amerlanchier x grandiflora 'Cummulus')</i>
Princess Diana Serviceberry	<i>(Amerlanchier x grandiflora 'Princess Diana')</i>
Ironwood	<i>(Ostrya virginiana)</i>
White Elm (disease resistant cultivar)	<i>(Ulmus americana)</i>

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Common Name	Scientific Name
Large-tooth Aspen (Softwood, restoration areas only)	<i>(Populus grandidentata)</i>
Scarlet Oak	<i>(Quercus coccinea)</i>
White Oak	<i>(Quercus alba)</i>
Ivory Silk Lilac	<i>(Syringa reticulata)</i>
Littleleaf Linden	<i>(Tilia cordata)</i>
Boulevard Basswood	<i>(Tilia americana 'Boulevard')</i>
New Horizon Elm	<i>(Ulmus x 'New Horizon')</i>

13.02 Coniferous Trees

Common Name	Scientific Name
Eastern Red Cedar	<i>(Juniperus virginiana)</i>
Eastern White Pine	<i>(Pinus strobus)</i>
Red Pine	<i>(Pinus resinosa)</i>
White Spruce	<i>(Picea glauca)</i>
Red Spruce	<i>(Picea rubens)</i>
Balsam Fir	<i>(Abies balsamea)</i>
Colorado Spruce	<i>(Picea pungens)</i>
Eastern Hemlock	<i>(Tsuga canadensis)</i>
Columnar White Pine	<i>(Pinus strobus 'Fastigiata')</i>
Scots Pine	<i>(Pinus sylvestris)</i>
Scots Sentinel Pine	<i>(Pinus sylvestris 'Fastigiata')</i>

13.03 Shrubs

Common Name	Scientific Name
Nannyberry	<i>(Viburnum lentago)</i>
Highbush Cranberry	<i>(Viburnum trilobum)</i>
Squashberry	<i>(Viburnum edule)</i>
Alternate Leaf Dogwood	<i>(Cornus alternifolia)</i>

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Common Name	Scientific Name
Silky Dogwood	<i>(Cornus amomum)</i>
Staghorn Sumac	<i>(Rhus typhina)</i>
Red Mulberry (Shrub-form)	<i>(Morus rubra)</i>
Service Berry (Shrub-form)	<i>(Amelanchier canadensis)</i>
Redbud (Shrub-form)	<i>(Cercis canadensis)</i>
Red Chokeberry	<i>(Aronia arbutifolia 'Brilliantissima')</i>
Black Chokeberry	<i>(Aronia melanocarpa)</i>
Spicebush	<i>(Lindera benzoin)</i>
Common Elderberry	<i>(Sambucus canadensis)</i>
Meadowsweet	<i>(Spirea alba)</i>

I3.04 Plant Material Specifications

All plant material is to conform to the Canadian Nursery Trades Association Specifications and Standards and shall be planted with a minimum two (2) year warranty. The warranty period shall be two (2) years from the date of certification regarding quality and health of the plant, which shall be issued by the Developer's landscape architect or arborist. All plant materials shall be maintained by the Developer, from the time of planting until Assumption by the Township. Any replacement trees shall also have a two (2) year warranty from the date of certification. Plant material shall be No. 1 Nursery Stock that has been grown under controlled conditions in accordance with the standards and practices of the Canadian Nursery Trade Association.

The below standards are minimum requirements. Trees and / or shrubs may be required to be planted at closer intervals, with higher calipers and in greater quantities if a specific purpose is identified by the Township.

The minimum acceptable size and condition requirements for plant material are as follows:

I3.05 Deciduous Trees

- 60 mm caliper measured at DBH and 2.25 m to 4.0 m minimum height.

Deciduous trees planted in a row should be centered 5.0 m to 7.0 m apart for small flowering trees and 8.0 m to 12.0 m apart for shade trees.

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- Deciduous trees – ornamental: 60 mm caliper, or 200 cm tall multi-stem.

I3.06 Coniferous Trees

- 1.8 m height.

Coniferous trees should be spaced 4.0 m to 8.0 m apart depending on effect.

I3.07 Shrubs

- 60 cm, 3 gallon pot.

Shrub spacing depends on variety; however, shrubs should be grouped in large beds and shall be mulched to a minimum depth of 100 mm.

I3.08 Mulch

All mulch shall be shredded bark, free of dyes and chemicals that inhibit plant growth. Mulch is not to be put into direct contact with tree or shrub trunks / stems. Mulch should not be placed within:

- 100 mm of the base of tree trunks.
- 50 mm of the base of shrub branching.

I4.00 Planting Details

Trees are to be planted in tree pits, large enough to accommodate the root system. Trees shall be planted in a soil mixture of equal parts topsoil, sand, and organic matter including compost, all to be thoroughly combined and properly filled to eliminate air pockets and settling. All trees are to be planted during the spring or fall dormant season in unfrozen soil.

Trees shall be protected by wooden stakes placed on both sides of the tree, parallel to the street line. Tree ties shall be 50 mm burlap strips or a proprietary flexible tie system which allows the tree a reasonable degree of movement to help build trunk taper. Plastic hoses and wire ties are not acceptable. Ties are to be removed after one year. Staking should be done in a manner that allows the crown of the tree to still have free movement, but to not be heavily affected or shifted by wind, snow loads, or human force. Tree stakes are to be removed after the duration of two full growing seasons. Refer to the Township's Tree Planting Standard Details.

Trunk guards shall be provided for all caliper trees planted in sod / lawn to prevent lawn trimmer damage. The guard shall consist of 150 mm Big "O" pipe

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a minimum of 300 mm up the trunk base or flexible trunk wrap. They may be omitted from trees in planting beds. Trunk guards shall be removed prior to Assumption to prevent trunk girdling.

Rodent guards shall be used on deciduous trees for all naturalization plantings, including stormwater facility plantings. For caliper sized material, rodent guards shall consist of white plastic spiral wrap wound around the base of the trunk, to a height of 60 cm to 100 cm. For seedlings, it shall consist of 1200 mm long vented, photodegradable, polypropylene tree shelters, twisted 50 mm into the ground and supported with 50 mm x 50 mm x 1,200 mm wood posts. Spiral rodent guards are to be removed after two years.

All trees proposed to be planted within the minimum suggested proximity to infrastructure services are to be excavated by hand. The final location of all trees is to be mutually determined with the Landscape Architect and the Township, prior to placement.

All trees that die or fail to grow prior to Final Assumption shall be replaced by the Developer.

I5.00 Tree Inventory and Preservation Plan

Depending on the nature of the existing site conditions, the Township may require a Tree Inventory and Preservation Report and Plan as part of the engineering submission. Tree Preservation Drawings are to be completed with inventory data collected by an ISA certified arborist from the project site. Tree protection fencing is to be installed as per the Township's Temporary Tree Protection Fencing Standard Details.

See Section A and Appendix C of these standards for submission requirements.

I6.00 Standard Tree Preservation Notes

The following notes are the minimum required notes to be included on the Tree Preservation Drawing:

1. There shall be no construction, grade alterations, disposal, parking of vehicles or machinery, storage, or disturbance of any kind within the tree protection zone.
2. Tree protection fencing shall be installed prior to any construction activity and is to remain in place and in good condition, periodically inspected and

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repaired as needed throughout the site construction and house building phases.

3. All trees are to be removed outside of the Wildlife Protection Window of April 1 to October 31 unless inspected by a qualified ecologist prior to clearing. Inspection is to occur no more than four days before clearing.
4. Vegetation clearing is to be avoided between the dates of April 1 to August 31 per the *Migratory Birds Protection Act*.
5. Tree protection fencing and ESC measures are to be monitored regularly for deficiencies that may result in wildlife entering the work zone.

17.00 Trails / Walkways

1. All pedestrian trails and walkways shall be compliant with the current AODA Standards.
2. Culverts (where required) are to be installed at street entrance of walkways and open space areas in accordance with Township Standard Drawings.
3. 3.0 m wide walkways to open space areas and subdivision walkways shall be paved, with a 1.0 m sodded mow strip on either side. Trees may be required to be planted along the walkways at 5.0 m to 7.0 m for small flowering species and 8.0 m to 10.0 m for larger species, at the discretion of the Township.
4. Black Vinyl coated chain link fencing to be installed for park perimeter fencing.
5. Security lighting, where required, shall be installed by the Developer and lighting shall be the same type as the subdivision street lighting and shall meet all Township Public Works Standards for streetlighting. Bollard-style lighting is not permitted. Park and walkway lighting to be pole mounted cobra head. Pole height may be adjusted for the specific usage.

18.00 Fencing

Fencing shall be in accordance with the requirements of the Township's Fence By-law and Draft Plan Conditions.

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Fencing shall be provided as described below, along rear and side lot lines, where residential lots abut the following lands:

Table 2: Fencing Heights and Types

Adjacent Land	Fence Height / Type	Subject Land
Public Land (open space, park, SWMF)	1.5 m chain link	Public land
Walkway block	1.8 m wood privacy (from front face of dwelling to rear lot line) and 1.5 m chain link (from front face of dwelling to street line)	Public land
Agricultural Land	1.5 m chain link	Residential lot
School and Institutional	1.8 m chain link	School / Institutional land
Commercial / Industrial	1.8 m wood privacy (or acoustic where required by the Noise Impact Study)	Residential lot
Collector Road	1.8 m wood privacy (or acoustic where required by the Noise Impact Study)	Residential lot
Existing Residential Properties	1.8 m wood privacy	Residential lot (development)
Community Mailbox (Along Flankage)	1.8 m wood privacy	Residential lot

Commercial and Industrial properties may also require wood privacy fencing where side or rear yards abut roadways at the discretion of the Township.

All chain link fencing shall be black vinyl coated with top rail in accordance with OPSD 972.130. Height to be 1.5 m or 1.8 m as identified in Table 2.

Privacy fencing shall be as per Township Standard Details.

Acoustic fencing shall be as per the requirements of the Acoustic Study / Noise Impact Study.

Private access gates are not permitted through municipally-owned fences.

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Timing of the installation of the fencing shall be determined as set out in the Subdivision / Development Agreement.

Additional chain link or wood privacy fence locations required or where deemed necessary by the Township shall be determined during the engineering submission review(s) and preparation of the subdivision or site Plan agreement(s).

All fencing shall be guaranteed until Assumption.

Removeable bollards are required at the entrances of walkways and maintenance access roads to control unauthorized vehicle access. Clear space between bollards and/or fencing shall be in accordance with AODA.



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Section J – Parklands

J1.00 General

Parks are an essential component of the urban area. They provide opportunities for both residents and visitors to explore other aspects of daily life and to have social, educational, and recreational experiences in a designated outdoor setting.

Parkland that provides maximum benefit to the public, integrates existing natural features (such as streams and creeks) and cultural heritage resources (such as woodlots and hedge rows) in a functional manner are a vital component of a well-planned community. The ideal park will have a wide range of features and facilities from open meadow to shady groves of trees and will accommodate use by residents with a variety of interests and capabilities.

Prior to the initiation of any design work, the Township requires pre-consultation with the Applicant and their agents to address the design features for park and open space facilities.

These standards focus specifically on the development of parkland within the Township and outline key requirements and expectations for the following:

- Planning of parkland through the planning process (Draft Plan).
- Minimum parkland requirements for municipal assumption under a Development Agreement.
- Minimum design, construction, and technical standards.
- Parkland drawing requirements (facility fit plan).

J1.01 Naturalization

Areas of naturalization are encouraged within all parks and open space areas. Naturalization may be in the form of a low maintenance planting area, a buffer area for adjacent woodlots or stream corridors, or a SWMF. The locations and design of these naturalization areas are to be coordinated with the existing natural heritage characteristics of the Site, technical studies such as EIS, the SWMF drawing, the Site's overall programming needs, and with consideration for any abutting natural areas or woodlots.

Naturalization areas will consist of either open meadows of herbaceous plants, (grasses, forbs, and native wildflowers) or of successional native woody plant material (shrubs, native ground cover, and trees) to eventually establish a woodlot.

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Standard maintenance activities in the naturalization areas are to be limited to the removal of invasive non-native species, and a 1.0 m mowed strip adjacent to all trails and walkways abutting the naturalized area. The NVCA and the NEC should be consulted where the limits of their jurisdiction overlap throughout the design process, and the Township must approve selection of all plant material for naturalized areas. All plant species are to be appropriate to the site conditions. The use of native, non-invasive species local to the region will be a requirement.

J.1.01.1 Design

The Township encourages the preservation of 25% of existing vegetation within park blocks. To preserve this vegetation, a naturalized planting area may be required. Naturalization and naturalized buffer planting may also be required for park areas that abut natural heritage systems and watercourses. Newly naturalized areas will incorporate the following design techniques:

- The use of several plant associations which are commonly found in that area.
- Clustering of plants in maximum groupings of five to seven of the same species to replicate natural communities.
- Installation of temporary deer abatement fencing around naturalization areas where applicable (grow tubes are another option for smaller stocks).
- Locally native and well suited seed mix is to be applied to all disturbed areas outside of the limits of sodding. Conventional sod will not be accepted in or near natural areas, or in areas regulated by NVCA, unless otherwise noted.
- When required, inclusion of wildlife habitats in areas with documented significant wildlife species (i.e., snake hibernaculum, bat roosting boxes, turtle nesting boxes, etc.). Any of these requirements will be identified in the EIS report supporting the project.

J1.02 Woody Plant Material Minimum Installation Requirements

The Developer shall be responsible for the supply, delivery, installation, and maintenance including watering of all newly planted material in open space areas, until the time of Assumption of the Phase in which the open space area(s) are located.

The installation and the plant material required shall be designated by the Township and planted and maintained by procedures outlined in Section I – Landscaping.

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J1.03 Site Preparation

Public open space areas shall be developed in accordance with the following requirements.

1. Unless otherwise directed, all open space sites are to be left in a natural state. Site-specific works may be required by the Township, NVCA, and / or the NEC with open space natural areas, depending on the Site's location.
2. The Developer is responsible for protecting all existing healthy trees from any damage from the drip line of their root zones inward. This protection shall remain in good condition during the entire construction phase and will be subject to regular inspection.
3. Underbrush less than 50 mm in diameter to a height of 1.0 m above ground shall be removed by the Developer.
4. All dead, diseased, or damaged trees shall be removed by a certified arborist.
5. All dead, diseased, or damaged wood in live trees shall be removed by a certified arborist, utilizing all proper pruning practices.
6. Any other trees that the Township deems necessary for removal shall be removed by a certified arborist.
7. Any fallen limbs, trees, litter, and debris shall be removed from the open space site by the Developer.
8. Any stumps that the Township deems necessary for removal shall be removed and disposed of by the Developer.
9. The existing topsoil shall not be removed from the open space site. Existing topsoil may be stockpiled in an area designated by the Township to allow for grading.
10. The stockpiling or the burial of litter and debris on the open space site shall not be permitted.

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All open space areas shall be fenced off / protected from the construction zone of the development until completion of all servicing works and the completion of the construction of all dwellings abutting the area.

J2.00 Park Classifications

The Parks, Recreation, and Culture Master Plan provides a framework to manage, sustain, and enhance parks within the Township. However, it does not identify classification types. Accordingly, these Standards define typical municipal park classifications as follows.

J2.01 Community Parks

Community parks are used by groups of residents and tourists for community events, festivals, and active recreation. They may contain athletic amenities for organized recreation such as sports fields, support buildings, and community-wide recreation amenities, as well as pathways, pavilions and / or unique elements that make the park a “destination”. Full services (water, sanitary, storm, hydro, etc.) are required, as directed by the Parks and Recreation Department, as well as on-site parking facilities and cycling infrastructure (bike racks).

J2.02 Neighbourhood Parks

Neighbourhood parks primarily support children’s play activities and are typically situated within subdivisions to promote walkability and cycling infrastructure. These parks contain playgrounds, local level play features, and / or passive open space intended to serve the immediate area. Full services (water, sanitary, storm, hydro, etc.) may be required at the discretion of the Township.

J2.03 Parkettes

Parkettes are generally the smallest of municipal park facilities. They are less developed than neighbourhood parks. Their primary purpose is to provide access to green space for nearby residents and travelers. They may contain seating areas, pathways, floral / ornamental gardens, shade trees, etc. Most do not contain playground equipment, unless there are no neighbourhood parks nearby.

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J2.04 Urban Plaza

Urban plazas are lands that are located in highly visible and accessible locations, typically gateways or higher density urban areas. They serve to support the Township's social and cultural fabric, create a sense of place, and may contain elements of historical or cultural importance. They are typically characterized by hardscaped areas for events and gatherings, public art, seating areas, related civic uses, etc.

J3.00 Park Planning

The layout and placement of parkland blocks within a development plan is critical. Parks should be located as defining community features and are integrated as focal destinations within an interconnected pedestrian and active transportation network.

Although it is recognized that the design of each community is influenced by various factors, generally a Draft Plan should demonstrate parkland blocks that achieve the following objectives:

- Parks must be located to permit convenient access from public road allowances for maintenance operations.
- Lot patterns, road, and pedestrian / trail networks should be designed to place parkland in prominent site locations to create visual and physical focal points within the community.
- Park blocks should be located to provide convenient and accessible pedestrian access.
- Where possible, parks should be located adjacent to natural features (i.e., watercourses, water bodies, forested areas, etc.) and naturalized SWMFs to provide greater green space impact.
- Similarly, parkland should also be located adjacent to community institutions (i.e., schools, places of worship, etc.).
- Community parks shall have a minimum of 120 m of street frontage on at least one side with additional walkway connections (blocks) to other nearby streets or community nodes.
- Park parcels with square or rectangular configurations are preferred as they provide the most versatility for incorporation of public amenities, particularly sports facilities. Parks with odd shapes may not be accepted, by the Township.

Section J – Parklands

- Mid-block pedestrian crossings may be required to access parks, where appropriate, to ensure direct access from walkways, trails, and other pedestrian connections.

The following parkland conditions are not considered acceptable:

- Dedication of awkward portions of the lot fabric that could not be developed into marketable residential or commercial properties.
- Blocks with odd shapes and excessive grades will not be accepted as parkland.
- Parks shall not be hidden from view from the street or neighbouring uses.
- Parkland shall be conveyed to the Township free of any physical encumbrances above or below grade.
- Easements in favour of the Township or local utilities creating limitations on the development of functional public space shall not be considered a component of the parkland calculation.
- SWMFs, valley lands, or floodplains are not acceptable as parkland.

J3.01 Facility Fit

The Township may define the required objectives and user programming for the park blocks and the Developer will be required to prepare a Facility Fit Plan to demonstrate that the proposed parkland can accommodate the requirements.

The Facility Fit Plan is generally a park concept drawing to demonstrate that the parkland dedication is of sufficient size and configuration to accommodate the required park amenities, facilities, grading, drainage, setbacks, fencing, and other requirements. It generally demonstrates the following:

- Tree preservation.
- Park configuration and size to accommodate the intended recreational amenities.
- Required setbacks.
- Anticipated grading and drainage works conforming to the accepted overall Stormwater Drainage Drawing for the subdivision.
- Required services and location for park construction.
- Identifying any encumbrances.

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J3.02 Accessibility

In coordination with the AODA and the Township's FADS, the Township will be expecting facilities and park designs to be sensitive towards user groups with disabilities. Designs will be considered on a site-by-site basis in order to evaluate the need and application of "accessible designs". The Township may consider a special, dedicated facility within a park to accommodate a variety of users.

Trails and Walkways – Parkland and park facilities will be designed to provide barrier free access to wheelchair users and others with mobility limitations as per AODA requirements. Each park will contain a pedestrian system of walkways, trails, bridges (where applicable), and ramps, in accordance with the Standard Drawings and FADS, to provide continuous direct access from the access or entry point at the edge of the park or parking lot to the park facilities.

Playground Equipment – The design of play areas is to include consideration for accessible paths to the play area from the rest of the park, as well as accessible surfacing to access the play equipment. As a minimum, playground equipment will be selected to allow for children who are wheelchair users to have access to the play equipment by means of a ramp or transfer platform used with the assistance of a parent or caregiver. Specific play components will take into consideration the needs of limited-mobility users, other special needs, and age groups. See AODA Regulation related Outdoor Play Spaces.

Other Features and Fixtures – The selection of site furnishings (e.g., picnic tables), hardware (e.g., door handles), and fixtures will be based on ease of use for a wide range of capabilities and age groups.

All park planning, design, and construction oversight shall be completed by a landscape architect who is a full member in good standing with the OALA with Seal and Certificate, who shall be responsible for the preparation of drawings and specifications to the satisfaction of the Township.

J4.00 Minimum Park Development Requirements

As a component of a Development Agreement, all new parkland developments shall be designed and developed to meet the minimum standards required by the Township. A summary of these minimum requirements is as follows:

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- Graded to provide positive surface drainage, with care to protect the root system of existing trees to remain. Minimum grades for parkland shall be 2%.
- Parkland trees shall be preserved and protected unless removals are necessary to accommodate the overall grading / servicing design and / or as formally directed and approved by the Township.
- The entire park shall have or receive a minimum of 150 mm of topsoil, unless deeper profiles are necessary for special features (pond embankments, naturalized areas, etc.), as may be required by the Township.
- All high-use areas of parks shall be sodded. Select areas may also be considered for seeding (hydro-seeding and / or terra-seeding) at the discretion of the Township (i.e., naturalization areas, no-mow areas, etc.).
- All public to private property interfaces shall be fenced with 1.5 m high black vinyl chain link fencing. Park frontages along streets and boundaries shared with schools, open spaces, or SWMFs do not require fencing, unless required by the Township or the school board.

J4.01 Protection

All existing vegetation is to be protected as identified on the accepted for construction drawings, prepared by a certified landscape architect prior to commencing any site works. The root systems and habitat of existing trees shall be protected from all construction works, hoarding, and compaction. For the installation of conduits, the contractor may be required to bore / tunnel under the tree's root system using methods and equipment acceptable to the Township and under the supervision of a certified arborist. No trees shall be pruned without prior approval from the Township.

J4.02 Clearing

The Site is to be cleared of all rubbish, rocks, boulders, tree stumps, and any other materials and debris, and disposed of off-site, unless instructed otherwise. All dead trees are to be cut and stumps and roots removed, to a minimum depth of 600 mm below proposed finished grade.

J4.03 Topsoil and Stripping

All areas designed for paving or the construction of structures, shall be stripped of all topsoil and organic matter to its full depth taking care not to contaminate

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it with any sub-soil. All stripped topsoil shall be stockpiled in areas identified on the accepted for construction drawings.

Topsoil will be re-used for landscape work, unless specified otherwise. Commence topsoil stripping only after designated areas have been cleared of scrub, weeds, brush stumps, rocks, and other deleterious materials.

J4.04 Filling

Fill material shall be clean, free of topsoil, and organic matter and debris, and shall be approved by the Township before placing. On-site excavated material may be used for filling when approved by the Township. Testing of proposed fill materials will be required. All imported fill material shall meet O. Reg. 406/19 criteria.

Where fill material is required, to raise existing grades to the specified level, as shown on the drawings, the fill shall be placed in 150 mm lifts and each layer compacted to a minimum dry density of 98% of the maximum Standard Proctor Density, before placing subsequent layers. The surface shall be shaped at all times to ensure adequate surface runoff and prevent ponding and scouring.

J4.05 Excavation

Before proceeding with excavating work for paving and footings, the areas shall be staked out in consultation with the landscape architect.

J4.06 Inspection

The Applicant's consulting engineer will verify existing sub-grade and site conditions including vegetation and report any changes / alterations / substitutions from the accepted for construction drawings, in writing, to the Township and the landscape architect.

The consulting engineer or appropriate authority will verify that all underground services, such as water lines, sewers, electrical cables, telephone, gas, and other utility lines and have been constructed as per the accepted for construction subdivision drawings.

Upon receipt of the consulting engineer's report, the Work will be inspected by the Township. Township approval must be obtained before proceeding with further Work.

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J5.00 Site Grading**J5.01 Drainage**

All drainage associated with park amenities and open space shall conform to Township Grading and Drainage standards outlined in Section G of this manual. Parkland is to be conveyed in a condition where no surface water will be left standing and in accordance with an overall Grading Drawing. The Developer will be responsible for all costs associated with installing a drainage system to the Township's satisfaction. The preliminary park drainage system required for conveyance is to be designed with the overall subdivision drainage taking advantage of nearby street storm sewers where possible. Park and open space property is not to be used for draining private properties. All park drainage is to be designed to encumber the Site as little as possible. The entrances to the park or open space are to be clear of sewer appurtenances.

J5.02 Topsoil and Grading

The park shall be fine graded in accordance with the accepted for construction Grading Drawing with particular care being taken to avoid damage to those trees that are to remain. Note that the Developer is responsible for protecting all existing healthy trees from the drop line of their root zones, inward. This healthy protection shall remain in place during the entire construction phase. All graded areas shall be covered with a minimum of 150 mm of approved topsoil (refer to Section I – Landscaping for detailed topsoil depth requirements), maximum slopes are not to exceed 3:1, and shall be sodded and fertilized in accordance with the specifications of the Township.

Spreading of topsoil, rough grading, fine grading, and bed preparation (including removal of all stones and debris) are to be completed by the contractor and inspected by the Township prior to sodding. Topsoil shall be stabilized within the construction year's growing season. Stockpiling of topsoil will not be permitted on parklands.

Native topsoil intended for re-use shall be tested in accordance with the requirements of Section I – Landscaping to ensure that the fertility and composition are suitable for use in a public park. Test results shall be submitted to the Township for approval prior to the park development.

Native topsoil shall be amended to conform with the Engineering Standard's specifications for "Topsoil", based on the testing laboratory recommendations.

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Topsoil for general parkland applications shall be screened through a 25 mm size screen and be reasonably free from debris, sub-soil, clay lumps, roots, and stones over 25 mm diameter and coarse vegetative material occupying greater than 2% of soil volume.

J6.00 Site Servicing**J6.01 Neighbourhood Parks**

The Developer shall be required to install a 25 mm diameter water service from the road allowance to a location approved by the Township, as identified on the Accepted for Construction drawings.

A single-phase electrical supply line from a local transformer is to be installed to a location approved by the Township, as identified on the Accepted for Construction drawings.

Additional municipal services and / or additional utilities may be required at the discretion of the Township.

J6.02 Community Parks

The Developer shall be required to install the following services to a location within the park block from the road allowance as approved by the Township, as identified on the Accepted for Construction drawings:

- A 150 mm diameter water supply line, complete with a valve located at the property line.
- A sanitary sewer stub, including an MH located at the property line.
- A 3-phase electrical service to be brought to surface 1.0 m inside the park property line.

For all park types, the Developer shall be required to provide an appropriately sized storm sewer outlet in the form of a ditch inlet, CB, or SWMF. Connections from these structures to the surrounding storm sewer system shall be set at an invert elevation low enough to positively drain the entire park block.

Where a community park has two or more street frontages, all or some services are to be provided at each park frontage, as directed by the Township.

Services shall be stubbed and clearly marked with a wooden stake at ground level.

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Where natural gas, and / or telecommunication utilities may be required to service specific facilities or amenities within a park, the need for such utility infrastructure will be assessed on a project-by-project basis, as determined by the Township and shall be installed as part of the servicing requirements of the Developer.

J7.00 Planting – General

The Township encourages the use of native, non-invasive, drought-resistant species within parks and open space. Where a proposed planting area is adjacent to woodlots, watercourses, or other natural areas, only non-invasive species native to the area, and otherwise accepted by the NVCA and / or NEC will be approved.

Non-naturalized planting areas are to be designed in continuous mulched beds of shredded bark with a depth of 100 mm for trees and 50 mm for shrubs, where possible, to reduce maintenance. Bare root plant material will be considered on a site-by-site basis. A variety of tree species is required and approved species are outlined in Section I – Landscaping. Clustering of similar species is discouraged and should be limited to clusters with a maximum of five to seven per grouping. See Section I – Landscaping for details on planting requirements.

J7.01 Park Trees

The Applicant is required to supply and install trees within parkland areas as necessary to provide user comfort, screening / buffering, enhancement, accenting of entrance plazas, wildlife habitat, etc., as determined by the Township.

Refer to Section I – Landscaping for a list of suitable tree species. Moisture regime, sunlight availability, and salt tolerance (where applicable) must also be considered as a factor in selecting species.

Trees are to be placed so as not to interfere with underground utilities, intersection sight lines, overhead wires, traffic signage, and light standards.

Refer to Section I – Landscaping for appropriate spacing requirements when planting near utilities and paved surfaces. Where possible, medium to large shade trees are to be selected for planting within Parklands.

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J7.02 Maintenance Period

During the maintenance period, the Developer must maintain all plants in a vigorous and healthy growing condition, including but not limited to:

- Cultivating and weeding of planting beds and tree pits.
- Watering when required and in sufficient quantities to saturate the root system.
- Pruning, including the removal of dead or broken branches, and treatment of pruning with an approved dressing.
- Disease and insect control when required. Use chemical methods in accordance with the manufacturer's directions. Any damage is to be remedied at no cost to the Township.
- Tree ties and stakes are to be in good condition and are to be removed as per Section I – Landscaping.
- Keep all accessories in good condition and property adjusted. Repair or replace accessories when required at no cost to the Township.

J7.03 Final Acceptance

Planting will be inspected at the end of the designated maintenance period by the Developer's landscape architect, and plant material will be accepted only if it is in a vigorous, healthy, growing condition, in full leaf with no more than 20% dieback. All beds and tree pits must be freshly cultivated and free of weeds, rubbish, and debris.

J7.04 Mechanical Seeding, Hydro-mulching, or Sodding

See Section I – Landscaping for details.

J8.00 Children's Play Spaces

Designs for playgrounds, play spaces, and waterplay areas should consider the physical needs of both children and caregivers, along with consideration for the nature / types of children's play. Active, artistic, creative, games, sensory, social, and reflective play are all consistent types of play, across all children, regardless of age or physical / cognitive ability. The focus should be on the creation of shared play experiences / features as opposed to accommodating differences and disabilities.

Specific minimum requirements are as follows:

Section J – Parklands

1. Play spaces should be located within public parks to be:
 - a) Clearly visible from adjacent streets, neighbouring uses, and neighbouring residents to provide passive surveillance.
 - b) Along secondary pedestrian pathways, to ensure that primary pedestrian routes do not separate adult supervision areas from play spaces.
2. At a minimum, each playground should incorporate separated play spaces that offer a range of diversity of play types for the following groups:
 - a) 1 Tot Area: 0 to 5 years of age.
 - b) 1 Youth Area: 5 to 12 years of age.
 - c) 1 Swing Area: Adult swings, toddler swings, accessible swings, basket swings.

J9.00 Playground Equipment**J9.01 General**

All playground equipment shall comply with CAN/CSA Standards Z614 – Children’s Play Spaces and Equipment (latest edition) and incorporate accessibility features that comply with AODA, 2005 and Ontarians with Disabilities Act, 2001.

Consultants and contractors shall provide shop drawings of creative play structures and play equipment for review and approval by the Township.

J9.02 Structures

A typical program for a neighbourhood park may include, at a minimum:

- Swings: two seats for toddlers, four belt seats, one accessible seat for children with disabilities, and a swing basket.
- Junior creative structure: two to three decks with minimum one roof, transfer station and stairs, two plastic slides – single and dual track, climber, tunnel, or bridge between decks, three to four activity panels, and talk tube or alternate.

Section J – Parklands

- Senior creative structure: three to six decks with minimum one roof, transfer station with stairs, accessibility ramp, two plastic slides – straight and spiral, both open, three climbers, rock wall, or similar activity, four to five activity panels, and sliding pole.
- Spring / spinning toys: two units varying types.

J9.03 Manufacturers

The following manufacturers are approved:

- PlayPower Canada.
- ABC Recreation.
- Henderson Recreation.
- Landscape Structures.
- Little Tykes (commercial play systems).
- Paris Equipment.

The same manufacturer must be used to install all equipment within the same park.

The Developer shall not select a discontinued product, including amenity or colour scheme or portion of the playground structure.

J9.04 Components**J.9.04.1 Decks:**

- Steel with plastisol coating preferred; plastic wood or Trex is acceptable.
- Provide a transfer deck on structure to make it accessible.
- Provide minimum one set of stairs.

J.9.04.2 Climbers:

- Chain net, cable net, and cargo net climbers shall have one piece coupling or nut and bolt couplings. Screw couplings are not acceptable.

J.9.04.3 Spring Toys:

- Direct buried spring toys are acceptable. Anchor all spring toys in a properly designed footing. Spring toys must be removable by Parks Maintenance personnel. Product to be consistent with the manufacturer chosen under Section J9.03.

J.9.04.4 Independent Climbers

- Product to be consistent with the manufacturer chosen under Section J9.03.
- Finish shall be zinc bath, polyester powder coat.

Section J – Parklands

J.9.04.5 Independent Swings

- Product to be consistent with the manufacturer chosen under Section J9.03.

J.9.04.6 Swing Standards:

- Product to be consistent with the manufacturer chosen under Section J9.03.
- All swing posts shall be embedded in footings (anchor footing to bedrock where depth of cover is not at least 1200 mm).
- Top cross bar shall be min. 2440 mm (8'-0") above finished grade.
- Top cross bar shall be 89 mm (3.5") diameter (some 60.3 mm (2-3/8") will be considered, example Little Tykes Anti Wrap).
- Minimum four seats provided in one unit or two separate units.
- Minimum two belt seats, one toddler seat, one accessible seat for a disabled child.
- All swing chains shall be ¼" galvanized.

J.9.04.7 Slides:

- Product to be consistent with the manufacturer chosen under Section J9.03.
- Attached to creative structures, no independent slides.
- In high areas of vandalism, specify stainless steel slide.
- All other areas specify poly slides.
- Open slides are required; slide tubes are not acceptable.
- Straight, wavy, and spirals are acceptable.

J9.05 Activity Panels

- Product to be consistent with the manufacturer chosen under Section J9.03.
- Do not place a poly panel at the end of a ramp. Use steel bars at ends of ramps, mix up steel bars, poly windows, activity panels to add interest to structure.
- Provide 40% of activity panels on ground level for wheelchair users.

J10.00 Play Area**J10.01 Perimeter**

Where walkways are provided, use asphalt or concrete sidewalks as borders to retain safety surface materials. In other areas, use sodded edge. Ensure minimum setbacks are provided from each piece of play equipment as per CSA standards.

Section J – Parklands

J10.02 Drainage

To prevent flooding of playgrounds, safety surfacing may require a drainage underlayer complete with a subdrain system comprised of 100 mm (4") diameter with filter sock, embedded in a French drain of 300 mm wide x 400 mm deep, 19 mm dia. clear stone set into the subgrade. All subdrain systems are to be drained to an appropriate surface outlet or storm sewer connection. Requirements for a sub-drainage system will be determined by the Township in consultation with the playground design consultant.

J10.03 Safety Surfacing

Fibar Systems engineered wood fibres minimum 300 mm (12") deep or approved equal.

Approved Products:

- Wood Carpet.
- Fibre Top Play Care.
- Bulk Wood Fibar.
- Ecostrat or similar biomass products will not be accepted.

J10.04 Electrical

For all parks and open space, an electrical service is required, at the discretion of the Township.

The Developer's electrical engineering consultant is to prepare the electrical drawings for the park or open space block and submit the drawings with the second submission drawing set, when lighting of the park or space, has been required by the Township.

J11.00 Completion**J11.01 Building Permits**

The Developer shall be required to complete all the open space works prior to the issuance of more than 25% of the Building Permits for the first phase of the development.

Should the Developer be responsible for the development of parkland, all required Works shall be completed prior to the first occupancy of the first phase of the development, regardless of what phase the parkland is in. If the park is in land surrounded by future phases, the Developer shall indicate on the

Section J – Parklands

drawings how safe access will be provided to the park (pathways, sidewalk, etc.) This shall be included in the Subdivision Agreement.

J11.02 Securities for Construction and Maintenance

The Developer shall be required to secure the Works for the construction and maintenance of any parks and open space areas. The value of the required securities shall be based on a construction estimate, provided by the Developer's Consultant, submitted to the Township for review and acceptance, and shall be included in the Subdivision Agreement.

J11.03 Guarantee

The Developer shall guarantee all materials, equipment, and Works with the exception of plant materials, for a period of two years following Acceptance. Plant materials shall be guaranteed for a period of two years following certification by the landscape architect. This shall be included in the Subdivision Agreement. See Section I – Landscaping

J12.00 Community Mailboxes

Community mail centres may be constructed in mini-parks, centrally and suitably located in consultation with Canada Post Corporation. The design of the community mail centre must incorporate such criteria as pedestrian safety, traffic flow, and aesthetics. The Township may require the developer to furnish the following amenities within the community mail centre:

- Park benches.
- Fencing.
- Litter containers.
- Landscaping.
- Pedestrian lighting.
- Concrete pad or interlocking stone surface.
- Architectural controlled kiosks.
- Adjacent car bays parallel to the traveled portion of the roadway.

The Developer shall be responsible for obtaining building permits when required, if designs for these mailboxes constitute a "building" when constructed with a roof enclosure.

Section J – Parklands

J13.00 Street Access Points, Access Walkways, and Subdivision Walkways

Walkways shall be constructed of 125 mm concrete surface conforming to OPSS 351 on a 150 mm Granular A base compacted to 95% SPMDD and a minimum width of 3.0 m.

All walkway designs must satisfy the requirements of the AODA and FADS.

Walkways that also function as an overland flow route shall have a minimum width of 6.0 m concrete and shall have a cross-section design to contain and convey the major storm events within the block.

Streetlights shall be provided at the access and egress of all walkways.

Removeable bollards are to be installed at street access points to prevent vehicular access.

Security lighting, where required, shall be installed by the Developer and lighting shall be the same type as the subdivision street lighting and shall meet all Township Public Works Standards for street lighting.



CLEARVIEW
TOWNSHIP

Section K – Standard Drawings

Section K – Standard Drawings

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Section K – Standard Drawings

K1.00 General

The Township Standard Drawings are to form the basis for the design and are to be included, as applicable, in the standard details of the overall drawing set.

Details can be made available in an AODA compliant format upon request.

K2.00 List of Standard Drawings**Table 1: List of Standard Details**

Section	Detail Number	Detail Name
A – General	A101	Unassumed Road Sign
A – General	A102	Benchmark Monument
A – General	A103	Standard Notes – General
A – General	A104	Standard Notes – Roads
A – General	A105	Standard Notes – Sanitary
A – General	A106	Standard Notes – Storm
A – General	A107	Standard Notes – Watermains
A – General	A108	Standard Notes – Erosion and Sediment Control
A – General	A109	Mud Mat Detail
A – General	BSD-24	Typical Rock Check Dam Erosion Control Device (NVCA)
A – General	BSD-23	Typical Detail of Silt / Sediment Fence (NVCA)
A – General	BSD-23A	Temporary Sediment Basin Outlet Details (NVCA)
B – Roads	B101	Local 7.0 m Rural Road – 20 m ROW
B – Roads	B102	Local 8.5 m Urban Road – 20 m ROW
B – Roads	B103	Minor Collector 8.5 m Urban Road – 23 m ROW
B – Roads	B104	Major Collector 11.5 m Urban Road – 26 m ROW
B – Roads	B105	Industrial 10.0 m Urban Road – 23 m ROW
B – Roads	B106	Rural Residential 7.0 m Turning Basin
B – Roads	B107	Urban Residential 8.5 m Turning Basin
B – Roads	B108	Typical 90° Bend

Section K – Standard Drawings

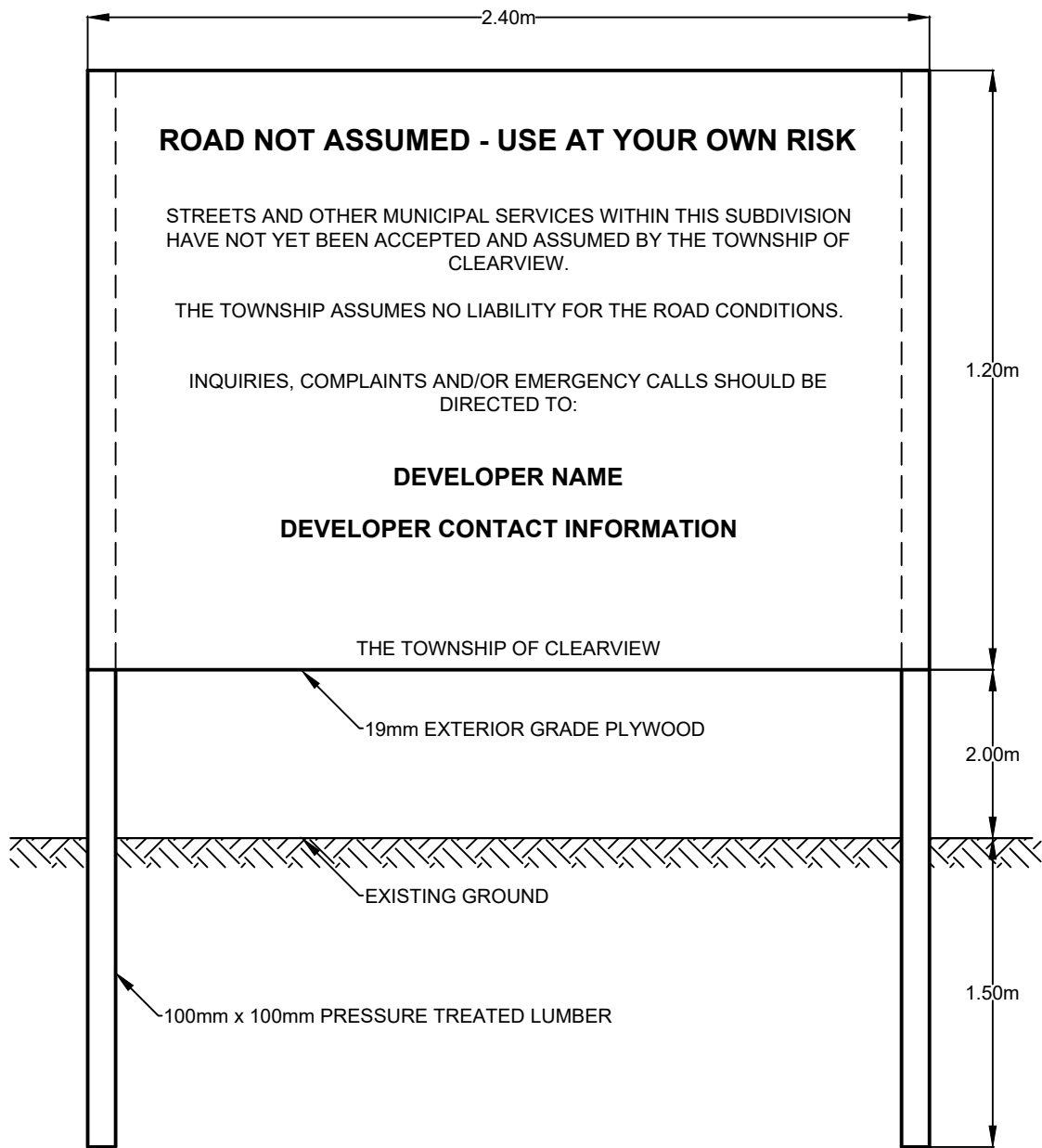
Section	Detail Number	Detail Name
B – Roads	B109	Typical Cul-de-Sac
B – Roads	B110	Urban Residential Driveway
B – Roads	B111	Rural Driveway Entrance
B – Roads	B112	Typical Walkway Cross-section
B – Roads	B113	Regulatory, Warning, and Street Name Sign and Location
B – Roads	B114	Bus Stop Layouts
B – Roads	B115	Bus Stop Signage Posts
B – Roads	B116	Temporary Road Connecting Parallel Streets
B – Roads	B117	Typical Temporary Road Cross-section
B – Roads	B118	Temporary Cul-de-Sac
B – Roads	B119	Typical Precast Circular Structure Waterproofing Details
C – Storm Drainage	C101	Driveway Culvert End Wall Detail (50 km Per Hour or Below)
C – Storm Drainage	C102	Stormwater Management Pond Warning Sign
C – Storm Drainage	C103	Typical Wet Pond
C – Storm Drainage	C104	Typical Wetland
C – Storm Drainage	C105	Sediment Forebay Detail
C – Storm Drainage	C106	Wetland Micropool Detail
C – Storm Drainage	C107	Roof Leader Soakaway Pit
D – Watermains and Appurtenances	D101	Gate Valve and Extendable Valve Box
D – Watermains and Appurtenances	D102	Hydrant and Valve Detail
D – Watermains and Appurtenances	D103	Sampling Station Detail
D – Watermains and Appurtenances	D104	50 mm Blow-off Flushing Hydrant Detail
D – Watermains and Appurtenances	D105	Typical Air Release Valve and Chamber Direct Bury Installation

Section K – Standard Drawings

Section	Detail Number	Detail Name
D – Watermains and Appurtenances	D106	25 mm Residential Water Meter Installation
D – Watermains and Appurtenances	D107	ICI Water Meter Installation Larger than 25 mm
D – Watermains and Appurtenances	D108	Water Service Connection
D – Watermains and Appurtenances	D109	Air Release Valve in Chamber
D – Watermains and Appurtenances	D110	ICI Service Connections
D – Watermains and Appurtenances	D111	Typical Cul-de-sac Water Servicing
E – Forcemains	None	None
F – Sanitary Sewers	F101	Sewer Service Connection Detail
F – Sanitary Sewers	F102	Typical Sanitary Air Release Chamber Details
F – Sanitary Sewers	F103	Trunk Sewer Maintenance Hole Venting Details
G – Grading	G101	Typical Detached Lot Servicing
G – Grading	G102	Typical Semi-detached Lot Servicing
G – Grading	G103	Typical Townhouse Servicing
G – Grading	G104	Front Lot Drainage (Preferred Lot Level Drainage Strategy)
G – Grading	G105	Split Lot Drainage
G – Grading	G106	Split Lot Drainage for Walkout or Backsplit
G – Grading	G107	Typical Side Yard Swale
G – Grading	G108	Typical Side Yard Easement for Rear Lot Catchbasin and Lead
G – Grading	G109	Subdrains for Reduced Slope Swales
H – Utilities and Streetlights	H101	Direct Buried – Joint Use Trench (for Subdivisions Only)
H – Utilities and Streetlights	H102	Streetlight Details – Residential, 1.2 m Arm

Section K – Standard Drawings

Section	Detail Number	Detail Name
H – Utilities and Streetlights	H103	Streetlight Details – Residential, 1.8 m Arm
H – Utilities and Streetlights	H104	Streetlight Details – Industrial, 1.2 m Arm
H – Utilities and Streetlights	H105	Streetlight Details – Industrial, 1.8 m Arm
I – Landscaping	I101	Coniferous Tree Planting Detail
I – Landscaping	I102	Coniferous Tree Planting Detail – On Slope
I – Landscaping	I103	Deciduous Tree Planting Detail
I – Landscaping	I104	Deciduous Tree Planting Detail – On Slope
I – Landscaping	I105	Shrub Mass Planting Detail
I – Landscaping	I106	Shrub Mass Planting Detail – On Slope
I – Landscaping	I107	Temporary Tree Protection Fencing
I – Landscaping	I108	Tree Protection Zone Signage
I – Landscaping	I109	Typical Trail Cross-section
I – Landscaping	I110	Wood Privacy Fence (Minimum Standard)
I – Landscaping	I111	Removable Bollards
I – Landscaping	I112	Chainlink Fence
J – Parklands	None	None



SIGN SPECIFICATIONS:

1. SIGN MATERIALS - 1.20m HIGH x 2.40m WIDE (19mm EXTERIOR GRADE PLYWOOD).
2. LETTERING - BLACK LETTERING ON WHITE BACKGROUND, HELVETICA MEDIUM (OR SIMILAR)
3. SUPPORTS - 2-100mm X 100mm PRESSURE TREATED LUMBER BURIED 1.50m INTO THE GROUND, WITH SIGN MOUNTED 2.0m CLEAR OF GROUND.
4. TITLE TO BE BOLD, UPPER CASE TEXT WITH A MINIMUM 100mm FONT HEIGHT. THE REST OF THE TEXT TO BE 50mm MINIMUM OR AS LARGE AS POSSIBLE TO THE EXTENTS THE SIGN WILL ALLOW.



TOWNSHIP OF CLEARVIEW

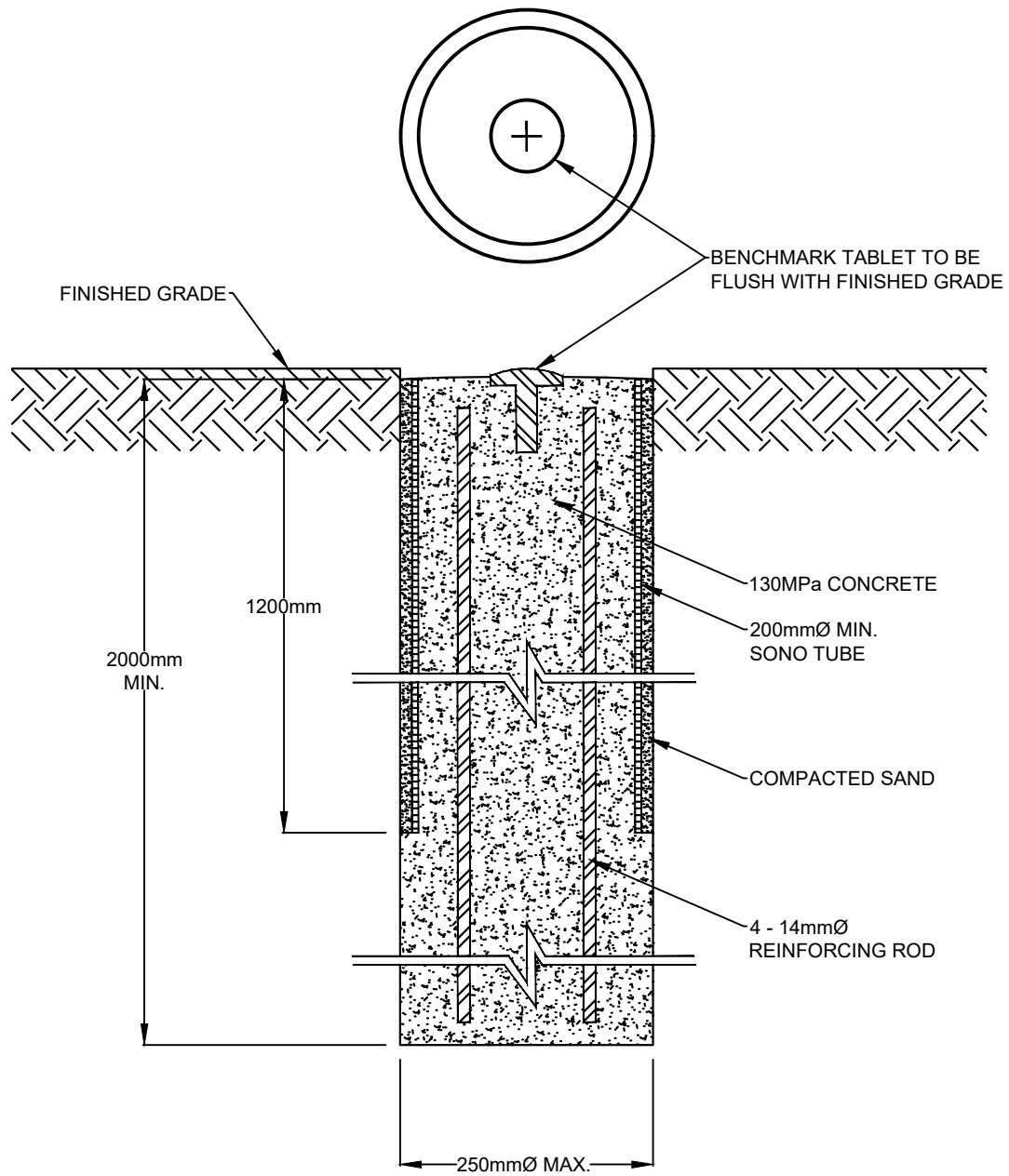
UNASSUMED ROAD SIGN

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	A101
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NOTES:

1. TOWNSHIP TO SUPPLY BRASS CAP.
2. REBAR TO BE EPOXY COATED.



TOWNSHIP OF CLEARVIEW

BENCHMARK MONUMENT

No.	Issue / Revision	Date	Auth.


Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	A102
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GENERAL NOTES:

1. ALL MEASUREMENTS ARE IN METRES, PIPE SIZES IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL EXISTING UTILITIES AND SERVICES TO BE LOCATED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION. LOCATION OF EXISTING SERVICES ARE NOT GUARANTEED. THE CONTRACTOR IS REQUIRED TO NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.
3. ALL RELEVANT ONTARIO PROVINCIAL STANDARDS SPECIFICATIONS (OPSS), ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD), AND THE TOWNSHIP OF CLEARVIEW'S STANDARDS SHALL APPLY.
4. THE ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY TOWNSHIP OF CLEARVIEW STANDARD DRAWINGS (STD), AND SECONDLY ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).
5. MAINTENANCE HOLE SAFETY PLATFORMS SHALL CONFORM TO OPSD 404.020.
6. MAINTENANCE HOLE TOPS (FRAMES) AND CATCHBASIN (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED.
7. A ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE PUBLIC WORKS DEPARTMENT PRIOR TO THE COMMENCEMENT OF WORK WITHIN ANY TOWNSHIP RIGHT-OF-WAY UNLESS WORKS FALL UNDER AN EXISTING DEVELOPMENT AGREEMENT.
8. ANY WORKS WITHIN THE TOWNSHIP RIGHT OF WAY IS SUBJECT TO A TRAFFIC CONTROL PLAN TO BE SUBMITTED AT LEAST 48 HOURS IN ADVANCE OF CONSTRUCTION.
9. NATIVE MATERIAL SUITABLE FOR BACKFILL SHALL BE COMPACTED TO 98% STANDARD PROCTOR MAXIMUM DRY DENSITY, UNLESS OTHERWISE NOTED BY THE GEOTECHNICAL CONSULTANT. ENGINEERING FILL (ON LOTS), SHALL BE COMPACTED TO 100% STANDARD PROCTOR MAXIMUM DRY DENSITY.
10. GRANULAR MATERIAL AND PIPE BEDDING MATERIAL SHALL BE PLACED IN LAYERS 150mm IN DEPTH AND COMPACTED TO 100% (ROAD GRANULAR 'A' & GRANULAR 'B') OR 100% (PIPE BEDDING AND COVER) STANDARD PROCTOR MAXIMUM DRY DENSITY OR AS DIRECTED BY THE GEOTECHNICAL CONSULTANT.
11. UTILITY ROAD CROSSING, WHERE REQUIRED, SHALL BE CONCRETE ENCASED AND ANY EXISTING STRUCTURES SHALL BE PROPERLY SUPPORTED. ALL UTILITY CROSSINGS TO BE REVIEWED BY THE TOWNSHIP OF CLEARVIEW.
12. DRIVEWAY ACCESS TO OCCUPIED RESIDENCES SHALL BE RESTORED AT THE END OF EACH WORKING DAY
13. CONTRACTOR SHALL COORDINATE THEIR WORK SUCH THAT THEY DO NOT INTERFERE WITH WORK BEING UNDERTAKEN BY A UTILITY COMPANY.
14. TOWNSHIP REQUIRES AT LEAST 48 HOURS NOTICE TO COORDINATE ANY SITE MEETINGS, INSPECTIONS, TESTING, ETC.
15. ALL DISTURBED AREAS SHALL BE REINSTATED TO EXISTING CONDITION OR BETTER. ALL GRASS AND VEGETATION COVERED AREAS SHALL BE RESTORED WITH MINIMUM 150mm TOPSOIL AND NO. 1 NURSERY SOD.
16. ALL GRADING MUST CONFORM TO THE TOWNSHIP OF CLEARVIEW LOT GRADING POLICIES CURRENTLY IN EFFECT.
17. ALL MATERIALS ARE TO COMPLY WITH THE MANUFACTURER'S SPECIFICATIONS PER APPROVED PRODUCTS AS LISTED IN APPENDIX B OF THE TOWNSHIP GUIDELINES.
18. THE CONTRACTOR IS RESPONSIBLE TO ARRANGE FOR AND MAINTAIN ALL UTILITY STAKE-OUTS AND LOCATES.
19. ALL DESIGNS TO MEET THE REQUIREMENTS OF THE ACCESSIBILITY FOR ONTARIANS WITH DISABILITIES ACT (AODA) AND PUBLIC SPACES MUST ALSO ADHERE TO THE TOWNSHIP'S FACILITY ACCESSIBILITY DESIGN STANDARDS (FADS) DOCUMENT.

 <p style="text-align: center;">TOWNSHIP OF CLEARVIEW</p>				STANDARD NOTES - GENERAL		
				Scale	Date	Dwg. No.
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ROAD NOTES:

1. CURB AND GUTTER TO BE AS FOLLOWS:
 - i) RESIDENTIAL AREAS, OPSD 600.070.
 - ii) COLLECTOR ROADS (MINOR AND MAJOR), OPSD 600.010.
 - iii) INDUSTRIAL ROADS, OPSD 600.010.
2. ROAD WORKS TO CONFORM TO APPLICABLE ROAD CROSS SECTIONS.
3. ROADS SHALL BE KEPT CLEAN DURING CONSTRUCTION AT THE CONTRACTOR'S EXPENSE.
4. SIDEWALKS TO COMPLY WITH OPSD-310.010 AND ARE TO BE 1.5 METERS WIDE. MINIMUM THICKNESS AS FOLLOWS:
 - i) RESIDENTIAL DRIVEWAY 150mm.
 - ii) COMMERCIAL/INDUSTRIAL DRIVEWAY 200mm (REINFORCEMENT AS PER OPSS IF REQUIRED).
 - iii) WHEN NO DRIVEWAY IS PRESENT, 125mm.
5. NATIVE SUBGRADE SHALL HAVE A CROSSFALL OF 3% AND THE MATERIAL SHALL BE APPROVED BY A GEOTECHNICAL CONSULTANT WITH THE REVIEW OF A PROOF ROLL WITH A LOADED TANDEM AXLE DUMP TRUCK AND IS SUBJECT TO APPROVAL BY THE TOWNSHIP OF CLEARVIEW.
6. ALL CURB RADII TO BE MINIMUM OF 9.0 METERS AT THE EDGE OF ASPHALT.
7. NATIVE SUBGRADE TO BE COMPACTED TO MINIMUM 98% STANDARD PROCTOR MAXIMUM DRY DENSITY AND SHALL BE TESTED BY THE GEOTECHNICAL CONSULTANT.
8. THE ROAD AND CROSS SECTION SHALL INCORPORATE 150mm DIA. SUBDRAIN WITH FACTORY INSTALLED FILTER FABRIC (OPSD-216.021).
9. GRADE AND CROSS FALL ADJUSTMENT OF MAINTENANCE HOLE AND CATCHBASIN FRAMES SHALL BE MADE USING PRODUCTS SPECIFICALLY MANUFACTURED FOR THAT PURPOSE. CAST IRON ADJUSTMENT UNITS SHALL BE USED FOR ALL MAINTENANCE HOLE AND CATCHBASIN GRATES TO BE SET AT PROPER GRADES FOR SURFACE COURSE ASPHALT ONLY. ALL OTHER ADJUSTMENTS UNITS FOR ALL MAINTENANCE AND CATCHBASIN FRAME AND GRATES SHALL BE CONCRETE (PER OPSD-704.010). ALL MAINTENANCE HOLES, CATCHBASINS, ETC SHALL HAVE MINIMUM OF 150mm TO A MAX OF 300mm OF ADJUSTMENT TO ALLOW FOR FUTURE ADJUSTMENT UP OR DOWN.
10. ADJUSTMENT UNITS SHALL BE CERTIFIED TO MEET ALL PERTINENT OPS, CSA, ASTM, AND MTO-DSM LIST, OR OTHER INDUSTRY GUIDELINES FOR MATERIALS, PERFORMANCE AND USE AS APPLICABLE.
11. ADJUSTMENTS UNITS AND JOINTS SHALL BE SEALED AND OR PARGED IN COMPLIANCE WITH MANUFACTURER'S SPECIFICATIONS AND GUIDELINES.
12. MORTAR SHALL BE USED FOR LEVELING OF PRECAST UNITS ONLY, THE THICKNESS OF MORTAR SHALL BE 10mm TO FILL ALL VOIDS CREATED BY IRREGULARITIES IN THE PRECAST UNITS TO ENSURE AN EVEN SURFACE ONLY.
13. NON-COMPRESSIBLE BACKFILL SHALL BE USED DURING REBUILDING, ADJUSTING, OR ANY OTHER APPLICABLE CATCHBASIN OR MAINTENANCE HOLE WORKS.
14. DRIVEWAYS TO BE CONSTRUCTED
 - i) RESIDENTIAL - MINIMUM 50mm HL3, 200mm GRANULAR 'A'.
 - ii) LIGHT INDUSTRIAL, COMMERCIAL, APARTMENT CONDOMINIUM - MINIMUM 40mm HL3, 50mm HL8, 150 GRANULAR 'A', 225 GRANULAR 'B'.
 - iii) HEAVY INDUSTRIAL MINIMUM 40mm HL3, 75mm HL8, 150 GRANULAR 'A', 300 GRANULAR 'B'.
15. PROVIDE FROST TAPERS FOR ROAD CROSSING CULVERTS AS PER OPSD 803.030.

 <p>TOWNSHIP OF CLEARVIEW</p>				<p>STANDARD NOTES - ROADS</p>		
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SANITARY NOTES:

1. SANITARY GRAVITY SEWER SHALL BE PVC (CLASS DR35 OR DR28) OR CONCRETE PIPE, WITH WATERTIGHT RUBBER GASKET JOINTS WHICH CONFORM TO C.S.A. B-182.2,3,4. CONCRETE SANITARY SEWERS SHALL CONFORMING TO C.S.A STANDARD A257.2. PIPE STRENGTHS AS PRESCRIBED PER APPLICABLE OPSD HEIGHT OF FILL TABLES.
2. SEWERS SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD-802.010, (GRANULAR. 'A' OR HIGH-PERFORMANCE EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD-802.030 OR 802.031 CLASS B (GRANULAR. 'A' OR HIGH-PERFORMANCE BEDDING MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE TOWNSHIP OF CLEARVIEW.
3. PRECAST SANITARY MAINTENANCE HOLES SHALL CONFORM WITH OPSD701.010 (1200mm) OR 701.011 (1500mm), WITH FRAME & COVER OPSD-401.010 TYPE 'A' AND SOLID RECTANGULAR RUNGS, OPSD-405.020.
4. SANITARY MAINTENANCE HOLE BENCHING AS PER OPSD-701.021.
5. INSTALL SEWER DROP CONNECTIONS TO MAINTENANCE HOLES AS PER OPSD 1003.010 AND 1003.020. ONLY EXTERNAL DROP STRUCTURES ARE PERMITTED.
6. SANITARY SERVICE CONNECTIONS.
 - i) SANITARY LATERAL CONNECTION TO BE LOCATED 2.5m RIGHT OF CENTRELINE OF LOT.
 - ii) LOCATION OF LATERAL TO BE MARKED AT PROPERTY LINE WITH A 60x100mm WOOD MARKER, PAINTED GREEN, AND EXTENDING FROM THE SERVICE INVERT TO 300mm ABOVE GROUND LEVEL.
 - iii) PIPE TO BE MINIMUM 125mm PVC DR28, RUBBER GASKET TYPE JOINTS AND SHALL CONFORM TO CSA (B-182.2,3,4)(COLOURED) FOR A RESIDENTIAL HOUSE AND MINIMUM 150mm PVC DR28 FOR INDUSTRIAL, AND COMMERCIAL DEVELOPMENT.
 - iv) MINIMUM DEPTH OF LATERAL AT PROPERTY LINE SHALL BE 2.7m MEASURED FROM THE SEWER OBVERT TO FINISHED GROUND SURFACE ELEVATION UNLESS OTHERWISE NOTED.
 - v) ALL CONNECTIONS TO NEW SANITARY MAINS SHALL BE PRE-MANUFACTURED, FABRICATED TEES, CONNECTIONS TO EXISTING SANITARY SEWER SHALL BE MADE WITH APPROVED FACTORY MADE TEES OR INSERT-A-TEES IN STRICT ACCORDANCE TO MANUFACTURER'S GUIDELINES.
 - vi) MINIMUM PIPE SLOPE TO BE 2.0% MAXIMUM 8.0%.
7. MAXIMUM DEFLECTION FROM COMBINED LIVE AND DEAD LOADING SHALL NOT EXCEED C.S.A., O.P.S. OR MANUFACTURER'S RECOMMENDED SPECIFICATIONS.
8. MINIMUM COVER 2.8m OVER TRUNK AND LOCAL SEWERS.
9. SANITARY TESTING TO BE PER OPSD 410 AND "SANITARY SEWER SYSTEM INSPECTION, TESTING, AND ACCEPTANCE GUIDELINE" PREPARED BY THE REGION OF YORK STANDARDS (WHICHEVER IS MORE STRINGENT) AND INCLUDE FLUSHING, CCTV, AND INFILTRATION OR EXFILTRATION TESTING (AS APPLICABLE) FOR THE LATERALS, MAINS, AND MAINTENANCE HOLES.
10. ALL MAINTENANCE HOLE ADJUSTMENT RINGS SHALL BE MADE WATERTIGHT BY PLACING SEALANT BETWEEN ADJUSTMENT RINGS AND WRAPPED ON THE OUTSIDE OF THE STRUCTURE WITH AN APPROVED COMPOSITE MEMBRANE PRIOR TO BACKFILLING.
11. MAINTENANCE HOLE JOINTS AND PIPE CONNECTIONS AT MAINTENANCE HOLES ARE TO BE MADE WATERTIGHT WITH AN APPROVED COMPOSITE MEMBRANE WRAP, OVERLAPPING JOINTS AND CONNECTIONS BY 0.3m ON THE OUTSIDE OF THE STRUCTURE PRIOR TO BACKFILLING.
12. "TRENCH PLUGS" AS SPECIFIED BY THE GEOTECHNICAL ENGINEER SHALL BE USED IN THE TRENCH AND BE PLACED 2 TO 3 METERS UPSTREAM FROM ANY MAINTENANCE HOLE WHICH IS SUSPECTED OF BEING SUSCEPTIBLE TO HIGH WATER LEVELS OF INFLOW/INFILTRATION, SUBJECT TO VERIFICATION BY GEOTECHNICAL ENGINEER.
13. MAINTENANCE HOLE TOPS (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINISHED GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. GRADE AND CROSSFALL ADJUSTMENT SHALL BE MADE USING PRODUCTS SPECIFICALLY MANUFACTURED FOR THAT PURPOSE. MODULAR ADJUSTMENT RINGS INCLUDING ADDITIONAL EXTERNAL COMPOSITE WATERPROOF MEMBRANE WRAP ARE TO BE USED TO ADJUST THE MAINTENANCE HOLE TO FINAL GRADE. ALL MAINTENANCE HOLES SHALL HAVE A MINIMUM OF 150mm TO A MAXIMUM OF 300mm OF ADJUSTMENT TO ALLOW FOR FUTURE ADJUSTMENTS UP OR DOWN.
14. ALL SANITARY MAINTENANCE HOLES TO HAVE BENCHING TO OBVERT PER OPSD 701.021.

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SANITARY NOTES (CONTINUED):

- 15. BULKHEADS OR PLUGS ARE REQUIRED IN DOWNSTREAM MAINTENANCE HOLE AT OUTLET FROM DEVELOPMENT, UNTIL THE TESTING IS COMPLETED AND TOWNSHIP HAS PROVIDED APPROVAL TO REMOVE.
- 16. MAINTENANCE HOLE STEPS ARE TO BE SOLID, RECTANGULAR ALUMINUM PER OPSD 405.020.

 TOWNSHIP OF CLEARVIEW				STANDARD NOTES - SANITARY (CONTINUED)		
				Scale	Date	Dwg. No.
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STORM NOTES:

1. STORM SEWER TO BE PVC (CLASS DR35 OR DR28) PIPE OR REINFORCED CONCRETE PIPE. PIPE MATERIAL FOR REINFORCED CONCRETE TO BE CERTIFIED TO C.S.A. STANDARD 257.2, STRENGTH AS PER APPLICABLE OPSD HEIGHT OF FILL TABLE. PVC MATERIAL TO BE CERTIFIED TO C.S.A. STANDARDS 182.1,2,4, UNLESS OTHERWISE NOTED. ALL STORM SEWERS OVER 450mm DIAMETER SHALL BE CONSTRUCTED WITH REINFORCED CONCRETE PIPE.
2. STORM SEWERS SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD-802.010 (GRAN. 'A' OR HIGH-PERFORMANCE EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD-802.030 OR 802-031 CLASS B (GRANULAR. 'A' OR HIGH PERFORMANCE BEDDING MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE TOWNSHIP.
3. PRECAST STORM MAINTENANCE HOLES SHALL CONFORM WITH OPSD-701.010 (1200mm) OR 701.011 (1500mm) WITH FRAME & COVER OPSD-401.010 TYPE 'B' AND SOLID RECTANGULAR RUNGS, OPSD-405.020.
4. ALL REAR YARD CATCHBASIN LEADS TO HAVE:
 - i) GRANULAR 'A' BEDDING TO OBVERT OF SEWER.
 - ii) 100mm THICK 10MPa CONCRETE TO BE PLACED 300mm ABOVE OBVERT OF SEWER LEAD IF PVC MATERIAL AND OVER FULL WIDTH OF SEWER LEAD ALONG SIDE LOT LINE. CONCRETE PIPE MAY BE USED IN PLACE OF PVC CONCRETE ENCASED.
 - iii) REAR LOT CATCHBASIN (RLCB) GRATES TO BE 'BIRD CAGE' STYLE PER OPSD 400.120.
5. MAINTENANCE HOLE BENCHING SHALL CONFORM WITH OPSD-701.021.
6. CATCHBASIN MAINTENANCE HOLES SHALL HAVE A 300mm SUMP AND NO BENCHING.
7. PIPE JOINTS TO CONFORM TO C.S.A. STANDARDS (B-182.2,3,4 AND A257.3).
8. MAINTENANCE HOLE TOPS (FRAMES) AND CATCHBASIN (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. A MINIMUM OF 150mm TO A MAXIMUM OF 300mm OF ADJUSTMENT UNITS SHALL BE PROVIDED. ALL ADJUSTMENT SHALL BE IN ACCORDANCE WITH STANDARD DETAIL. REFER TO ROAD NOTES 10, 11, 12, 13 AND 14.
9. ALL CONNECTIONS TO THE STORM MAIN SHALL BE MADE WITH A STORM MAINTENANCE HOLE OR APPROVED FACTORY TEE CONNECTION AS PER OPSD-708.01 OR 708.03.
10. STORM SEWER TO BE MINIMUM 300mm DIAMETER WITH JOINTS CONFORMING TO C.S.A. STANDARD A257.3.
11. NO FLEXIBLE PIPE SEWERS WILL BE INSTALLED WITH A DEPTH OF COVER GREATER THAN 6 METRES UNLESS SPECIFICALLY APPROVED BY THE PIPE MANUFACTURER.
12. ALL PIPE HANDLING INSTALLATIONS SHALL BE IN STRICT COMPLIANCE WITH MANUFACTURER'S INSTALLATION GUIDES AND THE O.C.P.A. OR UNIBELL GUIDELINES.
13. WHERE FROST SUSCEPTIBLE SOILS ARE ENCOUNTERED AND THE OBVERT OF THE STORM SEWER IS LESS THAN A DEPTH OF 1.5m FROM THE FINISHED ASPHALT SURFACE, THE FOLLOWING MEASURES ARE TO BE APPLIED:
 - i) WHERE THE SUBGRADE CONSISTS OF HIGHLY FROST SUSCEPTIBLE SOILS THE SUBGRADE SHALL BE REPLACED WITH NON-FROST SUSCEPTIBLE SOILS TO A DEPTH OF 1.2m OVER THE ENTIRE ROAD PLATFORM.
 - ii) WHERE THE SUBGRADE CONSISTS OF MODERATELY FROST SUSCEPTIBLE SOILS THE SUBGRADE REPLACEMENT SHALL BE TAPERED AT A SLOPE OF 10 HORIZONTAL: 1 VERTICAL, FROM THE STORM SEWER TRENCH TO THE EDGE OF THE ROAD PLATFORM.
14. DROP STRUCTURES SHALL CONFORM WITH OPSD 1003.010 AND 1003.020.
15. ROOF LEADERS SHALL DISCHARGE TO GRASSED AREAS ONLY USING CONCRETE SPLASH PADS.


 TOWNSHIP OF CLEARVIEW				STANDARD NOTES - STORM		
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STORM NOTES (CONTINUED):

16. SINGLE CATCHBASIN LEADS SHALL BE PVC DR35 PIPE WITH MINIMUM SLOPE OF 1% AND MINIMUM SIZE AS FOLLOWS:


- i) SINGLE CATCHBASIN 250mm DIAMETER.
- ii) DOUBLE CATCHBASIN 300mm DIAMETER.
- iv) REAR LOT CATCHBASIN 250mm DIAMETER.

17. CATCHBASINS MUST BE OF THE PRECAST TYPE AS SHOWN ON THE OPSD DRAWINGS 705.010 OR 705.020. DOUBLE CATCHBASINS ARE REQUIRED IN LOW POINTS.

 <p>TOWNSHIP OF CLEARVIEW</p>				STANDARD NOTES - STORM (CONTINUED)		
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WATERMAIN NOTES:

1. WATERMAIN MATERIAL TO BE PVC (CLASS 235, DR-18) AND, SHALL SATISFY AWWA C900-16 SPECIFICATION. DIAMETER TO BE AS INDICATED ON THE DRAWINGS ALL FITTINGS TO BE DUCTILE IRON, MECHANICAL JOINT WITH SACRIFICIAL NUTS ON EVERY OTHER BOLT.
2. MINIMUM RESIDENTIAL SERVICE TO BE 25mm PE IPEX GOLD 901.
3. WATERMAIN SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD-802.010 (GRANULAR 'A' OR HIGH-PERFORMANCE EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AS OPSD-802.030 OR 802.031 CLASS 'B' (GRANULAR 'A' OR HIGH-PERFORMANCE BEDDING MATERIAL, GRANULAR 'A' OR SELECT NATIVE COVER MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE TOWNSHIP OF CLEARVIEW.
4. SERVICES 25mm TO 50mm IN DIAMETER SHALL BE EMBEDDED IN SAND OR 'A' GRAVEL 100mm ABOVE AND BELOW.
5. CONTRACTOR SHALL INFORM THE TOWNSHIP OF CLEARVIEW A MINIMUM OF 48 HOURS IN ADVANCE OF THEIR INTENTIONS TO COMMENCE WORK.
6. CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION AND MATERIALS TO INSTALL TIE-IN REQUIRED TO FACILITATE THE TESTING OF THE NEWLY INSTALLED DISTRIBUTION SYSTEM PRIOR TO CONNECTION TO THE EXISTING SYSTEM. WATERMAIN TO BE PRESSURE TESTED, SWABBED AND CHLORINATED BY THE CONTRACTOR, UPON SUCCESSFUL TEST RESULTS. THE FINAL TIE-IN TO BE COMPLETED BY CONTRACTOR WITH TOWNSHIP OF CLEARVIEW SUPERVISION AND ASSISTANCE WITH OPERATING THE EXISTING WATER SYSTEM FOR A WATER SYSTEM SHUT OFF. RISER PIPES ARE TO BE REMOVED AS DIRECTED. SWABBING / TESTING SCHEDULE TO BE SUPPLIED BY THE CONTRACTOR TO THE TOWNSHIP OF CLEARVIEW TO REVIEW AND APPROVE.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE SWABBING, PRESSURE TESTING, CHLORINATION AND FLUSHING OF THE NEW WATERMAINS. ANY ADDITIONAL SWABBING, PRESSURE TESTING, CHLORINATION AND FLUSHING BEYOND THE INITIAL PROCEDURE WILL BE AT THE CONTRACTOR'S EXPENSE AND AT THE DISCRETION OF THE TOWNSHIP OF CLEARVIEW. THE CONTRACTOR SHALL MAKE ALL CONNECTIONS TO THE EXISTING WATERMAINS INCLUDING EXCAVATION, BACKFILLING, AND MATERIALS AS REQUIRED, UNDER TOWNSHIP OF CLEARVIEW SUPERVISION. CONTRACTOR TO USE TOWNSHIPS WATERMAIN COMMISSIONING PROCEDURE.
8. ALL NEW WATER CURB BOXES TO BE LOCATED ON PROPERTY LINE AND OUT OF THE DRIVEWAYS AND SIDEWALKS.
9. NO WATERMAIN IS TO BE LAID ON FILL UNTIL THE DENSITY REPORT HAS BEEN SUBMITTED TO AND APPROVED BY THE DEVELOPER'S ENGINEER. FILL TO BE PLACED TO 0.6m MINIMUM ABOVE THE TOP OF THE WATERMAIN GRADED AND COMPACTED AS PER OPSS-501. TESTS SHALL BE TAKEN ALONG THE CENTER LINE OF THE WATERMAIN AND 2.5m EITHER SIDE OF THE WATERMAIN AT A MAXIMUM INTERVAL OF 30m FOR EACH 0.6m LIFT. ALL TEES, HORIZONTAL BENDS, AND BRANCH VALVES IN FILL AREAS TO BE TIED WITH TIE RODS IN ADDITION TO CONCRETE BLOCKING ACCORDING TO NOTE 10.
10. THRUST BLOCKING: CONCRETE THRUST BLOCKS ARE TO BE INSTALLED AT ALL TEES, BENDS, ENDS OF MAINS AND CONNECTIONS 100mm AND LARGER AS PER OPSD-1103.010 AND 1103.020. AT ALL THRUST BLOCK LOCATIONS RESTRAINING DEVICES ARE REQUIRED IN ADDITION TO STANDARD CONCRETE THRUST BLOCKING.
11. ALL SEGMENTS OF THE FITTING AND THE WATERMAIN AT THE THRUST BLOCK LOCATION SHALL BE RESTRAINED AT LEAST 10m EACH SIDE OF THE THRUST BLOCK WHERE THE DEFLECTION ANGLE AT THE THRUST BLOCK IS MORE THAN 11.25°. TIE RODS AND CLAMPS SHALL BE GIVEN TWO COATS OF BITUMASTIC PAINT.
12. IMPORTED GRANULAR FILL (OPSD GRANULAR 'A' OR EQUIVALENT) IS TO BE USED BEHIND THE THRUST BLOCK AND FOR A MINIMUM DISTANCE OF 2m EACH SIDE OF THE THRUST BLOCK. THIS IMPORTED GRANULAR FILL IS TO BE COMPACTED TO A MINIMUM OF 100% STANDARD PROCTOR MAXIMUM DRY DENSITY. PRIOR TO CONSTRUCTION OF THE THRUST BLOCKS THE CONTRACTOR SHALL OBTAIN THE WRITTEN APPROVAL OF THE BACKFILL FROM A QUALIFIED GEOTECHNICAL ENGINEER.
13. CONTRACTOR TO PERFORM CONSTRUCTION SUCH THAT WATER SERVICE IS MAINTAINED AT ALL TIMES.
14. TRACING WIRE TO BE INSTALLED ON TOTAL LENGTH OF PVC WATERMAIN (#12 TWU STRANDED COPPER FOR OPEN CUT CONSTRUCTION OR #8 TWU FOR DIRECTIONAL BORING INSTALLATION), BROUGHT TO SURFACE AT ALL HYDRANT BARRELS AND MAINLINE WATER VALVE BOXES WIRE TO BE COILED UNDER THE VALVE BOX CAPS.

