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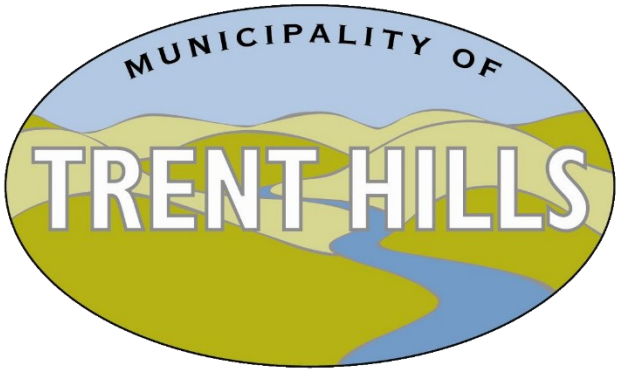

The Municipality of Trent Hills

Municipal Servicing Guidelines

April 2026

LIST OF REVISION NOTICE DATES

Rev. #	Rev. Date	Comments
1	April 28th, 2026	Issued for Approval

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Section 1.0 Introduction

1.1 Definitions

For the purpose of these guidelines, the following definitions will be recognized:

a) **"Acceptance"** means the date upon which the Municipality considers Works to be fully completed and acceptable to the Municipality, with the exception of deficiencies acceptable to the Director of Public Works, either collectively or in part, as the case may be, pending the completion of all requirements noted in the Agreement;

b) "**Agreement**" means the Subdivision or Development Agreement between the Owner and the Municipality;

c) "**AODA**" means Accessibility for Ontarians with Disabilities Act.

d) "**Approval**" means the approval of the draft Plan of Subdivision given under the Planning Act;

e) "**Approved Plans**" means all of the plans, drawings, reports, specifications, sketches, elevations, details and renderings submitted to and approved by the Municipality for development of the Lands;

f) **"Assumption"** means the date when Works, either collectively or in part, as the case may be, under the Agreement have been completed, the Maintenance Period has expired, the Municipality has assumed the Works by by-law and the responsibility for future maintenance of Works by the Municipality has been initiated;

g) "**Chief Building Official**" means the person from time to time holding the title of Chief Building Official for the Municipality or his or her designate;

h) "**Completion**" means the date upon which the Municipality first considers Works to be substantially completed and acceptable to the Municipality in a plan of subdivision or phase to allow for the issuance of building permits and for consideration of the first release of securities on Works completed;

i) **"Contractor"** means a person, partnership, or corporation who contract to undertake the execution of the whole or part of the Work;

j) "**Curb Ramp**" means a ramp that is cut through a curb or that is built up to a curb.

k) "**Depressed Curb**" means a seamless gradual slope at transitions between sidewalks and walkways and highways and is usually found at intersections.

l) **"Director of Planning and Development"** means the person from time to time holding the title of Director of Planning and Development for the Municipality or his or her designate;

m) "**Director of Public Works**" means the person from time to time holding the title of Director of Public Works for the Municipality or his or her designate;

n) "**Engineer**" means the Owner's professional consulting engineer who is hired and retained in accordance with the Agreement and who is responsible for the design and contract administration of the Works;

o) "**Main**" means every sewer pipe, except services and portions of private sewers, installed on the public road allowance or on any other land upon which the Municipality has obtained easements;

p) "**Maintenance Period**" means the minimum of two (2) year maintenance period after "Acceptance", and until "Assumption" of Works, either collectively or in part;

q) "**Municipality**" means the Corporation of the Municipality of Trent Hills, any of its employees, and any consultants contracted by the Municipality of Trent Hills;

r) "**OBC**" means Ontario Building Code.

s) "**OPSD**" means Ontario Provincial Standard Drawings.

t) "**OPSS**" means Ontario Provincial Standard Specifications.

u) "**Owner**" means the person(s) or developer who own(s) the Lands and who is a Party to the Subdivision or Development Agreement;

v) "**Plan**" means the Draft or Registered Plan of Subdivision;

w) "**ROW**" means the right-of-way or municipal road allowance, referring to a piece of Municipally owned land that includes roadways, sidewalks and land used for utility services.

x) "**Works**" or "**Work**" means all services to be constructed pursuant to this agreement and includes External Works and their respective component parts, all utilities, landscaping, tree planting and any other work or any facility, service, duty, or obligation of the Owner required pursuant to the Agreement.

1.2 Metric Usage

All plans, drawings, specifications, details, descriptions, notes and any other terms included in the engineering drawings, specifications, and tender package must be dimensioned or referenced using the Metric system of measurement.

Section 2.0 Subdivision Process & Submission Requirements

2.1 Subdivision Procedures

2.1.1 Draft Plan

A Draft Plan of Subdivision is required to ensure the land is suitable for the proposed purpose for subdivision. It ensures the proposal conforms to the Official Plan, adjacent plan of subdivisions and the Zoning By-law. A Draft plan of Subdivision protects the existing and future residents of the community from developments that are inappropriate or may place undue stress on existing services, facilities and the economy.

Draft Plan approval including all conditions must be issued by the Municipality prior to any detailed subdivision engineering review being conducted. The draft plan should illustrate all aspects required under the Planning Act, R.S.O. 1990, c. P.13 and should clearly identify the following elements:

- ☐ Right of way widths
- ☐ Cul-de-sac and ROW radii
- ☐ Daylighting triangles
- ☐ All property lines for proposed lots and blocks including frontage widths
- ☐ Servicing blocks/easements and reserves
- ☐ Existing contour lines and drainage features
- ☐ Table summarizing lot/block numbers and areas

The draft plan should be accompanied by a Functional Servicing Report which conveys how the proposed development will be provided with Municipal services. The FSR should be prepared in accordance with Section 2.2.1. Other supporting studies may be required by the Municipality or other agencies to support the draft plan application, such as a Preliminary Stormwater Management Report.

Pre-consultation with the Municipality is strongly encouraged prior to draft plan submission to ensure that the proponent understands the process and any requirements specific to their site.

2.1.2 Engineering Submissions

Following Draft Plan approval, the engineering design drawings and supporting reports should be submitted to the Municipality for review. The engineering submission will consist of the following documents and drawings:

- ☐ Subdivision engineering plans
- ☐ Stormwater management report and drawings
- ☐ Geotechnical report
- ☐ Confirmation of sufficient water and sewer capacity
- ☐ Tree Preservation Plan (if required)

- ☐ Environmental Impact Study (if required)
- ☐ Landscape and Tree Planting Plan
- ☐ Noise Study (if required)
- ☐ Traffic Impact Study (if required)
- ☐ Other supporting studies as identified by commenting agencies

Further Submission requirements are identified in Section 4.

2.1.3 Agreement

The Owner will be required to enter into an Agreement with the Municipality. A standardized form of Agreement is used, a copy of which is available from the Municipality. The Engineer is expected to obtain a copy of the Agreement and be fully conversant with its terms as well as the standards contained herein. The Engineer is expected to provide and/or co-ordinate the following schedules for inclusion in the Agreement:

Schedule “B“– Description and Cost of Works to be Constructed
Schedule “C“– Approved Plans & Reports for Works to be Constructed
Schedule “D“– Lot Grading and Drainage Plans
Schedule “E“– Parkland, Fencing, Landscaping and Tree Preservation

Financial security in a form satisfactory to the Municipality must be provided upon execution of the Agreement, based on the Engineer’s estimate of the work, to guarantee satisfactory performance of the work. The amount of financial security will be as outlined in the Agreement. The specific requirements related to release of securities are identified in the Agreement.

All approved plans for the works to be constructed need to be reduced to legal size (215.9 mm x 355.6 mm, 8.5” X 14”) for inclusion in the Agreement. The reduced versions are to be photographic reductions of the originals having black lines on a white background. Photocopy reductions are not permitted.

The estimated cost of the Works as prepared by the Engineer and approved by the Municipality is required to be incorporated into the Agreement. The estimate must be supported by a suitable breakdown by estimated quantity and unit price under the following general headings whereby it is assumed that individual unit prices will include taxes as they are applicable:

a) Roads (To top of asphalt surface course and curbing)
b) Stormwater Treatment System (Complete)
c) Water Distribution System (Complete)
d) Sanitary Sewer System (Complete)
e) Streetlights
f) Signs/Barricades

g) Sidewalks (Concrete/Asphalt)

h) Fencing (All types including Noise Attenuation)

i) Boulevard Landscaping (Topsoil and Sod)

j) Grading (Excavation and Fill Placement for road construction and those additional areas which may be designated for pre-grading)

k) Other Underground Utilities (Electric, Telephone, Cable TV, Gas)

l) Parkland Improvements

m) Tree Planting

n) Engineering (design, contract administration and inspection)

o) Contingencies Allowance (five (5%) percent of the total engineers' cost of the works)

p) Applicable H.S.T.

The Municipality reserves the right to re-examine the Engineers' estimates and request an update based on current construction costs to account for delays and/or scope changes.

2.1.4 Building Permits

Building permits will not be issued until such time as the Municipality has issued a Certificate of Completion for the Works. The Municipality may, at its discretion, allow up to 10% of the building lots to be used for the construction of unoccupied Model Homes prior to Completion to facilitate marketing of the subdivision. Conditions for issuance of building permits for Model Homes are as outlined below:

The conditions on which the Municipality generally will issue permits for the construction of unoccupied Model Homes are as follows:

a) The Owner must have constructed a minimum 6.1 metre access road from an open public road to the lot upon which the model home is to be constructed. The access needs to be paved to the base course asphalt stage with full curb and gutter;

b) The Owner must construct a gravel turning circle, or approved equivalent, at the end of any such access road, in accordance with these guidelines;

c) An in-service fire hydrant must be located within 90 metres of the model house, based on vehicular travel distance;

d) At the time of commencement of construction of a model house, no portion of a model house can be constructed within 15.0 metres of any other building with an unfinished exterior, other than another model house;

e) Water services can not be turned on.

f) The Owner must maintain, at its sole cost, the access road and turning circle, including snow ploughing, until Acceptance for the fronting public street; and

g) The Owner covenants and agrees that no model house will be occupied for residential purposes prior to the issuance of the Acceptance Certificate for the fronting public street.

2.1.5 Interim Acceptance

Building Permits are typically available after an Interim Acceptance Certificate has been issued by the Municipality. The Certificate of Completion will be issued after the fulfilment of the following requirements, and the Municipality has received a specifically worded written certification from the Engineer detailing how they have been completed:

a) Storm sewer, sanitary sewer, and water distribution systems have been completed and the sewers connected to outlets all to the satisfaction of the Municipal Engineer.

b) Interim ‘As Constructed’ road Plan and Profile drawings showing ‘As Constructed’ locations, inverts, lengths and slopes of all storm and sanitary sewers and structures, sewer lot service locations redrawn as measured to the downstream maintenance hole and invert elevations and locations at the property line. The Municipality requires that both the plan and profile components of the drawings be significantly re-drawn to accurately reflect the ‘As Constructed’ conditions. The submitted ‘As Constructed’ drawings must be signed and sealed by a professional engineer. Once the ‘As Constructed’ drawings are reviewed and approved by the Municipality of Trent Hills, they shall be provided in digital form in both PDF format and AutoCAD (DWG) format in the proper UTM coordinate system.

c) ‘As Constructed’ storm and sanitary sewer design calculations/charts have been provided to the Municipal Engineer based upon the ‘As Constructed’ pipe slopes. Design flows arising out of minor changes to the maintenance hole and catchbasin locations need not be altered from the approved design sheets, but pipe flow capacities based on ‘As Constructed’ slopes should be modified.

d) Leakage and deflection testing of the sanitary and storm sewers have been certified and submitted by the Developer’s Engineer.

e) The full width of the road allowances have been rough graded, the granular base, all maintenance hole and catchbasin adjustments to base course level, full asphalt base and full curb and gutter have been completed, including temporary turning circles at the termination of road allowances where necessary, all trenched road crossings have been completed and restored, and the streets have been connected to an existing assumed street, and all emergency accesses have been completed to base asphalt. There should be unencumbered access for any emergency vehicles to all lots within the subdivision.

f) An overall composite utility plan, signed and approved by all utility companies, showing the various utility services has been completed if not previously submitted.

g) An ‘As Constructed’ survey of the stormwater management facility has been completed and submitted to the Municipality and that the water quality design parameters and stage-storage-discharge are in conformance with the approved design.

h) The lots have been rough graded to within 750 mm of finished grade in conformity with the general lot grading plan and further specific elements of the plan have been established, such as rear yard swales common to and crossing through several lots, as deemed essential by the Municipal Engineer so that subsequent builders may conform readily to the plan.

i) The Developer has erected an adequate and legible sign at or near the subdivision entrance clearly depicting the land use designations within the Subdivision and on the immediately abutting lands and the arterial and collector streets as recited in the Official Plan. Temporary sedimentation pond lots and Stormwater Management facilities must also be clearly shown and labelled on the signs. The size, content and location of each sign needs to be approved by the Municipal Engineer in advance of erection.

j) The Developer has erected temporary street name signs and traffic control signs at all intersections to the satisfaction of the Municipal Engineer. The street name signs must be located and orientated properly for both streets and be labelled on both sides.

k) The Developer has marked the municipal address and lot number on the water service markers at each lot or block.

l) The Developer has made arrangements to maintain the Public Services and emergency routes to the satisfaction of the Municipal Engineer. Satisfactory arrangements must include an undertaking by the Developer's Engineer that the Public Services, including stormwater management and sedimentation and erosion control facilities, will be inspected on a weekly basis and/or after rainfall events and that deficiencies will be immediately rectified to the satisfaction of the Municipal Engineer and that contact information for the contractor for subdivision maintenance is provided.

m) The Developer has posted an irrevocable Letter of Credit to secure completion of its remaining obligations pursuant to the Subdivision Agreement to the satisfaction of the Municipal Engineer, which typically includes Lot Grading Certification and completion of Surface Works. Additionally, all of the outstanding invoices for work performed by the Municipality pursuant to the Subdivision Agreement must be paid in full.

n) A written acknowledgement from the Municipality of Trent Hills Fire Chief or his designate has been received to the effect that the Developer has made satisfactory arrangements for the sequence of building construction so as to create fire breaks during the period of construction and further that adequate access is available for Fire Department vehicles. The Developer's Engineer typically provides a Fire Break Plan for submission to the Municipality's Fire Department to assist in this process.

2.1.6 Subdivision Assumption

The mechanism for subdivision Acceptance by the Municipality is detailed in the Subdivision Agreement. The Owner, typically through its Engineer, may request Acceptance upon completion of the following:

a) The public services outlined in the Subdivision Agreement have been completed in a satisfactory manner based on an inspection by the Municipality and have been fully paid for. In general, the surface asphalt will not be permitted to be placed until after a minimum of one full winter season after the completion of binder asphalt and a minimum of 75% of the houses are completed.

b) The Developer has provided a certificate of Current Value, from the Developer's Engineer, establishing the value of the Public Services being assumed by the Municipality upon expiry of the Warranty Period.

c) The Developer has provided the Municipal Engineer with one full set of final "As Constructed" drawings showing the Public Services including completed surface asphalt and sidewalks. These drawings must be provided in a digital form in PDF format with Shapefile (SHP) and AutoCAD (DWG) format in the proper UTM coordinate system. The "As Constructed" drawing set should include the final "As Constructed" Stormwater Management drawing set arising out of a recent (within 90 days) detailed survey of the pond undertaken soon after the pond has been drained and all sediment removed from both the forebay and the main cell. A lot service record sheet shall also be provided for each serviced lot detailing the location of curb stops and cleanouts.

d) Within 3 months prior to final lift of surface course asphalt, the Developer has performed full length closed circuit television (CCTV) inspections and sewer ratings of the sanitary and storm sewers in accordance with the Municipality's Standards. The CCTV inspection is to include the main line sewers and all service laterals to the property line cleanout. All defects and recommended repairs must be reported by the Developer's Engineer to the Municipality and remedies need to be approved by the Municipal Engineer. Upon completion of the required repairs, a final set of CCTV inspection videos and ratings needs to be submitted for approval along with a certification from the Developer's Engineer that the videos were reviewed and all sewers and structures appear to be in accordance with the Municipality's standards noted above. Similarly, at this stage, the Developer is to perform a continuity test of tracer wire on the watermain, and provide the results to the Municipality. The Municipality will have 3 weeks to review and approve the final video submission prior to placement of surface asphalt.

e) The Developer has provided written confirmation from an Ontario Land Surveyor that all standard iron bars within the Subdivision, as shown on the registered plan, have been located, made visible, are flush to grade and, if necessary, replaced.

f) Upon the Municipal Engineer's provision to the Developer a certificate indicating that the Public Services have been completed to the satisfaction of Municipal Engineer (herein referred to as the "Final Acceptance Certificate"), the Developer will continue to be solely responsible for the maintenance of the Public Services in a state of good repair for twenty-four (24) months following the date of the Final Acceptance Certificate (herein referred to as the Warranty Period). The Developer will promptly remedy any defects in the work appearing within such period. The Warranty Period will not expire until the final inspection has been arranged by the Developer and carried out by the Municipality, and any defects identified by the final inspection have been repaired by the Developer. In the latter part of the Warranty Period, Municipal staff will prepare a report to Municipal Council in relation to the acceptance of the subdivision as Council Approval will be required prior to assumption. Within thirty (30) days of the final inspection, or the repair of any defects identified by the final inspection, performance security will be returned to the Developer and the Municipality will acknowledge in writing that the Public Services have been fully assumed by the Municipality.

g) The transfer of any provincial government approvals or certificates to the Municipality is required.

2.1.7 Maintenance Period

Upon Acceptance of the Works by the Municipality, the Owner will continue to be solely responsible for the maintenance of the Works in a state of good repair for twenty-four (24) months following the date of the Acceptance (herein referred to as the Maintenance Period) and must promptly remedy any defects in the work appearing within such period. Where any waterworks forming part of the Works have been connected to the municipal water system operated by the Municipality, all maintenance and repairs will be conducted by the Municipality at the expense of the Owner.

2.2 Submission Requirements

2.2.1 Functional Servicing Report

A Functional Servicing Report must accompany the Draft Plan submission for the proposed development which, among other things, must include the following:

a) All roadway location and alignments and intersections, including right of way widths and intended road classifications.

b) Parkland, open space and stormwater management (SWM) blocks.

c) Existing and proposed watercourses and channelization.

d) Any known floodplain and wetland boundaries.

e) Confirmation of adequate water and sewer servicing capacity.

f) Geotechnical and hydro-geotechnical reports including slope stability and potential well and septic system impacts. Hydro-geotechnical reports should make estimations of seasonally high groundwater table in relation to the proposed preliminary grading plans, servicing trenches, stormwater management facilities, and finished floor elevation. A water balance assessment should also be included.

g) Preliminary stormwater management report including water quality and sediment and erosion control plans. Size of SWM block should be confirmed and consideration of maintenance access and buffers included.

h) Preliminary sanitary sewer assessment including confirmation of downstream capacities, and required pumping station locations.

i) Confirmation with Utility/Cable/Hydro of available servicing.

j) In areas where the proposed subdivision is located within a portion of a larger area to be developed, the Functional Servicing Report must consider how the servicing of the subject application does not limit or encumber future development.

Other documents that may be required to accompany the Functional Servicing Report as a part of the Draft Plan submission include:

k) Tree Preservation Plan. (if required *Section 2.1.2 has ‘if required’ next to some of these requirements)

l) Landscape and Tree Planting Plan.

m) Traffic Impact Study.

n) Active Transportation – sidewalks and trails

o) Noise Study

p) Parking study (if applicable)

2.2.2 Engineering Plans

All development requiring municipal servicing must be designed and constructed under the supervision of the Engineer, who is a Professional Engineer registered and in good standings with the Professional Engineers of Ontario. All final drawings and relevant reports submitted to the Municipality must bear the seal of the registered Professional Engineer responsible for the design of the project. Drawings are to be A1 size and at a scale which is adequate to show sufficient detail of proposed works and provided in paper and digital format.

The Engineer shall submit two (2) hardcopies of all plans/studies, specifications and pertinent design calculations for the proposed municipal services in accordance with the requirements of the Municipality. A digital copy of all documents is also to be provided.

The plans, specifications and other documentation submitted will be reviewed and approved by the Municipality. One copy of information submitted will be returned to the Engineer noting any required revisions. When the plans, specifications and other design calculations are approved, the Municipality will sign as the municipality and/or applicant, all applications for submission to the appropriate regulatory agencies. No construction work can begin on any project until the Municipality is satisfied that approvals have been received from the regulatory agencies and the requirements, financial and otherwise, of the Agreement have been complied with.

The following plans must be submitted to the Municipality for review:

a) Title Page

b) Servicing Plans

c) Lot Grading Plans

d) Plan and Profile Drawings

e) Storm Sewer Catchment Area Plan

f) Sanitary Sewer Catchment Area Plan

g) Erosion and Sediment Control Plan

h) Tree Preservation Plan

i) Stormwater Management Plan

j) Landscape and Tree Planting Plan

k) Composite Utility Plan

l) Lighting Photometrics Plan

m) Standards and Specifications Plan.

