# MUNICIPAL ENGINEERING STANDARDS

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APPENDIX 1 – LANDSCAPING STANDARDS

APPENDIX 2 – ROADS STANDARDS

APPENDIX 3 – WATER SYSTEM STANDARDS

APPENDIX 4 – SEWER SYSTEM STANDARDS

# 1. GENERAL

## 1.1 GENERAL

The following sections outline the Town of Niagara-on-the-Lakes' requirements for all engineering submissions forwarded to the Town for approval of municipal servicing for all developments within the areas of its jurisdiction.

The Town of Niagara-on-the-Lake reserves the right to alter any of these requirements within the text of each Subdivider's Agreement.

## 1.2 GENERAL REQUIREMENTS

All developments shall include the following, unless otherwise stated:

1) Staging of serving (phases);
2) Storm and Sanitary sewers and services;
3) Watermains, hydrants and water services;
4) Stormwater Management Facilities;
5) Underground utilities (hydro, telephone, gas, cable T.V., etc.);
6) Roads;
7) Sidewalks;
8) Curbs and gutter;
9) Driveway aprons;
10) Grading to ensure adequate surface drainage;
11) Street name and regulatory signs;
12) Streetlighting;
13) Tree planting;
14) Sodding of boulevards and all residential lots;
15) Landscaping;
16) Fencing (including noise barriers).

## 1.3 ENGAGEMENT OF PROFESSIONAL ENGINEER

The development applicant shall retain for any and all development projects, a Professional Engineer licensed to practice in the Province of Ontario and with Consulting Designation, who is experienced in the design and execution of land development projects. The consultant and developer shall submit to the Town the engineering firm's name and contact personnel who will be responsible for the project.

# 2. ENGINEERING SUBMISSION REQUIREMENTS

## 2.1 GENERAL

The Town of Niagara-on-the-Lake requires a complete submission of Engineering Drawings and Specifications to be provided by the Developer's Consulting Engineer to the Town's Public Works Department for their technical review and comment.

A complete submission constitutes the following items:

- A letter of transmittal;
- Engineering Design Brief;
- Engineering Drawings and Working Days (digital format);
- Construction Cost Estimate;

## 2.2 LETTER OF TRANSMITTAL

A letter can be a standard form or a formal letter indicating the submission date and number, contents of submission package, and the name of the appropriate contact personnel.

## 2.3 ENGINEERING DESIGN BRIEF

The engineering design brief is a technical report summarizing the intent of the project, and outlines the design assumptions, calculations, supporting documentation and references to previous studies, for each component of the development.

The design brief shall also address all conditions of the draft plan approval including the co-ordination of all approvals from various agencies.

## 2.4 ENGINEERING DRAWINGS

### 2.4.1. GENERAL – ENGINEERING DRAWINGS

- Drawing size shall be 596mm x 841mm;
- Plan and Profiles,
    - Horizontal metric scale shall be 1:500
    - Vertical metric scale shall be 1:50;
    - Plan and profile drawings
        - Plan and profile drawings must be drawn for all streets within the subdivision as well as for any existing streets upon which the subdivision may front on and for any easements on which services are constructed.

- Plan and Profile drawings shall be drawn at the horizontal scale of 1:500 and at a vertical scale of 1:50, and shall show the following:
  - Construction details and sediment control plan (as required).
  - Streetlighting Plan (to scale of 1:1000)
- Electronic files should be AutoCAD Format

## 2.5 COST ESTIMATE AND PROPOSED CONSTRUCTION SCHEDULE

An itemized cost estimate for the construction of all works is required along with a breakdown of any items designated to be cost-shared. Cost Estimate must be broken down into primary, secondary and tertiary services as identified in the development agreement.

A proposed construction schedule for all construction activities is to be provided to the Town's Public Works Department. During the progress of the work, any revisions to the original schedule shall be forwarded to the Town.

## 2.6 CONTRACT DOCUMENTS

Upon final Engineering submission for approval for the Engineering Drawings and prior **to tendering,** one (1) copy of the Contract Documents for the project are required to be provided to the Town of Niagara-on-the-Lake Public Works Department for its review.

Prior to commencement of construction of services, one (1) copy of the Contract Documents, with signatures and prices, plus one (1) set of complete contract drawings are required to be provided to the Town's Public Works Department. The Contract Documents shall include all addenda and the Form of Tender, the required liability insurance as set out in the Niagara Peninsula Contract Documents with the **Town of Niagara-on-the-Lake** and Design Engineer as additional insured, performance bond, labour and material payment bond and Worker's Compensation Board Clearance.

## 2.7 CONSTRUCTION RECORDS DRAWINGS AND LOCATION PLANS FOR SERVICES

### 2.7.1. CONSTRUCTION RECORDS SERVICE LOCATION PLANS

Upon preliminary acceptance of services, the required location plans for as constructed measurements are to be completed on the Town of Niagara-on-the-Lake Standard Service Location Cards and submitted to the Town's Public Works Department showing all necessary details for underground service installations. (See Appendix 3)

### 2.7.2. SANITARY SEWER

Location of service tie connections at the main line sewer are to be dimensioned along the mainline sewer from each maintenance hole;

Location of services at streetline are to be dimensioned from the lot corners and the elevation of the service invert at streetline is to be recorded.

### 2.7.3. STORM SERVICE AND CATCHBASIN LEADS

Location of service and catchbasin lead tie connections at the mainline are to be dimensioned along the mainline sewer from each maintenance hole;

Location of services at streetline are to be dimensioned from the lot corners and the elevation of the service invert at the streetline is to be recorded;

Catchbasin locations are to be dimensioned as a distance along the storm sewer from the nearest maintenance hole and the elevation of the catchbasin rim and lead invert recorded.