 TOWNSHIP OF CLEARVIEW				STANDARD NOTES - WATERMAINS		
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WATERMAIN NOTES (CONTINUED):

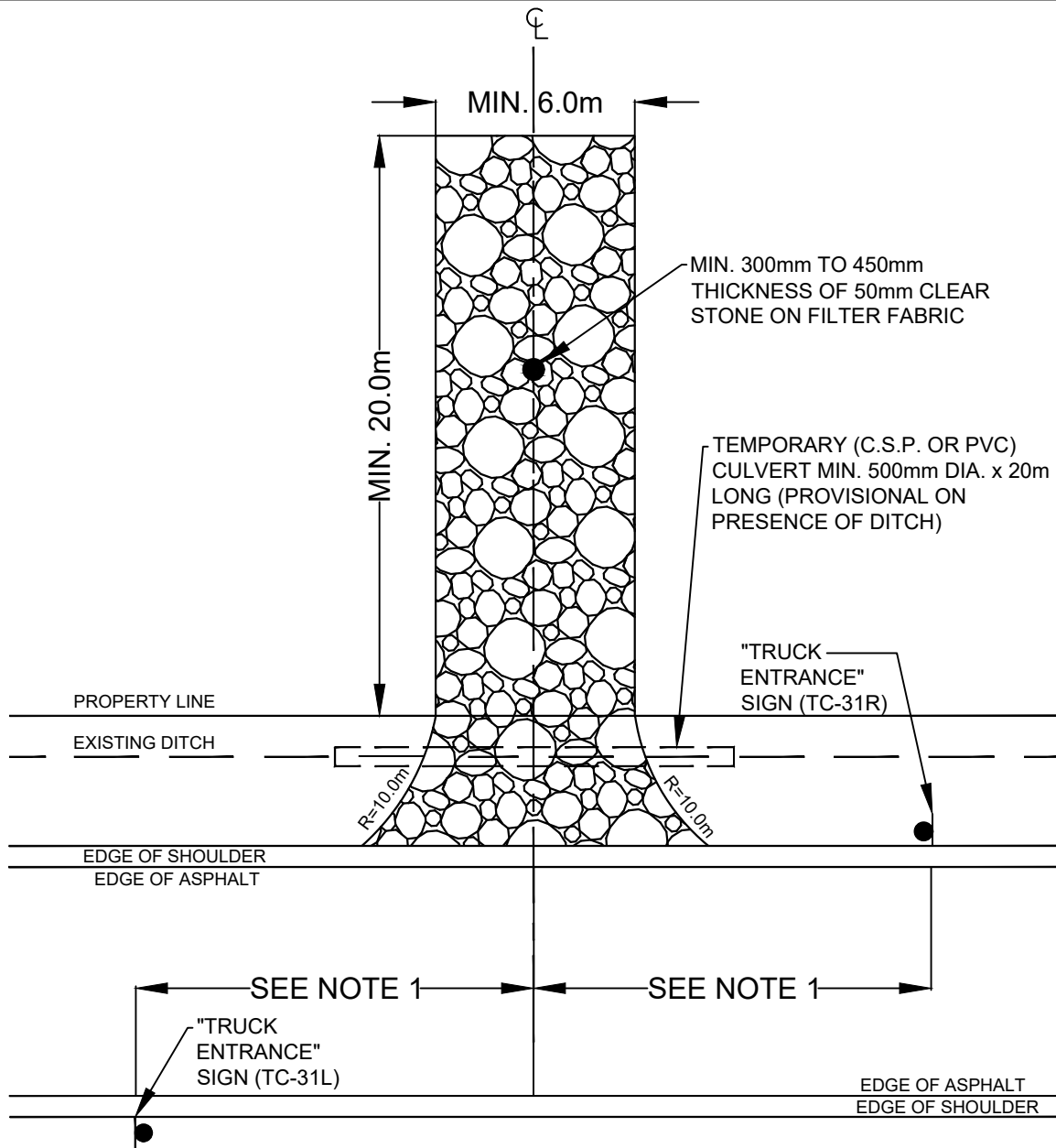
15. WHERE WATER SERVICES CONFLICT WITH OTHER UTILITIES, DEFLECT SERVICE SO AS TO PROVIDE A MIN. 0.5m CLEARANCE. MAINTAIN MIN. DEPTH OF COVER AT ALL TIMES.
16. SERVICE CONNECTIONS TO THE MAIN SHALL BE PLACED AT A MINIMUM SEPARATION OF 1.0m AND A MINIMUM OF 0.6m FROM JOINTS (END OF PIPE).
17. FIRE HYDRANTS TO BE CANADA VALVE CENTURY PREMIER TYPE WITH STORZ PUMPER TO THE TOWNSHIP OF CLEARVIEW SPECIFICATIONS. ALL PIPE FITTINGS, TEES, ETC. TO BE DUCTILE IRON CEMENT LINED MECHANICAL JOINT FITTINGS FOR PVC WATERMANS 150mm TO 200mm DIAMETER. RESTRAINING AND THRUST BLOCK PROTECTION WILL BE REQUIRED ON ALL MECHANICAL JOINTS. HYDRANTS TO BE RESTRAINED TO MAINLINE TEE.
18. FIRE HYDRANTS TO BE LOCATED 1.5m FROM ANY DRIVEWAY AND AS PER TOWNSHIP STANDARD DETAILS.
19. MINIMUM DEPTH OF COVER OVER WATERMAIN TO BE 1.8m.
20. WHERE WATERMAIN CONFLICTS WITH SEWER PIPES, DEFLECT WATERMAIN OVER SEWERS. DO NOT USE BENDS IF POSSIBLE. PROVIDE A MINIMUM OF 0.5m CLEARANCE BETWEEN WATERMAIN AND SEWERS. MAINTAIN MINIMUM DEPTH OF COVER OF 1.8m AT ALL TIMES.
21. MINIMUM HORIZONTAL SEPARATION BETWEEN WATERMAIN AND SEWERS TO BE 2.5m.
22. ALL VALVES TO BE RESILIENT CLOW CANADA F6100 SEAT GATE VALVES.
23. VALVES IN EXCESS OF 1.8m IN DEPTH SHALL REQUIRE A VALVE STEM EXTENSION.
24. THE MAXIMUM SIZE OF CONNECTION THAT CAN BE TAPPED INTO A 150mm DIAMETER WATERMAIN IS 50mm IN DIAMETER. WATER SERVICE CONNECTIONS 75mm IN DIAMETER AND LARGER SHALL BE MADE BY INSTALLING A TEE ON THE SUPPLY MAIN.

 TOWNSHIP OF CLEARVIEW				STANDARD NOTES - WATERMANS (CONTINUED)		
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EROSION AND SEDIMENT CONTROL NOTES:

1. PRIOR TO CONSTRUCTION, ADVISE TOWNSHIP AND CONSERVATION AUTHORITY OF STAFF RESPONSIBLE FOR SITE SEDIMENT CONTROL SUPERVISION, INSPECTION AND MAINTENANCE, INCLUDING AFTER HOURS CONTACTS AND PROVIDE WRITTEN INSPECTION AND MAINTENANCE SCHEDULE OF SEDIMENT CONTROL DEVICES.
2. INSTALL ALL SEDIMENT CONTROL DEVICES AS IDENTIFIED ON THE APPROVED EROSION CONTROL PLAN PRIOR TO COMMENCEMENT OF TOPSOIL STRIPPING OR EARTHWORKS OPERATIONS.
3. ENSURE TOPSOIL, STRIPPING, GRADING AND UNDERGROUND WORKS CONFORM TO APPROVED GRADING, SERVICING AND EROSION CONTROL PLAN.
4. CONTRACTOR TO CONDUCT REQUIRED WEEKLY INSPECTION AND FOLLOWING ANY MAJOR STORM, MAINTENANCE AND REPORTING OF SEDIMENT CONTROLS TO THE TOWNSHIP AND CONSERVATION AUTHORITY AND STABILIZE SITE AS REQUIRED THROUGHOUT SITE CONSTRUCTION SCHEDULE.
5. CONSTRUCTION AREA THAT EXCEED 30 DAYS OF INACTIVITY SHALL BE STABILIZED BY SEEDING. THIS IS TO INCLUDE STOCKPILES OF FILL AND TOPSOIL.
6. EROSION AND SEDIMENT CONTROLS TO BE DESIGNED IN ACCORDANCE WITH TOWNSHIP AND CONSERVATION AUTHORITY STANDARDS.
7. ALL SEDIMENT CONTROL BASINS SHALL BE IN ACCORDANCE WITH NVCA DRAWING BSD-23A.
8. ALL SEDIMENT CONTROL FENCES SHALL BE IN ACCORDANCE WITH NVCA DRAWING BSD-23.
9. ROCK CHECK DAMS SHALL BE IN ACCORDANCE WITH NVCA DRAWING BSD-24.
10. MUD MATS TO BE USED AT ALL CONSTRUCTION ENTRANCES AND EXIT LOCATIONS AND BE A MINIMUM 20m IN LENGTH AND 6m IN WIDTH. THE PAD SHALL BE A MINIMUM OF 300mm TO 450mm THICK, CONSTRUCTED WITH 50mm DIAMETER CLEAR STONE (SEE DETAIL A109).
11. CONTRACTOR TO MAINTAIN ALL ROADS AFFECTED BY CONSTRUCTION FREE OF SEDIMENT BY SWEEPING AS NECESSARY OR AS DIRECTED BY THE CONTRACT ADMINISTRATOR OR TOWNSHIP.
12. CONTRACTOR TO IMPLEMENT APPROPRIATE DUST CONTROL MEASURES TO PREVENT EXCESSIVE DUST ON SITE OR MIGRATION OF DUST TO ADJACENT PROPERTIES.
13. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION OR BETTER AS DETERMINED BY THE TOWNSHIP OF CLEARVIEW.
14. ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE, AND THE GRASS HAS ESTABLISHED GROWTH: SUBJECT TO APPROVAL BY THE TOWNSHIP OF CLEARVIEW.

 <p style="text-align: center;">TOWNSHIP OF CLEARVIEW</p>				<p>STANDARD NOTES - EROSION AND SEDIMENT CONTROL</p>		
				Scale	Date	Dwg. No.
				N.T.S.	OCT 2025	A108
No.	Issue / Revision	Date	Auth.			



NOTES:

1. TEMPORARY "TRUCK ENTRANCE" SIGNS (TC-31) SHALL BE INSTALLED ON THE SHOULDER, 150m IN ADVANCE OF THE CONSTRUCTION ACCESS. THE APPLICANT WILL BE RESPONSIBLE FOR THE COST OF OBTAINING, ERECTING AND MAINTAINING THESE SIGNS.
2. THE TEMPORARY CONSTRUCTION ACCESS SHALL BE REMOVED FROM THE ROAD ALLOWANCE WHEN ITS USE IS FINISHED AND ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITION.
3. LENGTH AS REQUIRED BUT NOT LESS THAN 20m.
4. WIDTH OF 6m BUT NOT LESS THAN THE WIDTH AT POINTS WHERE INGRESS AND EGRESS OCCURS.
5. MINIMUM 300mm TO 450mm THICKNESS OF 50mm CLEAR STONE ON FILTER FABRIC
6. TERRAFIX 270R GEOTEXTILE (OR APPROVED EQUIVALENT) TO BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
7. ENTRANCES SHALL BE PROVIDED WITH A CULVERT IF REQUIRED FOR ROADSIDE SURFACE DRAINAGE.
8. THE CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN THE ENTRANCE AND PROVIDE ADDITIONAL STONE TO THE SATISFACTION OF THE TOWNSHIP SUCH THAT SEDIMENT IS NOT TRACKED ONTO THE ADJACENT ROADWAY.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEARING ANY SEDIMENT THAT IS TRACKED ONTO MUNICIPAL RIGHTS-OF-WAY TO THE SATISFACTION OF THE TOWNSHIP.
10. INSPECTED DAILY AND REINSTATED ACCORDINGLY BY THE CONTRACTOR.



TOWNSHIP OF CLEARVIEW

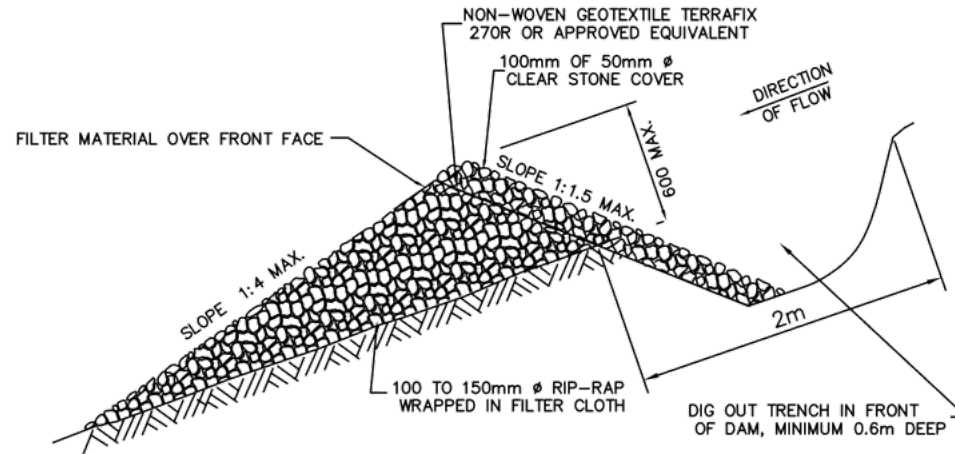
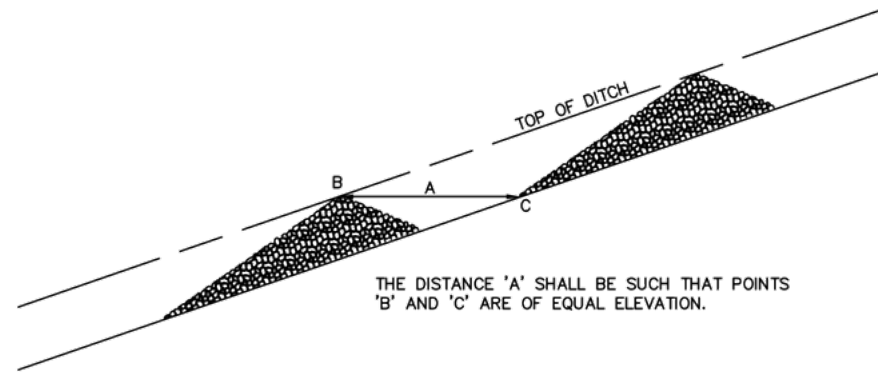
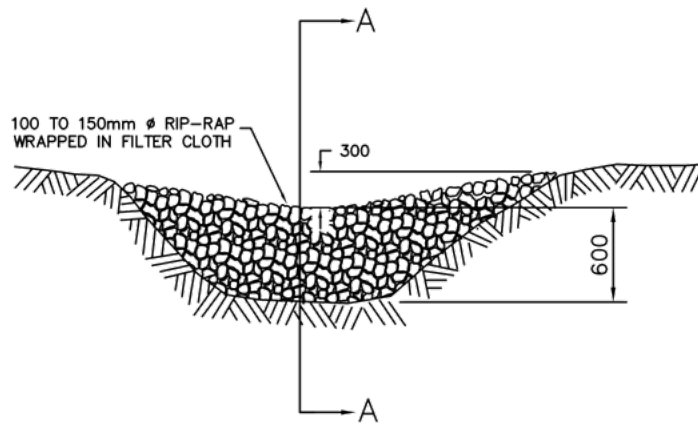
MUD MAT DETAIL

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	A109

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	A109

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	A109



SECTION A - A

NOTES:

1. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA IN SUCH A MANNER THAT IT WILL NOT ERODE. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION IS MINIMIZED.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.



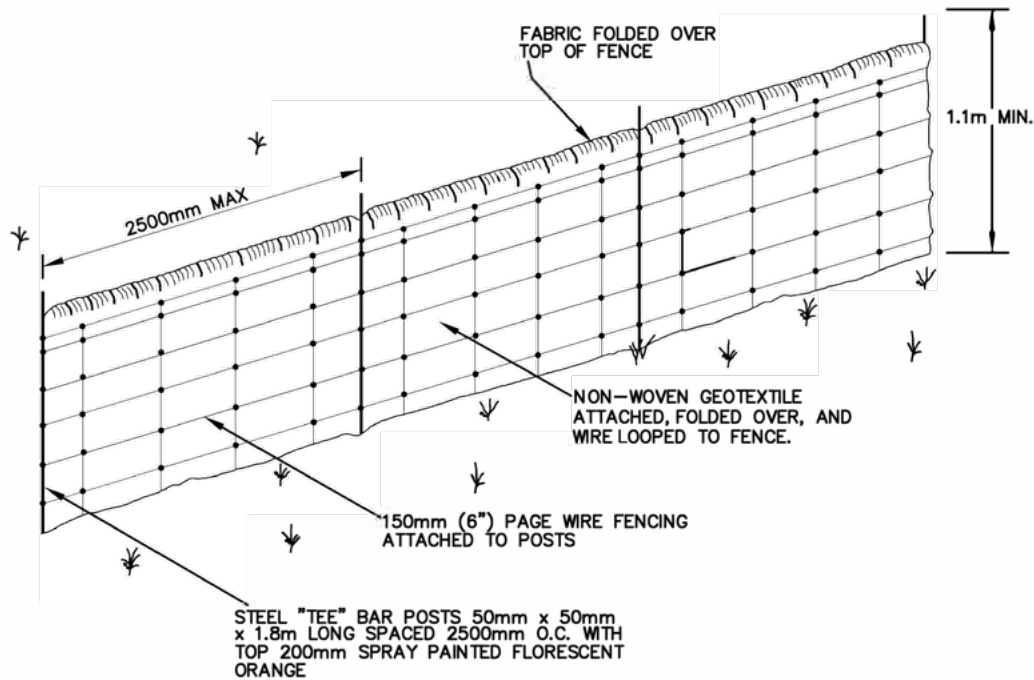
**Nottawasaga Valley
Conservation Authority**

**TYPICAL ROCK CHECK DAM
EROSION CONTROL DEVICE**

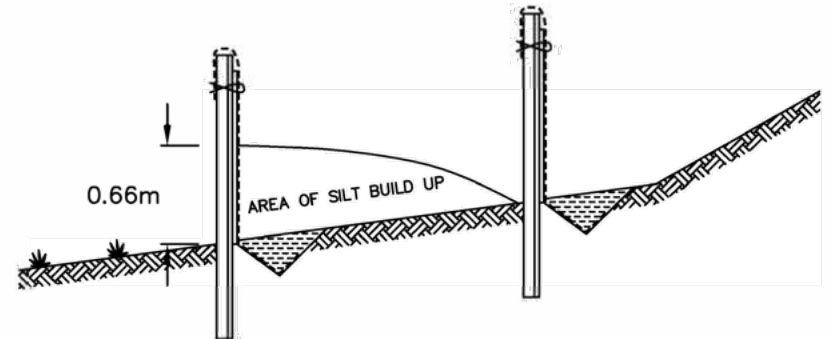
1	TRENCH ADDED AND FABRIC EXTENDED INTO IT		2003.02.19
NO.	REVISION	APR'D	DATE

APR'D:	DATE: 92.05.15
DRAWN: L.A.J.	SCALE: N.T.S.

BSD-24 DRAFT

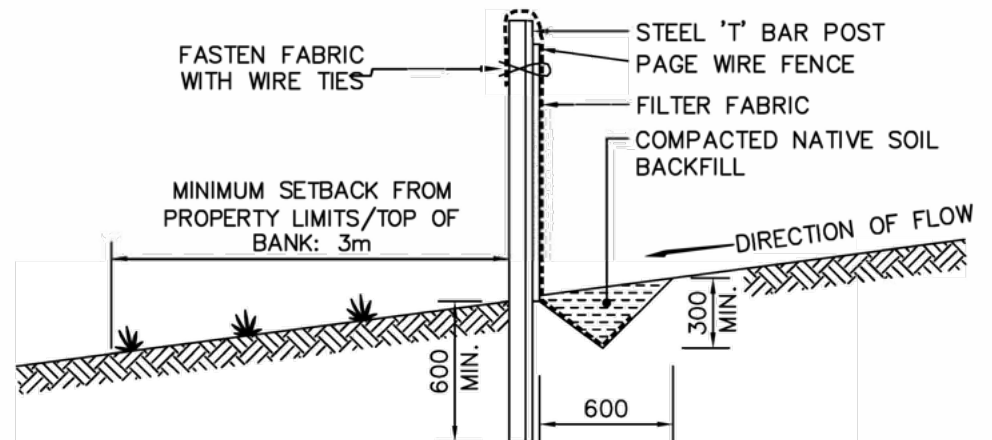


REPLACEMENT FENCE LOCATION



NOTES:

1. SILT CONTROL FENCE SHOULD BE ALIGNED WITH CONTOURS FOR SHEET OVERLAND FLOW.
2. SILT/SEDIMENT CONTROL FENCE IS TO BE LOCATED IN AREAS OF LOW SEDIMENT YIELD ON SLOPES THAT CONFORM TO MTO DRAINAGE MANUAL VOLUME 2 "CHART F4-3C TOPOGRAPHIC FACTOR LS BASED ON SLOPE LENGTH AND GRADIENT."
3. SILT/SEDIMENT CONTROL FENCE SHALL BE INSTALLED WITH FILTER MEDIA FABRIC TOED INTO THE SOIL A MIN. OF 300mm BY EITHER STATIC SLICING OR TRENCH METHODS WITH COMPACTION OF TRENCH MATERIAL MEETING 95% INSITU SOIL STRENGTH.
4. STEEL 'T' BAR POSTS ARE TO BE SPACED MAX. 2500mm ON CENTER.
5. FROZEN GROUND CONDITIONS REQUIRE FILTER FABRIC TO BE BACKFILLED IN TRENCH WITH CLEAR STONE.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
7. GEOTEXTILE FABRIC TO BE COMPRISED OF NON-WOVEN U.V. STABILIZED MATERIAL. FABRIC TO BE FOLDED OVER TOP OF FENCE MIN. 300mm AND WIRE FASTENED.



**Nottawasaga Valley
Conservation Authority**

**TYPICAL DETAIL OF
SILT/SEDIMENT FENCE**

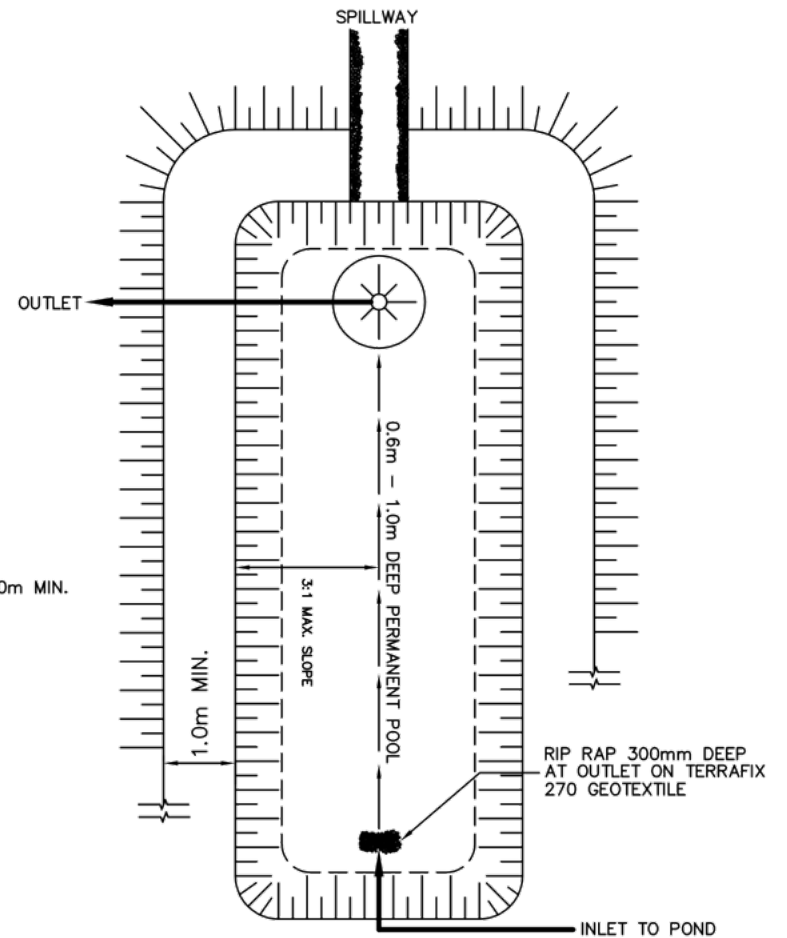
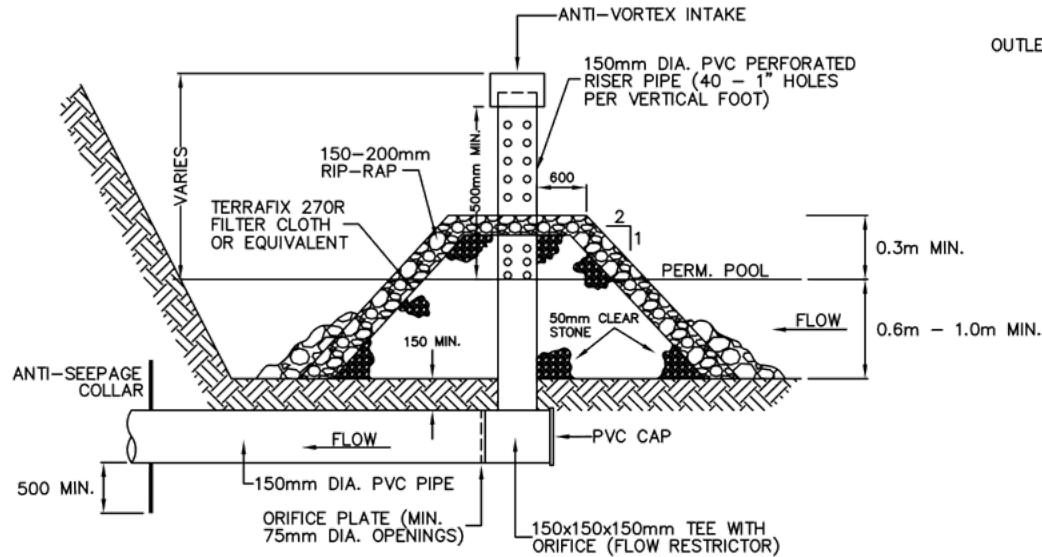
NO.	REVISION	APR'D	DATE

APR'D:	DATE: 03.06.24
DRAWN: A.S.C	SCALE: NTS

BSD-23

NOTES:

1. POND BERMS TO CONSTRUCTED USING IMPERVIOUS MATERIAL, COMPACTED TO 95% S.P.D, AND INSPECTED BY A PROFESSIONAL ENGINEER.
2. A 1.5m HIGH BARRIER FENCE SHALL BE ERECTED ALONG PERIMETER OF SEDIMENT BASIN. WARNING SIGNS SHALL BE ATTACHED TO THE FENCING STATING THE AREA IS OFF LIMITS TO THE GENERAL PUBLIC, AND ADVISING THAT THE BASIN IS USED FOR SEDIMENT CONTROL PURPOSES, AND THAT THE SUBJECT AREA IS SUBJECT TO FLASH FLOODING.
3. THE BASIN IS TO BE CONSTRUCTED ON THE BASIS OF A MIN. LENGTH TO WIDTH RATIO OF 4 TO 1.



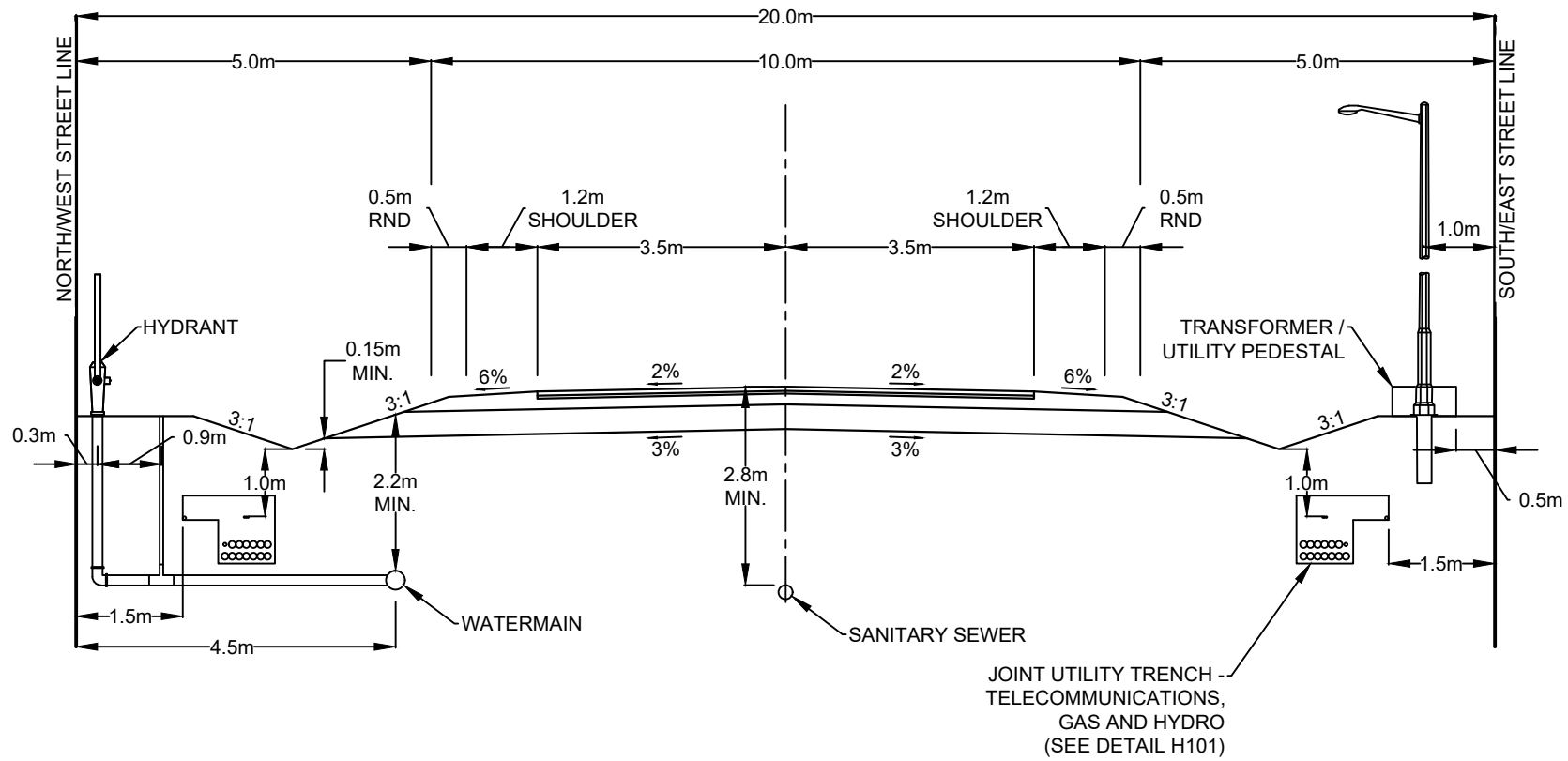
PLAN VIEW



**Nottawasaga Valley
Conservation Authority**

**TEMPORARY SEDIMENT
BASIN OUTLET DETAILS**

				APR'D:	DATE: 03.02.20
				DRAWN: A.S.C	SCALE: N.T.S
				BSD-23A	
NO.	REVISION	APR'D	DATE		



NOTES:

ROAD

- 40mm HL3 SURFACE COURSE ASPHALT
- 60mm HL8 BASE COURSE ASPHALT
- 150mm GRANULAR 'A'
- 350mm GRANULAR 'B'

SHOULDER

- 250mm GRANULAR 'A'
- 350mm GRANULAR 'B'
- ALL DITCH INVERTS TO BE CONSTRUCTED TO A MINIMUM 0.15 m BELOW THE ROAD GRANULAR SUB-BASE. IF THIS IS NOT POSSIBLE, THEN A 100 mm dia. PERFORATED SUB-DRAIN WRAPPED IN FILTER CLOTH IN A CLEARSTONE TRENCH IS TO BE INSTALLED BELOW THE DITCH INVERT, DISCHARGING TO A POSITIVE OUTLET.

BOULEVARD

- 150mm TOPSOIL + NURSERY SOD

STREETLIGHTS

- COBRA HEAD FIXTURE AND ARM WITH DECORATIVE STYLE POLES, ALL BLACK IN COLOUR

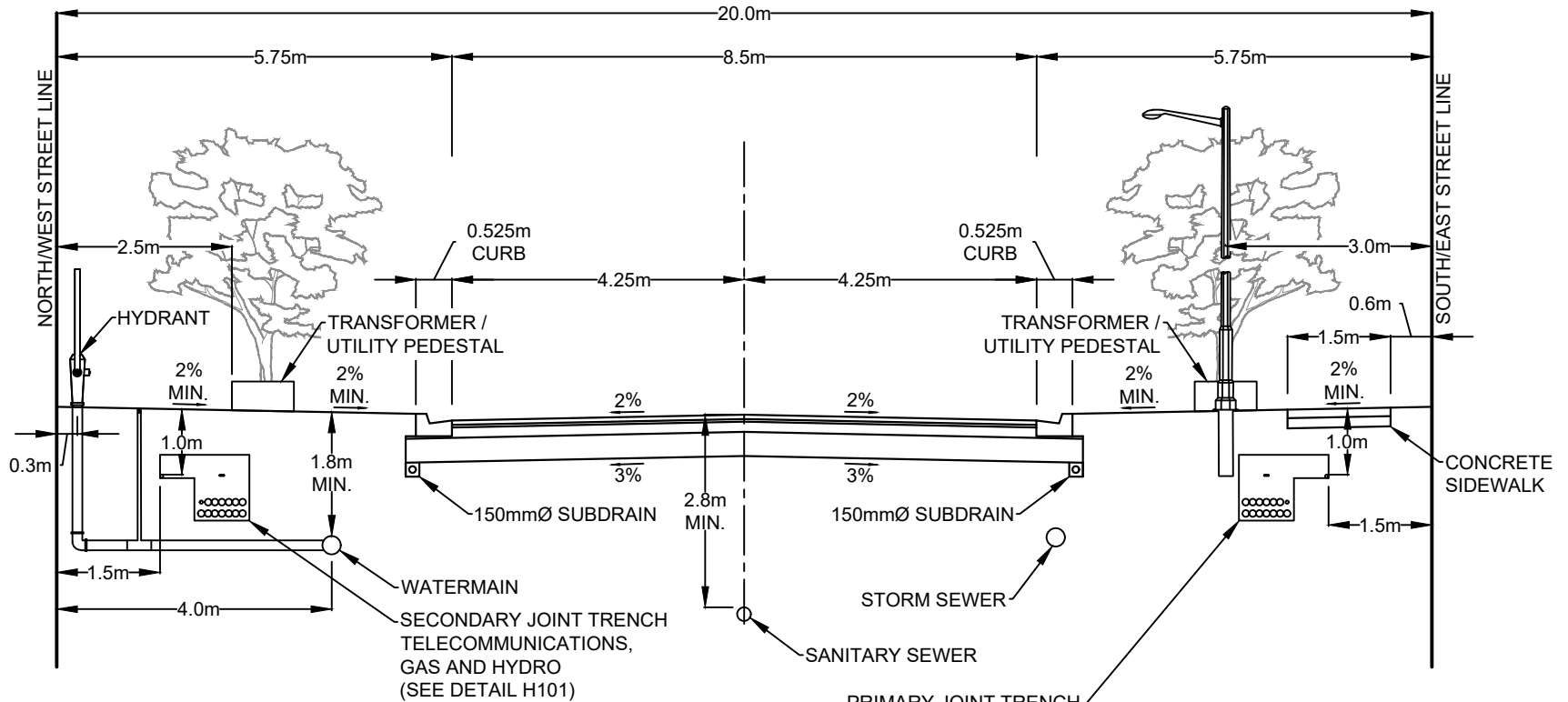


TOWNSHIP OF CLEARVIEW

LOCAL 7.0m RURAL ROAD - 20m R.O.W.

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	B101




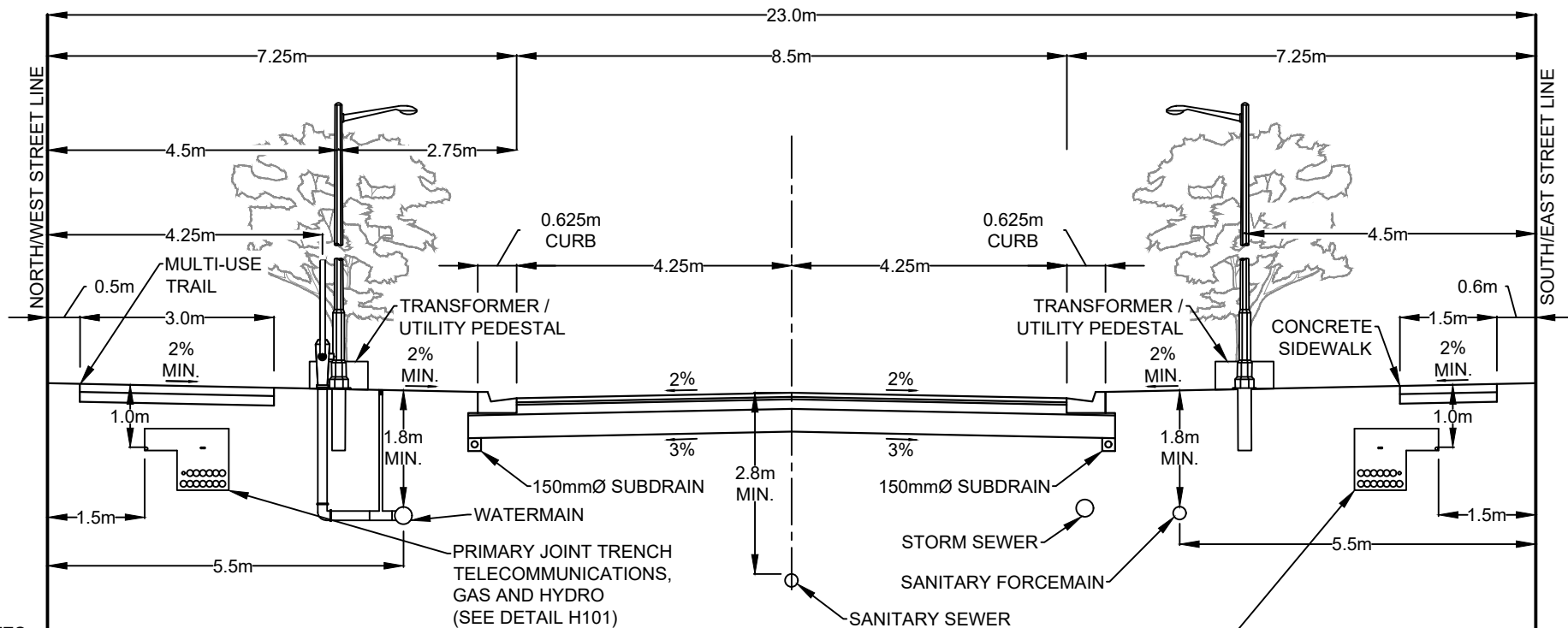
NOTES:

- ROAD**
 - 40mm HL3 SURFACE COURSE ASPHALT
 - 60mm HL8 BASE COURSE ASPHALT
 - 150mm GRANULAR 'A'
 - 350mm GRANULAR 'B'
- SUBDRAIN**
 - 150mm DIAMETER SUBDRAIN,
 - CONSTRUCTED PER OPSD-216.021
- CURB**
 - CURB OPSD-600.070
 - NOTE: IF ALTERNATE CURBS ARE PROPOSED, PROVIDE MODIFIED CROSS SECTION
- BOULEVARD**
 - 150mm TOPSOIL + NURSERY SOD
- SIDEWALK**
 - 125mm CONCRETE 32MPa (150mm AT DRIVEWAYS)
 - 150mm GRANULAR 'A'

- STREETLIGHTS**
 - COBRA HEAD FIXTURE AND ARM WITH DECORATIVE STYLE POLES, ALL BLACK IN COLOUR

PRIMARY JOINT TRENCH TELECOMMUNICATIONS, GAS AND HYDRO (SEE DETAIL H101)

 <p>TOWNSHIP OF CLEARVIEW</p>		<p>LOCAL 8.5m URBAN ROAD - 20m R.O.W.</p>	
		Scale	Date
		N.T.S.	OCT 2025
No.	Issue / Revision	Date	Dwg. No.
			B102



NOTES:

- ROAD**
 - 40mm HL3 SURFACE COURSE ASPHALT
 - 60mm HL8 BASE COURSE ASPHALT
 - 150mm GRANULAR 'A'
 - 400mm GRANULAR 'B'
- SUBDRAIN**
 - 150mm DIAMETER SUBDRAIN, CONSTRUCTED PER OPSD-216.021
- CURB**
 - CURB OPSD-600.010
- BOULEVARD**
 - 150mm TOPSOIL + NURSERY SOD
- SIDEWALK**
 - 125mm CONCRETE 32MPa (150mm AT DRIVEWAYS)
 - 150mm GRANULAR 'A'
- MULTI-USE TRAIL**
 - 50mm HL3 ASPHALT
 - 150mm GRANULAR 'A'

- STREETLIGHTS**
 - COBRA HEAD FIXTURE AND ARM WITH DECORATIVE STYLE POLES, ALL BLACK IN COLOUR

- PRIMARY JOINT TRENCH TELECOMMUNICATIONS, GAS AND HYDRO (SEE DETAIL H101)**

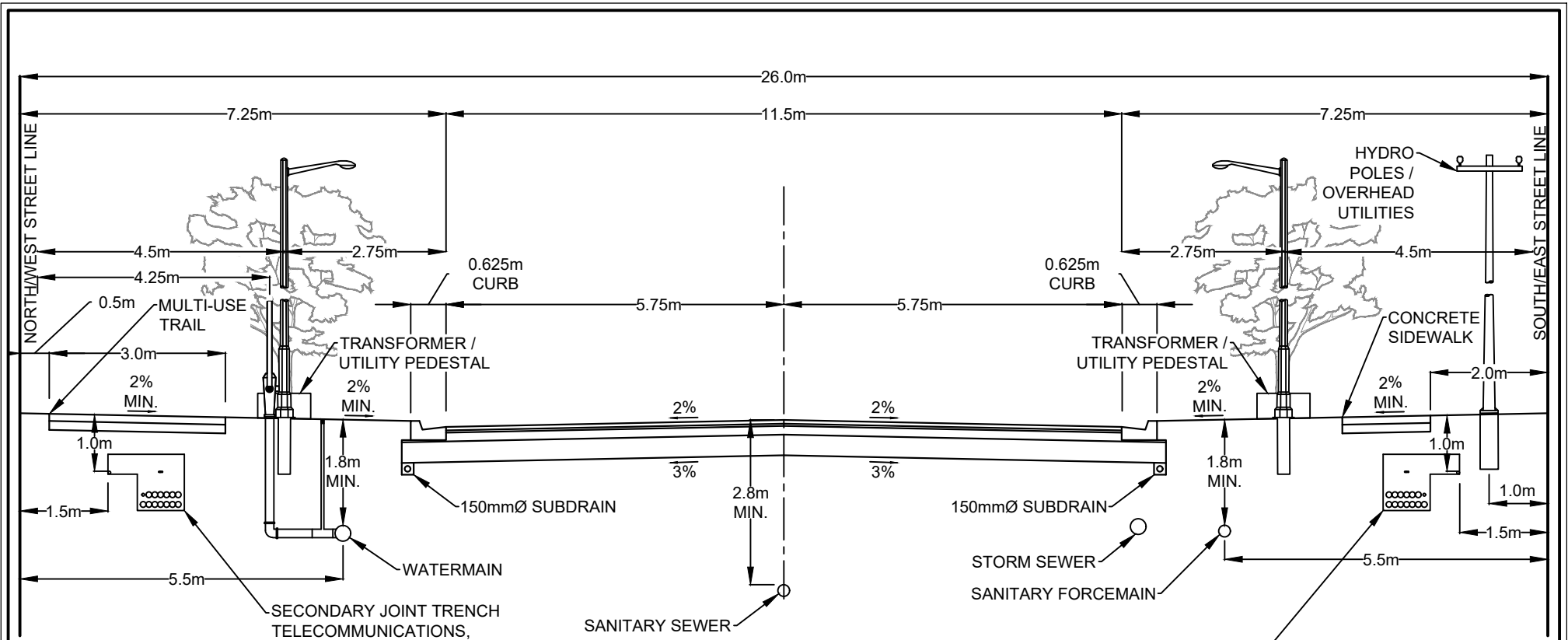


TOWNSHIP OF CLEARVIEW

MINOR COLLECTOR 8.5m URBAN ROAD - 23m R.O.W.

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	B103



NOTES:

ROAD

- 40mm HL3 SURFACE COURSE ASPHALT
- 100mm HL8 BASE COURSE ASPHALT
- 150mm GRANULAR 'A'
- 450mm GRANULAR 'B'

SUBDRAIN

- 150mm DIAMETER SUBDRAIN, CONSTRUCTED PER OPSD-216.021

CURB

- CURB OPSD-600.010
- IF ALTERNATE CURBS ARE PROPOSED, PROVIDE MODIFIED CROSS SECTION

BOULEVARD

- 150mm TOPSOIL + NURSERY SOD

SIDEWALK

- 125mm CONCRETE 32MPa (150mm AT DRIVEWAYS)
- 150mm GRANULAR 'A'

MULTI-USE TRAIL

- 50mm HL3 ASPHALT
- 150mm GRANULAR 'A'

STREETLIGHTS

- COBRA HEAD FIXTURE AND ARM WITH DECORATIVE STYLE POLES, ALL BLACK IN COLOUR

PRIMARY JOINT TRENCH TELECOMMUNICATIONS, GAS AND HYDRO (SEE DETAIL H101)

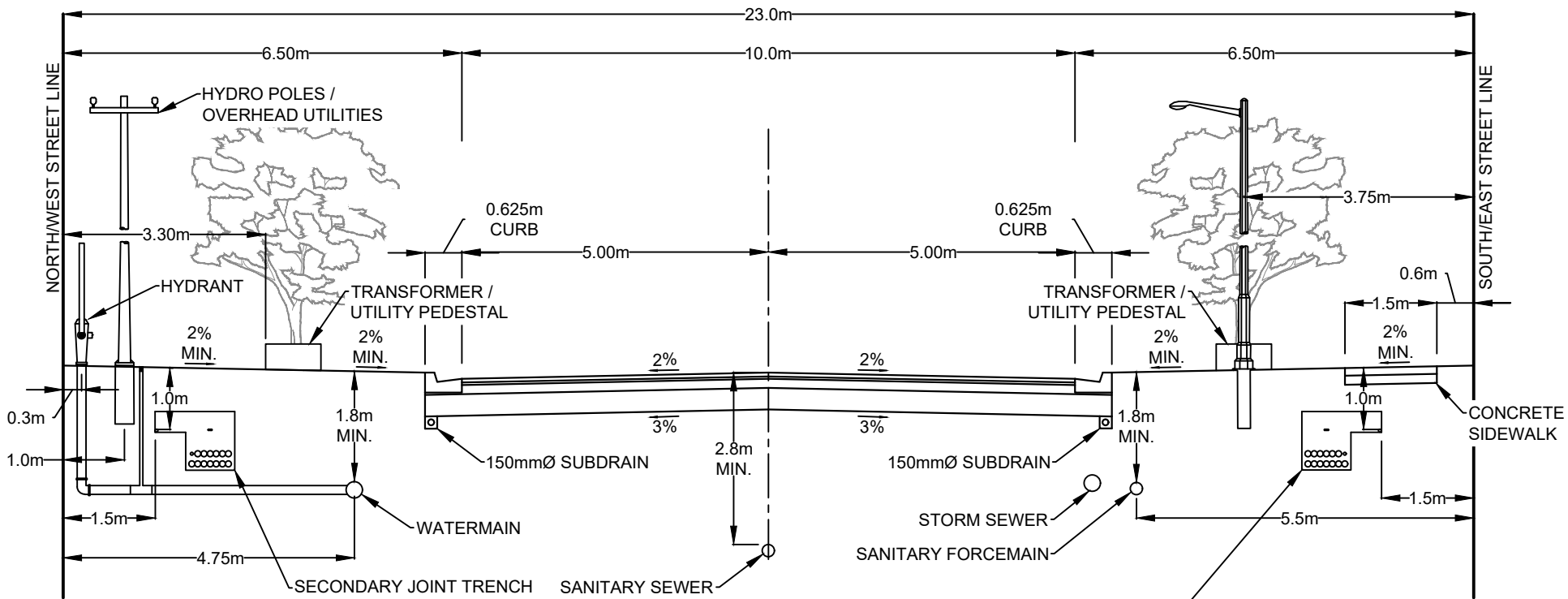


TOWNSHIP OF CLEARVIEW

MAJOR COLLECTOR 11.5m URBAN ROAD - 26m R.O.W.

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	B104



NOTES:

ROAD

- 40mm HL3 SURFACE COURSE ASPHALT
- 110mm HL8 BASE COURSE ASPHALT
- 150mm GRANULAR 'A'
- 500mm GRANULAR 'B'

SUBDRAIN

- 150mm DIAMETER SUBDRAIN, CONSTRUCTED PER OPSD-216.021

CURB

- CURB OPSD-600.010

BOULEVARD

- 150mm TOPSOIL + NURSERY SOD

SIDEWALK

- 125mm CONCRETE 32MPa (150mm AT DRIVEWAYS)
- 150mm GRANULAR 'A'

STREETLIGHTS

- COBRA HEAD FIXTURE AND ARM WITH DECORATIVE STYLE POLES, ALL BLACK IN COLOUR

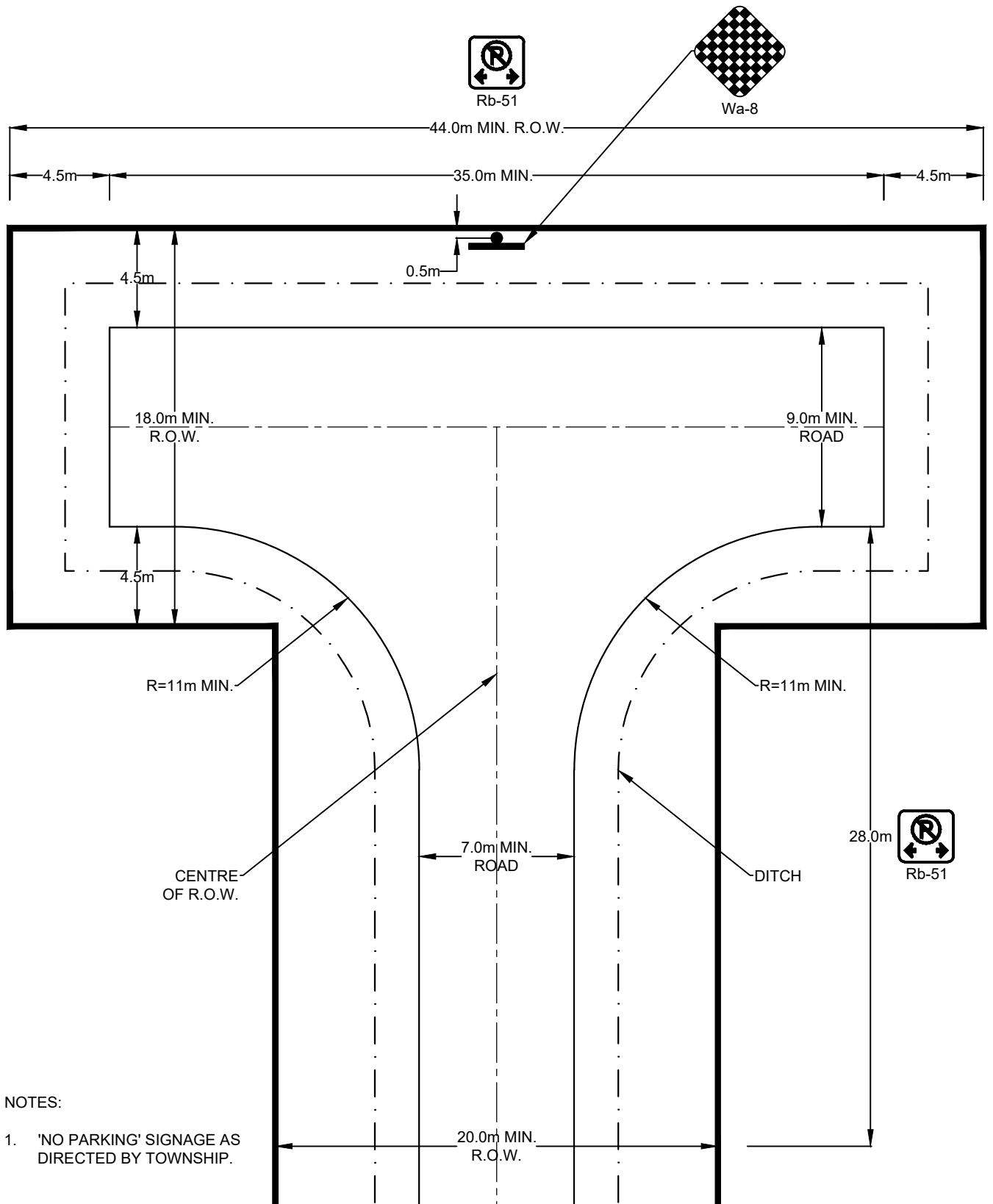


INDUSTRIAL 10.0m URBAN ROAD - 23m R.O.W.

No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
B105



NOTES:

1. 'NO PARKING' SIGNAGE AS DIRECTED BY TOWNSHIP.



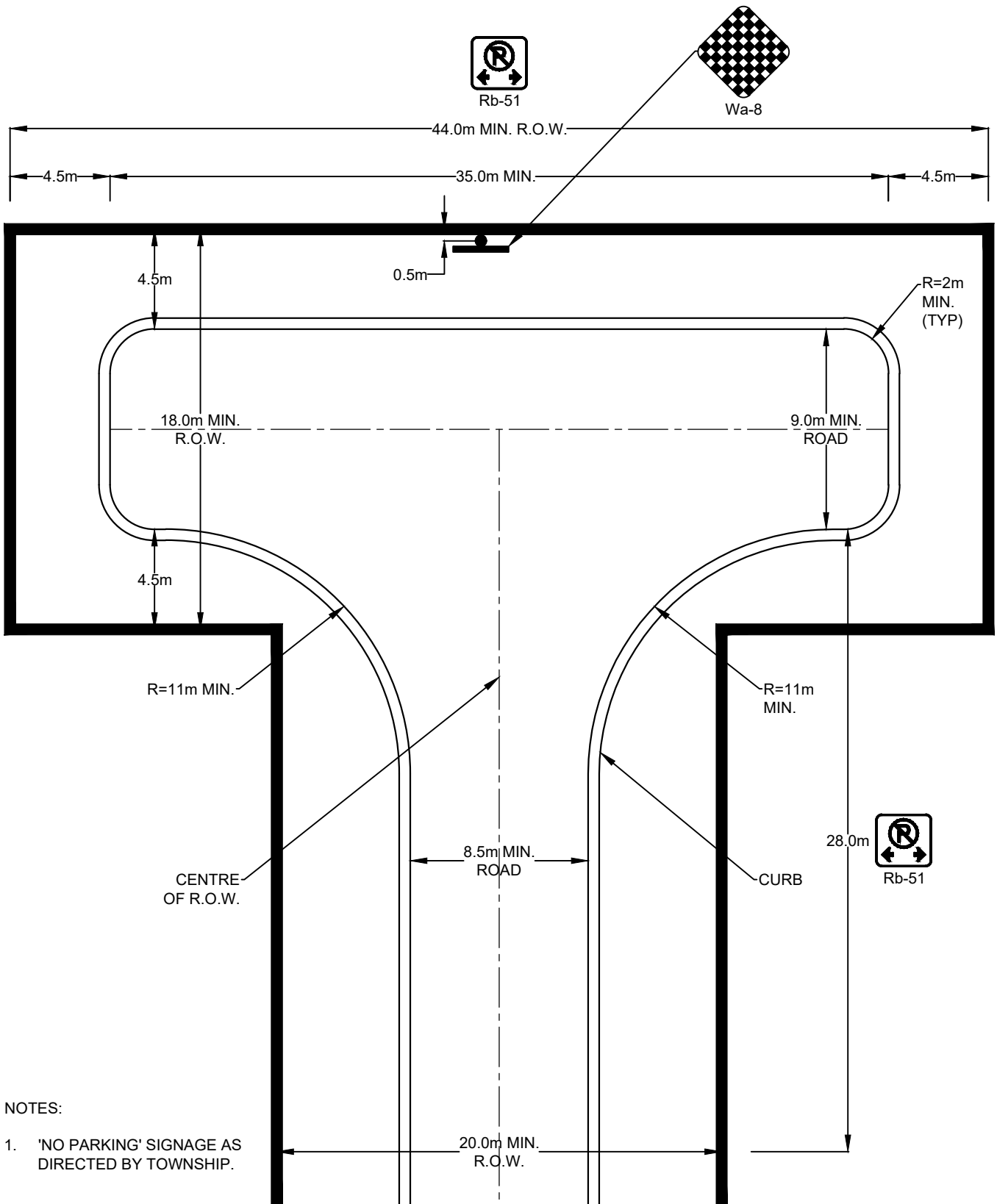
TOWNSHIP OF CLEARVIEW

RURAL RESIDENTIAL 7.0m TURNING BASIN

No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
B106



NOTES:

- 'NO PARKING' SIGNAGE AS DIRECTED BY TOWNSHIP.



TOWNSHIP OF CLEARVIEW

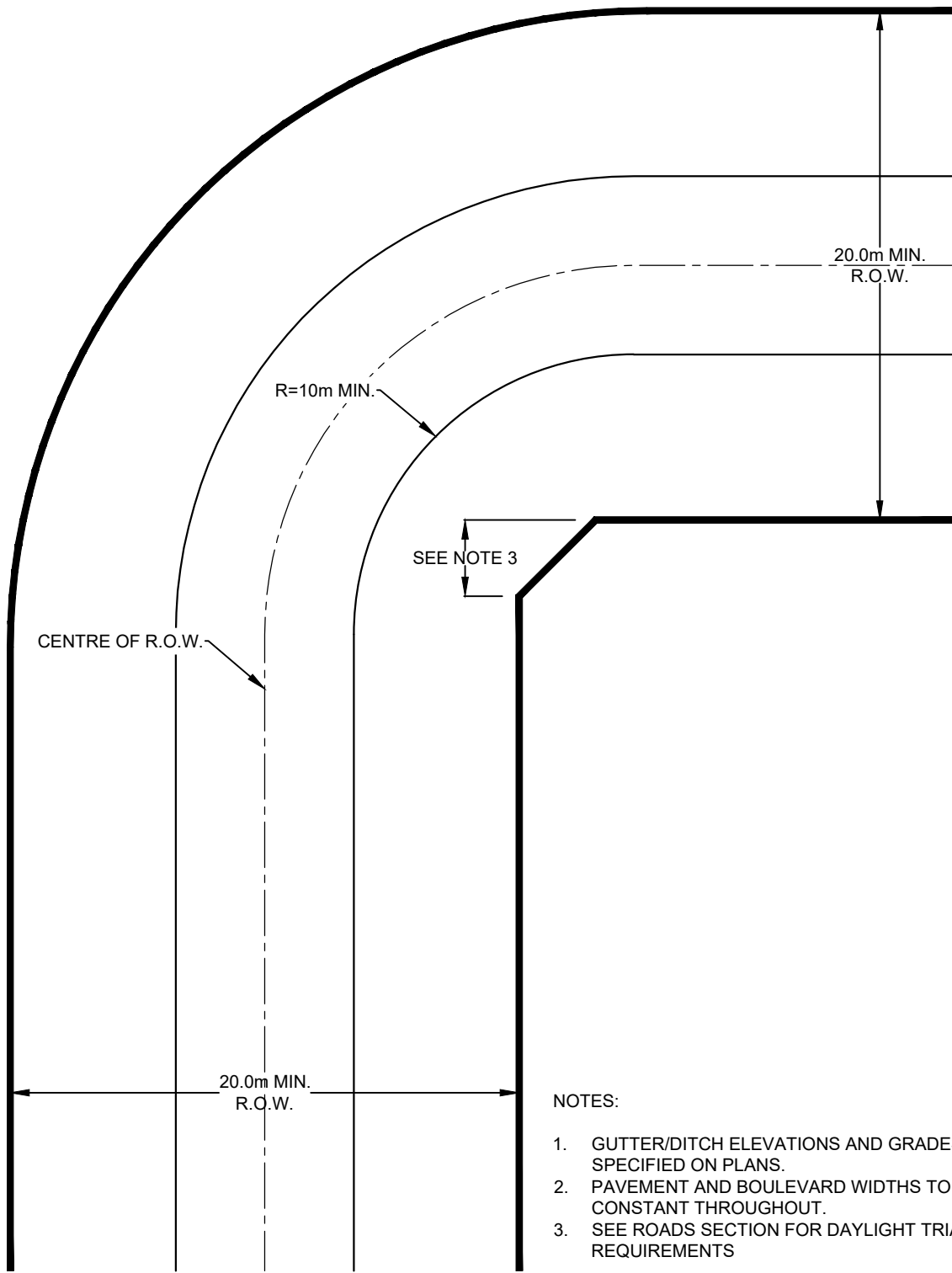
URBAN RESIDENTIAL 8.5m TURNING BASIN

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	B107
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NOTES:

1. GUTTER/DITCH ELEVATIONS AND GRADES TO BE SPECIFIED ON PLANS.
2. PAVEMENT AND BOULEVARD WIDTHS TO REMAIN CONSTANT THROUGHOUT.
3. SEE ROADS SECTION FOR DAYLIGHT TRIANGLE REQUIREMENTS



TOWNSHIP OF CLEARVIEW

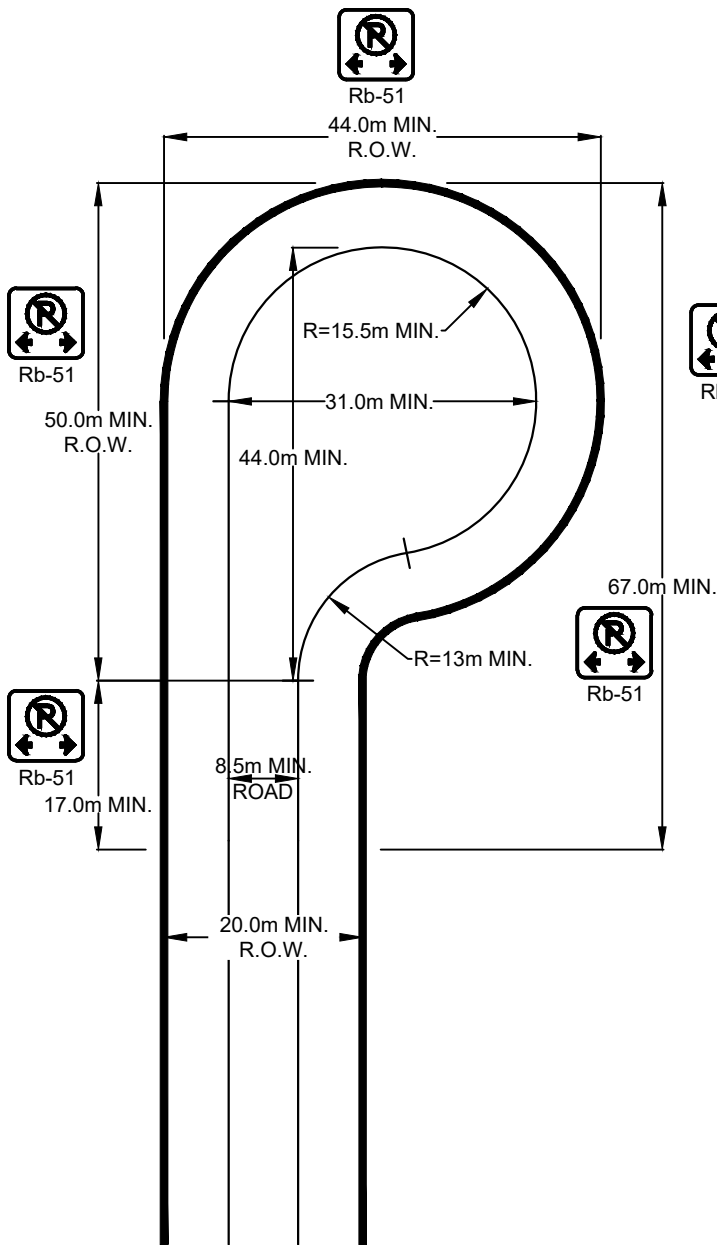
TYPICAL 90° BEND

No.	Issue / Revision	Date	Auth.

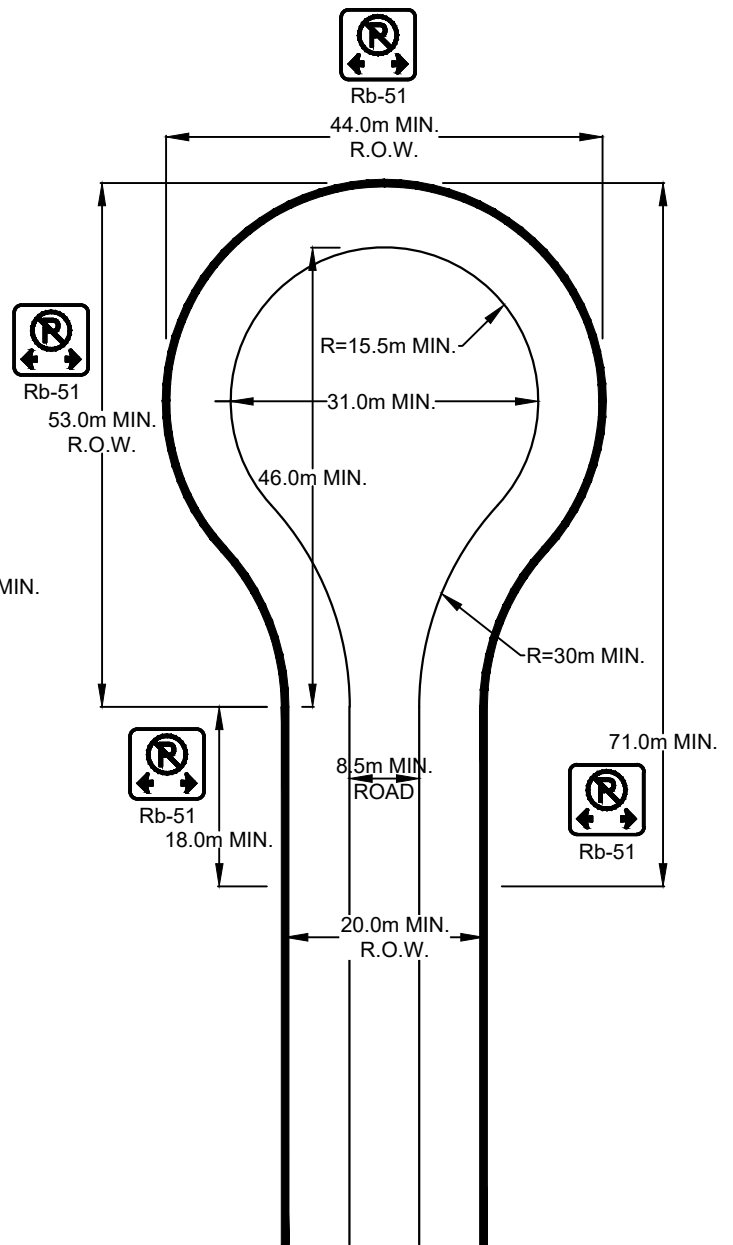
Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	B108
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TYPE A



TYPE B

NOTES:

1. MINIMUM 0.5% GUTTER/DITCH GRADE (GRADE TO BE DETAILED ON PLANS).
2. BOULEVARD WIDTHS TO BE MAINTAINED AROUND BULB.
3. MINIMUM 1.0 SPACING BETWEEN DRIVEWAY CURB DEPRESSIONS.
4. MINIMUM OF TWO CATCHBASINS IN THE CUL-DE-SAC.
5. 50mmØ WATERMAIN LOOP, MINIMUM OF FOUR SERVICES AND MAXIMUM OF SIX SERVICES (WHERE POSSIBLE). SEE DETAIL D111.
6. 'NO PARKING' SIGNAGE AS DIRECTED BY TOWNSHIP.

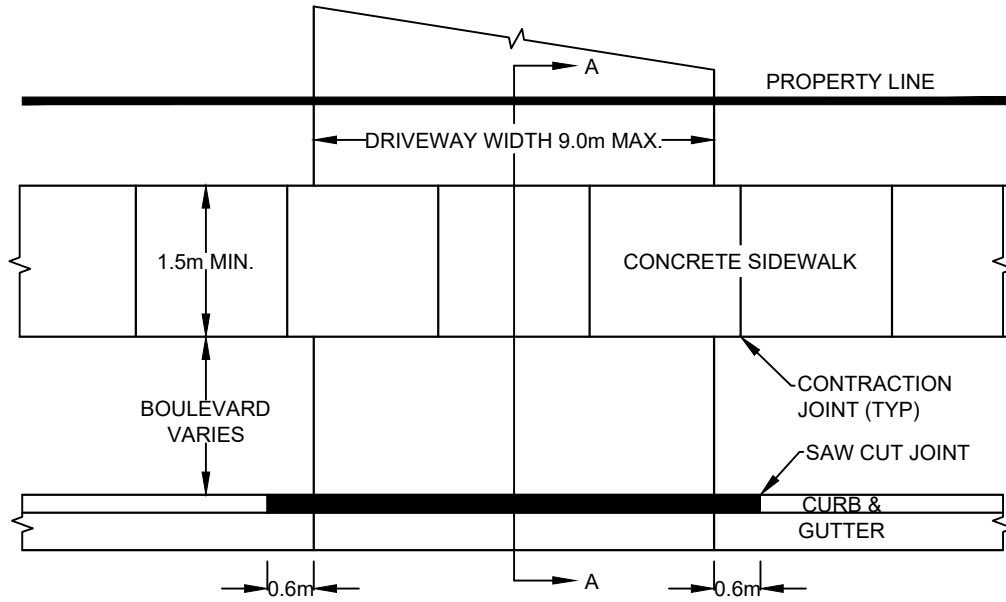


TOWNSHIP OF CLEARVIEW

TYPICAL CUL DE SAC

No.	Issue / Revision	Date	Auth.

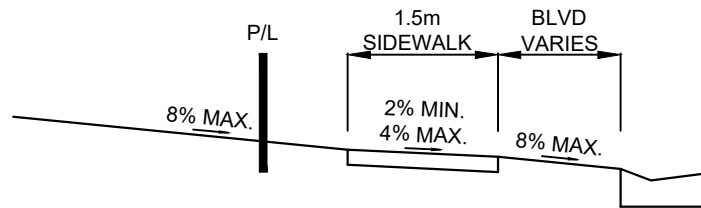
Scale	Date	Dwg. No.
N.T.S.	OCT 2025	B109



PLAN



ELEVATION



SECTION A-A

NOTES:

1. DRIVEWAY WIDTH TO MATCH GARAGE WIDTH (OUTSIDE WALLS) IN NEW DEVELOPMENTS OR EXISTING DRIVEWAY IN OLDER AREAS. MAXIMUM 9.0m AT PROPERTY LINE OR SIDEWALK.
2. DRIVEWAY GRADES IN REDEVELOPMENT AREAS MAY BE VARIED TO SUIT EXISTING CONDITIONS.
3. DRIVEWAY TO BE PAVED FROM CURB TO GARAGE/DWELLING. PAVING TO BE WITH 200mm GRANULAR 'A' AND 50mm HL3 ASPHALT (COMPACTED DEPTHS).
4. DRIVEWAY TO BE A MINIMUM OF 1.0m OFFSET FROM THE SIDEYARD PROPERTY LINES.