The following supporting documents shall be submitted to the Municipality for review in addition to the engineering plans:

a) One copy of the signed Draft Plan of Subdivision.

b) One copy of the Draft Plan Conditions.

c) A covering letter providing an overview of the submission and confirmation that all drawings reflect Draft Plan conditions.

d) Storm Sewer Design Charts for both 5 year flows and 100 year hydraulic grade line calculations.

e) Sanitary Sewer Design Charts.

f) Stormwater Management Report sealed by a Professional Engineer.

A) Title Page

The title page must contain the following:

- ☐ A key plan showing the project location in relation to the surrounding streets and major features. The plan must include a north arrow;
- ☐ A drawing index listing all plans within the set; and
- ☐ The project name and contact information for the Owner and Engineer.

B) Overall Servicing Plan

The Servicing Plan(s) shall be drawn at a scale of 1:500. In the event the entire subdivision cannot be contained on one sheet, additional drawing(s) shall be provided, and the plans may overlap. The Servicing Plan shall contain the following:

- ☐ The proposed lot and block layout, dimension, and numbering matching the final M Plan.
- ☐ M Plan.
- ☐ Lot frontage dimensions.
- ☐ Driveway locations.
- ☐ Stormwater sewers and catchbasins, maintenance holes and catchbasin maintenance holes (all treatment facilities).
- ☐ Sanitary sewers and maintenance holes.

- ☐ Watermains and hydrants.
- ☐ Roads, curbs and sidewalks.
- ☐ Storm, sanitary and water services for each lot.
- ☐ All external watermains, sanitary sewers, storm sewers and drainage courses that are required to service the subdivision.

C) Plan and Profile Drawings

Plan and Profile drawings are required for all streets, pipe outfalls, easements and watercourses. The Plan and Profile Drawings shall be arranged within the set such that all streets have their own drawing(s). The Plan and Profile drawings shall be drawn at a scale of 1:250 horizontally and 1:50 vertically. Where a street requires more than one plan, match lines with stationing should be provided with no overlap of information. The plan and profile portions of the drawing should be in line vertically with each other and shall have consistent stationing. Plan and Profile Drawings should include the following:

- ☐ The proposed lot and block layout within the plan component.
- ☐ Lot frontage dimensions on all lots and blocks.
- ☐ Chainage stationing shown every even 20 metres on the profile component (in sync. with grid lines) and 100 metres on the plan component.
- ☐ Chainage stationing at all road intersections for both roads.
- ☐ Existing ground profile along centre of right of way and existing left and right elevation marks corresponding to the edge of the right of way at even 20 metre stations.
- ☐ Proposed centreline profile including all longitudinal slopes, crest and sag K values, PVI station and elevations and vertical curve lengths. Horizontal centreline radii and BC and EC data should be shown on the plan portion. Where change in vertical grade is less than 1.5%, no vertical curve is required.
- ☐ Where plan and profile is an extension of an existing road, show profile extending at least 40 metres into the existing road to ensure proper profile transition. Lesser distances of existing road may be permitted where there is little change in the grade. The limits of construction including stationing must be shown on both the plan and profile portion.
- ☐ All storm sewer, sanitary sewer, and watermain information including structures such as maintenance holes, catchbasins, hydrants, valves, etc., should be shown. The profile portion should include: pipe size, material type and class, bedding type and class, length and slope of pipes, maintenance holes sizes, related OPSD numbers, and inverts at maintenance holes, catchbasin lead crossings, etc. Non-standard maintenance hole details or maintenance hole benching must be shown on the drawings.
- ☐ Grading details of cul-de-sac where minimum gutter grades are proposed.

- ☐ Watermain bends and vertical clearances must be shown at crossings.
- ☐ All water, storm and services should be shown (in different line types) as well as driveway locations.
- ☐ Rear yard catchbasin profiles shall be drawn in conjunction with the proposed surface lot grading and minimum underside of footing. Maintenance holes required at the main line intersection with rear yard catchbasins.
- ☐ Vertical Benchmark and UTM information required within title block. At least one vertical benchmark must be shown within or adjacent to the site and at least two fixed UTM horizontal control points are needed. Where additional benchmarks have been established within the subdivision since final approval, these benchmarks should be indicated on the drawing prior to 'As Built' submission.
- ☐ Road, boulevard, sidewalk and right of way widths, sidewalk locations and curb and right of way radii at intersections and bends.
- ☐ Above ground utility information.

D) Lot Grading Plans

Lot grading plans shall be prepared in accordance with this guideline and contain the following information:

- ☐ Lot Grading Plans must be drawn at a minimum scale of 1:250.
- ☐ Indicate a north arrow.
- ☐ All elevations should be referenced to a metric geodetic municipal benchmark.
- ☐ Show all existing and proposed lot numbers and blocks.
- ☐ Show all proposed rear lot catch basins, pipes, top of grate elevations and inverts**,** and easements.
- ☐ Show existing contours.
- ☐ Show existing and proposed elevations at lot corners.
- ☐ Show adjacent topography and drainage patterns.
- ☐ Show all existing structures, vegetation, natural features on, or adjacent to the subject property.
- ☐ Indicate specified house grade, top of foundation elevations, steps in foundation, low openings and garage floor elevations including proposed driveway grade.
- ☐ Show proposed road grades and elevations on all streets with arrows indicating direction of slope.
- ☐ Show proposed elevations along boundary of all blocks abutting single family and semi-detached lots in the subdivision.

- ☐ The maximum side slopes on swales should be 3 horizontal to 1 vertical (3:1). All swales must have a minimum depth of 150 mm. Swales within the development between lots are to be centered on property lines. Swales abutting other properties are to be constructed entirely within development lands.
- ☐ The maximum slope of all embankments should be 3:1. Where slopes greater than 3:1 are proposed a retaining wall should be constructed. All slopes are to be indicated on the plan, clearly defining the limits of the slope.
- ☐ The proposed direction of overland flow shall be indicated on the plans by arrows. High points and all changes in grade are to be clearly noted on the plan, with spot elevations.
- ☐ All Regional Flood and Fill Lines, verified by the Conservation Authority, must be indicated on lot grading plans where developments are adjacent to existing watercourses.

E) Stormwater and Sanitary Sewer Catchment Area Drawings

These drawings may be prepared at a scale of 1:500 in relation to the Lot Grading Plans, or at a scale of 1:750 or up to a maximum of 1:1000 to capture a greater area. Storm Sewer Catchment Area drawings must outline and indicate the tributary area and runoff coefficient for each location (typically a catchbasin) being analyzed. The Sanitary Sewer Catchment Area drawing should outline and indicate catchment areas and assumed population parameters (and land uses where mixed) for each maintenance hole. The storm and sanitary sewer design sheets shall be consistent with these drawings.

F) Tree Preservation Plan

The Tree Preservation Plan can be prepared at a maximum scale of 1:1000. The Plan must indicate all existing significant tree and shrub cover (drip lines) on the site, and clearly indicate which vegetation is to be preserved or removed. A detailed inventory is required for all trees with a diameter greater than 300 mm. The Tree Preservation Plan should be consistent with the grading requirements outlined in the Lot Grading Plans.

G) Sediment and Erosion Control Plan

The Sediment and Erosion Control Plans are required to indicate all proposed erosion control measures including installation details and timing, inspection, maintenance, and removal. The Sediment and Erosion Control Plans are typically prepared in conjunction with the Lot Grading Plans and Stormwater Management Reports. Temporary stockpiling areas must be noted on the plan. The plan should be prepared according to the Erosion and Sediment Control Guide For Urban Construction (TRCA 2019)

H) Stormwater Management Plan

The Stormwater Management Plan must provide enough information in both plan and profile to properly construct the approved proposed stormwater management facilities. Horizontal scale shall be a standard even value. Stormwater Management facility drawings should include the following:

- ☐ Location, size, grading, and berming for the proposed facility.
- ☐ Permanent pool, extended detention, 5 and 100 year ponding levels as well as regulatory floodplain elevations (where applicable).
- ☐ Seasonally high groundwater table levels.
- ☐ Details and elevations of inlets and outlets including overflows.
- ☐ The proposed berm widths and berm compaction and any water liner requirements should be noted.
- ☐ Proposed maintenance access roads, easements, pipes and overland outfall details.
- ☐ Vegetative cover and any proposed wet pond plantings and vegetative landscaping.
- ☐ Adequate buffer from any stormwater infrastructure to a property line.

Stormwater pond requirements are to be in accordance with MECP requirements.

I) Landscape and Tree Planting Plan

Landscape and Tree Planting Plan will be prepared and stamped by a full member of the Ontario Association of Landscape Architects in good standing. The plan should consider species diversity, tree form location and design. The landscape and tree planting plan will include:

- ☐ Location, species and specifications of the proposed trees, parkland plantings and any landscape screening areas for the development.
- ☐ Traffic signs, light poles, and surface utility features.
- ☐ Landscape specifications, locations, and spacing, in conformance this document.

J) Composite Utility Plan

The Composite Utility Plan must be completed to ensure that conflicts among utilities, trees, municipal services and driveways are avoided. The Composite Utility Plan shall be drawn at a scale of 1:500 and shall detail and locate all underground electrical, CATV, gas, and telecommunication servicing including trenching details, road crossing, streetlights, pedestals, transformers and other street ‘furniture’ such as hydrants and proposed Canada Post box locations. The final composite utility plan shall be signed by all utilities. The Composite Utility Plans must show building envelopes, road crossing details, driveway location and widths, boulevard trees and traffic signs. Specifications and locations for underground ducts for street lighting should also be included on the plans.

K) Street Lighting Photometrics Plan

The Street Lighting Photometrics Plan will demonstrate the location, height, type of all lighting fixtures. The plan must illustrate the lighting levels (metric units) on all proposed streets within the subdivision at a maximum grid spacing of 2.5 metres.

- ☐ The drawings should clearly demonstrate that the lighting levels meet TAC Guidelines for the Design of Roadway Lighting Standards or approved equivalent.
- ☐ The design approach (i.e. Luminance or Illuminance) should be stated on the drawing as well as Average Luminance (or Illuminance) and Uniformity Ratios for all streets.
- ☐ The assumed streetlight luminaires and pole type and height should be consistent with the electrical drawings and the pole height and locations should be consistent with the Composite Utility Plans and approved road cross-sections.
- ☐ A covering letter or report, sealed by a Professional Engineer, in support of the design, should accompany the plans.

2.3 Construction Approvals/Inspections

The Engineer responsible for the design of the Works is required to provide full-time inspection during construction. The Engineer is also responsible for the submission of PDF and AutoCAD file drawings to make a complete set of "As Constructed" drawings, following the completion of the works. Drawings are to be A1 size. As recorded submissions shall be prepared to accurately record how municipal works were constructed.

2.3.1 Construction Prerequisites

The following are considered pre-requisites to the commencement of construction:

a) Engineering plan approval including approval from all outside agencies having jurisdiction.

b) All construction related permits/approvals in place.

c) Acceptance of the owner’s contract documents.

d) Posting of the certificate of insurance and other as set forth in the Owner’s agreement.

e) Delivery of all forms of consent, securities and payments as provided for in the subdivision agreement.

f) Execution and delivery by the Owner/Owner of the subdivision agreement and all deeds and easements for lands to be given to the Municipality and other public agencies.

g) A pre-construction meeting.

h) Delivery of 3 sets of all final design plans plus 2 copies of all reports.

2.3.2 Pre-Construction Meeting

After the pre-requisites for the commencement of construction have been satisfied, the owner's engineer must request a pre-construction meeting to be arranged through the office of the Public Works Department prior to construction. The utility companies and any other agencies which are perceived to have an interest in the construction are to be contacted for by the consultant. It is expected that the developer's engineer and their site inspector, the contractor, a direct representative from the development firm, and the Municipality of Trent Hills staff will attend the pre-construction meeting.

The owner will be required to provide an approximate schedule of construction, a list of subcontractors, and a list of materials, mix designs, etc., to be used in the construction of the subdivision (materials must have Municipal approval). Minutes of the meeting will be taken by the owner's engineer and circulated to all in attendance after a draft has been reviewed and approved the Public Works Department.

2.3.3 Inspection and Testing

All works to be constructed must be inspected and tested under the direction of a Professional Engineer. The Engineer is approved by the Municipality to provide full time inspection in the subdivision. The Municipality or a representative of the Municipality will provide periodic part time observations at pertinent inspection intervals.

The Engineer shall make every reasonable attempt to maintain consistency regarding on-site inspection. The Engineer must notify the Public Works Department for approval if an alternate inspector is assigned to the project. If unforeseen circumstances require the immediate substitution of the designated inspector, the Public Works Department shall be notified as soon thereafter as possible.

Inspection works are to be carried out as outlined in Table 2.3.3

Inspection Frequency Table 2.3.3

F=Full time inspection, P=Part time inspection, A=as required to establish compliance

(1) Indicates mandatory notification to the Municipality of Trent Hills – Public Works Engineering Services staff.

Type of Operation	Municipality Notification	Engineer	Municipality of Trent Hills
Pre-construction meeting	(1)	A	A
Clearing and grubbing		P	A
Stripping topsoil		P	A

Type of Operation	Municipality Notification	Engineer	Municipality of Trent Hills
Below Ground Works			
Check benchmarks & control bars		A	A
Check trenching, bedding, and backfilling operations		F	A
Verify acceptability of materials		P	A
Check layout & monitor installation of below ground works		F	A
Monitor testing of watermain (leakage)	(1)	F	A
Monitor chlorination (Water)	(1)	F	A
Monitor testing of sanitary sewer and maintenance holes	(1)	F	A
Utility trenching (electric, telephone, cable, gas)	(1)	P	A
Utility trench backfill	(1)	F	A
Compile information and prepare as-constructed drawings		F	
Above Ground Works		F	
Checking grade and layout of all above ground works		F	A
Monitor road sub excavation and placement of granulars	(1)	P	A
Check rough grading of boulevards		P	A
Check pre grading of lots/swales/parkland/storm ponds		F	A
Check base asphalt	(1)	F	A
Check streetlight installation and wiring	(1)	F	A
Check curb and gutter installation	(1)	F	A
Walkways	(1)	F	A
Fencing (noise, berms, misc.)		P	A
CCTV sewers	(1)	F	A
Perform continuity testing of watermain tracer wire	(1)	F	A
Check top course asphalt	(1)	F	A
Boulevard landscaping	(1)		A
Park landscaping/street trees	(1)	A	A

Type of Operation	Municipality Notification	Engineer	Municipality of Trent Hills
Other			
Prepare weekly progress reports		A	A
Security reduction requests	(1)	A	A
Administering deficiency inspections	(1)	A	A

2.3.4 Duties of the Engineer during Construction

The Engineer must ensure that an approved construction inspector is present on site for the purpose of ensuring quality control during construction. The following functions are considered mandatory.

A) Start Up

- ☐ Attend pre-construction meeting
- ☐ Check all benchmarks on the plan for accuracy
- ☐ Check elevations of any receiving sanitary or storm sewers to ensure conformance with plan elevations
- ☐ Check for adequate control for layout i.e. survey bars
- ☐ Obtain asphalt and concrete mix designs, sieve analysis, and aggregate sources; to be forwarded to the Municipality and the chosen testing company

B) Underground Work

- ☐ Record top of rock elevations
- ☐ Check horizontal and vertical alignment and grades of all works
- ☐ Verify acceptability of material on site
- ☐ Inspect bedding installation and confirm proper compaction
- ☐ Inspect coverage of sewer pipes and verify clearances
- ☐ Check to make sure sufficient cover on watermain
- ☐ Check maintenance hole and catchbasin locations to ensure they meet plan dimensions
- ☐ Check tops of maintenance holes and catchbasins to ensure they are low enough to accommodate frames and grates plus at least one lift of modulo and mortar bed for frame and gate
- ☐ Ensure all maintenance holes are properly benched and have sufficient rungs
- ☐ Complete all necessary testing for sewer systems (air test, mandrel, leakage, etc.) as well as for watermains (pressure test, bacteriological test, continuity of tracer wire, chlorination, etc.) and record information
- ☐ Record all “As-Constructed” information and complete lateral sheets for each lot.

- ☐ Check final elevations for frame and grates of all maintenance holes, catchbasins and for ditch inlets which are not in the pavement

C) Road works

- ☐ Check sub base to make sure it is to grade; complete compaction testing
- ☐ Complete compaction testing and testing of granular materials
- ☐ Check curb grades, location and layout
- ☐ Ensure all storm inlets are in accordance with the approved design elevation
- ☐ Take air tests, slump tests, and cylinders on all concrete pours (curb and sidewalk)
- ☐ Check final road base elevations prior to base course asphalt to ensure proper crown and proper depth between top of base and top of gutter
- ☐ Ensure maintenance hole frames and grates are constructed to the proper grade and cross fall at base course asphalt grade including all gate valve boxes
- ☐ Sample both surface and base course asphalt
- ☐ Prior to surface course asphalt, confirm and witness CCTV; CCTV reports and video to be reviewed and commented upon
- ☐ Prior to surface course asphalt, confirm and witness watermain tracer wire continuity test
- ☐ Prior to surface course paving, make sure all maintenance hole and catchbasin frames are properly adjusted including all gate valve boxes
- ☐ Prior to surface course paving, ensure that tack coat is applied to entire base asphalt
- ☐ Supervise all testing of the asphalt (compaction, etc.)
- ☐ Ensure all ditch inlet structure grates and storm outfall grates are properly secured
- ☐ Check sidewalk alignment and grades
- ☐ Check sidewalk base material and compaction, check sidewalk forms to ensure proper thickness

D) Utility Trenches, Street Lights, Boulevards, and Street Trees

- ☐ Check location and depth of utility trenches
- ☐ Check location of ducts
- ☐ Check location of hydrants to confirm required minimum distance separation is met
- ☐ Check location and grade of transformer pads, pedestals, etc.
- ☐ Ensure road crossings and utility trenches are properly backfilled and compacted
- ☐ Check location of street lights and ensure they are vertical
- ☐ Sod and landscaping is checked at acceptance for compliance
- ☐ Confirm stakeout of street trees and confirm species planted

E) Miscellaneous

- ☐ If required by the Municipality – complete weekly progress reports which are forwarded to the Municipality which details the work completed, identifies significant deficiencies, details progression of work versus the contractors schedule of work, appends all test results, etc.
- ☐ Certification from a Professional Engineer that the works have been installed in accordance with the approved engineering drawings; both at above and below ground stages of construction
- ☐ Complete deficiency inspections and reports
- ☐ Verify security reduction requests
- ☐ Check all rip rapped areas for dimensions, grade, size, and quality of rock and installation of filter cloth
- ☐ Check all storm water management facilities for grade and dimensions
- ☐ Check all major drainage swales and rear yard swales for grades and alignment
- ☐ Monitor construction of berms and noise attenuation fences
- ☐ Monitor construction in park areas
- ☐ Check construction of walkways and fencing
- ☐ At completion of all landscaping, check fire hydrant flange elevation to ensure the minimum 150 mm clearance
- ☐ Check all gate valves and curbstops for visibility and operation
- ☐ Tie in all maintenance holes and gate valves which are not in the pavement

2.3.5 Quality Control and Inspection Frequency (Minimum Standards)

The Engineer must ensure that quality control and inspection frequency is carried out in accordance with Table 2.3.5.

Table 2.3.5 Quality Control and Inspection Frequency

Area	Min. % Compaction	Minimum Frequency/Intervals*	Test Location/Identification
Mainline Sewer - Bedding Cover and Trench Backfill	98	50m at random depths, 0.3m max. lift for first 150m and 100m thereafter	Street, Distance from Downstream Maintenance hole
Mainline Watermain - Bedding Cover and Trench Backfill	98	50m at random depths, 0.3m max. lift for first 150m and 100m thereafter	Street, Station and Offset

Area	Min. % Compaction	Minimum Frequency/Intervals*	Test Location/Identification
Road Subgrade Utility Crossings	100	50m at random depths, 0.3m max. lift for first 150m and 100m thereafter	Street, Station and Offset
Service Trenches (Water, Sanitary, Storm)	98	First 2 trenches and every other trench thereafter	Lot Number
Curb and Gutter Sidewalk	100	50m at random depths, 0.15m max lift	Street, Station and Offset (left or right)
Granular Road Base	100	50m at random depths, 0.15m max lift	Street, Station and Offset (left or right)
Asphalt	100	50m, Each lane	Street, Station and Offset (left or right)
Existing Driveway Reinstatement	100	Random	Lot or House Number and Distance

*Testing shall be done at all changes of soil types and/or types of mechanical compaction.