### 2.7.4. WATERMAIN VALVES, TEES AND APPURTENANCES AND WATER SERVICES

Location of watermain valve box, valve chambers and fire hydrants are to be dimensioned up or down the road with an offset distance from the centerline of the road or back of curb;

Water service main stops are to be dimensioned along the alignment of the water main from the nearest valve and curb stops and boxes are to be dimensioned from lot corners.

Where watermains are not within the road allowance or near sewers ties to property corners shall be used.

### 2.7.5. CONSTRUCTION RECORDS DRAWINGS

“Construction Records” Drawings constitute the original Engineering Drawings which have been replotted to show “Construction Records” conditions. The “Construction Records” drawing, mylars and a copy of the AutoCAD drawing files (or DXF Format of AutoCAD file unavailable) on a CD shall be submitted to the Town for our permanent records;

Service cards as per Town Standard card attached in Appendix 3 are to be completed by the consultant and submitted with the Construction record drawings.

As stated, final measurement location plans are to be completed and submitted at time of preliminary acceptance of services. “Construction Records” drawings are to be submitted to the Town’s Public Works Department, no later than six (6) months after preliminary servicing is complete.

# 3. ROADS

## 3.1 GENERAL

Road classification is designated by the Town of Niagara-on-the-Lake's Transportation Master Plan Study and shall be subject to the approval of the Town Engineer.

A map is attached in Appendix 2.

## 3.2 GEOMETRIC DESIGN STANDARDS

| | Urban Local | Rural Local | Collector |
|---|---|---|---|
| Minimum Grade | 0.5% | 0.5% | 0.5% |
| Maximum Grade | 8.0% | 8.0% | 8.0% |
| Maximum Grade for Through Roads at Intersections | 3.5% | 3.5% | 3.0% |
| Maximum Grade for Stop Roads at Intersections | 2.5% | 2.5% | 2.0% at Local<br>1.5% at Collector |
| Minimum Curb Radius at Intersection with Arterial or Collector Road | 9m | 9m | 13m |
| Minimum Curb Grade | 0.50% | N/A | 0.50% |
| | **Urban Local** | **Rural Local** | **Collector Road** |
| Minimum Curb Grade at Radius of Intersections | 0.8% | N/A | 0.8% |
| Cul-de-Sac Minimum Edge of Pavement Radius | 13m – without island<br>14.5m – with island | 13m – without island<br>14.5m – with island | N/A |
| R.OW. (minimum) | **See Appendix 2 – Roads** | | |
| Pavement Width<br>(traveled width) | **See Appendix 2 – Roads – Urban Street Design Policy PW-RDS009A** | | |
| Minimum Centreline Radius | 60m *** | 60m *** | 85m |
| Design Speed | N/A | N/A | 50kph to 60 kph |

| | Urban Local | Rural Local | Collector |
|---|---|---|---|
| Minimum Grade | 0.5% | 0.5% | 0.5% |
| Maximum Grade | 8.0% | 8.0% | 8.0% |
| Maximum Grade for Through Roads at Intersections | 3.5% | 3.5% | 3.0% |
| Maximum Grade for Stop Roads at Intersections | 2.5% | 2.5% | 2.0% at Local<br>1.5% at Collector |
| Minimum Curb Radius at Intersection with Arterial or Collector Road | 9m | 9m | 13m |
| Minimum Curb Grade | 0.50% | N/A | 0.50% |
| | **Urban Local** | **Rural Local** | **Collector Road** |
| Minimum Curb Grade at Radius of Intersections | 0.8% | N/A | 0.8% |
| Cul-de-Sac Minimum Edge of Pavement Radius | 13m – without island<br>14.5m – with island | 13m – without island<br>14.5m – with island | N/A |
| Vertical Curve<br>• Minimum Sight Stopping Distance<br>• LVC = KA (MTC manual)<br>• K. for Sag<br>• K for Crest | • 65 m<br>• 12<br>• 8 | • 65 m<br>• 12<br>• 8 | • 85 m<br>• 20<br>• 15 |
| Intersection Angle | 70-110 degrees at local,<br>80-100 degrees at collector & arterial | 70-110 degrees at local,<br>80-100 degrees at collector & arterial | 80-100 degrees<br>**(All streets are to intersect at 90 degrees unless existing road alignments or property restrictions** |

| | Urban Local | Rural Local | Collector |
|---|---|---|---|
| Minimum Grade | 0.5% | 0.5% | 0.5% |
| Maximum Grade | 8.0% | 8.0% | 8.0% |
| Maximum Grade for Through Roads at Intersections | 3.5% | 3.5% | 3.0% |
| Maximum Grade for Stop Roads at Intersections | 2.5% | 2.5% | 2.0% at Local<br>1.5% at Collector |
| Minimum Curb Radius at Intersection with Arterial or Collector Road | 9m | 9m | 13m |
| Minimum Curb Grade | 0.50% | N/A | 0.50% |
| | **Urban Local** | **Rural Local** | **Collector Road** |
| Minimum Curb Grade at Radius of Intersections | 0.8% | N/A | 0.8% |
| Cul-de-Sac Minimum Edge of Pavement Radius | 13m – without island<br>14.5m – with island | 13m – without island<br>14.5m – with island | N/A |
| | | | **require otherwise.)** |

* Town may request 23.0m R.O.W.

** Measured curb face to curb face or (shoulder to shoulder)

*** Except at 90-degree corners for crescents and courts.

### 3.3 ALIGNMENT

Horizontal and vertical alignment is to conform to the requirements as outlined above in the Geometric Design and Ontario Provincial Standard Drawings.