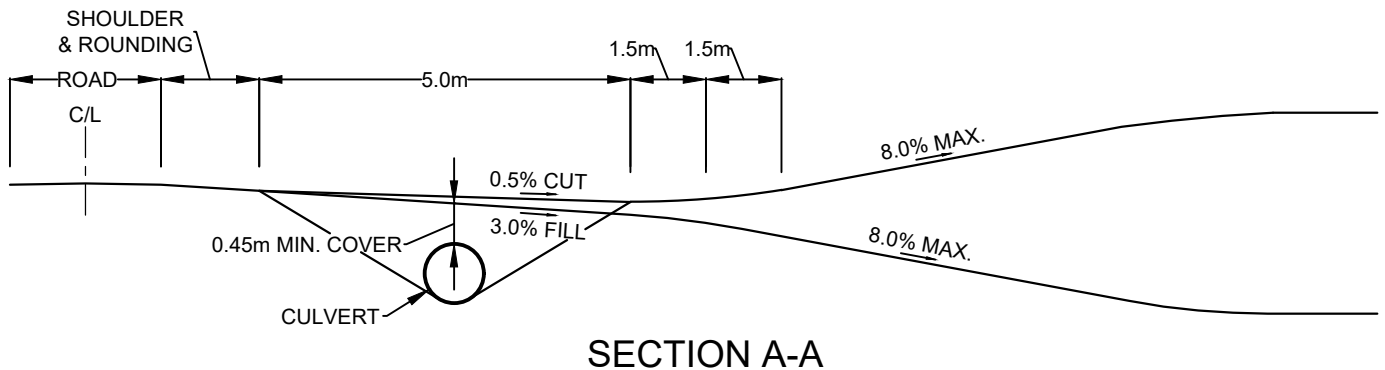
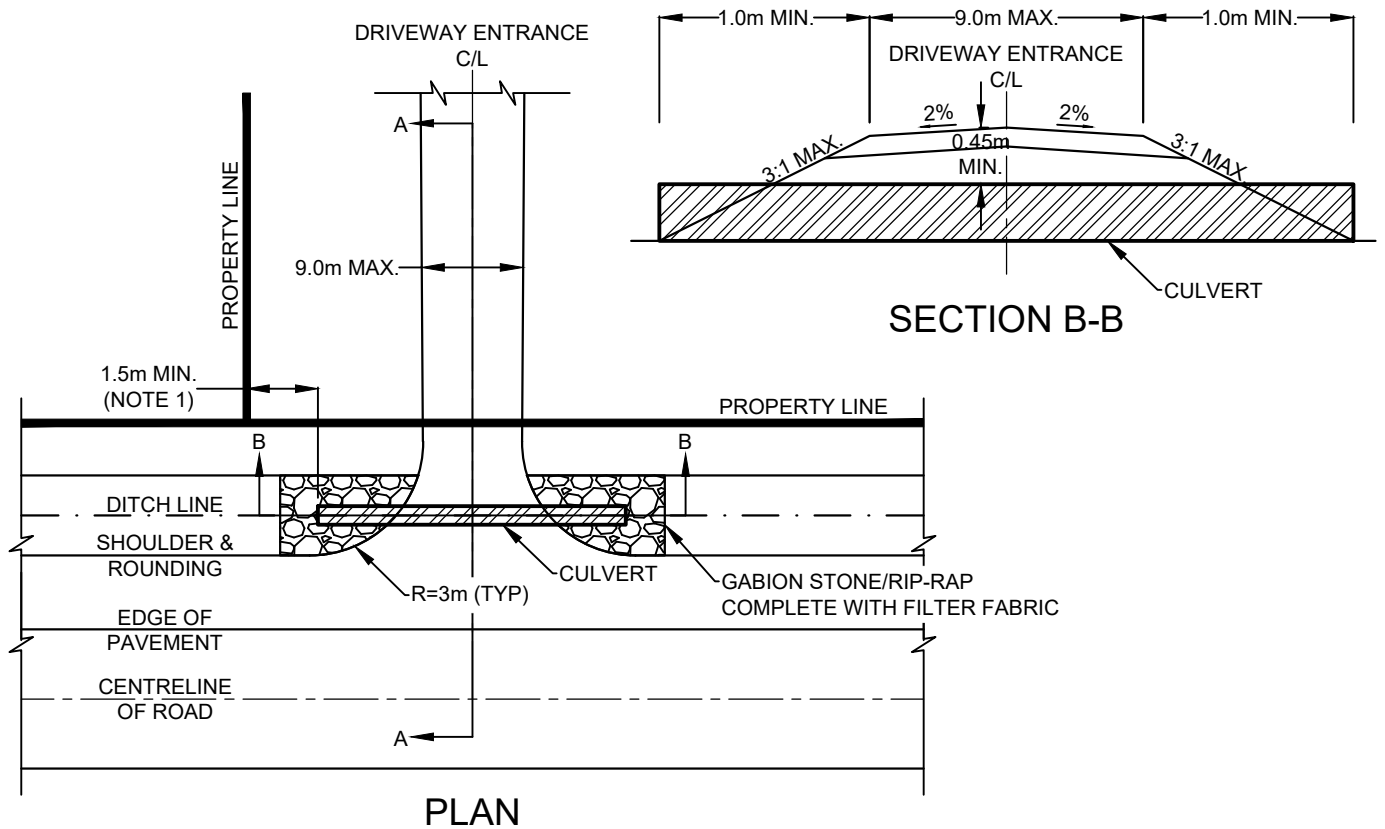
TOWNSHIP OF CLEARVIEW

URBAN RESIDENTIAL DRIVEWAY

No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
B110



NOTES:

1. NO DRIVEWAY OR CULVERT SHALL BE LOCATED CLOSER THAN 0.3m FROM ANY WATER VALVE, CURB STOP, TRANSFORMER OR STREET LIGHT, OR 1.5m FROM SIDE PROPERTY LINES.
2. DRIVEWAY CULVERT TO BE CORRUGATED DUAL WALL HDPE (PREFERRED) OR CSP, COMPLETE WITH PRE-FABRICATED CONCRETE BLOCKS OR EQUIVALENT END PROTECTIONS IN AREAS WITH A POSTED SPEED LIMIT OF LESS THAN 50km/hr. HEADWALLS ARE NOT PERMITTED IN AREAS WITH POSTED SPEED LIMITS GREATER THAN 50km/hr.
3. CULVERT TO BE MINIMUM 450mm DIAMETER AND MINIMUM THICKNESS AS RECOMMENDED BY MANUFACTURER FOR CL625ONT LOADING.
4. DRIVEWAY ENTRANCES SHALL BE GRAVEL (MINIMUM 150mm GRANULAR 'A') FROM THE EDGE OF THE TRAVELED ROAD TO THE PROPERTY LINE.



TOWNSHIP OF CLEARVIEW

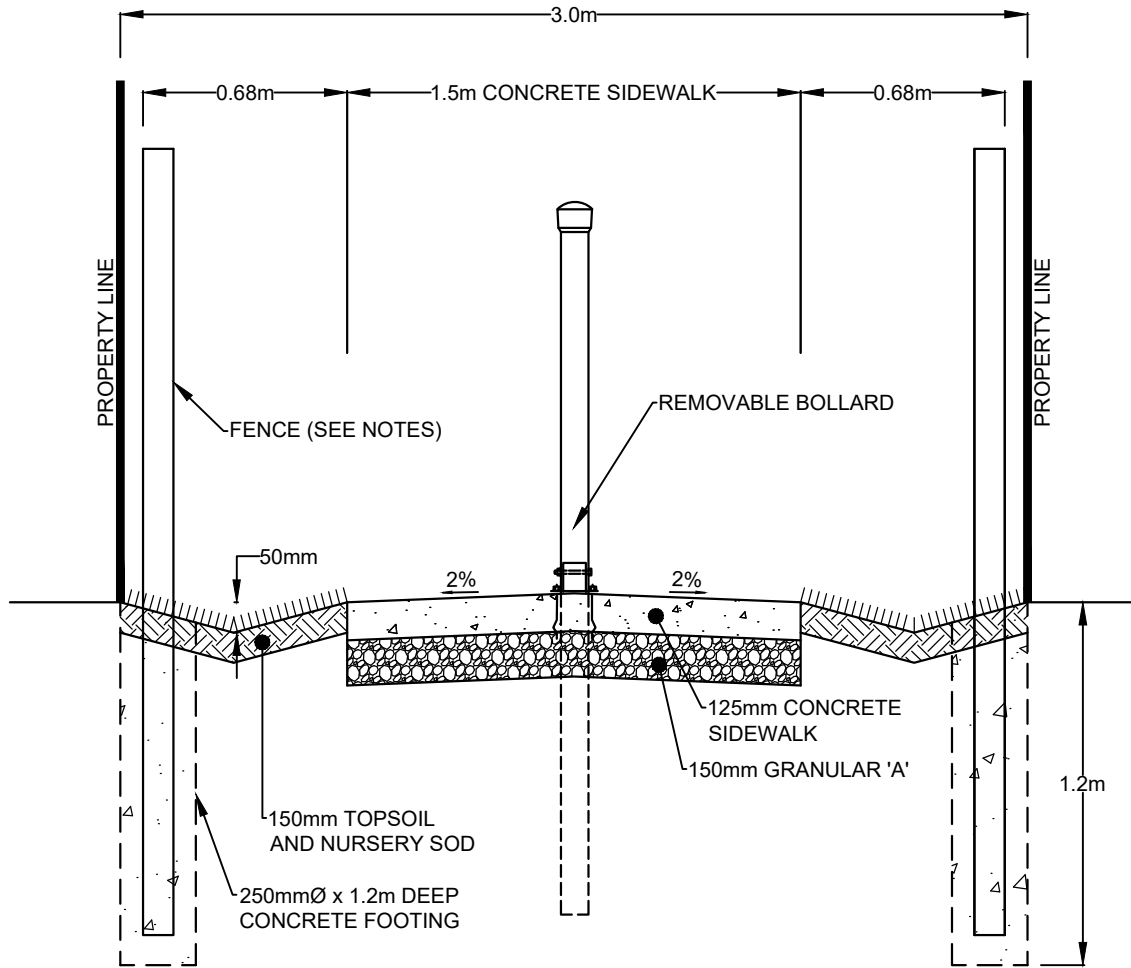
RURAL DRIVEWAY ENTRANCE

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	B111

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	B111

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	B111



NOTES:

1. HEIGHT OF CHAIN LINK FENCE TO BE 1.5m FROM THE FRONT PROPERTY LINE TO THE FRONT WALL OF BUILDINGS ON ADJACENT LOTS.
2. HEIGHT OF WOODEN PRIVACY FENCE TO BE 1.8m FROM THE FRONT OF WALL OF BUILDINGS TO THE REAR PROPERTY LINE ON ADJACENT LOTS.
3. REMOVABLE BOLLARDS TO BE INSTALLED AT EACH END OF THE WALKWAY.
4. CONCRETE WALKWAY TO BE OPSS-351, 32MPa CONCRETE. SEE OPSD-310.010 FOR ADDITIONAL DETAILS. EXPANSION JOINTS ON WALKWAY TO BE 0.6m SPACING. DUMMY JOINTS AT 1.5m INTERVALS.
5. SEE DETAIL I111 FOR DETAILS ON REMOVABLE BOLLARD.



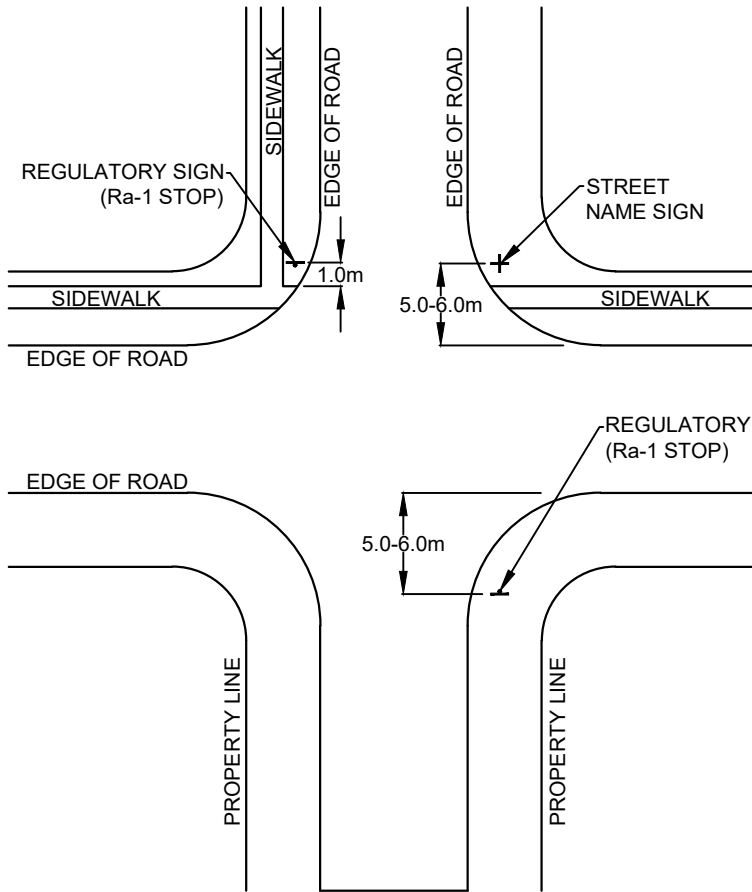
TOWNSHIP OF CLEARVIEW

TYPICAL WALKWAY CROSS SECTION

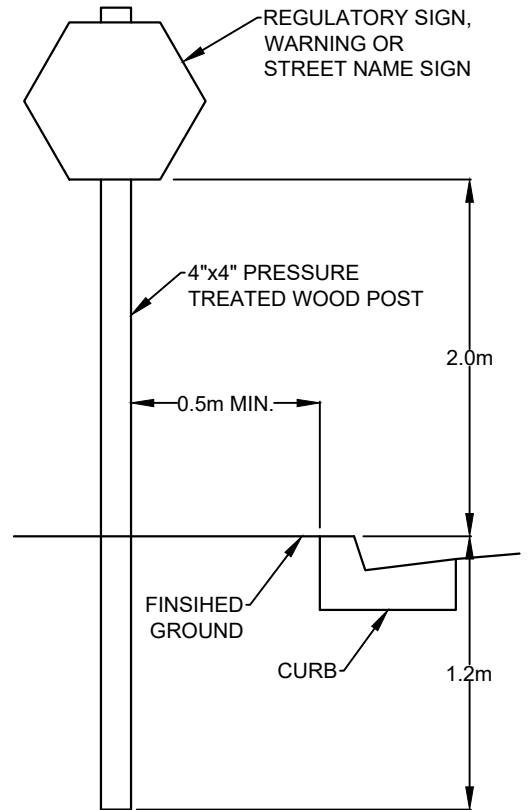
No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
B112



LOCATION PLAN



INSTALLATION DETAIL

NOTES:

1. REGULATORY AND WARNING SIGNS AS PER OHTA REG. 615/616 OR AMENDMENTS THEREOF.
2. ALL REGULATORY AND WARNING SIGNS SHALL BE MOUNTED ON 4"x4" PRESSURE TREATED WOOD POSTS AND IMBEDDED 1.2m IN GROUND.
3. ALL REGULATORY AND WARNING SIGNS SHALL BE MOUNTED A MINIMUM OF 2.0m ABOVE FINISHED GROUND ELEVATION IN URBAN AREAS.
4. ALL REGULATORY AND WARNING SIGN BLANKS SHALL BE GALVANIZED STEEL AND BE OF HIGH DENSITY GRADE REFLECTORIZED SURFACES.
5. STREET NAME SIGNS TO BE AS PER THE TOWNSHIP STANDARDS AND BE MOUNTED 2.5m IN HEIGHT



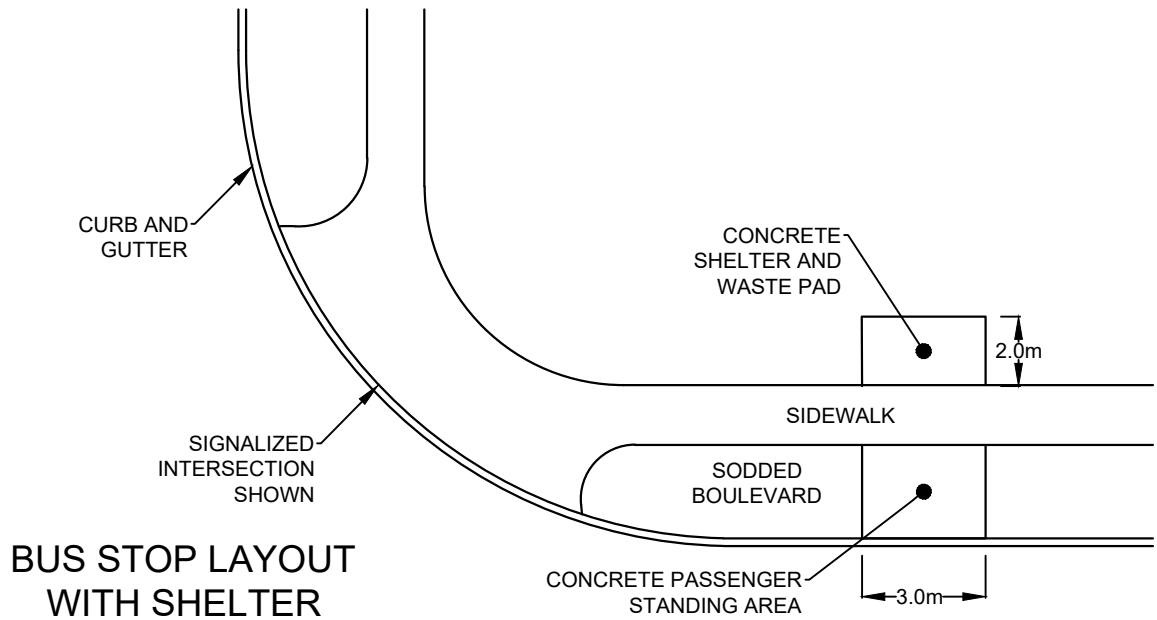
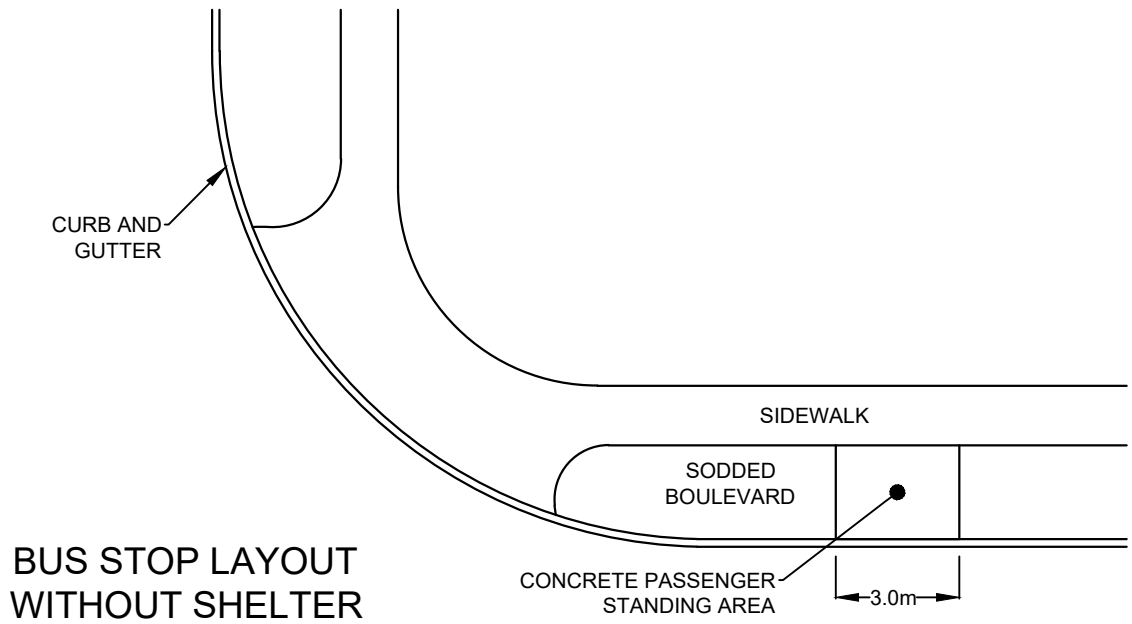
TOWNSHIP OF CLEARVIEW

REGULATORY, WARNING AND STREET NAME SIGN AND LOCATION

No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
B113



NOTES:

1. ALL CONCRETE WORK TO BE IN ACCORDANCE WITH OPSD-310.010, 310.020 WITH CROSSFALL OF 2% TO 4%.
2. SIDEWALK RAMPS TO BE IN ACCORDANCE WITH OPSD-310.030.
3. CONCRETE SIDEWALK LINKS FROM PASSENGER STANDING AREA TO THE NEAREST SIDEWALK OR INTERSECTION ARE REQUIRED WHERE A MUNICIPAL SIDEWALK IS NOT AVAILABLE.
4. SEE APPROVED MATERIALS LIST FOR BUS SHELTER SPECIFICATIONS.



TOWNSHIP OF CLEARVIEW

BUS STOP LAYOUTS

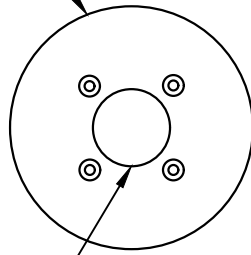
No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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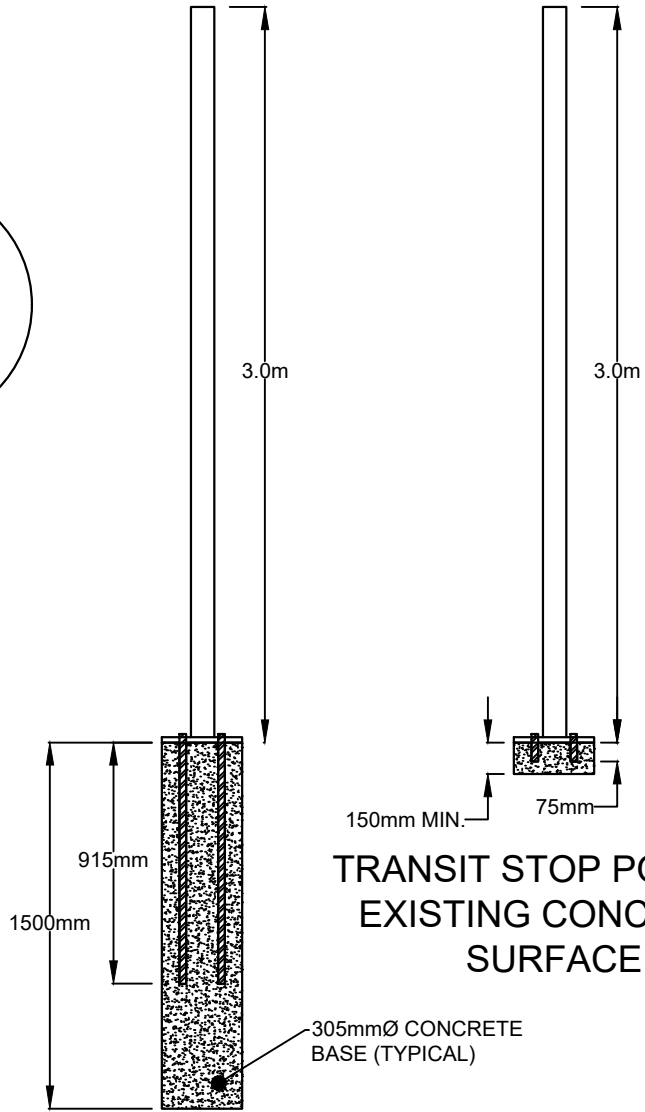
Date	OCT 2025
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Dwg. No.	B114
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305mmØ x 19mm THICK GALVANIZED STEEL PLATE



POST WELDED TO PLATE PER CSA W59.2



TRANSIT STOP POST ON EXISTING CONCRETE SURFACE

TRANSIT STOP POST WITH SONOTUBE BASE

NOTES:

1. POST TO BE GALVANIZED STEEL TUBING WITH WELDED CAP ON TOP.
2. USE 89mm POSTS WITH 6.35mm WALL FOR ARTERIAL ROADS AND 50mm WITH 6.35mm WALL FOR LOCAL ROADS.
3. BASE TO BE GALVANIZED PLATE 19mm THICK.
4. ALL WELDS PER CSA W59.2.
5. CONCRETE TO BE 25MPa.
6. ANCHOR BOLTS GALVANIZED WITH MIN. YIELD 44ksi. SECURE POST WITH WASHER AND 13mm ACORN NUTS.
7. POSTS TO BE POWDER COATED AND PAINTED BLUE (PAINT COLOUR TO BE PROVIDED BY TOWNSHIP).



TOWNSHIP OF CLEARVIEW

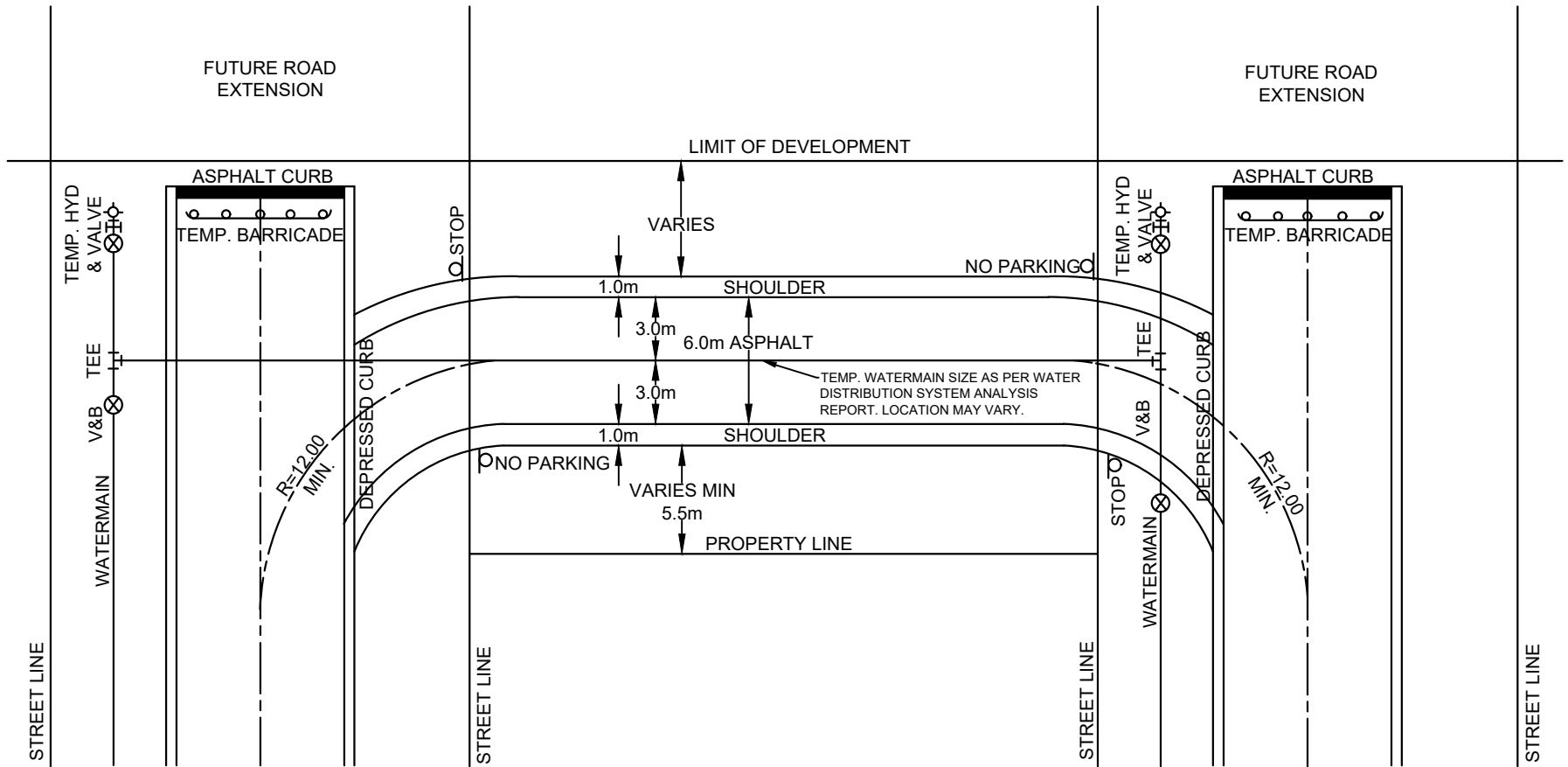
BUS STOP SIGNAGE POSTS

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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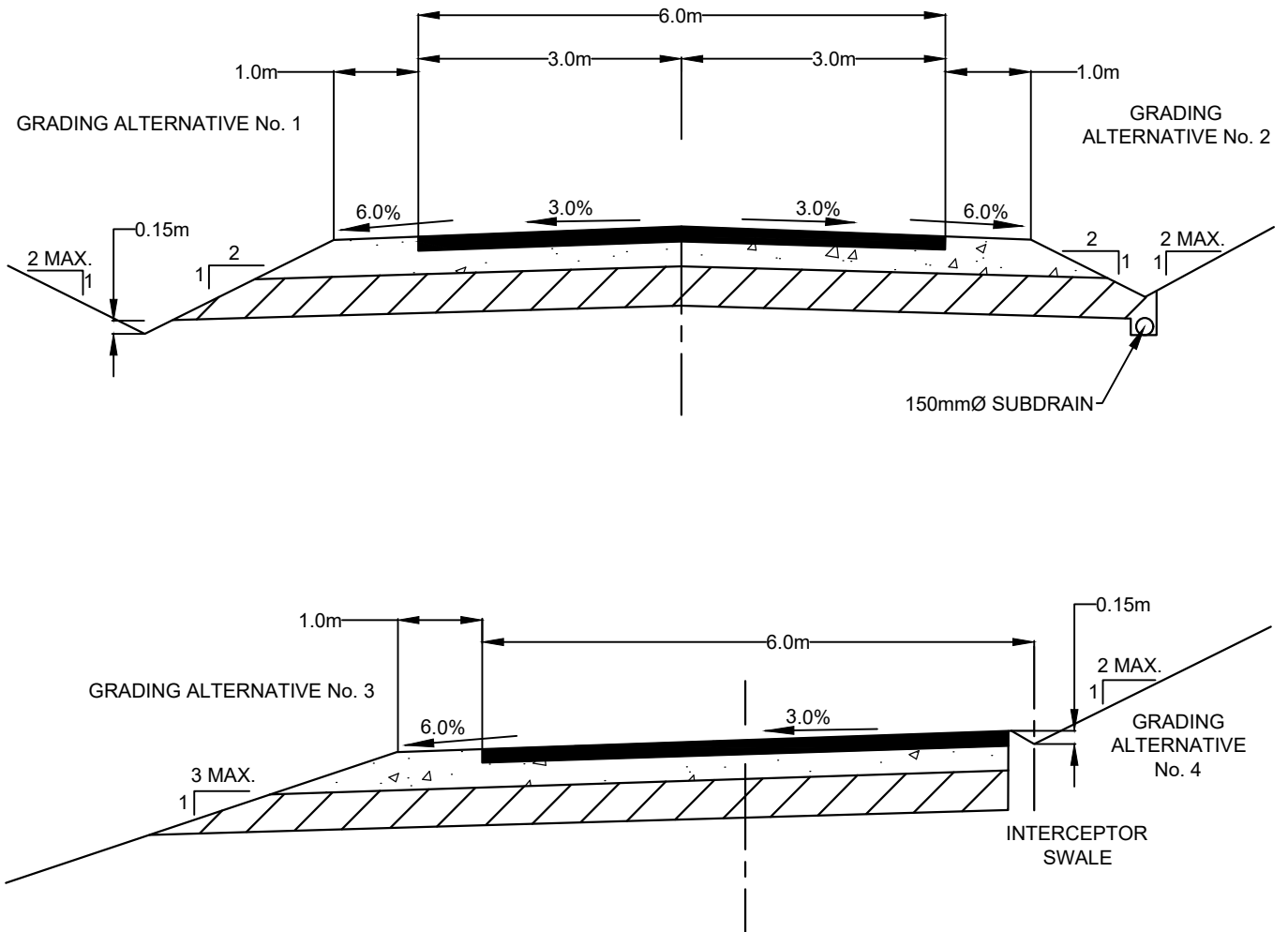
Dwg. No.	B115
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NOTES:

1. REFER TO STANDARD DRAWING B117 FOR TYPICAL TEMPORARY ROAD CROSS-SECTIONS

		TOWNSHIP OF CLEARVIEW		TEMPORARY ROAD CONNECTING PARALLEL STREETS		
No.	Issue / Revision	Date	Auth.	N.T.S.	OCT 2025	B116



NOTES:

1. REFER TO STANDARD DRAWING B116 FOR HORIZONTAL GEOMETRY OF TEMPORARY ROAD.



TOWNSHIP OF CLEARVIEW

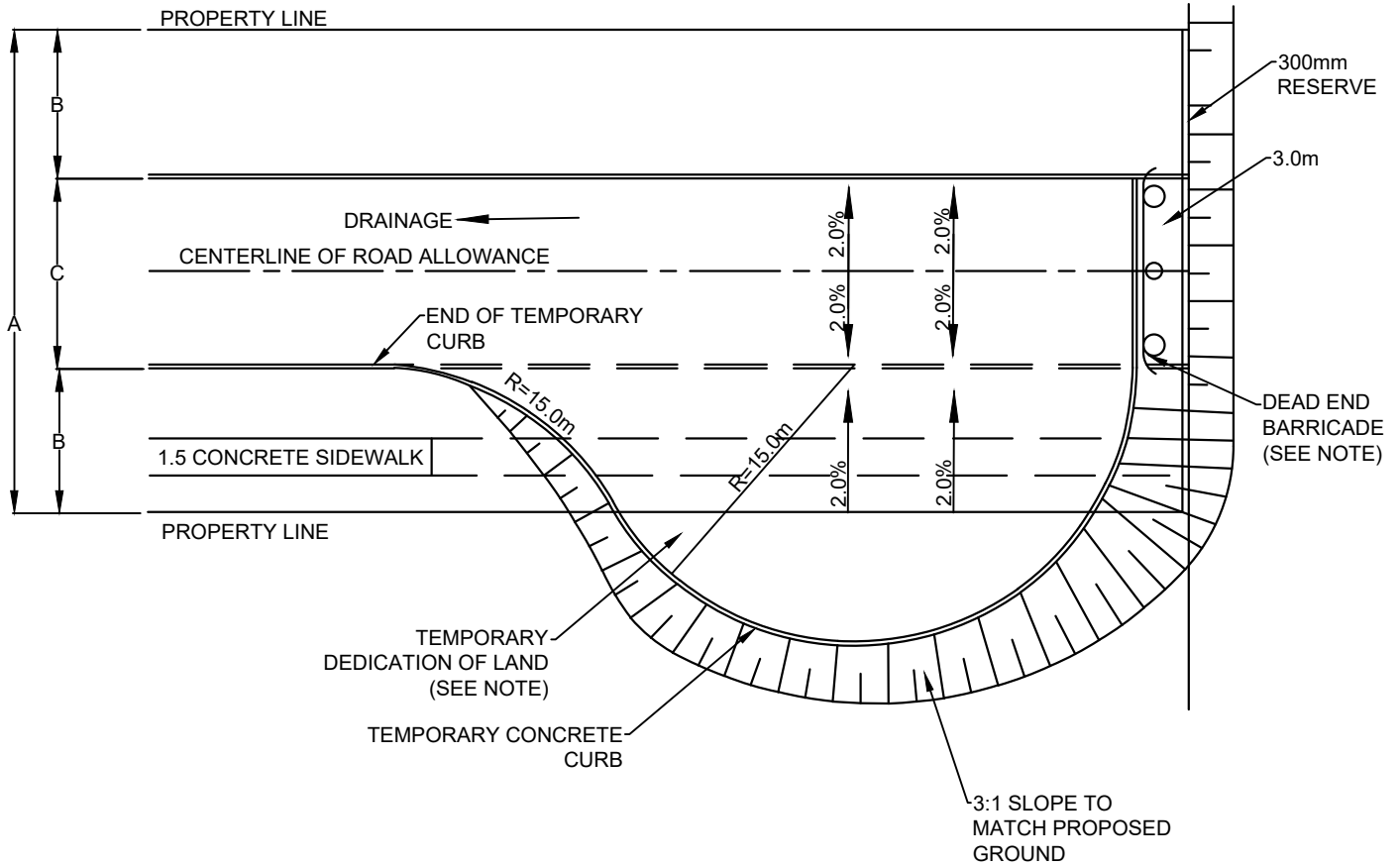
TYPICAL TEMPORARY ROAD CROSS SECTION

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	B117
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NOTES:

1. ALL CURB AND GUTTER SHALL BE CONCRETE BARRIER TYPE AS PER TOWNSHIP STANDARD.
2. ONLY TO BE USED WHEN ROAD IS TO BE EXTENDED IN A SHORT PERIOD OF TIME (E.G., 2 YEARS).
3. DEAD END BARRICADE PER OPSD 906.01 COMPLETE WITH ADDITIONAL 500mm x 500mm BLACK ON WHITE SIGN NOTING - TEMPORARY ONLY - LOCATION OF FUTURE ROAD.
4. TEMPORARY LAND DEDICATED VIA BLOCK ON PLAN.

A	B	C
20	5.75	8.50



TOWNSHIP OF CLEARVIEW

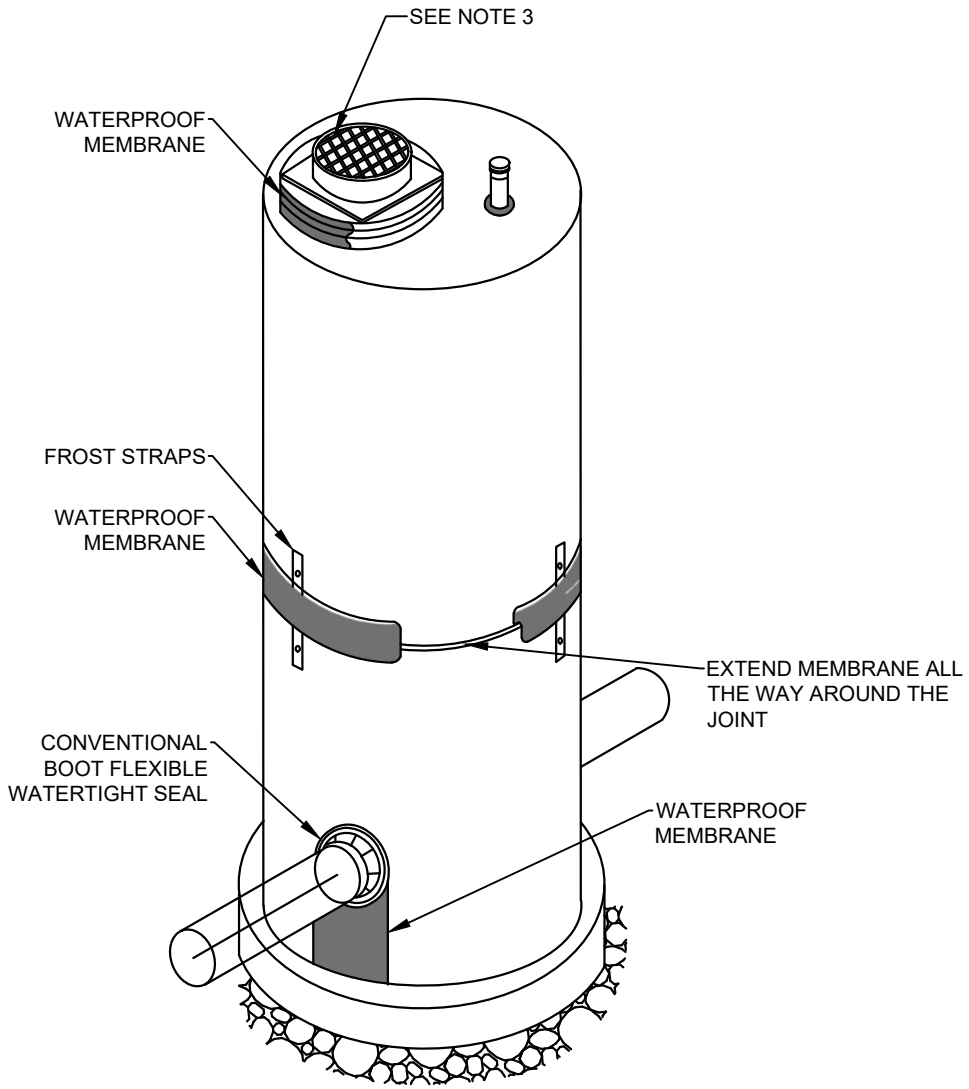
TEMPORARY CUL-DE-SAC

No.	Issue / Revision	Date	Auth.

Scale
N.T.S.

Date
OCT 2025

Dwg. No.
B118



NOTES:

1. WATERPROOF MEMBRANE TO EXTEND COMPLETELY AROUND ALL RISER JOINTS WITH A MINIMUM 300mm WIDE STRIP.
2. TOWNSHIP TO ACCEPT MEMBRANE SPECIFICATIONS PRIOR TO INSTALLATION.
3. WATERPROOF LID REQUIRED "NO FLO IN FLO" IN AREAS SUBJECT TO FLOODING OR AN OVERLAND FLOW ROUTE.



TOWNSHIP OF CLEARVIEW

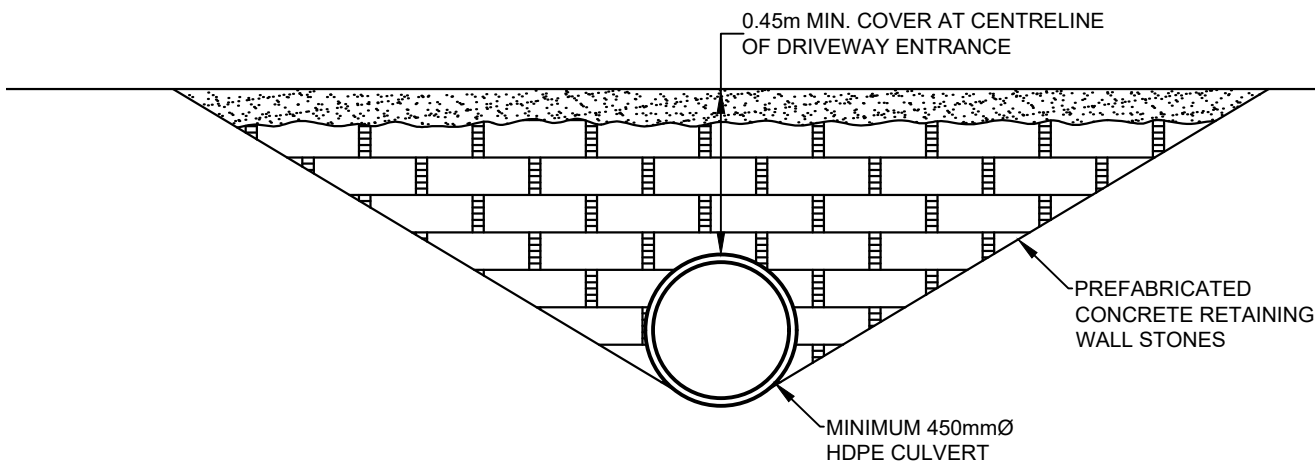
**TYPICAL PRECAST CIRCULAR STRUCTURE
WATERPROOFING DETAILS**

No.	Issue / Revision	Date	Auth.

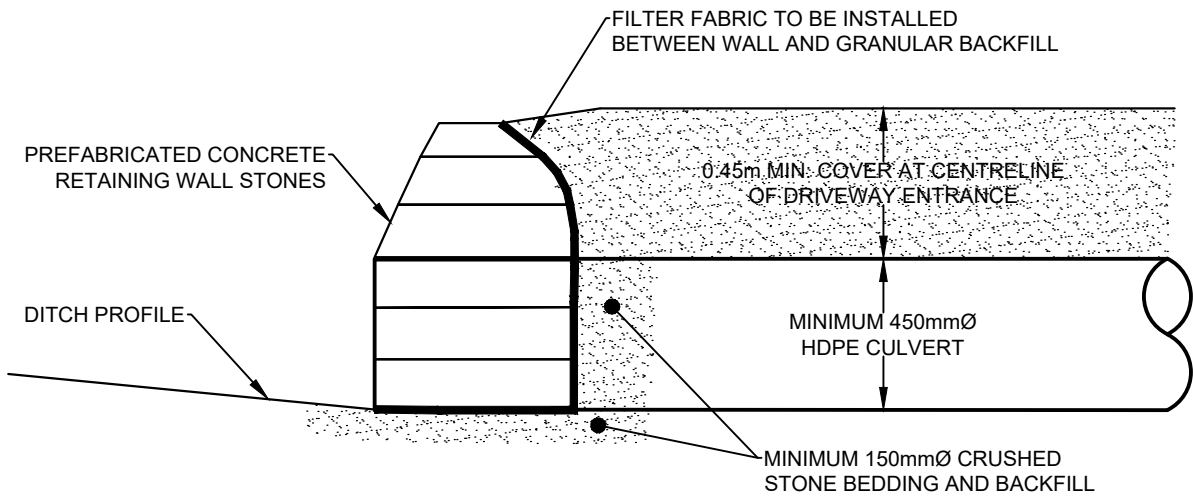
Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	B119
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END VIEW



LONGITUDINAL SECTION

NOTES:

1. NO DRIVEWAY OR DUAL WALL CULVERT SHALL BE LOCATED CLOSER THAN 0.3m FROM ANY WATER VALVE, CURB STOP, TRANSFORMER OR STREET LIGHT, OR 1.5m FROM SIDE PROPERTY LINES.
2. DUAL WALL CULVERT TO BE MINIMUM 450mm DIAMETER HDPE.
3. CEMENT END TREATMENTS OR PEERS AT DRIVEWAY ENDS ARE PROHIBITED ON THE ROW IN AREAS WHERE THE POSTED SPEED IS GREATER THAN 50 km/h. CULVERTS SHALL HAVE SUFFICIENT LENGTH TO PROVIDE MINIMUM 5.0m ENTRANCE WIDTH PLUS STABLE SIDE SLOPES (MINIMUM 2:1).



TOWNSHIP OF CLEARVIEW

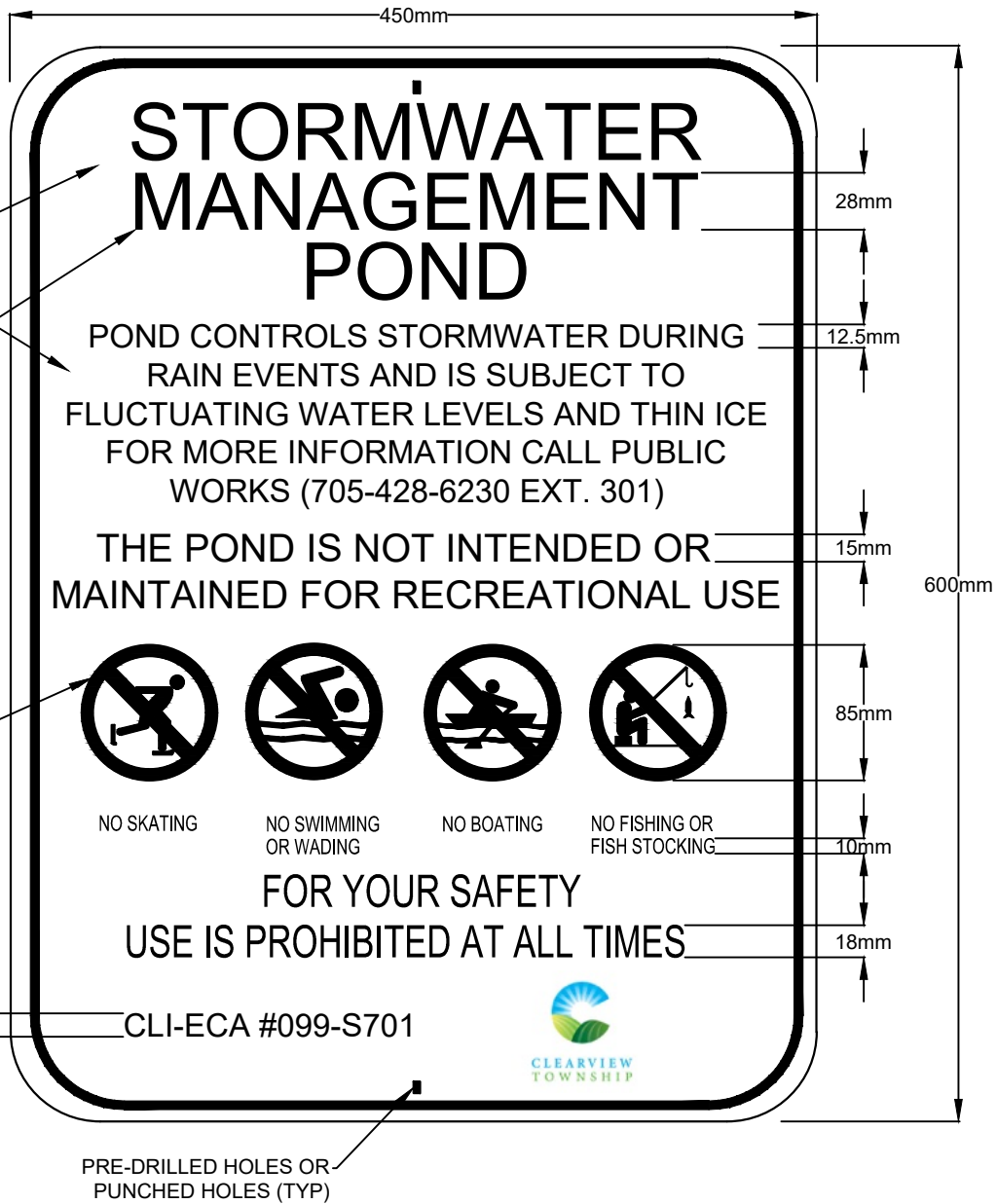
**DRIVEWAY CULVERT END WALL DETAIL
(50km PER HOUR OR BELOW)**

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	C101

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	C101

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	C101



NOTES:

1. SIGN(S) MUST BE PLACED AT ALL POND ENTRANCES AND OTHER LOCATIONS TO BE DETERMINED BY THE TOWNSHIP.
2. SIGN(S) TO BE MANUFACTURED USING REFLECTIVE FINISH (ENGINEER GRADE), WITH TOP AND BOTTOM MOUNT HOLES.
3. SIGN(S) TO BE MOUNTED TO A 3.8m 100x100mm PRESSURE TREATED WOODEN POST EMBEDDED MIN. 1.0m INTO THE GROUND.



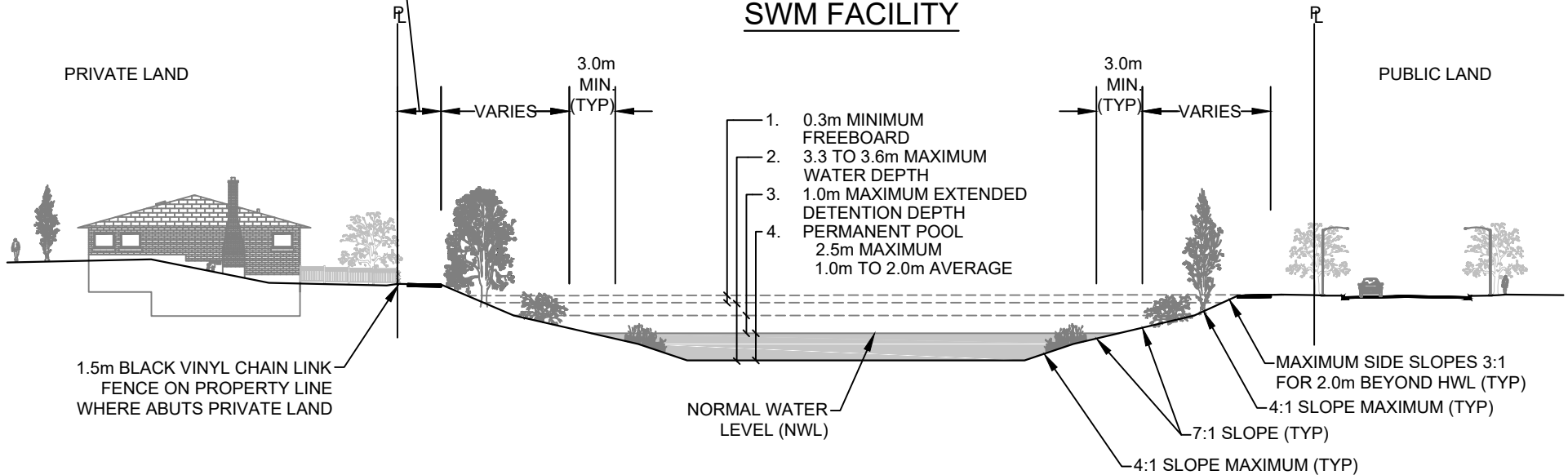
TOWNSHIP OF CLEARVIEW

**STORMWATER MANAGEMENT POND
WARNING SIGN**

No.	Issue / Revision	Date	Auth.


Scale	Date	Dwg. No.
N.T.S.	OCT 2025	C102

4.0m WIDE ASPHALT ACCESS ROAD
AROUND POND. WHERE ACCESS ROAD
IS ADJACENT TO RESIDENTIAL LANDS,
A 3.0m BUFFER WITH MAXIMUM CROSS
SLOPE OF 4% IS REQUIRED (TYP)



NOTES:

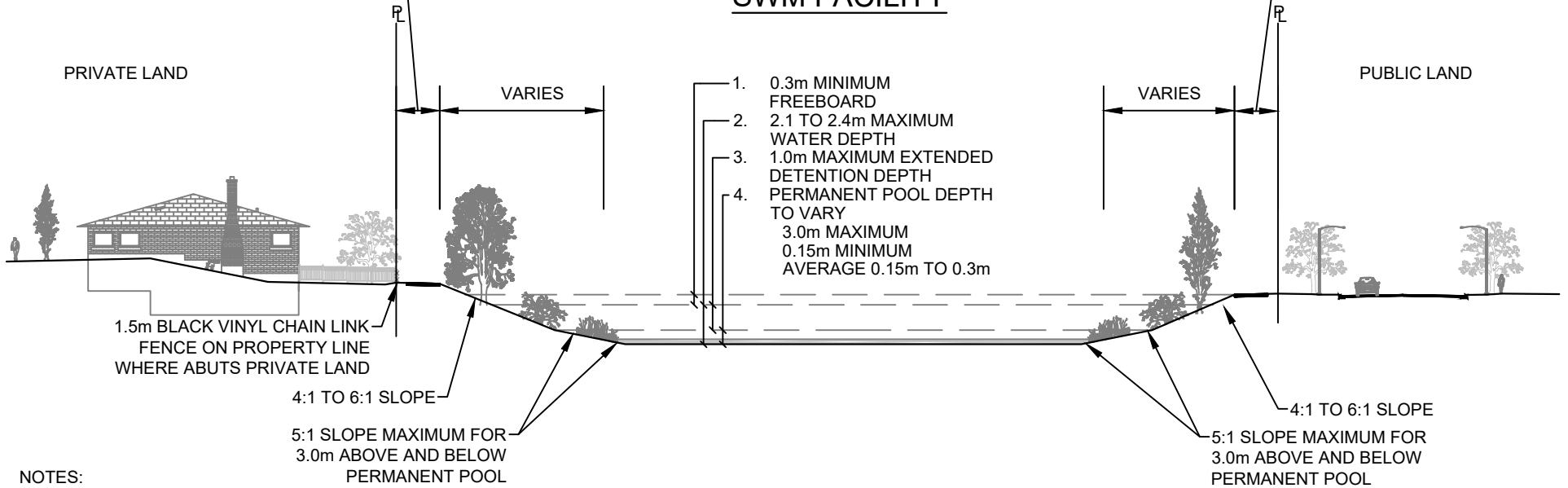
1. FOR ALL WET PONDS, VEGETATION STRATEGIES ARE REQUIRED IN ALL AREAS, INCLUDING DRY AND PERMANENT WET AREAS.
2. FOR SEDIMENT FOREBAY DESIGN REFER TO C105.
3. SLOPE AND DEPTH MUST MEET MECP PREFERRED POND CRITERIA.
4. ASPHALT MAKEUP OF ACCESS RING ROAD TO BE 50mm HL4, 150mm GRANULAR 'A', 250mm GRANULAR 'B'.

 <p>TOWNSHIP OF CLEARVIEW</p>				<p>TYPICAL WET POND</p>			
				Scale	Date	Dwg. No.	
				N.T.S.	OCT 2025	C103	
No.	Issue / Revision	Date	Auth.				

4.0m WIDE ASPHALT ACCESS ROAD AROUND WETLAND. WHERE ACCESS ROAD IS ADJACENT TO RESIDENTIAL LANDS A 3.0m BUFFER WITH MAXIMUM CROSS SLOPE OF 4% IS REQUIRED (TYP)


4.0m WIDE ASPHALT ACCESS ROAD AROUND WETLAND. WHERE ACCESS ROAD IS ADJACENT TO RESIDENTIAL LANDS A 3.0m BUFFER WITH MAXIMUM CROSS SLOPE OF 4% IS REQUIRED (TYP)

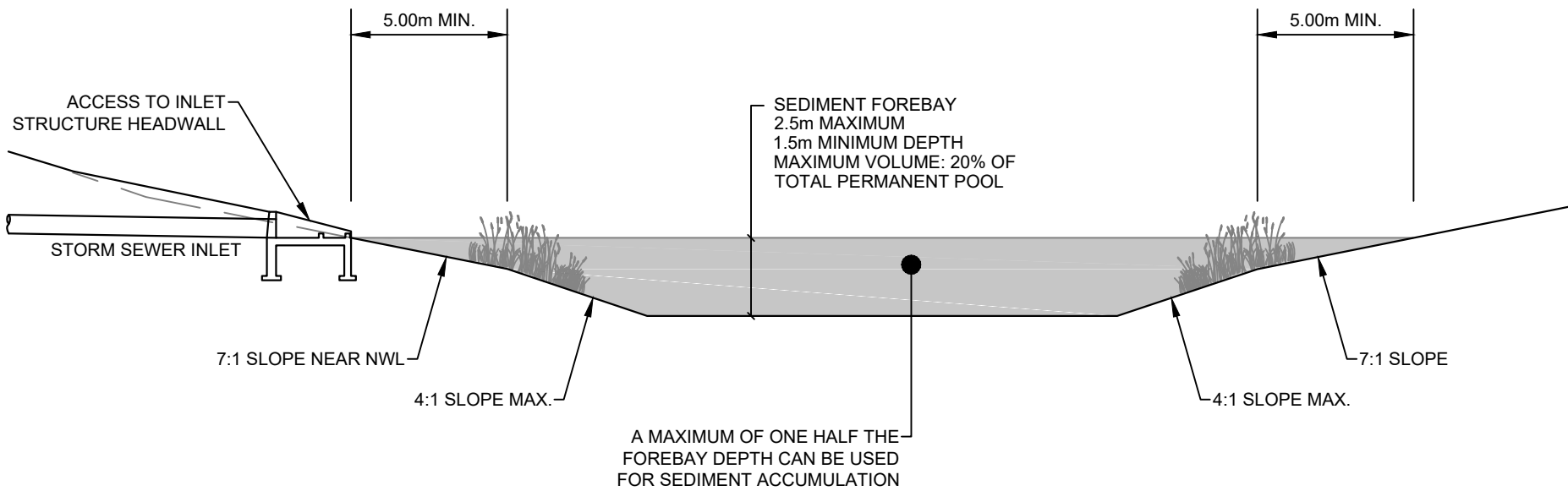
SWM FACILITY




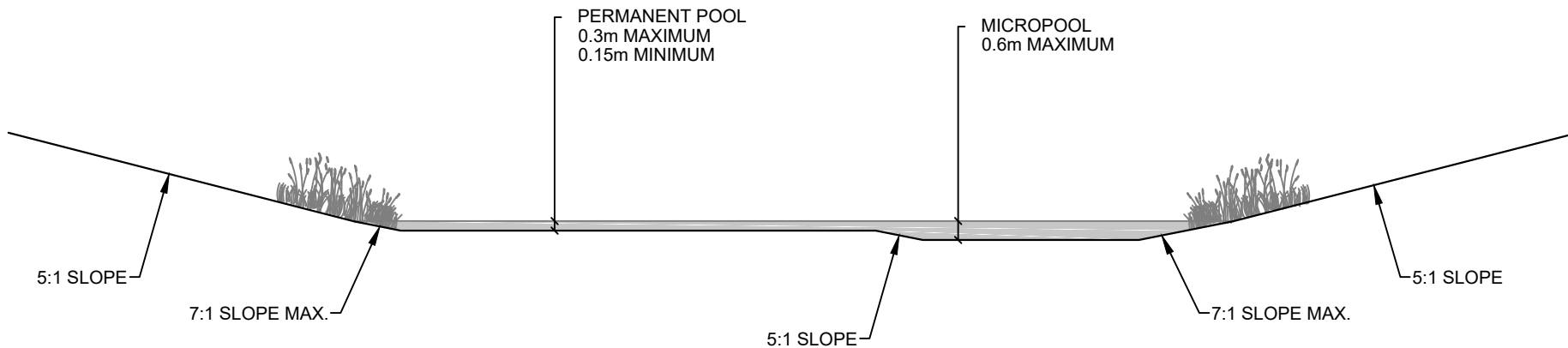
NOTES:

1. FOR ALL WETLANDS, VEGETATION STRATEGIES ARE REQUIRED IN ALL AREA, INCLUDING DRY AND PERMANENT WET AREAS.
2. FOR SEDIMENT FOREBAY DESIGN REFER TO C105.
3. FOR MICROPOOL DESIGN REFER TO C106
4. SLOPE AND DEPTH MUST MEET MECP WETLAND CRITERIA.

 <p>TOWNSHIP OF CLEARVIEW</p>				<p>TYPICAL WETLAND</p>		
No.	Issue / Revision	Date	Auth.	Scale	Date	Dwg. No.
				N.T.S.	OCT 2025	C104



 TOWNSHIP OF CLEARVIEW				SEDIMENT FOREBAY DETAIL		
				Scale	Date	Dwg. No.
				N.T.S.	OCT 2025	C105
No.	Issue / Revision	Date	Auth.			



TOWNSHIP OF CLEARVIEW

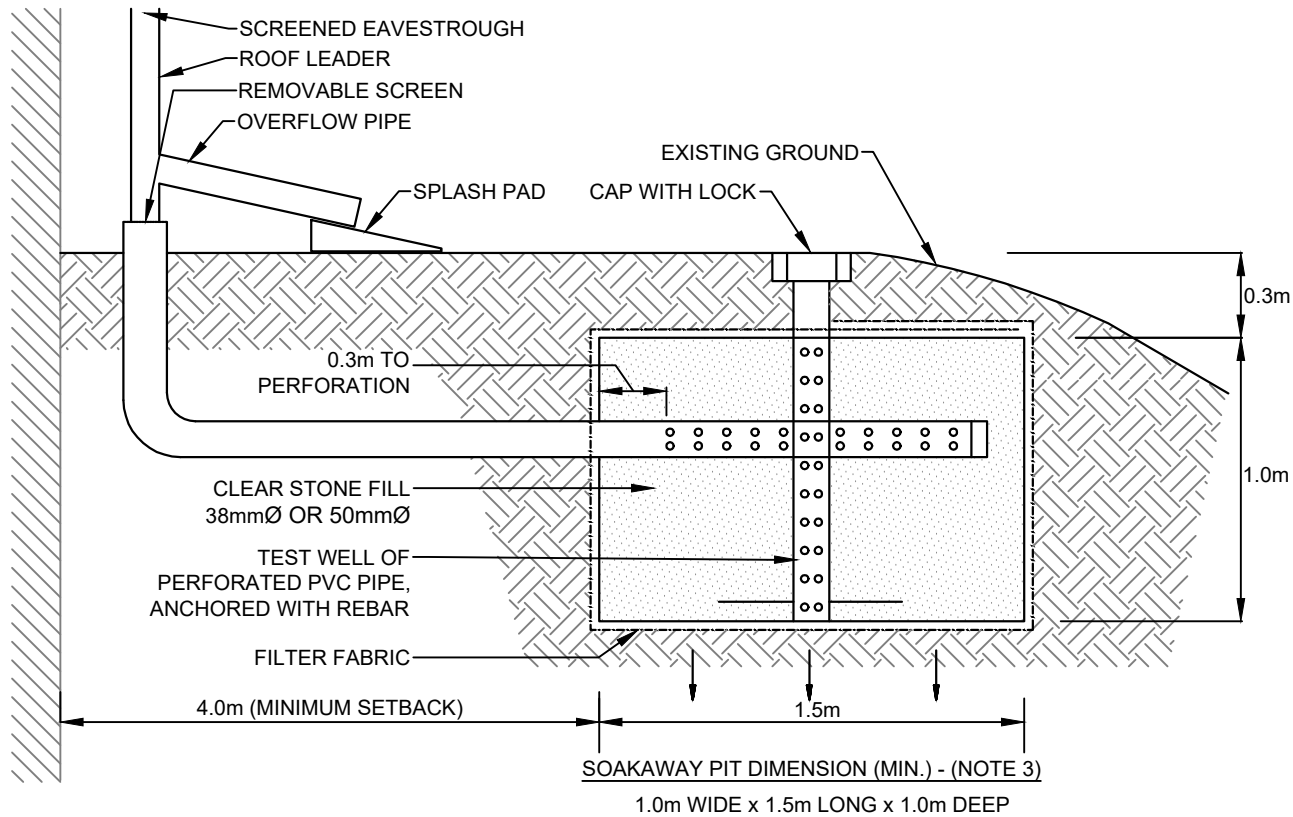
WETLAND MICROPOOL DETAIL

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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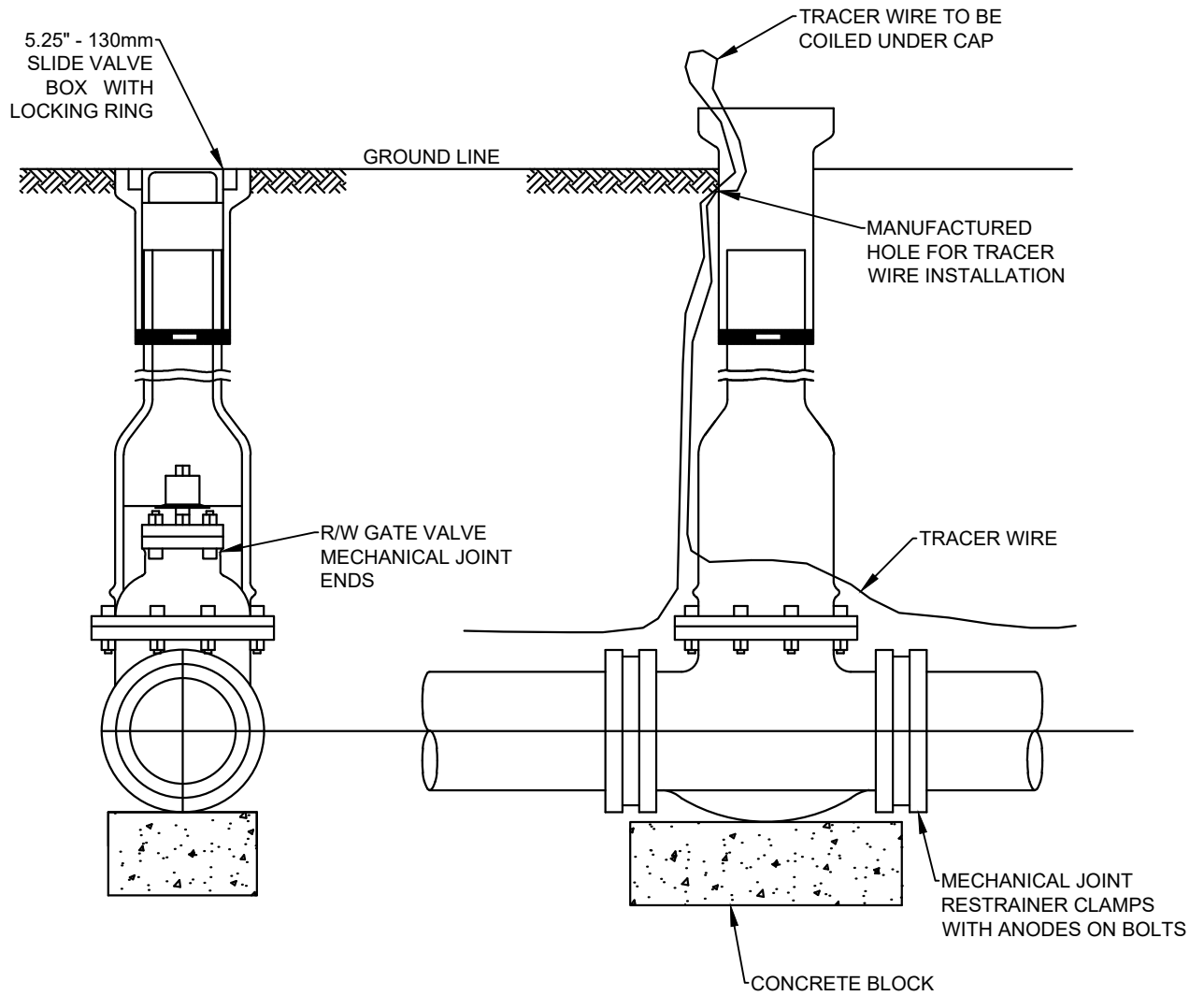
Dwg. No.	C106
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NOTES:

1. FILTER FABRIC TERRAFIX 270R OR EQUAL.
2. PROVIDE MINIMUM 0.5m CLEARANCE TO SEASONAL HIGH GROUND WATER ELEVATION FROM BOTTOM OF PIT.
3. SOAKAWAY PIT DIMENSIONS SHALL BE SIZED PER DESIGN ENGINEER RECOMMENDATION.
4. SOAKAWAY PIT TO BE INSPECTED BY DESIGN ENGINEER PRIOR TO BACKFILL.
5. SOAKAWAY PIT TO BE OFFSET A MINIMUM 4.0m AWAY FROM BUILDING.
6. SOAKAWAY PIT TO BE OFFSET A MINIMUM 1.0m AWAY FROM ANY PROPERTY LINE AND 150mm BELOW EXISTING PROPERTY LINE ELEVATION.

 <p>TOWNSHIP OF CLEARVIEW</p>		<p>ROOF LEADER SOAKWAY PIT</p>					
		Scale		Date		Dwg. No.	
		N.T.S.		OCT 2025		C107	
No.	Issue / Revision	Date	Auth.				



MECHANICAL JOINT THROUGHOUT

NOTES:

1. CONCRETE BLOCK TO BE MINIMUM SIZE 200mmx200mmx100mm (8"x8"x4").
2. R/W GATE VALVE MECHANICAL JOINT ENDS TO BE FUSION EPOXY - NSF 61 AND AWWA C550.



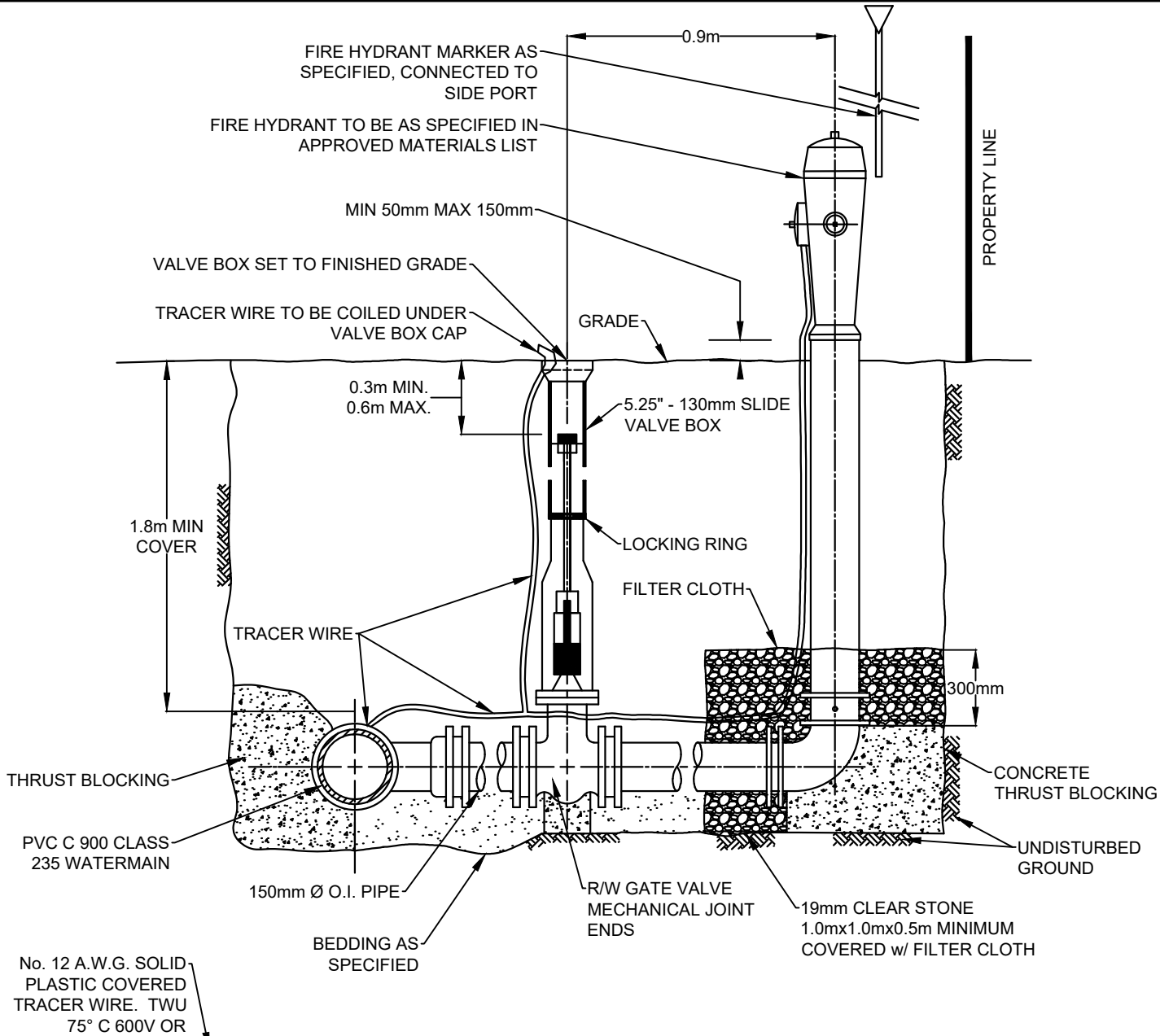
TOWNSHIP OF CLEARVIEW

GATE VALVE AND EXTENDABLE VALVE BOX

No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
D101



No. 12 A.W.G. SOLID PLASTIC COVERED TRACER WIRE. TWU 75° C 600V OR APPROVED EQUAL

MECHANICAL JOINTS THROUGHOUT

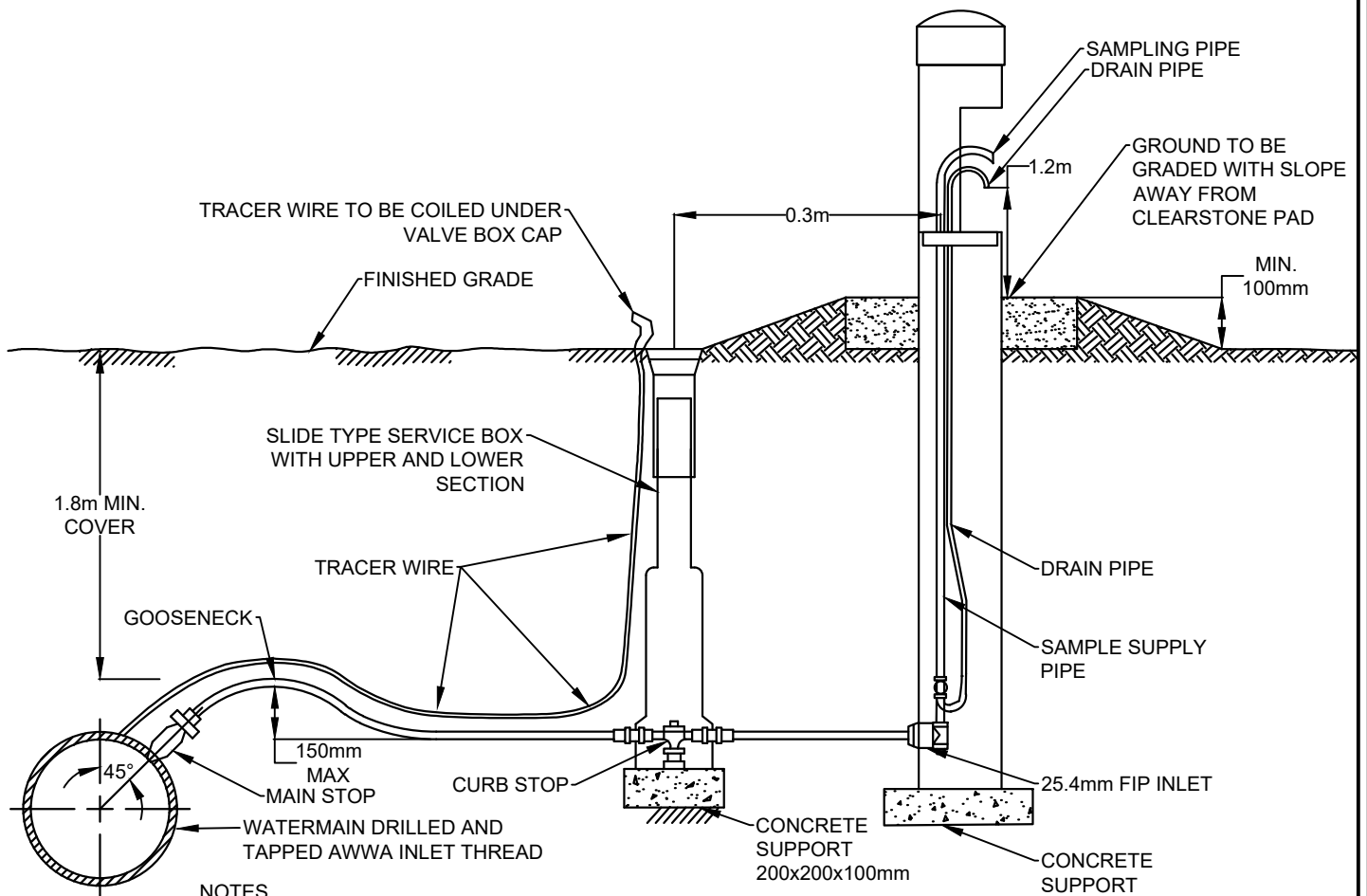
TRACER WIRE INSTALLATION FOR NON-METALLIC WATER MAIN

1. ALL CONNECTIONS MUST BE WATERPROOFED.
2. SPLICING OF TRACING WIRE IS NOT ALLOWED UNLESS SPECIFIED OR APPROVED BY THE ENGINEER.
3. TRACER WIRE CONTINUITY OF CURRENT MUST BE TESTED AND VERIFIED BY THE ENGINEER BETWEEN CADWELDED LOCATIONS.