2.3.6 Inspection by the Municipality of Trent Hills Staff

The Municipality of Trent Hills staff will attend the site at periodic and random intervals to ensure that the level of inspection is adequate. All costs incurred by the Municipality in attending to the periodic and random inspections will be the responsibility of the Owner in accordance with the Agreement. Payment shall be due as set out in the Agreement. All information regarding the work in progress will be made available on request to the Municipality's personnel. The Engineer must notify the Municipality at least 48 hours in advance of all key steps in the construction process. The Owner will provide the Public Works Department with a statement signed by a Professional Engineer certifying that all works were inspected and that they adhere to the plans and specifications approved by the Municipality of Trent Hills.

2.3.7 Site Trailer

An onsite heated and air conditioned office trailer with desk, chair, internet and telephone must be provided for the general use of the onsite inspector and Municipality's inspection personnel unless waived in writing by the Municipality.

2.3.8 Site Meetings

The Engineer will arrange for regular site meetings and will invite all interested parties, including a representative of the Municipality. Site meetings may be called by the Public Works Department as required to monitor the work in progress and to discuss and resolve matters of mutual interest or to resolve any on site difficulties.

2.3.9 Plan Revisions

Engineering Drawing revisions must be reviewed and approved by the Municipality prior to issuance for construction. Design alterations requests are to be coordinated by the Engineer, who must submit copies of the proposed revision to the Municipality along with a covering letter outlining the nature of the change. After all necessary approvals being granted, digital copies of the revised plan(s) must be submitted to the Municipality for internal use and for distribution to inspection personnel on site.

2.3.10 "As-Constructed" Drawings

As-Constructed information will be recorded by the on-site inspector and provided to the Engineer as the work progresses. As-Constructed drawings in digital format (PDF), compatible with AutoCAD software shall be provided to the Public Works Department for distribution to Municipal Departments within 3 months of substantial completion of the underground works and the subsequent issuance of the "Certificate of Completion". The digital copy must be accompanied by two hard copies.

The As-Constructed plans must include:

- ☐ Inverts of all gravity sewers at the maintenance holes
- ☐ Inverts of all gravity sewer laterals at the property line
- ☐ Top of watermain elevation
- ☐ Water service size and locations
- ☐ Sanitary lateral size and locations
- ☐ Fire hydrant locations
- ☐ Stormwater management infrastructure
- ☐ Pipe sizes, lengths and grades
- ☐ Pipe class and materials
- ☐ Top of grate, inlet and maintenance hole elevations
- ☐ Tie-ins to all water valves including curb stops (at all non-standard locations) from the 2 nearest property corners or 2 permanent structures.
- ☐ Tie-ins to maintenance holes from the 2 (two) nearest property corners of two (2) permanent structures.
- ☐ Trench rock elevations
- ☐ Sidewalk/ pathway locations

- Streetlights
- Entrance locations along with street addresses, as provided the Municipality of Trent Hills.

Following Completion of all works within the subdivision the Engineer must provide the Municipality with any updates to the As-Built plans resulting from any deviation in the placement of the above ground infrastructure, including a digital copy and two hard copies of the drawings.

All drawings and data files become the property of the Municipality and its agents may use these drawings and data files as the Municipality sees fit, without compensating the owner or the Engineer.

2.3.11 Closed Circuit Television Examination and Air Testing of Sewers

A Closed Circuit Television (CCTV) video examination must be carried out through the entire length of sanitary and storm sewer systems, including service laterals, in accordance with the provisions outlined in this document. The examination needs to be carried out prior to Acceptance of the Works and prior to the placement of the first lift of asphalt. A second CCTV inspection will be conducted prior to placement of the final lift of asphalt and prior to Assumption of the Works.

The CCTV inspection must be carried out in the presence of the Municipality's designated representative who will assist in the co-ordination of the work. In addition, the sanitary and storm sewers must be air tested in accordance with OPS specifications.

2.3.12 Lot Grading Certification

At the final completion of lot grading, the Engineer will provide to the Municipality with certification in writing that all lot grading has been completed in accordance with the approved plans.

2.3.13 Progress Reports/Inspection Records

The Engineer must prepare weekly reports indicating:

- Works completed
- Work in progress
- Any change orders and/or directions to the contractor involving issues of non-compliance
- Adherence to the construction schedule
- All test results for construction completed during the period

Completed copies of the weekly reports are to be furnished to the Municipality's Public Works Department for internal distribution.

2.4 Site Plan Applications

The Municipality will require Site Plan Control in accordance with applicable by-law.

All development applications of 10 or more residential units or non residential building additions of more than 100 square metres are subject to Site Plan Control. The ultimate goal of this process is to have applicants enter into Site Plan agreements with the Municipality. Development applicants are required to submit Site Plans and Building Elevations drawings to the Planning Department. The drawings are circulated to various Municipal departments and neighbouring property owners for their review and input. Applicants and their consultants are encouraged to contact the Municipalities Planner for more information in relation to the Site Plan Approval process, application forms, and applicable processing fees.

The Site Plan Application submission typically contains the following:

i. Completed Site Plan Application Form.
ii. Application Processing Fee.
iii. One (1) complete set of full size drawings are required for Site Plan submission. The drawings should be on standard size drawing sheets large enough to legibly provide all the applicable information.
iv. A 215.9 mm x 279.4 mm, (8.5” x 11” letter sized) and 279.4 mm x 431.8 mm (11”x17” ledger sized) reductions of the Site Plan drawings for circulation purposes.
v. A current property boundary survey prepared by an Ontario Land Surveyor.
vi. Site Plan submission drawings shall include Site Plans, Building Elevations, Landscape and Tree Planting Plans, Lighting, and other miscellaneous drawings as required by the Municipality, related to the scope of the proposed development works.
vii. Grading and Drainage Plan, Site Servicing Plan, and Stormwater Management Report, if required. These drawings and reports must be signed and sealed by a professional engineer, licensed to practice in the Province of Ontario.
viii. Any other reports deemed to be necessary by the Planner, Urban Design or USD.

2.5 Environmental Compliance Approval

The Municipality of Trent Hills has been approved by the Ministry of the Environment Climate Change and Parks (MECP) to receive, approve and issue Environmental Compliance Approvals that are preauthorized by the MECP. These preauthorized works include most alterations to Municipality’s municipal sewage collection systems (storm and sanitary) and stormwater management system.

Pre-Authorization Criteria

The CLI-ECA approval means that developers and the Municipality are no longer required to submit individual pipe-by-pipe ECA applications to the MECP provided the projects meet the following criteria:

i. The alterations follow the MECP's design criteria
ii. The alteration meets the requirements of the Municipality's Sewage CLI-ECA (ECA Number 150-W601) which includes sanitary pipes and pumping stations.
iii. The Alterations meets the requirements of the Municipality's Stormwater Management CLI-ECA (ECA Number 150-S701) which includes storm pipes, Stormwater Management Facilities including Ponds, Oil and Grit separators and Low Impact Development features.
iv. The alteration satisfies all other provincial and municipal conditions and standards.
v. The alteration is proposed on land that is currently owned by or will be owned by the Municipality after assumption.

Projects that do not meet these requirements for pre-authorization may still proceed but will require a direct submission to the MECP for review and approval as a Schedule C Amendment. These non-preauthorized projects will still follow the same application framework to ensure all other application requirements are met. Additionally, works that are being proposed on private property will also require a direct submission to the MECP.

Development Submissions

Upon completion on the design of the proposed alteration to the Sewage collection System and Stormwater Management system applicants may submit their completed application package via email to the Municipality's Engineering Department. The CLI-ECA forms have been attached to these design standards and are to be filled out and provided to the Municipality as a part of the application package. The application packages should include the CLI-ECA forms and any design drawings, reports and operation and maintenance manuals required for the proposed sewer and stormwater management infrastructure.

The Municipality will review the application for completion and provide the applicant with an approval letter and forms signed by the Municipality as well as receipts for applications fees.

All reports and drawings must follow the MECP requirements for sewage, stormwater work as well as the Municipalities Engineering and Design Standards.

In addition to the CLI-ECA, a Form 1 - Records of Watermains Authorized as a Future Alternation is to be completed and provided to the Municipality for any addition, modification, replacement or extension to the Municipal watermain system. The Form 1 form has been attached to these design standards.

2.6 Other Agreements

The Municipality may require other agreements depending on the nature and circumstances of the development and the Works to be constructed.

Section 3.0 Sanitary Sewers

3.1 General

The objective of Sanitary Design Works is to provide sewage systems that:

- Can be sustained by the water resources upon which services rely
- Are financially viable and complies with all regulatory requirements
- Protects human health and the natural environment
- Improves efficiency in the Municipality's existing sanitary system network
- Are in accordance with the Municipality of Trent Hills Official Plan and Zoning By-law

3.2 References

Sanitary sewer designs must follow current standards and be in conformance with the following standards, specifications and publications in addition to the standards specified in this manual:

- Ministry of the Environment, Conservation and Park (MECP) Guidelines for the Design of Sanitary Sewage Systems
- Ontario Provincial Standard Specifications
- Municipal Engineers Association Design Manual
- The Municipality of Trent Hills Official Plan and Zoning By-law

3.3 Design Sheets and Catchment Area Plans

Calculations demonstrating there is sufficient capacity in the proposed sewer system must be provided. Calculations must be completed in accordance with this document and be presented in a sanitary sewer design sheet. Calculated peak flows should not exceed 80% of the full flow capacity of the sewer.

Sanitary catchment area plans must be submitted showing the contributing area upstream of the proposed section of sewer, any sub-areas, population and peak flows, proposed sewer runs and maintenance hole with appropriate numbering. The numbering system must be consistent with all plans, drawings and design sheets.

3.4 Non-Permitted Flows

Roof leaders, weeping tile or foundation drains and sump pumps must not be connected to the sanitary sewer system. No hazardous waste is permitted to enter the sewer system as defined under EPA Regulation 347.

3.5 Sewer Easements

Sewer easements must be a minimum of 4.5 m wide for single sewer. If multiple utilities share the easement space, the easement requirements will be determined on a case-by-case basis.

3.6 Pipe Design Requirements

The following formulae shall be used in the design of sewer systems:

Table 3.6 - Standard Formulas to be used or Approved Equivalent

Formula	Equation	Criteria
Kutter Formula	$C = \frac{k_1 + \frac{k_2}{S} + \frac{k_3}{n}}{1 + \frac{n}{\sqrt{R}} * (k_1 + \frac{k_2}{S})}$	C = Chezy's roughness coefficient ($m^{1/2}$/sec) S = Friction slope (m/m) R = Hydraulic Radius (m) n = Kutter's roughness (unitless) k_1 = Constant 23 k_2 = Constant 0.00155 k_3 = Constant 1
Babbitt Peaking Formula	$PF = \frac{5}{p^{0.2}}$	P = Population (thousands)
Harmon Peaking Factor	$M = 1 + (\frac{14}{4 + p^{0.5}})$	P = Population (thousands)
Peak Sanitary Flow	[Number of People]*[Average Flow Per Person(L/s)]*[Peaking Factor]+Infiltration(L/s)	
Capacity Flow	$Q_{cap} = (\frac{\frac{D^{2.67}}{1000} * \frac{S^{.5}}{100}}{0.211 * n})$*1000(L/s)	D = Pipe size (mm) S = Slope (grade) of pipe (%) n = Roughness coefficient
Manning Equation	$V = \frac{1}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$	V = Velocity (m/s)

		n = manning roughness coefficient (n = 0.013 for smoothed walled pipes) R = Hydraulic radius in meters (m) S = Hydraulic Gradient (m/m)
Headloss Across Maintenance holes	$H = \frac{k(V_2^2 - V_1^2)}{2g}$	H = Headloss (m) k = coefficient V_1 = Entrance Velocity (m/s) V_2 = Exit velocity (m/s) g = acceleration due to gravity (m/s^2)

3.7 Design Flows

Daily Design flows should be calculated as follows:

A) Residential

1) Per Capita Flow

- □ For new infrastructure use 450 l/day/capita
- □ Peak the average flow using the Harmon formula;

2) Population

Zoning Designation

a. Low Density Residential (R1) = 25 units/ha @ 3.5 people/unit

b. Medium Density Residential (R2) = 75 units/ha @ 2.4 people/unit

c. High Density Residential (R3) = 110 units/ha @ 2.0 people/unit

3) Per Lot Basis:

a. Single-Family Detached= 2.3 people/ unit

b. Semi-Detached, Three or more Bedroom Townhouse = 2.3 people/unit

c. Two-Bedroom Townhouse = 2.3 people/unit

d. Two-to-Three Bedroom Apartments = 2.0 people/unit

e. Bachelor or One Bedroom Apartments = 1.6 people/unit

4) Area Basis: (Where there is mixed land uses, establish flow as the total of the individual land uses. e.g. residential, commercial, and industrial, etc.)
    a. Single Family = 25 units/ha @ 3.5 people/unit = 88 people/ha not considering roads. 19.2 units/ha @ 3.5 people/unit = 67 people per hectare considering roads.
    b. Semi-Detached = 30 units/ha @ 3.5 people/unit = 105 people/ha not including roads, 82 people per hectare with roads.
    c. Multi-Family = 75 units/ha @ 2.4 people/unit = 180 people/ha.
    d. Bachelor or one bedroom apartments = 110-250 units/ha @ 1.6 people/unit = 176 – 400 people/ha.
    e. Two – Three bedroom apartments = 110-250 units/ha @ 2.0 people/unit = 220 – 500 people/ha.

B) Commercial and Institutional

- □ Average flow 1.15 l/s/ha;
- □ Use higher design flows for point sources known to have significantly greater flows than the average design allowance; (e.g. car washes or other high water uses).
- □ Peak using a factor of 2.5 resulting in peak flows of 2.9 l/s/ha.

C) Schools

Elementary

- □ Average flow 0.35l/s/100 students
- □ Peak using a factor of 1.5 resulting in peak flows of 0.52 l/s/100 students

Secondary

- □ Average flow 0.491/s/100 students
- □ Peak using a factor of 1.5 resulting in peak flows of 0.74 l/s/100 students

D) Infiltration (extraneous flows)

- □ 0.28 l/s/ha for typical sanitary sewer assessments.
- □ In certain circumstances, higher inflow or infiltration rates, either by a per hectare basis, or point source(s) may be required to be implemented within the calculations due to known extraneous sources or sensitive receiving sewers.

3.8 Sanitary Sewer

3.8.1 Pipe Diameter

The minimum pipe diameter for gravity sewer systems shall be 200 mm. All sewers shall be designed based upon design flows not exceeding 80% pipe capacity.

3.8.2 Pipe Slope and Velocity

All gravity sewers shall be designed with minimum pipe slopes of 0.5%. Due to expected low flows, the first run of sewer or first 25 upstream dwelling units (whichever is greater) shall be designed with a slope of 1%.

Sewers shall be designed so that pipe velocity is a minimum of 0.6 m/s and a maximum velocity of 3.0 m/s.

3.8.3 Pipe Cover and Bedding

To prevent freezing and provide for adequate gravity flow from building foundations, the distance between the finished grade and pipe obvert should be a minimum of 2.75 m.

Pipe bedding shall be in accordance with OPSS and be based on the recommendations of the geotechnical report for the soil conditions on site.

3.8.4 Pipe Material

Sanitary gravity sewer shall be either PVC or concrete. PVC pipe shall be DR or SDR rated and conform to OPSS 1841, CSA B182.2. Concrete sewer pipe shall be in accordance with OPSS1820 and CSA A257.2 and certified under the OCPA. Concrete shall be used for pipe sizes greater than 600 mm. Concrete pipe class shall be determined by the pipe size, depth of cover and soil conditions on site.

3.9 Maintenance Holes (MH)

All maintenance holes shall conform to OPSD 700 standards. Where pipe of different sizes are connected to a MH, the crowns of the inlet pipe(s) mustt not be lower than the crown of the outlet. The difference in invert elevations between inlets and outlets shall be as indicated in MECP guidelines.

3.9.1 Spacing and Location

Maintenance holes must be used at all changes in horizontal alignment, grade, pipe size or at termination of sanitary sewer (including temporary works). The maximum spacing of maintenance holes shall be :

Sewers 200mm to 450mm – 120m

Sewers 525mm or greater – 150m

3.9.2 Pipe Connections

Pipe connections at maintenance holes shall be be completed with factory installed rubber gaskets for PVC pipe. For concrete sewers, the pipe shall be parged and supported with a concrete cradle.

3.9.3 Benching

All maintenance holes require benching at bottom of the structure in accordance with OPSD 701.021. Benching height should be increased to obvert where applicable to increase hydraulic benefit if required.

3.9.4 Adjustment Units

Adjustment units shall be provided at all maintenance holes to ensure that proper grade is provided between the top of the structure and the lid. A minimum of one and a maximum of three adjustment units are permitted.

3.10 Service Connections

Separate sanitary services are to be provided to each building lot and each unit of a semi-detached or row house residential building. Minimum service pipe size from the main sewer to the cleanout (property line) shall be 150 mm. Building services from adjacent properties cannot be connected to each other. Sanitary services must not be connected to a storm main. Water and sewer service shall not be connected at the property line until such time that the "Certificate of Substantial Completion of the Underground Infrastructure" or the required inspections and approvals by the Municipality's Building and Public Works Departments have been issued.

The first 40 building services connected to 200mm main shall be set above the spring line of the sewer main with proper "Y" fittings and with long radius bends. Building sewers connected to larger mains may be by a tee connection with the side of the tee rotated at between 221/2 degrees and 45 degrees above horizontal.

For road reconstruction projects and the replacement of existing services, new connections will be at the discretion of the Manager of Water/Wastewater.

3.10.1 Location

Water and sewer services are not permitted in driveways or private sidewalks and shall be located a minimum of 1m from driveways and private sidewalks, where possible. Services shall not be connected directly to maintenance holes.

Unconnected conventional and effluent sanitary laterals shall be brought to the property line, properly capped and clearly marked such that an installer can easily connect when necessary. Caps must withstand air testing of sewer including lateral services to the lot line. Capped services shall be appropriately marked to at least 1.0 meter above finished grade level with a 2" X 4" marker painted green.

3.10.2 Cover

The minimum cover for sanitary services will generally be 1.5 m from the finished grade. Services of less than 1.5 m may be permitted on a case-by-case basis based on a professional engineer's opinion and design. In such cases frost protection must be equivalent to 1.5 m cover.

3.10.3 Size

Building sewer services shall be sized to meet the Ontario Building Code.

3.10.4 Materials

Services shall be PVC, SDR28, and conform to CSA B182.2. Pre-manufactured tees shall be used for all service connections. Cleanouts must be installed on the property line of each building; clean outs are not permitted in driveways.

3.11 Testing

The Municipal Inspector must be given 48 hours' notice of all tests. Testing of gravity sewers and maintenance holes must be done by either a Water Exfiltration Test or an Air Test. All sewers are subject to Deflection Testing as per applicable standards. Sewers shall be flushed immediately prior to the closed-circuit TV inspection.

3.11.1 Water Exfiltration Test

Unless the water table is 0.6 m or more above the top of the pipe, exfiltration tests shall be used.

Extent: The complete sewer system including house connections and maintenance holes shall be tested in accordance with OPS Specifications.

Procedure: Any visible leak must be repaired.

The test section shall be sealed at its lower extremity by means of a watertight plug. The test selection shall be filled with water to the specified level in a manner to allow for the displacement of air in the line.

The minimum head measured from the crown of the pipe at the high end of the section under test shall be 0.6 m, provided that maximum head on the line is not more than 4.752 m.

The test shall stand completely full for 24 hours before test.

Measurements are commenced. The duration of the test must be two hours.

Maintenance holes shall be tested independent of the sewer pipe for leakage by filling the chamber to the underside of the roof slab with water. The test duration shall be a minimum of three hours. No leakage is permitted in maintenance holes.

Maximum allowable leakage of any test in gravity sewer:

$$\text{Allowable leakage in litres} = \frac{HDL}{5200}$$

Where: H=Duration of test in hours

D=Inside diameter of the pipe in millimetres

L=Length of pipe in test section in meters

3.11.2 Air Test

Air tests cannot be used with concrete sewers.

Extent: The complete sewer system including house connections and maintenance holes shall be tested in accordance with OPS Specifications.

Procedure: Based on OPSS 410, modified so that the pressure drop does not exceed 3.5 kPa over a time in minutes equal to the volume in cubic metres multiplied by 1.25.

3.12 Sewers Conveying Only the Liquid Portion of Sewage ("Low-Flow Technology")

3.12.1 Mains – Design Criteria

No decrease in pipe size downstream shall be allowed unless otherwise approved by the Public Works Department.

Population design density based on gross population per hectare will be provided by the Municipality. Contributing industrial, commercial and institutional design flows will be considered on a case-by-case basis. Sealed systems are to be designed with an inflow/infiltration rate of zero.