All curves must meet the geometric design standards

Vertical curves are required for changes in grade greater than 1.0% for collector and 1.5% for locals.

The minimum length of each grade is 6.0m. “Cul-de-sac” are to have a minimum grade of 0.5% around the longest curb, to ensure adequate surface drainage.

## 3.4 ROAD PAVEMENT DESIGN

The pavement design for arterial roads will be considered on an individual basis. The composition and construction thickness of the road pavement shall be design based upon the following factors as outlined in the geotechnical soils report.

- Mechanical analysis of the subgrade soil;
- Drainage;
- Frost susceptibility;
- The future volume, speed and class of traffic expected to use the pavement.

Local Urban and rural pavement designs shall be as per Town standard drawings attached in Appendix 2.

Pavement shall be designed for an anticipated life of 25 years. As a minimum standard, local **urban** roads shall have 450mm granular "A" plus 50mm H.L.8 HS and 40 mm H.L.3 HS asphalt. local **rural** roads shall have 450mm granular 'A' plus 50mm H.L.8 HS and 40 mm H.L.3 HS asphalt.

## 3.5 ROAD ALLOWANCE CROSS SECTION

The typical road allowance cross-section shall be as per Town standard location drawings Typical Urban Residential and Typical Road Allowance with Ditches. (Rural). Details shall be provided for any approved special provisions required due to unique physical conditions on the site or for existing of future design conditions such as retaining walls, slope protection, culverts, bridges or special crossfall conditions. The Town's standard cross sections are attached in Appendix 2.

## 3.6 INTERSECTIONS

At the intersection of two roads, any transition of the minor classification road shall not interfere with the normal crossfall of the major road. A 1.0% to 2.0% backfall grade shall be provided on all road profiles where local streets intercept with arterial roads. The backfall grade shall be from the crown of the major road to the end of curb (E.C.) of first catchbasin on the local road. Where possible intersections shall be utilized as the high point of the roadway.

## 3.7 ROAD SUB-DRAINS

In general, sub-drains will be required to run continuous along both sides of all roads. However, the Town will consider reducing sub-drain requirements for a particular development where a recognized soils consultant indicates that there will be no adverse effects to the road either during or after construction.

In all cases, sub-drains will be required for a minimum length of 6.0m on the upstream side of all catchbasins.

## 3.8 CURBS

**Barrier** curb as shown in O.P.S.D. 600.040 shall generally be used on local urban streets, saw cutting of curb depressions will be allowed. “Capping” of curb depression will not be permitted.

**Barrier- Two Stage** curb as shown in O.P.S.D. 600.070 shall generally be used on local urban streets, saw cutting of curb depressions will be allowed. “Capping” of curb depression will not be permitted.

**Semi-mountable** curb as shown in O.P.S.D 600.060 shall generally be used on local urban cul-de-sacs.

## 3.9 SIDEWALKS

Concrete sidewalks as per Town Standard Urban Cross Section drawing and locations are to be constructed to the following standards in accordance with OPSS 351.

- 1.50 metres minimum width (residential)
- Minimum depth of 150mm crushed stone base;
- Concrete sidewalk to be 100mm thick across boulevards, 150mm thick across residential driveways and adjacent to curbs, and 200mm thick across commercial and institutional driveways.

Concrete sidewalks are required:

- Along both sides of collector and arterial streets;
- Along only one (1) side of local urban streets
- Along the inside of crescents;
- On one (1) side of cul-de-sacs if:
- On one (1) side up to the built section of cul-de-sacs. The terminus of the sidewalk shall not conflict with driveways and services and the exact location shall be determined by the Town prior to construction.

Concrete sidewalks are not required in the “Bulb” section of the cul-de-sac or along the longer side of crescents, unless otherwise specified by the Town to minimize pedestrians crossing streets to get from one sidewalk to another.

## 3.10 BOULEVARD & REQUIREMENTS FOR LANDS TO BE CONVEYED TO THE TOWN

The boulevard area shall be excavated to a depth of 300mm and backfilled with 200mm clean fill material, free of stone, concrete, rocks and other extraneous material and compacted. The boulevard area shall then be filled with 100mm topsoil, compacted and sodded in accordance with Town requirements. Further to the above, the Developer/Owner is responsible to provide boulevard trees in accordance with the developer's agreement prior to sodding.

The owner will be responsible to ensure that all lands which will be transferred to the Town for parkland, drainage or boulevard purposes shall be developed in conformity with the following:

- Prepare a tree plan; (acceptable tree list and landscape guidelines are attached in Appendix 1 in accordance with the Town's Parks and Recreation Department)
- Protect existing trees as directed on site by the Town prior to commencing grading;
- Clear site of all rubbish, rocks, boulders, tree stumps and other useless materials and debris, remove from site;
- Cut all dead trees and remove stumps and roots to a minimum depth of 600mm below proposed finished grade;
- All areas designated for paving or excavation (i.e. Drainage courses, waterways) shall be stripped of all topsoil and organic matter to its full depth taking care not to contaminate with any sub-soil;
- All stripped topsoil shall be stockpiled for use in open space lands as required;
- Topsoil shall be re-used for landscape work;
- Commence topsoil stripping only after areas have been cleared;

### 3.10.1. GRADING

- After stripping of topsoil, do all necessary rough grading, excavating and filling, where required, to establish the sub-grade in conformity with the approved grading plans;
- Establish and maintain sub-grade parallel to finished grade and shape to allow adequate surface run-off and prevent ponding, scouring and erosion;
- Provide for uniform slopes between points for which finished grades are shown on drawings. Meet and blend with existing grades in a smooth manner;

- Establish smoothly rounded grades at top and toe of slopes and banks;
- Do not grade when soil is wet or frozen;
- Fill material shall be clean, free of topsoil and organic matter and debris before placing. On site excavated material may be used for filling.
- All topsoil shall be fertile, friable natural loam containing 4% minimum organic matter for clay loams and 2% minimum organic matter for sandy loams with an acidity range of 6-7.6 PH and shall be capable of sustaining vigorous plant growth. It shall be free of any admixture of sub-soil, clay lumps, stones and roots over 25mm diameter and other extraneous matter and shall be reasonably free of weeds and weed seeds.