NOTES:

1. VALVE EXTENSION REQUIRED WHEN DISTANCE FROM TOP OF VALVE TO FINISHED GRADE IS GREATER THAN 1.8m.
2. THRUST BLOCKS SHALL BE 20 MPa CONCRETE AS PER OPSD-1103.010 and 1103.020.
3. ALL HYDRANTS ARE SELF-DRAINING UNLESS OTHERWISE SPECIFIED.
4. HYDRANT LATERALS SHALL BE PVC C-900 CLASS 235.
5. RESTRAINER CLAMPS TO BE PROVIDED ON BOTH SIDES OF ALL MECHANICAL JOINTS.

TOWNSHIP OF CLEARVIEW				HYDRANT AND VALVE DETAIL			
				Scale	Date	Dwg. No.	
				N.T.S.	OCT 2025	D102	
No.	Issue / Revision	Date	Auth.				



NOTES

1. SAMPLING STATIONS SHALL HAVE A 12.7mm 316 STAINLESS STEEL WATERWAY. (NO LEAD)
2. SAMPLING STATIONS SHALL BE EQUIPPED WITH A 9.53mm 316 STAINLESS STEEL VENT TUBE. THIS IS USED TO PUMP STANDING WATER FROM UNIT AFTER USE, PREVENTING FREEZING AND BACTERIA GROWTH.
3. THE ENCLOSURE SHALL BE MADE FROM SCHEDULE 40 PVC PIPE WITH A LOCKABLE ACCESS DOOR.
4. THE ENCLOSURE SHALL PROTECT ALL COMPONENTS FROM CORROSIVE SOIL AND GROUND WATER.
5. AFTER THE WATER IS TURNED OFF AT THE CURBSTOP, ALL WORKING PARTS SHALL BE REMOVABLE WITHOUT DIGGING OR THE USE OF ANY TOOLS.
6. SAMPLING STATIONS WILL BE EQUIPPED WITH A 25.4mm FIP INLET FOR THE CONNECTION TO THE WATERMAIN.
7. STANDARD TEST TAP IS DESIGNED FOR A 1.8m BURY AND A 1.2m PEDESTAL. (ALTERNATE LENGTHS AVAILABLE)
8. THE TEST TAP SHOULD REST ON A CONCRETE SLAB. 30cm x 30cm PATIO SLAB IS ACCEPTABLE.
9. THE CURBSTOP SHOULD REST ON A CONCRETE SLAB. SMALL PATIO SLAB IS ACCEPTABLE.

TYPICAL INSTALL FROM WATERMAIN TO TEST TAP SAMPLING STATION

1. 25mm MAINSTOP, 25mm DOMESTIC PIPE TO A 25mm CURBSTOP, 25mm DOMESTIC PIPE TO TEST TAP.

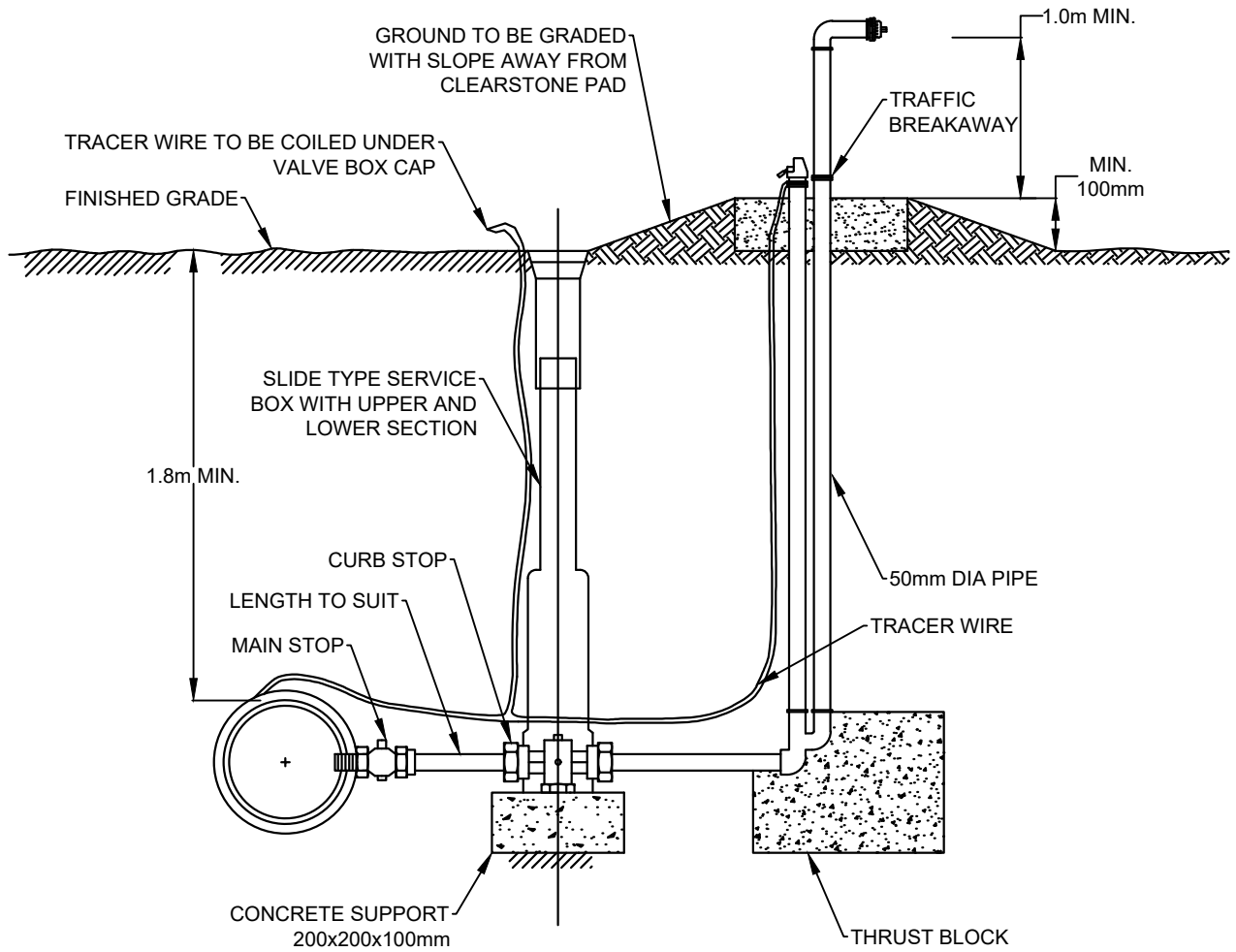


TOWNSHIP OF CLEARVIEW

SAMPLING STATION DETAIL

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	D103



NOTES:

1. BLOW OFF CONNECTIONS TO PLASTIC WATERMAINS TO BE MADE USING SERVICE SADDLES OR FACTORY MADE TEES.
2. VALVE EXTENSION REQUIRED WHEN DISTANCE FROM TOP OF VALVE TO FINISHED GRADE IS GREATER THAN 1.8m.
3. THRUST BLOCKS SHALL BE 20 MPa CONCRETE AS PER OPSD-1103.010 and 1103.020
4. ALL HYDRANTS ARE SELF-DRAINING UNLESS OTHERWISE SPECIFIED.
5. APPROVED MANUFACTURER IS MAINGUARD FLUSHING HYDRANT #77. EQUIVALENTS ARE NOT ACCEPTABLE.



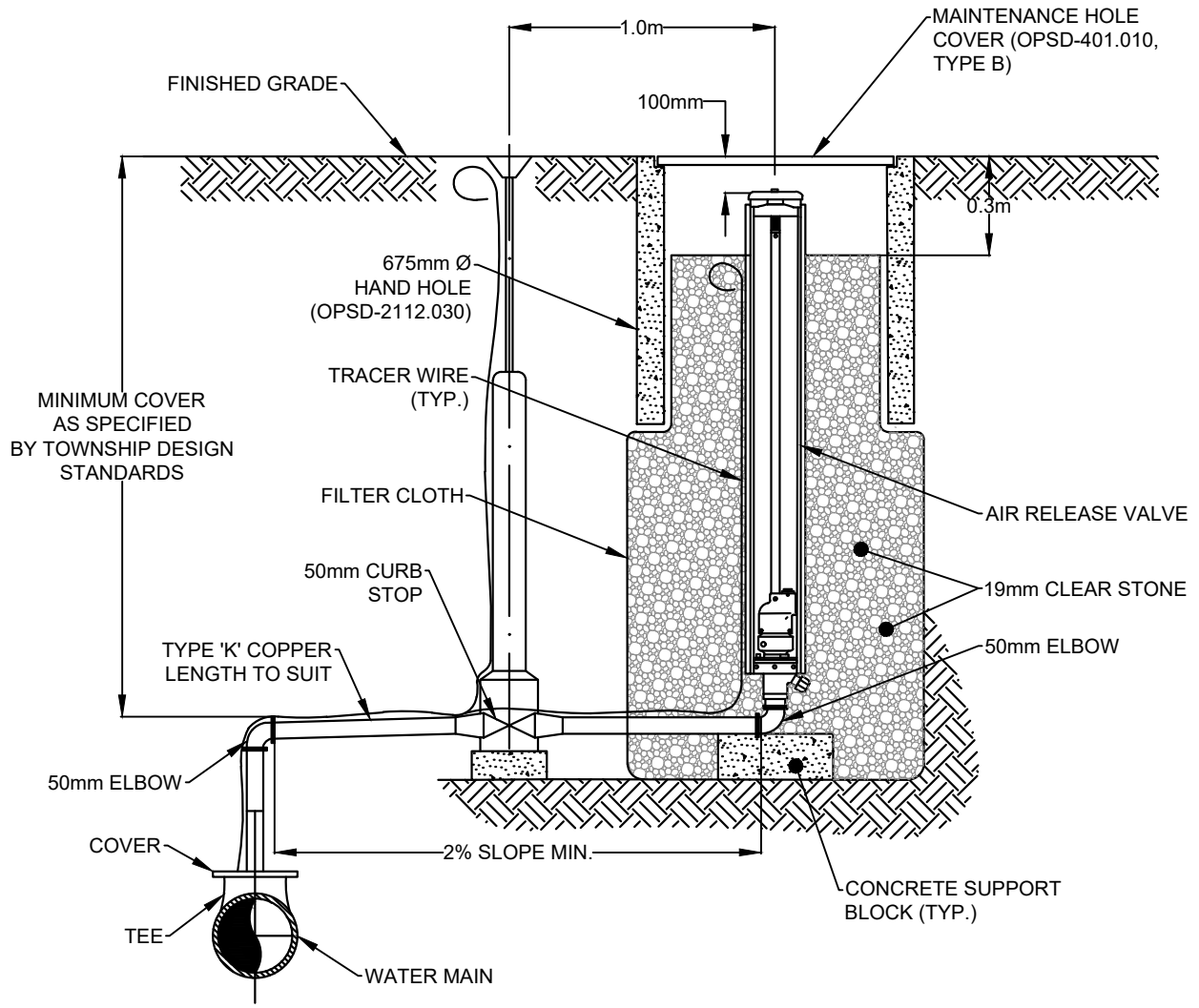
TOWNSHIP OF CLEARVIEW

50mm BLOW-OFF FLUSHING HYDRANT DETAIL

No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
D104



NOTES:

1. CONNECTION TO WATERMANS TO BE MADE USING MANUFACTURED TEE.
2. WHERE REQUIRED AIR RELEASE VALVES SHALL BE LOCATED WITHIN ROAD ALLOWANCE AT SAME OFFSET AS FIRE HYDRANTS.
3. BOULEVARD TO BE GRADED TO PROVIDE POSITIVE DRAINAGE AWAY FROM THE AIR RELEASE VALVE.
4. ALL VALVES, FITTINGS AND MECHANICAL RESTRAINTS TO BE EQUIPPED WITH SACRIFICIAL ANODES, APPLIED TO MANUFACTURERS RECOMMENDATIONS.



TOWNSHIP OF CLEARVIEW

**TYPICAL AIR RELEASE VALVE AND CHAMBER
DIRECT BURY INSTALLATION**

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	D105

MATERIALS

SUPPLIED AND
INSTALLED BY THE
TOWNSHIP

- 25mm WATER METER AND BACKFLOW (PREPURCHASED BY BUILDER)

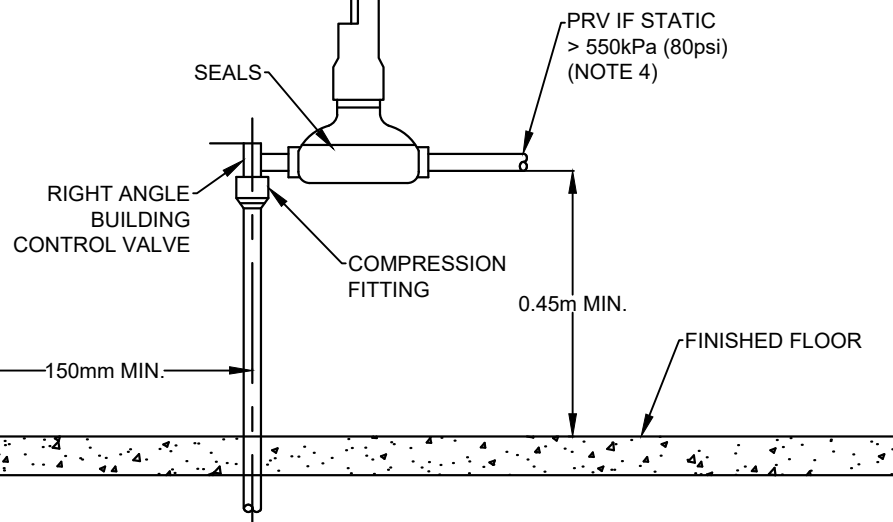
SUPPLIED AND
INSTALLED BY
OTHERS

- 1 RIGHT ANGLE METER VALVE COMPRESSION TYPE.

FINISHED GRADE

0.9m MIN.
CLEARANCE

FOR RESIDENTIAL WATER METER INSTALLATION ONLY



NOTES:

1. BUILDING CONTROL VALVE TO BE COMPRESSION TYPE AND THE SAME SIZE AS INCOMING PIPE.
2. ALL PIPE WORK DONE BY CONTRACTOR/BUILDER, INCLUDING CONNECTION TO TAIL PIECE IN ACCORDANCE WITH OBC.
3. WHERE THE STATIC PRESSURE EXCEEDS 550kPa (80psi) A PRESSURE REDUCING VALVE SHALL BE INSTALLED AFTER THE METER TO LIMIT THE MAXIMUM STATIC PRESSURE TO NOT MORE THAN 550kPa (80psi).
4. A MINIMUM HORIZONTAL ARC OF SPACE WITH 900mm CLEARANCE REQUIRED FOR SERVICING OF THE METER.



CLEARVIEW
TOWNSHIP

TOWNSHIP OF CLEARVIEW

25mm RESIDENTIAL WATER METER INSTALLATION

Scale

N.T.S.

Date

OCT 2025

Dwg. No.

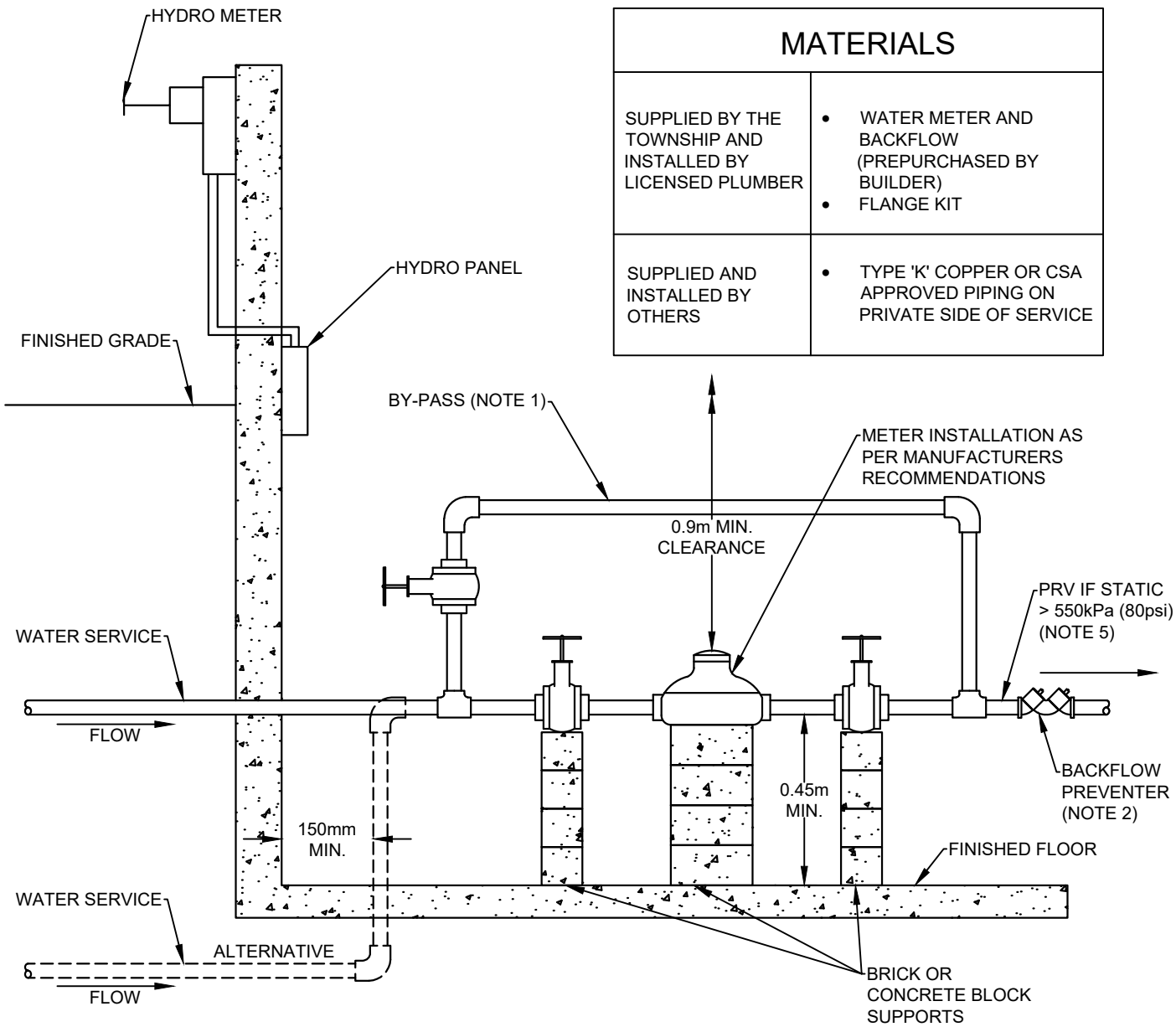
D106

No.

Issue / Revision

Date

Auth.



MATERIALS	
SUPPLIED BY THE TOWNSHIP AND INSTALLED BY LICENSED PLUMBER	<ul style="list-style-type: none"> WATER METER AND BACKFLOW (PREPURCHASED BY BUILDER) FLANGE KIT
SUPPLIED AND INSTALLED BY OTHERS	<ul style="list-style-type: none"> TYPE 'K' COPPER OR CSA APPROVED PIPING ON PRIVATE SIDE OF SERVICE

NOTES:

1. BY-PASS MAY BE ONE PIPE SIZE SMALLER THAN METER SIZE AND MAY BE INSTALLED HORIZONTALLY.
2. BACKFLOW PREVENTOR SHALL BE INSTALLED DOWNSTREAM OF THE METER AND BY-PASS.
3. INCOMING SERVICE TO BUILDING MUST BE TYPE K COPPER OR CSA APPROVED PIPING.
4. ALL PIPE WORK DONE BY CONTRACTOR/BUILDER, INCLUDING CONNECTION TO TAIL PIECE IN ACCORDANCE WITH OBC.
5. WHERE THE STATIC PRESSURE EXCEEDS 550kPa (80psi) A PRESSURE REDUCING VALVE SHALL BE INSTALLED AFTER THE METER TO LIMIT THE MAXIMUM STATIC PRESSURE TO NOT MORE THAN 550kPa (80psi).
6. BYPASS LOCATION MAY BE ADJUSTED, AT THE DISCRETION OF THE TOWNSHIP.

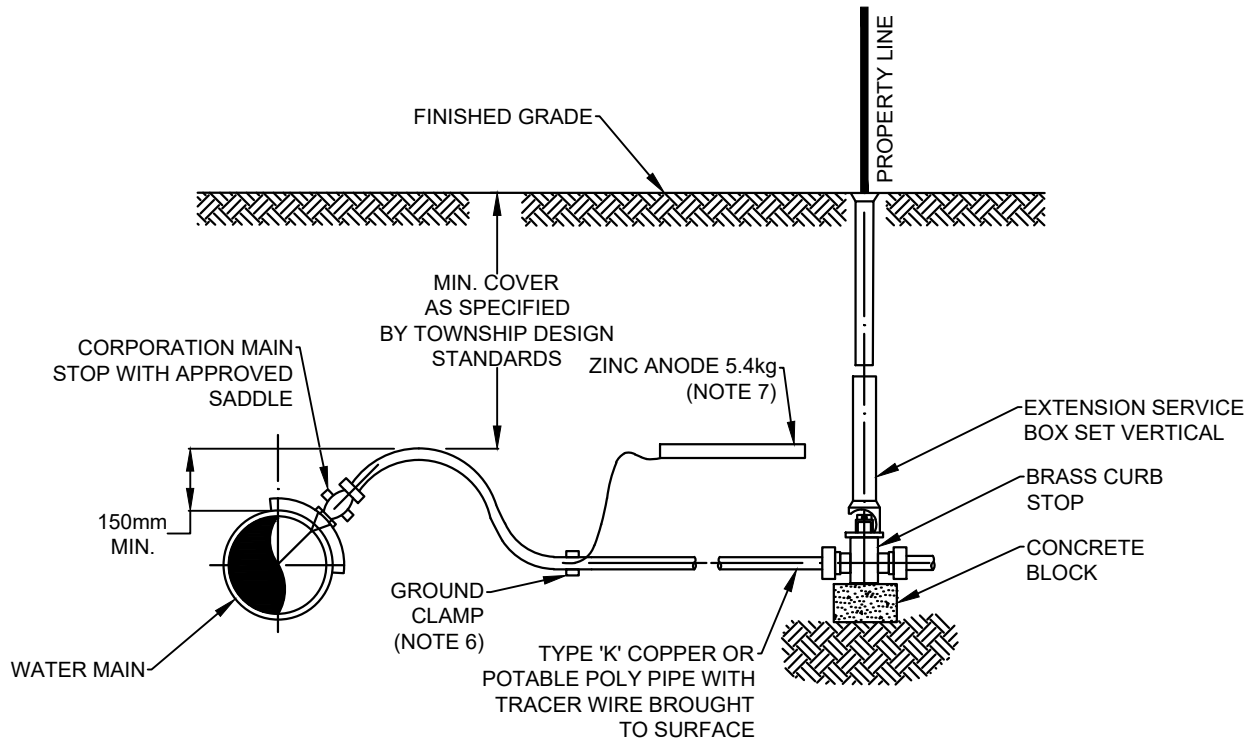


TOWNSHIP OF CLEARVIEW

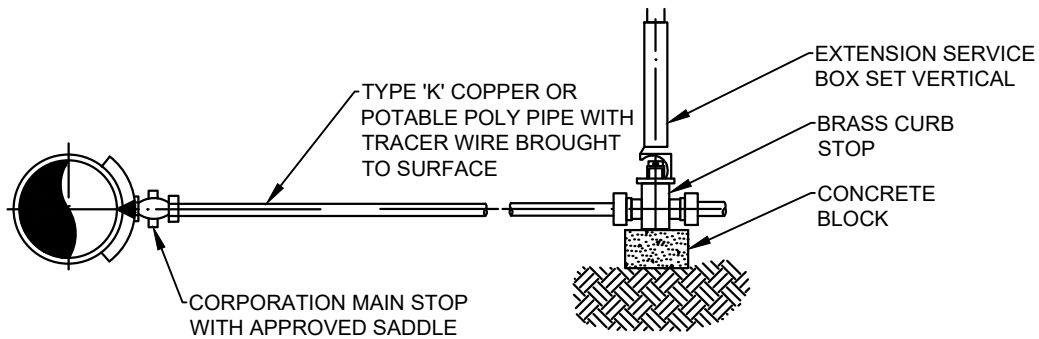
ICI WATER METER INSTALLATION LARGER THAN 25mm

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	D107



25mm DIAMETER SERVICE



SERVICE LARGER THAN 25mm DIAMETER

NOTES:

1. ALL SERVICES TO BE AT 90° TO WATERMAIN UNLESS OTHERWISE SPECIFIED.
2. SERVICE DEPTH TO MEET MINIMUM COVER AS SPECIFIED BY TOWNSHIP DESIGN STANDARDS.
3. NO DIRECT TAPPING OF PVC WATER MAINS. ALL CONNECTIONS TO PVC PIPE TO BE MADE USING AN APPROVED WIDE BAND SERVICE SADDLE.
4. TRACER WIRE TO BE INSTALLED AS PER TOWNSHIP DESIGN STANDARDS.
5. FOR FITTINGS: LOOP AND TIE CABLE TO NUT TO PREVENT STRAIN ON THERMITE WELD DURING BACKFILL.
6. ZINC ANODE IS NOT REQUIRED ON CSA APPROVED POTABLE PLASTIC PIPING.



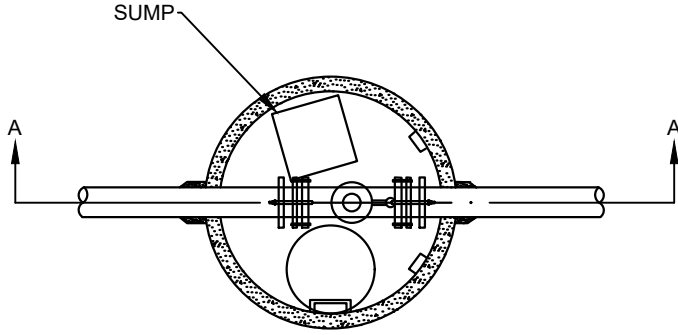
TOWNSHIP OF CLEARVIEW

WATER SERVICE CONNECTION

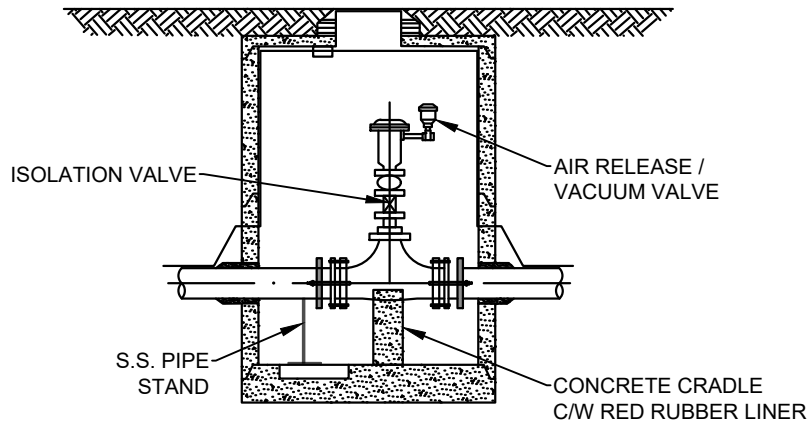
No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
D108



**AIR RELEASE VALVE IN CHAMBER
PLAN**



**AIR RELEASE VALVE IN CHAMBER
SECTION "A"**

NOTES:

1. ALL JOINTS MECHANICALLY RESTRAINED PER OPSS 441.
2. ALL VALVES, FITTINGS AND MECHANICAL RESTRAINTS TO BE C/W SACRIFICIAL ANODE CAPS.
3. CHAMBER TO BE SUPPLIED WITH VENT AS REQUIRED OR DIRECTED.
4. CHAMBER TO BE SUPPLIED WITH DRAINS AS REQUIRED OR DIRECTED.
5. CHAMBER TO BE SUPPLIED WITH WATERPROOF MEMBRANE PER DETAIL B119



TOWNSHIP OF CLEARVIEW

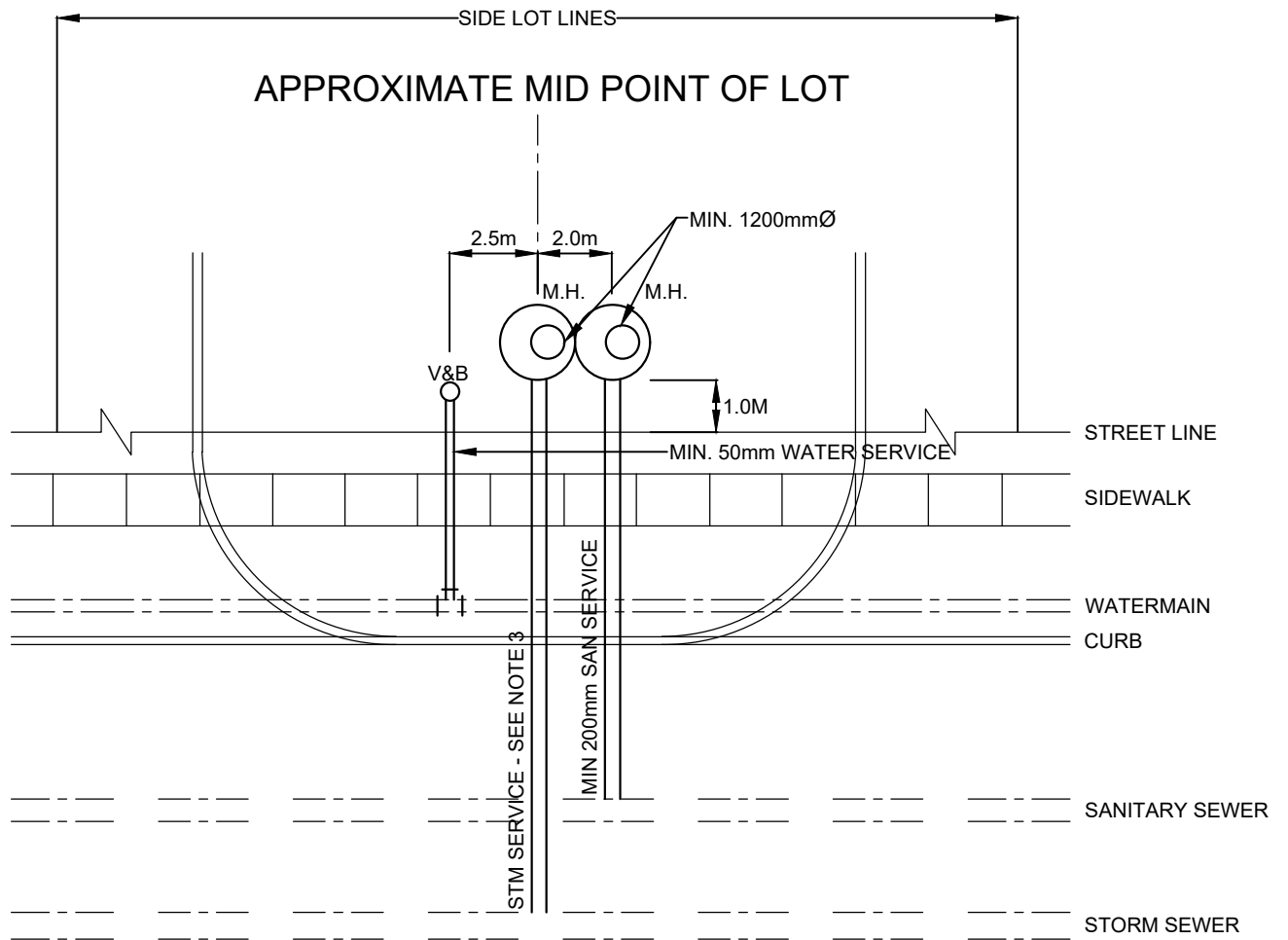
AIR RELEASE VALVE IN CHAMBER

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	D109
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NOTES:

1. THIS DETAIL APPLIES TO ALL INDUSTRIAL, COMMERCIAL AND INSTITUTIONAL (ICI) PROPERTIES.
2. ABOVEGROUND UTILITIES TO BE LOCATED MINIMUM 1.0m FROM CURBS, SIDEWALK AND DRIVEWAYS.
3. MAINTENANCE HOLES AND VALVE CHAMBERS FOR SERVICE CONNECTIONS TO BE LOCATED AT 1.0m OFF STREET LINE ON PRIVATE PROPERTY.
4. STORM SEWER CONNECTIONS SHALL BE SIZED BASED UPON STORM WATER MANAGEMENT REQUIREMENTS.
5. PROVIDE RESTRAINED MECHANICAL JOINTS OR SLIP-ON JOINTS TIE RODS AND CLAMPS FOR WATERMAIN, AS REQUIRED.
6. WATER METER AND BACK FLOW VALVE TO BE WITHIN A HEATED MECHANICAL ROOM WITH THE BUILDING. ANY REQUIRED FIRE MAIN TO BE DOWNSTREAM OF BACKFLOW VALVE.



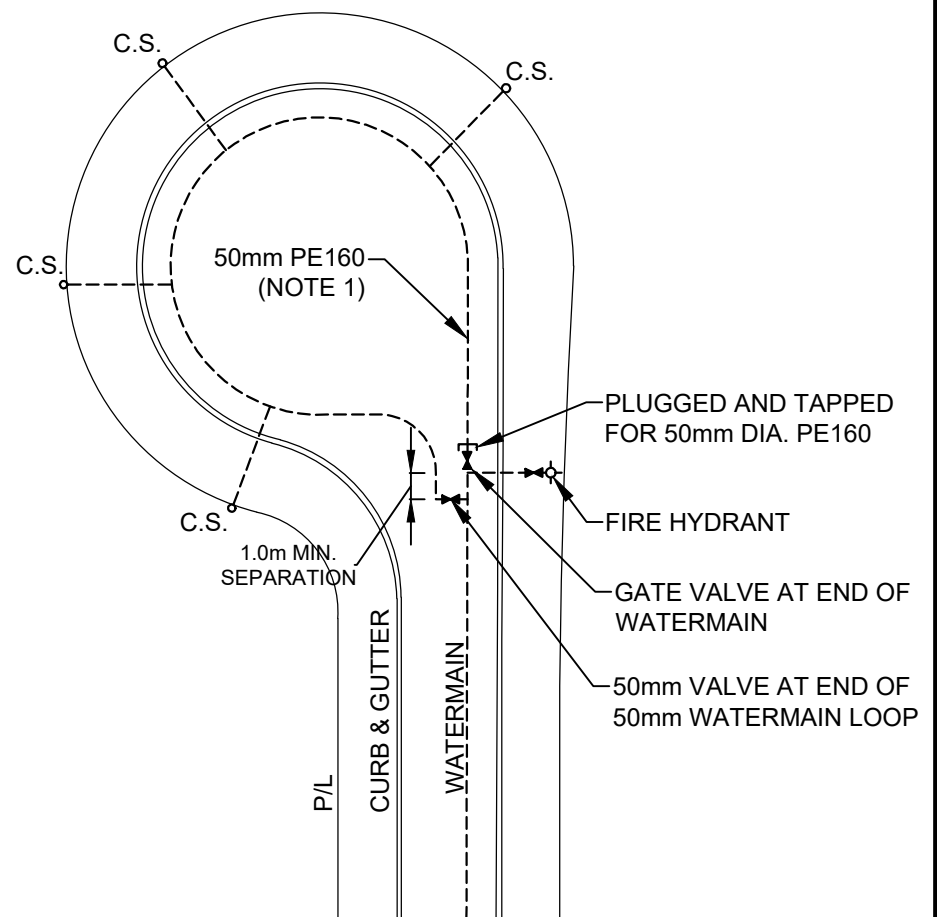
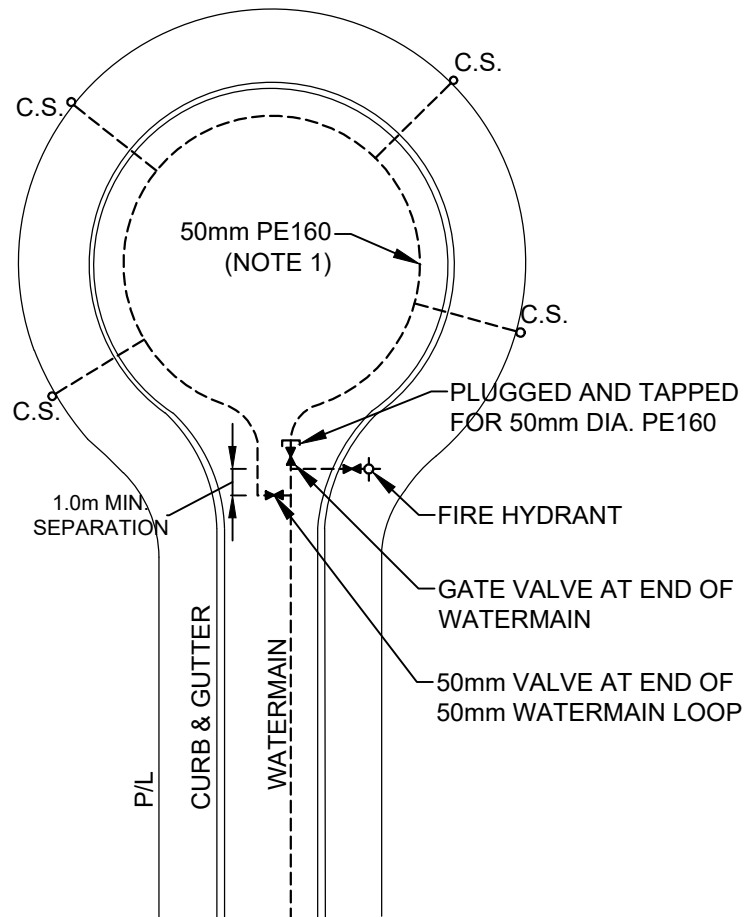
TOWNSHIP OF CLEARVIEW

ICI SERVICE CONNECTIONS

No.	Issue / Revision	Date	Auth.


Scale	Date
N.T.S.	OCT 2025

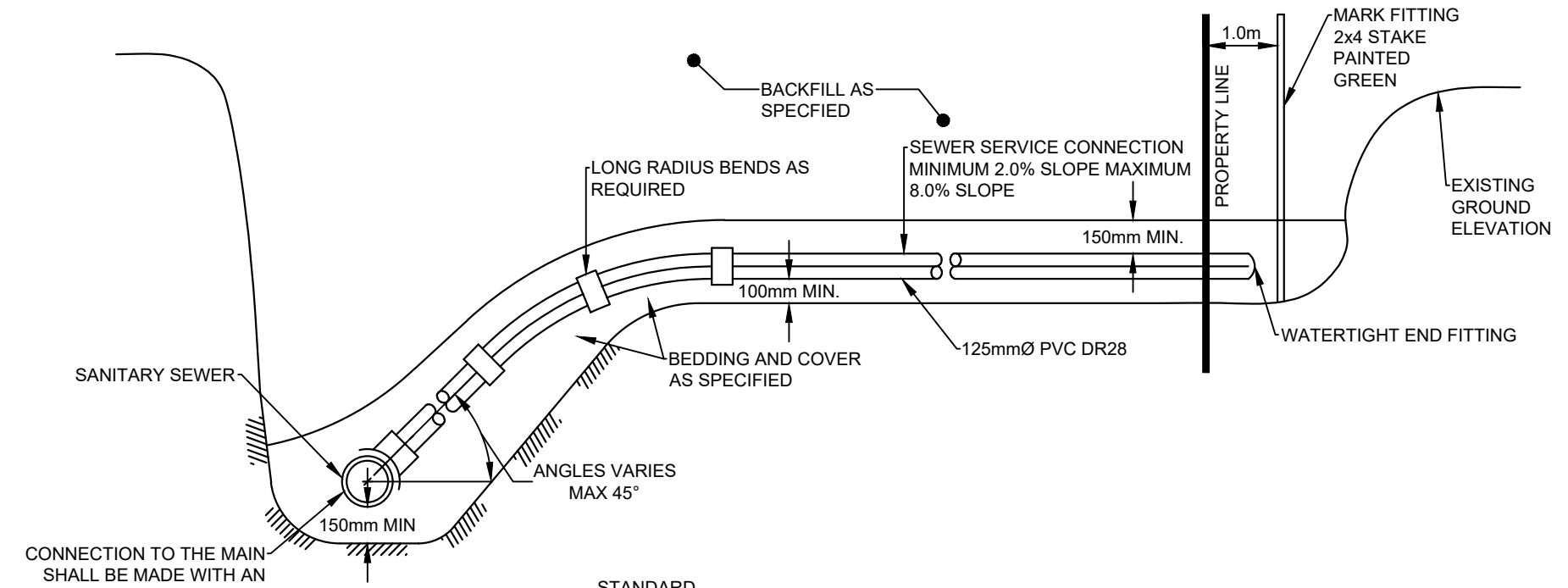
Dwg. No.
D110



NOTES:

1. MINIMUM OF 4 RESIDENTIAL WATER SERVICES ARE REQUIRED ON THE 50mm DIA. LOOPED WATERMAIN.


 TOWNSHIP OF CLEARVIEW				TYPICAL CUL-DE-SAC WATER SERVICING		
No.	Issue / Revision	Date	Auth.	Scale	Date	Dwg. No.
				N.T.S.	OCT 2025	D111

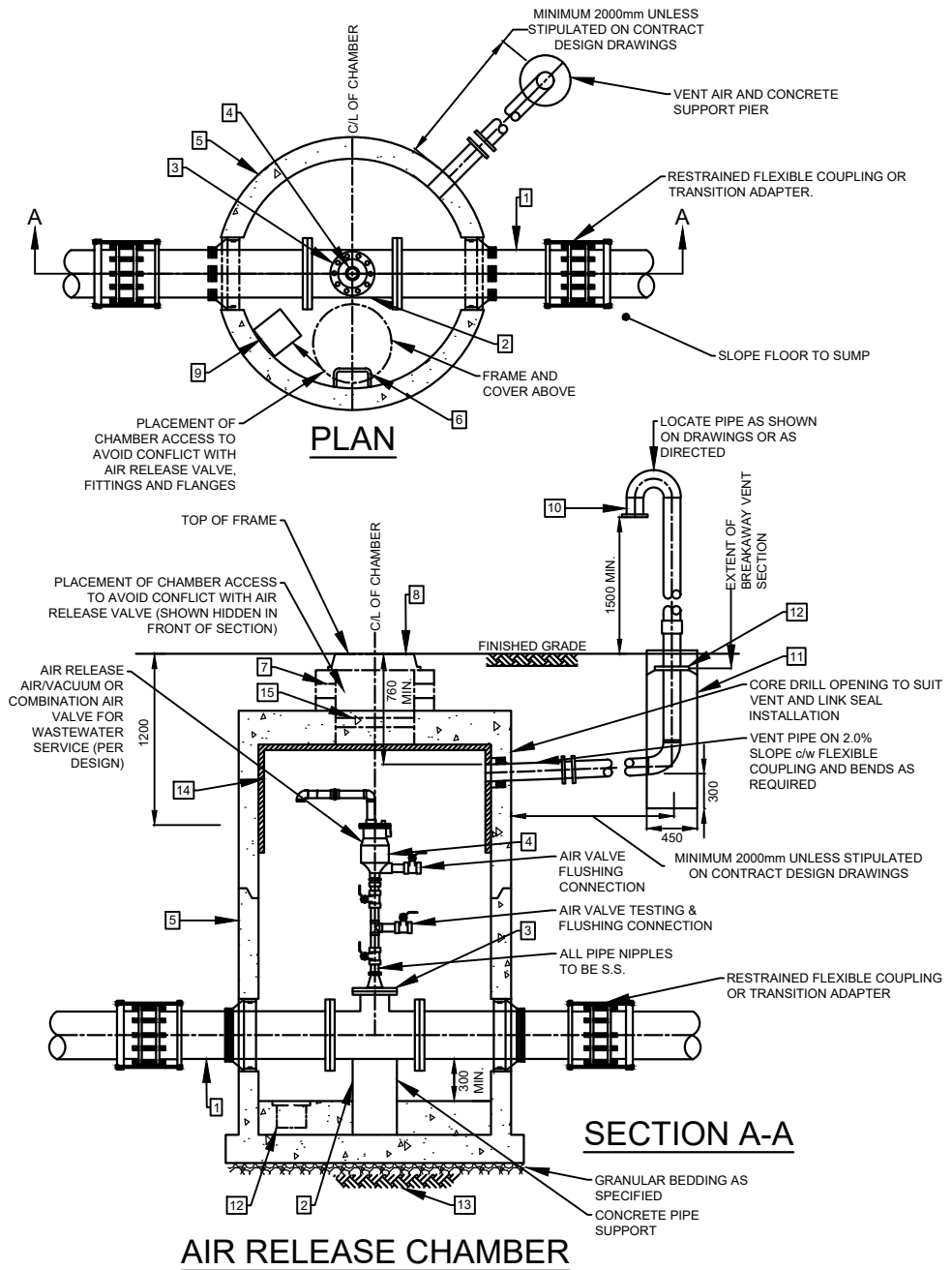


CONNECTION TO THE MAIN SHALL BE MADE WITH AN APPROVED MANUFACTURED TEE CONNECTION ONLY, NO SADDLES TO BE USED.

STANDARD

1. MIN. TRENCH WIDTH TO BE 900mm.
2. SANITARY TEST FITTINGS AND PLUGS TO BE MARKED "SAN" (BY IPEX INC. OR APPROVED EQUAL).
3. ALL TEST FITTINGS TO BE COMPATIBLE WITH PIPE MATERIAL USED.
4. ALL PIPING TO MEET OPS REQUIREMENTS.

 <p>TOWNSHIP OF CLEARVIEW</p>				<p>SEWER SERVICE CONNECTION DETAIL</p>		
				Scale	Date	Dwg. No.
				N.T.S.	OCT 2025	F101
No.	Issue / Revision	Date	Auth.			



AIR RELEASE CHAMBER

NOTES:

1. ALL VALVES TO BE RESILIENT SEAT TO AWWA C509, FUSION BONDED EPOXY (FBE) SHOP COAT FINISH ON INTERIOR AND EXTERIOR OF VALVE TO AWWA C550.
2. INTERIOR OF ALL STEEL (NOT STAINLESS STEEL) PIPE SHALL BE LIQUID EPOXY COATED TO AWWA C210 AND BE ANSI/NSF 61 APPROVED. ALL EXTERIOR SURFACES SHALL BE LIQUID EPOXY COATED TO AWWA C210.
3. INTERIOR OF ALL DUCTILE IRON PIPE AND FITTINGS IN CONTACT WITH POTABLE WATER SHALL BE CEMENT MORTAR LINED TO AWWA C104.
4. FOR 25mm AND 50mm AIR VALVES MUST USE I.P.T THREADED OUTLET WITH STAINLESS TELL NIPPLES AS REQUIRED.
5. AIR RELEASE VALVE TO AWWA C512, FUSION BONDED EPOXY (FBE) SHOP COAT FINISH ON INTERIOR AND EXTERIOR OF VALVE TO AWWA C550.
6. ALL NUTS, BOLTS, AND WASHERS TO BE STAINLESS STEEL UNLESS OTHERWISE NOTED.
7. ALL PIPING, FITTINGS, VALVES, APPURTENANCES AND MECHANICAL RESTRAINTS TO BE c/w DENSO PASTE, DENSO MASTIC AND DENSO TAPE OR APPROVED EQUAL, APPLIED TO MANUFACTURER'S RECOMMENDATIONS.
8. ALL WASTE WATER AIR VALVES TO BE STAINLESS STEEL WITH MINIMUM 50mm INLET.
9. ALL THREADED PIPE, FITTINGS, VALVES AND APPURTENANCES MUST BE STAINLESS STEEL 316L SCHEDULE 40 TO ASTM A776,
10. PROVIDE FLANGED TEE TO EQUAL SIZE OF FORCEMAIN AND MIN. 200mm FOR FORCEMAINS LARGER THAN 200mm.



TOWNSHIP OF CLEARVIEW

**TYPICAL SANITARY AIR RELEASE CHAMBER
DETAILS**

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	F102

ITEM DESCRIPTION	
1	FORCEMAIN
2	REDUCING TEE c/w 100Ø FLANGED BRANCH OUTLET
3	BLIND FLANGE TAPPED TO SUIT AIR VALVE SIZE
4	AIR RELEASE, VACUUM AND/OR COMBINATION VALVE AS PER DESIGN. INTERIOR AND EXTERIOR OF VALVE SHALL BE FUSION BONDED EPOXY COATED ANSI/NSF 61 APPROVED
5	CIRCULAR PRECAST CHAMBER 1800mm MINIMUM DIAMETER
6	CHAMBER STEPS
7	APPROVED ADJUSTMENT UNITS
8	FRAME AND COVER
9	400 X 400 X 200 mm DEEP SUMP C/W ALUMINUM FRAME AND GRATE
10	150Ø 304 SS VENTILATION HOOK-UP WITH WELDED JOINTS AND FLANGE AND 304 SS INSECT SCREEN
11	CONCRETE SUPPORT PIER 25MPa CONCRETE
12	BREAK AWAY CONNECTION WITH WELDED FLANGE OR PLATE WITH 4 LIGHT DUTY CONCRETE ANCHORS WHICH WILL ENSURE THAT THE PIPE WILL SHEER AT THE CONCRETE INTERFACE
13	UNDISTURBED GROUND
14	50 mm THICK STYROFOAM SM INSULATION MECHANICALLY ANCHORED TO CHAMBER WALL
15	ACCESS RIDER RIGID INSULATION BLOCK CONSISTING OF 100mm STYROFOAM SM INSULATION SANDWICHED BETWEEN 19mm THICK PRESSURE TREATED PLYWOOD IN 2 EQUAL HALVES HELD TOGETHER WITH 12mm STAINLESS STEEL NUTS, BOLTS AND WASHERS AT 150mm C/C. TOP PLYWOOD SECTIONS TO HAVE STAINLESS STEEL LIFT HANDLES. BOTTOM PLYWOOD TO REST ON 50 X 50 X 6 mm STAINLESS STEEL ANGLE CLIPS ANCHORED TO PRECAST AT 200mm C/C WITH 12mm STAINLESS STEEL ANCHOR BOLTS WITH 100mm MINIMUM EMBEDMENT

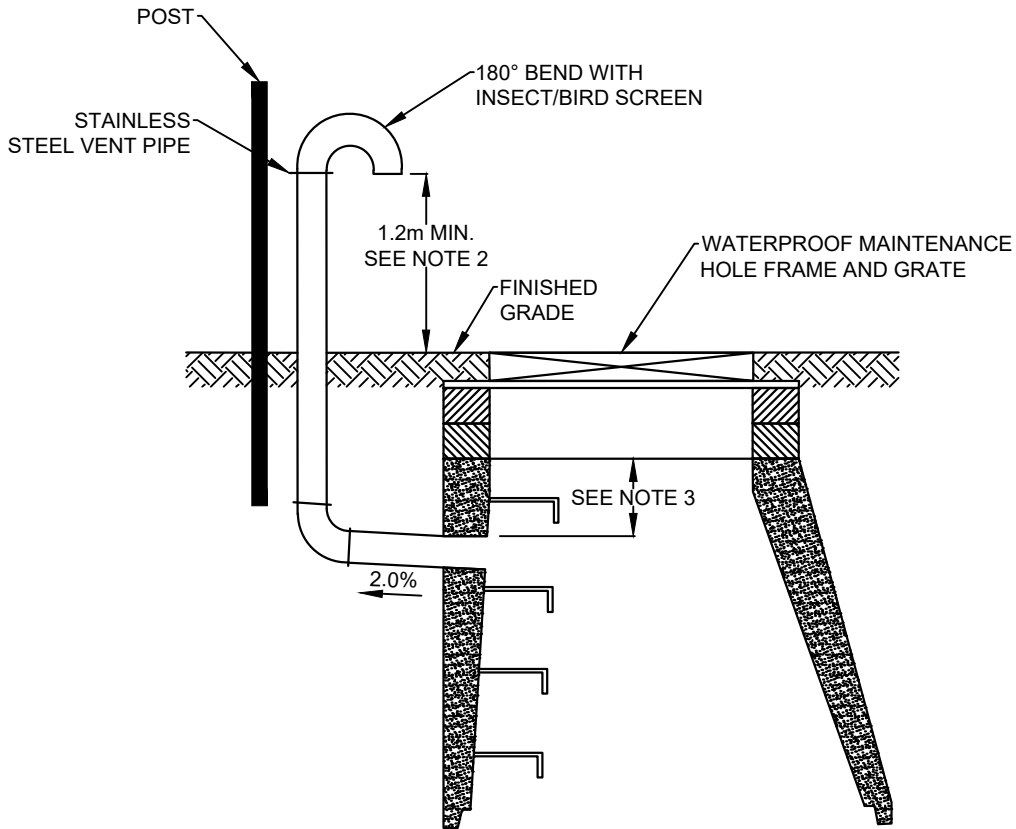


TOWNSHIP OF CLEARVIEW

TYPICAL SANITARY AIR RELEASE CHAMBER ITEM DESCRIPTION

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	F102



NOTES:

1. WHERE SECTIONS OF SANITARY SEWERS ARE PROVIDED WITH WATERTIGHT COVERS, VENTS WILL BE REQUIRED EVERY THIRD MAINTENANCE HOLE.
2. ELEVATION OF THE VENT OPENING SHALL BE ABOVE REGION FLOOD LINES AS DETERMINED BY THE CONSERVATION AUTHORITY AND A MINIMUM OF 1.2m ABOVE GRADE (WHICHEVER IS GREATER).
3. VENT PIPE OPENING TO BE 450mm MIN. BELOW MODULOC SECTIONS.
4. MAINTENANCE HOLES TO INCLUDE WATERPROOF MEMBRANE AS PER DETAIL B119.
5. WATERTIGHT LIDS ARE REQUIRED IN AREAS OF OVERLAND FLOW AND WITHIN FLOODPLAINS.
6. AS PER THE CLI-ECA, MAINTENANCE HOLES SHALL BE LOCATED AWAY FROM ANY FLOW ROUTE OR PONDING AREA. IN THE CASE WHERE THEY CANNOT BE LOCATED AWAY FROM THE OVERLAND FLOW ROUTE FOR THE 25 YEAR STORM EVENT, AN ANALYSIS SHALL BE COMPLETED TO VERIFY IF THE OVERLAND FLOW ROUTE WILL SUBMERGE THE SANITARY MAINTENANCE HOLES. IF THE MAINTENANCE HOLE IS SUBMERGED, DESIGN TO BE WATERTIGHT INCLUDING WATER-TIGHT COVERS. WHERE MORE THAN ONE CONSECUTIVE SANITARY MAINTENANCE HOLE REQUIRES SEALING, APPROPRIATE VENTILATION SHALL BE PROVIDED.



TOWNSHIP OF CLEARVIEW

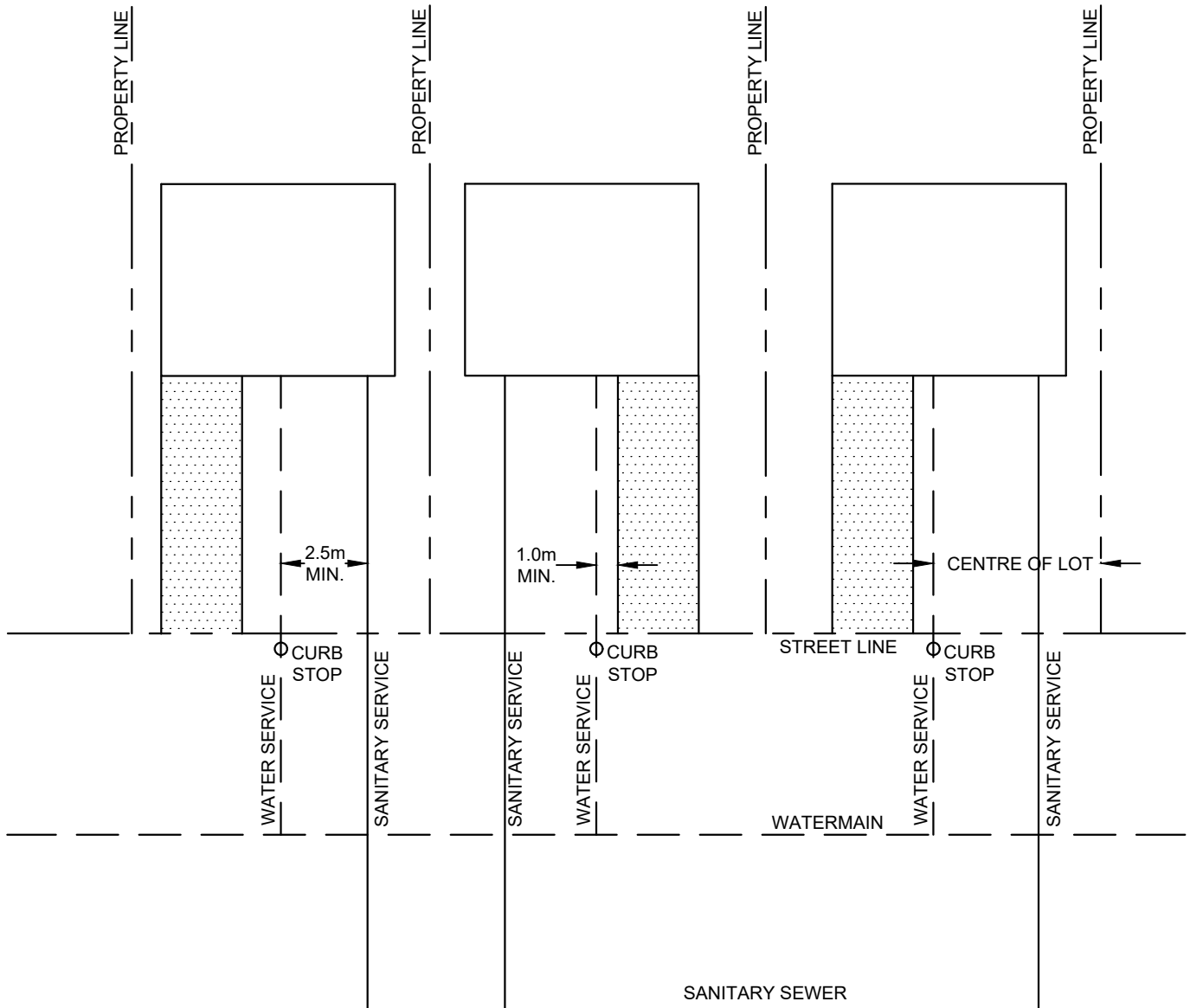
**TRUNK SEWER MAINTENANCE HOLE VENTING
DETAILS**

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	F103
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NOTES:

1. MUNICIPAL SERVICES WILL NOT BE PERMITTED WITHIN DRIVEWAYS.
2. REFER TO STANDARD DRAWINGS D108 AND F101 FOR DETAILS FOR CONSTRUCTION OF WATER SERVICES AND SANITARY SERVICES.
3. ANY SERVICE TO BE LOCATED A MINIMUM OF 0.5m FROM ANY LOT LINE.
4. WATER SERVICES TO BE A MINIMUM 1.0m OFFSET FROM DRIVEWAYS.



TOWNSHIP OF CLEARVIEW

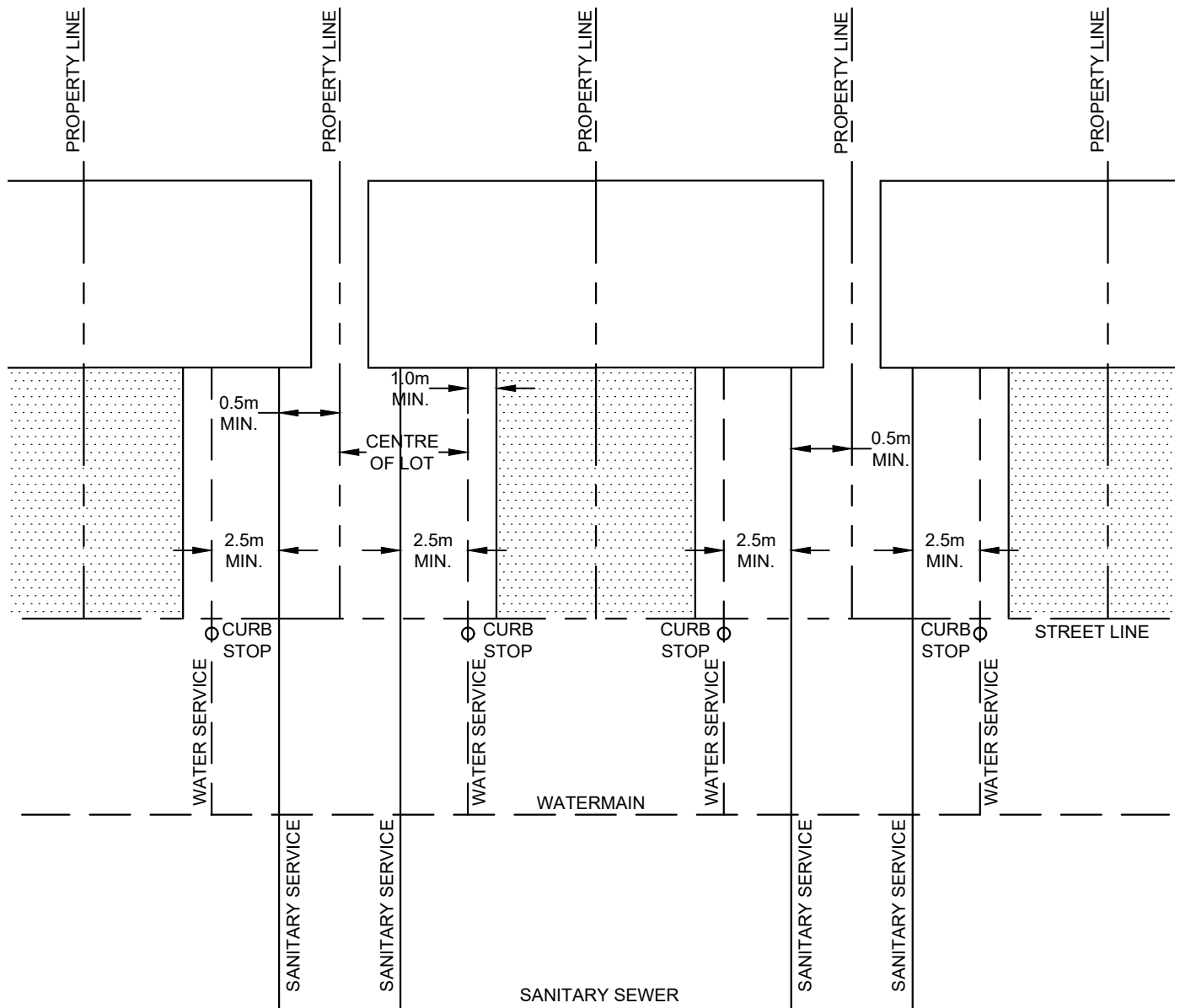
TYPICAL DETACHED LOT SERVICING

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	G101
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NOTES:

1. MUNICIPAL SERVICES WILL NOT BE PERMITTED WITHIN DRIVEWAYS.
2. REFER TO STANDARD DRAWINGS D108 AND F101 FOR DETAILS FOR CONSTRUCTION OF WATER AND SANITARY SERVICES.
3. WATER SERVICES TO BE A MINIMUM 1.0m OFFSET FROM DRIVEWAYS.



TOWNSHIP OF CLEARVIEW

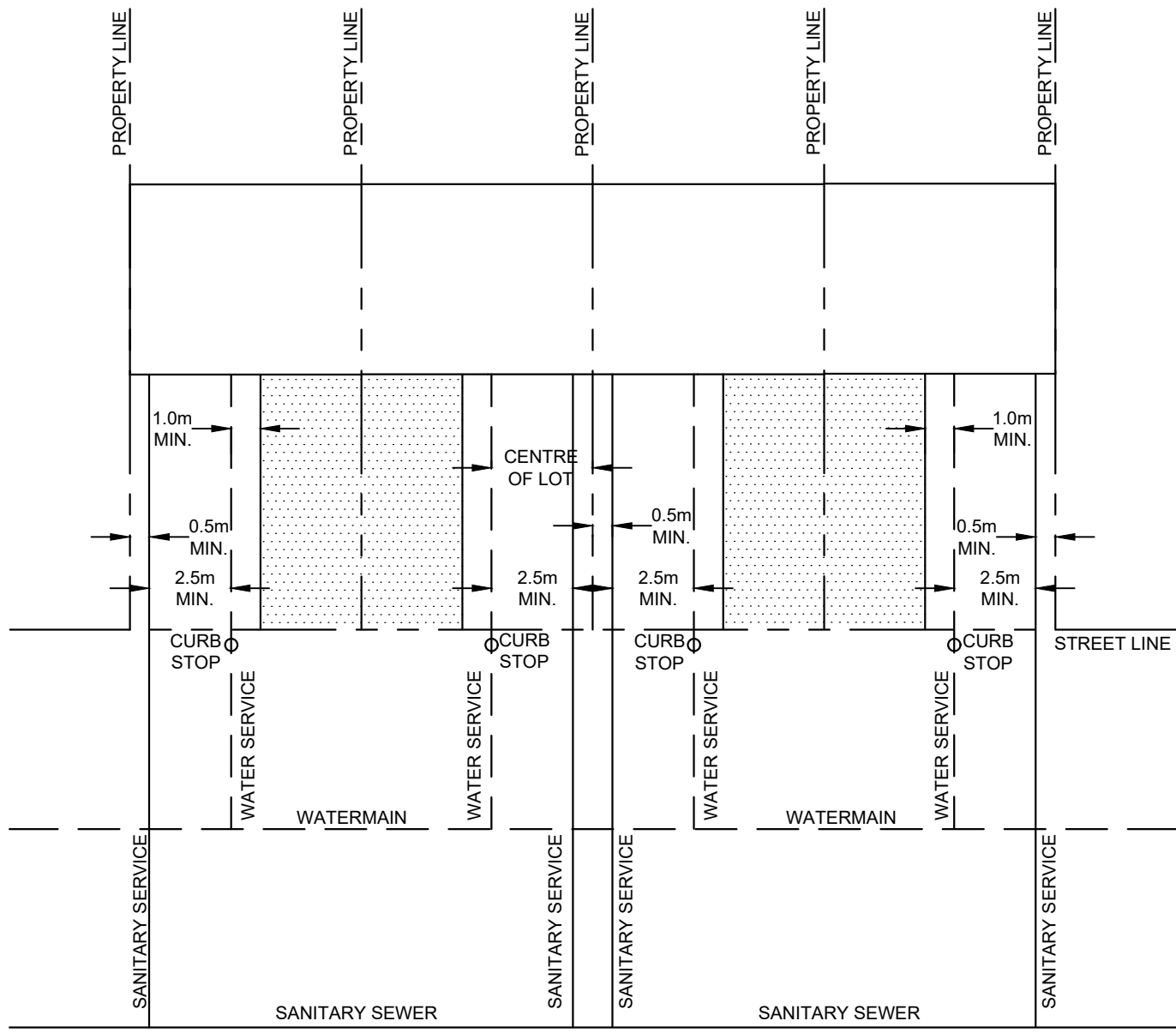
TYPICAL SEMI-DETACHED LOT SERVICING

No.	Issue / Revision	Date	Auth.

Scale
N.T.S.

Date
OCT 2025

Dwg. No.
G102



NOTES:

1. MUNICIPAL SERVICES WILL NOT BE PERMITTED WITHIN DRIVEWAYS.
2. REFER TO STANDARD DRAWINGS D108 AND F101 FOR DETAILS FOR CONSTRUCTION OF WATER AND SANITARY SERVICES.
3. WATER SERVICES TO BE A MINIMUM 1.0m OFFSET FROM DRIVEWAYS.

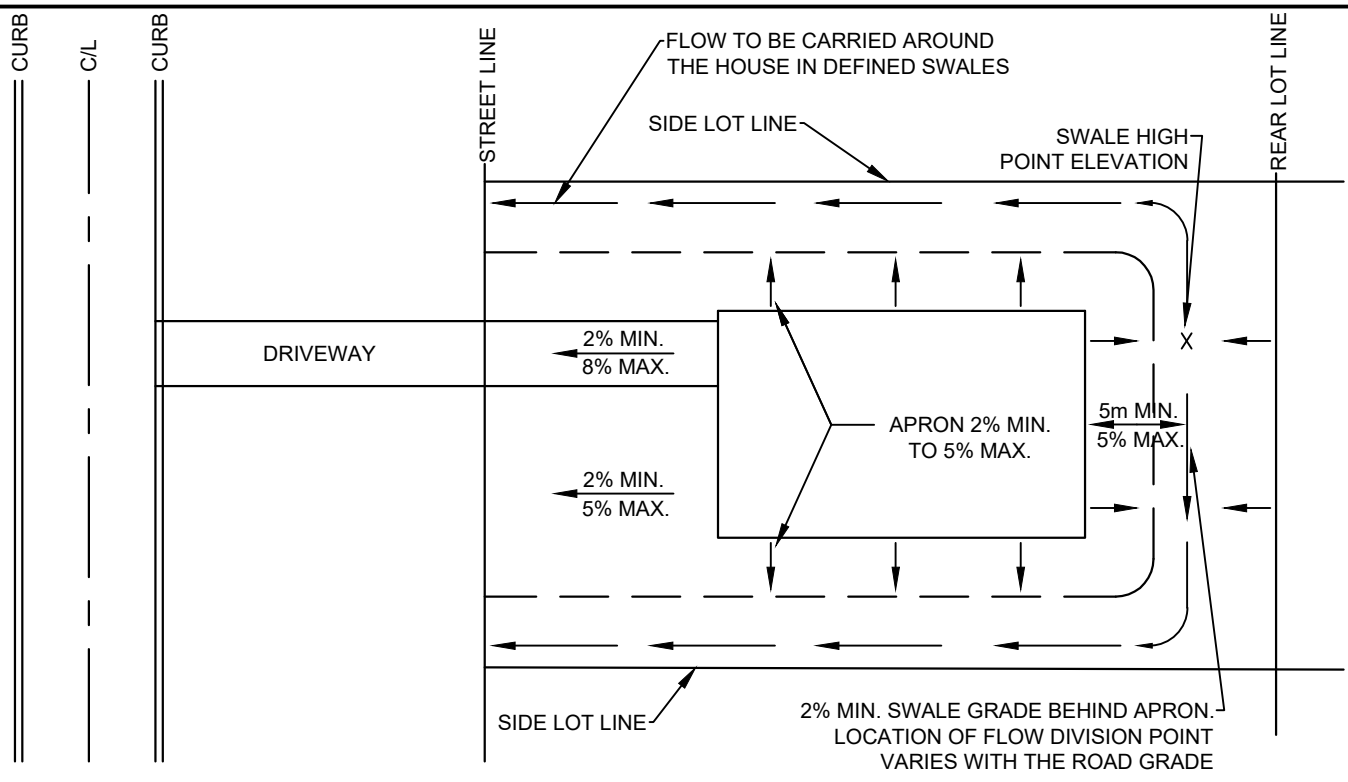


TOWNSHIP OF CLEARVIEW

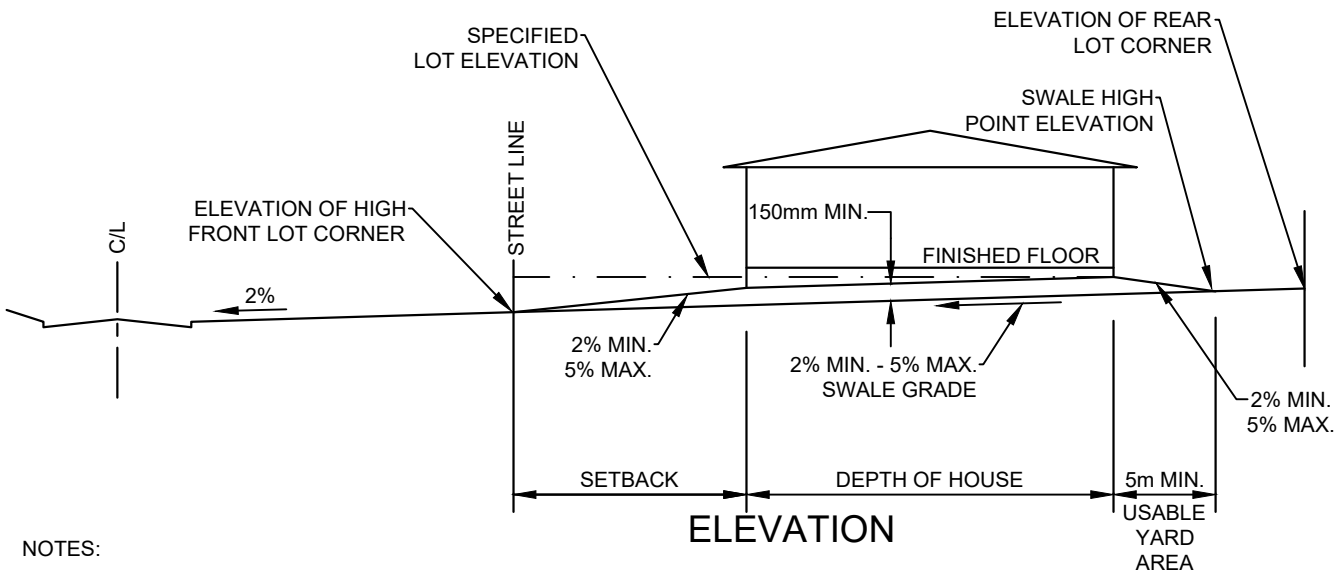
TYPICAL TOWNHOUSE SERVICING

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	G103



PLAN



ELEVATION

NOTES:

1. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR SIDEYARD SWALES.
2. MINIMUM SWALE DEPTH 0.15m
3. SIDEYARD SWALES TO BE ENTIRELY WITHIN SUBJECT LOT, IF ADJACENT LOT IS NOT CONCURRENTLY UNDERGOING DEVELOPMENT.
4. ALL ROOF LEADERS TO DIRECT DRAINAGE TO THE FRONT OF THE LOT.
5. GRADING SHALL MEET EXISTING SURROUNDING LOT ELEVATIONS VIA GRADING. RETAINING WALLS WILL ONLY BE CONSIDERED ON A CASE BY CASE BASIS.
6. FRONT LOT DRAINAGE IS THE PREFERRED METHOD OF LOT LEVEL DRAINAGE. SPLIT DRAINAGE WILL ONLY BE CONSIDERED IF IT CAN BE DEMONSTRATED THAT FRONT DRAINAGE IS NOT POSSIBLE.