Table 3.12.1 – Low-Flow Technology Design Criteria

Criteria	Size/Condition	Minimum	Maximum
Pipe Size*	If proven by a HGL analysis to the Municipality's satisfaction	75mm	

Velocity	Minimum design velocity can be less than the stated value if good engineering principles are used to meet the minimum scouring velocity necessary to create self-cleaning conditions once daily, upon approval of the Municipality	0.15 m/s	3.0 m/s
Pipe Slope	If proven by a HGL analysis to the Municipality's satisfaction	0%	
Cover	Acceptable Fill	1.5m from the finished grade	
Peaking Factors	Substantiated peaking factor attenuation data from existing system installations will qualify	4.0	2.75
Average Daily Domestic Flow	Zero infiltration		225 litres per person per day

Additional Criteria:

Manning's Roughness Coefficient	Shall meet the manufacturer's specification and MECP guidelines (typically n=0.013)
*Pipe Sizing	All main sizes must be approved by the Municipality's Public Works Department. If good engineering principles are used and the designer can demonstrate that local contractors have existing equipment to facilitate the cleaning of such diameter piping, a smaller diameter may be considered.

3.12.2 Materials

Table 3.12.1 – Sanitary Sewer Materials

Criteria	Specification
Pipe	Polyvinyl Chloride (PVC) pipe, DR 11 (minimum), CSA B137.3 and B137.2

Connections	Shop pre-manufactured tee connections shall be used for building sewer connections
Cleanouts	Municipal cleanouts at property line are required on all connections. Specifications as per product manufacturer's requirements and approval by the Public Works Department.

3.12.3 Maintenance Holes/Service Cleanouts

Sealed cleanouts shall be at a distance not greater than 150 meters to permit pressure-washing, if required, unless increased spacing can be flushed by existing servicing equipment.

Where required, cleanouts shall have odor control devices attached which will provide additional air flow through the system. Cleanouts on roadways shall have an approved load bearing casing installed to protect cleanout access piping.

All cleanouts shall be compatible with the Municipality of Trent Hills equipment. Verification of compatibility per the Municipality of Trent Hills requirements shall be the responsibility of the Developer.

3.12.4 Service Connections

The crown of the main at the point where the service is connected shall be a minimum of 1.0m below the lowest floor grade of the buildings being serviced except where connection is by a pumped sewage connection with back flow prevention installed to protect the building being connected or where a solids-separation tank is employed.

Table 3.12.4 – Sanitary Service Connections Specifications

Criteria	Specification
Connections	The cleanout is installed off the exit side of the interceptor tank. Each dwelling connected to the effluent sewer must be equipped with a ball valve or check valve which shall be installed between dwelling and interceptor tank.
Materials	100 mm diameter for building connections to interceptor tanks 75 mm diameter for gravity discharge from interceptor tanks to sewer mains. 50 mm diameter for pressure discharge from interceptor tanks to mains.

3.12.5 Effluent Sewer System Interceptor Tanks

A) Design Criteria

Interceptor tanks shall be installed as recommended by the manufacturer and as follows:

Table 3.12.5 – Interceptor Tank Criteria

Criteria	Specification
Access	Interceptor tanks shall be equipped with insulated access hatches that extend to the ground surface at both the inlet and outlet locations.
Elevations	The elevation difference between the inlet and outlet should be a minimum of 50mm.
Cover/Insulation	Insulation cover shall be at least 50 mm extruded polystyrene Dow Styrofoam HI-40 or equivalent, or as recommended by the geotechnical engineer.
Bedding	All tanks shall be installed on prepared foundation bedding, consisting of a 200mm thick bed of Granular “A” to OPSS 1010, compacted to 95% SPMDD. Native soil backfill shall be approved by the engineer prior to placement.
Filter	For gravity discharge from interceptor tank to sewer main, an effluent filter must be located in the effluent tank.

B) Materials

All interceptor tanks shall meet the requirements of CSA B-66-05: Design, Material and Manufacturing Requirements for Prefabricated Septic and Sewage Holding Tanks.

All concrete reinforcement must meet the requirements of G30.18 M92 (R2002). Concrete shall follow CSA A23.4, latest revision and can not be less than 32 MPa (4,500psi) minimum compressive strength at 28 days with 6-8% air entrainment.

Tanks and connecting fitting must be certified vacuum tested, resulting in a leak-proof assembly.

C) Specifications

Volumes for interceptor tanks shall conform to design standard provisions for daily design flow and septic tank capacities as stipulated within Sections 8.2.1.3 and 8.2.2.3 of Part 8 of the Ontario Building Code.

D) Testing

The Municipal Inspector shall be given 48 hours' notice of all tests.

3.13 Sanitary Sewage Pumping Station Design Specifications

Sanitary sewage pumping stations are to be designed in accordance with the Sanitary Sewage Pumping Station Design Specifications included in Appendix A.

3.14 Rural Wastewater Servicing

The requirements for wastewater disposal in rural development will be discussed in the Functional Servicing Report and/or Hydrogeological Report. Prior to the Municipality approving the Draft Plan and the issuance of Conditions of Draft Approval by the approval authority, the method for disposing of wastewater will be determined for the Development either by means of a communal sewage or individual sewage systems.

Communal sewage collection and treatment systems shall be designed in accordance with current Ministry of the Environment Guidelines and Regulations and the Municipality of Trent Hills standards. Individual sewage systems shall be designed in accordance with the Ontario Building Code Regulation No. 403/97 as amended.

A report outlining the soils capabilities of the site for sewage disposal must be submitted with the Draft Plan. Additional soils testing required by the Municipality or the Ministry of the Environment will be completed as part of the design and any special requirements for construction or restricted areas shall be identified prior to Draft Plan Approval.

Section 4.0 Watermain Design Requirements

4.1 Water Supply System

Central water supply systems must be designed in accordance with current Ministry of the Environment Guidelines and Regulations.

The Functional Servicing Report shall address the requirements for water supply to service the Development. Where connections are to be made to an existing municipal system, the capacity of existing wells, treatment facilities and storage facilities will be considered when reviewing the requirements for new source wells and storage facilities. All water supply systems shall incorporate provisions for standby power, metering, chlorination, fire storage, pre-charged tanks to buffer the well pumps and security fencing of the site. Should the existing supply system not have sufficient capacity to provide for new development, the Developer's Engineer shall provide a Hydrogeological Report commenting on proposed sources for additional water supply and how any impacts on the existing ground water regime will be mitigated.

Fire flow protection and storage provisions will be reviewed with the Municipality of Trent Hills for each development during the initial stages of Draft Plan Approval. Any expansions to the existing water systems, together with the requirements for additional wells, storage facilities and/or trunk mains will be resolved at that time.

Development outside of currently serviced areas which will be serviced by private communal systems are discouraged by the Municipality. Developments outside the areas designated by Council as requiring municipal water supply systems, may be approved on the basis of individual wells and sewage disposal systems.

For developments proceeding with a Rural Standard and individual services, a hydrogeological report will be required to confirm the suitability of the site to support development on individual wells and septic systems. Private wells shall be designed in accordance with current Ministry of the Environment Design Criteria and Provincial Regulations and in accordance with the Municipality's Building By-law.

4.2 Watermains

Watermains with services to each lot or block shall be provided in accordance with the Ministry of the Environment Guidelines and the following the Municipality of Trent Hills Public Works Department design criteria:

Table 4.2 – Watermain Design Criteria

Capacity:	Hazen-Williams formula in accordance with current Ministry of the Environment design criteria.
Population:	See Section 3 - Sanitary Sewers
Design Flow:	Greater of Maximum Daily Demand plus Fire Flow or peak demand flow.
Average Day:	450 L/cap.d. (litres per capita per day)
Peaking Factor	In accordance with current Ministry of the Environment design criteria.
Minimum Size:	200 mm diameter mains
Minimum Cover Depth:	2.0 metres for mains and services.
Location:	In accordance with the Municipality of Trent Hills typical road cross-sections. (See Standard Drawing S1, S2 and S3.) Separation between water and sewer mains shall conform to MOE Guidelines. Where, due to construction in rock or Type 4 Soils, it is proposed to use methods other than horizontal separation to protect the water main, all design of such works must be approved by the Municipality.
Material:	See Table 12.

Dead Ends:	All mains shall be looped including those servicing cul-de-sacs. Alternatives to looping that may be considered are: continuous twin feed loop, “lollipop” option, a single 50 mm (2”) Municipex line with no more than 5 service connections, or a hydrant at 150 metres from the end of the last service connection. The approved alternative will be at the sole discretion of the Municipality. A suitable means for flushing, such as a hydrant or a blow-off, shall be provided on mains larger than 50 mm. Such flushing devices shall not be connected to any sewer. Devices other than hydrants shall be approved on a case-by-case basis.
Pipe Bedding:	Per OPSD 802.010 and 802.013.
Fittings:	Ductile Iron, mechanical joint, AWWA C110 approved, pressure rating 1035 kPa. PVC bends and tees, to be used with mechanical joint restraints.
Valves:	One less valve than number of streets at an intersection with valve located at extension of Property Line of intersecting street. Maximum spacing between valves shall be 200 m on straight runs. Chambers will be required for all valves over 300 mm dia. (OPSD 1101.01) (1) Three valves shall be placed on a tee intersection and four valves on a cross intersection. On straight runs, isolation valves shall be not less than 150 m or such that 40 family dwellings units or equivalent can be isolated. (2) Valve boxes shall be adjusted to finish grade. (3) All valves up to and including 400 mm in diameter shall be provided with a valve box and shall be direct bury. For valves greater than 400 mm, a cast in place or precast waterproof concrete valve chamber with a drainage sump shall be provided. All valves 300 mm or greater in diameter shall have a bypass. (4) All valves shall be resilient seat valves conforming to AWWA C509 (latest revision).

<table>
<tr><td></td><td>(5) All valves shall open counter clockwise with 50 mm operating nut.

(6) The operation of all valves, curb stops and hydrants shall be restricted to Municipal employees.

(7) Air valves shall be located at all significant high points on feeder mains.</td></tr>
<tr><td>Valve Type:</td><td>See Table 12.</td></tr>
<tr><td>Valve Boxes:</td><td>See Table 12.</td></tr>
<tr><td>Restraints:</td><td>(1) For watermain with a diameter of 350 mm or less, thrust blocks or thrust blocks and restraints shall be used. Restraint for watermains greater than 350 mm in diameter shall be designed by a professional engineer.

(2) Restraints shall be galvanized or made of stainless steel or have cathodic protection.

(3) Restraints shall be used at minimum 2 (two) pipe length from any bend, Tee, or valve</td></tr>
<tr><td>Hydrants:</td><td>See Table 12.

All hydrants to be painted Yellow with black Storz cap.

Anchor tees to be used with hydrant installation. Hydrants shall be painted Yellow and shall be marked with reflective markers on each port based on the flow, refer to table below for colouring

<table>
<tr><td>US Gal / min</td><td>1500+</td></tr>
<tr><td>US Gal / min</td><td>1000-1500</td></tr>
<tr><td>US Gal / min</td><td>500-1000</td></tr>
<tr><td>US Gal / min</td><td><500</td></tr>
</table>
</td></tr>
<tr><td>Hydrant Spacing:</td><td>150 m maximum (75m in commercial areas)</td></tr>
</table>

Service Connections	(1) Services shall be sized in accordance with the **Ontario Building Code as amended**. The minimum shall be 20 mm for lots zoned for single family dwelling units, and 25 mm for lots zoned for low density, industrial, commercial or multiple residential with an average width greater than 20 m and where the service line between the main and the dwelling exceeds 25m. (2) Service connections shall have a corporation main stop and be "goose-necked" near the water main as per the appropriate OPSD. Main stops may be set at the spring line and the gooseneck may be horizontal. (3) A curb stop will be ball valve type only and without drain and associated service box to finish grade shall be provided on the service connection to each premises and be located at the property line. All such service connections shall be in accordance with relevant OPSD. A stainless steel extension rod shall be used. (4) Separate services from the road watermain shall be provided to each building and each unit of a semi-detached or row house residential building, or otherwise as approved. (5) Water services to a single unit shall be ¾" diameter minimum, PVC, or polyethylene. The outer pipe diameter must match standard copper pipe diameters, and therefore may require upsizing to get the required inside diameter. (6) There shall be no joints between the main stop and the curb stop and no joints between the curb stop and the building interior. Couplings shall be copper to copper compression. (7) Service connections to PVC mains shall be by double bolt stainless steel saddle or approved equal, either of which shall be approved by the Township. All new

	construction shall use pre-manufactured tees Services and Fittings. (8) Curb Stops shall be of compression joint type ¾" to 2" Ball Valves counter clockwise to open. (9) Service boxes shall be slide type. (10) All services for which Public Works has distribution rights or maintenance responsibilities become the sole property of the Municipality (11) upon the issuance of the assumption. (12) The minimum depth of cover measured from the top of a service connection gooseneck shall not be less than 1.8 m. Water and sewer services may be laid in the same trench subject to the provisions of Ontario Building Code and MOE requirements. In such cases the horizontal separation between each service shall be 0.5 m. All other utility services shall be separated 2.5 m from water and sewer services measured from edge of structure. Sanitary and foundation/storm service drains shall Temporary plastic blow-off pipes are required for all unconnected services.
Tracer Wire:	All mains and services shall be traced with an appropriate tracer wire. Tracer wire shall be "CAD welded" to valve boxes and service boxes or connected in an equal fashion as approved by the Municipality. All wire to wire splice connectors shall be filled with a waterproof dielectric silicone and rated for direct bury application
Anodes:	DZP-24, 10.9 kg shall be installed on all connections to existing iron watermain. DZP-12, 5.4 kg shall be installed on all iron fittings, valves etc.
Mechanical Joint Restraints:	Grip Ring Pipe Restrainer manufactured by Romac Industries Inc. Uni-Flange Series 1300 manufactured by Ford Meter Box Company, Inc.

	MJ Field Lok, Series PV manufactured by Clow Canada Series 350 Restrainers manufactured by Clow Canada Sigma One-Lok restrainer manufactured by Sigma Corporation Sigma PV-Lok restrainer manufactured by Sigma Corporation
Water Meters:	All Domestic and ICI connections to the Municipal system are to be metered with AMR capability.

4.3 Operation of Valves and Connection Procedures

The Developer's contractor cannot operate any valve or hydrant of the existing water distribution system. Operation of valves and hydrants on the municipal system can only be undertaken by certified municipal staff.

No new watermain can connect to an existing watermain until all testing procedures have been completed and approved by the Municipality of Trent Hills Public Works Department.

The new watermain must be isolated from the existing waterworks system using a physical separation until satisfactory bacteriological testing has been completed and accepted by the Municipality. Water required to fill the new main for hydrostatic pressure testing, disinfection, and flushing is to be supplied through a temporary connection between the existing water system and the new main. The temporary connection will include an appropriate and approved cross-connection control device (reduced pressure zone backflow preventer).

Public Works Department may require written certification of the backflow preventer operation in accordance with CAN/Canadian Standards Association-B64 Series Manual.

At the beginning of each new watermain installation, a minimum of two swabs shall be installed. Swabbing of the new watermain must be completed prior to hydrostatic testing.

4.4 Hydrostatic Testing

i. Hydrostatic testing must be conducted under the supervision of the Municipality of Trent Hills Public Works Department upon completion of the watermain including services and backfilling.
ii. A test section shall be either a section between valves or the completed watermain.
iii. Test pressure is 1035 kPa.
iv. The test section shall be filled slowly with water and all air removed from the pipeline. A twenty-four hour absorption period may be allowed before starting the test. The test section shall be subjected to the specified continuous test pressure for two hours.

v. The resulting leakage is the amount of water added to the test section to maintain the specified test pressure for the test duration. The measured leakage shall be compared with the allowable leakage as calculated for the test section. The allowable leakage is 0.082 litres per millimetre of pipe diameter per kilometre of watermain for the two hour test period.
vi. If the measured leakage exceeds the allowable leakage, all leaks must be located and repaired. The test section must be retested until a satisfactory result is obtained.
vii. Watermain Pressure Test Form shall be completed for all installations (form attached).

4.5 Flushing and Disinfecting Watermains

Flushing and disinfection of watermains must comply with MECP Guidelines.

i. Flushing and disinfecting operations shall be conducted under the supervision of the Municipality of Trent Hills Public Works Department. The Public Works shall be notified at least two (2) business days in advance of the proposed date on which flushing and disinfecting operations are to commence.
ii. Sampling and testing for chlorine residual will be carried out by the Municipality of Trent Hills Public Works Department.
iii. Watermain shall be flushed in a sequence approved by the Municipality of Trent Hills Public Works Department. The Public Works may permit or require the flushing to be carried out in stages as sections of the system are completed. Flushed sections shall be protected from contamination.
iv. The Contractor shall provide acceptable equipment and chemical additives to dechlorinate the water that must be wasted. Chlorinated water discharged to the sanitary sewer shall be discharged at such a low flow rate or dechlorinated prior to discharge so that there is no possibility of chlorine residual remaining in the waste water when it reaches the waste water treatment plant. Total residual chlorine in water discharged into storm sewers, drainage ditches or watercourses shall not exceed 0.2 mg/L.
v. Recharge the watermain with Municipal water and flush using a 20mm maximum diameter pipe for 24 hours.
vi. After final flushing, and before the watermain is approved for connection of the new main to the existing water system, two consecutive sets of water samples, taken at least 24 hours apart, shall be collected, every 350 metres, plus from the end of the line and from each branch. Certified staff from the Public Works Department shall collect for bacteriological samples.

vii. All water samples will be collected by the Municipality of Trent Hills Public Works Department and analysed by a certified laboratory. Two - 200 ml bacteriological sample (bottles supplied by the Municipality ONLY) must be obtained at each location. The sample form is to be filled out requesting for PA and background analysis and is to include the sampler's license number. Each sample collected must include a Total and Free Chlorine residual reading.

viii. The Municipality of Trent Hills minimum requirements for acceptability of bacteriological tests are:

E-coli Coliform	0 CFU/ 100mL
Total Coliform	0 CFU/ 100mL
Background	not greater than 25 CFU/ 100mL

4.6 Commissioning of New Main

i. When all of the tests including the bacteriological samples are satisfactory, approval from the Water Department for the main to be connected to the existing water system must be obtained. All connections to existing watermains must be under the supervision of a certified operator.

ii. All new piping and appurtenances placed in the connection of the new main and existing waterworks system must be disinfected with a 1-% solution of sodium hypochlorite or equivalent method.

iii. The system shall not be put into operation until clearance has been given by the Municipality of Trent Hills Water Department

Section 5.0 Storm Drainage

5.1 General

Storm sewer systems may consist of one or any combination of pipes, ditches, culverts, maintenance holes, catchbasins and stormwater management facilities that convey stormwater. Storm sewers shall be designed to collect runoff from private and public lands. Storm drainage systems shall be designed with consideration being given to Major and Minor drainage systems. Minor drainage systems collect runoff that results from more frequent storm events and conveys the runoff to the receiving stormwater management facility or watercourse through storm sewers, minor swales and ditches. The major drainage system is the route that runoff follows when the capacity of the minor drainage system is exceeded. The major drainage system consists of the roads, pathways, swales and channels that direct runoff to the receiving stormwater management facility or watercourse.

5.2 References

The storm drainage system must adhere to these guidelines and the following documents:

- □ Ministry of the Environment Guidelines for the Design of Storm Sewers
- □ Ontario Provincial Standard Specifications
- □ Municipal Engineers Association Manual

5.3 Design Sheets and Drainage Area Plans

Calculations demonstrating there is sufficient capacity in the proposed sewer system must be provided. Calculations should be completed in accordance with this section and presented in a storm sewer design sheet. Calculated peak flows should not exceed 80% of the full flow capacity of the sewer.

Storm drainage area plans must be submitted showing the contributing area upstream of the proposed section of sewer, any sub-areas, runoff coefficient, proposed sewer runs and maintenance holes/catchbasins with appropriate numbering. The numbering system must be consistent between the drainage area plan and design sheets.

5.4 Design Requirements

The following requirements must be used in the design of storm sewer systems:

Table 5.4 – Storm Sewer Design Requirements

Rainfall System	Closest to the subject site of: □ City of Peterborough Airport □ Atmospheric Environment Weather Station □ Trenton Air Base

Design Storm	Minor System:	5-Year Storm local Sewers 10 high value commercial development, downtown business, and trunk collectors.
	Major System:	Regional Storm expressed as the Timmins Storm or 100 year (whichever generates greater runoff values).
	Rural System:	25 Year storm for road culverts. 10 Year storm for driveway culverts
Runoff Coefficients:	In accordance with MTO Drainage Manual or other approved standard.	
Inlet Time:	The time of concentration (Tc) should be calculated. Where this is not practical, a ten (10) minute time of concentration should be used.	
Pipe Roughness:	Manning's "n" value, 0.013 for concrete, and PVC pipes. Manning's "n" value, 0.024 for corrugated steel pipes.	
Pipe Capacity:	Sewers – Manning's Formula (Full flow) Culverts – MTO Drainage Manual, Section 'D'	

5.5 Storm Sewer

All storm sewer shall meet the following requirements:

Pipe Materials: See Table 12.