### 3.10.2. TOPSOIL SPREADING / FINE GRADING

- Spread topsoil on prepared sub-grade at a minimum depth of 100mm over all areas to be seeded or sodded (compacted depth);
- Fine grade topsoil to produce a smooth, even surface free from debris, sod, stones and roots over 25mm diameter;
- Meet and match all existing turf areas, curbs, maintenance holes, catchbasin frames etc. in a smooth uniform line to the satisfaction of the Town.

### 3.10.3. SEEDING (Hydro-Seeding)

Seeding is to be generally used only in rural areas or as directed by the Town – manicured lawns must be sodded.

- Fertilizer: complete commercial fertilizer, minimum of 50% of elements derived for organic sources;
- Seed area during early spring or between August and September or weather permitting
- Apply seeding when winds less than 10km/h using equipment suitable for are involved;
- Measure seeding quantities by square metre
- Charge seeder with water, mulch, seed fertilizer and mix thoroughly. Add material into seeder under agitation. Pulverize and add material slowly into seeder and mix thoroughly to complete seeding slurry.
- Add erosion control agent into seeder for steep slopes and mix thoroughly to complete seeding slurry.

### 3.10.4. SODDING

- Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.
- Do not lay small, irregular or broken pieces of sod
- During dry weather, protect sod from drying and water sod, as necessary, to ensure its vitality and prevent dropping of soil in handling. Sod which dries out will be rejected.
- Sod shall be turf grass nursery sod, specially sown and cultivated in nursery field all in compliance with the specifications in the latest issue of the Nursery Sod Growers Association of Ontario for (A) Number One Kentucky Bluegrass – Fescue Sod.
- Lay sod during growing season. Sodding at freezing temperatures or on frozen ground is not acceptable.
- Sodding during dry weather is acceptable only if sufficient and continuous watering is assured.
- Where slippage of sod is likely to occur because of the degree of slope, pegging is required and shall be at no extra cost to the Owner. When sod is established, drive pegs flush with sod.
- Lay sod even with adjoining areas. The rows shall have staggered joints. Butt section closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections.
- Provide close contact between sod and soil by means of light roller. Heavy rolling to correct irregularities in grade is not permitted.
- Water immediately after laying to obtain moisture penetration through sod into top 150mm of topsoil.
- Provide adequate protection of sodded areas against erosion and other damage. Remove this protection after sod has become established and if approved by Town.

### 3.10.5. GENERAL

- Keep site well drained.
- Clean up immediately soil, mulch or other debris spilled onto pavement.
- Take reasonable care to prevent overspray of seeding slurry to structures, signs, guide rails, fences and utilities.

- Maintain seeded and sodded areas for a period of 60 days of growing season after installation. Maintenance includes, but is not limited to, weeding, fertilizing, cutting at least once and watering as required.

- Apply water in sufficient quantities to prevent grass and underlying soil from drying out. The Developer is responsible for supplying water to the site.

- Maintain grassed areas free of pests and disease by non-chemical means.

- Re-seed areas which show root growth failure, deterioration, bare or thin spots or which have been damaged by any means, including replacement operations.

- Warranty – all hydro-seeded and sodded areas shall be guaranteed for a period of one (1) year from the date of acceptance by the Town.

## 3.11 DRIVEWAY ENTRANCES

The Subdivider shall be required to provide for the excavation, stoning and maintenance of each driveway from the traveled portion of the road to the lot line. All driveways are to be hard-surfaced from curb/edge of pavement to municipal sidewalk or equivalent distance in toward property line.

Residential driveways shall be constructed as per OPSD 351.010. The width of curb cut for apartment, commercial and institutional driveways shall take into account the basic width of the driveway and the radius of curvature as further outlined below. Where mutual driveways are constructed between two adjoining properties, the curb cut-out shall be continuous. (i.e. where the barrier curb is less than 1 metre between driveways). All driveway entrances will be in accordance with Town By-Law No. 1873-87.

Standard curb cut widths are as follows:

- Residential driveways – 6 m

- Commercial / Industrial driveways will be subject to review

The radius of curvature from the road into apartment, commercial and institutional driveways shall be designed to accommodate the anticipated vehicular traffic without causing undue interference with the traffic flow on the street [(TAC) Traffic Turning Templates)]. As a minimum requirement, refer to OPSD 350.01

### 3.11.1. ASPHALT DRIVEWAY STANDARDS

The following minimum standards apply to driveway entrances:

- OPSS 311 and 1150 applies to this item

- **Residential** – 75mm H.L.3F and 300mm Granular ‘A’ base
- **Commercial** – 50mm H.L.8 MDBC and 40mm H.L.3 and 300mm Granular ‘A’ base
- **Industrial** – 50mm H.L.8 MDBC and 40mm H.L.3 and 375mm Granular ‘A’ base
- Note: The Municipality assumes no responsibility for any driveway entrance.

## 3.12 DAYLIGHTING

When subdivision streets intersect at any internal or external street intersection, the Engineer may request land for daylighting triangles. The size of the daylighting required is based on the classification of the intersecting roads. The Town may request additional daylighting above these requirements, if deemed necessary by the Town, notwithstanding Regional Government requirements.