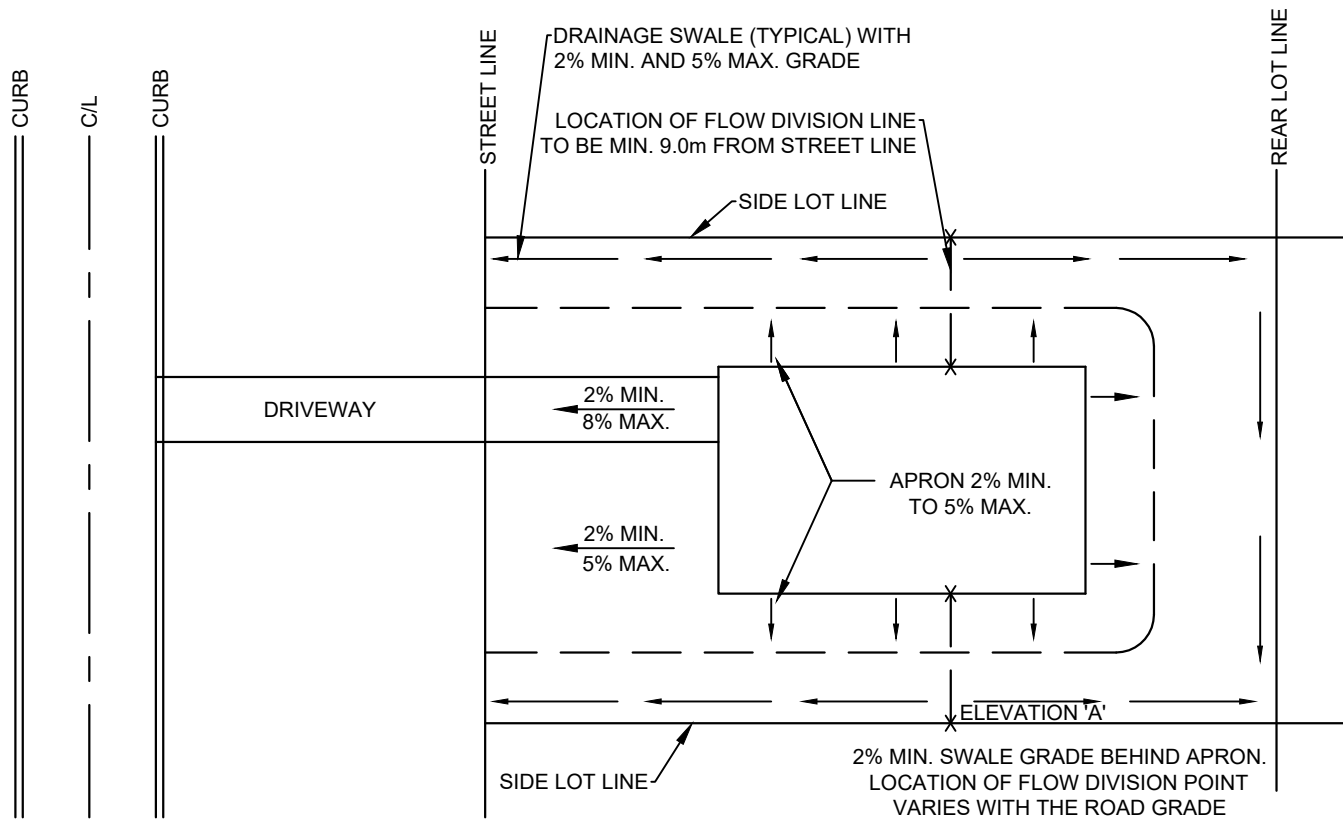


TOWNSHIP OF CLEARVIEW

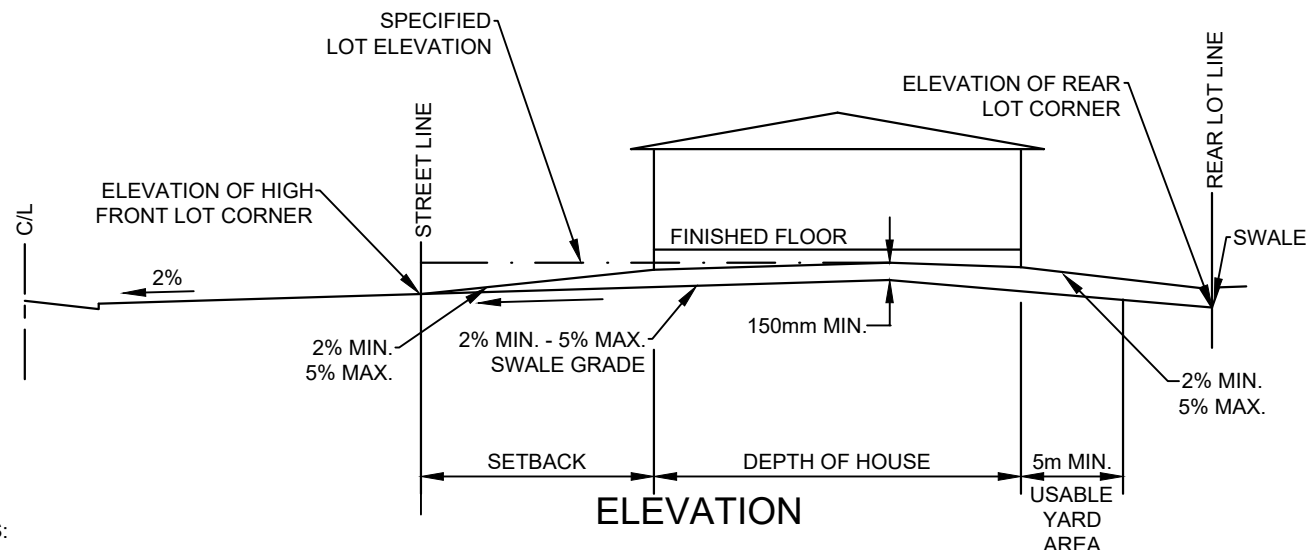
FRONT LOT DRAINAGE (PREFERRED LOT LEVEL DRAINAGE STRATEGY)

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	G104




PLAN

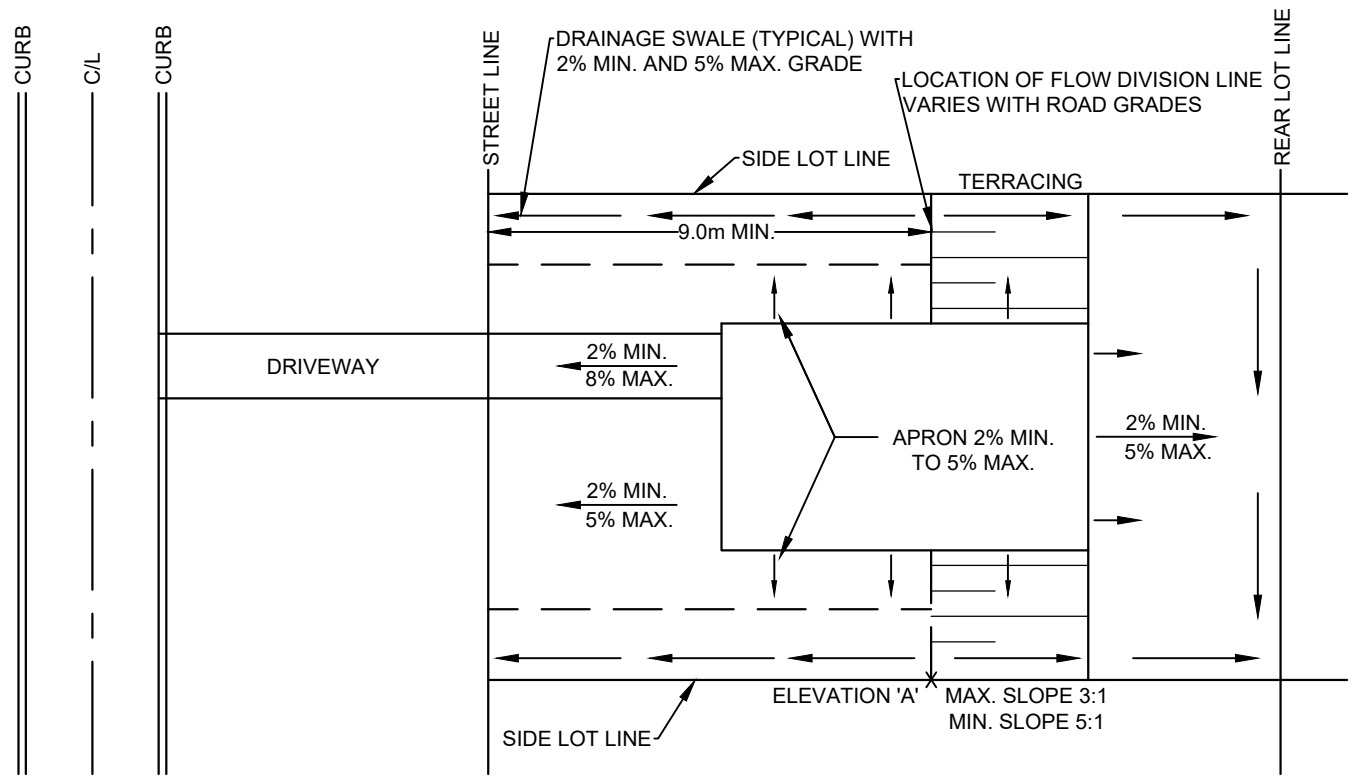


ELEVATION

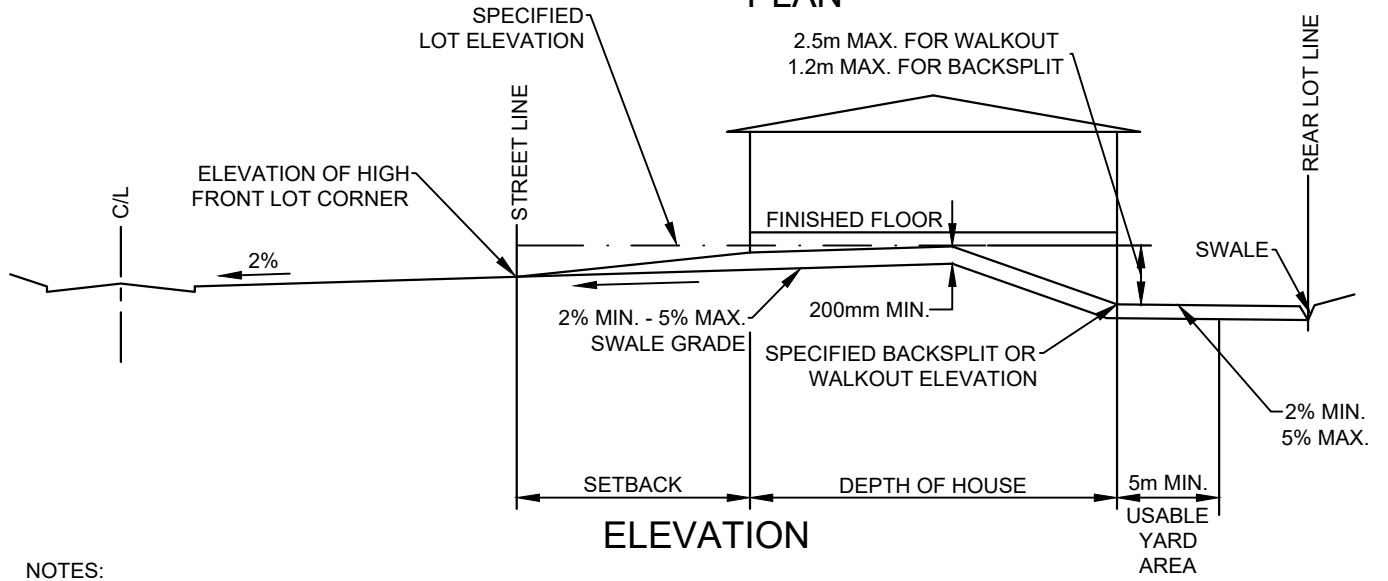
NOTES:

1. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR SIDERYARD SWALES.
2. SIDERYARD SWALES TO BE ENTIRELY WITHIN SUBJECT LOT, IF ADJACENT LOT IS NOT CONCURRENTLY UNDERGOING DEVELOPMENT.
3. GRADING SHALL MEET EXISTING SURROUNDING LOT ELEVATIONS VIA GRADING. RETAINING WALLS WILL ONLY BE CONSIDERED ON A CASE BY CASE BASIS.
4. FRONT LOT DRAINAGE IS THE PREFERRED METHOD OF LOT LEVEL DRAINAGE. SPLIT DRAINAGE WILL ONLY BE CONSIDERED IF IT CAN BE DEMONSTRATED THAT FRONT DRAINAGE IS NOT POSSIBLE.

 TOWNSHIP OF CLEARVIEW				SPLIT LOT DRAINAGE			
				Scale	Date	Dwg. No.	
				N.T.S.	OCT 2025	G105	
No.	Issue / Revision	Date	Auth.				



PLAN



ELEVATION

NOTES:

1. THE MAXIMUM SLOPE ON ALL EMBANKMENTS AND TERRACES SHALL BE 3:1 FOR SLOPES UP TO 1.0m IN HEIGHT AND 4:1 FOR SLOPES GREATER THAN 1.0m IN HEIGHT.
2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR SIDEYARD SWALES.
3. SIDEYARD SWALES TO BE ENTIRELY WITHIN SUBJECT LOT, IF ADJACENT LOT IS NOT CONCURRENTLY UNDERGOING DEVELOPMENT.
4. GRADING SHALL MEET EXISTING SURROUNDING LOT ELEVATIONS VIA GRADING. RETAINING WALLS WILL ONLY BE CONSIDERED ON A CASE BY CASE BASIS.
5. FRONT LOT DRAINAGE IS THE PREFERRED METHOD OF LOT LEVEL DRAINAGE. SPLIT DRAINAGE WILL ONLY BE CONSIDERED IF IT CAN BE DEMONSTRATED THAT FRONT DRAINAGE IS NOT POSSIBLE.

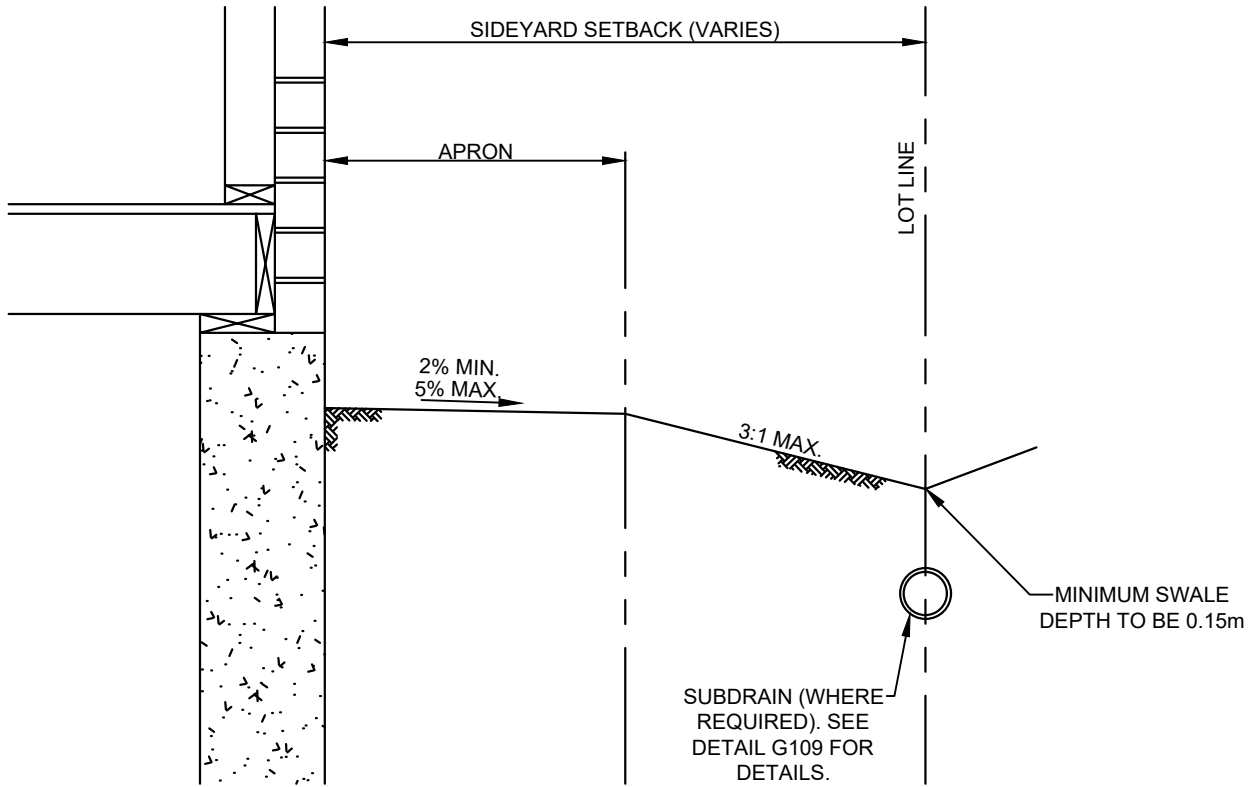


TOWNSHIP OF CLEARVIEW

SPLIT LOT DRAINAGE FOR WALKOUT OR BACKSPLIT

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	G106



NOTES:

1. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR SIDEYARD SWALES.
2. MINIMUM SWALE DEPTH 0.15m
3. SIDEYARD SWALES TO BE ENTIRELY WITHIN SUBJECT LOT, IF ADJACENT LOT IS NOT CONCURRENTLY UNDERGOING DEVELOPMENT.
4. ALL ROOF LEADERS TO DIRECT DRAINAGE TO THE FRONT OF THE LOT.
5. GRADING SHALL MEET EXISTING SURROUNDING LOT ELEVATIONS VIA GRADING. RETAINING WALLS WILL ONLY BE CONSIDERED ON A CASE BY CASE BASIS.



TOWNSHIP OF CLEARVIEW

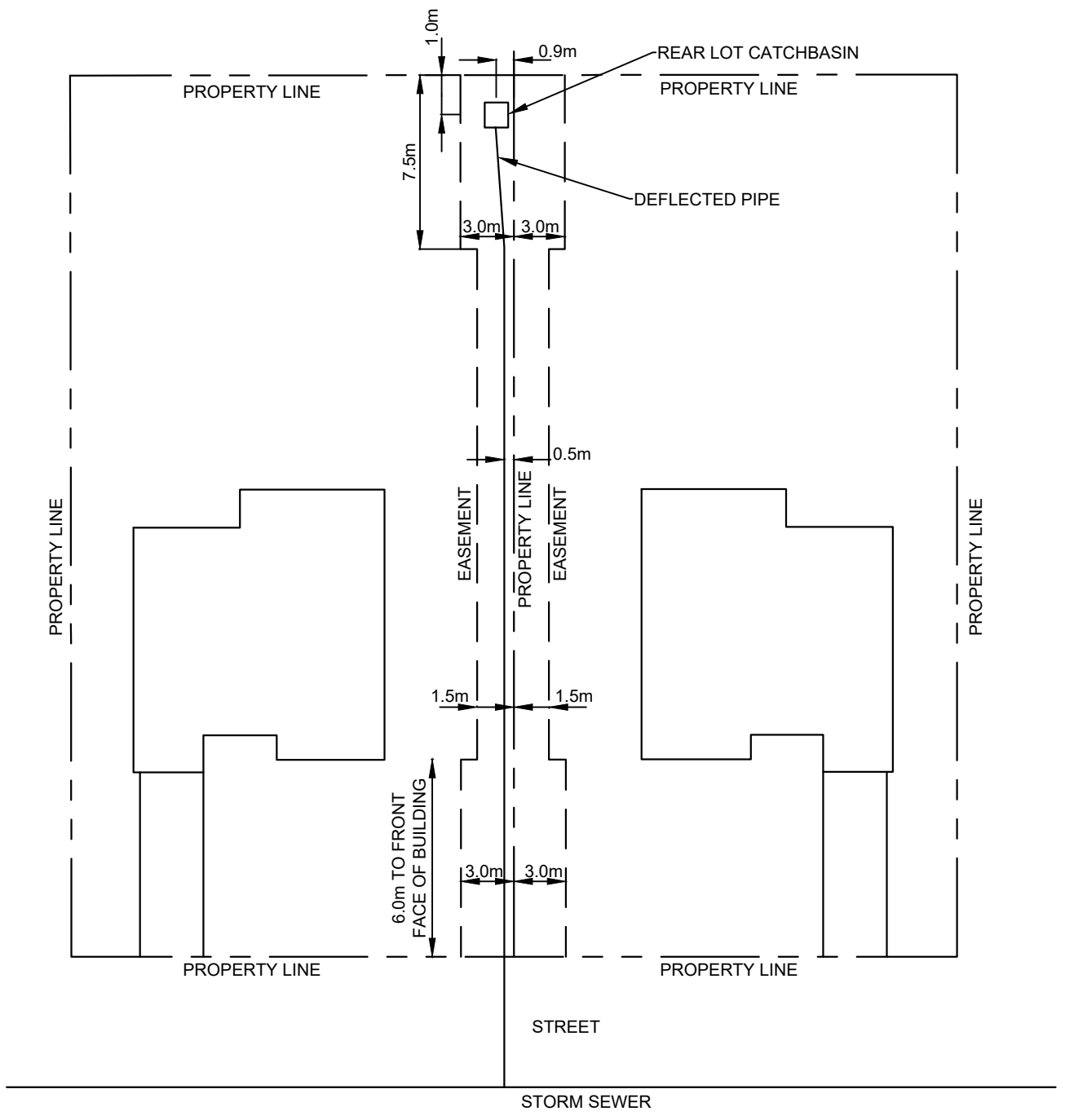
TYPICAL SIDE YARD SWALE

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	G107
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TOWNSHIP OF CLEARVIEW

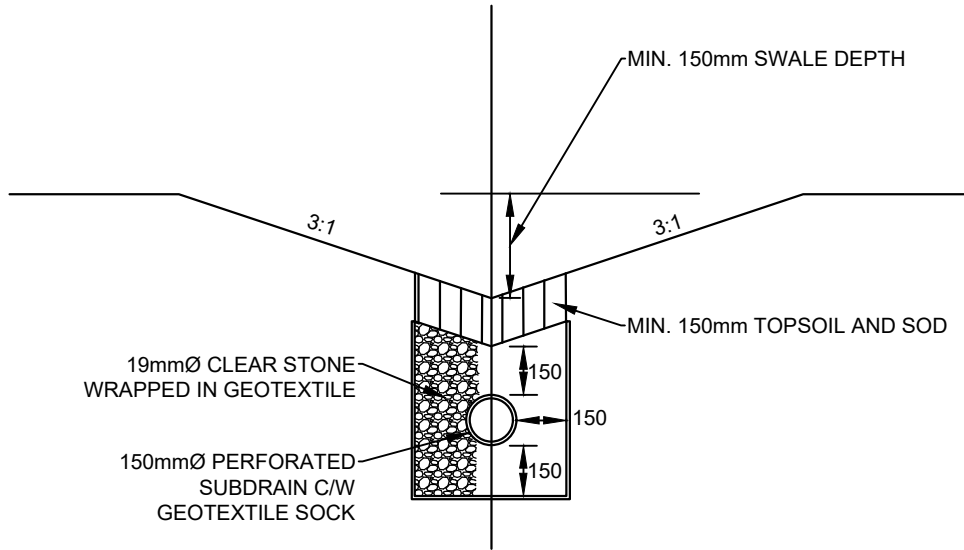
TYPICAL SIDE YARD EASEMENT FOR REAR LOT CATCHBASIN AND LEAD

No.	Issue / Revision	Date	Auth.

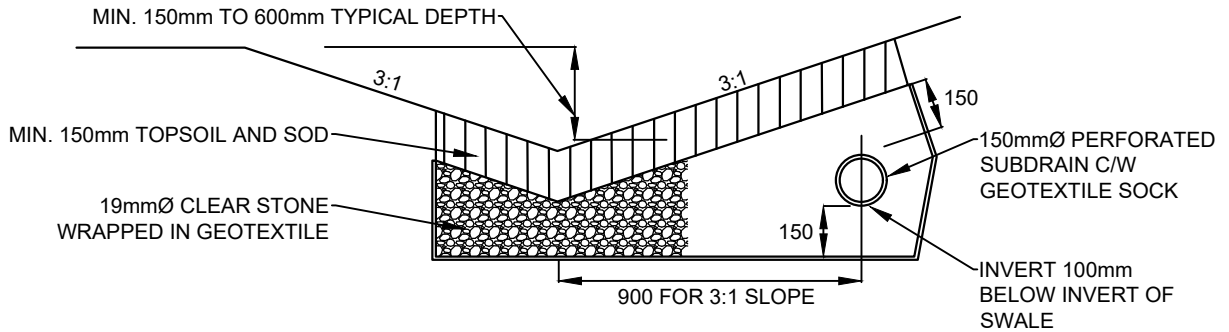
Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	G108
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SUBDRAIN TYPE "A"



SUBDRAIN TYPE "B"

(TYPE "B" SUBDRAIN TO BE USED WHERE
OUTFALL ELEVATION PREVENTS DEEPER
INSTALLATION OF TYPE "A" SUBDRAIN)



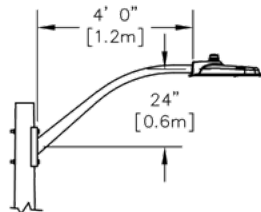
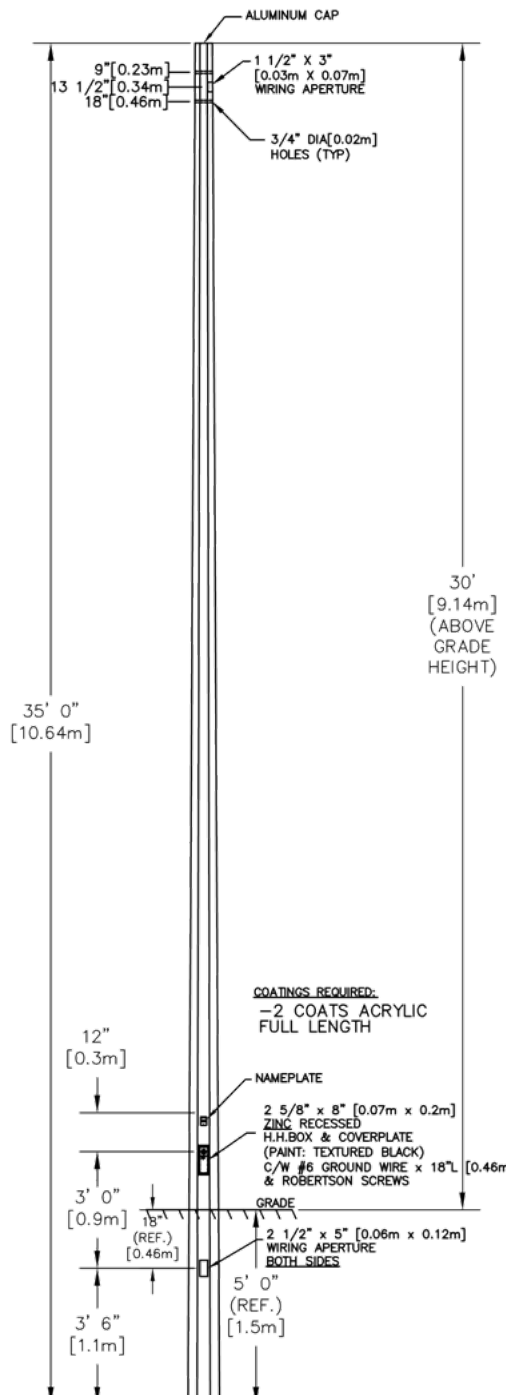
TOWNSHIP OF CLEARVIEW

SUBDRAINS FOR REDUCED SLOPE SWALES

No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
G109



FIXTURE SPECIFICATIONS: (BY OTHERS)
 CURRENT EVOLVE ERLC, ERL1 OR ERL2 TYPE II & III
 (GE EVOLVE COBRAHEAD STYLE LUMINAIRE)

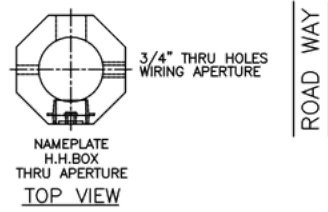
ARM SPECIFICATIONS:
 CATALOGUE NO.: KA120-A-S-1-4'
 QUANTITY:
 MATERIAL: ALUMINIUM
 PAINT: TEXTURED BLACK

POLE SPECIFICATIONS
 CATALOGUE NO.: E350-BPO-G-E11
 S/F 120

QUANTITY:
 POLE CLASS: B
 SECTION: OCTAGONAL
 FINISH: ECLIPSE
 COLOUR: ETCHED
 POLE TOP: 5 3/8" [0.14m] FL/FL
 POLE BUTT: 9 3/4" [0.25m] FL/FL
 POLE LENGTH: 35' 0" [10.64m]
 APPROX. WGT.: 1,656 lbs.
 MIN. RACEWAY: 1 1/8" [0.03m] ø

COATINGS REQUIRED:
 -2 COATS ACRYLIC
 FULL LENGTH

NAMEPLATE
 2 5/8" x 8" [0.07m x 0.2m]
 ZINC RECESSED
 H.H. BOX & COVERPLATE
 (PAINT: TEXTURED BLACK)
 C/W #6 GROUND WIRE x 18" [0.46m]
 & ROBERTSON SCREWS



NOTES:
 StressCrete makes no claims that the reference embedment depth shown is suitable for supporting this structure. It is recommended that a competent professional evaluate the soils present on site, confirming required embedment depth, hole diameter and backfill material to be used.
 Contractor to install burndy kau22 6-25 universal servit bolt connectors (or equivalent), connecting the #6 copper wire from the pole to the luminaire ground & a separate connector bonding pole to supply grounding conductor.

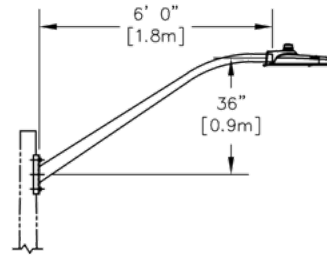
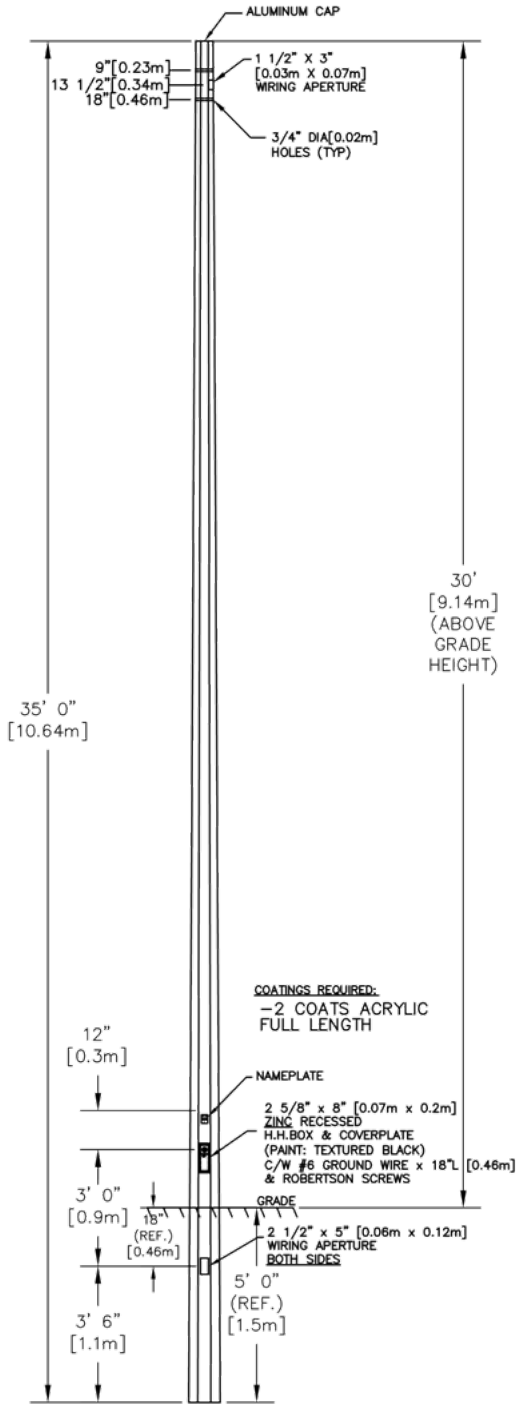


TOWNSHIP OF CLEARVIEW

STREETLIGHT DETAILS - RESIDENTIAL, 1.2m ARM

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	H102



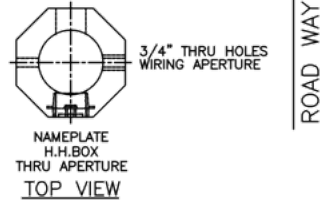
FIXTURE SPECIFICATIONS: (BY OTHERS)
 CURRENT EVOLVE ERLC, ERL1 OR ERL2 TYPE II & III
 (GE EVOLVE COBRAHEAD STYLE LUMINAIRE)

ARM SPECIFICATIONS:
 CATALOGUE NO.: KA120-A-S-1-6'
 QUANTITY:
 MATERIAL: ALUMINIUM
 PAINT: TEXTURED BLACK

POLE SPECIFICATIONS
 CATALOGUE NO.: E350-BPO-G-E11
 S/F 120
 QUANTITY:
 POLE CLASS: B
 SECTION: OCTAGONAL
 FINISH: ECLIPSE
 COLOUR: ETCHED
 POLE TOP: 5 3/8" [0.14m] FL/FL
 POLE BUTT: 9 3/4" [0.25m] FL/FL
 POLE LENGTH: 35' 0" [10.64m]
 APPROX. WGT.: 1,656 lbs.
 MIN. RACEWAY: 1 1/8" [0.03m]ø

COATINGS REQUIRED:
 -2 COATS ACRYLIC
 FULL LENGTH

NAMEPLATE
 2 5/8" x 8" [0.07m x 0.2m]
 ZINC RECESSED
 H.H. BOX & COVERPLATE
 (PAINT: TEXTURED BLACK)
 C/W #6 GROUND WIRE x 18" [0.46m]
 & ROBERTSON SCREWS



NOTES:
 StressCrete makes no claims that the reference embedment depth shown is suitable for supporting this structure. It is recommended that a competent professional evaluate the soils present on site, confirming required embedment depth, hole diameter and backfill material to be used.
 Contractor to install burndy kau22 6-25 universal servit bolt connectors (or equivalent), connecting the #6 copper wire from the pole to the luminaire ground & a separate connector bonding pole to supply grounding conductor.

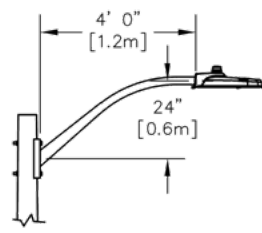
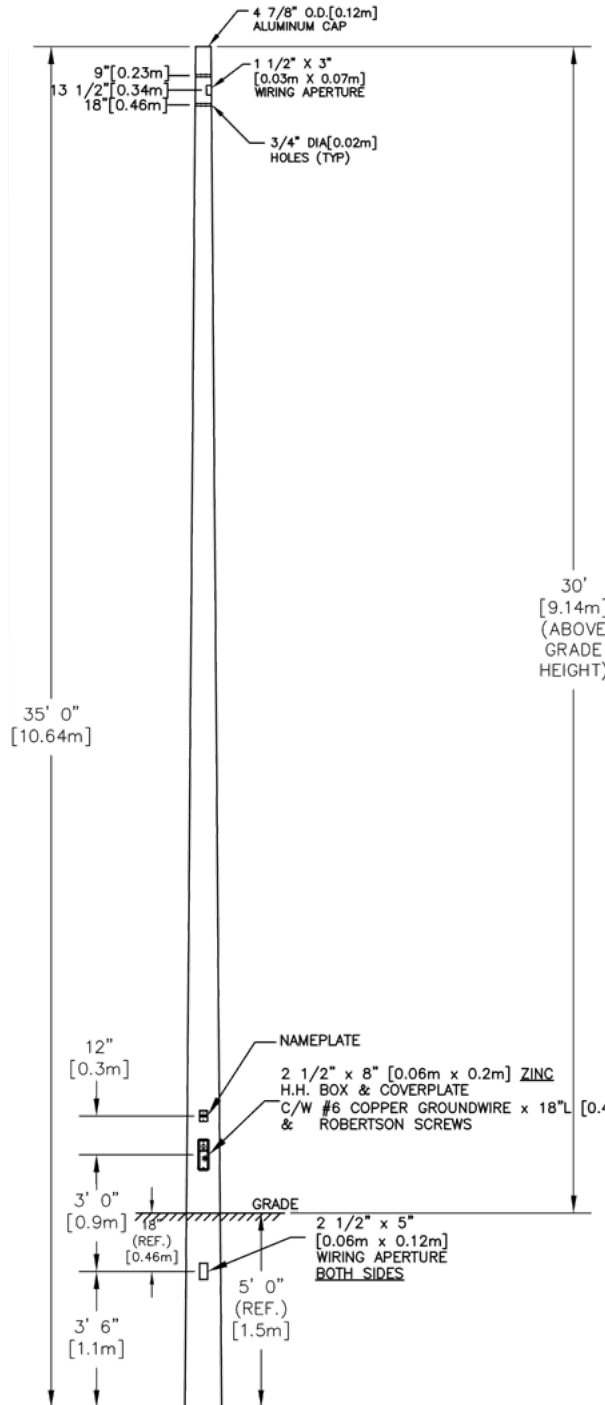


TOWNSHIP OF CLEARVIEW

STREETLIGHT DETAILS - RESIDENTIAL, 1.8m ARM

No.	Issue / Revision	Date	Auth.

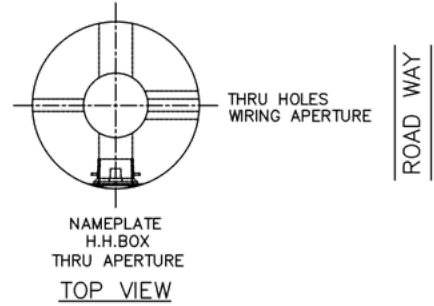
Scale	Date	Dwg. No.
N.T.S.	OCT 2025	H103



FIXTURE SPECIFICATIONS: (BY OTHERS)
 CURRENT EVOLVE ERLC, ERL1 OR ERL2 TYPE II & III
 (GE EVOLVE COBRAHEAD STYLE LUMINAIRE)

ARM SPECIFICATIONS:
 CATALOGUE NO.: KA120-A-S-1-4'
 QUANTITY:
 MATERIAL: ALUMINIUM
 PAINT: NATURAL FINISH

POLE SPECIFICATIONS
 CATALOGUE NO.: E350-BPR-G-M00
 S/F 120
 QUANTITY:
 POLE CLASS: B
 SECTION: ROUND
 FINISH: MOLD FINISH
 COLOUR: MOLD FINISH
 POLE TOP: 4 3/4" [0.12m]φ
 POLE BUTT: 11" [0.28m]φ
 POLE LENGTH: 35' 0" [10.64m]
 APPROX. WGT.: 1,720 lbs.
 MIN. RACEWAY: 1 1/8" [0.03m]φ



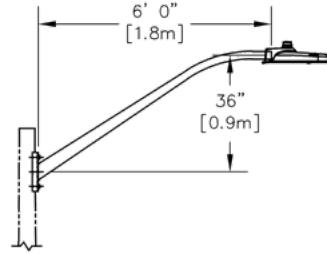
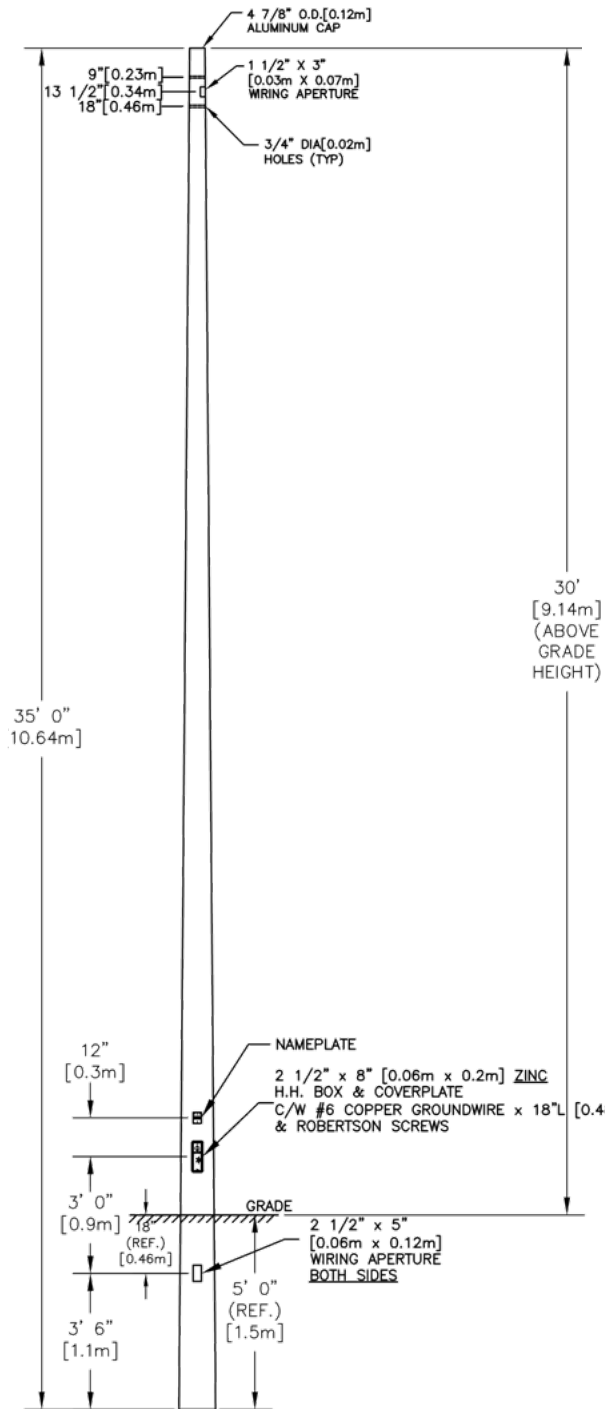
NOTES:
 StressCrete makes no claims that the reference embedment depth shown is suitable for supporting this structure. It is recommended that a competent professional evaluate the soils present on site, confirming required embedment depth, hole diameter and backfill material to be used.
 Contractor to install burndy ksu22 6-25 universal servit bolt connectors (or equivalent), connecting the #6 copper wire from the pole to the luminaire ground & a separate connector bonding pole to supply grounding conductor.

TOWNSHIP OF CLEARVIEW

No.	Issue / Revision	Date	Auth.

STREETLIGHT DETAILS - INDUSTRIAL, 1.2m ARM

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	H104



FIXTURE SPECIFICATIONS: (BY OTHERS)

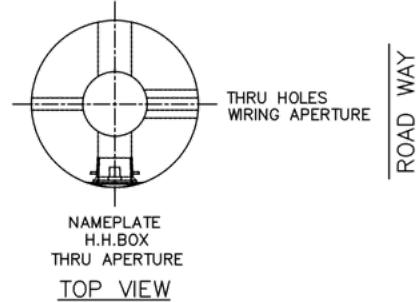
CURRENT EVOLVE ERLC, ERL1 OR ERL2 TYPE II & III
(GE EVOLVE COBRAHEAD STYLE LUMINAIRE)

ARM SPECIFICATIONS:

CATALOGUE NO.: KA120-A-S-1-6'
QUANTITY:
MATERIAL: ALUMINIUM
PAINT: NATURAL FINISH

POLE SPECIFICATIONS

CATALOGUE NO.: E350-BPR-G-M00
S/F 120
QUANTITY:
POLE CLASS: B
SECTION: ROUND
FINISH: MOLD FINISH
COLOUR: MOLD FINISH
POLE TOP: 4 3/4" [0.12m]Ø
POLE BUTT: 11" [0.28m]Ø
POLE LENGTH: 35' 0" [10.64m]
APPROX. WGT.: 1,720 lbs.
MIN. RACEWAY: 1 1/8" [0.03m]Ø



NOTES:

StressCrete makes no claims that the reference embedment depth shown is suitable for supporting this structure. It is recommended that a competent professional evaluate the soils present on site, confirming required embedment depth, hole diameter and backfill material to be used.
Contractor to install burndy ksu22 6-25 universal servit bolt connectors (or equivalent), connecting the #6 copper wire from the pole to the luminaire ground & a separate connector bonding pole to supply grounding conductor.



TOWNSHIP OF CLEARVIEW

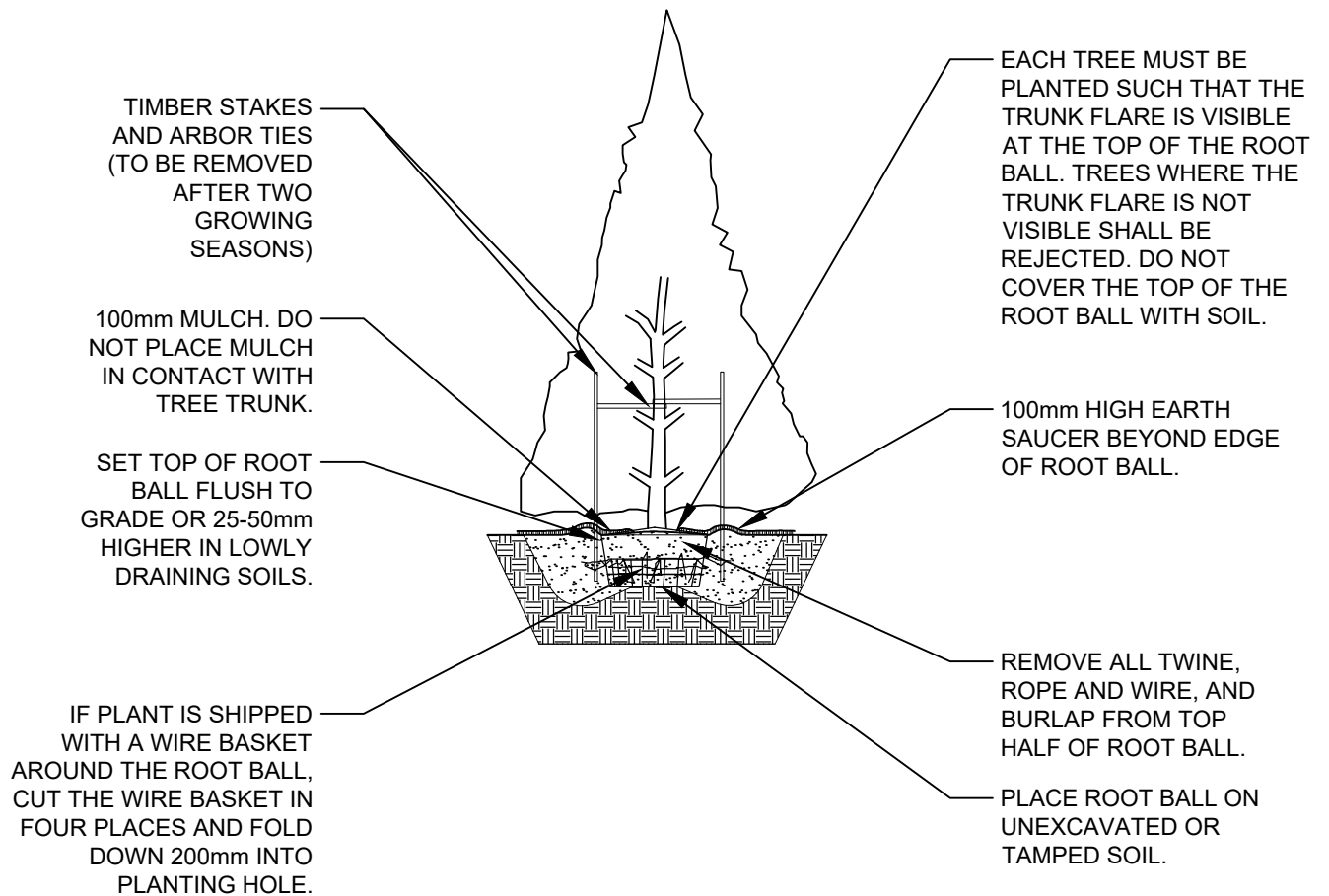
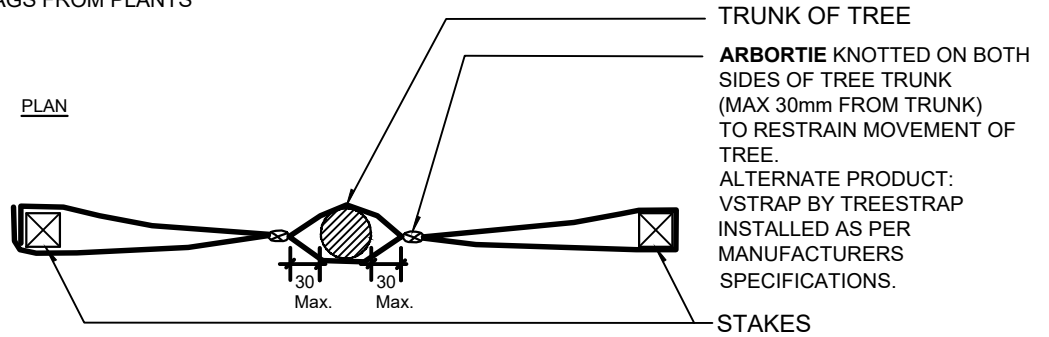
STREETLIGHT DETAILS - INDUSTRIAL, 1.8m ARM

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	H105

NOTES:

- DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
- STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT.
- REMOVE ALL LABELS AND TAGS FROM PLANTS



TOWNSHIP OF CLEARVIEW

CONIFEROUS TREE PLANTING DETAIL

No.	Issue / Revision	Date	Auth.

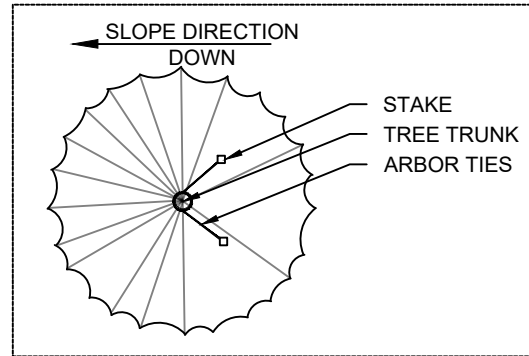
Scale	Date	Dwg. No.
N.T.S.	OCT 2025	1101

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	1101

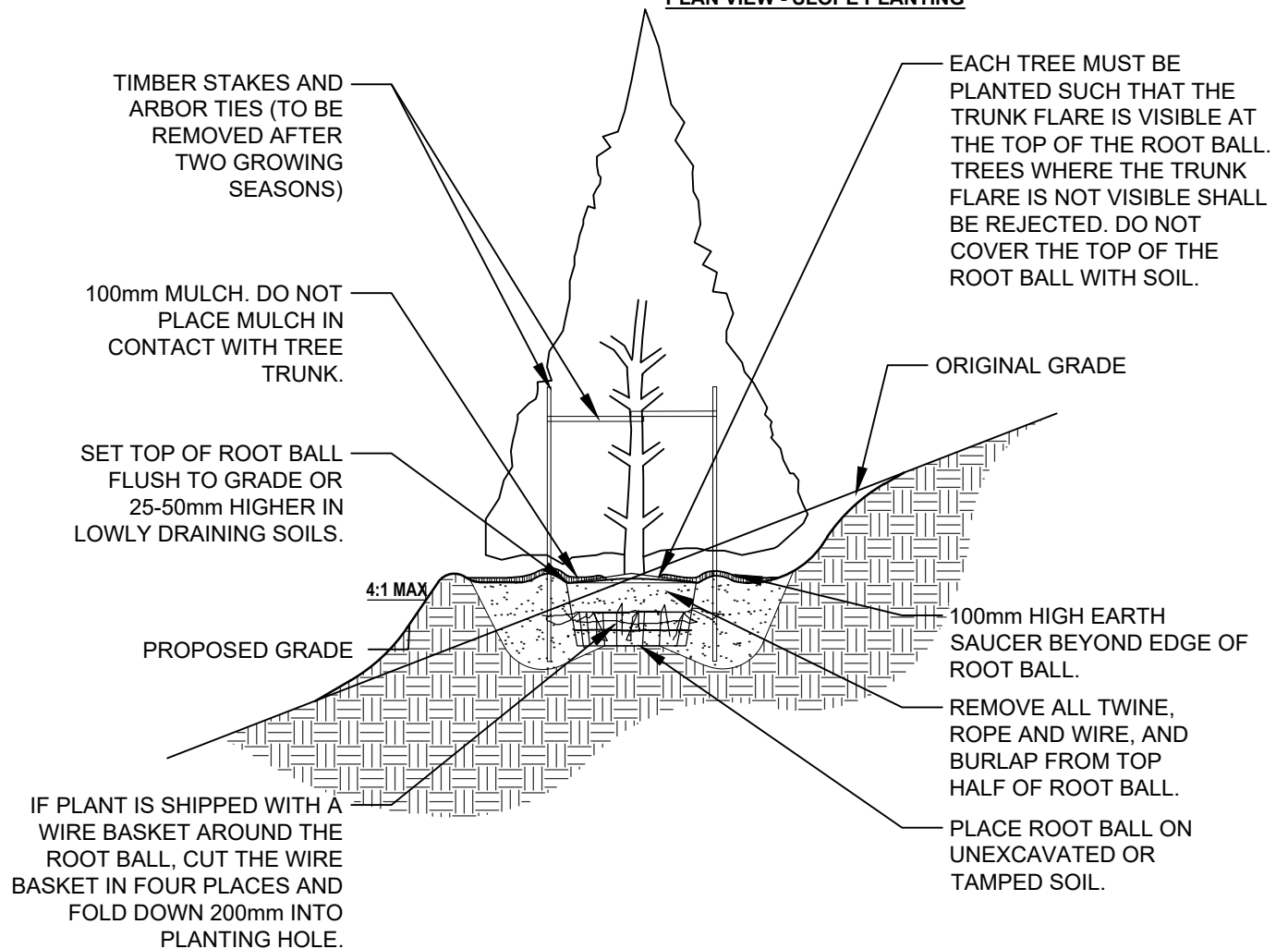
Scale	Date	Dwg. No.
N.T.S.	OCT 2025	1101

NOTES:

1. DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED, HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
2. STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT.
3. REMOVE ALL LABELS AND TAGS FROM PLANTS.



PLAN VIEW - SLOPE PLANTING




TOWNSHIP OF CLEARVIEW

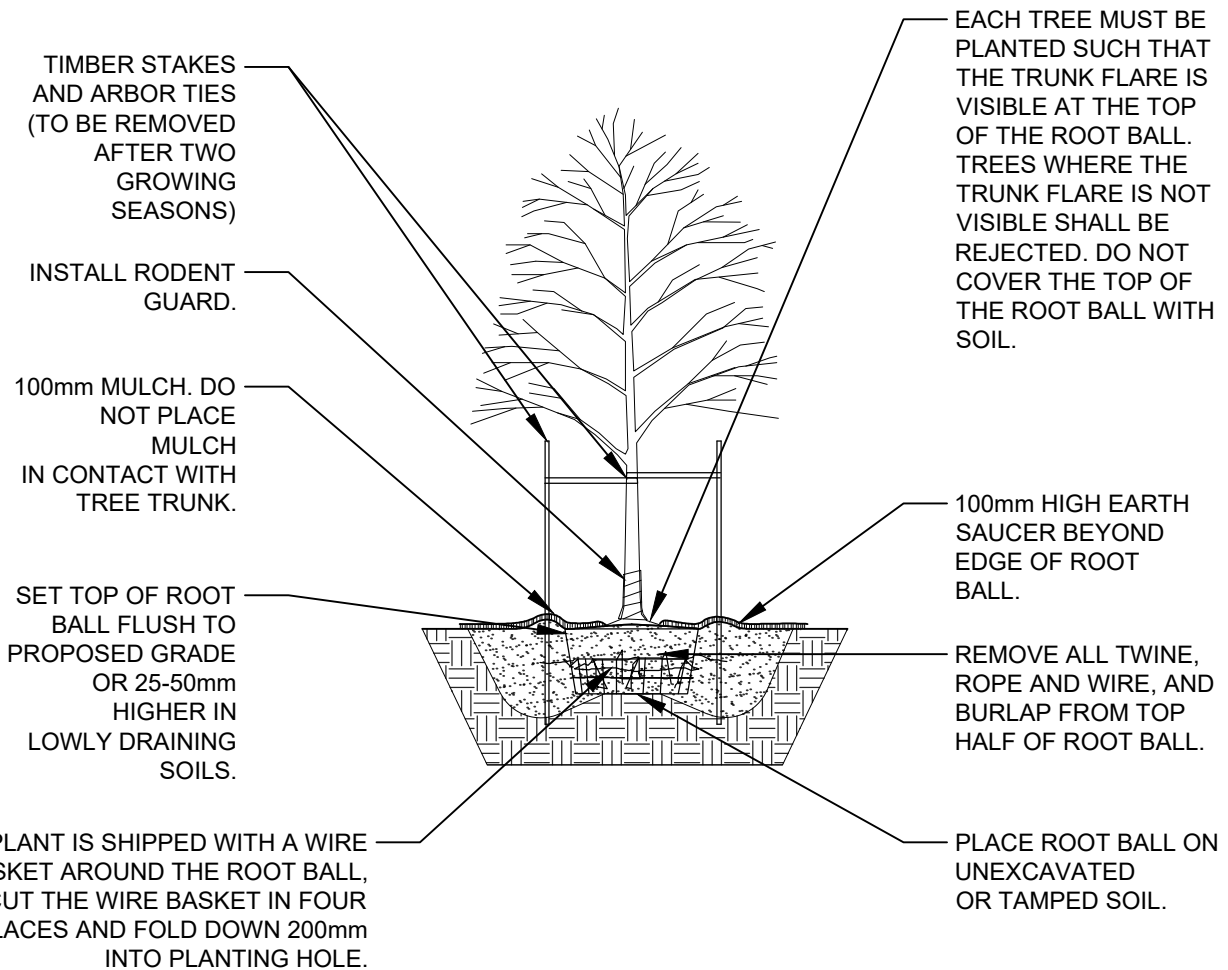
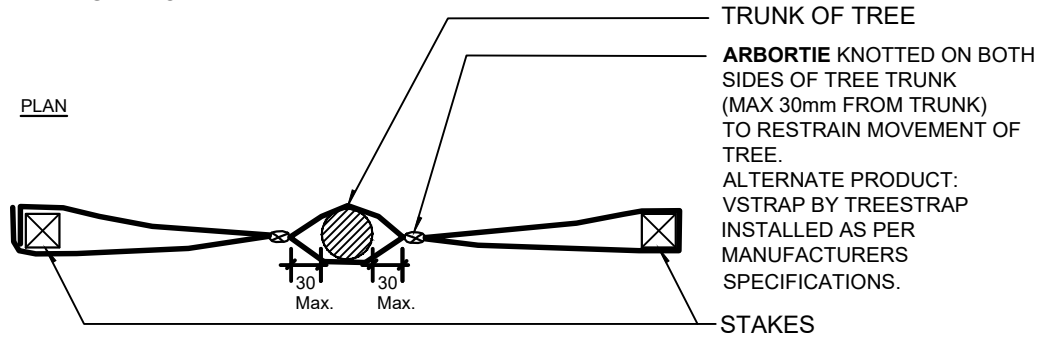
CONIFEROUS TREE PLANTING DETAIL - ON SLOPE

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	I102

NOTES:

- DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
- STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT.
- REMOVE ALL LABELS AND TAGS FROM PLANTS



TOWNSHIP OF CLEARVIEW

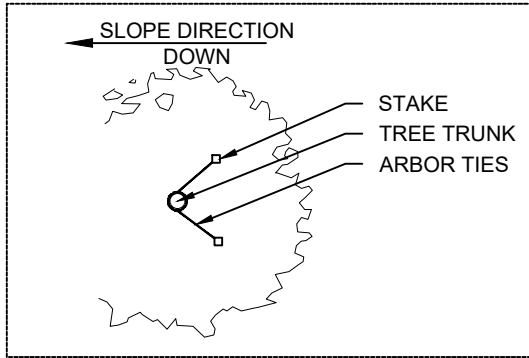
DECIDUOUS TREE PLANTING DETAIL

No.	Issue / Revision	Date	Auth.

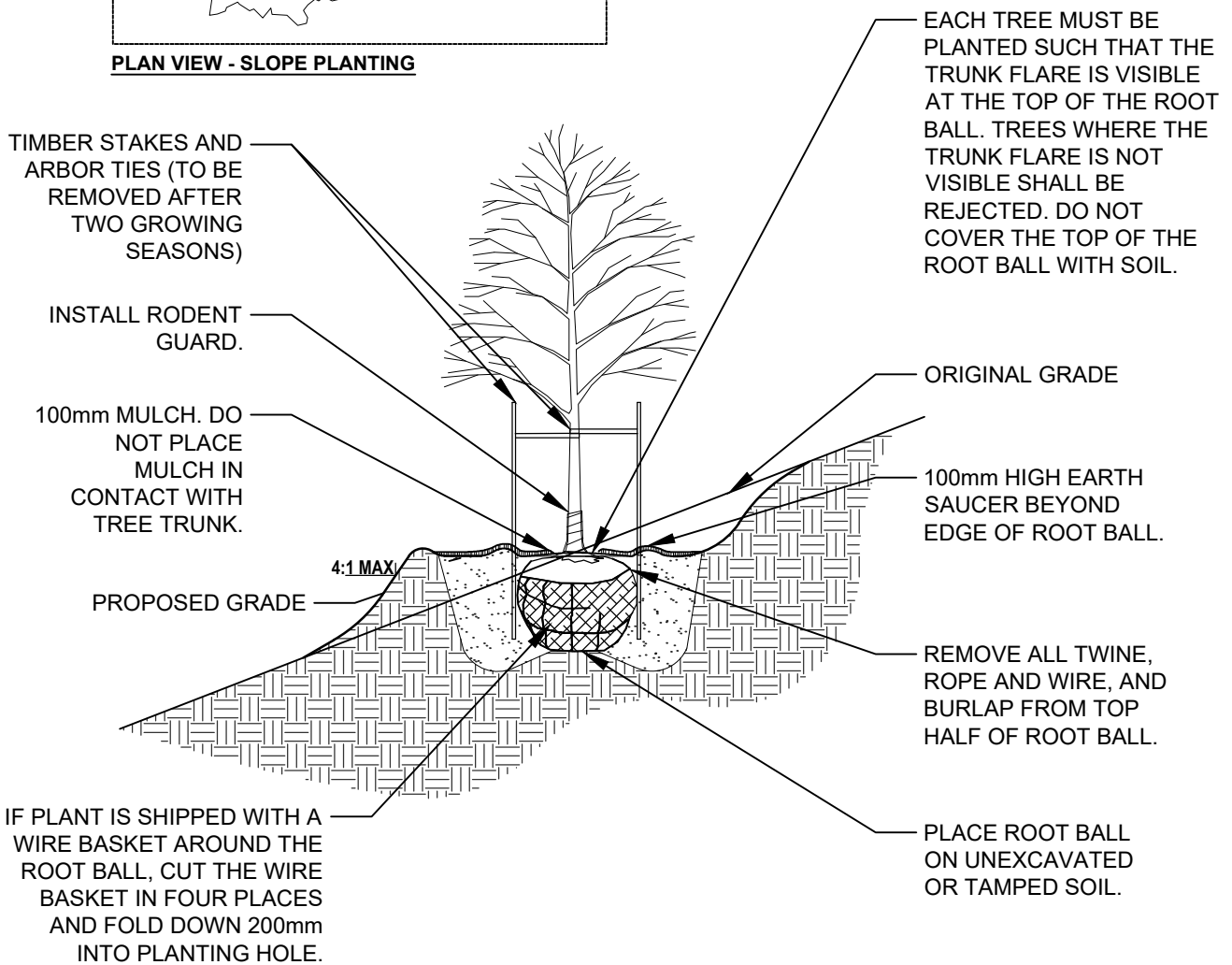
Scale	Date	Dwg. No.
N.T.S.	OCT 2025	I103

NOTES:

1. DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED, HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
2. STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT.
3. REMOVE ALL LABELS AND TAGS FROM PLANTS.



PLAN VIEW - SLOPE PLANTING



IF PLANT IS SHIPPED WITH A WIRE BASKET AROUND THE ROOT BALL, CUT THE WIRE BASKET IN FOUR PLACES AND FOLD DOWN 200mm INTO PLANTING HOLE.



TOWNSHIP OF CLEARVIEW

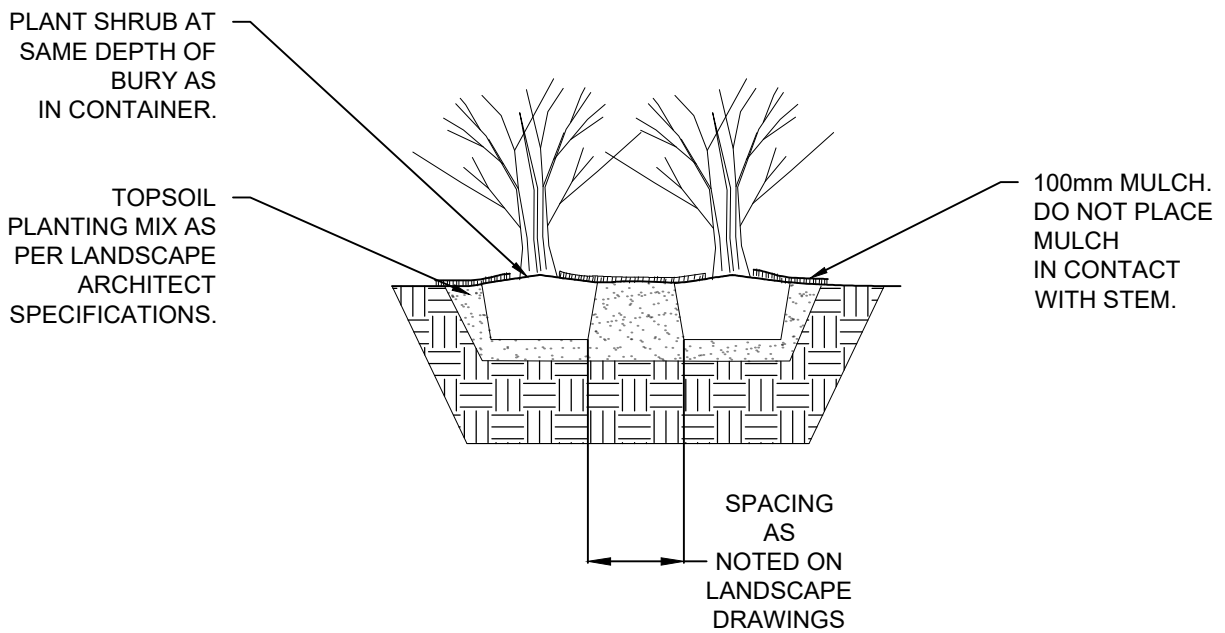
DECIDUOUS TREE PLANTING DETAIL - ON SLOPE

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	1104

NOTES:

1. DO NOT HEAVILY PRUNE THE SHRUB AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED, HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
2. SHRUBS TO BE PLANTED IN CONTINUOUS BEDS.
3. REMOVE ALL LABELS AND TAGS FROM PLANTS.



TOWNSHIP OF CLEARVIEW

SHRUB MASS PLANTING DETAIL

No.	Issue / Revision	Date	Auth.

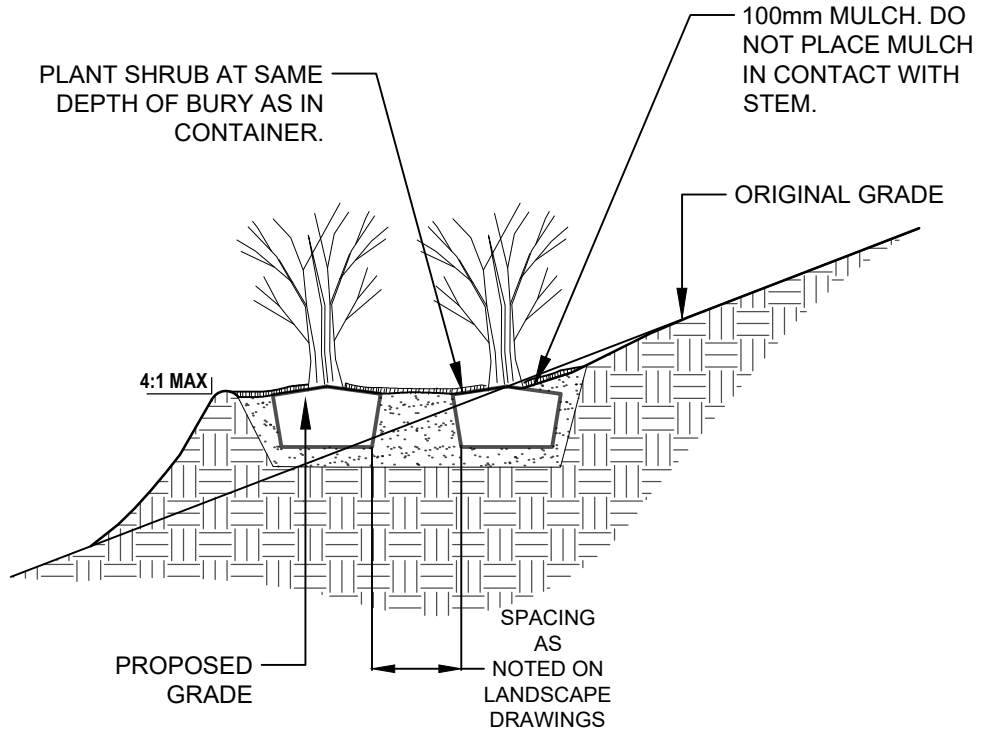
Scale	N.T.S.
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Date	OCT 2025
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Dwg. No.	I105
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NOTES:

1. DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED, HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
2. SHRUBS TO BE PLANTED IN CONTINUOUS BEDS.
3. REMOVE ALL LABELS AND TAGS FROM PLANTS.



TOWNSHIP OF CLEARVIEW

SHRUB MASS PLANTING DETAIL - ON SLOPE

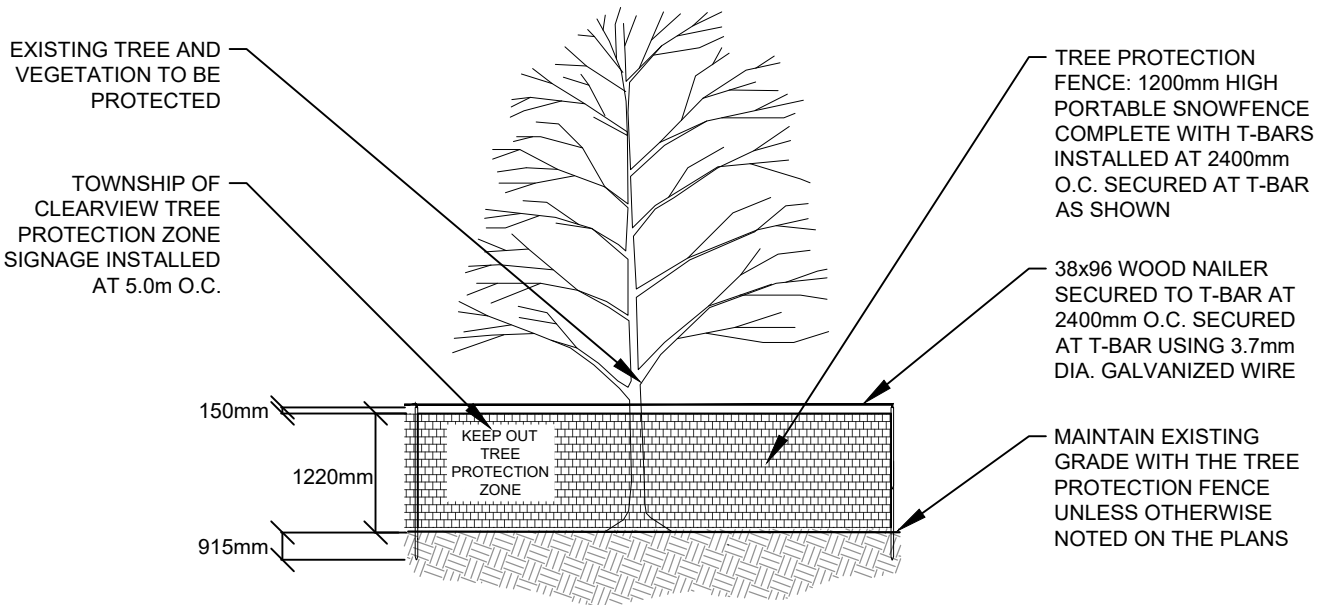
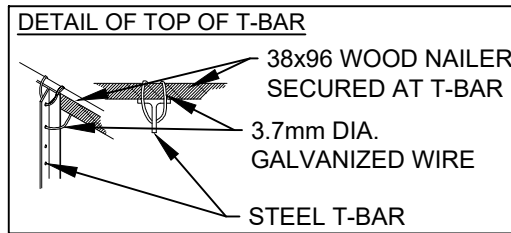
No.	Issue / Revision	Date	Auth.

Scale	Date
N.T.S.	OCT 2025

Dwg. No.
I106

NOTES:

1. EXISTING TREES SHALL BE PROPERLY PROTECTED WITHIN THE DRIP LINE WITH TEMPORARY FENCING AS PER THE APPROVED TREE PROTECTION PLAN UNTIL PRELIMINARY ACCEPTANCE.
2. THE AREA WITHIN THE PROTECTED FENCING SHALL REMAIN UNDISTURBED AND FREE OF DEBRIS, BUILDING MATERIAL, AND EQUIPMENT. NO EQUIPMENT IS TO BE OPERATING WITHIN THE PROTECTION ZONE.
3. PRUNING OF DEAD WOOD TO BE COMPLETED ONLY BY A CERTIFIED ARBORIST.
4. WATERING AND FERTILIZING PROGRAM SHALL BE MAINTAINED TO THE SATISFACTION OF THE TOWNSHIP, BASED ON RECOMMENDATIONS OF AN ARBORIST.
5. THE COST OF REPLACING DEAD AND SEVERELY DAMAGED TREES, AS DETERMINED BY THE TOWNSHIP, SHALL BE BORNE BY THE DEVELOPER AND/OR LANDSCAPE ARCHITECT. REPLACEMENT MUST BE APPROVED BY THE TOWNSHIP.
6. REFER TO TREE PROTECTION PLANS FOR LOCATION OF TREE PROTECTION ZONE FENCING.



TOWNSHIP OF CLEARVIEW

TEMPORARY TREE PROTECTION FENCING

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	1107



CLEARVIEW
TOWNSHIP

TREE PROTECTION ZONE (TPZ)

NO CONSTRUCTION ACTIVITIES, INCLUDING GRADE CHANGES, STORAGE OF MATERIALS OR EQUIPMENT, DUMPING, OR EXCAVATION IS PERMITTED WITHIN THIS TPZ.

THIS TREE PROTECTION BARRIER MUST REMAIN IN GOOD CONDITION AND MUST NOT BE REMOVED OR ALTERED WITHOUT THE AUTHORIZATION OF THE TOWNSHIP OF CLEARVIEW.

CONCERNS OR INQUIRIES REGARDING THIS TPZ CAN BE DIRECTED TO:
705-428-6230

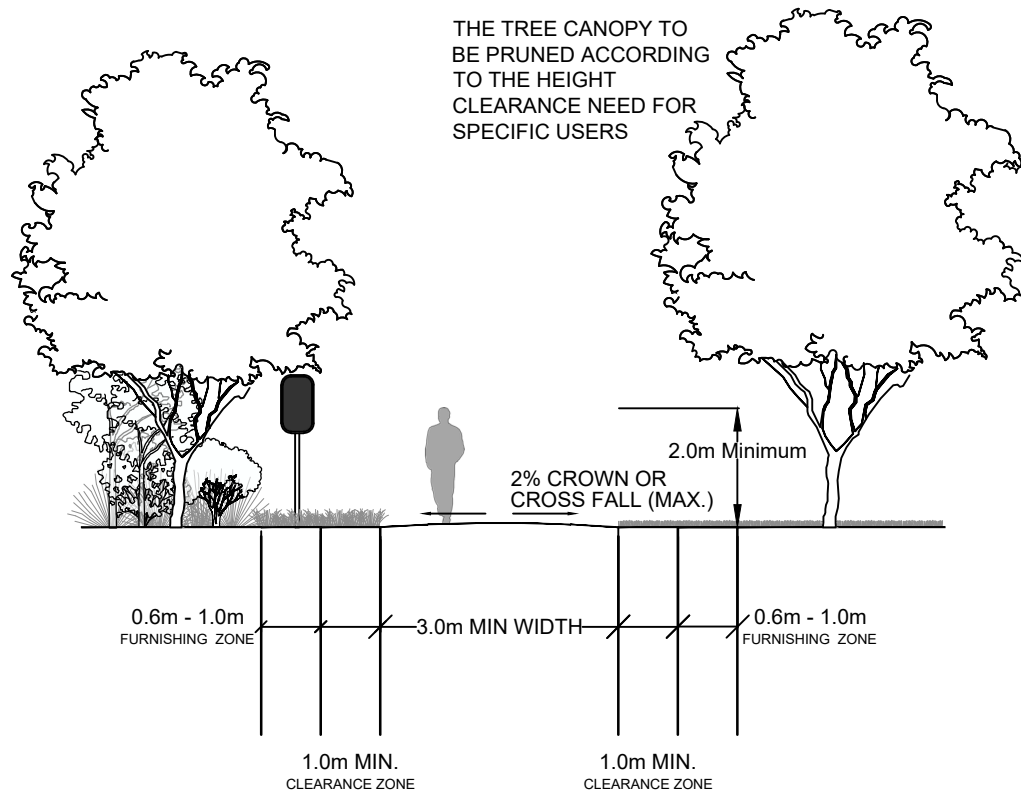


CLEARVIEW
TOWNSHIP

TOWNSHIP OF CLEARVIEW

TREE PROTECTION ZONE SIGNAGE

				Scale	Date	Dwg. No.
				N.T.S.	OCT 2025	I108
No.	Issue / Revision	Date	Auth.			