Pipe Bedding: See Table 2.3.5.

Minimum Velocity: 0.75 m/s

Maximum Velocity 4.5 m/s

5.6 Catchbasins and Maintenance Holes

All storm sewer structures shall meet the following requirements:

Table 5.6 – Storm Catchbasins and Maintenance Holes

Maintenance Hole Spacing:	100m for pipes with diameters up to and including 1200mm. 150m for pipes with diameters greater than 1200mm.
Maintenance Hold Diameter:	Minimum 1200mm diameter or as manufacturer's specifications.
Structure Pipe Connections:	Brick, block, and non-shrink grout shall be used for the connection of all pipes and structures.
Structure Adjustment:	Precast concrete adjustment units to be used. Minimum 150mm adjustment allowance. Maximum 300mm adjustment allowance. No brick, block or steel lift rings permitted.
Catchbasin Spacing:	75m maximum
In-Line Drains:	Where storm sewers are extended along rear yard swales behind multiple unit blocks, in-line drains are to be installed every two units.
Twin Inlet Catchbasins:	Required at sag points.
Blind Connections:	Not permitted to storm sewers under 900mm in diameter.
Sumps:	catchbasins and maintenance holes require a 600mm sump if connected to any pipe with a diameter of 450mm or less.
Benching:	Required for pipes over 450 mm diameter.
Minimum Pipe Cover:	1.2 metres
Minimum Size:	300 mm Single CB leads 250mm Twin Inlet CB leads 300mm 375mm culvert

5.7 Storm Services

All storm services shall meet the following requirements:

All lots to have service connection for foundation drain sump pumps. Gravity connections at building not permitted. See Std. Dwg. S6.

Service Connections:	Minimum Size: 100mm Minimum Slope: 1% Minimum Depth @ Property Line: 1.2 metres Services to be located 1.5 m minimum from side lot line, for singles locate on low side of lot. One service/residential unit for singles, semis, row or block townhouses. See Std.Dwg.S6 for service layout. All connections to be made with an approved pre-fabricated tee or "Kor-N-Tee".
Roof Drains	All roof drains shall discharge to surface.
Storm Sewer Outlets	Suitable bank and stream bottom erosion protection must be provided i.e., headwalls, rip rap, CSP end section, etc.
Subdrain:	6 m - 100 mm diameter geotextile wrapped subdrain required upstream of all storm structures and in both directions at sags in the road profile. Additional subdrain as required by geotechnical consultant.

5.8 Testing

Sewers shall be air or water tested to 350kPa (50psi) to ensure there is no system exfiltration.

The Developer shall provide all labour, equipment and materials to carry out the tests, and repair or reconnect services to where necessary. The Developer shall arrange the tests for sections of sewer between cleanouts or maintenance holes.

Any sections of sewer which fails to meet the requirement of this section shall be repaired and re-tested.

Maintenance Holes shall be tested in accordance with O.P.S.S. 407

Field testing of storm sewers shall be tested in accordance with O.P.S.S. 410

Section 6.0 Stormwater Management Design Requirements

6.1 General

All developments greater than 0.1 ha within the Municipality including, new development, redevelopment, infill development, or conversion of a rural cross-section into an urban cross-section, will require stormwater management controls designed to mitigate the impacts of development on downstream properties and the hydrological cycle. The intent of these measures is to limit the peak flow of runoff to pre-development levels and to maintain water quality to sensitive downstream receivers. All developments will require the preparation and implementation of stormwater management report to the satisfaction of the Municipality of Trent Hills and the applicable Conservation Authority.

6.2 References

Stormwater management shall be in accordance with these guidelines and the following documents:

- ☐ Stormwater Management Planning and Design Manual by MECP
- ☐ Conservation Authority Stormwater management Guidelines
- ☐ Low Impact Development Guidelines by Credit Valley Conservation (CVC) /Toronto Region Conservation Authority (TRCA)
- ☐ Low Impact Development Guidance Manual by MECCP
- ☐ Trent Hills Environmental Compliance Approval for a Municipal Stormwater Management System (CLI ECA)

6.3 Drainage Areas

For smaller sites (drainage areas up to 1 Hectare), peak flows may be calculated using the Rational Method and storage volumes may be calculated using the Modified Rational Method.

For larger developments, a computational hydrologic model (ie. Visual Otthymo) will be required to calculate peak flows and stormwater management storage requirements.

6.4 Quantity Control Requirements

Quantity controls shall be implemented such that the post-development release rates are limited to the pre-development release rates for each of the 2 through 100-year storm events. In cases where there are downstream capacity issues, the Municipality may impose stricter post-development release rates to protect downstream properties or infrastructure.

When designing stormwater management facilities, a range of storm distributions and durations shall be evaluated. The facility design shall be based on the storm producing the largest volume and not necessarily the peak flows.

6.5 Quality Control Requirements

Quality control shall be in accordance with the MECP SWPDM and Conservation Authority requirements. The design must control the 90th percentile storm event and if conventional methods are necessary, then the minimum level of quality control in the Municipality shall be Normal, as defined in the MECP SWPDM. Enhanced quality control should be targeted in most instances.

Retrofit scenarios must improve the level of water quality control currently provided and provide the required suspended solids removals.

6.6 Water Balance

Controls need to be provided that maintain the water balance in accordance with any completed assessment studies if undertaken. Alternatively, the recharge must be controlled to meet pre-development conditions on the property or control the runoff from the 90th percentile storm event.

Control methods to maintain the water balance include, retention, Low Impact Development filtration, and conventional stormwater management. Each method is to be exhausted before proceeding to the next, in the order presented. Refer to the Low Impact Development Guidelines by CVC/TRCA and the Low Impact Development Guidance Manual by MECCP for further design information. Operation, inspection and maintenance of these facilities must be outlined in the supporting stormwater management report or an independent document.

6.7 Erosion and Sediment Control

Erosion and sediment control plans shall be prepared for each phase of development. The plans shall clearly depict the means by which erosion and sediment transport will be reduced during construction. Calculations supporting the proposed ESC measures may be included in the SWM report for the development.

Section 7.0 Roadways

The following Municipality of Trent Hills Road Design Criteria for residential roads applies to local and minor collector streets:

7.1 Standard Road Section

The residential roadway section is shown on Standard Drawing R1, R2 & R3. This section designates standard locations for all Municipal Services and other utilities.

7.2 Geometric Standards

Streets with a 18 m, 20 m, and 23 m Right-Of-Ways (ROW) will have minimum pavement width of 8.0 m, 8.0m and 9.5 m respectively. This width does not include the concrete gutter. The minimum pavement radii for intersections shall be 12.0 m, 12.0 m for a hammerhead turnaround and 16.8 m on a cul-de-sac with an island and 16.8 m on a cul-de-sac without an island (permanent or temporary). The minimum property radius on a cul-de-sac shall be 20.0 m.

The following standards are to be followed, however, specific conditions may warrant some change. Any change will require approval from the Municipality of Trent Hills.

Minimum Grade:	To maintain 0.50% minimum on gutter grade.
Maximum Grade:	Maximum Grade: 6.0 %
Vertical Curves:	Vertical curves to effect gradual change between tangent grades are to be used in accordance with the MTO Geometric Design Standards.
Horizontal Curves:	Use in accordance MTO Geometric Design Standards.
Cross Fall:	2%
Asphalt Depth:	90 mm Minimum (base coat, 50 mm, of HL8) on Local Residential. 120 mm Minimum (base coat, 50 mm, of HL8) on Collector & Arterial. 50 mm on temporary cul-de-sac or temporary access roads.
Granular Depth:	Depending on soil conditions and a geotechnical report, but no less than: 150 mm Granular "A" 450 mm Granular "B"

7.3 Curb and Gutter

Concrete Curb and Gutter shall be constructed on both sides of all streets in accordance with Std. Dwg S1, S2 & S3.

7.4 Sidewalks

Concrete sidewalks shall be a minimum of 1.5 m wide on both sides of residential collector and arterial streets and one side on residential local streets. Hand railings shall be provided where 3 or more steps are required. Hand Railings shall comply with the Ontario Building Code (OBC), Ontario Provincial Standards (OPS) and Accessibility of Ontario Disability Act (AODA) Standards.

7.5 Walkways (Active Transportation element)

Pedestrian walkways shall be concrete, 1.8 m wide with 1.5 m minimum height galvanized chain link fence on each side within property limits. Minimum R.O.W width is to be 6.0 m. Bollards are to be installed 1.1 m either side of centre of sidewalk, at both ends of the walkway. Bollards are to be 150 x 150 mm x 2.4 m pressure treated wood exposed and buried 1.2 m. Bollards are to be removable as approved by the Municipality of Trent Hills.

Minimum R.O.W. to be increased to minimum 9.0 m where servicing and walkway exist through corridor.

Asphalt multi-use pathways to support biking and other forms of active transportation should also be considered in coordination with the Municipality.

7.6 Boulevards

All boulevards shall be graded, top soiled with a minimum depth of 200 mm, and sodded from the property line to the back of curb.

7.7 Community Mailbox Standards

Layby for community mailbox installation to be in accordance with Std. Dwg S9.

7.8 Street Signs and Pavement Markings

Traffic control signs will be provided at locations designated by the Municipality and shall be in accordance with the "Manual of Uniform Traffic Control Devices" published by the MTO. Street name signs should be 16 cm high with a green background and white lettering (both sides), reflectorized and mounted on galvanized steel 60 mm diameter x 3.2 m posts in accordance with the Municipality of Trent Hills specifications.

Pavement markings shall be provided on surface asphalt in accordance with OTM, MUTCD and OPSS.

7.9 Daylighting Triangle

Minimum 9.0 m by 9.0 m daylighting triangle required on all intersection corners for arterial and collector streets. Minimum 7.5 m by 7.5 m daylighting triangle required on all intersection corners for local streets. Additional area may be required for special circumstances. Daylighting triangles are to be part of Municipal ROW.

7.10 Easements

Minimum 6.0 m easements required for single municipal services, minimum 9.0 m easements required for two municipal services. Where more than two services are to be accommodated by an easement consult with the Municipality for specific easement requirements.

For rear yard storm sewers 300 mm diameter or less, and catchbasins, minimum easement width to be 3.0 m, with centre offset 0.5 m from property line. For storm sewers larger than 300 mm diameter consult with Municipality for specific easement requirements.

The Municipality of Trent Hills Standard Drawings which apply to road construction are included and/or referenced in this Manual.

Section 8.0 Utility Design Requirements

All hydro, telephone and other utilities shall be underground and placed in accordance with current local utility company regulations and standards. A Composite Utility Plan shall be prepared and submitted documenting the location of all above and below ground utility infrastructure. The plan must be reviewed by all utility companies.

Satisfactory evidence that the Developer has entered into an agreement providing for the installation of underground hydro and street lighting must be submitted to the Municipality of Trent Hills prior to the execution of a Subdivision Agreement.

All developments shall be provided with street lighting in accordance with the current requirements of the local utility companies and the Municipality of Trent Hills. Street lighting shall be dark sky compliant.

All materials and installation shall meet or exceed current O.P.S.S. standards and the requirements of the local utility supplier. The materials and supplier shall be reviewed with the Municipality prior to approval and samples shall be supplied if requested.

Poles:	Poles shall be 1 piece Concrete, Aluminum or Steel. Concrete poles shall be direct burial. Aluminum and steel poles shall be installed with an adjustable frangible base (direct burial shall not be permitted). All poles shall be supplied so that the minimum distance between the shoulder of the road and the bottom of the luminaire is 8 m.
Brackets:	All brackets shall be tapered Elliptical Aluminum with a minimum length of 2.4 metres.
Luminaries and Lamps:	Luminaires shall be supplied with an individual photo cell and 150 w clear LED lamp. The luminaire shall be supplied with a clear lens. Luminaire style shall be determined and approved by Municipality staff, depending on location of development.
Spacing	The poles will be installed in the location specified on the Urban, Suburban or Rural Road Section Detail. In general, the spacing for estate lot developments shall not exceed 100 m and in urban areas shall not exceed 50 m

Note: The Municipality will consider the use of architectural lighting subject to submission and approval of detailed Shop Drawings of the proposed standard and luminaires.

Section 9.0 Landscaping

9.1 Topsoil and Sod

Boulevards: All boulevards shall have a minimum depth of 200 mm topsoil plus sod.

Parks: All parks shall have a minimum depth of 200 mm topsoil, seed and mulch.

Seed mix shall be as follows:

Table 9.1 – Grass Seed Mix

Type	Amount
Nu Blue Kentucky Bluegrass	25%
Baren Kentucky Bluegrass	25%
Herald Creeping Red Fescue	15%
Wilma Chewing Fescue	10%
Pinnacle Turf Type Per Rye	25%

Seed shall be applied at a rate of 1.5-1.7 Kg/100 square metres.

All topsoil shall be in conformance with OPSS 570.

Roadside and Ditching: All roadside and diches shall have minimum depth of 200 mm topsoil and seed. Seed mix shall be MTO Roadside Seedmix, or equivalent approved by Municipality of Trent Hills staff.

9.2 Trees

9.2.1 Planting Requirements

a) Trees shall be planted in front of every lot on the Municipal Right-Of-Way at a location 300 mm from the street property line.

b) On corner lots a tree shall be planted every 15 m on the adjacent side yard on the flanking street.

c) Trees are to be planted so as not to interfere with other street functions or services when the tree matures. Where it is not possible to conform to the foregoing, the trees shall be planted at locations approved by the Municipality.

d) Planting of trees shall be detailed in the Standard Drawings. They shall be watered at time of planting and every two weeks thereafter up to the expiration of the guarantee period. The guarantee period shall be one year from the date of planting and the period for planting shall be Spring and Fall only.

e) All trees shall be No. 1 nursery stock, 2.5 m minimum height with a minimum caliper of 60 mm measured 300 mm above ground level.

All areas for planting shall be stabilized with sod or seed as required, prior to planting of trees.

9.2.2 Species:

Alternate species shall be provided on all streets. A species list shall be provided and approved for each street, prior to any planting.

The species that are approved for planting on Municipal property shall include the following:

Table 9.2.2 – Tree Species

Scientific Name	Common Name
Acer Nigrum	Black Maple
Acer Saccharum	Sugar Maple
Aesculus Hippocastanum	Common Horse Chestnut
Fraxinus Americana	White Ash
Fraxinus Pennsylvania Var. Subintegerrima	Green Ash
Gleditsia Triacanthos Var. Inermis "Halica" Honeylocust	Honey Locust

Gleditsia Triacanthos Var. Inermis Sunburst Locust	Sunburst Locust
Pyrus Calleryana	Redspire Pear
Tilia Cordata	Glenleven Linden

9.3 Park and Recreational Areas:

The Municipality may request that the Park or Recreational Areas dedicated for the development be provided with a suitable entrance, sanitary and water services, parking lot and be graded and seeded so that they are suitable for recreational use.

The area to be dedicated for park use shall be reviewed with the Municipality on submission of the Preliminary Draft Plan. Requirements for entrances, grading and seeding will be finalized at time of engineering drawing review. The Municipality may also request that a different area than that proposed by the Developer be set aside for a park due to the physical features of site.

Section 10.0 Lot Grading Requirements

10.1 General

This section covers the requirements for lot grading within new developments in the Municipality. New subdivisions are required to have an Overall Lot Grading Plan for the entire development and Individual Lot Grading Plans for each individual lot. The Overall Plan depicts all the grading and surface drainage features for the entire development and shows how they tie together. The Individual Plans show specific grades and drainage features at each lot.

10.2 Overall Grading Plans

These plans are required as part of the subdivision approval process. Overall Lot Grading Plans show all site grading and drainage features for the entire development. The plans must include lot corner, lot line, breakpoint and building elevations as well as slope arrows depicting overall drainage patterns for the site.

10.3 Individual Lot Grading Plans

These plans are required at the building permit stage. These plans are to be prepared by a professional engineer and reflect the specific house style and dimensions to be constructed. The plan is prepared to demonstrate conformance with grading requirements and zoning by-laws. These plans must show detailed lot grades at all lot corners, lot lines, building corners, entrance points, basement floor elevation, and garage floor elevation. Drainage patterns on the lot must be shown with slope arrows and all swales must be depicted with inverts and slopes.

10.4 Lot Grading Design Requirements

The following parameters shall be used in the design of lot grading plans:

Minimum surface slope for lots	2%
Maximum surface slope for lots	3:1
Minimum driveway slope	2%
Maximum Driveway Slope	8%
Minimum swale slope	2%
Minimum swale depth	0.15m

The maximum allowable length of rear-yard swale without a catchbasin is 100m. The maximum rear yard catchbasin contributing area is 0.5 ha.

Section 11.0 STANDARD DRAWINGS AND DETAILS

Where the Ontario Provincial Standard Drawing No. has been indicated, this Standard shall apply. Where a the Municipality of Trent Hills Standard Drawing No. has been indicated in addition to the Ontario Provincial Standard Drawing No. the latter shall be read in conjunction with the Municipality of Trent Hills Standard. Should there be an inconsistency between the Standards, the Municipality of Trent Hills Standard shall take precedence.

The Municipality of Trent Hills reserves the right to update its Standards from time to time and any person using them should ensure they have a copy of the current listing prior to proceeding with a project.

In all cases, the latest revisions of the Standard Drawings as of the date the design is completed shall be used. For the Municipality of Trent Hills Standards, the Standard number includes the month and year of the latest revision of the Standard.

Table 11: Standard Drawings

Title	Ontario Provincial Standard Drawing	Trent Hills Standard
Pipe Bedding-Gran.'A' Cover Material-Gran.'A' or sand	802.010,802.013, 802.030,802.033.	
M.H. Frame and Cover a) Standard-Sanitary b) Standard-Storm c) Watertight-Sanitary	401.01 (Type "A") 401.01 (Type "B") 401.03	- - -
Catchbasin Frame and Grate	400.11	-
Ditch Inlet Catchbasin Frame and Grate	403.01	-
M.H. Steps	405.010 (Hollow Aluminum)	-

Title	Ontario Provincial Standard Drawing	Trent Hills Standard
Safety Platform Aluminum	404.20	
Sewer Service Connections	1006.010, 1006.020	-
M.H. (precast)	Section 700 & 1000	-
Catchbasins (precast)	Section 700	-
Catchbasin M.H. (precast)	Section 700	-
M.H. Benching	701.021	-
Water Service	1104.010, 1104.020	-
Valve and Box	1101.020	-
Hydrant Setting	1105.010	-
Thrust Blocks	1103.010, 1103.020	-

Title	Ontario Provincial Standard Drawing	Trent Hills Standard
18 m Right-Of-Way	-	S1
20 m Right-Of-Way	-	S2
23 m Right-Of-Way		S3
Typical Rural Section (20 m and 23m Right-Of-Way)		S4 and S5
Concrete Sidewalk (125 mm Concrete) (100 mm Granular "A" minimum)	310.010	-
Sidewalk Ramps	310.030	-
Barrier Curb and Gutter	600.040	-
Asphalt Gutter	601.010	-
Typical Service Layout		S6

Title	Ontario Provincial Standard Drawing	Trent Hills Standard
Hammerhead Turnaround		S7
Typical Turning Basins for Terminated Roadways		S8
Mailbox Layby Detail		S9

Section 12.0 APPROVED MATERIAL LIST

Table 12: Approved Materials and Product List

Service	Item	Approved Products
Sanitary	Sewer Pipe	PVC DR 35 Concrete CSA#A257.1/A257.2
	Service Pipe	PVC DR 28
	Connections	Kor-N-Seal (maintenance holes)prefab tees or Kor-N-Tee (services)
Storm	Sewer Pipe	375 mm diameter or less: PVC DR 35 - IPEX "Ultra Rib" - Loc Pipe "Loc PVC" - Concrete-CSA A257.1 (non-reinforced) and A257.2 (reinforced). - HDPE Big 'O' Boss Polytite - Royal Rib AKorflo@ 450 mm diameter or greater: S Concrete-CSA A257.1 (non-reinforced) and A257.2 (reinforced). Leads to rear yard catchbasins are to be concrete. All culverts shall be galvanized CSP, (minimum 1.6 mm thickness) or HDPE Boss 2000, 320 k Pa stiffness c/w Ultra Stab 75 Joint
	Service Pipe	PVC DR 28
	Connections	Kor-N-Seal (PVC) Adaptor with sand (ribbed) prefab tee or Kor-N-Tee (services)

Service	Item	Approved Products
Water	Watermain	Acceptable watermains are C900 Polyvinyl Chloride (PVC), SDR 18, B 137.3 conforming to relevant AWWA and CSA specifications and Ductile Iron pressure Class 350, cement lined pipe conforming to the latest edition of AWWA C104/A21.4-95 with Poly encasement.
	Valves	Mueller Resilient Wedge Gate Valve AWWA C-509, mechanical joint with: - fusion-bonded epoxy coating - bronze stem - open counter clockwise Clow Resilient Wedge Valve AWWA C-509,F-6100 mechanical joint with: - fusion-bonded epoxy coating - bronze stem - open counter clockwise American AVK Co., Series 25 Resilient Seated Gate Valve AWWA C-509, mechanical joint with: - fusion-bonded epoxy resin coating, AWWA C550 - standard stainless steel stem - open counter clockwise
	Hydrants	Canada Valve New Century Type Compression, or McAvity M59M, both with "Storz" pumper connection.
	Main Stop	Cambridge Brass, Series 102, Compression Joint "Successor".
	Curb Stop	Cambridge Brass, Century Ball Valve, Compression Joint "Successor", Stainle ss steel rod and pin.