## 3.13 FOOTPATHS AND WALKWAYS

All walkways shall be a minimum of 3.0 metres in width unless otherwise noted. They shall be excavated to a minimum depth of 400mm. The excavation is to be backfilled with a minimum 300mm compacted Granular ‘A’ limestone plus 50mm H.L.8 and 25mm H.L.3A or H.L.2 asphalt. On either side of the walkway, the developer/owner shall construct a 1.5-metre-high chain link fence consisting of industrial type posts, No. 9 gauge wire, except such fence shall be 0.9 metres high in any required front yard. The said fencing shall have a 1-11/16” outside diameter (O.P.) top rail and single strand bottom tension wire 14.0 gauge fastened 450mm on centre. (if required by the Town)

## 3.14 EMERGENCY ACCESSESS

All subdivisions shall have adequate emergency access and comply with the following items:

- All subdivisions shall have adequate emergency access routes with direct access from public thoroughfares while also ensuring accessibility to all buildings.
- Access routes shall be at minimum of 6m wide with a centre line turning radius no less than 12m.
- All access routes shall maintain an overhead clearance of 5m.
- Unless not reasonably possible due to the topography of the land, maximum gradient changes of access routes within subdivisions shall be no more than 1:12.5 over 15m.
- All access route surfaces must be able to support loads imposed by firefighting equipment.
- Subdivisions shall be provided with a minimum of two access routes in and out. One of the required access routes may be in the form of a restricted or “closed to the public” access.

- Any restricted access routes may be restricted by the use of bollards spaced 6m part with a locked chain that can be cut by fire staff in the event of an emergency.
- Any access routes that may contain a dead end longer then 90m shall have proper turnaround facilities installed.
- Deviance from any of the above requirements shall be at the discretion of the fire chief.

## 3.15 EASEMENTS

The minimum easement width for municipal works shall be the greater of:

- Two (2) times the depth where the depth is from the proposed final grade to the invert rounded up to the nearest half metre.
- The maximum easement width is 15m
- For utilities, any easement will be per the utility's requirements.

## 3.16 STREET NAME AND TRAFFIC SIGN REQUIREMENTS

The owner shall provide the Town with a sign plan and schedule and pay the cost of the supply and installation of permanent street name and traffic signs (installation completed by Town Forces). Sufficient traffic control signs, as determined by the Town, shall be installed to ensure the safe and efficient flow of traffic.

## 3.17 UTILITY INSTALLATION

All utilities must be placed within the municipal right-of-way in a standard location as per Town specifications or within an easement provided by the owner for that purpose.

Location and installation details for utilities must be approved by the Town prior to installation or in accordance with the following standards. (Attached in Appendix 2 for Standard Drawings)

All utility trenches within the road allowance are to be backfilled and compacted to 95% S.P.D. Backfill material shall be in accordance with the requirements of the Town and utility authority.

The Developer's Design Consultant is responsible to ensure that there is no conflict of plants and appurtenances with other utilities, driveways, tree planting pits etc.

## 3.18 ELECTRICAL DISTRIBUTION

Design and installation of the electrical distribution system for the proposed development is to meet the requirements of the Niagara-on-the-Lake Hydro Inc. (Contact Niagara-on-the-Lake Hydro for required design information.) Underground street wiring and wiring to the lots and houses are mandatory. In circumstances where underground wiring is not practical, an alternative may be agreed upon. The Subdivider shall supply and enter into a separate agreement with Niagara-on-the-Lake Hydro with easements wherever they are required.

- Pad-mounted transformers shall not be located on the outside of curves.
- The Developer's Consultant is responsible to ensure that there is no conflict of appurtenances with other utilities, driveways, tree planting pits etc.
- Work will conform to the latest rules, regulations and definitions of the Canadian Electrical Safety Code and applicable Municipal and Provincial Codes and Regulations. Standards established by drawings and specifications will not be reduced by applicable codes and regulations.
- All drawings shall be filed with the proper authorities and obtain their approval of the installation and appropriate permits before proceeding with said work. This will include the submission of detailed drawings as required.
- Upon the completion of the project the Town shall be supplied with the following:

a) Copy of the Certificate of Inspection as supplied by the Electrical Safety Authority.

b) Completed As-Built Drawing

c) Certificate of the As-Built Performance Criteria

# 4. STREETLIGHTING

## 4.1 GENERAL

The Subdivider shall arrange for the design and installation of all lighting facilities, including lamp standards, conduits, lamps and control mechanisms in accordance with current Illuminating Engineering Society (IES), Transportation Association of Canada (TAC), Town of Niagara-on-the-Lake and Niagara-on-the-Lake Hydro standards. The type, number of lights, and their location together with the estimated cost of the total installation thereof, must be approved by Niagara-on- the-Lake Hydro and the Town of Niagara-on-the-Lake. The Subdivider shall supply the Town and/or the local electrical supply authority with easements wherever they are required.

Streetlights shall be placed on the same side of the street as sidewalks are present and poles generally will not be placed on the outside of curves where avoidable. Similarly, at least two lights will be placed at all street intersections one on each intersecting street.

## 4.2 WALKWAY LIGHTING

The Consultant must complete a photometric analysis for all proposed walkway arrangements to compare with the Town's Standards, Policies and Guidelines.

### 4.2.1 POLES

- All walkway poles shall be direct buried with pre-stressed coloured concrete, polished or etched finish. The same parameters apply for bollard style walkway poles. Acceptable poles are shown in Table 1 – Fixture and Poles.

- All poles will include a cast metal tamper proof hand hole cover and a ground wire cast into concrete.