NOTES:

1. TRAILS IN RESIDENTIAL AREAS TO BE ASPHALT. GRANULAR SURFACE (LIMESTONE SCREENINGS) MAY BE ENTERTAINED IN RURAL AREAS AT TOWNSHIP DISCRETION.
2. ASPHALT TRAILS TO BE 50mm HL4, 150mm GRANULAR 'A', 250mm GRANULAR 'B'.



CLEARVIEW
TOWNSHIP

TOWNSHIP OF CLEARVIEW

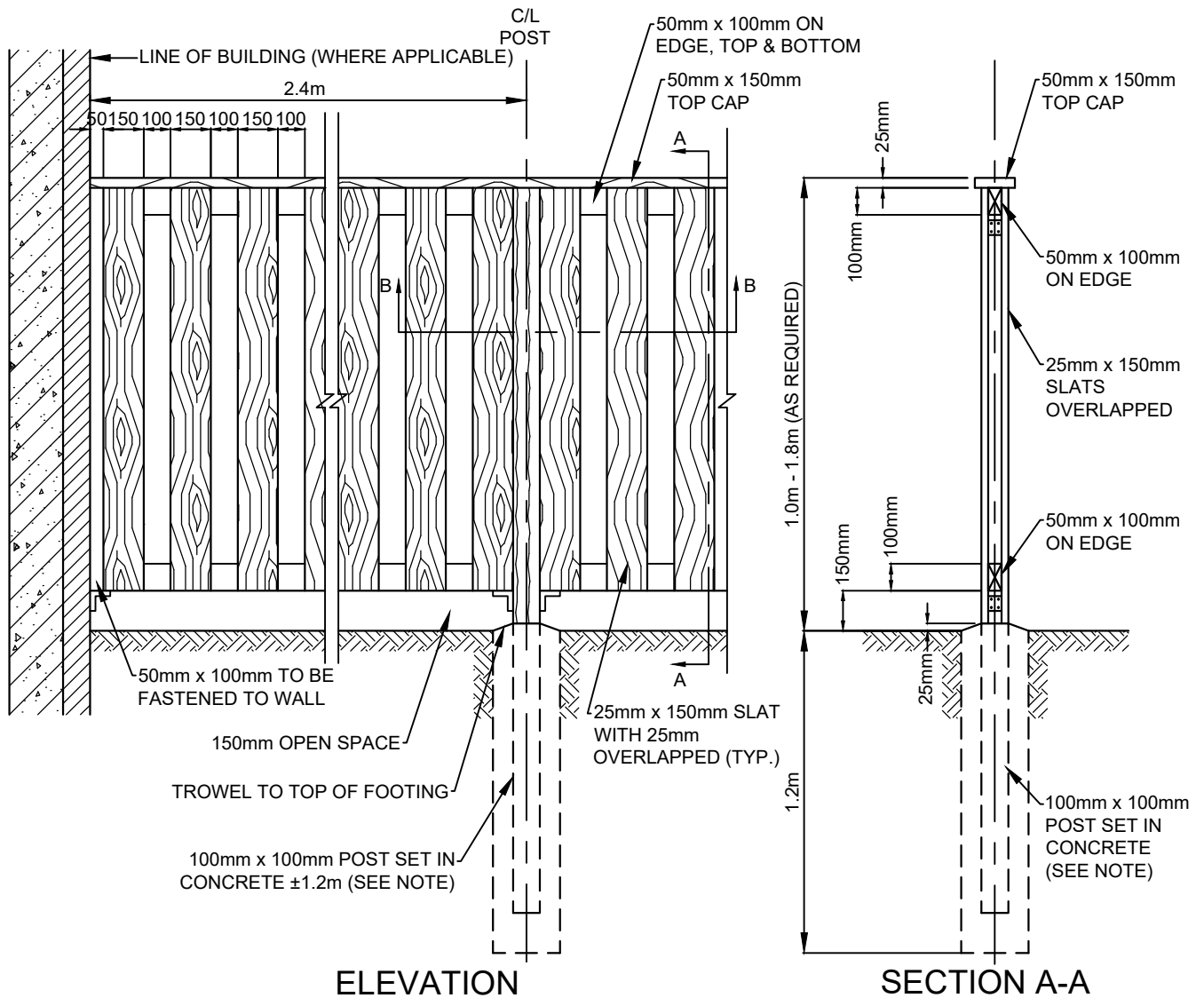
TYPICAL TRAIL CROSS SECTION

No.	Issue / Revision	Date	Auth.

Scale	N.T.S.
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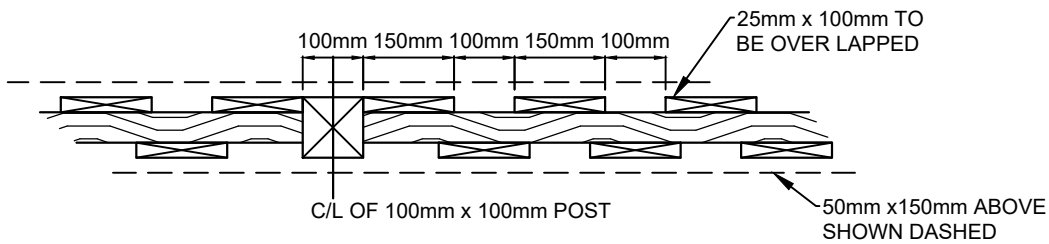
Date	OCT 2025
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Dwg. No.	I109
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ELEVATION

SECTION A-A



SECTION B-B

NOTES:

1. USE WESTERN RED CEDAR, No. 1 SELECT GRADE.
2. USE STEEL ZINC COATED TWISTED NAILS x 11 GAUGE 64mm x 76mm
3. USE GALVANIZED STEEL FENCE BRACKETS, BOLTS, AND HARDWARE.
4. ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED.
5. CONCRETE TO BE PROPORTION NORMAL DENSITY CONCRETE TO CSA A23.1, EXPOSURE CLASS C-2. MINIMUM COMPRESSIVE STRENGTH OF 32MPa AT 28 DAYS.

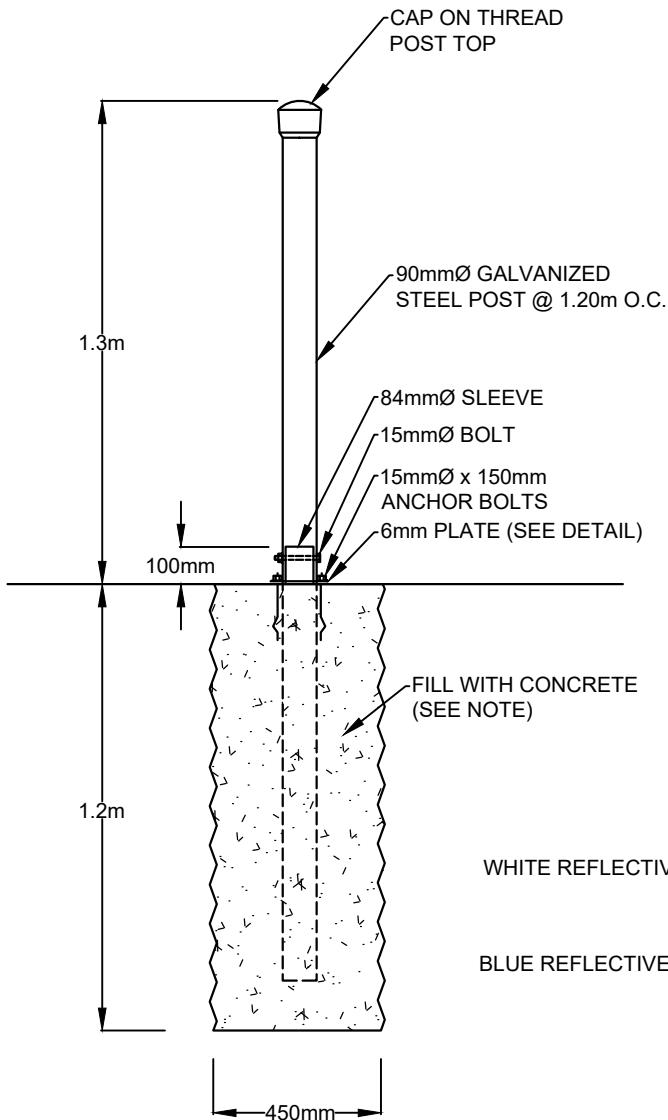


TOWNSHIP OF CLEARVIEW

WOOD PRIVACY FENCE (MINIMUM STANDARD)

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	I110



ELEVATION

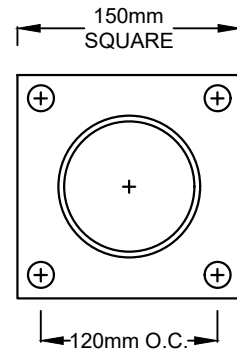
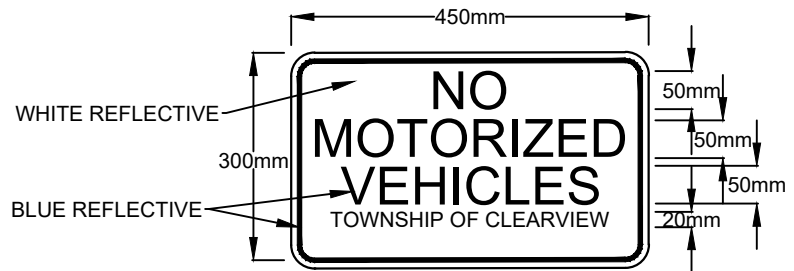


PLATE DETAIL



SIGN ON A 100mm x 100mm WOOD POST OR U-FLANGE AT MIN. 1.5m HEIGHT

SIGN

NOTES:

1. GALVANIZED STEEL POST 3.16mm (1/8") WALL THICKNESS.
2. ALL OTHER METAL TO BE PAINTED WITH GALVANIC PAINT.
3. CONCRETE TO BE PROPORTION NORMAL DENSITY CONCRETE TO CSA A23.1, EXPOSURE CLASS C-2. MINIMUM COMPRESSIVE STRENGTH OF 32MPa AT 28 DAYS.
4. LOCATION TO BE IN ACCORDANCE WITH AODA REQUIREMENTS.
5. BOLLARDS TO BE PLACED AT ENTRANCES TO TRAILS, SWM POND ACCESS, ETC TO PREVENT UNAUTHORIZED VEHICLE ENTRY.
6. CLEAR SPACE BETWEEN BOLLARDS, FENCING, OR OTHER OBSTRUCTIONS SHALL BE SUFFICIENT TO ALLOW ACCESS IN ACCORDANCE WITH AODA.



TOWNSHIP OF CLEARVIEW

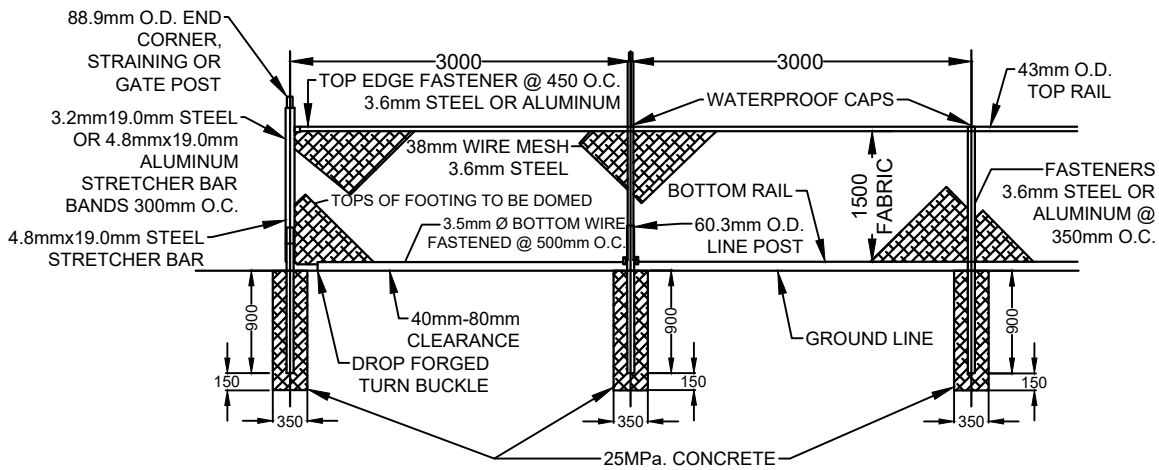
REMOVABLE BOLLARDS

No.	Issue / Revision	Date	Auth.

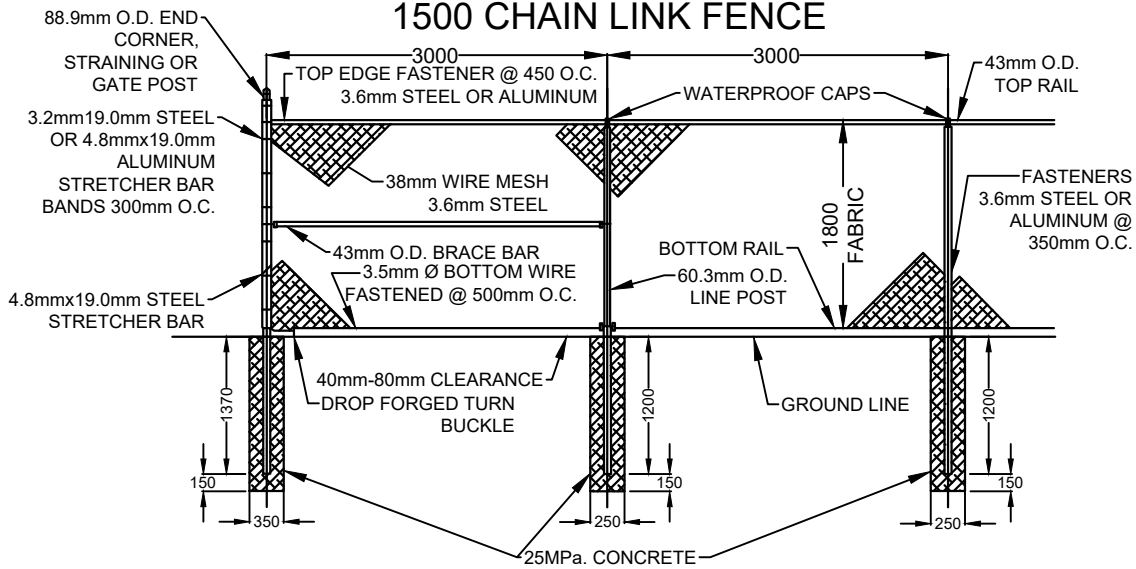
Scale	Date	Dwg. No.
N.T.S.	OCT 2025	I111

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	I111

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	I111



1500 CHAIN LINK FENCE



1800 CHAIN LINK FENCE

NOTES:

1. ALL FABRIC SHALL BE 3.6mm KNUCKLED AT TOP AND BOTTOM AND ONE OF THE FOLLOWING MATERIALS:
 - i) STEEL WIRE, HOT DIP GALVANIZED AFTER WEAVING
 - ii) STEEL WIRE, ELECTRO GALVANIZED BEFORE WEAVING
2. ALL POSTS AND RAILS SHALL BE GALVANIZED STEEL "SCHEDULE 40 PIPE", CONFORMING TO CURRENT SPECIFICATIONS FOR BLACK & HOT DIPPED ZINC COATED (GALVANIZED) WELDED AND SEAMLESS PIPE. FOR ORDINARY USES, ASTM DESIGNATION A 120.
3. ALL REQUIRED FITTINGS AND HARDWARE SHALL BE OF A SUITABLE ALUMINUM ALLOY OR OF A STEEL DUCTILE IRON. ASTM SPECIFICATIONS (A 152)
4. MINIMUM REQUIREMENTS FOR ZINC COATING

FABRIC AND WIRE	0.5 kg/m ²
POST AND RAILS	0.5 kg/m ²
FRAMES AND BRACES	0.5 kg/m ²
CAST FITTINGS	0.6 kg/m ²
OTHER FITTINGS	0.6 kg/m ²



TOWNSHIP OF CLEARVIEW

CHAINLINK FENCE

No.	Issue / Revision	Date	Auth.

Scale	Date	Dwg. No.
N.T.S.	OCT 2025	I112



Appendix A – Development Inspections and Checklists

Bridge and Culvert Inspections

Acceptance of Underground Works (Initial Acceptance) Checklist

Acceptance and Assumption Checklist

Appendix A – Development Inspections and Checklists

Table of Contents

A1.00 Bridges and Culverts..... 1
A2.00 Retaining Walls..... 1

Appendix A – Development Inspections and Checklists

A1.00 Bridges and Culverts

The Developer shall complete an inspection by a qualified professional engineer, registered in Ontario for each bridge or culvert with a span or combined span of 3.0 m or greater, within one year of the bridge or culvert installation. The inspection shall be in accordance with the Ontario Structure Inspection Manual (OSIM) and a report, including a completed OSIM form, shall be provided to the Township. The Developer shall continue to complete an OSIM inspection of each bridge or culvert every two years up until assumption is completed, as required by O. Reg. 104/97 and 472/10 and any updates to these regulations. The Developer shall provide a copy of the OSIM inspection and report immediately after completion of the inspection.

A2.00 Retaining Walls

The Developer shall complete an inspection by a qualified professional engineer, registered in Ontario for each retaining wall meeting the definition in the OSIM within one year of the wall installation. The inspection shall be in accordance with the OSIM and a report, including a completed OSIM form, shall be provided to the Township for each wall structure. The Developer shall complete an OSIM inspection of each retaining wall every two years, as required by the OSIM manual. The Developer shall provide a copy of the OSIM inspection and report, immediately after completion of the inspection.

Stand-alone retaining walls are defined as retaining walls that are not built immediately adjacent to a bridge. Stand-alone retaining walls that satisfy at least one of the following criteria shall be inspected independently and have a separate site number:

1. Average exposed wall height is greater than 1.0 m.
2. Failure of the wall would cause significant adverse effects.
 - a) Wall is located near utilities or limit of ROW.
 - b) Wall is retaining superimposed surcharge loads, i.e., roadway or pathway.
 - c) Wall is accessible to the public.

Acceptance & Assumption Checklist

Development Name: _____

Location: _____

Date : _____

Section Reference _____




Certificate of Acceptance {Start of 2 year Maintenance Period}

Municipal Assumption

Responsibility	Requiements to be Completed	Date Completed	Check
Developer / Town	Lot Grading Certification (All Lots)		
Developer / Town	SWM Facilities Cleanout and Inspection		
Developer	Certificate from Engineer certifying that all SWM related works have been completed and elevations confirmed		
Developer	constructed in accordance with the designs and circulated to NVCA		
Developer	Storm Sewer System Cleanout and Video Inspection		
Developer	Sanitary Sewer System Flushing and Video Inspection		
Developer / Town	Sanitary and Storm Structure Inspections		
Developer	Storm Pond As-Built Survey		
Developer / Town	Water Distribution System - verify all Valves, Valve Chambers, Hydrants & Services are Functional		
Developer / Town	Concrete Curb & Gutter Inspection including sidewalks		
Developer / Town	Surface Asphalt Inspection		
Developer / Town	Boulevard Inspection		
Developer / Town	Block / Buffer Inspection		
Developer / Town	Streetlight Inspected and in functional order		
Developer / Town	Fencing / Walkways / additional landscaping Inspection		
Developer / Town	Parkland / Parkland Improvements Inspection		
Developer / Town	Tree Clearing / Removals Inspection		
Developer / Town	Tree Planting Certification (1 Tree per lot) & Blvd		
Developer	Signage Inspection		
Developer / Town	Construction Debris to be removed		
Developer	Provide one light standard and fixture for every tenth pole per phase		
Developer	Correction of All Outstanding Deficiencies		
Developer	Record Drawings - Electronic (.dwg, .pdf) & 2 Hard Copies		
Developer	Surveyors Certificate		
Developer	Clearance from Canada Post		
Developer	Clearance from All Utilities		
Developer	MECP CofA - Change's as Required		
Developer	Confirmation that all Deeds are registered and deposited		
Developer	Plan of Easements and Registration of Same		
Developer	Payment of All Capital Contributions & Accounts		
Developer	Unassumed Road signs to be relocated / removed		
Developer	WSIB Clearance Certificate		
Developer	Statutory Declaration that Accounts are Paid		
Developer	Notify Utility Distribution re: hydro bills to PW		
Developer	pumping stations, & provide confirmation that all accounts are paid to date		
Developer	Replace, rectify and repair any damage or fault in the works as required		
Developer	All requirements under Section "O" under the subdivision agreement are to be fulfilled		
Developer	Quantity take off of underground and above ground infrastructure for assesst management purposes. (e.g. Water, sewer, Sani, MH, CB, sidewalk,utilities,road)		

Acceptance of Underground Works Checklist (Initial Acceptance)

Development Name:			
Location:			
Date :			
Section Reference	CONDITIONS & REQUIRMENTS FOR INITIAL ACCEPTANCE AS PER SCHEDULE N OUTLINED WITHIN THE SUBDIVISION AGREEMENT		
Requirments To Be Completed		Date Completed	Check
Pre-Servicing	Acceptance of the Pre-Servicing Certificate (if applicable)		
Watermain	Completed Testing (Swabbing, Chlorination, and Pressure Testting as per ANSI/AWWA)		
	Bacteriological Results (as per ANSI/AWWA Standards)		
	Continuity Testing Completed		
	Fire Hydrants Flow Testing/Confirmation of Adequate Fire Flow		
	Field Confirmation of All Mainline and Secondary Valves Are Operational		
	As - Built drawings for underground services shall be provided within 90 days of connection to municipal water system.		
Geotechnical	Hydrant Markers		
	Asphalt and Concrete Mix Designs		
	Asphalt and Concrete Test Results		
	Sieve Analysis (Granulars)		
Storm Water Pond	Geotechnical Summary		
	SWMP Certificate Letter (Pre-Landscaping Works)		
	Survey of SWM Pond to confirm elevations and storage volumes		
Sanitary Sewer	Manhole Visual Inspection		
	Air Testing and/or Infiltration Testing		
	Deflection Testing		
	Manhole Exfiltration Testing (water)		
	Flushing and CCTV Rectifying Any Deficiencies		
Roadway	Temporary Traffic Signs and Street Signs		
	Road Unassumed Signs		
	Completion of Curb		
Storm Sewer	Manhole and CB Visual Inspection		
	Deflection Testing		
	Flushing and CCTV		
	Certification of OGS		
Engineering Administration <small>Certification of all below and above ground infrastructure by a Professional Engineer</small>	Pre-Grading Certification Letter		
	Geotechnical Certification Letter		
	WSIB Clearance		
	Proof of Publication		
	Statutory Declaration Provided		
As-Constructed	Certificate of Substantial Performance of all underground and above ground infrastructure works		
	Pre-Grade/Fill Survey		
	As-Built Required as Per the Approved Drawings of All Works		
	Details of survey monuments constructed		
General Site	Provide Inspection Reports and All Required Digital Data		
	ESC Measures are in place		
	Light Standards Installed & Operational - Provide Certification of Lighting and Electrical		
Utilities	Subdivision is energized		
	Gas available		
	Communications available		
Site Walk	Site walk has taken place and all required deficiencies are rectified (site to be clean & clear from debris including street sweeping)		



Appendix B – Material List

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
1.0 Lighting				
Electrical Handholes	CSA	Precast concrete type complete with cover 460 mm Dia., as per OPSD 2112.02.		
Ducts	CSA C22.2, No.211.1 CSA C22.2, No.211.2 CSA Standard B137.1, Series 75 or ENT CSA C22.2, No.227.1	In boulevard, rigid PVC DB2 duct, 53 mm Dia. Below roadways, rigid PVC Thick wall duct, 53 mm Dia. Flexible duct (Polypipe) to be used for protection of cables entering the wiring aperture in the concrete poles.		
Cables		Cabling to be installed as per the Ontario Electrical Safety Code and shall be reviewed and accepted by the ESA Inspector.		

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
2.0 Poles & Arms Residential		<p>Poles shall be StressCrete, spun concrete (Octagonal). Model No. E300-BPO-G-E11 S/F 120. Poles shall be direct-bury type and shall have a height of 9.14 m above grade and 1.5 m to 2.0 m below grade. They shall be designed to support the loadings imposed by the selected luminaire and arm for the local wind conditions. Access handholes shall be oriented toward the street.</p> <p>Arms shall be StressCrete, of the following specifications: Arm to be KA120. Colour and finish of both pole and arm shall be powder coated black. 1.2 m or 1.8 m length to place luminaire at or near curblin.</p> <p>All hardware, fittings, and anchors shall be stainless steel.</p>		

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
3.0 Poles and Arms Industrial Areas				
Standard Roadway Lighting Poles	CSA A14-M1979	<p>Poles shall be StressCrete, spun concrete. Model No. E300-BPR-G-MOOS/F 120.</p> <p>Pole shall be mold finish grey. Poles shall be direct bury type and shall have a height of 9.14 m above grade and 1.5 m to 2.0 m below grade. They shall be designed to support the loadings imposed by the selected luminaire and arm for the local wind conditions. Access handholes shall be oriented toward the street.</p> <p>Arms shall be StressCrete, of the following specifications: Arm to be KA120. Colour and finish shall be natural aluminum finish to match pole. 1.2 m or 1.8 m length to place luminaire at or near curblineline.</p> <p>All hardware, fittings, and anchors shall be stainless steel.</p>	StressCrete / King Luminaire	

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
4.0 Poles & Arms Commercial Areas				
	Pole and arm style for commercial areas is to be determined in consultation with the Township.			
5.0 Luminaires				
Arterial / Industrial Roads		Standard LED Luminaires, to be complete with a bird stop and have a full cut-off distribution classification. Cobra Head” style, type II or III distribution pattern, medium cut-off, internally shielded with flat tempered glass lens and photocontrol receptacle. Colour shall be grey to match the pole and arm. LM79/LM80 Compliant. The luminaire shall contain an SPD to protect all electrical components from harmful line transient voltage surges as a result of utility line switching, lightning strikes, or other electrical supply system disturbances. The SPD shall meet a 6 kV, 3 kA	Evolve	

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
		<p>surge level and meet application and testing requirements as per ANSI/IEEE C.62.41.2 for Category C low operation and ANSI/IEEE C62.45. The SPD shall be mounted such that it is easily accessible and replaceable.</p> <p>The luminaire shall be IP 66 optics and enclosure, 3G vibration test. Luminaire should have a glass lens that will not attract dirt, withstand outdoor weather and ultraviolet stabilized with smooth outside surface.</p> <p>Warranty to be a minimum of five years. Operating voltage shall be 120 volts.</p> <p>LED with a CCT of 3000K (to be DarkSky compliant).</p> <p>Ground terminal or lug.</p> <p>Wattage to be adjustable.</p> <p>Toolless access for lamp and driver service.</p> <p>Die cast aluminum housing.</p> <p>Stainless steel hardware.</p> <p>Twist lock time delayed photocell controller.</p> <p>Exterior nameplate indicating manufacturer, catalogue number, and wattage.</p> <p>Interior label indicating LED optics position for</p>		

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
		<p>various light distributions. Interior label indicating supply voltage, frequency, input current, and lamp voltage. Interior driver label with wiring diagram.</p>		
Local and Collector Roads		<p>Standard LED Luminaries, to be complete with a bird stop and have a full cut-off distribution classification. "Cobra Head" style, type II or III distribution pattern, medium cut-off, internally shielded with flat tempered glass lens and photocontrol receptacle. Colour shall be black to match the pole and arm. The distribution pattern shall be IES Type II or III with full cutoff optics to reduce light pollution and meet Dark Sky recommendations. The luminaire shall contain a surge protection device (SPD) to protect all electrical components from harmful line transient voltage surges as a result of utility line switching, lightning strikes, or other electrical supply system disturbances. The SPD shall meet a 6 kV, 3 kA surge level and meet application and testing requirements as per</p>	Evolve	

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
		<p>ANSI/IEEE C.62.41.2 for Category C Low operation and ANSI/IEEE C62.45. The SPD shall be mounted such that it is easily accessible and replaceable.</p> <p>The luminaire shall be IP 66 optics and enclosure, 3G vibration test. Luminaire should have a glass lens that will not attract dirt, withstand outdoor weather and ultraviolet stabilized with smooth outside surface.</p> <p>Warranty to be a minimum of five years. Operating voltage shall be 120 volts.</p> <p>LED with a CCT of 3000K (to be Dark Sky compliant).</p> <p>Ground terminal or lug.</p> <p>Wattage to be adjustable.</p> <p>Toolless access for lamp and driver service.</p> <p>Die cast aluminum housing.</p> <p>Stainless steel hardware.</p> <p>Twist lock time delayed photocell controller.</p> <p>Exterior nameplate indicating manufacturer, catalogue number, and wattage.</p> <p>Interior label indicating LED optics position for various light distributions.</p>		

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
		Interior label indicating supply voltage, frequency, input current, and lamp voltage. Interior driver label with wiring diagram.		
Photoelectric Controller		Photoelectric Controller to be twist-lock type with surge protection Model ELL124CUL with electronic twist lock photo controllers with: A filtered (human eye spectral response) silicon light sensor with infrared blocking filter. 40,000 amperes (amp) 640 joules (J) metaloxide varistors (MOV) surge protection. Rated for 120 volts. Load rating: 1,000 watts (W), 1,800 voltamperes (VA) ballast. Turn on level at 16 lux and turn off at 1.5 times turn on. 10Year Warranty. Operating temperature range from 40°C to 70°C. Must be manufactured using nonhazardous materials. Must meet CSA specifications and are subject to ESA inspection and approval.		
Standard Roadway Luminaires: LED		Luminaire – Cobra Head style, Type 2 or 3 distribution pattern, rugged die cast		

Appendix B – Material List

Streetlight Electrical				
Material	Standards	Features	Manufacturer	Catalogue No.
		aluminum housing with surge and brown-out protection, LED drivers and electronic transfer switch. Temperature control by robust heat sink ensuring a minimum of 80,000 hours L70 at 40C operating ambient. Operating range from – 40 to + 50C with light engines meeting the dust and moisture rating of IP-66. Luminaire design to meet CSAC22.2 number 250 for 40C, wet location and to be ROHS compliant. Maximum total harmonic distortion to conform to ANSI C82.77 : 2002. Solid state 120 volt 60 Hz electronic drivers with extended life to 100,000 hours minimum. LED colour temperature 4000K nominal. 5-year limited warranty on LED light engine, LED drivers and all nonelectrical components.		
Commercial Site Luminaires:	Luminaires style for commercial areas is to be determined in consultation with the Township.			

Appendix B – Material List

Storm Sewer Main System				
Material	Certification	Specification	Manufacturer	Catalogue No.
1.0 Sewer Main				
PVC (300mm to 450mm)	CSA B182.2	-DR 35 -Rubber gasket in integral bell and spigot joints -Green in Colour	IPEX Royal Pipe Rehau Diamond Pipe Armtec	As per individual manufacturer
Concrete	CSA A257.2	-Rubber gasket type joints certified to CSA A257.3	OCPA Plant Prequalification Member	
PVC	CSA B182.4	-PVC Profile Pipe	NAPCO Royal Pipe & Fittings IPEX	Kor-Flo Ultra-Rib
HDPE (300mm to 600mm)	CSA B182.6-02	-320 kPa pipe stiffness -Rubber gasket in integral bell and spigot joints	Armtec Look for other suppliers	Boss Poly-Tite
SaniTite HP Pipe	CSA B182.13	-ASTM F2764, dual gaskets, compatible with INSERTA TEE connections	ADS	As per individual manufacturer
2.0 Storm Connection Tees				
PVC Sewer Main	CSA B182.2	-DR 28 -Injection molded or factory-fabricated gasketed tee	IPEX NAPCO Royal Pipe & Fittings	As per individual manufacturer
Concrete Sewer Main	CSA A257.2,3	-Factory-fabricated tee		
HDPE Sewer Main	CSA B182.6-02	-Injection molded or factory-fabricated gasketed tee		
PVC	CSA B182.4	-PVC Profile Fittings	NAPCO Royal Pipe & Fittings IPEX	Kor-Flo

Appendix B – Material List

Storm Sewer Main System				
Material	Certification	Specification	Manufacturer	Catalogue No.
3.0 Storm Service Laterals*				
PVC	CSA B182.2	*Storm Service Laterals are not generally permitted for residential properties. These specifications are for ICI only. -DR 28 -Rubber gasket in integral bell and spigot joints -White or Grey in Colour	IPEX NAPCO Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
4.0 Storm Catchbasin Leads				
Concrete	CSA A257.2	-Rubber gasket type joints certified to CSA A257.3	OCPA Plant Prequalification Member	
PVC	CSA B182.2	-DR 35 -Rubber gasket in integral bell and spigot joints	IPEX NAPCO Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
HDPE	CSA B182.6-02	-320 kPa pipe stiffness	Armtec	Boss Poly-Tite
5.0 Storm Sub-Drains				
HDPE	OPSS 1840	-210 kPa pipe stiffness -Perforated, with geo-textile sock filter	Armtec	Big "O"

Appendix B – Material List

Storm Sewer Main System				
Material	Certification	Specification	Manufacturer	Catalogue No.
6.0 Storm Maintenance Holes				
Concrete	CSA A257.4	-Rubber gasket type joints certified to CSA A257.3 -Use pre-cast concrete grade adjustment, units with Moduloc tape between layers or Self-leveling cast iron riser rings for final adjustment -Frame & grate as per OPSD 401.010 (open cover) with date cast into the cover	OCPA Plant Pre-Qualification Member	
7.0 Frames and Grates				
Cast Iron Ductile Iron	OPSS 1850	-Storm grate as per OPSD 401.010 (open cover) with date and "STORM" cast into the cover -Adjustable / Autostable Frame -C-50M-ONT -SELFLEVEL – MC401010243	Bibby-Ste-Croix Star Pipe Canada, Inc. Bibby-Ste-Croix EJ Canada	As per individual manufacturer
8.0 Storm Catchbasin				
Concrete	CSA A257.4	-Use pre-cast concrete grade adjustment units with Moduloc tape between layers -Frame & grate as per OPSD-400.020 -Rear yard catchbasin frame & grate as per OPSD-400.120 -Lifespan rubber manhole frame and cover -Lifesaver Catch basin Adjustment units	OCPA Plant Pre-Qualification Member	

Appendix B – Material List

Storm Sewer Main System				
Material	Certification	Specification	Manufacturer	Catalogue No.
9.0 Culverts				
Concrete	CSA A257.2		OCPA Plant Prequalification Member	
CSP	CSA G401	-Galvanized -Wall thickness as recommended by manufacturer for H2O loading. -Minimum wall thickness 2.0 mm for road crossing, 1.6 mm for entrance.		
HDPE	CSA B182.6- 02	-320 kPa pipe stiffness -Smooth Interior Wall	Armtec	Boss Poly-Tite
10.0 Headwall and Endwall Treatments				
Concrete		To be addressed on a case-by-case basis	OCPA Plant Prequalification Member	

Appendix B – Material List

Linear Wastewater System				
Material	Certification	Specification	Manufacturer	Catalogue No.
1.0 Sanitary Sewer Main				
PVC	CSA B182.2	-DR35 -Rubber gasket in integral bell and spigot joints	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
Concrete	CSA 257.1,2,3 (whichever applies per design), OPSS 1820	-Rubber gasket type joints certified to CSA A257.3	OCPA Plant Prequalification Member	As per individual manufacturer
2.0 Sanitary Connection Tees				
PVC	CSA B182.2	-DR28 -Injection molded or factory-fabricated gasketed tees	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
3.0 Sanitary Service Laterals				
PVC	CSA B182.2	-DR28 -Rubber gasket in integral bell and spigot joints	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
4.0 Sanitary Service Saddles				
PVC	CSA B182.2	-For use as a new service connection to an existing municipal sewer only -Township to specify type of saddle on a case-by-case basis.		As per manufacturer (varies by size)

Appendix B – Material List

Linear Wastewater System				
Material	Certification	Specification	Manufacturer	Catalogue No.
5.0 Sanitary Maintenance Holes				
Concrete	CSA A257.4	-Rubber gasket type joints certified to CSA A257.3 -"Kor-n-seal" gaskets on all pipes entering manholes	OCPA Plant Pre-qualification Member	As per individual manufacturer
6.0 Frames and Grates				
Cast Iron	OPSS 1850	-Frame & grate as per OPSD-401.010 (Closed Cover) with the date and "SANITARY" cast into the cover	Bibby-Ste-Croix Star Pipe Canada	As per individual manufacturer
7.0 Adjustment Units				
Concrete	CSA A257.4	-Pre-cast concrete grade adjustment units with Moduloc tape between layers or Self-leveling cast iron riser rings for final adjustment	OCPA Plant Prequalification Member	As per individual manufacturer
8.0 Forcemain				
PVC	CSA B137.3 AWWA C900 or, AWWA C905	-SDR26 -Colour; White	IPEX NAPCO	As per individual manufacturer
HDPE	CSA B137.0, B137.1 ASTM D3035, D3350 or CG 5 Spec. 41-GP-25M DR11 (size and class as per design)		KWH Pipe Canada Ltd	

Appendix B – Material List

Linear Wastewater System				
Material	Certification	Specification	Manufacturer	Catalogue No.
9.0 Waterproof Membrane				
Waterproof Membrane/ Petrolatum Tape	ASTM D412, ASTM E96,		Blueskin R.W. Meadows Denso	WP200 Mel-Roll
10.0 Service Abandonment Sleeve				
Service Abandonment Sleeve		Stainless Steel	Link-Pipe	As per manufacturer
11.0 Forcemain Tracer Wire				
Forcemain Tracer Wire		#12 AWG (0.0808" diameter" high strength copper clad steel conductor (HS-CCS), insulated with a 30 mm high density polyethylene (HDPE) insulation, rated for direct burial use at 30 volts	Electrical Suppliers Bren Technologies Canada Wire Copperhead Phillips Pirelli	As per manufacturer
12.0 Tracer Wire Waterproof Connector				
Tracer Wire Waterproof Connector	ASTM D1248, ASTM B910/B910M		Copperhead	Low-voltage Ace Connectors (SC-PB-01)
13.0 Tracer Wire Test Station				
Tracer Wire Test Station		Colour Coded Green	Rhino	72" RhinoDome Test Station

Appendix B – Material List

Water Distribution System				
Material	Certification	Specification	Manufacturer	Catalogue No.
1.0 Watermain				
PVC Pipe	AWWA C900 (Pipe 100mm to 300mm) AWWA C905 (Pipe ≥ 350mm) CSA B137.3	-DR18, Class 150 -Rubber gasket in integral bell and spigot joints -Colour coded "Blue" -6 m pipe length -CI OD	IPEX Royal Pipe Rehau Diamond Pipe National Pipe	As per individual manufacturer
Polyethylene	AWWA C906 CSA B137.1	-DR17, Class 100 -Thermal butt fusion joining of pipe -CI OD	KWH Pipe	As per individual manufacturer
2.0 Water Services				
Polyethylene	CSA B137.6, 137.1 AWWA C901	-High Pressure Rating minimum 200 psi.	IPEX Trinus Trinus Blue Muni	
Water Service Shut-off		Full Port Angle Meter Stop C800 or Equivalent	Cambridge Brass	
3.0 Watermain Fittings				
Ductile Iron Compact Ductile Iron	AWWA C110/A21.10 AWWA C153/A21.53 AWWA C104/A21.4 AWWA C111/A21.11	-Minimum Pressure Class 350 -Cement Mortar Lined -Mechanical joint	Sigma Bibby St. Croix Magotteax Tyler Pipe Star	As per manufacturer
PVC	AWWA C	-Blue Brute fittings (100mm to 300mm) -IPEX Centurion Fittings (350mm to 600mm) -Injection molded	IPEX	

Appendix B – Material List

Water Distribution System				
Material	Certification	Specification	Manufacturer	Catalogue No.
4.0 Watermain Valves				
Gate Valves	AWWA C509 AWWA C515 AWWA C111/A21.11	-Non-rising stem and 50 mm square operating nut -Open counter clockwise -Resilient seat gate -Epoxy coating internal and external per AWWA C550 -Mechanical joints with restrainers	Mueller Clow AVK Bibby AFC	A2360 F-6100 Series 25/00 As per manufacturer Series 65
Pressure Reducing Valves	AWWA C530	-Epoxy coating internal and external as per AWWA C116/ A21.16	Singer CLA-VAL	
Reduced Pressure Principle Back Flow Preventer	AWWA C511		Watts	#909 Series
Air Release Valve	NSF 61 AWWA C512- 07		Apco CLA-VAL A.R.I	As per manufacturer
Swing Check Valves	AWWA C508	Gravity operated, bronze or stainless-steel disc facing, stainless- steel bolts, epoxy coated interior and exterior	Muller Clow Val-Matic	As per individual manufacturer

Appendix B – Material List

Water Distribution System				
Material	Certification	Specification	Manufacturer	Catalogue No.
5.0 Fire Hydrants				
Fire Hydrant	AWWA C502 AWWA C509-01	-2 side outlets with 2.5" CSA standard hose nozzle threads -Caps painted appropriate colour to match fire flow results -1 to 4" Storz pumper nozzle outlet painted black -All hydrants are painted chrome yellow. -Breakaway flange -Self draining	Canada Valve (Mueller Co.)	Century
Hydrant Marker		-48" in height fluorescent yellow -Installed on side port	Flexstake	FH 800 Series
6.0 Valve Boxes				
		Slide Valve Box	Bibby Emco/Concord	
7.0 Flushing Hydrants				
		2" Supply Mainguard # 77 Blow Off Hydrant	Kupferle	
8.0 Joint Restraining Devices				
MJ Fitting Gland for Ductile Iron & PVC Water Main	NSF61	C153 Ductile Iron Mechanical Joint Fittings	SIGMA	
MJ Retaining Gland for Ductile Iron & PVC Water Main	NSF61	GripRing" Pipe Restrainer	Romac Industries	

Appendix B – Material List

Water Distribution System				
Material	Certification	Specification	Manufacturer	Catalogue No.
9.0 Cathodic Protection				
Cathodic Nuts and Sacrificial Caps		-99.9% high grade Zinc -Steel core -Coated with low resistant depolarizing material: 175 grams ASTM B-418-73-type II	Bren Technologies	SAP Cap
10.0 Tracer Wire				
		-12 Gauge TWU solid copper, -For splicing, use DryConn or Copperhead waterproof connector		As per manufacturer
11.0 Tie Rods (19mm)				
		-Stainless Steel		As per manufacturer
12.0 Service Boxes				
		-Steel boot only	Mueller Emco Concord Clow	
13.0 Service Box Rods				
		Stainless steel	Mueller Clow Bibby	As per manufacturer
14.0 Service Saddles				
Stainless Steel Tapping Sleeve		-See Robar 6606 Tapping Sleeve Specs.	Robar Cambridge Brass	
15.0 Main Stops				
	AWWA	Brass AWWA/ Thread Compression	CC Inlet Taper x	Mueller Cambridge Brass Ford

Appendix B – Material List

Water Distribution System				
Material	Certification	Specification	Manufacturer	Catalogue No.
16.0 Curb Stops				
Ball Style	AWWA C800	Brass Compression x Compression Non-Draining Min. 300 psi working pressure	Mueller Cambridge Brass Ford	
17.0 Couplings				
	AWWA C800	C153 Ductile Iron MJ Fittings	SIGMA	
18.0 Sampling Station				
		All working components are protected from corrosive soils by the PVC enclosure. Stainless steel waterway. Full ½" flow for a quick flush. A stainless steel ball valve for its reliable performance	D.R. Innovations Inc. "Test Tap"	

Appendix B – Material List

Transit Shelter				
Material	Certification	Specification	Manufacturer	Catalogue No.
1.0 Concrete Pad				
	OPSS.MUNI 180, OPSS.MUNI 201, OPSS.MUNI 206, OPSS.MUNI 310, OPSS.MUNI 311, OPSS.MUNI 314, OPSS.MUNI 350, OPSS.MUNI 351, OPSS.MUNI 492, OPSS.MUNI 501, OPSS.MUNI 510	Concrete pad to be a minimum pad size of 2 m x 3.5 m (6.5' x 11.5'). Concrete pad to be a minimum pad thickness of 150 mm (6.0")		
2.0 Transit Shelter				
		ADF5x10N 1.56 m x3.03 m (5'x10') Barrel Roof Shelter with Solar Light	DayTech	



Appendix C – Terms of Reference (TOR) for Studies

Traffic Impact and Functional Traffic Studies TOR

Geotechnical Study TOR

Hydrogeological Report TOR

Arborist Report and Tree Inventory and Preservation Plan TOR



Appendix C – Traffic Impact and Functional Traffic Studies TOR

Appendix C – Traffic Impact and Functional Traffic Studies TOR

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Appendix C – Traffic Impact and Functional Traffic Studies TOR

C1.00 Introduction

The main purpose of a Transportation and Traffic Impact Study (TIS) is to demonstrate that the transportation impacts of a proposed development or redevelopment will be manageable and that the transportation aspects of the proposal are consistent with the objectives of the Township. The TIS also provides the basis for the identification and evaluation of transportation-related improvements or measures to be included as conditions of approval for the development or redevelopment application. The TIS will also assess the impacts the development would have on the present and future transportation system.

The overall goals, objectives and benefits of TIS may include:

- Provide a rationale for evaluating whether the development scale is appropriate for the Site.
- Identify future localized transportation system deficiencies requiring improvement.
- Demonstrate that the site access and circulation is sufficient.
- Address transportation issues that may concern neighbouring property owners.
- Provide a basis for negotiations for the funding of improvements through the planning process.

The onus is on the Developer to retain a qualified consultant to conduct a TIS to address the transportation related issues of the development and obtain approval of the study. The TIS must be dated, signed, and sealed by a registered professional engineer in good standing in the Province of Ontario. The signing engineer is verifying that appropriate assumptions and methodologies have been utilized in the completion of the TIS and they are the individual who is taking corporate / professional responsibility for the Work. The Township has prepared these guidelines to streamline the approval process and provide a standardized framework for consultants to follow when submitting the TIS for review. The guidelines should be complemented with good transportation engineering judgment.

Appendix C – Traffic Impact and Functional Traffic Studies TOR

C2.00 General Requirements**C2.01 Need for a Traffic Impact Study**

In general, a TIS is submitted in support of any proposed development which is expected to generate a total of at least additional (new) 50 vehicle trips (combined inbound and outbound) during the adjacent roadways' peak hour or the proposed development's peak hour.

A TIS may also be required even if there are less than 50 additional vehicles during peak hours when one or more of the following conditions are anticipated or present:

- The development is located in an area of high roadway congestion and / or a high expected rate of population or employment growth.
- The access or type of operation of the development is not envisioned by local land use or transportation drawings.
- As part of the proposed development, a new traffic signal or other traffic control device(s) is proposed.
- Existing transportation issues in the local area, such as a high collision area, complex intersection geometrics, heavy traffic corridors.
- The development has the potential to create adverse operational and safety impacts on the local road network such as:
 - Inadequate horizontal or vertical sight distance at access points.
 - The proximity of the proposed access points to other existing driveways or intersections.
 - Lack of existing left or right turn lane(s) on the adjacent roadway at the proposed access points.
 - The vehicular traffic generated by the development would result in volume / capacity (V/C) ratios at a signalized intersection becoming critical (i.e., greater than 0.85 overall or for a shared through / turning movement, or greater than 0.90 for an exclusive turning movement).

C2.02 Staff Consultant and Preliminary Investigation

Before commencing a TIS for a particular site, developers or their consultants are advised to discuss with Township staff in order to review the level of detail, verify the study scope and study area, determine data requirements, and to confirm assumptions used in the analysis.

Appendix C – Traffic Impact and Functional Traffic Studies TOR

The TIS should take into account the findings of previous studies and transportation system concerns pertaining to the study area. The study should also consider traffic generated from adjacent sites with the potential for developments within the time horizon being considered in the study, including coordination with Works anticipated by such other developments.

C3.00 Traffic Impact Study Outline

The TIS should contain the sections outlined below.

C3.01 Description of the Proposed Development

This includes but is not limited to the following elements:

- Township address.
- Existing land uses or permitted use provisions in an Official Plan, Official Plan Amendments, Zoning By-law, etc.
- Existing planning studies that may impact the development, including Transportation Master Plans and Active Transportation Plans.
- Proposed land uses and relevant planning regulations to be used in the study.
- Total building size and building location.
- Floor space including a summary of each type of use / number of residential units.
- Anticipated date of occupancy.
- Approximate hours of operations.
- Planned phasing of the developments.
- The location of access points and type of access (full movement, right-in / right-out, turning movement restrictions, etc.).
- Surrounding road networks, intersections and type of controls.
- Transit stops and services.
- Bicycle and pedestrian links and facilities.
- Nearby curb parking and off-street parking.
- Nearby developments and their access points.
- Proposed internal parking arrangement and circulations.
- Internal provisions for traffic calming and speed control.

A composite site drawing of a suitable scale should be provided for consideration in the review of the TIS.

Appendix C – Traffic Impact and Functional Traffic Studies TOR

C3.02 Study Area

The study area should extend far enough from the development to contain all Township, County, or Provincial roadways that will be noticeably impacted by the site traffic. Typically, this will include the area that may be impacted as follows:

- An increase of 5% or more traffic volumes on an intersection approach.
- Volume-to-Capacity (V/C) ratios for overall intersection operations, through movements or shared through / turning movements increased to 0.85 or greater.
- V/C ratios for exclusive turning movements increase to 0.90 or greater.
- Locations where other traffic operational issues may be of concern.

The Township reserves the right to establish the study area as may be deemed necessary, including a requirement to provide sufficient traffic analysis to confirm whether the above noted parameters are met or mitigation work may be required. It is recommended to consult with Township staff prior to initiating the study.

The TIS should contain a map that identifies relevant information such as the following:

- All adjacent roads including the road classifications, number of lanes, on street bike lanes, posted speeds, traffic calming, and pedestrian crossing facilities.
- All adjacent and affected intersections including type of control, lane configurations, lane widths, and any turning or similar restrictions.
- If appropriate, on-street parking spaces, stopping restrictions, and parking meters in the vicinity of the development site and those which would affect the operation of key intersections being analyzed.
- Transit routes, stops, and terminals.
- Heavy vehicle prohibitions and restrictions.
- Other transportation facilities such as trails and walkways, etc.

Potential future transportation improvements that are currently being considered and may facilitate the traffic demand produced by the development / redevelopment should be identified. These improvements should be described to a level of detail sufficient to assess their implications for

Appendix C – Traffic Impact and Functional Traffic Studies TOR

travel to / from the development. In each case, identify the status and anticipated date of implementation.

C3.03 Horizon Years and Peak Periods**C.3.03.1 Horizon Years**

Identify horizon years for the analysis, which will be:

- The year of completion of the development.
- In general, five years after the completion of the development. For very large developments that will be phased over longer periods, a five and ten year horizon may be used.
- If the development is to be carried out in phases, impact analysis for each phase should be undertaken.
- Additional horizon years that may be required depending on the magnitude of the development, any major transportation system changes, or other planned significant land use changes.

C.3.03.2 Peak Periods

The critical time period is directly associated with the peaking characteristics of both the development related traffic and the nearby transportation system traffic. Typically, the AM and PM peak traffic period will constitute the “worst scenario” combination of site-related and background traffic.

In the case of retail, entertainment, religious, institutional, sport facility uses, or industrial uses, the Saturday, Sunday or site peak may require analysis. As part of the consultation process prior to commencing the study, the consultant should determine, in conjunction with the Township, for the selected time for the study. Seasonal traffic variations shall also be a consideration in determining the peak design period.

C3.04 Existing Traffic Conditions

The TIS should provide exhibits showing the existing traffic volumes and turning movements for roadways and intersections in the study area including pedestrian and cyclist volumes, and heavy truck movements.

Typically new traffic data will need to be collected by the proponent, unless recent counts are available from other sources. The traffic data must be based on the most recent traffic / transit counts available. The consultant should take additional traffic counts where existing data is more than two years old or where

Appendix C – Traffic Impact and Functional Traffic Studies TOR

existing data appears to be inconsistent. The additional traffic counts should be collected for a minimum of two hours during the peak period at each affected intersection. A greater duration of count may be required depending on the type of development and its peaking characteristics.

The raw data collected by the consultant should be included in the appendices of the report and should include date, time, road surface, and weather conditions. Any ongoing road constructions or detours should be identified if they affect the counts being collected.

C3.05 Background Traffic**C.3.05.1 Background Traffic**

The background traffic growth should be established in consultation with Township staff through one of the following methods:

- Estimation of roadway growth factors from a calibrated traffic forecast model.
- Regression analysis of historical traffic growth.
- A growth rate based on area transportation studies.

C.3.05.2 Other Area Developments

All significant developments under construction, approved, or in the approval process within the study area and are likely to occur within the same time horizons should be identified and recognized in the study. The land-use type and magnitude of the probable future developments in the horizon years should be identified in consultation with Township staff.

The trips that are expected to be generated by these developments should be included in the future background volumes.

C.3.05.3 Transportation Network Improvements

Changes to the present or planned transportation networks should be determined in consultation with Township staff. A realistic assessment of timing and certainty should be made. The impacts of the transportation system changes should be identified. In particular, diversions of volumes from other facilities to new or improved facilities should be estimated.

C.3.05.4 Transit Considerations

In areas with existing or potential transit services, these services should be identified and evaluated as having potential significant impact and possible changes in modal split.

Appendix C – Traffic Impact and Functional Traffic Studies TOR

C3.06 Estimate of Travel Demand

All trip generation, trip distribution, trip assignment, and modal split assumptions should be in accordance with standard / accepted techniques and be based on local parameters. Sources should be well documented and any assumptions which may be considered less than conservative must be justified.

C.3.06.1 Trip Generation

The method of determining trip generation rates should be clearly identified. Trip generation methods may include one or more of the following and will be a function of the proposed development and its intended operations:

- Trip generation surveys from similar developments in the Township or other comparable municipalities which have similar operating characteristics as the proposed development.
- Modifications should be made to the trip generation rates to account for difference in the surveyed and proposed development sites.
- ITE Trip Generation Manual (most recent edition) rates or equations, provided that difference in the site nature and size are accounted for.
- "First principles" calculations of anticipated trips to / from Site.

Where appropriate, it may be justified to reduce the base trip generation rates of the proposed development to account for:

- Redundant Land Use Trips: Trips which are generated by existing land use activity and reflected in current traffic volumes that have been collected, and which will be replaced by the proposed development. Unless otherwise accounted for, these trips are normally subtracted from the trip generation estimates on the surrounding road network but not from the calculation of the trips generated to / from the proposed accesses.
- Pass by Trips: Trips that represent intermediate stops on a trip already on the road network, e.g., a motorist stopping into a retail store on their way home from work. It should be recognized that pass by trips must be accounted for in the turning movements into / out of the Site.
- Captive market effects/"Synergy" Trips: Represents trips which are shared between two or more uses on the same site, e.g., a motorist visiting a retail store and a grocery store on the same site.

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- Travel Demand Management (TDM) strategies trips: Reductions in automobile travel to the Site to account for travel to / from the Site by public transit, walking, and cycling. No reductions in the trip generation should be made for these alternative modes if they have already been accounted for in the methods / data that has been used to forecast the vehicular trip generation.

All trip generation assumptions and adjustments assumed in the calculation of "new" vehicle trips should be supported and documented. Sensitivity analysis should be undertaken where trip generation parameters have the potential to vary considerably, and most probable values cannot be readily identified.

A table should be provided in the study report identifying the categories and quantities of land uses, with the corresponding trip generation rates or equations and the resulting number of trips. For large developments that will be phased in over time, the table should identify each significant phase separately.

C.3.06.2 Trip Distribution

The directions from which traffic will approach and depart the Site can vary depending on several location-specific factors, including:

- Size of the proposed development.
- Type of proposed development.
- Surrounding, and in some cases competing land uses, population, and employment distributions.
- Prevailing condition on the existing road network.

Trip distribution assumptions should be supported by one or more of the following:

- Transportation Tomorrow Survey (TTS) data.
- Origin-destination surveys.
- Comprehensive travel surveys.
- Proximity of adjacent employment and population centres.
- Market studies.
- Existing / anticipated travel patterns.

Engineering judgements should be used to determine the most applicable of the above methodologies for each particular application.

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C.3.06.3 Trip Assignment

Traffic assignments should consider logic routings, available and projected roadway capacities, and travel time. Traffic assignments may be estimated using a transportation planning model or “hand assignment” based on knowledge of the proposed / future road network in the study area.

The assumptions shall consider projected “pass by” trips, “diverted” trips, and internal “Synergy” trips.

C.3.06.4 Summary of Traffic Demand Forecasts

A summary of the existing and future traffic demands should be provided in the form of exhibits / illustrations that summarize the following:

- Existing traffic.
- Future background.
- Site generated traffic.
- Pass by or other diversionary traffic.
- Future total traffic (Future background plus site generated traffic).

In some cases, interim traffic conditions may need to be assessed to reflect phasing of developments, interim site access arrangements, or planned transportation system improvements.

If there are significant numbers of large trucks, buses, and recreational vehicles, a typical adjustment factor of 2.0-Passenger Car Units (PCUs) may be used to convert these vehicles to equivalent passenger cars, particularly for inputs to queuing requirements.

C3.07 Evaluation of Impacts of Site Generated Traffic

An evaluation of signalized and un-signalized intersections which will be affected by site generated traffic for all time horizons and scenarios is required and summaries are to be provided in a tabular format.

The objective should be to ensure that no new “problem” movements are created by the development and that “problem” movements which exist with the addition of site generated traffic are not worsened by this addition.

Documentation should be provided in an appendix to the traffic impact study of all assumptions used in the analysis concerning lane configuration / use, on-street parking, vehicle classification, pedestrian activity, saturated flows, traffic signal cycle length, phasing and timing, utilization of the inter-green

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phase, and other relevant parameters. Existing signal timings should be used for existing intersection and signal timing modifications / optimization may be considered as a measure to address capacity or level of service deficiencies.

Supplementary surveys or analyses may be needed to assess saturation flows, gap availability, projected queue lengths, and possible blocking queues.

C.3.07.1 Capacity Analysis at Intersections

The summary should include level-of-service including average vehicle delay and V/C ratios for overall intersection operations and individual critical movements for all analysis periods and time horizons. Full documentation of results of all levels of service analysis should be provided in an Appendix. The Township may require that a copy of the computer software model be provided for review and approval.

Analysis may be performed using the most current versions of Highway Capacity Manual (HCM) and Canadian Capacity Guide (CCG), using computer models that are currently used within the industry (e.g., Sychro, SimTraffic, Arcady, etc.).

The analysis should include the identification of signalized intersections where:

- V/C ratios for overall intersection operation, through movements or shared / turning movements increased to 0.85 or above.
- V/C ratios for exclusive movements increased to 0.90 or above.
- Queues for an individual movement are projected to exceed available turning lane storage.

Identification of un-signalized intersections where:

- Level of service (LOS) based on average delay per vehicle, on individual movements at LOS "E" or "F".
- The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

Conventional signal timing drawings should be used and all proposed adjustments to traffic signal timing, phasing, and cycle lengths should be evaluated in terms of pedestrian crossing time, effects on queue lengths, adequacy of existing storage, and effects on the existing signal coordination.

The need for a new traffic signal and / or underground provisions should be evaluated in conformance to the guidelines in "Ontario Traffic Manual – Book 12".

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C.3.07.2 Site Operations

The TIS should provide a summary of operations that may affect the ability for vehicles to circulate on-site without impacting driveways and related adjacent road operations. Site operations described in the TIS will include:

- Driveway locations and confirmation that the driveways meet Township and TAC standards.
- Parking supply and layout.
- Pedestrian and cycling facilities.
- Site circulation, drive-through requirements (if any), loading operations, access for waste vehicles, access for fire trucks, etc.

C.3.07.3 Safety Analysis

Identification of potential safety or operational issues associated with the following, as applicable:

- Weaving.
- Merging.
- Corner clearances.
- Sight distances and sight triangle / daylight triangle as per Transportation Association of Canada (TAC) standards and Township Engineering Standards.
- Vehicle-pedestrian conflicts.
- Traffic infiltrations.
- Access conflicts.
- Cyclist and pedestrian movements.
- Heavy truck movements / conflicts.
- Transit operational conflicts.
- Internal circulation, if applicable.
- Other safety issues that have been identified on a site-specific basis.

Where the proposed development is in the vicinity of an intersection or roadway with identified safety problems, existing collision data must be reviewed and an assessment of the impact of the proposed development provided.

C3.08 Access Analysis**C.3.08.1 Access Geometrics**

The number and location of access points must not adversely impact the flow of traffic along abutting roads. Access points should be located on minor roads

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where feasible and justifications for more than one access must be based on the capacity of site traffic and not design preference.

The locations should be adequately spaced from adjacent streets and driveway intersections. The number of exit lanes, radii, and vehicle parking should be appropriate to accommodate traffic demands placed on them. The throat lengths at the road should be sufficiently long to minimize conflicts with street traffic and within the Site.

Access points should be evaluated in terms of capacity, safety, and adequacy of queue storage capacity. Access points should be free of all encumbrances and provide appropriate sight distances / daylight triangles. Proposed truck loading facilities and access to these facilities should be evaluated to ensure that they are adequately sized, designed, and provided with suitable access so that they will not adversely affect operations on Township roads.

Access standards should be in conformance with those outlined in the "Geometric Design Guide for Canadian Road", 2017 edition, issued by the Transportation Association of Canada (TAC) and the Ontario Traffic Manuals.

C.3.08.2 Turn Lane Requirements

The requirements for left turn and right turn lanes should be examined. Adequate spacing should be provided between access points to avoid potential turn lane overlaps. All design standards must be in conformance with those outlined in the TAC manual and the Ontario Traffic Manuals.

Where turning lanes are warranted or proposed the length of storage and taper must be documented.

C3.09 Traffic Collision Analysis

Where the development is adjacent to an area with identified problems, existing collision data should be reviewed and an assessment of the impact of the proposed development provided. Such information may be helpful to minimize any additional problems through the design or location of access points.

C3.10 Sight Distance Evaluation

At each access and at each intersection where a new road is proposed, the sight distance requirements should be determined based on appropriate standards (TAC Manual), and the availability of sight distance determined from actual field measurements.

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C3.11 Transportation System Mitigation Measures

The physical and operational road network deficiencies identified in the TIS must be addressed and feasible solutions to mitigate these deficiencies identified. Functional design drawings or detailed design drawings may be required for identified improvements to all modes of transportation, to ensure their feasibility.

A preliminary cost estimate will be required for all identified infrastructure improvements.

C3.12 TIS Recommendations

All reasonable attempts should be made to identify transportation improvements that mitigate the development proposal such that:

- Pedestrian and cycling needs are safely accommodated.
- The capacity of transit services or facilities is sufficient to accommodate site-generated transit demand, if required.
- Site-generated traffic does not have an unmanageable adverse impact on transit operations, where available.
- TDM measures are identified that would mitigate the traffic or transit impacts from site generated travel demand.
- Traffic calming measures are proposed to ensure that safety and speed-related issues have been adequately addressed.

It is important to structure recommendations for improvements within appropriate time perspectives. Recommendations should be sensitive to the following issues:

- Timing of short-range, and long-range network improvements that are already planned and their schedules.
- Anticipated time schedule of adjacent developments.
- Size and timing of individual phases of the proposed development.
- Logical sequencing of various improvements or segments.
- ROW needs and availability of additional ROW within the appropriate time frames.
- Local priorities for transportation improvements and funding.
- Cost-effectiveness of implementation improvements at a given stage of development.
- Necessary lead-time for additional design and construction.

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C3.13 Documentation and Reporting

The following is a suggested study structure:

- Executive summary.
- Study purpose and objectives.
- Site / development description.
- Study area.
- Existing conditions.
- Analysis periods.
- Background traffic demand including existing and future background.
- Site generated traffic (tables required).
- Trip distribution and modal split.
- Traffic assignment for site generated traffic.
- Pass by trips and diverted trips.
- Total traffic demand including all trips mentioned above.
- Exhibits are required for:
 - Site Plan or Plan of subdivision.
 - Study area.
 - Existing and future background conditions.
 - Existing lane configurations.
 - Existing traffic volumes.
 - Future traffic volumes after being adjusted by annual growth rates.
 - Other new development trip distributions (if applicable).
 - Trip distribution.
 - Trip assignment for site generated trips.
 - Pass by and diverted trips (if applicable).
 - Total trips.
 - Improvement alternatives required to mitigate traffic impacts.
 - Traffic impacts for future background and total traffic with and without mitigation measures (tabular summaries).
 - Access considerations.
 - Conclusions and Recommendations.
 - Traffic reports.
 - Signal warrant analysis (if applicable).
 - Left turn lane warrant analysis (if applicable).
 - Sight distance and sight triangle / daylight triangle analysis (if applicable).

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A copy of the final TIS complete with engineer stamp and signature, supporting documentation, along with the electronic analysis traffic files should be submitted to the Township for review. The study will be forwarded to the Township's consultant for Peer Review. The cost(s) associated with that review will be the responsibility of the proponent / Developer.

C3.14 Functional Traffic Analysis (Internal to Development)

In addition to analysis of the external traffic including as part of the TIS, discussed in the above sections, an analysis of the internal traffic is also required. This can be completed as one comprehensive report provided all aspects of both external and internal traffic are covered.

The scope presented below is to be followed as part of the TIS submission during the submission review process.

The internal traffic analysis is intended to balance appropriate urban design guidelines with a detailed assessment of internal transportation and traffic geometric design including opportunities for traffic calming, off-street or driveway parking issues, signalization warrants, roadway capacity, lane configurations, boulevard requirements (i.e., snow storage and utility corridors and buy-in from utilities), transit and pedestrian requirements, vehicle decision-making criteria, and intersection vehicle sight lines, medians, and entrance features.

The list presented below is to be followed during the submission review process. It is understood that a Developer should submit drawings which adhere to current engineering standards; however, alternative road cross-sections and design standards can be brought forward for consideration, provided justification is submitted. The review process examines the details of the submission and measures and evaluates the details against the applicable standards.

A list of items is summarized below. The list begins by determining ultimate vehicle demand flows, confirms the roadway network types and classifications and ensures that the critical design elements of the road network are confirmed. The list is further complemented by items which deal with the provision of adequate parking for all land uses, proper access for major attractors and generators, and provision of a satisfactory traffic control device Plan.

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Depending upon the circumstance, additional items shall be added which address traffic calming measures and devices.

Associated with each item are specific criteria which require measurement, calculation, and / or demonstration of adherence to standards and operating parameters. The following list presents each of the items and the associated criteria. It is recognized that not all items may be applicable to all applications.

Items identified with an asterisk indicate that this item must be completed at the initial stages of submissions for Official Plan Amendments, Draft Plan, Zoning By-law Amendments, or to support Secondary Plans. All other items can be submitted at the time of subdivision application or Site Plan Approval, but it must be emphasized that adherence to proper geometric and standards must occur.

1. Road Network Layout and Design Volumes*

The built out traffic flows are to be determined on each internal road (especially collector roads) for the typical weekday AM and PM peak hours. In addition, if the development application contains a collector road which forms an intersection with a bounding arterial road the typical weekday AM and PM peak hour turning volumes must be identified. Similarly, for collector to collector road intersections within the development application, the typical weekday AM and PM peak hour turning movements must be identified. It is imperative that any associated exclusive turning lanes, particularly left turns, are provided with their ultimate storage and taper length dimensions based on TAC Criteria. It is understood that collector roads at intersections with other collector roads and arterial roads may require a ROW widening to permit the introduction of necessary vehicle turning lanes and proper sight triangles, as determined through a TIS and / or to meet the requirements set out in the Official Plan or Zoning By-law of the Township.

2. Internal Road Classification and Right-of-Way*

Standards are available from accredited associations (e.g., TAC) identifying the acceptable range of traffic flows that a type of road can satisfactorily accommodate either in 24 hours or during the weekday roadway peak hours. The road type and classification being considered must be capable of serving the traffic flow demand within the identified level.

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3. Horizontal Curves, Vertical Curves, Intersection Angles and Safe Vehicle Stopping and Turning Decision Criteria*

Acceptable standards are contained in Manuals available from the MTO, the TAC, and Institute of Transportation Engineers. All road elements are to be evaluated and made to conform to the applicable criteria. The most conservative criteria should be used where these standards differ, unless analysis can be provided to justify otherwise.

4. Intersection Spacing

Standards are available from accredited associations that identify the minimum spacing of intersections from each other. The development application must meet these minimum standards.

5. Intersection Turning Lanes, Traffic Signals, Traffic Circle, or Roundabout*

The forecast demand volumes, intersection turning movements, Level of Service / Delay and queuing requirements will dictate the appropriate traffic control device as well as the intersection lane configuration. The forecast demand volumes will be used to calculate required storage and taper lengths for any turning lanes. If a traffic signal is to be considered, then signal warrant analysis must be conducted in accordance with the requirements of Book 12 of the OTM. A neighbourhood traffic circle, mini-roundabout or full roundabout can be considered as an alternative to a traffic signal at collector road and collector road intersections.

Functional design drawings may be required to confirm the geometric requirements of intersections, with more detailed drawings provided as part of the detailed design phase.

6. Street Elbows*

Certain internal local roads may have centre line radii greater than 90 degrees in order to continue lot fabric. At these locations pavement width analysis must be conducted to ensure that opposing vehicles (automobiles, as well as an opposing automobile and emergency service vehicle) can negotiate the manoeuvre with no impacts. In addition, individual driveways must be located such that the road manoeuvring area and sidewalk is not compromised.

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7. Temporary Turn Arouds and Cul-de-Sacs*

Any proposed temporary turnaround or cul-de-sac must be capable of satisfactorily accommodating service and emergency vehicle turning capability.

8. On-street Parking*

The location of on-street parking must be done in a consultative manner with all disciplines involved in the preparation of the development application. The location of on-street parking will be guided by many factors including adjacent land uses, roadway geometrics, and traffic demand flows. It is expected on local roads that parking will be permitted on one side. It is expected that parking will be introduced in a sensitive manner on collector roads. Additional pavement on collector roads must not encourage speeding or diminish the operation of future transit. Consideration of parking bays with protected intersection conditions minimizing pedestrian walking distances are considered appropriate (indent parking).

The development application must demonstrate, through scaled drawings, that the required parking supply for residents and visitors can be achieved. On-street parking must respect vehicle sight line requirements, parking space width and length, clearance to hydrants, emergency vehicle needs, snow storage, and intersection setbacks. No portion of a vehicle parked in a driveway can protrude onto the curb or across a sidewalk.

9. Traffic Calming

Development applications must demonstrate how speeding has been addressed in design. All roadway cross-sections must consider pavement widths that are conducive to reducing vehicle speeds. On-street parking should be strategically placed such that the additional pavement does not encourage greater vehicle speeds. If necessary, traffic calming devices can be considered (in accordance with the Township's Traffic Calming Policy) excluding devices that are not acceptable to transit or emergency service vehicles. Should further traffic calming features be desired, the traffic tables, medians, and boulevard treatments can be considered. The Developer may be accountable for traffic calming needs within the maintenance and warranty period of the development.

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10. Headlight Screening

“Window Streets” or other internal roads may parallel a bounding arterial road. Vehicle headlight movements must be examined on the local road and preventative measures must be brought forth which prevent headlight glare from reaching the eye level of drivers on the bounding arterial road.

11. Service and Emergency Vehicle Circulation

All internal roads must demonstrate that the available driving surface is capable of efficiently accommodating the free flow movement of emergency and service vehicles.

12. Curb Radii

Curb radii can be introduced, which reduce vehicle speeds and benefit pedestrians. The curb radii must demonstrate to scale that sufficient capacity is provided for vehicle turning demands and that all service and emergency vehicles can efficiently negotiate turns.

13. Corner Daylighting and Sight Distances

Each intersection must be examined to verify that the clear vehicle sight lines are available to provide the required stopping sight distance, intersection turning sight distance and approach sight distance. Daylighting should be provided at the intersections to maintain acceptable sight distances. Any special circumstances must be justified.

14. Pedestrian and Accessibility Accommodation

Sidewalks must be available to serve primary pedestrian flows and in accordance with AODA and the Township’s FADS document. At curb locations grading must be provided to accommodate wheelchair movements.

15. Surface Treatments

As part of traffic calming at intersections and in an effort to accommodate major pedestrian flows, consideration may be given to providing alternative surface treatments. These surface treatments are meant to give textural and noise signals to drivers that increased awareness is necessary.

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16. Roundabout and Traffic Circles

Neighbourhood traffic circles, mini-roundabouts, or single-lane roundabouts may be considered for intersection control, depending on design requirements and constraints. Any proposed roundabout must be designed to meet forecast traffic demands as well as the turning paths required for all Township services including transit and emergency vehicles. Larger vehicles such as moving trucks should also be examined. Pedestrian cross-walks must be properly located to provide maximum visibility and safety to all users.

17. Driveway Locations

Driveways to individual properties must respect the adjacent traffic flow demands and resultant intersection lane configuration requirements. The driveway location must minimize impacts on the role and function of adjacent boundary lanes, particularly turning lanes. Consideration should be given to driveway locations where a collector road intersects with a bounding arterial road thereby reducing the impact on intersection lane functions. Driveway locations should also provide for corner clearance requirements, as well as adequate stopping sight distance and intersection sight distance.

18. Sidewalks

The placement of sidewalks must conform to Township guidelines and the standards in Book 15 of the OTM. Continuity and connectivity are imperative to providing an environment which encourages walking. Special pedestrian crossing outside of intersection locations must be examined in detail and the justification for pedestrian actuated controls brought forward.

19. Bicycle Paths and Lanes

Bicycle paths and lanes must be in conformity with the Township goals and objectives and meet the guidelines in Book 18 of the OTM. Those bicycle routes, whether lanes or paths, must be clearly identified and the appropriate geometric standards incorporated into the roadway cross-sections or where bicycles cross a roadway.

20. Transit Route Pattern

The primary transit route pattern, to serve the development application, will be identified.

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21. Bus Stop and Pedestrian Pad

Major bus stop locations along each route will be identified. At these locations, the necessary concrete pad and shelter to serve boarding and de-boarding passengers will be identified and included in the development application.

22. Development Integration

Opportunities should be examined at significant locations where adjacent land uses can provide an integration opportunity with transit. This could range from integrated shelter / building conditions to a minor pick up and drop off area in the vicinity of the bus stop.

23. Major Public Generators and Attractors – Driveway and Entrance Locations

Within the development application there could be uses such as public schools, high schools, and community centres, parks, etc. These land uses generate unique vehicle circulation and parking demands. The vehicle flow demands should be examined in the context of planning driveway and entrance locations which minimize impacts on bounding intersections and major pedestrian flows. Strategies should be provided to minimize traffic congestion and reduce the potential for safety issues developing along the roads located in the areas of these major traffic generators.

24. Major Public Generators and Attractors – On-street Parking Assessment

Many of these generators are also located next to parks. The bounding road network should be examined to determine if on-street parking can serve multiple parking demands. How the on-street parking is incorporated with the roadway cross-section should be examined in detail. However, creating a continuous widening of the asphalt surface area is discouraged, due to the potential to increase vehicle speeds.

25. Major Public Generators and Attractors – Traffic Device Plan for Entrances
Providing Direct Access

An appropriate traffic control device Plan is to be provided to maintain safe access to land uses that generate significant traffic demands from the public. The accommodation of pedestrian flows must also be identified.

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26. Traffic Control Device Plan

The development application must provide the definition and location of all traffic control devices to be installed.



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C1.00 Introduction

Geotechnical studies are required for the design and construction of Township roads and all developments including site drawings. The need and scope for this study will be decided by the Township. If the proposed development is revised, the study / report shall reflect the revisions by an updated report and/or letter from the author indicating the changes and whether the recommendations and conclusions are the same (Note: this is subject to the extent of the revisions).

The detailed design of any infiltration facilities will be based on site-specific percolation tests. The number of tests will be dependent on the size of the facility and the different types of soils conditions found within the proposed facility footprint zone of influence.

Additional studies such as slope stability studies or investigations may be required if the proposed work involves or is influenced by the existing presence or proposed construction of a slope or watercourse. If the proposed work is within areas regulated by NVCA, slope stability studies must also meet NVCA geotechnical engineering and design submission requirements for slope stability studies.

In addition to a geotechnical study, a hydrological study is required.

A geotechnical study is an objective, science-based, subsurface investigation study, prepared by a qualified expert (geotechnical engineer / consultant) that analyses soil and bedrock composition to determine its structural stability and its ability to accommodate development.