Service	Item	Approved Products
Water	Saddle	Cambridge Brass, Series 403 Stainless Steel Saddle Type 304 Double Bolt, AWWA Thread
	Mechanical Joint Restraints	- Uni-Flange Series 1300 manufactured by Ford Meter Box Company, Inc. - Grip Ring pipe restrainer manufactured by Romac Industries. - MJ Field Lok manufactured by Clow Canada - Series 350 Restrainers manufactured by Clow Canada -Sigma One-Lok restrainer manufactured by Sigma Corporation -Sigma PV-Lok restrainer manufactured by Sigma Corporation
	Tracer Wire	Tracer wire for open trench construction shall be high Strength (HS) 12 gauge (AWG) Copper Clad Steel (CCS) wire. Wire shall have a minimal break load of 452 lbs, a 30 mil HDPE jacket and rated for direct bury application. Tracer wire for trenchless construction shall be Extra High Strength (EHS) 12 gauge (AWG) Copper Clad Steel (CCS) wire. Wire shall have a minimal break load of 1150 lbs, a 45 mil HDPE jacket and shall be rated for directional drill application. (Std. Dwg. No. W3).
	Water Service Material	PVC, or polyethylene. Municipex or approved equivalent

APPENDIX A:
FORMS, STANDARD DRAWINGS AND SPECIFICATIONS

Ontario Ministry of the Environment

Form 1 - Record of Watermains Authorized as a Future Alteration

RETAIN COMPLETED FORM - DO NOT SEND TO MOE

Part 1 - Drinking Water Works Permit Number

(Insert the Drinking Water Works Permit number authorizing the addition, modification, replacement or extension of watermains)

Part 2 - Description of watermain addition, modification, replacement or extension (Use attachments if required)

The description shall include:

1) A brief description above of the undertaking (e.g. street name(s); subdivision name; project name); and
2) An attachment including a plan view drawing identifying at a minimum:
   a) location(s) of the undertaking (e.g. showing street names, easements, etc.); and
   b) nominal diameter of the watermain(s) associated with the addition, modification, replacement or extension.

Part 3 - Verification by Professional Engineer

I hereby verify that I am a Professional Engineer who is licensed to practice in the Province of Ontario and the design of the watermain addition, modification, replacement or extension:

1) Has been prepared by a Professional Engineer who is licensed to practice in the Province of Ontario;
2) Has been designed only to transmit water and has not been designed to treat water;
3) Satisfies the design criteria set out in the Ministry of the Environment publication "Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – March 2009", as amended from time to time; and
4) Is consistent with or otherwise addresses, the design objectives contained within the Ministry of the Environment publication "Design Guidelines for Drinking Water Systems, 2008", as amended from time to time.

Name (Print)	PEO Licence Number

Signature	Date (yyyy/mm/dd)

Part 4 - Verification by Owner

I hereby verify that:

1) The maximum demand for water exerted by consumers who are serviced by the addition, modification, replacement or extension of the watermain will not result in an exceedance of the rated capacity of a treatment subsystem or the maximum flow rate for a treatment subsystem component as specified in the licence, or the creation of adverse conditions within the drinking water system;
2) The watermain addition, modification, replacement or extension will not adversely affect the distribution system's ability to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions.
3) Secondary disinfection will be provided to water within the added, modified, replaced or extended watermain to meet the requirements of O. Reg. 170/03;
4) The watermain addition, modification, replacement or extension is wholly located within the municipal boundary over which the owner has jurisdiction;
5) The owner consents to the watermain addition, modification, replacement or extension; and
6) I am authorized by the owner to complete this verification.

Name of Owner (Print)	Name of Owner Representative (Print)

Signature	Date (yyyy/mm/dd)

Clear Form Print Form

Ontario

Ministry of the Environment, Conservation and Parks

Form SS1

Record of Future Alteration Authorized for Separate Sewers/Nominally Separate Sewers/Forcemains

RETAIN COMPLETED FORM - DO NOT SEND TO THE MINISTRY

Part 1 - Environmental Compliance Approval Number

(Insert the Environmental Compliance Approval number authorizing the alteration of Separate Sewers/Nominally Separate Sewers/Forcemains)

Part 2 - Description of separate sewer/nominally separate sewer/forcemain alteration (Use attachments if required)

The description shall include:

1) A brief description above of the undertaking (e.g. street name(s); subdivision name; project name); and
2) An attachment including plan and profile drawings identifying at a minimum:
   a) location(s) of the undertaking (e.g. showing street names, easements, discharge points, slope (separate sewer only), etc.); and
   b) nominal diameter of the sewers/forcemain(s), associated with the alteration.

Part 3 - Verification by Licensed Engineering Practitioner

I hereby verify that I am a Licensed Engineering Practitioner who is licensed to practice in the Province of Ontario and the design of the separate sewer/nominally separate sewer/forcemain alteration:

1) Has been prepared by a Licensed Engineering Practitioner who is licensed to practice in the Province of Ontario;
2) Has been documented in a design report and any other applicable design forms;
3) Has been designed only to collect and transmit sewage and has not been designed to treat sewage;
4) Satisfies the design criteria set out in the Ministry of the Environment, Conservation and Parks publication “Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval”, as amended, and have documented the reasons for this opinion; and
5) Is consistent with, or otherwise addresses, the design objectives contained within the Ministry of the Environment, Conservation and Parks publication “Design Guidelines for Sewage Works”, as amended;

Name (Print)	PEO Licence Number

Signature	Date (yyyy/mm/dd)

Part 4 - Verification by Owner

I hereby verify that:

1) The maximum wastewater discharge by users who will be serviced by the addition, modification, replacement or extension of the separate sewer/nominally separate sewer/forcemain will not result in:
   a) An exceedance of the municipal sewage collection system hydraulic capacity, sewage treatment plant uncommitted reserve hydraulic capacity, or the downstream pumping station capacity;
   b) Adverse effects;
   c) Any increase in collection system overflows that is not offset by measures, and have documented any offset measures used; or,
   d) Any increase in the frequency and/or volume of Sewage Treatment Plan (STP) bypasses or STP overflows that is not offset by measures, and have documented any offset measures used. (Alternatively, if the wastewater flows to a STP not owned by the Owner, then the wastewater volume or flow rate is as agreed to with the Owner of the STP.)

2) The separate sewer, nominally separate sewer or forcemain alteration will:

   a) Not cause overflows or backups, nor increase surcharging at any maintenance holes or privately owned infrastructure (e.g. basements) within the municipal sewage collection system or any municipal sewage collection system connected to it; and
   b) Provide smooth flow transition to existing gravity sewers.

3) An assessment of the proposed works has been completed to determine if the works pose a significant drinking water threat. The proposed works do not pose any threats to sources of drinking water or design includes features that mitigate the threat to sources of drinking water, such as those included in: Ministry's Standard Operating Policy for Sewage Works, as amended from time to time; and Source Protection Plan policies pertaining to the works;

4) The separate sewer/nominally separate sewer/forcemain alteration is wholly located within the municipal boundary over which the owner has jurisdiction except where there is an agreement existed between municipalities;

5) The owner consents to the separate sewer/nominally separate sewer/forcemain alteration; and

6) I am an authorized representative of the owner to complete this verification.

Name of Owner (Print)	Name of Owner Representative (Print)
Signature	Date (yyyy/mm/dd)

Part 5 - Post Construction Verification by Owner for Inspection and Testing

I hereby verify that:

1) The separate sewer, nominally separate sewer or forcemain alteration has complied with inspection and testing requirements set out in the Ministry of the Environment, Conservation and Parks publication "Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval", as amended, and have documentation of the inspection and testing results.

Name of Owner (Print)	Name of Owner Representative (Print)
Signature	Date (yyyy/mm/dd)

Note: Parts 1 to 4 above shall be completed before construction.
Part 5 is to be completed after the inspection and testing have been undertaken.

Print Form

Documentation for New Watermains

Backflow Prevention:

- Air gap (as defined in CSA Standard B64.10 "Selection and Installation of Backflow Preventers) or Reduced Pressure Principle Backflow Preventer installed as per Section 4.8.9 of ANSI/AWWA Standard C651. **Air Gap/RP**

- Backflow preventer tested as per Section 1.1.1 of Ontario Watermain Disinfection Procedure. **Y/N**

  Person completing test _____ Certificate # _____

- Pre-disinfection swabbing and/or flushing have been completed. **Y/N**

- Pressure test completed**. Y/N**

***Disinfection*: Chlorine Concentrations and Contact Times for Disinfecting New Watermains**

Disinfection Method	Minimum Contact Time	Initial Chlorine Concentration	Maximum Allowable Decrease in Chlorine Concentration
Tablet or Continuous Feed	24 hours	≥ 25 mg/L	40% of the Initial Chlorine Concentration to a maximum of 50 mg/L**
Slug	3 hours	≥ 100 mg/L	25 mg/L
Spray	30 minutes	≥ 200 mg/L	Measurement Not Required

- Method of disinfection _____

- Disinfection chemical meets the requirements of both the AWWA and NSF/ANSI/CAN 60 Standards. **Y/N**

- Date and time disinfection started and ended;
  Chlorination start date_____ Time_____
  Chlorination end date _____ Time _____

Chlorine concentration at start and end of contact time at each sampling point; and decrease in chlorine concentration in mg/L and/or percentage as applicable.

Sample Point	Start of Contact Time Residual mg/L	End of Contact Time Residual mg/L	Decrease in Residual	
			mg/L	%

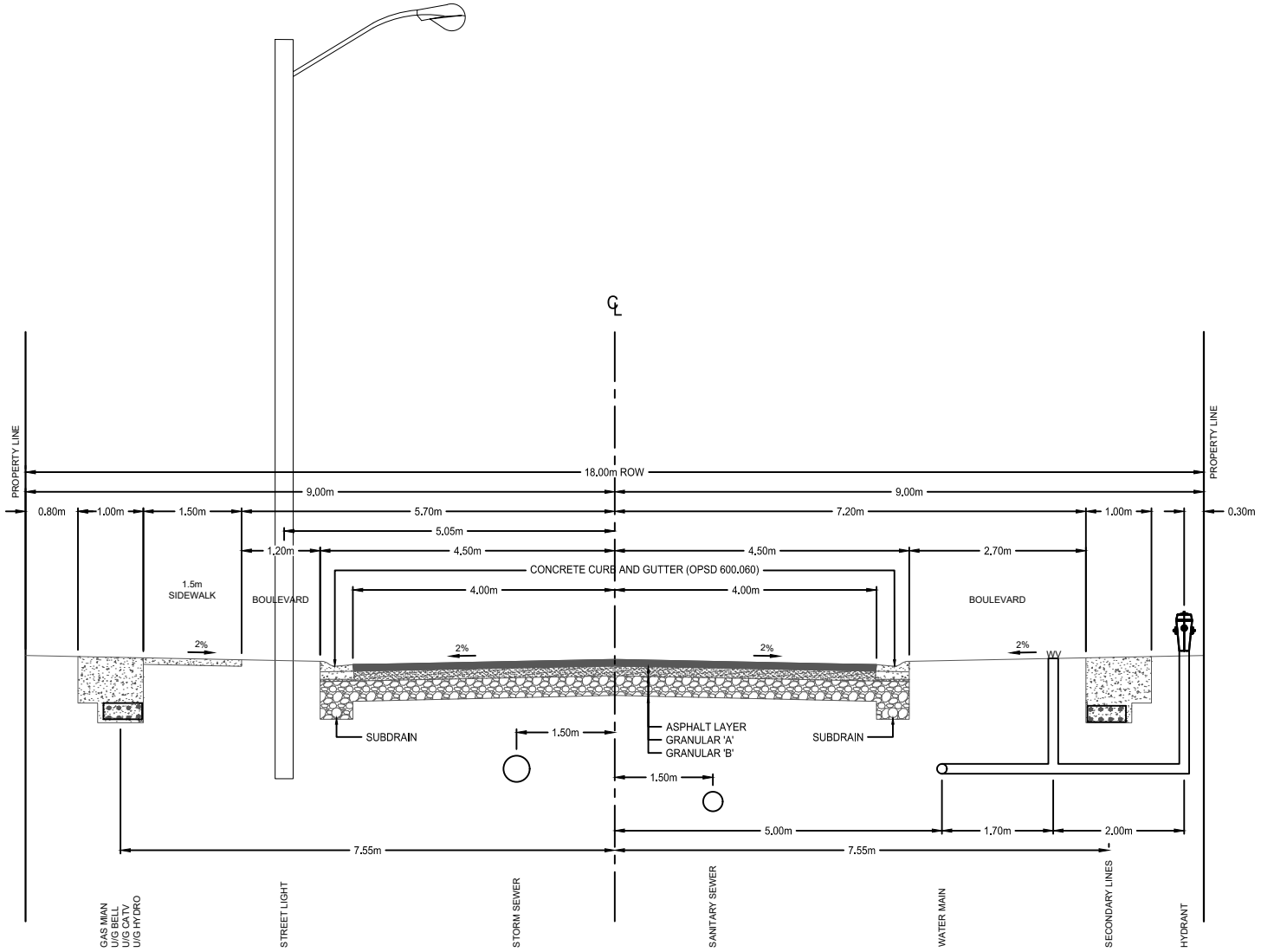
Microbiological Sampling

- Schematic or drawing showing approximate location where *Microbiological Samples* were taken, see attached.
- *Microbiological* and disinfectant residual sample results, see attached chain of custody.
- For staged sampling: flow rate, time each sample was taken and calculated length.

Connections referred to in Section 1.1.4 of Ontario Watermain Disinfection Procedure:

- Length of *Connection* _____
- Sanitary construction practices were followed during connection **Y/N**
- Proper disinfection was performed during the connection **Y/N**
- Name of *Certified Operator* present for the installation of the *Connection*_____
- Results of *Microbiological* and disinfectant residual samples if required (no certified operator present), see attached if applicable.
- Reason for using the exception under s. 1.1.4.2 (if used) _____
- Disinfectant residual after watermain is flushed and put in service _____
- Date and time watermain was placed into service. _____

Field Sketch to Indicate Locations Microbiological Samples were Collected.



NOTE:

A. BOULEVARD WIDTHS ILLUSTRATED ARE TYPICAL, BUT CAN BE ALTERED AT THE DISCRETION OF THE TRENT HILLS PUBLIC WORKS DEPARTMENT MANAGER
B. BOULEVARD MATERIALS CAN BE GRASS, STAMPED CONCRETE, CONCRETE OR ASPHALT DEPENDING ON LOCATION AND DIRECTION FROM OF THE TRENT HILLS PUBLIC WORKS DEPARTMENT MANAGER
C. SIDEWALK ON 1 SIDE IS A MINIMUM. SIDEWALKS ON BOTH SIDES ARE RECOMMENDED DEPENDING ON THE ROW WIDTH AND THE LOCATION OF THE ROADWAY.

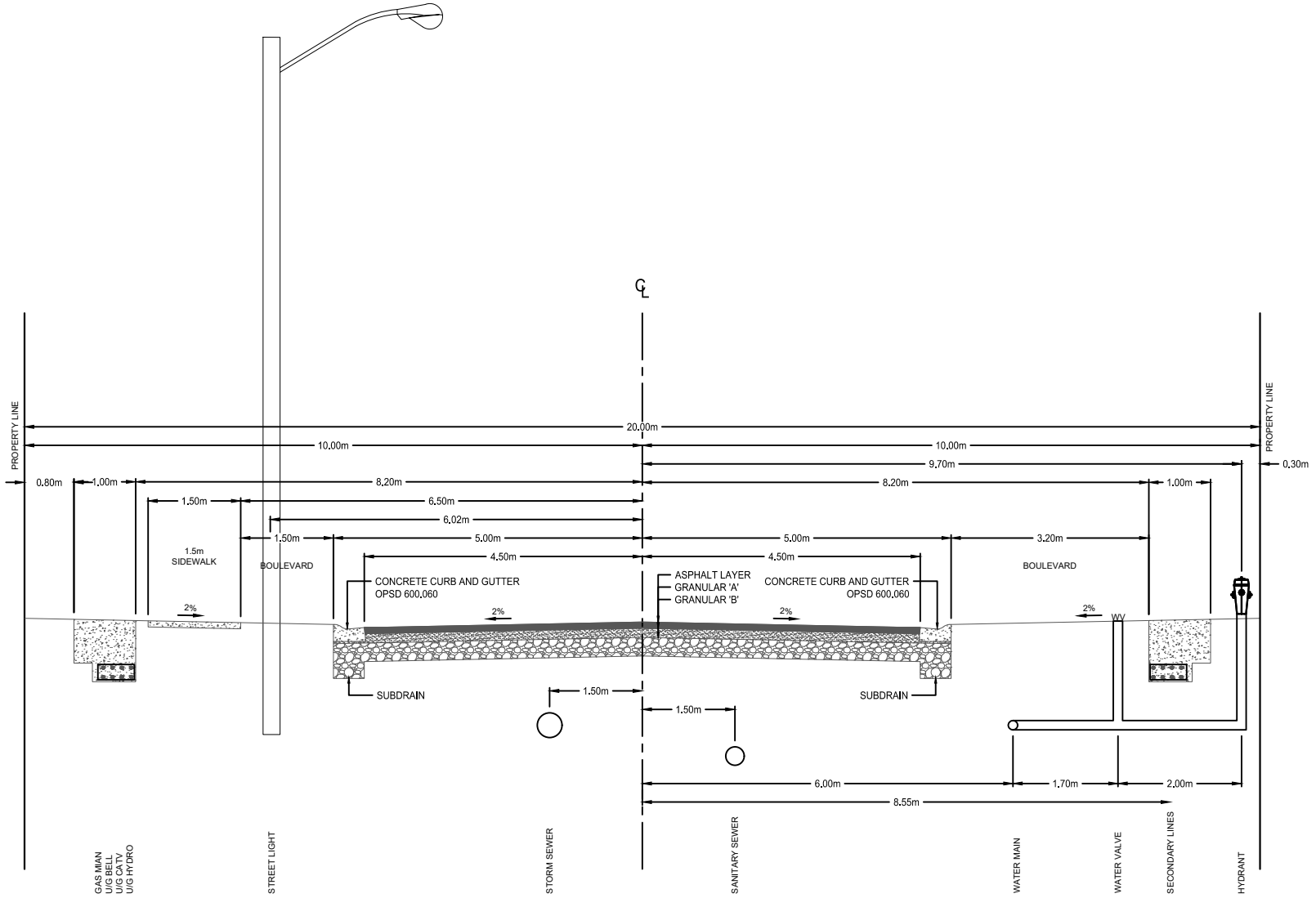
MUNICIPALITY OF TRENT HILLS

18 METER URBAN ROW SIDEWALK ON ONE SIDE

82 of 100

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S1



NOTE:

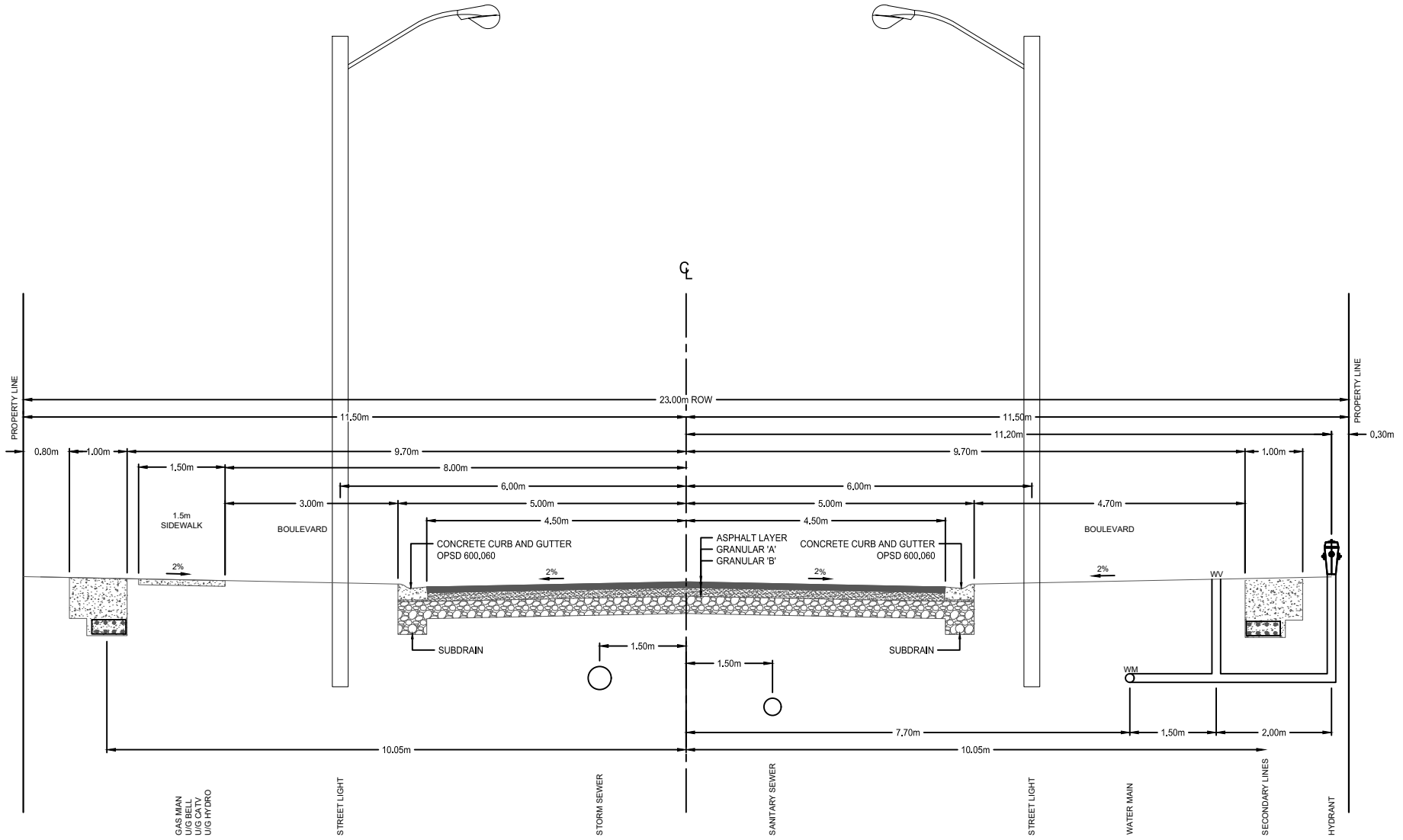
A. BOULEVARD WIDTHS ILLUSTRATED ARE TYPICAL, BUT CAN BE ALTERED AT THE DISCRETION OF THE TRENT HILLS PUBLIC WORKS DEPARTMENT MANAGER
B. BOULEVARD MATERIALS CAN BE GRASS, STAMPED CONCRETE, CONCRETE OR ASPHALT DEPENDING ON LOCATION AND DIRECTION FROM OF THE TRENT HILLS PUBLIC WORKS DEPARTMENT MANAGER
C. SIDEWALK ON 1 SIDE IS A MINIMUM. SIDEWALKS ON BOTH SIDES ARE RECOMMENDED DEPENDING ON THE ROW WIDTH AND THE LOCATION OF THE ROADWAY.

MUNICIPALITY OF TRENT HILLS

20 METER URBAN ROW SIDEWALK ON ONE SIDE

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S2



NOTE:

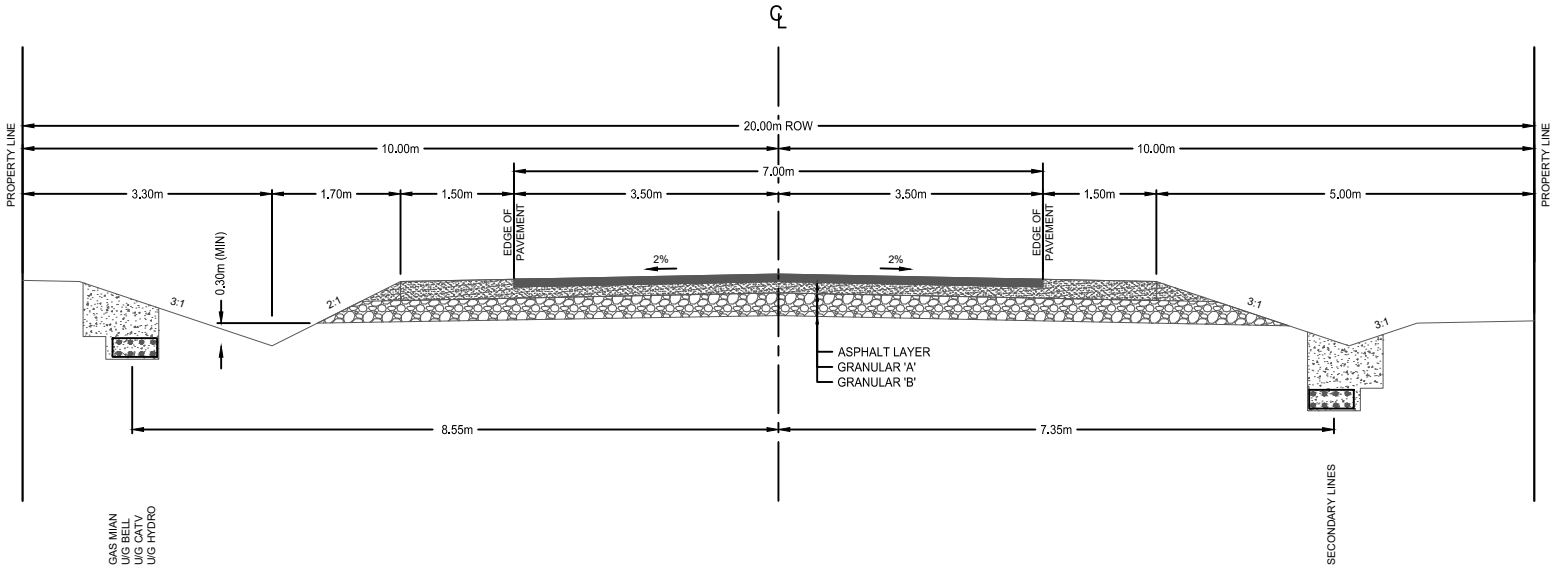
A. BOULEVARD WIDTHS ILLUSTRATED ARE TYPICAL, BUT CAN BE ALTERED AT THE DISCRETION OF THE TRENT HILLS PUBLIC WORKS DEPARTMENT MANAGER
B. BOULEVARD MATERIALS CAN BE GRASS, STAMPED CONCRETE, CONCRETE OR ASPHALT DEPENDING ON LOCATION AND DIRECTION FROM OF THE TRENT HILLS PUBLIC WORKS DEPARTMENT MANAGER
C. SIDEWALK ON 1 SIDE IS A MINIMUM. SIDEWALKS ON BOTH SIDES ARE RECOMMENDED DEPENDING ON THE ROW WIDTH AND THE LOCATION OF THE ROADWAY.

MUNICIPALITY OF TRENT HILLS

23 METER URBAN ROW SIDEWALK ON ONE SIDE

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S3



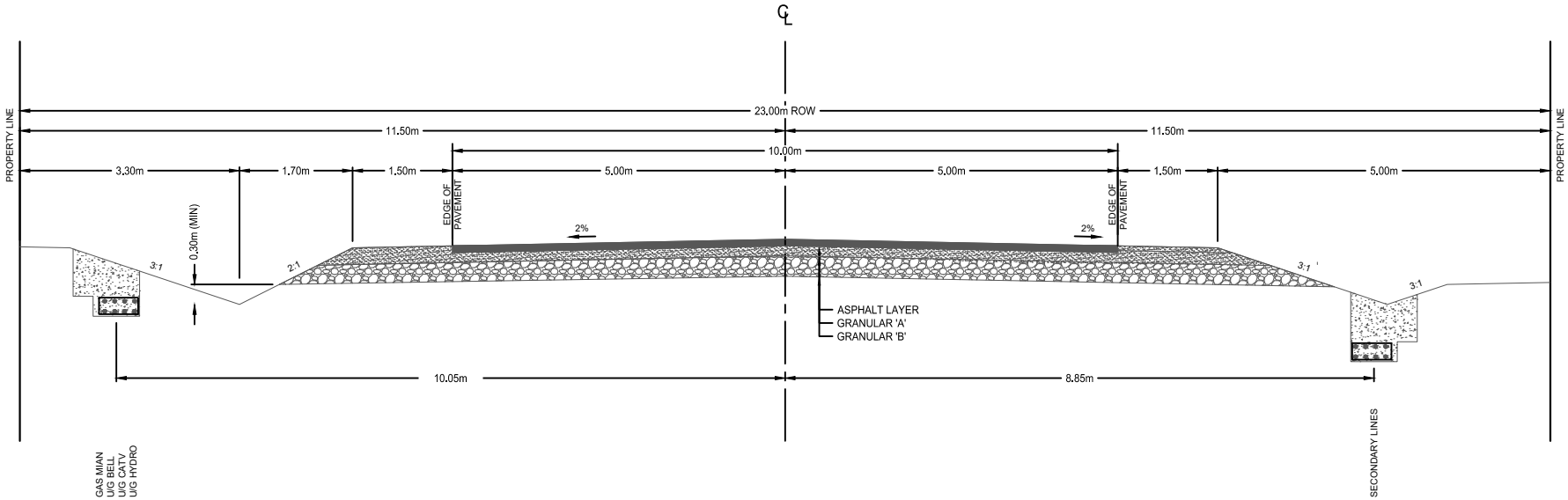
NOTE:

A. STREETLIGHTING AT INTERSECTIONS MAY BE REQUIRES AND TO BE CONFIRMED WITH MUNICIPALITY
B. MTO ROADSIDE SEED MIX TO BE INSTALLED WITHIN DITCH AND DISTURBED ROW AREAS

20 METER ROW RURAL ROAD CROSS SECTION

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S4



NOTE:

A. STREETLIGHTING AT INTERSECTIONS MAY BE REQUIRES AND TO BE CONFIRMED WITH MUNICIPALITY
B. MTO ROADSIDE SEED MIX TO BE INSTALLED WITHIN DITCH AND DISTURBED ROW AREAS

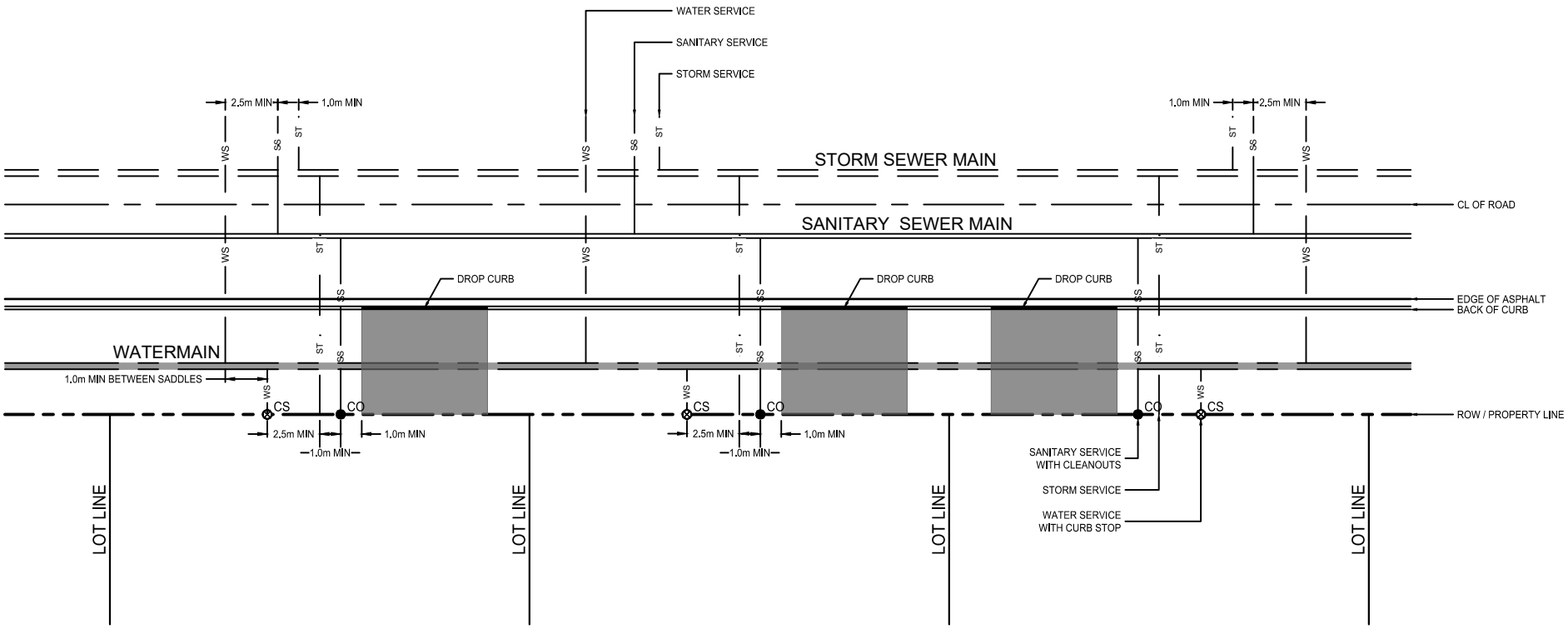
MUNICIPALITY OF TRENT HILLS

23 METER ROW RURAL ROAD CROSS SECTION

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S5

S:\01 - Projects\20000\20111 - Trent Hills Standards\02 Design\01 - Drawings\01 - Current Drawings\20111-XR2.dwg PRINTED: Jul 14, 2025



NOTES:

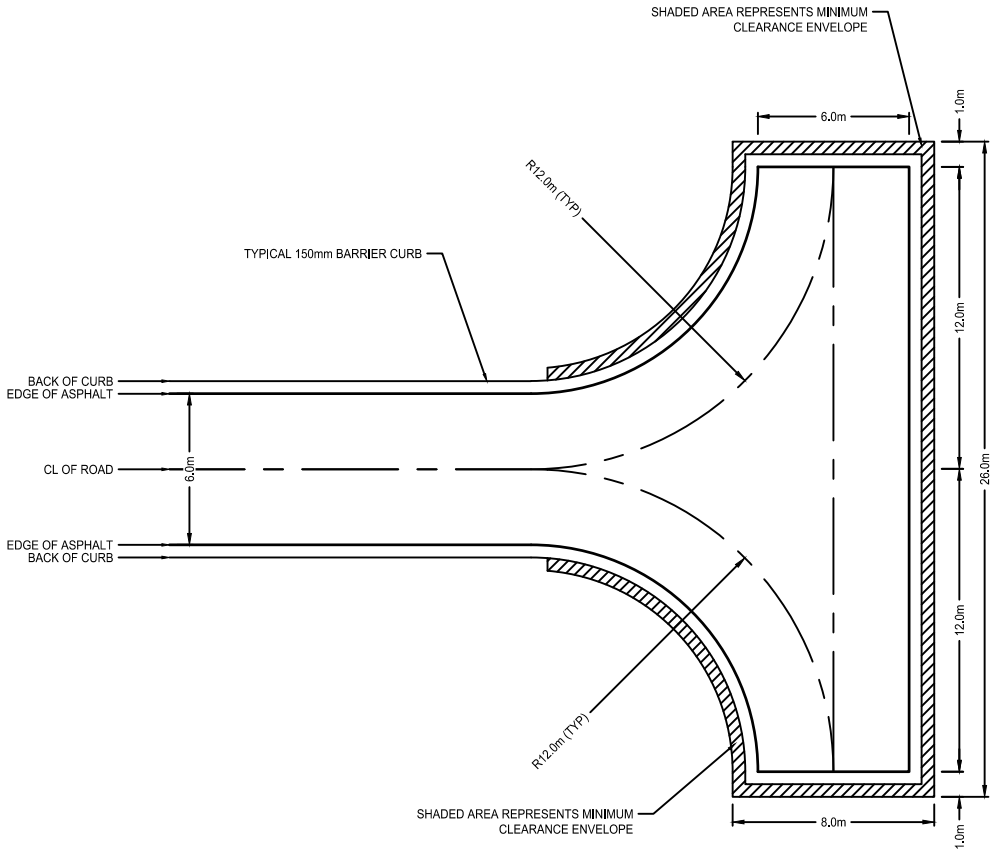
1. SANITARY SERVICES ARE TO BE BROUGHT TO PROPERTY LINE, TERMINATED WITH A CLEANOUT. WATER SERVICES ARE TO BE BROUGHT TO PROPERTY LINE, TERMINATED WITH A CURB STOP.
2. SANITARY SERVICE TO HAVE A MINIMUM DIAMETER OF 150mm.
3. SERVICES ARE NOT TO BE LOCATED BENEATH THE DRIVEWAY.
4. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

MUNICIPALITY OF TRENT HILLS

TYPICAL SITE SERVICING PLAN

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S6



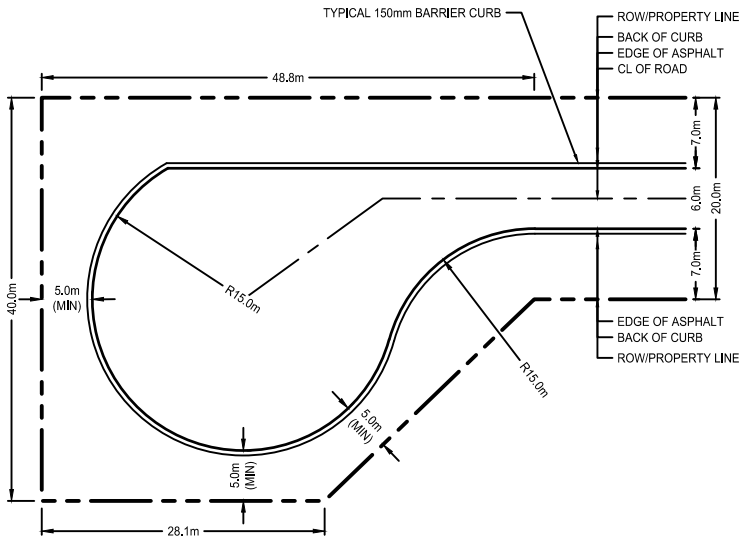
NOTES:

1. MINIMUM TURNING MOVEMENT BASED ON RTAC; SU-9-SINGLE UNIT TRUCK, WITH THE FOLLOWING DIMENSIONS: WHEELBASE-6.1m
   OVERALL LENGTH - 7.9m
   (EXCLUDES OVERHANG AT REAR)
2. ALL DIMENSIONS ARE MINIMUM

TYPICAL HAMMERHEAD TURNING MOVEMENT DIAGRAM

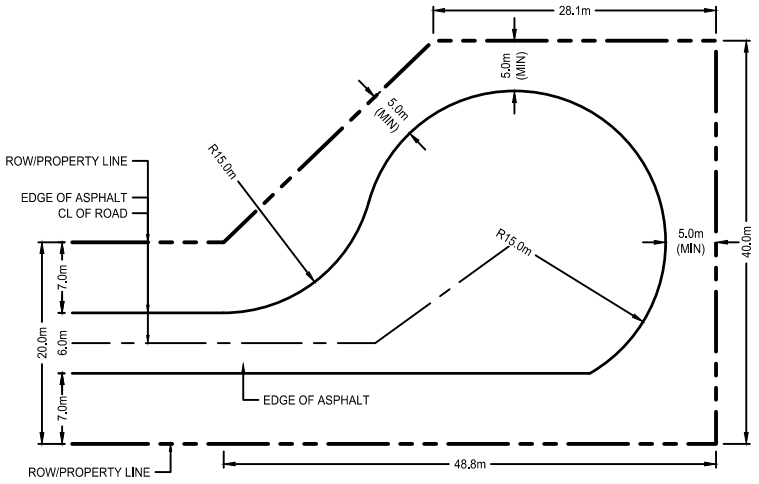
REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S7



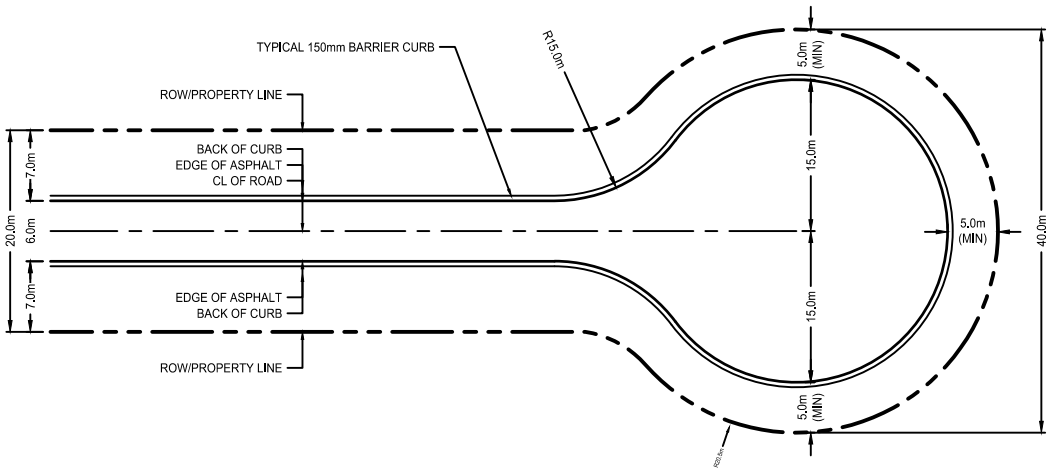
20m RIGHT OF WAY- URBAN UNCENTERED CUL-DE-SAC