- Pole colour shall be specified and coordinated with the color of the fixture. Typically, a grey or black pole is acceptable.

- The wire within the pole will be RWU copper only.

### 4.2.2 FIXTURES

- All walkway fixtures will be IES Type II or Type III full cut-off distribution pattern. The fixture colour to be coordinated with the pole. Typically, a black fixture is acceptable.

- Walkway Poles shall be spaced no more than 30 metres (center to center), subject to review by the Lighting Consultant and/or approval from the Town of Niagara-on-the-Lake representative.

Fixtures will consist of the following;

- 120-270V Standard
- IP66, Wet Listed
- UL, cUL and CSA Certified
- All specified fixtures will be equipped with an integral button type photo control.

## 4.3 DESIGN APPROVAL PROCESS

- The consultant is responsible for determining the appropriate lighting levels, along with spacing requirements to achieve the levels set out in the IESNA recommended practices. When Town standard drawings and cross-sections are utilized, the Consultant will be responsible to complete a photometric analysis to determine the spacing which meets the Town requirements. This information shall be included in the Detailed Design Drawings submission.
- The Consultant is responsible for ensuring that the design is in complete accordance with the Town's Standards, Specifications, Policies and Guidelines.
- All street light designs drawings shall be submitted to the Town for review as a complete package.
- The Consultant is responsible for ensuring that the street light design is accurately shown on the Hydro Distribution Design Drawings and submitted to the Town of Niagara-on-the-Lake Hydro.
- If the Design deviates from the Town's Standards, Policies or Guidelines the Consultant is responsible for listing the exception with a detailed explanation as to why it is necessary. The Town will review the request and advise whether or not it is acceptable.

## 4.4 NIAGARA-ON-THE-LAKE REVIEW PROCESS

The Town will review all submitted Street lighting plans and will make comments as required. The comments from the Town do not preclude the Consultant and/or Engineers recommendation for the design. If the Town makes recommendations that compromise the integrity of the design, then it shall be taken upon the Engineer to advise the Town in writing of the conflicting recommendation.

The Consultant will be notified as soon as the Town deems the drawings to be acceptable and will provide approval in the form of a signature from the department head.

### 4.4.1 SHOP DRAWING APPROVAL PROCESS

The Consultant is responsible for reviewing and approving all manufacturers' street light assembly drawings to ensure they meet the Town's Standards, Policies and Guidelines.

The Consultant shall include the I.E.S file on the shop drawings for all fixtures.

### 4.4.2 PROFESSIONAL CERTIFICATION

All Street Lighting designs must be submitted by a Professional Engineer or Lighting Consultant licensed to practice professional Engineering in the Province of Ontario.

## 4.5 APPROVED STREETLIGHTING POLES AND FIXTURES

Approved Streetlight Poles and Fixtures for Urban Area's will refer to the Town's Policy regarding Decorative Street lighting PDS-PLG-009.

**Table 1 – Fixtures and Poles**

| Location | Style | Mounting | Poles |
|---|---|---|---|
| Area 1 | Traditional Square Lantern (Schedule C) | Pole, Single (Picton Street, Double) | Concrete, black Belmont style-Stresscrete |
| Area 2 | KA 56 King Luminaire (Schedule D) | Pole, single/bracket | Concrete, black Belmont style-Stresscrete |
| Area 3 | Lumec Optima, Excel 10 or King Luminaire K330 Versailles (Schedule E) | Pole, Single | Concrete, black Belmont style-Stresscrete |
| Area 4 | King Luminaire K206 Marine Pendant (Schedule F) | Pole, single/bracket | Concrete, black Belmont style-Stresscrete |
| Area 5 | Consistent with surrounding neighbourhood | Pole, Single | Concrete, black Belmont style-Stresscrete |
| Area 6 Queenston | Traditional Square Lantern (Schedule C) | Pole, Single | Concrete, black Belmont style-Stresscrete |
| Area 7 Virgil | Standard Colonial Lantern (Schedule G) | Pole, Single | Concrete, black Belmont style-Stresscrete |

| | | | |
|---|---|---|---|
| Area 8 St. David's West | KA 56 King Luminaire (Schedule D) | Pole, Single | Concrete, black Belmont style-Stresscrete |
| Area 9 St. David's East | Traditional Square Lantern (Schedule C) | Pole, Single | Concrete, black Belmont style-Stresscrete |
| Area 10 Glendale | Standard Colonial Lantern or similar (Schedule G) | Pole, Single | Concrete, black Belmont style-Stresscrete |
| Walkways and Trails | KLCS – T1AF King Lighted Bollard LED | Bollard, Single | Concrete, black or grey, Silhouette Style Stresscrete |

## 4.6 GENERAL SPECIFICATIONS

- All street lighting fixture installations will be Light Emitting Diode (LED). The street lighting system is designed to meet the average illumination level and minimum uniformity ratio for each classification of roadway or walkway.

- The Consultant shall refer to the I.E.S. RP8 for Lighting Guidelines and Illumination criteria.

- Street lights shall be placed a minimum of two (2) metres from all hydro transformers, fire hydrants and street trees. A minimum of one (1) metre clearance is required between streetlights and residential and commercial driveways.

- Where walkways intersect the Municipal Right of Way, the Town requires a street light either on the walkway or street side to be located within two (2) metres of the walkway entrance.

### 4.6.1 LAMP WATTAGES

The Consultant must specify the lamp wattages on the street light drawings which must meet the Town's required lighting levels and be considered Full-Cut Off fixtures without causing adverse glare.

### 4.6.2 FIXTURE VOLTAGES

If ballasts are installed, they must be dual voltage 120/270V. Residential subdivisions are to be wired for 120V usage and Industrial subdivisions will be wired for 270V usage.