The report provides recommendations for construction including but not limited to earthworks, drainage works, landscaping, sewers, and other below-grade utilities, road, and pavement design to ensure that Works constructed by others are built to Township and other applicable standards.

The study will be used to guide the design and construction of buildings, Township roads, and services as well as to determine feasibility for infiltration of groundwater, if it is part of the proposal.

The geotechnical study and drawings shall be prepared and stamped by a professional engineer licensed in the province of Ontario and has suitable experience in the field of geoscience.

The geotechnical study is required to provide an assessment of whether there may be significant challenges in the conceptual designs, land requirements,

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detailed design, and construction stages of a development and to supplement Stormwater Management (SWM) Reports.

C2.00 Geotechnical Study Scope (Minimum Requirements)**C2.01 Introduction**

- Address of the subject property.
- General site location of the subject property.
- Project name (if applicable).
- Developer and Owner's contact information.
- Author name, title, qualifications, company name, and appropriate stamp.
- Brief description of the proposed development.
- Overview of the study area.
- Purpose of the study.
- Location and context map.

C2.02 Proposal Description and Context

- A description of the proposal, development statistics (such as number of units, site area) type of development proposed, building height, parking areas, access points, location of amenity areas, and proposed phasing.
- A description of the existing on-site conditions as well as surrounding areas, roads, natural areas, buildings, and parking areas.
- Concept Drawing for the development including building location, parking, access, amenity areas, grading and natural features, and any natural hazards.

C2.03 Investigation / Evaluation**C.2.03.1 Identification of Subsurface Conditions Including:**

- Geologic setting.
- Soil, bedrock (if required), and groundwater characteristics. Note that confirmation of the seasonal high groundwater levels (HGWLs) are to be completed in the wet seasons, and through ongoing monitoring of water levels.
- Locations of investigation on-site and servicing drawings for the proposed development.
- Factors of safety, feasibility, and risk assessment.

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C2.04 Impacts and Mitigation Measures

- Discuss the suitability of the site's soils for the proposed development and its planned structures, proposed Township roadways, and infrastructure or grading alterations.
- Provide a rationale for any recommendations of soil excavation, importing of soil materials, trenching, or backfilling.
- Identify recommended construction methods and materials, including those related to backfilling and the placement of fill materials.
- Provide recommendations on foundation design and construction based on the Site's subsurface conditions.
- Provide recommendations on surface treatments including granular base and asphalt composition for Township and private roads, parking lots, driveways, etc. This is to include new areas as well as areas that require restoration.
- Provide recommendations related to SWMFs, infiltration, and pond liners.
- recommendations for the site's drainage, considering pre-construction, during, and post-construction conditions.
- Mitigation measures and monitoring programs where necessary.
- Recommendations regarding below-grade watertight structure(s) and / or requirement of Environmental Compliance Approval (ECA) from MECP, where applicable.
- Other items as applicable per the specific site conditions and what is being proposed.

C2.05 Recommendations

- Summary and conclusions of the studies and how they support the development and any special considerations or conditions that should be imposed.
- Any recommendations or conditions that should form part of a decision on a particular matter.

C2.06 Drawings and Supporting Information

- Concept drawings.
- Location and context map.
- Borehole location maps.
- Borehole logs.
- Groundwater monitoring information in chart form.



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C1.00 Introduction

A Hydrogeological Report is a review of the subsurface hydrogeological conditions to identify development suitability, constraints, and mitigation measures to be implemented.

A Hydrogeological Report must be completed by a licensed, professional geoscientist or exempted engineer as set out in the *Professional Geoscientist Act* and Professional Engineers of Ontario. All reports and drawings must be stamped, signed, and dated by a qualified professional, licensed in the province of Ontario.

If the proposed development is revised, the study / report shall reflect the revisions by an updated report and/or letter from the author indicating the changes and whether or not the recommendations and conclusions are the same (Note: this is subject to the extent of the revisions).

The study area should include the land surface area covering the largest possible area of influence that could result from the proposed groundwater taking. This may include potential influences on water levels, flow direction, and water quality.

The level of detail required in the hydrogeological report is normally expected to align with the level of risk posed by the groundwater taking, and level of uncertainty of the available information.

C1.01 Required by Legislation**The following regulations apply:**

Ontario Water Resources Act, R.S.O., 1990, c. O.40

For Environmental Activity and Sector Registry:

Environmental Protection Act (Part II.2)

Ontario Regulation 245/11 (Part II.2 – General)

Ontario Regulation 63/16

For Permits to Take Water:

Ontario Regulation 387/04

Ontario Water Resources Act, (Sections 34 and 98)

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For Source Water Protection:*Clean Water Act*

Ontario Regulation 284/07

C2.00 Hydrogeological Report Scope (Minimum Requirements)

- Groundwater occurrence (unconfined and confined aquifers, aquitards, water table depth) and associated subsurface geology.
- Surface water / groundwater interactions.
- Groundwater infiltration or recharge, when water balances are required.
- Groundwater baseflow and discharge.
- Seasonal groundwater elevations and groundwater flow direction.
- Availability of groundwater to support individual wells (if required) in accordance with MECP Guideline D-5-5.
- Groundwater quality.
- Groundwater impacts from use of individual on-site sewage systems in accordance with MECP Guideline D-5-4 (if required).
- Temporary and / or permanent dewatering volumes, discharge locations, and zone of influence.
- Dewatering impacts, including contaminant migration and impacts to existing and proposed private water wells (quality and quantity), and surface water features.
- Mitigation measures and monitoring requirements of dewatering impacts.
- Dewatering impacts to building foundations and road structural stability (potential settlement) associated with dewatering.
- Evaluate dewatering and development impacts on the Township drinking water sources (if applicable).
- Identify potential impacts to groundwater discharge which supports cold-water fisheries, if required.
- Compliance with applicable requirements from the MECP, for Permits to Take Water or Environmental Activity and Sector Registry.

The review area shall encompass the land area covering the largest possible zone of influence that could result from the proposed groundwater taking and / or source of contamination.

Appendix C – Hydrogeological Report TOR

C3.00 Hydrogeological Report Contents (Minimum Requirements)**C3.01 Introduction**

- Address of the subject property.
- General site location of the subject property.
- Project name (if applicable).
- Developer and Owner's contact information.
- Author name, title, qualifications, company name, and appropriate stamp.
- Brief description of the proposed development.
- Overview of the study area.
- Purpose of the study.
- Location and context map.

C3.02 Proposal Description and Context

- A description of the proposal, development statistics (such as number of units, site area), type of development proposed, building height, parking areas, access points, location of amenity areas, proposed phasing.
- A description of the existing hydrogeological conditions on the Site and within a 500 m study area as well as surrounding areas, roads, natural areas, buildings, and parking areas.
- Concept Drawing for the development including building location, parking, access, amenity areas, grading and natural features, and any natural hazards.

C3.03 Minimum Investigation / Evaluation

- Include a description of existing regional and local geology and hydrogeology including surficial and bedrock geology, lithology, and hydrostratigraphic units.
- Include a description of topography and drainage (surface water features and functions), physiography, existing land use, and soils.
- Overlap of the Site and / or the study area with regulated area(s) from NVCA.
- Use test pits / boreholes to establish local geology and prepare test pits / boreholes logs that include water table elevations and lithology.
- Install enough monitoring wells to establish groundwater flow direction, vertical gradients, and groundwater quality.
- Complete single well response tests or pumping test(s) to establish hydraulic conductivity.

Appendix C – Hydrogeological Report TOR

- Plot the location of water wells within 500 m of the Site using data from the MECP water well database and complete private well surveys (as required).
- Confirm aquifer properties, groundwater levels (including areas of flowing artesian conditions), groundwater flow direction(s), hydraulic conductivity, and calculate vertical and / or horizontal gradients.
- Collect sufficient samples to establish pre-development groundwater quality.
- Complete water quantity and quality testing in compliance with Township Sewer Use By-law (as required) and MECP Guideline D-5-5 (Water Supply).
- Identify Source Protection Plan (SWPP) policies and vulnerable areas pertaining to the development.
- Identify Ecologically Significant Groundwater Recharge Areas.
- Complete water balance for sites as required by SWPPs (i.e., sites located within Wellhead Protection Area (WHPA)).
- Complete infiltration testing for locations where LIDs are being considered and rely on design guidance for LIDs.

C3.04 Impacts and Potential Short / Long-term Impact Assessment

- Assess potential impacts to groundwater levels / groundwater flow.
- Establish seasonally / historically high groundwater levels (HGWLs).
- Complete four-season monitoring using automatic water level recorders (AWLRs).
- Assess surface water system, other groundwater users, and land stability.
- Quantify potential impacts to groundwater recharge, baseflow, and discharge to natural heritage features.
- Identify potential impacts to water supply wells.
- Identify potential impacts to settlement of existing structures.
- Calculate pre-development and post-development water balance with and without mitigation.
- Complete nitrate and phosphorous impact assessment in accordance with MECP Guideline D-5-4 (On-site Sewage Systems).
- Address Source Water Protection: WHPA, Highly Vulnerable Aquifer (HVA), Significant Groundwater Recharge Areas, Creation of a Transport Pathway, Significant Drinking Water Threats, Existing Conditions / Issues.
- Quantity and quality of an aquifer used for drinking water supply.
- Temporary and permanent dewatering, if required.
- Contaminant migration flowing conditions, if required.

Appendix C – Hydrogeological Report TOR

C3.05 Mitigation Measures and Monitoring Plan for Dewatering (if Required)**C.3.05.1** If Required, the Plan Needs to Identify Methods to:

- Mitigate impacts to infiltration / recharge.
- Mitigate impacts associated with groundwater quality.
- Conduct Groundwater Quantity Monitoring Program, for discharge evaluation.
- Assess temporary dewatering needs.
- Eliminate or reduce permanent dewatering needs.
- Design and implement Contingency Plans for dewatering, quantity, and quality concerns.
- Install sentry wells within Township boundaries to assess and monitor impacts associated with dewatering to private / public wells, as applicable.
- Carry out a ground settlement monitoring program during dewatering.
- Conduct surface water quality monitoring (as required).
- Monitor groundwater and / or surface water level fluctuations associated with dewatering activities.
- Monitor groundwater dewatering volumes for compliance with Environmental Activity and Sector Registry / Permits to Take Water or requirements from NVCA and MECP.
- Use engineering measures to reduce / eliminate dewatering volumes (e.g., waterproofing, soldier piles and lagging, caisson walls, sinking shafts, etc.).
- Plan for pre-treating water before discharge in the storm sewer system (as required).

If it has been determined that there will be a negative impact to the natural environment, Township's sewage works, or the land stability because of groundwater taking and discharging, the review shall identify the following:

- The extent of the negative impact.
- Details of the existing or pre-construction state of all the infrastructure, Township sewage works, and natural environment within the affected zone.
- The proposed mitigation and monitoring Plan.

If any potential settlement due to dewatering activities is identified, the Developer will be required to submit a pre-construction survey (including photos) and CCTV of any Township infrastructure identified in the hydrogeology report as potentially susceptible to settlement due to the dewatering activities.

Appendix C – Hydrogeological Report TOR

If a proposed mitigation Plan is recommended, subsequently, a follow-up report is required confirming that the affected zone has been returned to its pre-development / existing conditions prior to the groundwater taking and discharge.

C3.06 Recommendations

- Proposal of actions to support the development and any special considerations or conditions that should be imposed.
- Any recommendations or conditions that should form part of the development approval.

C3.07 Drawings and Supporting Information

- Figures supporting the narrative in a report.
- Results of MECP water well records' search.
- Results of water well surveys.
- Borehole logs.
- Hydrogeological cross-sections.
- Groundwater and / or surface water monitoring results.
- Automatic Water Level Recorders (AWLR) plots.
- Results of pumping test analysis and / or single-well response test analysis.
- Laboratory certificates of analysis.
- Dewatering spreadsheets.
- Drawings supporting the application.
- Infiltration test analysis.
- Settlement analysis reports.
- Water balance calculations (as required).
- Correspondence with NVCA or MECP (as required).



**Appendix C – Arborist Report and Tree Inventory and
Preservation Plan TOR**

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Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

C1.00 Introduction

An Arborist Report and Tree Inventory and Preservation Plan are technical reports and drawings that present detailed information on existing tree and vegetation on and around the proposed development site. It determines the potential effects of the proposed development on existing trees and vegetation on and around the Site and seeks to minimize injury and loss of trees and vegetation and propose restoration / replanting solutions to maintain and enhance the Township's tree canopy.

Trees and woodlands throughout our community are an essential component of our urban infrastructure contributing to a high quality of life. All trees and woodlands, whether on public or private land, represent the urban forest. Collectively, they help make our community healthy and resilient in countless ways including cleaning the air and water, reducing flood risk, conserving energy, counteracting urban heat stress, and increasing property value. The Township works to protect trees in our community's urban forest which are important for our quality of life today and for the future. Development applications are required to provide an Arborist Report and Tree Inventory and Preservation Plans prepared by an arborist to identify and provide recommendations for retention or removal of trees, which are reviewed as part of the development process.

The studies must be completed by a certified arborist who is either:

- A full member in good standing, of the Ontario Professional Foresters Association (OPFA).
- A full member in good standing, of the American Society of Consulting Arborists (ASCA).
- A full member in good standing, of the International Society of Arboriculture (ISA).
- A landscape architect certified and in good standing, by the Ontario Association of Landscape Architects (OALA).
- A registered professional forester (RPF) as defined by the *Professional Foresters Act* S.O. 2000.

An Arborist Report, Tree Inventory and Preservation Plan may be required as part of the following applications:

- Official Plan Amendment.
- Zoning By-law Amendment.
- Draft Plan of Subdivision

Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

- Draft Plan of Condominium.
- Site Plan Control.
- Consent Applications.
- Minor variances.
- Site Alteration Permit.

An Arborist Report, Tree Inventory and Preservation Plan are required to:

- Demonstrate conformity to any applicable by-laws or Official Plan policies.
- Provide a basis on which to assess the proposed application with regard to tree preservation / protection issues and the overall contribution to the urban forest canopy cover.
- Confirm whether any Species at Risk are located on the Site.
- Ensure replacement plantings are provided, which are required when a tree 20 cm DBH or greater has been removed. The location of the replacement plantings must be shown on the drawing in accordance with the ratios outlined in the table below:

Table 1: Replacement Plantings Ratios

DBH of Trees to be Removed	# of Replacement Trees Required
0 to 19 cm	0
20 to 30 cm	1
31 to 40 cm	2
41 to 50 cm	3
51 to 100 cm	4
>100 cm	5

C2.00 Arborist Report

An Arborist Report shall contain, at a minimum the following information:

C2.01 Introduction

- Address of the property.
- General site location of the subject property.
- Project name (if applicable).
- Developer and Owner's contact information.
- Author name, title, qualifications, company name, and appropriate stamp.

Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

- The assignment of the professional(s) and their obligation throughout the entire project period.
- Brief description of the proposed development.
- Overview of the study area.
- Purpose of the study.
- Location and context map.
- Date of preparation / submission / site visit.

C2.02 Proposal Description and Context

- A description of the proposal, development stats (such as number of units, site area) type of development proposed, building height, parking areas, access points, location of amenity areas, proposed phasing.
- A description of the existing on-site conditions as well as surrounding areas, roads, natural areas, buildings, parking areas.
- A description of the proposed development during construction and post development that may have an impact on the trees/vegetation including the area of development, and units, servicing, SWM, roads, parkland areas, recreational uses, lighting, site remediation, grading, and filling for the subject and adjacent lands.
- A Concept Plan for the development including building location, parking, access, amenity areas, grading and natural features, and any natural hazards.

C2.03 Investigation / Evaluation**C.2.03.1 Vegetation Inventory**

- A description of the site vegetation and condition at the time of inspection including the private property, Township property, and adjacent properties that may be impacted by the development.
- Identification of any species at risk.
- A photo log of the Site showing site conditions.
- Descriptions of the tree(s) identified on the Tree Inventory and Preservation Plan (linked to the drawing and the corresponding tree identification numbers and tags) in a table format as shown below including: species (common and botanical name), size (DBH), health (a general rating of Poor, Fair, or Good based on tree age, presence of disease, canopy structure, proportion of live wood, etc.), condition (a general rating of Poor, Fair, or Good based on the presence of cavities, decay, broken limbs / trunk, lean, root damage, form, etc.), hazard rating, ownership, and recommendation to preserve, remove, transplant, or injure.

Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

C2.04 Impacts and Mitigation Measures

- Trees proposed to be removed, retained, or transplanted and the reason for each recommendation.
- A discussion of the rationale for proposed tree removal or retention.
- Information to address tree protection measures for all retained trees.
- A detailed tree protection methodology section to address those particular conditions where the proposed development will have an impact on the health and structural integrity of the trees, which conform to, or are consistent with Township Details and Specifications.

Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

Table 2: Tree Descriptions / Identifications

Tree ID	Species Common Name	Species Botanical Name	Size (DBH)	Condition Rating	Hazard Rating	Ownership	Recommendation
						Subject Site	Remove
						Township	Preserve
						Neighbour	Injure

Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

C2.05 Recommendations

- Recommendation as to whether each tree or grouping of trees identified on the drawing should be preserved, removed, or transplanted and the reason for each recommendation.
- Recommendations and methods for the containment and removal of any invasive species found.
- Identification of any potential and imminent hazard tree(s)
- Proposed tree replacement and other recommendations including the size and species of replacement trees.
- Recommendations for the maintenance and management of trees to be preserved (i.e., required pruning, fertilization, or cable work).
- A cost valuation associated with trees to be removed and / or preserved may be required.

C3.00 Tree Inventory and Preservation Plan

A Large format drawing, typically at a metric 1:500 scale, visually displaying the information presented in the Arborist Report and other relevant information within the report including:

- The surveyed location of all the tree(s) on the subject property and within 6 m of the subject property on adjacent properties.
- Tree identification numbers.
- An indication as to whether the tree(s) is / are recommended for preservation, transplant, or removal.
- Tree protection zone (TPZ) limits for all trees, which must be in accordance with the table below or as specified by the Arborist:

Table 3: Tree Protection Zone (TPZ) Limits

Trunk Diameter DBH	Minimum Protection Distance Required*
<10 cm	1.8 m
11 to 40 cm	2.4 m
41 to 50 cm	3.0 m
51 to 60 cm	3.6 m
61 to 70 cm	4.2 m
71 to 80 cm	4.8 m

Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

Trunk Diameter DBH	Minimum Protection Distance Required*
81 to 90 cm	5.4 m
91 to 100 cm	6.0 m

*The TPZ is measured as a radius from the edge of the tree trunk and is dependent on DBH measured as the diameter of the trunk 1.4 m above the ground.

- The location of tree protection fencing.
- An outline of the proposed development including grade changes, structures, and work areas / zones associated with the application.
- Location of topsoil stockpiles.
- The Township's detail(s) of tree protection barrier type.
- Storage and staging areas including the construction access route.
- The drip lines of vegetated areas (as delineated by NVCA when in regulated areas).
- Qualified Tree Consultant's contact information.
- Township address of the subject property.
- Key map (approximate scale of 1:10,000) in the top right corner of the drawing indicating the location of the Site in relation to a larger area (at least one major intersection should be visible).
- Working scale of the drawing (i.e., metric scale between 1:200 and 1:1,000).
- Complete legend / key plan.
- Date of preparation / submission / site visit.
- The Site Servicing and Grading Drawing that may accompany some applications must include the existing and proposed grades.

The scope of the Arborist Report, Tree Inventory and Preservation Plan will be confirmed as part of the pre-consultation process. No activity shall proceed onsite until a full evaluation of the existing vegetation and recommendations are determined and an approved drawing for development has been processed or reached a satisfactory stage.

Developers should be aware of the County and local tree by-laws, policies, and guidelines.

Boundary trees shall be evaluated on a site-by-site basis and, where injury or removal is proposed, written consent is required from the neighbouring boundary tree owner as per the *Ontario Forestry Act*.

Appendix C – Arborist Report and Tree Inventory and Preservation Plan TOR

If the proposed development is revised, the Arborist Report and Tree Inventory and Preservation Plan shall reflect the revisions by providing an updated report and/or letter from the author indicating the changes to recommendations and conclusions.

If the submitted study is incomplete, is authored by an unqualified individual, or does not contain adequate analysis, the application(s) will be considered incomplete and returned to the Developer.



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Appendix D – Site Plan Design Requirements for Private Developments

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Appendix D – Site Plan Design Requirements for Private Developments

D1.00 Site Plan Requirements

The Site Plan Application process is administered by the Planning Department in accordance with the *Planning Act* R.S.O 1990, c. P.13 and the Township Site Plan Control By-law. For details on the Site Plan Application process, please contact the Planning Department.

This document is to serve as a guide to explain the expected deliverables for the reports, studies, and drawings that have been requested for a Site Plan Application. This guide is for Owners, Developers, Architects, Engineers, and Planners when submitting a Site Plan Application to the Township.

It is highly recommended that the Developer retain the services of a single qualified agent such as a professional planner to administer and control the site plan process on the Developer's behalf.

Depending on the location of the development, other permits may be required from external agencies. The onus is on the Developer to obtain approval from other external agencies such as, but not limited to the NVCA, NEC, HydroOne, Epcor, Bell, Rogers, Enbridge, County of Simcoe, MTO, MECP, MNRF, and DFO prior to undertaking any site work (tree removals, pre-grading, etc.).

Where a specific item is not addressed or there is a discrepancy within this document, the Developer should refer to the Township of Clearview Engineering Standards. Notwithstanding the requirements in this Appendix, the requirements of the Township of Clearview Official Plan and Zoning By-law that are more restrictive shall prevail.

The following items are engineering requirements applied to the development or redevelopment of a site. These requirements are to be read in conjunction with the Township of Clearview Engineering Standards, the Site Plan Application, and pre-consultation package that are available at the Township Planning Department.

D2.00 Submission Requirements

A complete package shall be submitted with all required documents. Partial or incomplete submissions **will not be accepted** and will be returned to the Developer without a review.

Appendix D – Site Plan Design Requirements for Private Developments

D2.01 Reports

All Reports are to be prepared by the applicable, qualified professional (Planner, Engineer, Architect, Landscape Architect, etc.)

The relevant studies that are applicable to each application shall be confirmed through the pre-consultation process in accordance with the provisions of the Township Official Plan and the Pre-consultation and Completeness By-law. Such documentation is to include (as applicable), but shall not be limited to, copies of the following reports, unless waived by the Township Public Works Department:

- D-Series Study.
- Functional Servicing Report.
- Geotechnical / Soil Stability Report.
- Hydrogeological Study / Hydrology Study.
- Planning Justification Report.
- Stormwater Management Report.
- Source Water Protection Land Use Assessment.
- Natural Hazards Study.
- Environmental Impact Statement.
- Environmental Site Assessment.
- Noise Impact Analysis.
- Vibration Monitoring Report.
- Traffic Impact Study.
- Parking Justification Study.
- Tree Inventory, Assessment, and Preservation Report.
- Excess Soils Management Plan.
- Standalone Operation and Maintenance Manual.
- Security Estimate.
- Pre-condition Survey.

D2.02 Drawings

All drawings are to be prepared by the appropriate, qualified professional (Planner, Engineer, Architect, Landscape Architect, etc.)

All drawings shall be in **metric** and drawn to scale (a metric scale of 1:200 or 1:250 is recommended) and shall include a key plan showing the property location (1:10,000).

All drawings shall be based on a plan of survey prepared by an Ontario Land Surveyor and must include a complete legal description, all property bearings and

Appendix D – Site Plan Design Requirements for Private Developments

dimensions, geodetic data, location of benchmarks (geodetic benchmarks required, NAD83 UTM 17), easements, north arrow, and a detailed title block showing the Developer's name, the person / firm that prepared the drawing and the date (including a revision box.)

All Site Plan and building design must include accessibility requirements in conformance with the OBC and the AODA.

The relevant drawings that are applicable to each application shall be confirmed through the pre-consultation process, in accordance with the provisions of the Township Official Plan and the Pre-consultation and Completeness By-law. Such documentation is to include (as applicable), but shall not be limited to, copies of the following drawings, unless waived by the Township Public Works Department:

- Cover Sheet, complete with the following information:
 - Development name.
 - Key plan showing site location.
 - Developer and consultant's information.
 - Drawing index.
 - Submission number.
- Site Plan.
- Erosion & Sediment Control (ESC) Drawing.
- Site Servicing Drawing.
- Stormwater Facility Design Drawing and Details.
- Plan / Profile.
- Overall Grading Drawing.
- Landscape Drawing.
- Composite Utility Drawing (including any external upgrades required to support the development).
- Lighting / Illumination Drawing.
- Pavement Markings and Signage Drawing.
- Details and Notes Drawing.
- Building elevations.
- Floor Plan, Roof Plan.
- Legal survey.
- Record Drawings (Existing Record Drawings, if any, that were used as a basis for design).

Appendix D – Site Plan Design Requirements for Private Developments

D3.00 Report Requirements

The following outlines a high-level scope for the reports required for a Site Plan submission. The Developer's Engineer shall determine additional scope items needed based on the site and proposed development. For minor site plans and amendments, the below reports may be submitted as "Briefs", or, as one fulsome report including all the items below. Consultation with the Township is required to confirm if full standalone reports, briefs, or one fulsome report is acceptable, based on the scope of work proposed.

D3.01 Functional Servicing Report

A professional engineer shall prepare a report demonstrating the appropriate services exist to support the proposed development. This report must be presented in a readable, comprehensive, and professional manner. The FSR shall at a minimum address the proposed servicing of the development, with regard to water supply and distribution, sanitary capacity and sewage collection, storm drainage and stormwater management (SWM), and roads, including a review of the existing infrastructure to confirm whether they are sufficiently sized to accommodate the proposed development. The report shall review the existing infrastructure capacity, condition, location, and connection details. The report shall describe the proposed infrastructure design, sizing, and location.

Water and Sanitary calculations including fire flows calculations (using the most current version of the FUS for the worst-case scenario) will be required as part of this report and shall include flow and pressure requirements for sprinkler systems, if these are being specified. If on-site fire storage is proposed, include sizing calculations and tank design details and cross-sections.

This report shall also include the provision of utilities such as telecommunications, natural gas, and hydro distribution, etc. This report shall identify any improvements to existing infrastructure which may be required to service the proposed development.

A calculation shall be provided that equates the water demand into equivalent Single Detached Equivalents (SDEs). This calculation shall be based on a per SDE 'maximum day' water usage as per Section D of the Township of Clearview Engineering Standards.

The report shall demonstrate how any applicable external areas will be accommodated by the proposed infrastructure.

Appendix D – Site Plan Design Requirements for Private Developments

The method of disposal of sewage shall be demonstrated, including calculations and size of on-site sewage systems or sanitary lateral. Include dimensions of offsets to on-site sewage system from wells, buildings, etc. as required. Include sizing calculations for the sanitary lateral to confirm it is sized appropriately.

Private infrastructure is to be tested to municipal standards and per the applicable OPSS. This is to be stated in the reports and on the drawings. Storm sewer testing to include CCTV and flushing of all pipes and CB leads. Sanitary sewer testing to include (but not limited to) CCTV and flushing of all pipes and laterals, low pressure air, and water testing of the MHs to confirm no infiltration.

This report shall be stamped and signed by a licensed professional engineer.

A digital copy of the FSR is to be submitted.

D3.02 Stormwater Management Report

A professional engineer shall prepare a report detailing the modeling, design, and features of the proposed Stormwater Management (SWM) System. The Stormwater Report is to provide system performance data for the 5-year to 100-year (and Regional where applicable) design storms and must include scale drawings showing delineated drainage catchment areas, delineated surface ponding limits for the 100-year design storms (where applicable), major system overland flow route and a schematic diagram reflecting the model (complex models).

Stormwater quantity controls are required to control to pre-development conditions. The SWM design shall include consideration of external areas and convey drainage to an adequate outlet. Blocking external drainage and / or causing ponding on adjacent properties is not permitted. Drawings must be provided with sufficient contours to demonstrate any external contributing drainage. On-site stormwater quality control is to be provided. Quality control shall follow the requirements set out in the most current Township CLI-ECA document and following the NVCA guidelines.

Water balance calculations are to be provided and follow the requirements set out in the most current Township CLI-ECA document.

If the existing ditches / storm sewers are to be the outlet for drainage, calculations are to be provided to confirm they are sized appropriately to accommodate the flow, including any external drainage areas. If the existing

Appendix D – Site Plan Design Requirements for Private Developments

ditches / storm sewer do not have capacity for the drainage, a design shall be proposed, in consultation with the Township.

Erosion and Sediment Controls (ESCs) are to be detailed in the SWM report and on drawings to ensure the surrounding properties and ditches / storm sewer are not contaminated by sediment during and after site construction. Controls to include (but not limited to) silt fence, mud mat, rock check dams, erosion protection, etc. Include phasing details and Township's Standard Notes for ESC, as well as including all applicable detail drawings.

When a natural drainage channel passes through and is affected by the site development, in consultation with the NVCA, drawings must be submitted to indicate the location and typical cross-sections of the existing channel or any proposed changes. The Developer is to check with the Township and the NVCA to determine the current status of master copies of flood mapping models before proceeding with storm drainage planning or design.

All proposed stormwater controls shall be in accordance with the Township, Road Authority (County of Simcoe and / or MTO), the NVCA, and NEC requirements, and their assessment and approval of the design is required.

For further details on SWM, please see Section C of the Township of Clearview Engineering Standards.

D3.03 Geotechnical Report

A soils investigation and report are required. This report shall provide calculations and recommendations for slope stability, pipe bedding, trench backfill requirements, engineered fill requirements, building foundations, retaining walls, soil corrosivity, infiltration rates for percolation, removal and management of excess soil in accordance with O. Reg. 406/19, etc., as necessary. The report shall include recommendations on seasonal high groundwater levels including recommendations of separation from underside of slab, infiltration, road base and asphalt recommendations, and heavy duty and light duty pavement (where required), etc.

The report is to be stamped and signed by a licensed professional engineer or professional geoscientist.

For further details on Geotechnical Reports, please see Appendix C of the Township of Clearview Engineering Standards.

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D3.04 Excess Soils Management Plan

If applicable to the site development, a Qualified Person shall be required to prepare a report to include soil sampling results, volumes of soils to be moved off-site, the planned accepting site of the soils, how the soil will be tracked, and all other pertinent information in accordance with the requirements of O. Reg. 406/19 (or the latest revision thereof).

D3.05 Hydrogeology Report

A Hydrogeological Report shall be conducted by a qualified professional engineer and / or geoscientist to characterize the groundwater regime from a site specific and area perspective in order to address issues related to impacts to existing wells, soil permeability and associated properties, groundwater impact assessment to area aquifers from construction activities and / or discharge of wastewater, impacts to nearby surface water bodies, and specific review of wellhead capture zones.

For internal or external road and servicing construction the report should consider the depth of services and identify areas where dewatering may be required, the rate of dewatering, requirements for dewatering, permits, and the strategy to achieve the required groundwater levels. Where applicable the report shall also provide an assessment of the use of sump pumps for building design.

For further details on Hydrogeology Reports, please see Appendix C of the Township of Clearview Engineering Standards.

D3.06 Traffic Impact Study (TIS)

The purpose of the TIS is to examine the impact of traffic generated by a new use at its access and at nearby intersections and interchanges and determine necessary road improvements. The TIS will be used to support the development's internal parking lot layout and access locations. Impact assessment is to relate to current and future traffic volumes and the level of improvement required. The need for and content of a TIS shall be determined in consultation with the Township's Public Works Department.

For further details on TIS Reports, please see Appendix C of the Township of Clearview Engineering Standards.

D3.07 Parking Justification Study

This report is required to support a deficit in parking provided in comparison to the parking spots required per Planning Requirements.

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D3.08 Phase 1 Environmental Site Assessment (ESA)

An ESA shall be completed. If required, a Phase 1 ESA shall be undertaken by a “qualified person” as defined in O. Reg. 153/04 (or the latest revision thereof) and a report shall be completed in accordance with the requirements set out in the same regulation as well as the guidelines published by the CSA.

D3.09 Environmental Impact Study (EIS)

An EIS shall be prepared by a qualified professional and will assess any potential impact of the proposed project upon the natural environment including but not limited to, wetlands, woodlots, and natural habitats for threatened and / or endangered species. The study shall also characterize the impact and make recommendations for mitigation, if necessary.

D3.10 Noise Impact Study

All industrial and commercial developments and any development adjacent to or within close proximity to residential dwellings or in any location determined to be sensitive by the Township, shall be required to conduct a noise impact analysis to demonstrate compliance with MECP guidelines. The study shall also make recommendations for mitigation, if necessary.

D3.11 Standalone Operations and Maintenance (O&M) Manual

An O&M manual is required to detail the requirements for ongoing short and long term maintenance of the Site. This manual shall be registered on title and address maintenance of all aspects of the Site.

For further details on the O and M Manual, please see Appendix E of the Township of Clearview Engineering Standards.

D3.12 Security Estimate

Securities shall be based on the submitted construction cost estimate, as detailed in the Site Plan Control By-law. This estimate shall reflect current unit prices and quantities and shall include all Works to be constructed. These shall include at a minimum:

- General Items (i.e., site trailer, traffic control, etc.).
- Siteworks, grading, and ESCs.
- Stormwater facilities.
- Watermain, sanitary, and stormwater servicing, testing, and commissioning.

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- Roads (including granular, asphalt, curbs, sidewalks).
- Streetlighting / Parking Lot Lighting and Utilities.
- Landscaping (vegetation, benches, bicycle racks, etc.).
- Contingency Allowance (10%).
- HST (13%).

The value of securities shall be as per the Agreements. However, in general, the requirements are as follows:

Table 1: Value of Securities

Development / Agreement Type	Internal Works Secured	External Works Secured
Site Plan	25%	110%

Please refer to the Development Agreements for details on security release and associated requirements and process. The security estimate shall be separated into internal and external works.

D3.13 Pre-condition Survey

The Developer shall undertake a pre-condition survey where existing public or private structures are located in the determined zone of influence related to vibrations, dewatering, or other construction activities.

D3.14 Any Other Report

Any Report authorized by the Township of Clearview Official Plan that may be applicable to the development such as; Tree Inventory, Assessment and Preservation Report, Archaeological Study, Flood Plain Analysis, and Vibration Monitoring Report.

D4.00 Drawing Requirements

D4.01 General

The Developer shall retain a qualified professional engineer to prepare all engineering drawings and to supervise the construction of all engineering services. The consulting engineer shall act as the Developer's representative in all matters pertaining to the design and construction of the services in the development. A declaration (located in Appendix G of Township Engineering Standards) from the Developer is required at the time of application showing that the consulting engineer has been retained to design and supervise the

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construction of the proposed development. Where a question arises over the requirements for professional design, the decision of the Township shall prevail.

All drawings shall be submitted with **metric** dimensions, be drawn in black and white, to a standard scale (1:50, 1:100, 1:200, 1:250, 1:500, etc.) and submitted on standard ARCH D (610 mm x 914 mm) sheets.

All drawings to include:

- Title block and revision block.
- Identification of the proposed use of the Site (Development Name).
- Name and address of firm preparing the Site Plan.
- Name of Developer.
- Municipal address and legal description (Reference Plan, Lot, Concession, and Registered Plan Lot Number).
- Metric scale.
- Key Plan indicating general location of the development in respect to the Township street network.
- Benchmark data used (geodetic) described and labeled on the drawing.
- Contour lines and / or spot elevations referenced to the Benchmark.
- North arrow.
- Legend.

The duties of the Developer's consulting engineer to include, but not be limited to the following:

- Prepare the designs in accordance with the Engineering Standards of the Township and Ontario Provincial Standard Specifications and Drawings.
- Prepare and furnish all required drawings in accordance with the Engineering Standards of the Township.
- Obtain all necessary approvals from the MECP, the NVCA, County of Simcoe, and any other government or regulatory agency, as required.
- Provide the field layout of the external works including the utilities and certify the quality of the required testing of the external works.
- Act as the Developer's representative in all matters pertaining to the construction.
- Provide coordination and scheduling to comply with the timing provisions of the Site Plan Agreement and the requirements of the Township, for all external works specified in the Agreement.

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D4.02 Cover Page and Drawing Index

Showing: the development name, Township development number, Key Plan showing the development location relative to the nearby arterial roads, Developer and consultant information, drawing index, and revision number are to be provided with the bound set of drawings.

D4.03 Site Plan

All Site Plans must demonstrate conformity with the requirements of the Township's Zoning By-law, Integrated Accessibility Standard under the AODA, the OBC, and any other applicable law in effect at the time of submission.

All existing site conditions must be shown on the Site Plan, including, but not limited to the following:

- Boundary dimensions, property lines, and area of the Site.
- Boulevard and road features (i.e., curbs, landscaping, trees, utilities, sewers, MHs, watermains and valves, hydrants, ditches, sidewalks, etc.).
- Location of all buildings and structures indicating all building dimensions, setbacks, separations, projections, canopies, ground signs, retaining walls, etc.
- Location and width of existing walkways, driveways, drive-through, parking and loading areas, width of all streets abutting the Site, street widenings, curbs, sidewalks.
- 0.3 m reserves, ROWs, easements, road widenings and daylighting.
- Existing natural features – vegetation, watercourses, wetlands, steep slopes, etc.
- Abutting land uses, structures, and features.
- Location of existing sanitary sewers, watermains, storm sewers, and their applicable appurtenances.

All proposed features must be shown on the Site Plan, including, but not limited to the following:

- Location and dimensions of all proposed buildings and structures.
- Location and dimensions of all proposed driveways / access points / drive-through queue length.
- Location, dimension, and type of all parking and loading areas (i.e., surface, garage, deck, underground). Indicating any areas to be assigned to visitors, tenants, employees, and accessible parking.
- Location and nature of all landscape areas including walkways, sidewalks, courts, walls, fences, entrance features, etc.

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- Location and size of any signs and lighting thereof (Note: all signs must be designed / installed in accordance with the Township's Sign By-law in effect at the time of submission).
- Location and direction of exterior lighting.
- Location and type of garbage enclosure.
- Locations and type of signage and line painting.
- Location of sanitary sewers, watermains, storm sewers, stormwater facilities, and their applicable appurtenances.
- Snow storage areas.
- Loading spaces, driveways, walkways.
- Sight triangles and boundary fencing.

The following development statistics in chart form must be shown on the Site Plan. The Developer is to confirm with Township Planning staff if any other information is required:

- Zoning of the Site – the Standards required by the zone and those provided (i.e., site area, density, frontage, setbacks, parking / loading, etc.)
- Building type, number of floors, total number of units, and height.
- Total gross floor area of both the existing and the proposed buildings.
- Area and percentage of the Site (i) covered by buildings (lot coverage), (ii) paved, and (iii) landscaped.
- Snow storage areas required and provided.

D4.04 Landscaping Drawing

Landscape Drawings shall be in accordance with the requirements of the Zoning By-law. Drawings shall include but not be limited to, the following information:

- Location and identification of all proposed plant materials (using symbols and letters).
- A planting list, showing the botanical and common name, size, height, spread, spacing, condition, quantity, or other pertinent information.
- Identification of any planting beds and existing trees to be preserved or transplanted; all proposed site furniture such as benches, bollards, tree grates, light standards, picnic tables, bike racks, etc. noted on the Drawing and details provided.
- Existing trees / shrubs by type and size – identify which vegetation is to be preserved (vegetation to be removed should be indicated by a hatched line).

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- Location, type, size, spacing, and number of new plantings where substantial landscaping is proposed, include a plant materials list showing the name, size, and quantity of all new plantings.
- Location, type, and size of all planters.
- Location, dimensions, and construction materials for all sidewalks, walkways, fences, acoustic fences, walls, ramps, stairs, patios, decks, and similar features.
- Location and dimensions of all recreational facilities and amenity areas.
- When planning the landscape features, the following considerations should be incorporated into the layout:
 - Appropriate plant species for appropriate zone hardiness and for areas prone to salting and snow loading, sunny or shade areas, wet or dry soils, and acid or alkaline soils.
 - Landscape buffer strips and fencing in accordance with the Zoning Bylaw
 - Decorative planting schemes along the street frontages.
 - Shade trees planting adjacent to parking areas and within parking islands.
 - Shrub massing to soften fence lines and to add relief to asphalt surfacing.
 - Sufficient area for snow storage.
 - Planting schemes should emphasize the use of native species.

In preparing a landscape drawing, landscape design considerations must achieve the fundamental objective to provide an aesthetically pleasing view of the subject development from the street. Parking lots, for example have a significant impact on both the aesthetic qualities and functional elements of a development. As such, landscape drawings must attempt to break up the monotony of paved surfaces, define internal driveways for traffic movement versus parking, and screen headlights from abutting areas.

The use of specialty paving within pedestrian areas is encouraged to define crossing points, arrival and entrance areas, and amenity spaces. Such paving shall complement the architectural style and façade treatments of proposed buildings.

Large projects shall also provide for pedestrian connections within the Site itself, as well as from external locations. Walkways and sidewalks must take into account car overhangs, trees, signage, bike racks, benches, etc.

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D4.05 Grading Drawing

Where applicable, lot grading is to be in accordance with the approved overall subdivision lot grading plan. The Site Grading Drawing shall include, but not be limited to the following information; spot elevations at all locations where the grade changes on the Site; retaining wall information; all swale and berm information; proposed elevations on all CB grates and MH covers; elevations at all building corners, underside of footing elevation, basement slab and finished first floor elevation (F.F.E.), 100-year ponding limit and access points (i.e., ramps, entrances, and loading bays); the existing elevations at 15.0 m and 30.0 m beyond the site limits (where possible); elevations in driveways and parking lots to show drainage patterns.

The Grading Drawing shall show the following information:

- Existing and proposed external grades including centreline of road (at 20m intervals), edge of asphalt, edge of boulevard, top and bottom of ditches / swales, curbs, top of grate or MH, inverts, etc., and existing grades at 20 m intervals along all existing streets bounding the property.
- A legend indicating all drawing information and symbology.
- Contours at 0.5 m intervals to indicate the existing elevations of the Site. These contours are to extend to a minimum distance of 15 m beyond the property limits to indicate the grading and drainage patterns of the adjacent lands. As an alternate to contours, spot elevations may be noted on the drawings to illustrate existing conditions, provided that these elevations were obtained from field survey on a regular grid pattern with the interval not to exceed 15 m.
- Cross-sections as required to clarify the proposed grading, particularly in relation to adjacent lands.
- Proposed elevations on paved areas, around proposed buildings, along swales, along roadways, parking areas, driveways, CB rim elevations, and any other elevations necessary to establish the grading and drainage patterns for the development. Arrows to be used to indicate direction of the surface drainage.
- All building elevations to be established and referenced to a "Finished First Floor" or a "Finished Entrance Floor" elevation, and a "Finished Basement Floor" elevation.
- A typical roadway cross-section to indicate the pavement and granular base design.
- The location, grades (top, bottom, gutter), and detail of all curbs.

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- The location of embankments, retaining walls, stairs, play areas, swimming pools, etc.

D4.06 Site Servicing Drawing

The Site Servicing Drawing shall include, but not be limited to, the following information; location of all existing municipal infrastructure (i.e., watermain, sanitary sewer, storm sewer, CBs, MHs, streetlights, traffic controls, sidewalk, signs, fences, trees, or landscaping, etc.); all future local improvement works agreed to within the Site Plan Agreement; location of all proposed servicing (i.e., watermain, sanitary sewer, storm sewer, MHs, CBs, light standards, traffic controls, etc.); all details of any service connections to the Township infrastructure including methods and materials; all utility services.

The following information **must** be shown on the servicing Drawing:

- Existing and proposed contours and / or spot elevations, geodetic benchmarks and elevations on-site (at all grade changes and intervals no greater than 10.0 m over the entire site) and on abutting roads and properties.
- Existing and proposed grades and ground floor elevations, including:
 - The first floor building elevations, together with underside of footings, basement floors / underside of slab and top of foundation wall.
 - The proposed finished ground grades (use spot elevations) sufficient to show all surface drainage, including elevations, gradients, and cross-sections of ditches and swales.
- Existing and proposed utilities and services on and adjacent to the Site, including:
 - Sanitary sewers, storm sewers, MHs, CBs, waterlines, ditches and swales, electrical system, driveway, culverts, etc.
 - Type, size, slope, class, and CSA standards for all pipes.
 - Locations and size of any septic systems, tile beds, soak away systems, holding tanks, wells, etc.
 - Location and size of meter rooms, transformers, vault valves, Siamese connections, etc.
 - Top of grate and invert elevations of all MHs and CBs.
- Show existing and proposed roads, driveways, and curbs including:
 - Type of and thickness of the surfacing material.
 - Traffic circulation, traffic signs, curbs, and line painting.
 - Drive-through location, complete with sign locations and minimum queue length.

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- Proposed road widenings, daylight triangles, or any other related dedications or easements.
- Proposed SWM quantity and quality control structures, together with construction and permanent erosion and siltation control structures.

D4.07 Electrical Services, Lighting Drawing, and Photometric Drawing

- The design of all site and parking lot illumination must be in accordance with the Illuminating Engineering Society of Canada (IESNA) National Standard Practice for Lighting (latest version).
- Luminaires shall be Light Emitting Diode (LED) technology. The design engineer is to provide the luminaire manufacturer's recommendation for selection of the Light Loss Factor (LLF) value for design. For LED technology, the LLF is expected to be between 0.8 and 0.9.
- Illumination Drawings are to show the location and design of all exterior lighting, including lighting specifications and photometrics.
- All exterior lighting shall be adequate for the Site and directed inward and down into the Site. Lighting shall be designed to be DarkSky compliant, avoid causing ambient light pollution, and not have lighting encroach onto adjacent properties. Lighting design and photometric analysis demonstrates that all lighting levels are zero at the property line and 10 m onto adjacent properties. All lights to be DarkSky compliant and this shall be noted on the drawings.
- The Electrical Services Drawing shall be prepared by a qualified electrical consultant. The Drawing shall show all details, specifications, and notes of the electrical distribution system and the street and parking lot lighting systems. All hydro lines are to be located underground, unless expressly approved by the Township.

The following details are to be included in the drawing submission:

- A summary table of the site lighting statistics based on the photometric analysis and comparison to the required standards noted below. The table is also to confirm the LLF used in the calculations.
- A detail drawing and specification sheet of the selected luminaires, light poles, and pole base foundations proposed for the Site. Note that all luminaires shall be of LED technology, classified as Fully Cut-off and designated as "DarkSky Compliant" as determined by the International DarkSky Association, with no up-light characteristics.

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D4.08 Architectural Elevations Drawings

The Architectural Elevation Drawings shall include, but not be limited to, the following information; the massing and conceptual design of the proposed building; the relationship of the proposed building to adjacent buildings, streets, and exterior areas; the character, scale, appearance, and design features of buildings, and their sustainable design; the elevations of all sides of all main and accessory buildings, showing all roof structures (penthouses, chimneys, roof top units, vents, air conditioning, etc.) with metric measurements.

The building drawings must show the exterior walls of the proposed buildings in sufficient detail to indicate the following:

- Design concept of the building and exterior building materials.
- Entrances, doors, arcades, any recesses, projections, or special features.
- Finished grade, floor, and roof elevations.
- Proposed fascia, signs, lights, equipment, and equipment housings.

D4.09 Drainage Area Drawing

- A Drawing shall be prepared to a scale of 1:1,000 or 1:2,000, dependent upon the size of the watershed area, to show the nature of the drainage of the lands surrounding the development site, and to show all external drainage areas that are contributory to the drainage system for the development.
- The external drainage areas shall be divided into smaller tributary areas, and the area and location to which the tributary area is considered in the design shall be clearly shown.
- The Drawing shall clearly show all existing contours used to justify the limits of the external drainage areas.
- In lieu of precise information on development or any part of a contributing drainage area, the latest Zoning By-law and Official Plan issued by the Township of Clearview shall be used to determine the land uses. These land uses shall be used to determine the correct values of the run-off parameters for all contributing external areas in the design..
- An internal storm drainage Drawing shall be prepared to a scale of 1:200 and shall include all roads, laneways, lots, blocks, and other lands within the development.
- The proposed storm sewer system shall be shown on this Drawing with all MHs numbered consecutively from the outlet.
- MHs shall be the tributary points in the design, and the area contributing to each MH shall be clearly outlined on this Drawing.

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- The area, in hectares, of each contributing area (to the nearest hundredth) and the run-off parameter used, shall be shown in a circle located within the contributing area.
- In cases where areas of different run-off parameters may be tributary to the same MH, the areas and the parameters shall be separately indicated on the Drawing.
- SWM techniques, including water budget assessments and the use of LID techniques shall be employed over all sites in accordance with requirements identified under Section C of the Township of Clearview Engineering Standards, subject to the Township's approval.

D4.10 Erosion and Sediment Control (ESC) Drawing

Showing temporary ESC measures to be implemented on the Site, including topsoil stockpile location and siltation control pond location, refer to Section C of the Township of Clearview Engineering Standards for additional information required on the Drawing. Temporary construction access location and details to be provided on this Drawing.

D4.11 Tree Inventory and Preservation Drawing

The Tree Inventory / Preservation Drawing shall include, but not be limited to, the following information; a detailed inventory of all existing trees, significant shrubs or hedgerows, natural features, etc., with exact surveyed locations; location of tree protection fencing around trees and vegetation to be preserved.

D4.12 Pavement Marking and Signage Drawing

- Include all on-site traffic control, parking signs, and pavement markings.
- The drawing is to reflect the findings and recommendations of the TIS and a Parking Study and show any measures to address potential impacts on adjacent roads, site access, and vehicle and pedestrian movements around the Site including underground parking garages.
- Large vehicle turning movements (fire, delivery, garbage trucks, and snow plowing equipment) shall be identified on this Drawing.
- All signage, with details of each sign used.

D4.13 Construction Management Plan (CMP)

A CMP shall be prepared to ensure that construction operations on and adjacent to the proposed development minimizes impact to adjacent public and private

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lands at all times. The CMP shall include the following as required by the individual development:

- Central coordinating contact and tracking for all community complaints and respective responses.
- Trades communication and enforcement plan.
- Construction phasing limits if applicable.
- Site access / egress details including location, dimensions, and structure makeup.
- Temporary construction fencing location and details to ensure site security at all times during construction.
- Site office, material storage and staging areas, trades parking areas, delivery areas, and concrete truck washout area.
- Traffic Protection Plan for vehicular and pedestrian traffic in accordance with OTM Book 7.
- Construction working hours and noise restrictions per applicable Township By-laws.
- Debris / garbage / typical housekeeping requirements of Site.
- Municipal road cleaning / dust control requirements.
- Site deliveries, material removal, and constructed traffic queuing.
- Importation and exportation of fill or surplus material.
- Crane operations if applicable.
- Impact mitigation plan for residents affected by off-site servicing.
- Signage and site security.

D5.00 Design Requirements

D5.01 External Works

Installation of external works may be required within the municipal ROW as a result of a proposed development. The Works may include items such as the installation of municipal infrastructure (i.e., watermains, sanitary sewers, pump stations, storm sewers), traffic control devices (i.e., traffic signals), sidewalks and curbs, turning lanes, etc.

Depending on the scope and magnitude of the Works, the Township may wish to manage the design, tendering, and inspection of Works on the public ROW, at the Developer's cost. If the Township chooses not to manage the Works themselves, the Developer shall appoint a qualified professional engineer,

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acceptable to the Township, to design, administer, and provide full time inspection for the external works.

Contact Public Works for the Approved Contractor List for Contractors permitted to complete work in a public ROW in the Township of Clearview.

D5.02 Site Grading Design

Grading design shall meet the requirements of Section G of the Township of Clearview Engineering Standards unless otherwise noted by Public Works Staff.

The drainage of the Site is to be self-contained. Any external drainage is to be accommodated within the design of the site drainage system.

The grading of the Site is to be compatible with the elevation of the surrounding lands.

Any proposed retaining walls are to be designed, constructed, and certified by a professional engineer and in accordance with OBC.

All grassed embankments shall have a maximum slope of 3:1.

Drainage shall be directed away from buildings and conveyed by sheet flow or in defined swales. The grade of grassed or other landscaped areas shall have a maximum slope of 5.0% and a minimum slope of 2.0%. Finished lot grades in sodded areas within 0.6 m of a property line are to be no greater than 5% slope to allow for grass cutting adjacent to property line fencing.

Swales on grassed areas shall have a minimum slope of 2% and a maximum slope of 5% as well as such that the velocity for the flow contained does not exceed 1.25 m per second. Where approved by the Township in areas of granular soils and low water tables, lower swale grades may be considered if it is deemed by the Township to be necessary. Swales with a grade of 1.0% or less shall include a subdrain directed to an acceptable outlet. Subdrains and swales to have adequate separation from the seasonal high groundwater levels.

The maximum length for any drainage swale shall be 75 m.

The minimum depth for any drainage swale shall be 150 mm.

The maximum depth for any drainage swale shall be 450 mm.

The maximum side slope on any drainage swale shall be 3:1.

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D5.03 Roadway and Driveway Design

All private roadways and drive aisles shall be designed in accordance with the recommendations of the Geotechnical Report and Section B of the Township of Clearview Engineering Standards, unless noted otherwise by Public Works Staff.

All Site Plans within the settlement boundary shall be hard surfaced (asphalt) including internal roads, driveways, parking areas, equipment storage areas, etc.

The necessary pavement markings and signage for internal roadway and drive aisle traffic control, parking space designations and site accesses are to be shown on the Drawings.

Pavement design suitable for commercial sites, heavy duty traffic, and fire routes shall be provided by the consulting geotechnical engineer. The **minimum** pavement design for any road cuts or roadway restoration within the Township right of way shall be as per Section B of the Township of Clearview Engineering Standards.

All private residential/condominium driveways shall be paved with asphalt or an approved alternate from the edge of the roadway to the building or garage face. The minimum asphalt pavement design for all driveways shall be:

- Subgrade compacted to 95% proctor density.
- 150 mm compacted depth of Granular A or 20 mm crushed limestone.
- 50 mm compacted depth of HL3 asphalt.

All other private entrances shall be surfaced in accordance with the Zoning Bylaw.

All private roadways shall be designed to facilitate passage of emergency and service vehicles. Driveway geometry is to be in general conformance with OPSD 350.010.

The Township requires the submission of turning envelopes of design vehicles with the Site Plan submission. Include the largest vehicle that may enter the Site. Additional details on driveways, drive aisles, and parking can be found in the Township's Zoning By-law.

The Township does not support the use of dead-end roads within Site Plans. Where dead-end roads are unavoidable, provision shall be provided for vehicle turning with the use of turning circles.

The minimum grade for any driveway shall be 1.0% and the maximum grade shall be 8.0%. The desirable range for driveway grades is 2% to 5%. Driveway

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grade beyond this range shall only be permitted with Township approval. All driveway aprons shall be sloped towards the roadway.

Site entrances shall be such that the minimum sight distance shall be per the TAC design manual. The sight distance requirements are to be based on roadway design speed versus the posted speed and are to account for turning sight distances where applicable.

Sidewalks in the street boulevard are to be continuous through the driveway entrances to properties developed under Site Plan control.

Site entrances are to be defined per OPSD 350.010. Where curb exists at the proposed entrance location, it is to be removed and replaced with a poured drop curb section. Cutting of existing curb is not permitted.

Rural entrances are to be defined per OPSD 301.020 (or as applicable). If rural entrances are to be relocated or decommissioned, existing culverts are to be removed and the ditch regraded and restored with a minimum 150 mm depth of topsoil plus nursery sod.

D5.04 Fire Routes

The Township of Clearview requires submission of a completed Fire Route. The Fire Route shall be signed accordingly.

The designated fire route providing access through the property shall meet the following requirements:

- Be connected to a public road allowance.
- Have a clear width of minimum 6.0 m.
- Have a minimum centerline radius of not less than 12 m, and a curb radius of 9 m.
- Have an overhead clearance of not less than 5 m.
- Have a change in gradient not more than 1 in 12.5 over a minimum distance of 15 m.
- Dead-end sections of the access routes are not permitted. The route will have a method for the emergency vehicles to enter and leave the Site without having to reverse.
- Shall consist of heavy-duty asphalt or concrete or other material acceptable to the Township in order to support the expected loads of firefighting equipment and to permit accessibility under all climatic conditions.

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D5.05 Water Distribution System

All watermains in the Township are to be designed and built to the Township and MECP Standards. Works not specified within the Standards will be specified on an individual project basis by the Township. The proposed watermain design must consider and be able to convey all domestic water and fire flow needs for the project under consideration plus adjacent lands external to the project (where applicable).

The phasing of any construction or implementation must be in a manner to provide orderly and reliable water distribution systems within the development, looping of these systems shall be provided to the satisfaction of the Township.

All watermains must be designed in accordance with:

- MECP's Design Guidelines for Drinking Water Systems, latest edition.
- OPSS and OPSD, latest edition.
- The Township of Clearview Engineering Standards.
- Any other applicable Legislation including legislated standards and regulations such as the *Municipal Act*, *Ontario Water Resources Act*, *Safe Drinking Water Act*, or *Environmental Protection Act*.
- Private hydrants, if proposed, will not be assumed or maintained by the Township. Any private hydrants are to be shown on drawings, downstream of backflow protection.

All chemicals and materials used in the alteration or operation of the drinking water system that come in to contact with water within the system shall meet all applicable standards set by both American Water Works Association (AWWA) and the American National Standards Institute (ANSI) Safety Criteria Standards NSF/60, NSF/61, and NSF/372.

All watermain materials shall comply with all applicable current industry standards and specifications for quality management and quality control including:

- MECP's Design Guidelines for Drinking Water Systems, latest edition.
- The Canadian Standards Association (CSA).
- American Water Works Association (AWWA).
- American Standard and Testing Materials (ASTM).
- Underwriters Laboratory (UL).
- NSF International (NSF).

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D5.06 Service Connections

All sites are to include a water connection from the main to the street line in accordance with the standards of the Township. A water service application is required to be submitted to the Township prior to any connections. All watermain design is to meet the requirements of Section D of the Township of Clearview Engineering Standards.

D5.07 Pipe Specifications

The water system design, including materials and bedding is to meet the requirements of Section D of the Township of Clearview Engineering Standards.

The provision of the pipe, the size, and the need are to be established by an architect or engineer as necessary for the applicable use of the Site. Design parameters will include the fixture demands of the proposed use, requirements for fire suppression, building code requirements, etc.

Only one service connection pipe is permitted to any site and must be sized to provide for fire suppression systems and domestic needs. All water flows into the site are to be metered and outfitted with an appropriate backflow prevention device.

D5.08 Metering and Backflow

All flows are to be metered, and the meter product material is to be as stipulated and ordered by the Township, all at the cost of the Developer.

Private water systems shall include a backflow prevention device, upstream of any connections. The backflow valve and meter shall be located inside the heated mechanical room of a building.

D5.09 Connections to Municipal Watermain

All connections to the Municipal water system are to be approved by the Township. Connection configuration will be assessed by the Township on a site-specific basis.

The specific requirements for each site plan connection are to be developed in conjunction with the consultant based on the expected use and scale of the Site, buildings, etc.

The Developer should pre-consult with Township staff to determine the approach to be used for the specific application. The following shall apply:

- There shall be no private watermains within a public road allowance.

Appendix D – Site Plan Design Requirements for Private Developments

- The system shall include a backflow preventer as the first control device within a building's mechanical room with no branching or services upstream of the control.
- Each condominium corporation shall have only one independent connection to a municipal watermain.

D5.10 Fire Hydrants

All private fire hydrants shall meet the requirements of Section D of the Township of Clearview Engineering Standards.

Private hydrants, if proposed, will not be assumed or maintained by the Township. Any private hydrants are to be shown on drawings, downstream of backflow protection.

All private hydrants shall be maintained as per the most current version of the Ontario Fire Code, insurance requirements, Building Code, and NFPA24 by the Developer. The Township accepts no responsibility for private hydrants and does not maintain them.

Private fire hydrants or other fire water service outlets shall not be operated except in the case of fire for fire protection purposes unless special permission of the Township has been obtained.

D5.11 Fire Mains for ICI or Private Residential Development

The Developer shall provide one watermain for both domestic and fire flows until downstream of the meter and backflow assembly. Watermain shall be metered with a backflow device and fire rated meter inside a heated mechanical room. If required, the servicing can split to a domestic and fire main, downstream of the meter and backflow valve.

Sizing calculations for the service to be provided. Consultant to provide domestic and fire flow calculations and servicing sizing calculation to support sizing.

PVC and PE pipe must be installed complete with tracer wire. A continuity test must be undertaken and certified prior to acceptance.

All site watermains must be swabbed, flushed, chlorinated, and pressure tested in accordance with OPSS and Township Standards.

All fire services shall conform to the OBC and *Ontario Fire Protection and Prevention Act*.

Appendix D – Site Plan Design Requirements for Private Developments

If a distribution system installed for combined domestic and fire supply cannot be turned over in three days under average daily demand, then two separate supply feeds (one for domestic use and one for fire flow supply) may be required to ensure the adequacy and reliability of water supply while maintaining adequate water turnover. Turnover time calculations shall be submitted to support this design.

D5.12 On-site Fire Storage

On-site fire storage to be designed in accordance with the applicable NFPA Standards.

If the building requires a sprinkler system in accordance with the OBC, and the municipal water system is not available or cannot supply adequate fire flows per the sprinkler system design, additional on-site fire storage is required. On-site storage required at the discretion of the Township Fire Department.

D5.13 Private Servicing of Residential Lots

The method of site servicing shall be in accordance with the Township Zoning By-law.

All private wells and / or waste-disposal systems shall be constructed in accordance with the appropriate legislation and regulation administered by the MECP and such requirements specified by the Health Unit.

Where a development is privately serviced, all wells shall be constructed in conformance with the *Ontario Water Resources Act*, R.S.O., 1990, and current Ontario Regulation, and all private waste disposal systems shall be constructed in accordance with the *Environmental Protection Act*, R.S.O., 1990, and current Ontario Regulation, and with the requirements of the Health Unit.

D5.14 Private Water Supply Systems

The method of site servicing shall be in accordance with the Township Zoning By-law. Wells shall be drilled by a licensed well driller as per OWRA O. Reg. 903/90, as amended. Private residential water systems shall be designed to municipal and MECP standards.

D5.15 Commissioning, Testing, and Certification of Water Connections

All testing and commissioning procedures are to be as outlined in the Township Standards (see Appendix G) and in consultation with Township Public Works Staff. For all new piping 100 mm diameter and larger, the Developer's engineer

Appendix D – Site Plan Design Requirements for Private Developments

is to inspect its construction, supervise the sampling, testing and commissioning of the system, and certify to the Township that the required standards have been met. The completed forms and results of water sample testing from the new system are to be submitted to the Township prior to connection to the municipal system.

D5.16 Site Boundary Conditions

Design of the site servicing and grading is to include all screening, fencing, and berming along the property boundaries in accordance with Township requirements, the approved noise report recommendations and the landscaping Drawing.

These features and associated details are to be included on the drawings submitted for Site Plan approval.

D5.17 Storm Sewer Design and On-Site Stormwater Management (SWM)

All SWM and storm sewers within a development proceeding under Site Plan control are to be designed in accordance with Section C of the Township of Clearview Engineering Standards.

The Modified Rational Method may also be used to design detention storage for small sites, generally less than 5 ha.

The following method is described in the Hydrology Handbook (1996). A trapezoidal hydrograph is obtained by setting rising and receding limbs equal to t_c . The volume of required detention storage is the area between the trapezoidal inflow hydrograph and the outflow hydrograph, the latter being the allowable controlled discharge. Storage volume is then computed as:

$$V_p = Q_p D - Q_o (D+t_c)/2$$

Where: D = Duration of rainfall (minutes)

Q_p = the runoff peak for that duration (m³/s)

Q_o = the maximum allowable discharge from the area (m³/s)

T_c = time of concentration (minutes)

Source: Hydrology Handbook (ASCE Manuals and Reports on Engineering Practice No. 28), Second Edition pp580-582, Copyright 1996, ISBN 0- 7844-0138-1

A copy of all stormwater management calculations, including a digital version of any model created and storm sewer design sheets, signed, and stamped by a professional engineer, are to be submitted to the Township.

Appendix D – Site Plan Design Requirements for Private Developments

Each site plan development is required to include stormwater pre-treatment devices sized to remove 80% of total suspended solids from the runoff from the Site before entering the municipal sewer system. Calculations demonstrating the correct sizing of the units are to be included in the SWM report. Sizing shall be in accordance with the most current Township CLI-ECA criteria.

Use of parking lot storage or rooftop storage as a method of quantity control is only permitted for commercial and industrial uses.

D5.18 Site Water Budget and LID Design

A site specific water budget and LID design report is to be prepared per the requirements of Sections A and C of the Township of Clearview Engineering Standards.

D5.19 Easements

Please see applicable sections of the Township of Clearview Engineering Standards for details on easement requirements for specific types of infrastructure.

D5.20 Storm Sewer Connection Size

If required, the storm drain connection to the Municipal storm system for all site plans shall be sized individually according to the intended use of the lands, to any on-site SWM control requirements and in accordance with the requirements of Section C of the Township of Clearview Engineering Standards. The minimum size of storm sewer to connect to the Township storm sewer system shall be 300 mm diameter.

D5.21 Depth of Storm Sewer Connection

The depth of the storm drain connection shall be governed by the grading of lands, the depth of the storm sewer outlet location identified for the Site and the extent of the area to be served.

The depth of the connection shall be sufficient to provide for drainage of all lands within the block, but in no case shall the depth to the top of the pipe be less than 1.5 m. Where this cannot feasibly be achieved, pipe insulation is required.

Where storm sewers are aligned parallel to building foundations, the sewer setback from the foundation shall be sufficient to ensure that the trench excavation for the sewer is beyond the area of influence for the foundation

Appendix D – Site Plan Design Requirements for Private Developments

bearing. Trench cross-sections may be requested to illustrate that this requirement is met.

D5.22 Storm Control Maintenance Hole

A storm sewer control maintenance hole is to be installed immediately inside the property line and is to be accessible for inspection of the sewer and incoming flow by the Township. The control maintenance hole is to be sized and benched based on the OPSD to accept the outflow sewer from the private development and the municipal service connecting the main storm sewer.

D5.23 Connection to Main Sewer

The connection of the storm drain to the storm sewer may be made at a MH or directly to the storm sewer if the size of the connection is less than one-half of the size of the storm sewer. If the connection size is greater than one-half the size of the main sewer, the connection must be made to a MH on the storm sewer.

D5.24 Storm Drain Materials

Storm sewer materials are to meet the requirements of Section C of the Township of Clearview Engineering Standards.

D5.25 Bedding for Storm Drain Connections

Storm sewer bedding is to meet the requirements of Section C of the Township of Clearview Engineering Standards.

D5.26 Storm Drain Construction

All storm drain connections shall be constructed in accordance with the specifications and Standard Detail Drawings of the Township of Clearview, current at the time of approval of the Engineering Drawings by the Township.

D5.27 Rooftop Storage

Rooftop storage for stormwater quantity control may be considered in commercial and industrial type developments where no other options for other SWM controls exist, as approved by the Township Public Works Department. Rooftop storage will not be considered for any building that has any type of residential usage including mixed residential / commercial use.

Rooftop storage design must be reviewed and approved by a structural engineer. The NVCA requirements for rooftop storage shall be followed, as applicable.

Appendix D – Site Plan Design Requirements for Private Developments

Where rooftop controls are considered, design submissions must indicate the following:

- Type of control to be installed (i.e., product name and manufacturer), complete with tamper-proof screening.
- Number and placement of proposed drains and weirs.
- Product specifications showing design release rates for each structure.
- Maximum ponding depth of 150 mm, draw down time and detained volume at each structure; and the total release rate and detained volume for the roof.
- An emergency weir overflow be provided at the maximum design water elevation.
- O&M requirements for the systems.

D5.28 Parking Lot Storage

Parking lot storage within residential or institutional developments is not permitted.

The use of parking lot storage is only permissible in commercial or industrial developments during storm events greater than the 1:5-Year design storm, where no other options for stormwater quantity control exists and in which temporary loss of access to vehicles or buildings does not have a dramatic impact, as approved by the Township Public Works Department. Depth of parking lot storage shall be a maximum of 0.2 m and an emergency overland flow route with a suitable outlet shall be identified on the drawing. The NVCA requirements for parking lot storage shall be followed as applicable.

The 100-Year ponding elevation and storage volume provided at each ponding location shall be shown on the Site Grading and Drainage Drawing. No ponding is permitted within the designated fire routes.

D5.29 Underground Storage

The use of underground storage will be considered by the Township subject to the results and recommendations of a geotechnical investigation. Underground storage systems that incorporate infiltration measures into the design shall be required to complete in-situ infiltration testing to confirm that the infiltration rate of the native soil is adequate. Safety factors are to be applied to the infiltration rate as per the LID Stormwater Management Planning and Design Guide prepared by CVC and TRCA, 2010 – Version 1, or most recent version.

Appendix D – Site Plan Design Requirements for Private Developments

A minimum of 1.0 m separation from the invert of the system to the seasonally high groundwater table is required for systems incorporating infiltration measures into the design. For any underground storage system, approval of the design from a geotechnical perspective (infiltration rates, hydrostatic uplift, cover requirements, etc.) is required from a geotechnical engineer.

O&M requirements shall be included in an O&M Manual.

D5.30 Sanitary Sewers

All future development blocks within a plan of subdivision shall have a sanitary drain installed from the mainline sanitary sewer to the street limit of the proposed block.

Sanitary sewer design for the block shall be in accordance with the approved Secondary Plan supporting documentation, subdivision plan or other requirements of the Township.

Where the proposed development land use zoning differs from the current approved land use zoning, a detailed design study may be required to ensure that the receiving sanitary system has sufficient capacity for the proposed development.

All tributary sanitary drainage areas, including future development lands, are to be considered in assessing the capacity of the receiving system.

The Township will not consider the use of on-site sanitary flow storage to address the issue of existing system capacity.

Any required upgrades to the Township's sanitary sewer system, resulting from the proposed development will be the responsibility of the Developer.

D5.31 Sanitary Sewers Design

Private sanitary systems shall be constructed and tested to municipal and MECP standards.

All sanitary sewers within a development proceeding under Site Plan control are to be designed in accordance with Section F of the Township of Clearview Engineering Standards.

D5.32 Sanitary Sewers Connection Size

The sanitary drain connection for all site plans shall be sized individually according to the intended use of the lands, and in accordance with the requirements of

Appendix D – Site Plan Design Requirements for Private Developments

Section F of the Township of Clearview Engineering Standards. The minimum connection sewer size is 200 mm diameter.

D5.33 Depth of Sanitary Sewer Connection

The depth of the sanitary drain connection shall be governed by the grading of lands and the extent of the area to be served.

The depth of the connection shall be sufficient to provide for drainage of all lands within the block, but in no case shall the depth to the top of the pipe be less than 1.7 m. Insulation is required if this cannot be achieved.

Where sanitary sewers are aligned parallel to building foundations, the sewer setback from the foundation shall be sufficient to ensure that the trench excavation for the sewer is beyond the area of influence for the foundation bearing. Trench cross-sections may be requested to illustrate that this requirement is met.

D5.34 Sanitary Control Maintenance Hole (MH)

A sanitary sewer control MH is to be installed immediately inside the property line and is to be accessible for inspection of the sewer and incoming flow by the Township. The control MH is to be sized and benched based on the OPSD to accept the outflow sewer from the private development and the municipal service connecting the main sewer.

D5.35 Connection to Sanitary Sewer

For connections 200 mm in diameter and above, the connection of the private sanitary sewer to the existing municipal sewer shall be made at an existing or newly installed MH. Existing manhole to be abutting the property, otherwise a new MH is to be installed. Newly installed MHs shall be appropriately cut in, per Township approval. "Dog house" of a MH is not permitted. Where bypass pumping is required, a bypass pumping plan is required to be submitted in advance for Township approval.

A direct connection to the sanitary sewer is permitted only for a single service 150 mm in diameter or less.

D5.36 Sanitary Sewer Materials

Sanitary sewer materials are to meet the requirements of Section F of the Township of Clearview Engineering Standards.

Appendix D – Site Plan Design Requirements for Private Developments

D5.37 Bedding for Sanitary Sewer Connections

Sanitary sewer bedding is to meet the requirements of Section F of the Township of Clearview Engineering Standards.

D5.38 Sanitary Sewer Construction

All sanitary drain connections shall be constructed in accordance with the specifications and Standard Detail Drawings of the Township of Clearview, current at the time of approval of the Engineering Drawings by the Township.

D5.39 Erosion and Sediment Control (ESC)

ESC requirements for all sites shall be confirmed on a site-specific basis and reviewed with the Township prior to submission.

Generally for development sites that are more than 5.0 ha in drainage area, ESC measures should be implemented whereby the 25 mm – 4-hour Chicago storm shall be stored and released over a minimum 24-hour period, in accordance with MECP guidelines.

A Tree Preservation and ESC Drawing shall be prepared for all sites and submitted for review to the Township and the NVCA as applicable.

The Drawing shall consider all phases of construction from topsoil stripping and earthworks to ultimate site stabilization.

All ESCs are considered temporary applications and are to be constructed prior to any disturbance of land and shall be maintained until the Site has been stabilized to a condition that is equal to, or better than, the pre-existing or design condition, whichever is more stringent.

The Tree Preservation and ESC Drawing may include measures such as, but not limited to:

- Temporary sediment control ponds.
- Sediment control fences.
- Topsoil stockpile and external staging areas: locations and footprint.
- Rock check dams.
- Vegetation buffer zones and tree preservation zones.
- Locations of all trees that are to be retained.
- Stone mud mats.
- Erosion control blankets.
- Catch basin sediment traps.

Appendix D – Site Plan Design Requirements for Private Developments

D5.40 Retaining Walls

Retaining walls are to meet the requirements of Section G of the Township of Clearview Engineering Standards

For retaining walls greater than 1.0 m in height, complete retaining wall designs and details, signed and stamped by a structural engineer are to be provided as part of the Site Plan Application. Design information shall include:

- Provide cross-sections, longitudinal sections, construction, and design notes and specifications on the drawings.
- Specify the wall materials / product of supplier.
- Granular backfill with locations and elevations of weeping tile drain including defined tile outlet locations and elevation.
- Fence or guard meeting OBC requirements and provide a detail of how the fence is constructed adjacent to or affixed to the wall.
- Notes regarding the Record Drawings and certification requirement.

D5.41 Site Plan Acceptance / Certification

The Developer shall retain a qualified engineering consultant who, upon completion of construction and following a site inspection with Township Public Works Staff, shall provide written certification to the Township that all Works have been constructed in accordance with the approved accepted for construction drawings and specifications, and in accordance with good engineering practices.

This consultant will be responsible for completing the design, supervise and provide on-site inspection for the installation of private systems on the lots / blocks, and certify that the private systems have been installed in accordance with all approved drawings and to the satisfaction of the Township, Health Unit, and the MECP.

D5.42 Security Release Inspection

Securities are to be released as per the Site Plan Agreement terms. For the security release, all deficiencies found during site inspection shall be immediately corrected by the Developer. This inspection is carried out for the benefit of the Township and shall in no way relieve the Developer of his obligations under the Site Plan Agreement.

Following the completion of the maintenance period and a final inspection of the Site with Township Public Works staff, the final security holdback may be released.

Appendix D – Site Plan Design Requirements for Private Developments

D5.43 “Record” Drawings

After all construction is complete, the design drawings shall be amended to incorporate the changes and alterations made during construction in order that the drawings as amended represent the services and conditions as constructed.

One set of hard copy and digital Record Drawings must be submitted to the Township. Record Drawings for underground municipal servicing to be provided within 90 days of connection to municipal system.



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Appendix E – Operations and Maintenance Manual Requirements for Private Developments

Appendix E – Operations and Maintenance Manual Requirements
for Private Developments

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Appendix E – Operations and Maintenance Manual Requirements for Private Developments

E1.00 Operations and Maintenance Manual Requirements

A site-wide Operations and Maintenance Manual (O&M Manual) shall be submitted by the Proponent and approved by the Township, prior to approval of the Site Plan. This manual shall form a Schedule to the Site Plan Agreement, which will ensure ongoing adherence, even in the case that the Site changes Developers.

The Township has the right to enforce the requirements of this manual in the case it is not being adhered to. The Site Developer will be responsible for adherence. If the Developer does not adhere, the Township will complete the maintenance requirements at the Developer's cost.

This document applies to all commercial, residential, industrial, and institutional Site Plans within the Township.

The proceeding Sections outline what information the manual shall contain. However, this list is not exhaustive, and the Proponent shall include all components that require any ongoing maintenance. The Township reserves the right to require additional items above and beyond those outlined below.