SCALE: NTS



20m RIGHT OF WAY- RURAL UNCENTERED CUL-DE-SAC

SCALE: NTS



20m RIGHT OF WAY- CENTERED CUL-DE-SAC

SCALE: NTS

NOTES:

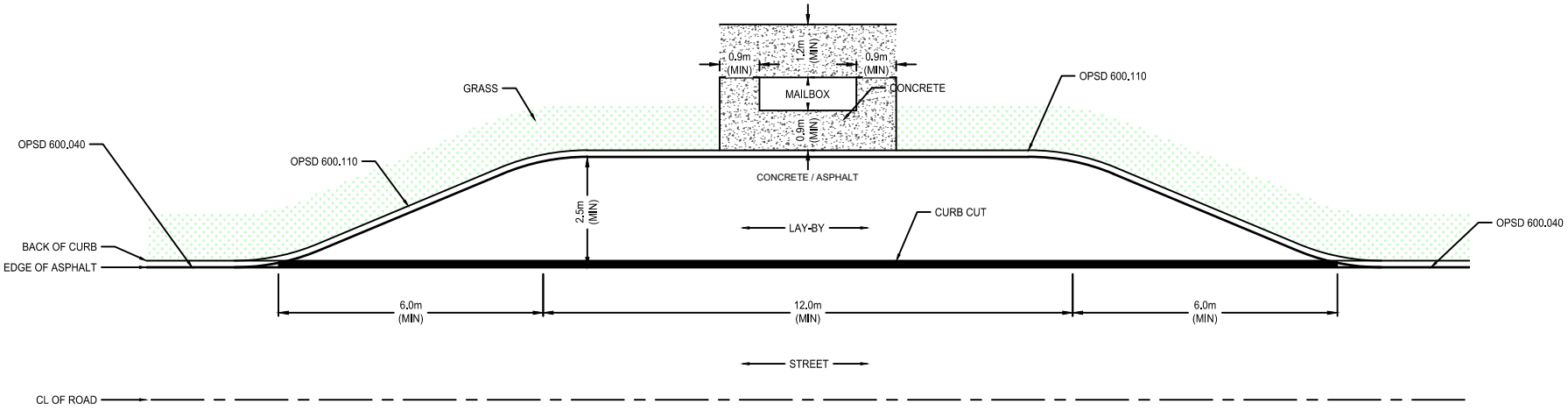
1. ROAD DESIGN MUST COMPLY WITH MTO STANDARDS AND APPROPRIATE TRENT HILLS CROSS SECTION. REFERENCE THE TAC MANUAL AND TRENT HILLS ROADS INFRASTRUCTURE GUIDELINES FOR STANDARDS.
2. GRANULAR ROAD BASE TO BE COMPACTED TO 100% S.P.D.
3. DITCHES & BOULEVARD AREAS TO RECEIVE 150mm TOPSOIL AND NUMBER 1 NURSERY SOD.

MUNICIPALITY OF TRENT HILLS

TYPICAL TURNING BASINS FOR TERMINATED ROADWAYS

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S8



NOTES:
1. ROAD DESIGN MUST COMPLY WITH MTO STANDARDS AND APPROPRIATE TRENT HILLS CROSS SECTION. REFERENCE THE TAC MANUAL AND TRENT HILLS ROADS INFRASTRUCTURE GUIDELINES FOR STANDARDS.
2. GRANULAR ROAD BASE TO BE COMPACTED TO 100% S.P.D.
3. DITCHES & BOULEVARD AREAS TO RECEIVE 150mm TOPSOIL AND NUMBER 1 NURSERY SOD.

MUNICIPALITY OF TRENT HILLS

MAILBOX LAY-BY DETAILS

REV NO.	DATE: JULY 2025
1	SCALE: N.T.S

S9

1.0 General Specifications

The design of the pumping station must conform to the current communications strategy, SCADA Operations Philosophy, and all other related standards, codes, acts and regulations, unless authorized and approved by the Municipalities Engineer and other approval authorities. The following information is to be provided prior to the commissioning of any pumping station:

- Provide a pre-start health and safety review as per OHSA, NFPA-820 and the Ontario Electrical Safety Code
- Provide a plastic laminate fact sheet for the pumping station, including lowest basement elevation, location of forcemain outlet to gravity system and bypass invert elevation. The fact sheet shall be a minimum size of 11” x 17” and mounted adjacent to the control panel.
- A plastic laminate process flow diagram indicating valves and key interlocks shall also be included with Operations and Maintenance Manual.
- A separate information document providing firm design range for inflow rate, optimum inflow rate for station that it is being designed for, estimated operating costs for the pumping station including HVAC, heating and odour control, estimated pump life.
- Wet Wells shall be designed to meet or exceed MECP Guidelines.
- For design purposes, MECP Design Guidelines recommend average daily domestic sewage flows of 225 to 450 L/capita/d for residential developments. Station flows shall be determined in Functional Servicing review
- MECP Guidelines recommend that wet wells be sized to allow a minimum ten (10) minute cycle time (equivalent to six (6) starts per hour).
- MOE Guidelines recommend filling times not exceed thirty (30) minutes based on the design average daily flows.
- The wet well floor shall have adequate slope to the intake hopper and the horizontal area of the hopper shall be kept to a minimum

- Sanitary Pumping stations unless other wise specified will initially be equipped with a minimum two (2) submersible pumps (1duty & 1 standby). Under normal station operation, the duty and standby pump status will be alternated with each pump stop. One pump must be able to handle the firm station flows.

- The wet well will be equipped with lockable aluminum access hatches to accommodate pump/equipment removal and operator access and rescue.

- Wet wells will be designed in a manner that the pumps are able to be removed without the requirement for entry under normal circumstances.

- A stainless-steel access ladder and grated safety (operations) platform, complete with safety railings, will be provided inside the wet well

- The wet well is considered a Class 1 Zone 1 environment and all electrical equipment installed in the wet well will be rated as such.

- MECP Guidelines require a minimum wet well area of 4.9 m^2, as such this shall be the minimum area.

- Electrical equipment and components such as motors, lights, cables, conduits, switch boxes, control circuits, etc., shall comply with the Ontario Electrical Safety Code (OESC), CSA approved, and comply with the Municipalities SCADA Standards

2.0 Site Layout and Servicing

Pumping stations and access to pumping stations are to be located above the 100 year flood limits unless approved otherwise by the Municipalities Engineer and other regulatory agencies. The site shall have good vehicular access and maneuvering area and minimize potential adverse environmental impacts. The facilities layout shall allow for future expansion, and comply with front, rear and side yard setbacks according to the applicable zoning and site plan standard and requirements

Building construction shall be architecturally pleasing, in relation to surrounding community, and low maintenance. Permanent structures shall be masonry or concrete construction. Temporary structures shall not be of wood frame construction. Cladding for temporary structures shall be of pre-formed FRP or pre-finished metal and include provisions to protect the building from vehicles.

Building insulation requirements, interior finish, and minimum interior building

temperature shall be as directed by the Municipal Engineer or CBO.

Building design, layout and construction materials shall be to the satisfaction of the Municipalities Engineer. Facility design and layout shall have regards to making confined space entry user friendly, optimizing sight and retrieval lines and comply with OHSA regulation. Landscaping of the site shall be low maintenance and architecturally pleasing, well graded, minimal grass areas and landscaped to the satisfaction of the Municipality. Site drainage shall not drain onto adjacent private property.

Fencing shall be 1.8m high chain link fence with three strands of Barbed wire and lockable gates that are sized appropriately. Include warning and municipal address signage as per current Municipal standards.

Provide adequate exterior lighting of the pumping station facilities such as access, parking, provide security hardware and alarms for all exterior doors, windows and exterior equipment to the satisfaction of the Municipality. Exterior lighting may be controlled by motion sensor or photo-eye as directed by the Municipality.

All control equipment and panels shall be indoors unless approved by the Municipal Engineer. All utility meters such as gas, hydro, water meter reader, shall be mounted on the exterior of the building.

Access to the site shall include provision for parking of maintenance vehicles and standby/emergency equipment. Roads shall be asphalt surfaced in parking and maneuvering areas and provide convenient removal and storage of snow, and turn around for trucks, tankers and heavy equipment.

All utilities including phone and computer communications servicing the site shall be underground unless authorized by the Municipality. Design, installation and planning of services shall be according to requirements of applicable codes, regulations and the Municipal standards.

3.0 Structural

The pumping station shall be evaluated for uplift and resistance to all combined or single loadings considering soil conditions, ground water level, and frost action. Uplift shall be determined when the structure is completely empty and dry, free of equipment, roof slab removed, and the structure watertight. Design the base slab to withstand all earth loadings when the structure is completely filled to maximum level, roof slab on, and all equipment installed. Provide crane and hoist design including appropriately sized hatches for convenient pump and equipment removal. Location of crane, hoist,

and hatches, and arrangement of piping, pumps and equipment shall be such to facilitate ease of removal and installation of equipment. Station shall be designed so that pumps can be removed without entry into the Wet well under normal conditions.

4.0 Process Piping and Valves

Wet wells will be equipped with a minimum two (2) submersible sewage pumps (1 duty & 1 standby) equipped with variable frequency drives or soft-starts, depending on motor size, and complete with discharge quick-connect elbows and guiderails to accommodate pump removal.

The discharge piping from each pump will extend vertically in the wet well above the grated safety (operations) platform from where it will transition horizontally (through the exterior wall of the wet well) and underground to the adjacent valves.

The wet well piping will include the following:

- swing-flex check valve on each pump discharge
- 50 mm combination air valve on each pump discharge

The pump discharge pipes will extend outside the wet well (underground) routed to an adjacent precast concrete (3.0m x 3.0m) valve chamber.

The valve chamber piping will include the following:

- plug valve (horizontal) on each pump discharge
- common discharge header (horizontal) pipe
- plug valve on common discharge header (upstream of bypass connection and flowmeter)
- magnetic flowmeter on common discharge header
- wye connection for bypass pumping, equipped with blind flange (upstream of flowmeter)
- plug valve on bypass piping and downstream of flow meter.

All discharge piping within the wet well and valve chamber will be minimum 316L Schedule 10S stainless steel.

Valves installed inside the wet well (check valves and combination air valves) will be accessible from the grated platform installed inside the wet well. Confined space entry will be required.

Manual operators (50 mm operating nuts) for the valves installed inside the valve chamber will be extended vertically to allow operation of these valves from the exterior of the valve chamber (through valve boxes cast into the top of the chamber).

Pressure gauges complete with diaphragm seals will be provided on the individual pump discharges and the discharge header (inside the valve chamber).

5.0 Pumps

Wet wells will be equipped with a minimum two (2) submersible sewage pumps (1 duty & 1 standby) equipped with variable frequency drives or soft-starts, depending on motor size, and complete with discharge quick-connect elbows and guiderails to accommodate pump removal.

Firm capacity shall be maintained by one pump and shall be of the same size. When multiple pumps are used, firm capacity shall be maintained by the remaining pumps when the largest pump is out of service. The capacity of the largest pump will be equal to the required firm capacity. All pumps must undergo a hydrostatic and operating test performed by the manufacturer prior to installation. Pumping stations equipped with chopper pumps or inline grinders and screens shall match the model and manufacturer of equipment currently being installed in the Municipalities sanitary collection system.

Pumps handling raw wastewater shall be capable of passing spheres of at least 76mm diameter. Pump suction and discharge openings shall be at least 100mm in diameter. Pumps shall be positioned so that under normal operating conditions, they will operate under a positive suction head. When the pump is a suction-lift type, it shall be a self priming. Where possible pumps shall match the manufacturers and models of equipment already in use by the Municipality, in the case Flyght/xylem pumps shall be specified.

Submersible pumps and motors shall be designed specifically for raw wastewater use, including totally submerged operation during a portion of each pumping cycle and shall meet the requirements of the Ontario Hydro Electrical Safety Code and CSA for such units.

6.0 Heating and Ventilation and Odour Control

Adequate ventilation, as per O.H.S., Building Code and NFPA shall be provided for all pumping stations. Underground dry wells and wet wells with screens or mechanical equipment require the ability to provide mechanical ventilation.

Exhaust from the wet well. Interconnection between the wet well and dry well is not allowed and vents shall not open or be connected to any building ventilation system. Consideration for the installation of air scrubbers shall be made as directed by the Municipality.

For dry wells, over 4.6m deep, multiple air inlets and outlets should be used. Dampers, fine screens or other obstructions are not to be used on exhaust or fresh air ducts. Switches and controls to operate ventilation equipment shall be conveniently located and marked. All intermittently operated ventilation equipment shall be interconnected with the respective lighting system. Consideration should also be given to automatic controls where intermittent operation is used. The manual lighting and ventilation switch shall override the automatic controls.

The fan blades shall be fabricated from non-sparking material. Automatic heating and dehumidification equipment shall be designed for all dry wells. The electrical equipment and components shall meet the requirements for electrical equipment in Section 4.3.5. Wet well ventilation may be either continuous or intermittent.

Continuous or intermittent ventilation shall meet or exceed the number of complete air changes per hour as required by NFPA 820. Air shall be forced into the wet well by mechanical means rather than solely exhausted from the wet well. The air change requirements shall be based on 100 percent fresh air. When permanent ventilation equipment is not practical, portable ventilation equipment shall be designed for use at submersible pump stations and wet wells.

Dry well ventilation may be either continuous or intermittent. Continuous or intermittent ventilation shall meet or exceed the number of complete air changes per hour as required by NFPA 820. A two-speed ventilation system may be used to conserve heat. The air change requirements are based on 100 percent fresh air.

All Wet Wells shall have provisions for odour control.

7.0 Water Supply

Water supply shall be potable. Water supply shall be equipped with back-flow preventers to prevent contamination of the water system and all plumbing shall conform to the Ontario Building Code. Water supply shall be a minimum 25mm.

8.0 Access

Access shall consider the Municipalities Confined Space Entry procedures and policy. Provision shall be made to facilitate easy and efficient removal of pumps, motors, and other mechanical and electrical equipment. A suitable and safe means of access for persons wearing self-contained breathing apparatus shall be provided to wet and dry wells and valve chambers.

Provide davit base anchors where required for DBI Sala standard equipment that complies with Municipalities confined space standards.

Equipment such as access hatches, ladders, service platforms, guards, grates and handrails, shall be constructed of a suitable material when exposed to wet/and or corrosive conditions.

9.0 Submersible Pump Stations

Submersible pumping stations shall be designed so that pumps are readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. Location of crane, hoist, and hatches, and arrangement of piping, pumps and equipment shall be such to facilitate ease of removal and installation of equipment.

Electrical supply, control, and alarm circuits shall be designed to provide strain relief and to allow disconnection from outside the wet well. Terminals and connectors shall be outside the wet well. Controls shall be designed in accordance with Municipal SCADA Standards and current control panel designs.

The motor control center shall be located outside the wet well, be readily accessible, and be protected by a conduit seal or other appropriate measures meeting the requirements of the Ontario Hydro Electrical Safety Code, to prevent the atmosphere of the wet well from gaining access to the control center. The seal shall be so located that the motor may be removed and electrically disconnected without disturbing the seal. Pump motor power cords shall be designed for flexibility and serviceability under conditions of extra hard usage. They shall meet the requirements of the Ontario Hydro

Electrical Safety Code standards for flexible cords in wastewater pump stations. Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cable. Power cord terminal-fittings shall be corrosion resistant and constructed in a manner to prevent the entry of moisture into the cable. They shall also be provided with strain relief appurtenances and be designed to facilitate field connecting.

Valves required shall be located in a separate valve chamber, unless otherwise approved by the Municipality. Provisions shall be made to remove or drain accumulated water from the valve chamber. The valve chamber may be dewatered to the wet well through a drain line with a gas and watertight valve. Check valves that are integral to the pump need not be located in a separate valve chamber if the valve can be removed from the wet well in a convenient and efficient manner. Separate valve chambers shall be insulated and heated to prevent freezing.

10.0 Alarm and Monitoring Systems

Pumping station alarms and equipment shall conform with the Municipalities current SCADA System. Integration into the SCADA system is to be completed by Municipality approved forces, this includes PLC programming and operator interfaces. Alarm systems shall be consistent with all other Municipal Plants and Pumping Stations.

11.0 Emergency Operations

The objective of emergency operation is to prevent the discharge of raw or partially treated wastewater to any waters and to protect public health by preventing back up of wastewater and subsequent discharge to basements, streets, and other public and private property. Pumping stations shall be designed to provide temporary pumping around the station and enable isolation of the forcemain and pumping station, by means of isolation valves inside and outside the pumping station. All stations shall be equipped with a bypass pipe down stream of flow meter for by pass pumping.

12.0 Emergency Power

Emergency power is required for all pumping stations. There shall be sufficient capacity of emergency power to start up and maintain the total confirmed pumping station capacity of the station, the SCADA system and all other electrical equipment for 24 hours, unless otherwise approved by the Municipality. All pumping stations shall be equipped with an onsite generator. A genset plug compatible with Municipalities existing generators may be installed as directed by the Municipality. Generators shall be

capable of running full station load powered by natural gas or diesel as directed by the Municipality. The design of generators shall meet all applicable regulations.

13.0 Instructions and Equipment

Wastewater pumping stations and portable equipment shall be supplied with a minimum of 3 complete sets of operational instructions, including emergency procedures, maintenance schedules, and such tools and spare parts as may be necessary. The consultant will ensure that this documentation will be provided along with the necessary training for operation and maintenance of the equipment prior to commissioning.

14.0 Forcemains.

At design pumping rates, a desired cleansing velocity of at least 0.90 m/s) shall be maintained. The minimum force main diameter for raw wastewater shall not be less than100 mm.

An air relief valve shall be at high points in the force main to prevent air locking. Vacuum relief valves may be necessary to relieve negative pressures on forcemains. The forcemain configuration and head conditions should be evaluated as to the need for and placement of vacuum/air relief valves. Fittings and isolation valves shall be stainless steel.

Forcemain design shall include transient analysis and consider the provision of water hammer relief. Forcemains should enter the gravity sewer system at a point not more than 200 mm above the flow line of the receiving maintenance hole.

Pipe and joints shall be equal to water main strength materials suitable for design conditions. The force main, reaction blocking, and station piping shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater lift stations. The need for surge protection chambers shall be evaluated. Forcemain pipe materials shall be approved by the Municipality

Force main construction near streams or water works structures and at water main crossings shall meet applicable requirements. Friction losses through forcemains shall be based on the Hazen and Williams’s formula or other acceptable methods. When the Hazen and Williams formula is used, the following value for "C" shall be used regardless of pipe material:

Pipe Diameter C-Factor
100-150mm 100
200-250mm 110
300-600mm 120
Over 600mm 130

When initially installed, force mains may have a significantly higher "C" factor.
The force main shall be appropriately identified when they are constructed of material that may cause the force main to be confused with potable water mains.
Force main shall be tested to ensure there is no leakage.

15.0 SAFETY

The design of the pumping station shall give due regard to safety for the protection of maintenance personnel and visitors from hazards:

- Enclose the station site with 1.8m chain link fence, lockable gates, designed to discourage entry by unauthorized persons and animals; provide safety, unauthorized entry and municipal address signage, as per Municipal standards;
- Handrails and guards are to be installed around tanks, trenches, pits, stairwells, and other hazardous areas;
- Gratings are to be installed over areas where access for maintenance is required;
- Confined space entry shall comply with the Pollution Control Operation and OHSA regulations. Facility design and layout shall have due regard to make confined space entry user friendly, optimizing sight and retrieval lines;
- Gas detection and monitoring equipment where required. Where gas alarms are
- provided, install an indicator light outside the building so that the operator can check gas levels before entering the building
- Portable ventilation and blower equipment, intrinsically safe, with sufficient hose, where required;
- Portable lighting equipment intrinsically safe, where required;
- Appropriately placed warning signs for slippery areas, low head clearance, open service maintenance holes, hazardous material storage areas, flammable fuel storage areas, etc.;
- Adequate ventilation in pumping chambers;
- Provisions for lockout and tag-out of mechanical and electrical equipment;
- Eyewash fountains and safety showers were required;
- Fire extinguishers and emergency lighting.