## 4.7 MATERIAL SPECIFICATIONS

### 4.7.1 CANADIAN STANDARDS ASSOCIATION

The Town will only accept materials for street lighting that are CSA approved.

### 4.7.2 WARNING TAPE

Warning tape must be placed 300 mm below finished grade above all street light ducts, as per the Electrical Safety Association (ESA)

### 4.7.3 DUCTS

All street light ducts are to be installed with a 50 mm PVC Type DB2 underground duct. Along with a 50 mm Black Poly Pipe to protect the cable from entering the wiring aperture in the concrete pole.

### 4.7.4 PEDESTALS

- All street light pedestals to be steel with a lockable and weather proof enclosure. The enclosure to be finished in powder coat green.

- The interior panel is to include a 60-Amp 22k main breaker with four (4) 15-Amp breakers suitable for street lights. This will include the proper grounding to be in accordance with E.S.A. standards and specifications.

### 4.7.5 CABLES

All cables and wiring will be CSA approved and include weather proof connectors.

All connections will be covered with electrical grade tape or electrical grade jacket covers.

| From | To | Wire Type | Ground Wire |
|---|---|---|---|
| Transformer | Pedestal | 3-#2 Copper RWU-90 | N/A |
| Power Supply | Hand hole | 2-#6 Copper RWU-90 | 1#6 stranded copper green jacket ground wire |
| Hand hole | Fixture | 2-#12 Copper RWU-90 | 1#6 stranded copper green jacket ground wire |

### 4.7.6 PHOTO CONTROL

Each fixture is to be controlled by an individual photo control mounted in the fixtures twist lock photo control receptacle.

### 4.7.7 LAMPS AND FIXTURES

- The Town of Niagara-on-the-Lake reserves the right to change the type of fixtures as specified in the Town's Policies, Standards and Specifications. The fixture wattages shall be specified by the Consultant to conform to the standards set out by the Town of Niagara-on-the- Lake.

- All fixtures shall be LED and rated for a minimum of life span of 50,000 hours.

- In cases where the Town requires the street lighting fixtures to match the existing area as set out by the Town's Policy regarding Decorative Street lighting: PDS-PLG-009, the Consultant is responsible for specifying the fixture as it matches the areas set out in the policy.

- The Town requires one (1) fixture for inventory purposes for every ten (10) fixtures installed. If less than ten (10) fixtures is installed, the contractor will provide one (1) fixture only.

### 4.7.8 POLES

Refer to Table 1.1 in section 3.19.6. for the pole type as specified in the Town's Policy: PDS-PLG-009.

## 4.8 INSTALLATION SPECIFICATIONS

### 4.8.1 ELECTRICAL SAFETY ASSOCIATION (ESA)

It will be the sole responsibility of the contractor to obtain clearance from the Electrical Safety Association (ESA) prior to completing the final connection.

### 4.8.2 DUCTS

- All street light cables are to be installed in 50 mm PVC Type 2 Direct Buried Ducts (DB2) in the main trench from the power source to the street light location.

- All ducts are to be solvent welded together as a part of the installation procedure.

- Where street light conductors cross the road, the 50 mm duct is to be installed through the 100 mm road crossing duct in a continuous installation.

- All turn's and bends in the duct are to be sized sufficiently so as to facilitate the pulling of street light conductors.

### 4.8.3 TRENCH

- Trenches are to be a suitable depth as to provide a minimum cover of 750 mm over the direct buried street light duct.

- All street lighting ducts must have warning tape installed 300 mm below finished grade.

### 4.8.4 STREET LIGHT CABLES

- Cables will only be installed within ducts after the trench is backfilled.

- Street light cables cannot be spliced.

- All connections must be covered by electrical grade tape or electrical grade sleeves or jackets. In no circumstance can the wiring be exposed.

### 4.8.5 STREET LIGHT FUSING

All street light cables must be fused in the transformer and in the street light handhole.

### 4.8.6 GROUNDING

- Street light pedestals are to be grounded to the standards set out by the E.S.A. by utilizing a ground plate at the pedestal location.

- A continuous ground from the pedestal to each circuit shall be installed within the streetlight corridor. The last street light on each circuit from the pedestal shall be grounded with a ground plate.

- Refer to Niagara-on-the-Lake Hydro for specifications regarding the installation of a ground wire between the transformer and pedestal.

- Energizing of the Street Lighting System is subject to the approval of the ESA. After the approval and inspection process, Niagara-on-the-Lake Hydro will make all required connections at the supply point for the system on behalf of the Town.

# 5 SANITARY SEWERS

## 5.1 GENERAL

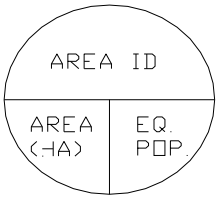
The design and construction of all sanitary sewers and service connections in the Town of Niagara-on-the-Lake shall be in accordance with the current and appropriate Ontario Provincial Standard Specifications and Standard Drawings, MOE guidelines and Regional Municipality of Niagara Public Works Department's "Guidelines for the Design and Construction of Sewer and Watermain Systems".

## 5.2 DESIGN FLOWS

Calculation of sewage design flows shall conform to the latest editions of the Regional Municipality of Niagara, Public Works Department's "Guidelines for the Design and Construction of Sewer and Watermain Systems", and the Ontario Ministry of the Environment's Guidelines for the Design of Water Storage Facilities, Water Distribution Systems, Sanitary Sewage Systems and Storm Sewers".