In the case that the Site does not include components applicable to any of the Sections below, include in the O&M Manual, the Section header and "Not applicable" within the Section.

E2.00 Introduction

Complete as applicable to the Site.

E3.00 Site Location

Complete as applicable to the Site. Include a key map.

E4.00 Watermain Distribution System

- Domestic Supply
 - Size, material type.
 - Water meter location and details.
 - Backflow preventer or check valve details and associated maintenance / inspection requirements.
 - Backflow valve and meter located within a heated mechanical room of a building.
 - All valves exercised twice annually to ensure they are accessible and remain operational.

Appendix E – Operations and Maintenance Manual Requirements for Private Developments

- Fire Supply
 - Fire Hydrant
 - Details (type, location, etc.).
 - Hydrant to be inspected annually and after each use.
 - Hydrant and Valve inspection and maintenance in accordance with Subsection 6.6.5 of the Fire Code.
 - Associated snow removal requirements.
 - Anti-freeze process prior to winter.
 - Sprinkler System
- Siamese Connection Location / Details.
 - Watermain Testing Requirements
 - Shall conform to MECP, AWWA, OPSS, and Township testing procedures.
 - Backflow prevention requirements as per Ontario Watermain Disinfection Procedure.
 - Township requires 48-hours' notice prior to operation of valves.
 - Watermains are to be disinfected in accordance with Ontario Watermain Disinfection Procedure (latest revision).
 - Swab, hydrostatic pressure test OPSS 441, Chlorination, Chlorine Residual, Bacteriological Sampling – two sets (after 16-hours, per AWWA C651 Standard), Continuity test of the tracer wire.
 - Water Quality
 - Flushing infrastructure to ensure water quality for all consumers.
 - Prior authorization must be obtained from the Township for any maintenance activities that would result in abnormally higher flow rates.
 - O&M by Qualified Operator
 - Inspection and operation of valves, etc. shall be undertaken by a qualified operator certified by the MECP and a copy of the inspection / maintenance report is to be provided to the Public Works Department.
 - Alternatively, arrangements can be made with the Township to have the certified operators of the Public Works Department undertake the inspection and maintenance of hydrants and valves, at the Developer's expense.
 - The Developer is responsible for their service and associated maintenance from their Site to the trunk watermain situated within the Township ROW.
 - Backflow Prevention

Appendix E – Operations and Maintenance Manual Requirements for Private Developments

- An annual report prepared by a certified inspector must be submitted to the Township confirming that all backflow prevention devices have been inspected, tested, and certified in accordance with MECP and Building Code requirements.

E5.00 Sanitary Collection System

- MH at property line for access for inspection and cleanout
- SAN MH inspection twice annually
- In the event of blockage, a CCTV inspection may be undertaken by a plumber / mechanical contractor to determine the cause and subsequent cleaning or flushing requirements.
- All sanitary sewer lines 200 mm and over shall be flushed at minimum every two years and CCTV inspected every eight years.
- The Developer is responsible for their service and associated maintenance from their Site to the trunk sanitary sewer situated within the Township ROW.

E6.00 Storm Sewer System

- MH at property line for inspection / access.
- CBs, CB MHs, and Storm Maintenance holes must be inspected regularly to ensure that the grates and structures are not clogged with debris.
- CB sumps must be inspected every spring and fall and cleaned once annually to remove debris accumulated over the year including sand from winter snow clearing operations.

E7.00 Stormwater Management Facility

- Stormwater Quantity Control
 - Detention / Retention Facility.
 - Rooftop Storage Details (for commercial buildings only).
 - Maximum 150 mm depth.
 - Overflow weir details, location, etc.
 - Roof drain location, type, etc.
 - Controlled flow roof drains complete with anti-tampering screens.
 - Storm service connection details.
 - Parking Lot Storage Details.
 - Maximum 200 mm depth.
 - No ponding up to and including the 1:5-year events.

Appendix E – Operations and Maintenance Manual Requirements for Private Developments

- Overland Flow Route.
- Reduced pipe / orifice plate details, location, etc.
- Lot level control / LID Details.
 - Type, location, and sizes of facilities.
- Stormwater Quality Control
 - Oil / Grit Separator.
 - Details.
 - Manufacturer’s recommended maintenance requirements.
 - Removal of sediment and petroleum deposits, together with approved disposal location.
 - Local maintenance contractors.
 - SWM Pond
 - Sediment forebay cleanout frequency, measures, and estimated cost.
 - General maintenance requirements, etc.
 - Soakaway Pit
 - Details, location, etc.
 - Eaves trough and screens to be inspected at a minimum twice annually – spring and fall.
 - Access port cap – flushing.
 - Lot level control / LID Details.
 - Frequency of maintenance / cleanout.
 - Details for cleanout measures including depth of removals and disposal of materials.
 - Type and quantity of material required to replace filtration materials.

E8.00 Snow Storage / Removal

- The Developer is responsible to provide snow clearing operations for the parking facilities and all accesses routes.
- Snow storage locations must not encroach Township ROW or adjacent properties and must not conflict with drainage systems, including swales.
- In the event that the Site does not have sufficient area for snow storage in accordance with the accepted Site Plan, snow accumulation is to be removed off-site, at the Developer’s expense.

Appendix E – Operations and Maintenance Manual Requirements
for Private Developments

E9.00 Pavement Markings and Signage

- Site pavement markings including directional guidelines, parking stalls, and symbols are to be repainted at minimum once a year and / or as required, to maintain adequate information for motorists and pedestrians.
- All required traffic signage, such as, but not limited to Stop, Fire Route, No Parking, Accessible Parking, etc., is to be inspected and maintained regularly to ensure visibility and reflectivity.
- Estimated costs for maintenance.

E10.00 Conclusions and Recommendations

Complete as applicable to the Site.



Appendix F – Sewage Pumping Station (SPS) Design Guide

SPS Design Guide

Figures 1 to 5

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Appendix F – Sewage Pumping Station (SPS) Design Guide

F1.00 Introduction

The Township Sewage Pumping Station Design Guide is intended to provide an engineering basis for Sewage Pumping Station (SPS) design, to establish uniform criteria of minimum standards, and to improve the processing of engineering design submissions for development related works. Alternatives that improve or maintain the quality of design will be considered for acceptance subject to the approval of the Township's Public Works Department.

F2.00 General

SPSs must be designed in accordance with the more stringent version of applicable codes and regulations, industry standards, and Clearview's standards.

Some of the applicable external standards and guidelines include:

- MECP Design Guidelines for Sewage Works.
- MECP Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (NPC-300).
- MECP's Standard Operating Policy for Sewage Works.
- National Fire Protection Association (NFPA) 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
- Hydraulic Institute Standards.
- Canadian Standards Association (CSA) B139 – Installation Code for Oil Burning Equipment: as adopted by the Technical Standards and Safety Authority (TSSA).
- Ontario Building Code (OBC).
- Ontario Electrical Safety Code (OESC).
- Ontario Provincial Standards Specifications (OPSS) and Drawings (OPSD).
- Occupational Health and Safety Act (OHSA).

Prior to the commencement of the design of the SPS, a pre-design meeting shall be arranged with Township staff and their operators to confirm design flows, station design type, and any other pertinent items dealing with the facility.

Prior to the commencement of detailed design of the SPS, the designer / Developer is to submit a preliminary design report that identifies, at a minimum, the following:

- Design criteria.
- System head curves.
- Pump curves.

Appendix F – Sewage Pumping Station (SPS) Design Guide

- Site Plan layout.
- Forcemain alignment.
- Station layout.

Selection of equipment, technology, materials, and other design solutions should consider a life cycle cost (LCC) approach that includes factors beyond the initial purchase price of an asset. Typical LCC costs include energy consumption, installation costs, maintenance costs, operational costs, replacement costs, and decommissioning costs.

The design should incorporate a sufficient level of redundancy (e.g., pumps, primary and backup level control systems, etc.) such that failure of one single component does not result in a total system failure. Selection of process equipment should consider overall reliability and suitability to handle all potential operating conditions.

F3.00 Design

F3.01 System Head Curve

The calculations of the system head curve shall include static head loss as well as head losses through valves, fittings, pipes inside the station, and forcemains, as well as entrance and exit losses. System head curves shall be calculated under the following conditions:

Table 1: System Head Curves Calculation Conditions

C Value	Liquid Level / Flow Condition
120, 130, 140	Low liquid level, static head
120, 130, 140	Mid-point between low liquid and high liquid level, static head
120, 130, 140	Overflow conditions, static head

Pumps shall be capable of operating satisfactorily over all the conditions above.

F3.02 Station Layout

Pumping station configuration shall be based on the most efficient layout of pumps and equipment for safe and cost-effective O&M of the facility. The designer shall select pumps and equipment from the Township's Equipment and Material List included in this document or the Township's Approved Product and Equipment List based on the optimal combination of pump efficiency, capital, and O&M costs. Where discrepancies exist, the Equipment and Material List included in this document shall take precedence. All pump station control,

Appendix F – Sewage Pumping Station (SPS) Design Guide

monitoring, and alarm equipment shall be integrated with the Township's SCADA system.

The general station design and layout shall include the following:

- An outdoor, self-contained, standby generator complete with automatic transfer switch shall be provided at all pump stations. Generators should be designed to meet air and noise emission and vibration requirements, in accordance with provincial regulations.
- Grinders shall be provided at all pump stations complete with a guide rail system and lifting device for removal and maintenance. In smaller stations, grinder pumps or pumps with "chopper style" impellers may be considered in lieu of grinders.
- Influent pipe to be positioned to ensure that wastewater does not flow directly over the pump suction, or over the pumps. Influent pipe for in-ground pumping stations shall have a minimum distance of two-volute diameters away from the pump centre line.
- Inlet sewer shall include an isolation valve, stainless steel stem extension, and 50 mm square operating nut at a level to avoid confined space entry to open or close the valve.
- Benching in wetwell shall be sloped towards pump inlet to prevent sediment buildup. Benching at 60° or greater is preferred but shall not be less than the MECP guidelines of 45°. For larger wetwells, provide steps within the benching, at the bottom of the access ladder, to enable staff to safely access pumps.
- A bypass connection for the forcemain, complete with isolation valves, shall be provided and located outside the wetwell. The bypass shall be 150 mm in diameter, flanged, and complete with a quick connector extending 450 mm above finished grade. The bypass should include valves to allow:
 - The permanent wetwell sewage pumps to pump to a haulage truck.
 - Portable pumps to pump from the wetwell or upstream MH into the forcemain.
- A 50 mm dia. water service and frost-free hydrant (or valved hose connection at the control building) as per Township Standards shall be provided for flushing purposes. If there is not a control building, the water service shall be protected with a double check valve type backflow preventer, equivalent to a Watts Series 7, located in an underground chamber, as per Township standards. If there is a control building, the water service shall be protected

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with a reduced pressure zone assembly type backflow preventer, equivalent to a Watts Series 9, located in the building.

- Personnel entry access and equipment hatches shall be “Safe Hatch” style by Xylem (Flygt), Bilco, or MSU, made of construction grade aluminum with stainless steel hinges, secondary fall protection grating, be spring assisted, include associated accessories, and be lockable by padlock. Lockport shall be recessed and equipped with a drainage pipe. The hatch shall include a hold open arm, that locks in place (e.g., a locking channel), to keep the cover in the vertical position while open. Personnel entry access hatches shall have a minimum clear opening of 750 mm by 900 mm. Equipment hatches shall be adequately sized for the installation and removal of pumps and other equipment.
- Vertical access ladders shall be non-slip aluminum complete with telescopic side rail (ladder up) extensions located beneath personnel entry access hatches.
- An emergency overflow pipe shall be provided for Types 3 and 4 Stations unless location and topography prohibit installation. A backflow and shut off valve are required on the overflow pipe.
- Pressure gauges shall be provided at each pump discharge pipe, located above the flood line.
- Locate all controls and electrical devices above the flood line except local pump control hand switches, which are to be submersible.
- All valves, flow meters, pressure gauges, and other appurtenances to be in a separate chamber or drywell depending on station type. Locating this equipment in the wetwell is not acceptable.
- Provide equipment for the safe retrieval of personnel in confined spaces. This shall include davit posts; portable davit complete with hand crank winch and self-arresting Sala block dedicated to the station.
- Provide lifting and lateral transfer devices for the removal and installation of equipment including removal from the station. The following equipment shall be provided and dedicated to this station:
 - For wetwells and underground valve chambers:
 - Davit post / sockets and portable lifting davit.
 - Portable electric chain or wire rope hoist.
 - For drywells in basement areas:
 - Trolley beam, trolley, and hoist.
- Provide a minimum of 1 m of clear space around equipment for servicing within drywells and SPS buildings.

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- Ensure backflow preventers are installed on potable water lines complete with isolation valves and testing ports. Related equipment must not be installed in the wetwell.
- To ensure safe access, provide a minimum of 1 m concrete or paved area as a level walking area around two sides of openings for tanks and hatches.
- All electrical equipment in wetwell to be Class 1 Zone 1 explosion proof in accordance with NFPA 820, OESC, and other applicable codes and / or standards.
- Provide a combustible gas detection system, where appropriate within buildings and drywells accessed via stairs.
- In general, the station is to be sized based on pumps sized to handle instantaneous peak flow.
- Firm capacity of an SPS is defined as the pumping capacity of the facility when both the largest pump and largest forcemain (where more than one forcemain exists) are out of service.

F3.03 Site Considerations

The following must be included as part of the site design:

- All structures, including electrical and mechanical equipment, shall be protected from physical damage by the 100-Year or regional design flood event (whichever is greater). SPSs shall remain fully operational and accessible during the 100-Year or regional flood event. Regulations / requirements of municipalities, provincial, and federal agencies regarding flood plain obstructions must be considered.
- All buildings, wetwells, and valve chambers shall be designed to meet post-disaster requirements in accordance with the OBC.
- Buildings shall be designed to blend in with the aesthetics of the surrounding environment (e.g., neighbouring houses, etc.)
- 1.8 m high chain link security fencing and inward swinging lockable access gate, with sufficient space to temporarily park in front of the gate without obstructing traffic on roadway or sidewalk. In residential areas, the fencing shall be black vinyl coated.
- Exterior lighting for illumination of the Site, panels, and building exterior (if applicable) with zero spill of light beyond the property line, and dark sky compliant.
- A dedicated paved access road and sufficient parking for maintenance and operation vehicles. Access roads shall have a minimum paved surface width of 4.6 m.

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- Adequate access for:
 - Emergency vehicles, including fire trucks.
 - Operations personnel access to all hatches, valves, and chambers.
 - Sewer flushing truck access to inlet maintenance hole, grinder chamber, wetwell, and emergency and maintenance storage tanks.
 - 22 m³ capacity vacuum truck for access and cleaning of wetwell and emergency sewage haulage.
 - Forcemain inspection and cleaning.
 - Bypass pumping equipment (temporary pumps, generator, and piping to tanker trucks).
 - Fuel delivery truck for access to fuel fill station.
 - Large mobile cranes for stations with equipment weights that would require such vehicles for installation or removal.
- Site drainage graded away from all structures with a minimum 2% slope.
- Adequate space for snow storage and snow clearing on-site.
- Use protective bollards or other suitable devices around structures that could inadvertently be damaged by vehicles.
- Authorized entry alarms with signal transmission to local authority.

F3.04 Health and Safety

In addition to all current health and safety guidelines and regulations, the following requirements for SPSs shall apply:

- A general requirement to design facilities to eliminate confined spaces. Where the design cannot eliminate all confined spaces, all reasonable efforts must be made to reduce the quantity of confined spaces and hazards within any confined space. For valves located in confined spaces, valve stem extensions and operating nuts are to be provided at top of chamber ceiling slab level. Ensure operating nuts are in accessible locations. The space must be designed for ease of ingress, prompt egress, and have appropriate fall arrest and retrieval safeguards. As part of the design, identify all confined space areas, the equipment housed within the areas, and the rating of the space.
- Access hatches to be designed with secondary fall protection grating.
- Designs must address travel restriction, fall restriction, and fall arrest for Work that may be required while working at heights. Design to include engineered 2 m +/- tall post(s) as required. Post to be equipped with D-ring anchor points to which operators (wearing harnesses) can connect their safety lanyards.

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- Designs must identify how the Township's O&M staff will be protected.
- Hazardous gas monitoring in potentially hazardous areas shall be conducted using personal, portable devices in areas where permanent monitoring systems are not required.
- Electrical safety considerations must be made according to all applicable acts, codes, standards, and guidelines.
- Adequate designs must integrate lock-out / tag-out requirements for all sources of energy. The location of disconnects shall be in the most logically safe location for access and operation.
- Designs must mitigate excessive noise to the environment and to workers.
- Where possible designs must identify atmospheric hazards, assess these hazards with respect to incompatible emissions, and provide adequate ventilation.
- Emergency eyewash and deluge shower stations shall be provided in the vicinity of any chemical storage areas or where there are other potential exposure risks. The water supply should be tepid water and be compliant with American National Standards Institute (ANSI) Standard Z358.1. The water supply and eyewash / shower facilities shall be protected from freezing.
- With respect to the area and function of the environment, designs must provide adequate illumination for worker safety.

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F3.05 Sewage Pumping Station Design**Table 2: Sewage Pumping Station**

Design Type	Typical Station Flow (Peak)	General Layout	On-site Emergency Storage Capacity (Minimum)	Number of Pumps and Type of Starter
1	4.7 L/s or less ¹	Submersible pumping station, valve chamber and above-grade electrical panel, outdoor, self-contained standby generator, single forcemain	Two-hour peak flow on-site storage	Minimum of two constant speed pumps (one duty, one standby) with consideration for soft starters
2	Between 4.7 L/s and 30 L/s	Submersible pumping station with separate building for controls and motor control centre (MCC). Outdoor, self-contained standby generator, single forcemain	Two-hour peak flow on-site storage	Minimum of two constant speed pumps (one duty, one standby) with consideration for VFDs
3	Between 30 L/s and 60 L/s	Submersible pumping station, separate building for controls, MCC and a basement (drywell) to house valves, with outdoor, self-contained standby generator, two forcemains each sized for peak flow	One-hour peak flow storage on-site, total two-hour peak flow storage when combined with available system storage	Minimum of two pumps (one duty, one standby) with consideration for VFDs.
4	60 L/s or greater	Wetwell / Drywell with divided wetwell and with building above the drywell to house controls, MCC, etc. with outdoor, self-contained generator, two forcemains each sized for peak flow	One-hour peak flow storage on-site, total two-hour peak flow storage when combined with available system storage	60 to 100 L/s; Minimum of three pumps (lead, lag, and standby), with VFDs Greater than 100 L/s; Minimum of four pumps (three duty, one standby), with VFDs

Notes: 1 – Flows for Type 1 Station based on achieving a minimum self-cleansing velocity of 0.6 m/s in a 100 mm diameter forcemain.

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F.3.05.1 Type 1

Type 1 pumping stations are generally small in-ground submersible stations. Refer to Attachment A for a schematic of the pumping station type and a general arrangement drawing.

In addition to all other applicable design criteria set out in this guide, Type 1 stations, with peak flows 4.7 L/s or less, shall include the following:

- Combined wetwell and on-site emergency storage capacity of two hours (minimum) retention, based on peak flow. Emergency storage shall be in addition to peak operating storage requirements.
- Two constant speed pumps in a single wetwell configuration, each sized for peak flow. In no case shall the minimum designed discharge velocity be less than 0.6 m/s.
- Concrete or asphalt surface with a minimum of 1.5 m width shall be installed around the top of the wetwell. Surface mounted sockets or posts for davits to enable equipment hoisting and personnel retrieval shall be provided.
- Provide weatherproof outdoor standby generator sized for all connected loads with appropriate sound attenuation, including 24-hour subbase double wall diesel fuel tank.
- Electrical Junction Boxes:
 - Provide separate lockable boxes for different voltages.
 - Electrical and process controls to be located above grade in stand-alone panel, a minimum of 1.5 m away from wetwell or venting system to ensure the area is not classified according to NFPA 820. Bottom of panel to be a minimum of 0.5 m above-grade.
 - EYS seals and any other related components shall be installed between junction boxes and control panels.
- Provide junction box equipped with terminal strip immediately adjacent to the wetwell to facilitate changes of the floats. Provide separate junction box for grinder / pumps power supply and to enable the removal and installation of the grinder / pumps.
- Provide weatherproof NEMA 4X lockable enclosures for outdoor panels. Enclosure shall include LED lighting and general-purpose receptacles. For VFD and PLC panels, heating, and cooling should be provided.
- Valve / meter chamber to be separate from the wetwell. Valve / meter chamber shall include pump isolation and check valves, discharge flow meter, emergency bypass piping connection, and forcemain connection piped to the exterior. All pump discharge and forcemain piping isolation valves shall

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include valve stem extensions and 50 mm square operating nuts to the top of the chamber ceiling for valve operation without confined space entry. Locate valve operators to allow valve to be operated using standard watermain valve key. All electrical devices to be located above the valve chamber's flood level or waterproof rated. Valve chamber to be equipped with means of automatic drainage back to the wetwell should any water accumulate within the chamber.

- Exterior lighting is to be considered, for illuminating both the wetwell access area, if site location permits, and the electrical panel. The light switch to be mounted inside the electrical panel. Lighting shall not spill past site property lines.
- Provide paved vehicular access to wetwell and generator. Minimum 4.6 m wide driveway that can accommodate a vehicle with hammerhead style turnaround for pickup truck sized vehicles. Driveway geometry and thickness must be designed to accommodate a fully loaded 22 m³ sewage haulage truck to the wetwell and a 17 m³ diesel fuel truck to the generator location. Site Plan to show truck turning movements dimensions for largest vehicle to be accommodated to prove that truck can back in from main road to point adjacent to camlock connection point.
- For water service to station, install meter pit with backflow preventer on-site to Township standards. Backflow preventer to be double check valve style equivalent to a Watts Series 7. Chamber to be accessible via access hatch for annual backflow preventer testing.

F.3.05.2 Type 2

Type 2 pumping stations are generally small to mid-size submersible stations complete with a control building. Refer to Attachment A for a schematic of the pumping station type and a general arrangement drawing.

In addition to all other applicable design criteria set out in this guide, Type 2 stations, with peak flows greater than 4.7 L/s and less than 30 L/s, shall include the following:

- Combined wetwell and on-site emergency storage capacity of two hours (minimum) retention, based on peak flow. Emergency storage shall be in addition to peak operating storage requirements.
- Depending on flows, a minimum of two submersible pumps shall be provided in a single wetwell configuration, each sized for peak flow. In no case shall the minimum designed discharge velocity be less than 0.6 m/s.

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- Provide paved vehicular access to wetwell, building, and generator. Minimum 4.6 m wide driveway that can accommodate a vehicle off the road with hammerhead turnaround for pickup truck sized vehicles. Driveway geometry and thickness must be designed to accommodate a fully loaded 22 m³ sewage haulage truck to the wetwell and a 17 m³ diesel fuel truck to the generator location. Site Plan to show truck turning movements dimensions for largest vehicle to be accommodated to prove that trucks can back in from main road to point adjacent to camlock connection point.
- Concrete surface with a minimum 1.5 m width shall be installed around the top of the wetwell. Surface mounted sockets or posts for davits to enable equipment hoisting and personnel retrieval shall be provided.
- Provide outdoor, self-contained standby generator sized for all connected loads with appropriate sound attenuation, including 24-hour subbase double wall diesel fuel tank.
- The electrical and process controls to be located in a building with the following design requirements:
 - Sized to include incoming site water service, water meter, backflow preventer, mop sink with hot and cold running water, space for storage of portable hoisting equipment, heating and ventilation equipment, and sized to permit safe maintenance work. Building shall include floor and plumbing fixture drainage via a sanitary service back to the wetwell equipped with trap seal primer.
 - Include facility power feed, pump starters, automatic transfer switch (ATS), pump controls, SCADA and networking hardware, and location for a hydro meter. Station incoming power main breaker, pump starters, VFDs, and ATS to be housed in a floor mounted MCC configuration.
 - Building to be a minimum distance of 1.5 m from the wetwell. Ensure exhaust vent from wetwell is not pointing towards building and air intakes for the building are not near this exhaust. Ventilation for the building shall be on the opposite side of the building from the wetwell.
 - No windows.
- Provide junction box equipped with terminal strip adjacent to the wetwell to facilitate changes of the floats. Provide separate junction box for grinder / pumps power supply adjacent to the wetwell to enable the removal and installation of the grinder / pumps. Located junction boxes in accordance with the latest edition of NFPA 820.
- Valve / meter chamber to be separate from the wetwell. Valve / meter chamber shall include pump isolation and check valves, discharge flow meter,

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emergency bypass piping connection, and forcemain connection piped to the exterior. All pump discharge and forcemain piping isolation valves shall include valve stem extensions and 50 mm square operating nuts to the top of the chamber ceiling for valve operation without confined space entry. Locate valve operators to allow valve to be operated using standard watermain valve key. All electrical devices to be located above the valve chamber's flood level or waterproof rated. Valve chamber to be equipped with means of automatic drainage back to the wetwell should any water accumulate within the chamber.

F.3.05.3 Type 3

Type 3 pumping stations are generally mid-sized submersible stations complete with a control building and a drywell. Refer to Attachment A for a schematic of the pumping station type and a general arrangement drawing.

In addition to all other applicable design criteria set out in this guide, Type 3 stations, with peak flows greater than 30 L/s and less than 60 L/s, shall include the following:

- On-site emergency storage of one hour (minimum) retention, based on peak flow and a total combined wetwell and system emergency storage capacity of two hours, based on peak flow. On-site emergency storage shall be in addition to peak operating storage requirements.
- A minimum of two submersible pumps in a single wetwell configuration.
- Provide variable frequency drives(s) where there is a need for continual flow from one pumping station to the next pumping station or to a wastewater treatment plant. The final design decision shall be based on good engineering practice. In no case shall the minimum designed discharge velocity be less than 0.6 m/s.
- Provide paved vehicular access to wetwell, building, and generator. Minimum 4.6 m wide driveway that can accommodate a vehicle off the road with hammerhead turnaround for pickup truck sized vehicles. Driveway geometry and thickness must be designed to accommodate a fully loaded 22 m³ sewage haulage truck to the wetwell and a 17 m³ diesel fuel truck to the generator location. Site Plan to show turnaround dimensions for the largest vehicle to be accommodated.
- Concrete surface with a minimum 1.5 m width shall be installed around the top of the wetwell. Surface mounted sockets or posts for davits to enable equipment hoisting and personnel retrieval shall be provided.

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- Provide outdoor, self-contained standby generator sized for all connected loads with appropriate sound attenuation, subbase double wall fuel tank.
- Electrical and process controls to be located in a building with a dedicated room at ground floor level adjacent to but not directly above the drywell with the following design requirements:
 - Sized to include incoming site water service, water meter, backflow preventer, mop sink with hot and cold running water, space for storage of portable hoisting equipment, heating and ventilation equipment, and sized to permit safe maintenance work. Building shall include floor and plumbing fixture drainage via a sanitary service back to the wetwell equipped with trap seal primer.
 - Include facility power feed, pump starters, ATS, pump controls, SCADA, and networking hardware, and location for a hydro meter. Station incoming power main breaker, pump starters, VFDs, and ATS to be housed in a floor mounted MCC configuration.
 - Building to be a minimum distance of 1.5 m from the wetwell. Ensure exhaust vent from wetwell is not pointing towards building, and air intakes for the building are not near this exhaust. Ventilation for the building shall be on the opposite side of the building from the wetwell.
 - No windows.
- Provide junction box equipped with terminal strip adjacent to the wetwell to facilitate changes of the floats. Provide separate junction box for grinder / pumps power supply adjacent to the wetwell to enable the removal and installation of the grinder / pumps. Located junction boxes in accordance with the latest edition of NFPA 820.
- Drywell to be separate from the control room with separate entrance doors for each area. A superstructure shall be above the drywell, to provide access. This drywell area shall include pump isolation valves, discharge flow meter, and forcemain connection piped to the exterior. The drywell shall be accessible by stairs. All electrical devices to be located above the drywell's flood level or be waterproof rated.
- Provide a trolley beam, manual trolley, and manual chain hoist above the drywell area for removal of drywell equipment.

F.3.05.4 Type 4

Type 4 pumping stations are typically large and possibly complex stations with a wetwell / drywell configuration. Typically, wetwells for large stations have two or more cells and the drywell is located beneath a control building. Refer

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to Attachment A for a schematic of the pumping station type and a general arrangement drawing.

In addition to all other applicable design criteria set out in this guide, Type 4 stations, with peak flows greater than or equal to 60 L/s, shall include the following:

- Sink with hot and cold water located in the drywell.
- Operator work surface area and desk located in control room.
- Washroom at main floor level adjacent to the control room.
- On-site emergency storage of one-hour (minimum) retention, based on peak flow and a total combined wetwell and system emergency storage capacity of two hours, based on peak flow. On-site emergency storage shall be in addition to peak operating storage requirements.
- A minimum of three pumps in a single drywell configuration.
- For the 3-pump operating system, determine the most efficient pumping configuration for the station based on:
 - Three equally-sized pumps.
 - Three unequally-sized pumps.
 - Combination of the above with variable speed pump(s).
- In no case shall the minimum designed discharge velocity be less than 0.6 m/s.
- Provide paved vehicular access to wetwell, building, and generator. Minimum 6.5 m wide driveway that can accommodate a vehicle off the road with hammerhead turnaround for pickup truck sized vehicles. Driveway geometry and thickness must be designed to accommodate a fully loaded 55 m³ sewage haulage truck to the wetwell and a 17 m³ diesel fuel truck to the generator location. Site Plan to show turning movements dimensions for largest vehicle to be accommodated.
- Concrete surface with a minimum 1.5 m width shall be installed around the top of the wetwell. Surface mounted sockets or posts for davits to enable equipment hoisting and personnel retrieval shall be provided.
- Provide a weatherproof, self-contained, standby generator sized for all connected loads with appropriate sound attenuation, including 24-hour subbase double wall fuel tank and spill containment.
- Electrical and process controls to be located in a building at ground floor level adjacent to but not directly above the drywell with the following design requirements:

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- Sized to include incoming site water service, water meter, backflow preventer, mop sink with hot and cold running water, space for storage of portable hoisting equipment, heating and ventilation equipment, and sized to permit safe maintenance work. Building shall include floor and plumbing fixture drainage via a sanitary service back to the wetwell equipped with trap seal primer.
- Include facility power feed, pump starters, ATS, pump controls, SCADA, and networking hardware, and location for a hydro meter. Station incoming power main breaker, pump starters, VFDs, and ATS to be housed in a floor mounted MCC configuration.
- Building to be a minimum distance of 1.5 m from the wetwell. Ensure exhaust vent from wetwell is not pointing towards building, and air intakes for the building are not near this exhaust. Ventilation for the building shall be on the opposite side of the building from the wetwell.
- No windows.
- Two celled wetwell with isolation gate on dividing wall. The top of the wetwell dividing wall is to be located at least 0.2 m above station emergency overflow. The inlet shall be designed to feed both wetwells evenly and shall contain an arrangement of gates to permit isolation of either one of the wetwell cells for cleaning and maintenance.
- Provide junction box equipped with terminal strip in the wetwell to facilitate changes of the floats. Provide separate junction box for grinder power supply and to enable the removal and installation of the grinder.
- Provide drywell area containing pumps, process piping, valves, and metering equipment. A superstructure shall be provided above drywell, to provide access. Access to the drywell area shall be via stairs.
- Drywell superstructure area to be separate from the control room area with separate entrance doors for each area. Provide motorized crane and motorized hoist within building above the drywell for lifting and removing pumps and drywell equipment.
- All drywell equipment shall be rated for Class 1, Zone 2 hazardous environment as well as any rooms not physically separated from the space (e.g., room directly above if there are access hatches, stairwell areas). The room above the drywell must have a dedicated exterior door. Do not provide continuous ventilation for the purpose of reducing the classification of the area.

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F4.00 Wetwell Design

The wetwell and associated equipment shall include the following:

- Wetwell shall be provided with only one inlet sewer. Multiple upstream sewers shall converge in a common collector MH with only one outlet sewer travelling into the wetwell.
- Wetwell should be designed to suit the pump capacity which should, in turn, be matched to the station design flow rate and flow variation. The size of the wetwell, in relationship to the suction pipe(s), shall be in accordance with the Hydraulic Institute to prevent hydraulic interference. The depth of the wetwell shall be sufficient to ensure adequate control bands for each pump.
- Where VFDs are provided, ensure the minimum speed is sufficient to provide minimum self-cleansing velocity required in the discharge forcemain(s).
- Configuration to prevent turbulence and vortex formation to not adversely impact pump operation.
- Access to wetwell to be directly from outdoors.
- Benching in the wetwell shall be steep and close to the pump inlet to prevent sediment buildup on the wetwell floor.
- Where possible, provide benching at a 60° slope or greater around the pump suctions to prevent buildup of solids in the wetwell. As a minimum, adhere to the Ministry standard of 45°.
- Benching of a lesser slope may be provided where additional means of solids resuspension are provided, such as pump recirculation valves or piping, or alternate mixing systems.
- Within the benching, for larger wetwells, provide steps within the concrete, at the bottom of the access ladder, to enable staff to safely reach the pump level.
- Ensure that, with the selected benching, the station still has sufficient vertical working space for the level transmitter and back up floats to operate properly.
- Use corrosion resistant materials, Type 316L SS, FRP, or aluminum in the wetwell.
- Where sluice gates or fabricated slide gates are used, provide provisions to isolate gates for maintenance.
- In no case shall the wetwell be sized to have the submersible pumps cycling more than six times per hour for a station with pumps 40 HP or less. In no case shall the number of pump starts exceed the manufacturer's recommendations but, in all cases, the more stringent criteria shall apply.

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For submersible pumps with motors greater than 40 HP, the number of starts per hour shall not exceed the manufacturer's recommendations. If VFDs are employed and the control system modulates the speed of the VFD in response to wetwell level, the number of starts per hour can be reduced but shall not exceed the number of starts recommended by the pump manufacturer.

- Wetwells are classified as Class 1, Group D, Zone 1 Hazardous Locations and the requirements of the OESC must be satisfied with respect to electrical installations within these spaces.
- Ultrasonic equipment is to be used for the primary pump controls system. Provide float control, complete with anti-sway hardware, as a backup.
- Provide adequate pump operating range within the wetwell, as per Ministry guidelines as well as the following:
 - Minimum distance between start and stop levels for each pump must be at least 0.3 m.
 - As the backup pump control, a full set of floats (equivalent to the primary level transducer set points) above and below the normal ultrasonic operating range are to be provided. A minimum distance of 0.2 m shall be provided between the primary pump start level and the backup float.
- All wetwells shall be provided with a water service to enable flushing or cleaning of the wetwell. The water service shall be provided with a backflow preventer, sized no smaller than 50 mm and shall be metered. For Station 1 Type provide a yard hydrant adjacent to the wetwell. For Station Types 2, 3, and 4, the water service shall be plumbed into the building.
- Wetwells shall be equipped with LED lighting rated for the space. Lighting shall be installed in an accessible location to allow for maintenance.
- Top slab of wetwell shall be located at least 200 mm above surrounding ground, with grade sloped away from the chamber.

F4.01 Access Hatches

- All hatches must be construction grade aluminum with removable stainless steel pin hinges for ease of greasing and removal.
- Personnel entry access and equipment hatches shall be "Safe Hatch" style by Xylem (Flygt), Bilco, or MSU.
- Provide guards, as required, under various regulations.
- Provide secondary fall protection with grating.
- Hatches must be spring assisted and be lockable by padlock.

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- Hatches must include a hold-open arm that locks in place (e.g., a locking channel) to keep the cover in the vertical position when open.
- Hatches shall be a minimum size of 750 mm by 900 mm or sized adequately to allow for equipment maintenance and personnel retrieval.

F4.02 Wetwell Vertical Access Ladders

- Vertical access ladders shall be anodized, non-slip aluminum and designed to the requirements of OHSA. All other components, such as mounting hardware, must be at least 304/316 stainless steel.
- Ladder, for access to the wetwell, shall be mounted on the wall of the structure.
- Provide ladder with telescopic side rail (ladder up) extensions that can extend above the platform and chamber for safe entry and can be lowered when not in use. Extensions are to be located beneath personnel entry access hatches.
- Ladder, for access to or through a service platform, shall extend from bottom of wetwell through the service platform with hinged platform grating to the underside of hatch, or other grating section. The ladder shall be continuous and travel vertically from the bottom of wetwell to the top. There shall be no offsets in the ladders which could impede emergency retrieval of an entrant.
- Locate ladder a suitable distance away from inlet sewer to allow entrant to use ladder without being splashed by sewage.

F4.03 Service Platform

- Design service platform for wetwell at a maximum of 300 mm above the top of the influent sewer. All others shall be located to meet operating, servicing, or safety requirements. Platforms to be installed at 5 m intervals in deeper wetwells (e.g., 15 m deep station would require two grating platforms).
- Provide anodized aluminum grating in all areas requiring grating.
- Design grating to support a uniform live load of 4.8 kPa and a concentrated load of 2.5 kN over an area of 300 mm x 300 mm. Grating shall also be capable of withstanding the impact of 3.0 kN, with permanent deflection due to this impact loading not exceeding 1/150 of the span. Provide all opened edges of the service platform with 1.1 m high anodized aluminum handrail, complete with toe boards in accordance with the OBC.

F4.04 Storage

- Emergency storage is to be considered as part of design. Emergency storage shall be in addition to peak operating storage requirements.

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- Emergency overflow pipe shall be provided for Types 3 and 4 Stations unless prohibited by location or topography.
- Provide on-site wetwell storage for two hours (minimum) for Types 1 and 2 Stations at peak inflow rate.
- Provide on-site wetwell storage for one hour (minimum) for Types 3 and 4 Stations at peak inflow rate and total combined wetwell and system emergency storage for two hours (minimum) at peak inflow rate.
- The hydraulic grade line and its relation to the lowest connected basement elevation shall be provided with the design package.
- Emergency storage is to be located above the standby pump start level but below the lowest basement level in the catchment area or where applicable, the overflow pipe.

F4.05 Solids Handling

- As dictated by the characteristics of the wastewater flowing into the pumping station, an appropriately-sized grinder(s) shall be placed at the inlet or upstream of the wetwell in all pump stations.
- All pumps shall be capable of handling 75 mm solids.
- Grinder pumps or pumps with “chopper style” impellers may be considered by the Township for Types 1 and 2 Stations.

F4.06 Pump Design

Design and selection of pumps and associated equipment shall include the following:

- Pumps should be of a capacity and in sufficient numbers to allow maximum operating flexibility and optimum performance of the station components through the range of flows expected during the service life of the facility. This requirement is most critical during the initial years of operation when actual flows are normally less than ultimate design flows.
- Pumps shall be high efficiency, explosion-proof, submersible, a non-clog impeller type suitable for the fluid to be pumped.
- The use of grinder pumps or pumps with “chopper style” impellers is only acceptable for flow rates less than 30 L/s and must be approved by the Township first on the basis of wastewater characteristics.
- Drywell pumps shall be provided with an inspection port to check impeller condition or unclog the pump.
- Provide pipe flushing connections to facilitate the cleaning of plugged lines or pumps.

Appendix F – Sewage Pumping Station (SPS) Design Guide

- Provide an air vent pipe from the high point on the submersible pump volute discharging back to the wetwell above the emergency overflow level to facilitate priming after wetwell pump down. Air release piping from pump discharge pipe shall not be PVC. For dry pit pumps, a manually activated backflow actuator shall be provided on the pump discharge check valve to allow backflow from the discharge forcemain to reprime the pump.
- Submersible pumps shall include a hydraulic flush valve.
- Vibration and harmonic analysis must be conducted for pumps if installed in drywells.
- Harmonic analysis must be conducted for all VFDs.
- Pumps shall be equipped with thermal and leak detection devices.
- For a Type 4 configuration, provide piping and valves to allow recirculation of pumped wastewater into wetwell cells to prevent solids build up at the bottom.
- For submersible pumps, pumps must be removable from the surface utilizing guide rails. Provide guide rails as per pump manufacturers requirements. Guide rails extending more than 6 m shall have intermediate guide brackets to prevent separation.
- Pumps shall have mechanical seals.
- Lifting equipment shall be provided for all pumps. For larger drywell stations, a crane rail and explosion proof hoist shall be provided.
- The firm capacity of the station should be based on a pumping rate with the largest pump out of service.

F4.07 Piping and Valve Design

Process piping shall be designed in accordance with the most current Hydraulic Institute Standards.

Design of the process piping and valves shall include the following:

- Stainless steel 316L shall be used for discharge piping within the station and shall have a minimum wall thickness of Schedule 10.
- Forcemains to be CSA Certified HDPE DR11 or PVC Class 235 DR18.
- Butterfly valves shall not be used for forcemains.
- Isolation valves shall be plug valves.
- Sluice gates shall be 316L stainless steel, with operators located at ground level.
- Check valves on pump discharge shall be horizontal and not vertical. Check valves to be anti-slam.

Appendix F – Sewage Pumping Station (SPS) Design Guide

- Design piping layout with T configuration.
- Isolation valves shall be in the horizontal position, if possible.
- Provide air / vacuum valves where required.
- Provide flushing connections to facilitate cleaning of pipes, where required. Flushing connections shall be a minimum of 50 mm diameter.
- Provide isolation valves on discharge header prior to leaving the pumping station.
- Provide facility / station bypass connections.
- Provide surge control on main discharge header.
- Valves must be located in a separate watertight valve chamber or valve room.
- Valves located in the wetwell are not acceptable.
- All valves shall be supplied with fully restrained dismantling coupling (i.e., Victaulic grooved coupling) on the adjacent spool pipe.
- Each pump will be provided with a separate air release valve on its discharge pipe.
- A means for draining the forcemain into the wetwell is required. Drain connection is to be located prior to the isolation valve on the forcemain.
- Flow metering shall be provided on all forcemains.
- All flow metering to be magnetic and shall be independently grounded. Provide flanged by flanged spool pipe of same length as magnetic flow meter installed for use when meter is removed from service for maintenance.
- All appurtenances and connectors shall be corrosion resistant and compatible with the piping material.
- All process piping shall be provided with colour coded labels to comply with the latest edition of the ANSI/ASME A13.1 Pipe Labelling Requirements.

F4.08 Odour Control

All SPSs shall be designed to minimize the escape of odours from the wetwell. The designer should provide engineering calculations of potential for hydrogen sulfide generation in the forcemain and provide recommendations to prevent generation of odours and for odour control.

For pumping stations located in residential areas, or areas that are within 100 m of residential dwellings or commercial / institutional establishments, an adequately sized odour control system shall be provided.

The Township prefers passive odour control systems; however, if circumstances dictate a larger active odour control system is required based on proximity of receptors, the size of the station, or the wastewater composition being received

Appendix F – Sewage Pumping Station (SPS) Design Guide

at the station, the Township may consider it on a case-by-case basis. Passive odour control is to be provided for the wetwell vent pipes and should be installed at an elevation that is reasonable for maintenance.

F4.09 Heating and Ventilation

Provide heating and ventilation as per the requirements set out in the current version of MECP Design Guidelines for Sewage Works, NFPA 820 and OESC documents. If there are discrepancies between requirements, the more stringent shall apply.

All non-classified areas shall be suitably separated from classified areas. No portion of the SPS facility shall be de-energized due to a loss of ventilation (refer to OESC Section 22, Clause 22-708-5).

F4.10 Equipment and Material List

The following is a list of acceptable major equipment / manufacturers:

- The standby generator shall be diesel fuel powered, and radiator cooled. The generator set supplied shall be a Cummins diesel engine / generator unit or a Caterpillar diesel engine / generator unit, complete with sound attenuating weatherproof enclosure and double walled subbase fuel tank.
- Pumps: Xylem (Flygt).
- Mechanical Process Piping: 316L Stainless Steel.
- Plug Valve: Val-Matic, Clow, Dezurik, Pratt.
- Gate Valve: AVK, Clow, Dezurik, Mueller.
- Knife Edge Gate Valve: Stafsjo, Orbinox, Trueline, Dezurik.
- Check Valve: Val-Matic Surgebuster, PSI-Pratt Surge Inhibitor.
- Access and Equipment Hatches: Xylem (Flygt), Bilco, MSU (Aluminum Construction).
- Magnetic Flow Meter: Endress & Hauser, ABB, Khrono, Rosemount.
- Slide / Sluice Gates: Fontaine, Orbinox, Dynamic, Armtec, Whipps.
- Floats: Xylem (Flygt) (EMN-10).
- Chemical Feed Equipment: ProMinent.
- Eyewash: Haws.
- Electric Actuators: Rotork, Auma, Limitorque.
- VFD: Schneider / Square D, Allen Bradley, ABB, Eaton.
- Soft Starters: Schneider / Square D, Allen Bradley, Benshaw, Eaton.
- Motor Control Centre: Allen Bradley, Eaton (Cutler Hammer), Schneider / Square D, General Electric.
- Automatic Transfer Switch: ASCO (Schneider / Square D).

Appendix F – Sewage Pumping Station (SPS) Design Guide

- Hazardous Gas Detection / Monitoring Equipment: Armstrong AMC.
- Ultrasonic Level Transducer: Siemens Milltronics.
- Odour Control:
 - Passive: Robert Wager, Camfil.
 - Active: To be determined on a site-by-site basis.
- The SPS shall be equipped with SCADA and the SCADA system shall communicate with the applicable local Water Pollution Control Plant (WPCP) and current operating authority.
- The PLC to be provided for the pumping station shall be an Allen Bradley unit and shall be connected to the Township’s sewage SCADA. Include capability to monitor and control equipment at the SPS from two remote locations.
- Plant equipment shall be controlled / monitored through field adjustable PLC(s). The PLC(s) shall allow operator field adjustment of process equipment variables (e.g., transducer level set point control of raw sewage pumps) through a graphical user operator interface terminal without the need for an external laptop computer. Any PLC or operator interface equipment shall include non-proprietary programming. Equipment control panels shall include isolated outputs wired to terminals for all discrete and analog process variables, control status, and fault indication for connection to a central PLC monitoring panel. Programming and integration shall be completed by ARO Technologies Inc. of Collingwood.

Please refer to the Township’s Approved Product and Equipment List for additional items.

F4.11 Commissioning

Commissioning of pumping station equipment is to be supervised by the design consultant and the equipment manufacturer representatives. The equipment manufacturer representatives shall be present to inspect and certify the installation of the equipment, provide assistance during commissioning and startup, and provide training to operations personnel.

Commissioning shall be followed by a minimum 14-day period of satisfactory operation prior to the station receiving wastewater and being put into service. After the design consultant has successfully proven out all operational aspects of the station, a demonstration session shall be provided to the Township operators and engineering staff.

Appendix F – Sewage Pumping Station (SPS) Design Guide

F4.12 Asset and Maintenance Data

For all new equipment included within the design, the design consultant or developer must provide the Township with the required asset and maintenance data.

The following data is required for all new assets where possible: Asset ID, manufacturer, make, model, serial number, year installed, estimated service life, along with any other fields deemed necessary by the Township.

F4.13 Final Deliverables

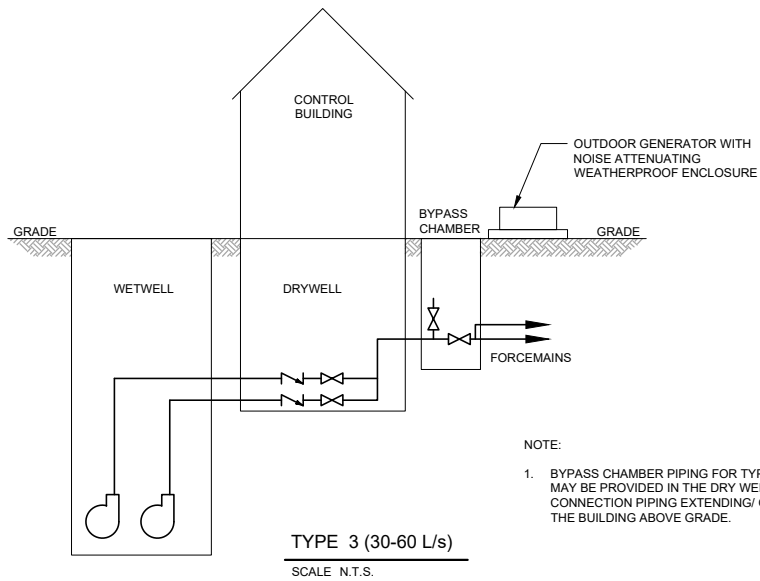
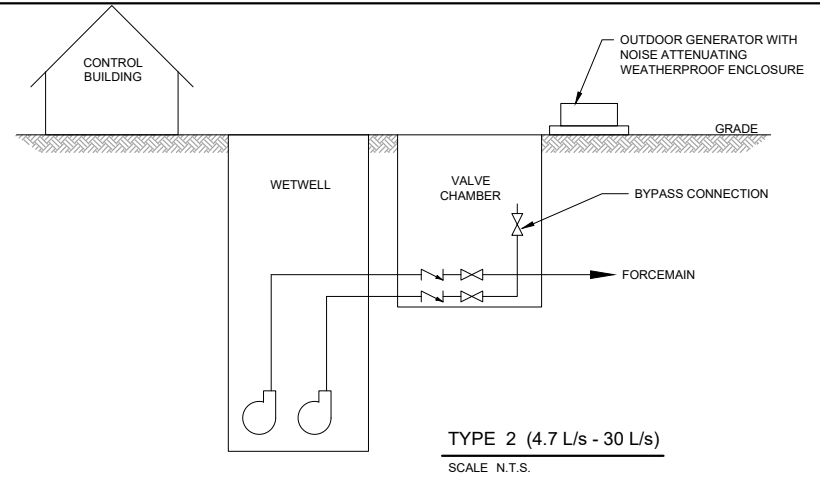
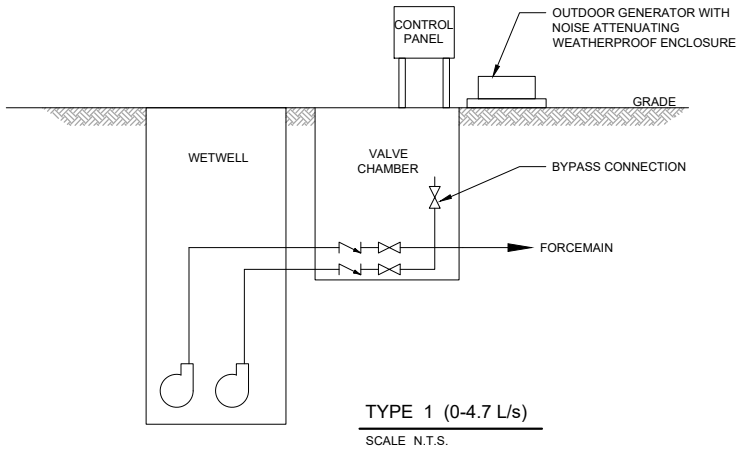
Prior to the Township allowing the stipulated maintenance period to begin and the Township assuming operational duties of the pumping station, the following deliverables must be provided to the Township:

- “Record Drawings” consistent with the requirements noted in the Subdivision Agreement in an electronic format acceptable to the Township.
- A Facility Operations Manual for the pumping station. The format of the Operations Manual shall follow the MECP’s “Master Model Operations Manual for Water Supply Systems”, 1992 or approved equivalent. The Manual shall be prepared using the latest version of Microsoft Word in the format provided by the Township. Two hard copies and one electronic copy (in Microsoft Word and PDF) shall be provided. A sample manual showing the required format and content will be provided by the Township upon request.
- A “Record” Process Control Narrative (PCN) for the pumping station. The PCN shall describe the operation of the station including monitoring and control of all associated equipment. Specifics regarding equipment controlled and / or monitored by a Process Logic Controller (PLC), SCADA system, or autodialer shall be included. Two hard copies and one electronic copy (in Microsoft Word and PDF) shall be provided.
- A complete set of final shop drawings for all pumping station materials and equipment. Two hard copies in appropriately labelled 3-ring binders shall be provided along with one digital copy (in PDF format).
- An Equipment O&M Manual for all pumping station equipment. The equipment data shall be organized into applicable sections consistent with the project specification divisions. The information shall be contained within a 3-ring binder with labelled tabs. Information including process description, operation, and maintenance instructions shall be provided. This shall also include a complete equipment list and spare parts list as well as a manufacturer’s recommended spare parts list and lubricants. Equipment

Appendix F – Sewage Pumping Station (SPS) Design Guide

information such as make, size, capacity, and serial number shall be indicated along with contact information for applicable subcontractors and suppliers. Any equipment guarantees and warranties shall be included ensuring information including commencement date, duration, and remedial action to be taken under the guarantee / warranty is clearly defined. Two hard copies of the binders are to be provided along with a digital version (in PDF format).

- Provide copies of all software and control programs for any SCADA, PLC, or Human Machine Interface (HMI) equipment on a USB memory stick or another format acceptable to the Township.



NOTE:
1. BYPASS CHAMBER PIPING FOR TYPES 3 AND 4 MAY BE PROVIDED IN THE DRY WELL WITH CONNECTION PIPING EXTENDING/ OUTLETING THE BUILDING ABOVE GRADE.

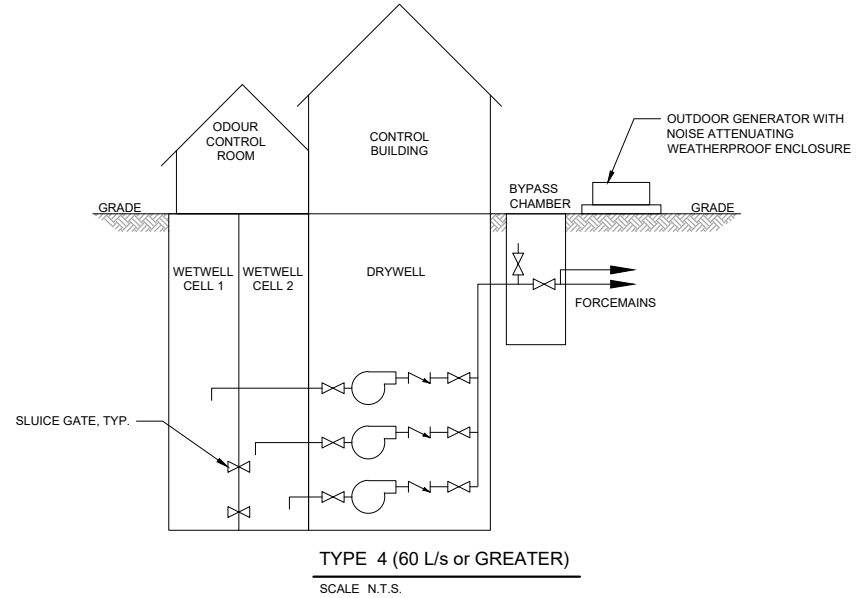
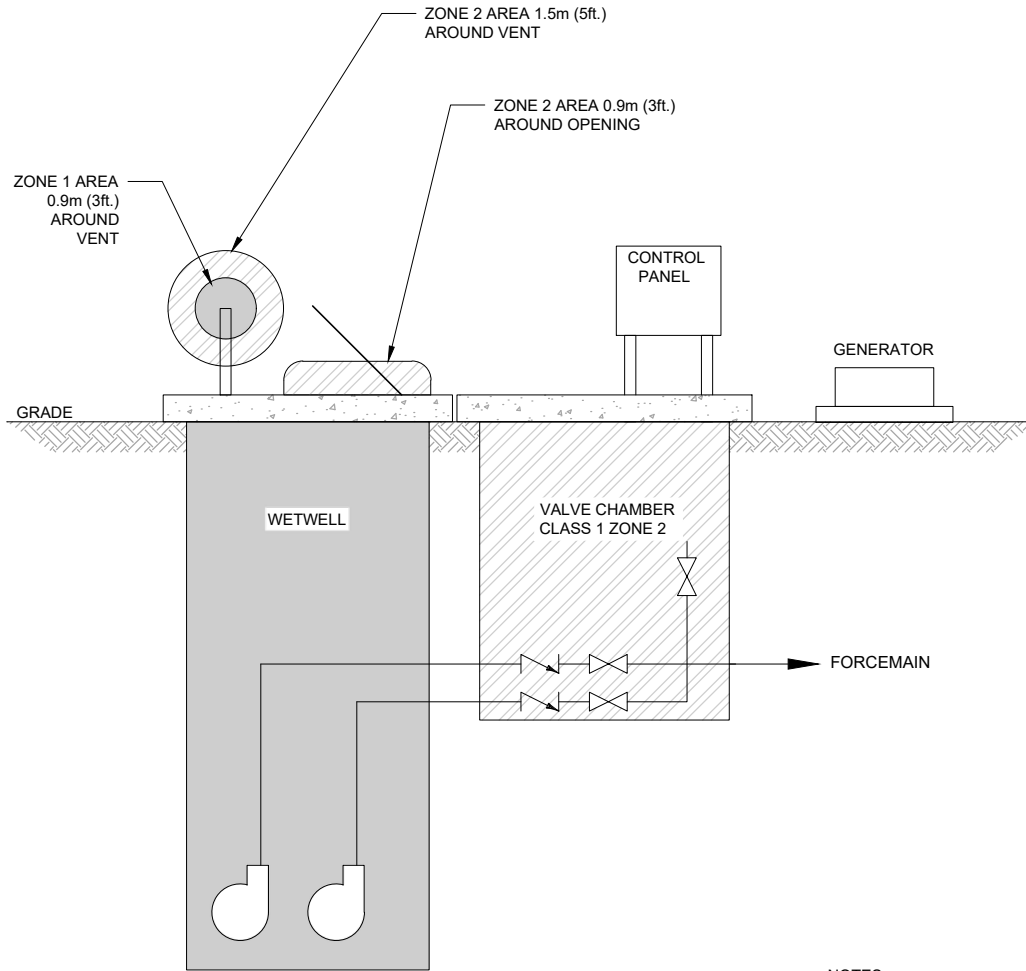


Figure Title
**SEWAGE PUMP STATION
DESIGN GUIDE**
PUMPING STATION TYPES

Date
SEPTEMBER 2025


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Figure No.
1



NOTES:

1. AREA / SPACE CLASSIFICATIONS DEFINED AS PER THE CANADIAN ELECTRICAL CODE, NFPA 820 AND SECTIONS 18 AND 22 OF THE OESC.

 HAZARDOUS AREA - CLASS 1 ZONE 1

 HAZARDOUS AREA - CLASS 1 ZONE 2

2. LOCATE CONTROL PANEL AND GENERATOR OUTSIDE OF HAZARDOUS AREAS.

TYPE 1 PUMPING STATION ARRANGEMENT

SCALE N.T.S.



Figure Title

SEWAGE PUMP STATION DESIGN GUIDE

TYPE 1 PUMPING STATION ARRANGEMENT

Date

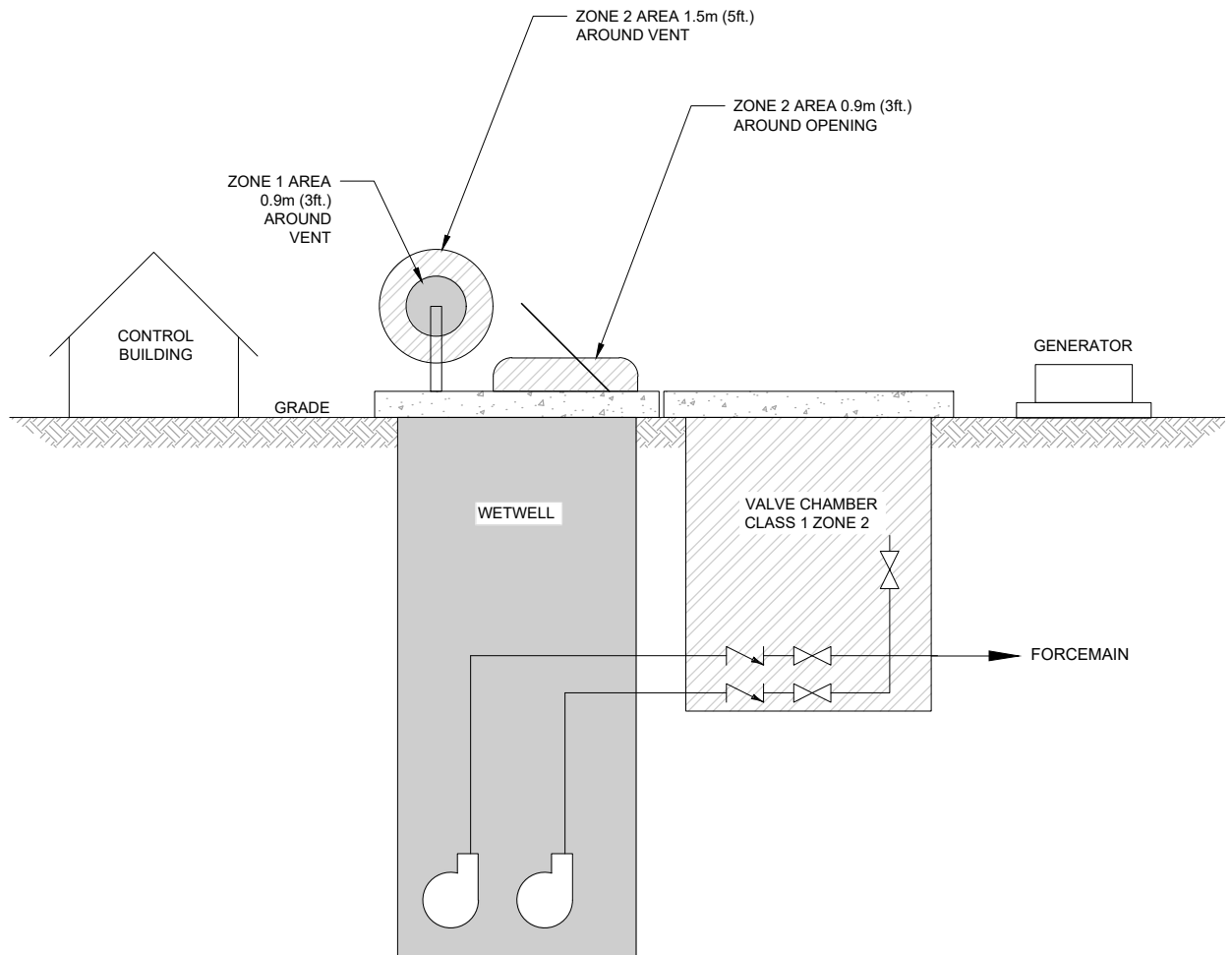
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NOTES:

1. AREA / SPACE CLASSIFICATIONS DEFINED AS PER THE CANADIAN ELECTRICAL CODE, NFPA 820 AND SECTIONS 18 AND 22 OF THE OESC.

 HAZARDOUS AREA - CLASS 1 ZONE 1

 HAZARDOUS AREA - CLASS 1 ZONE 2

2. LOCATE CONTROL BUILDING AND GENERATOR OUTSIDE OF HAZARDOUS AREAS.

TYPE 2 PUMPING STATION ARRANGEMENT

SCALE N.T.S.



Figure Title

SEWAGE PUMP STATION DESIGN GUIDE

TYPE 2 PUMPING STATION ARRANGEMENT

Date

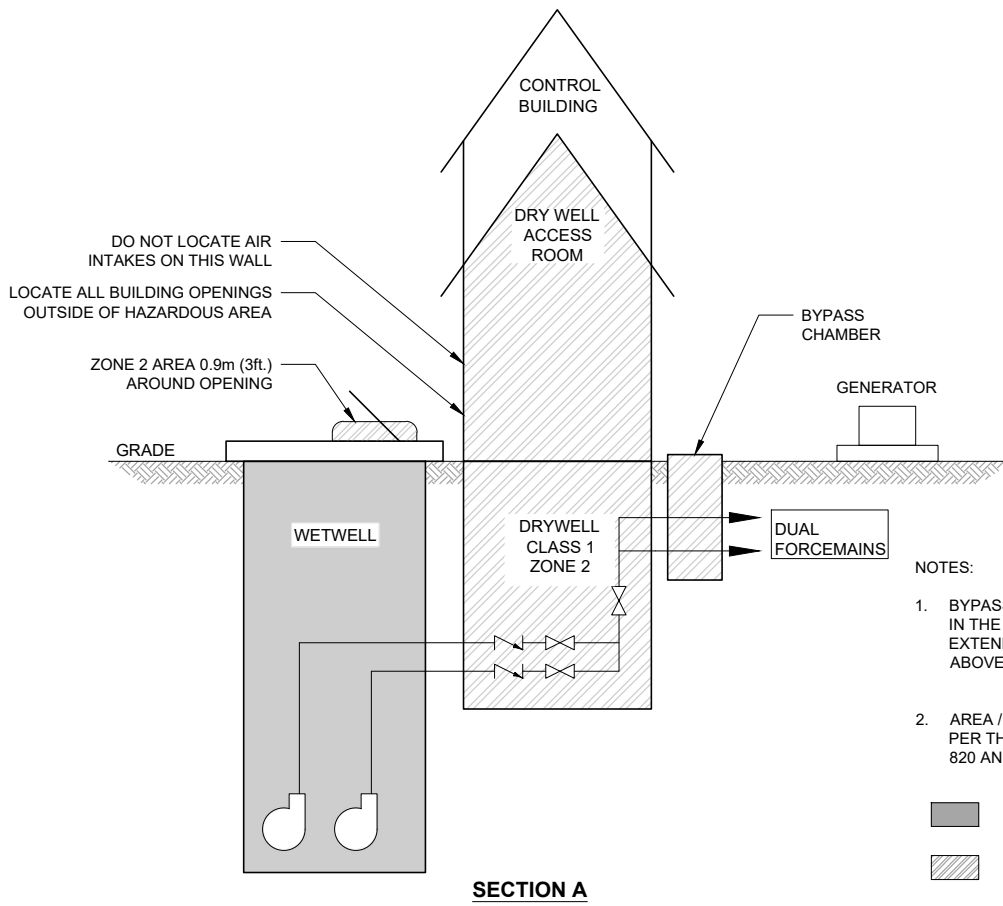
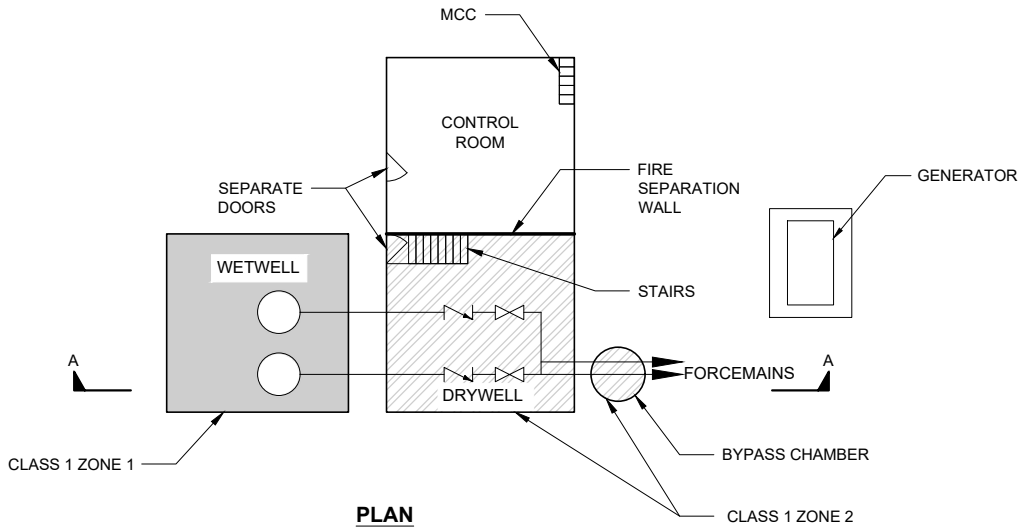
SEPTEMBER 2025

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Figure No.

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NOTES:

1. BYPASS CHAMBER PIPING MAY BE PROVIDED IN THE DRYWELL WITH CONNECTION PIPING EXTENDING/ OUTLETING THE BUILDING ABOVE GRADE.
2. AREA / SPACE CLASSIFICATIONS DEFINED AS PER THE CANADIAN ELECTRICAL CODE, NFPA 820 AND SECTIONS 18 AND 22 OF THE OESC.
3. LOCATE GENERATOR OUTSIDE OF HAZARDOUS AREAS.

TYPE 3 PUMPING STATION ARRANGEMENT

SCALE N.T.S.



Figure Title

**SEWAGE PUMP STATION
DESIGN GUIDE**

TYPE 3 PUMPING STATION ARRANGEMENT

Date

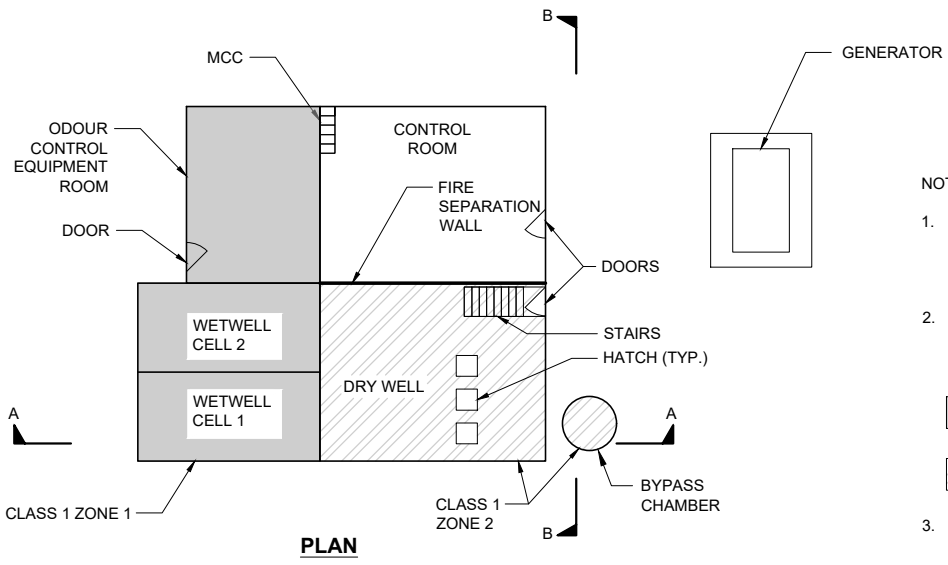
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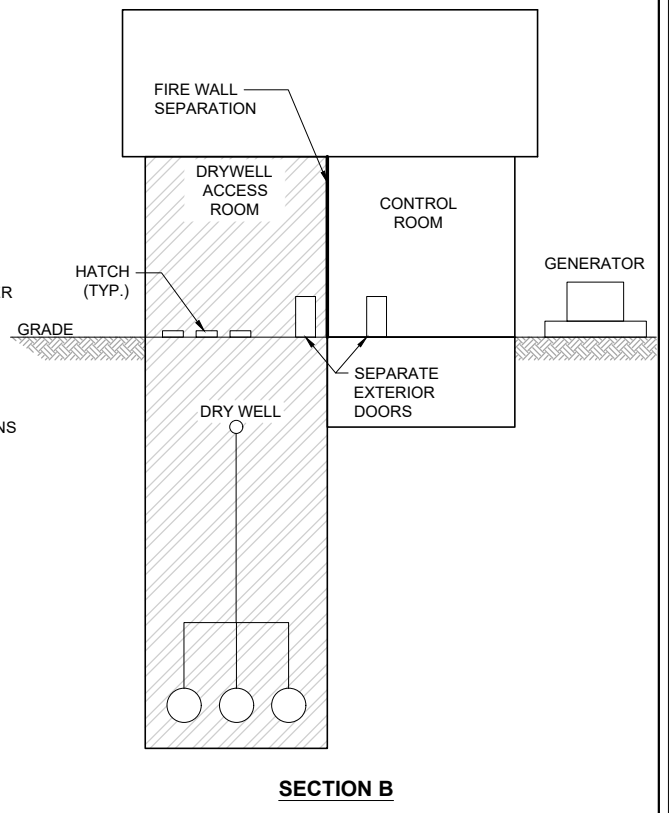
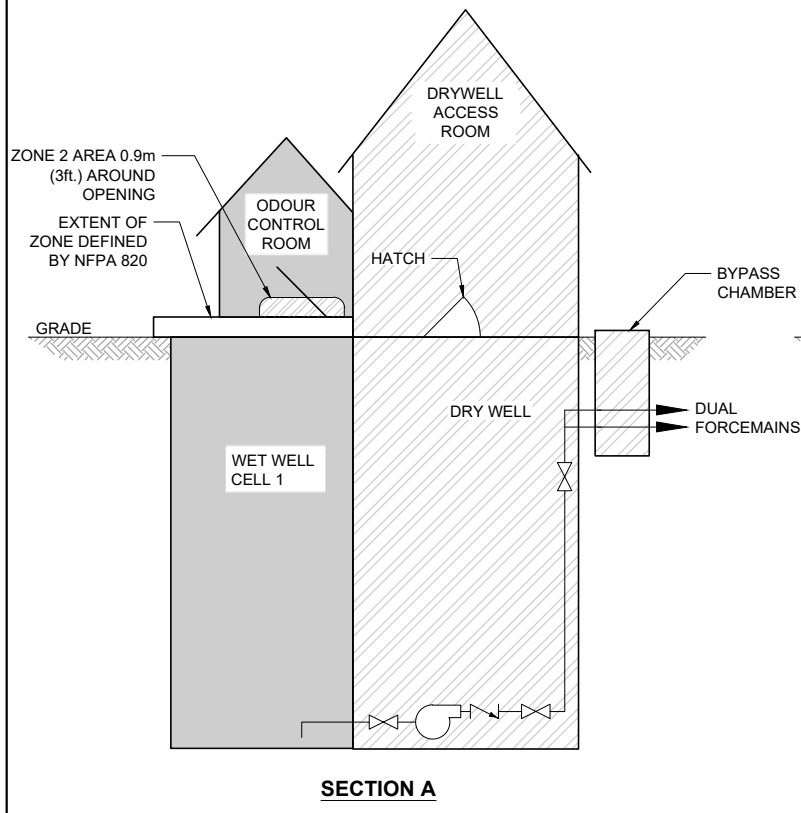
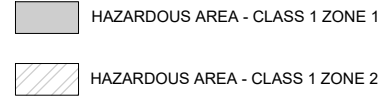
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NOTES:

1. BYPASS CHAMBER PIPING MAY BE PROVIDED IN THE DRYWELL WITH CONNECTION PIPING EXTENDING/OUTLETING THE BUILDING ABOVE GRADE.
2. AREA / SPACE CLASSIFICATIONS DEFINED AS PER THE CANADIAN ELECTRICAL CODE, NFPA 820 AND SECTIONS 18 AND 22 OF THE OESC.
3. LOCATE GENERATOR OUTSIDE OF HAZARDOUS AREA.



TYPE 4 PUMPING STATION ARRANGEMENT
SCALE N.T.S.



Figure Title		SEWAGE PUMP STATION DESIGN GUIDE
TYPE 4 PUMPING STATION ARRANGEMENT		
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CLEARVIEW
TOWNSHIP

Appendix G – Watermain Commissioning and Disinfection Procedures

The latest version of the Watermain Testing and Disinfection Procedures is to be requested through the Township's Public Works Department.



Appendix H – Service Record Sheet

The latest version of the Service Record Sheet is to be requested through the Township's Public Works Department.



CLEARVIEW
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Appendix I – Survey Monument Record Sheet

Survey Monument Record Sheet – Township of Clearview

Location Plan (In Metric)

Monument No.: _____

UTM Zone 17N	
Northing:	(m)
Easting:	(m)
Elevation:	(m)
Scale Factor:	

Monument Type:	
Established By:	Date:
Description:	
Intervisible With:	
Horizontal	
Control Est. By:	Date:
Equipment:	Precision:
Comments:	
Vertical	
Elevation Est. By:	Date:
Equipment:	Precision:
Comments:	



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TOWNSHIP

Appendix J – Engineer’s Declaration Form



CLEARVIEW
TOWNSHIP

Declaration of Owner and Consulting Engineer

Date: _____

Project Name: _____

Project Address: _____

This Declaration serves as notification to the Township of Clearview that the undersigned hereby authorizes the following professional engineer, duly qualified, licensed and in good standing with the Professional Engineers Association of Ontario, who holds a Certificate of Authorization for municipal engineering applications, to be appointed as the Project Manager for the above noted Project.

Name of Authorized Project Manger:

Address: _____

Email: _____ Phone: _____

The above authorized Project Manager has been retained to design the Works and acknowledges that they have reviewed the Township's Engineering Standards and confirm that the design of the Works adheres to the Township Standards. They further acknowledge and confirm that they will supervise and certify the construction and installation of the Works of the proposed development according to the Engineering Standards.

Print Owner Name

Print Consulting Engineer Name

Signature

Signature