A plan of the drainage area shall be prepared and shall include all affected streets and lots. The proposed sanitary sewer system shall be shown on this plan including each maintenance hole numbered consecutively for design reference. Maintenance holes shall be located at each and every change of pipe size, grade and alignment but in any case, no greater than 120m apart. Inspection maintenance holes shall be provided at the property line for any commercial sanitary service laterals.

Each area on the drainage plan shall be labeled as follows:




The minimum pipe diameter is 200mm. Design calculations for the sanitary sewer system shall be completed and submitted for review. See Regional Standards for typical flow rates and infiltration allowances.

In lieu of precise information on development of the whole or any part of a watershed area, the latest approved Zoning By-law and Plans shall be used to select the correct values of the run-off coefficients and parameters to be used in the design and to determine the specific areas where they will apply.

## 5.3 SEWER COMPONENTS DESIGN STANDARDS

### 5.3.1 PIPE

The class, type of pipe and type of bedding shall be shown on the profile for each section of sewer and shall be CSA approved and in accordance with OPSS.

The use of radius pipe or deflected pipe will be permitted to achieve changes in horizontal alignment for sewer sizes 1050mm diameter and larger. The minimum radius allowed for various pipe diameters shall be as detailed in the manufacturer's specifications. When pipes are deflected at the joints, the angle of joint displacement shall not exceed 3 degrees.

In general, no decrease of pipe size from a larger size upstream to a smaller size downstream will be allowed regardless of increase in grade.

Pipe bedding and class of pipe shall be designed to suit ultimate loading conditions.

### 5.3.2 SEWER DESIGN

#### 5.3.2.1 SEWER CAPACITY

Sewer capacities shall be computed by using Manning's Formula on the basis of sewer pipe flowing full.

#### 5.3.2.2 ROUGHNESS COEFFICIENTS

For all types of pipe, a roughness coefficient of n=0.013 shall be used.

#### 5.3.2.3 VELOCITY, GRADE AND SIZE

All sanitary sewers are to be designed with a minimum velocity of 0.76 m/sec and the maximum allowable is 3.0 m/sec under peak theoretical flows. The minimum size of sanitary sewer main shall be 200mm @ 0.60% minimum slope. The minimum gradient for the first reach of permanent dead-end sewers shall be 1.0%. For sanitary sewers larger than 200mm, the flow velocity criteria shall be used to limit pipe gradient. Refer to MOE and Regional Design Guidelines.

#### 5.3.2.4 LOCATION

Sanitary sewers shall be located within the road allowance, as shown on the Standard Road Cross Section Drawings attached in Appendix 2. If common trenching is required for the storm and sanitary sewer, the subdivider's consultant shall prepare a special design standard and provide the Town the specification for such requirements. Any non-standard design for locations will require the approval of the Town prior to submission of such drawings.

#### 5.3.2.5 CROSSINGS

Generally, under normal conditions, watermains should be laid with at least 2.4 metres horizontal separation from any sewer; the distance shall be measured between the centre lines of pipes.

Generally, a minimum clearance of 200mm shall be provided between the outside of the pipe barrels at the point of pipe crossing for storm sewers and other utilities except for watermain crossings in which instance the minimum clearance shall be not less than 500mm.

In the event that the minimum clearance or distance cannot be obtained in then the pipes at the location shall be concrete encased to ensure that the pipes are properly bedded.

#### 5.3.2.6 MAINTENANCE HOLES

All maintenance holes are to be constructed in accordance with OPS.

- Maintenance holes shall be constructed of poured or precast concrete as detailed on the Ontario Provincial Standards Drawing with watertight connections KOR-N-SEAL type or approved equal. Maintenance holes 3000mm and smaller shall be precast concrete.

- Maintenance holes shall be provided at each change in alignment, grade, pipe material and at all junctions, and at the points of connection of sewer over 200mm in diameter where the size of connection is equal to or one size smaller than the Town sewer.

- General Maintenance holes shall be spaced at

    - A maximum of 100 metres for pipe sizes 200mm diameter to 450mm diameter;

    - A maximum of 130 metres for pipe sizes greater than 450mm.

- All sanitary maintenance holes shall be benched as per OPSD 701.021 with a minimum width of 225mm.

- The type and size of maintenance hole shall be specified on the profile and a detail of the benching is to be shown on the plan portion of the engineering drawing for cases when the benching differs from OPS.

- All maintenance hole chamber openings shall be located on the upstream side of the maintenance hole.

- The maximum change in the direction of flow in any sanitary sewer maintenance hole shall be 90 degrees. A change of flow direction at acute interior angles shall not be permitted.

- The maximum drop allowed across a maintenance hole is 0.5m. If the design of the sewer system is such that the difference in elevation between the maintenance hole inlet and outlet will exceed 0.5m then a drop structure will be required. All drop sections are to be external.

- When pipe size does not change through a maintenance hole and the upstream flow velocity does not exceed 1.5m/sec, the following allowances shall be made to compensate for hydraulic losses.

- Any lateral connections to manholes must be approved by the Town's Public Works Department.

- In all site plan and condominium applications, a 'service' maintenance hole shall be required on services larger than 135mm diameter, to be located on private property near the entrance of the service, as close as possible to the property line.

| Alignment Change | Drop Required |
|---|---|
| a) Straight Run | Grade of sewer |
| b) 14-45 degrees | 0.03m |
| c) 45-90 degrees | 0.06m |

When the upstream flow velocity exceeds 1.5m/sec or for all junction and transition maintenance holes the drop shall be hydraulically designed.

- The obvert(s) on the upstream side of a maintenance hole shall in no case be lower than the obvert(s) on the downstream side of the maintenance hole.

- The OPS provide details for maintenance holes up to certain maximum depths, the Consulting Engineer shall analyze individually, each application of the standards, related to soils conditions, loading and other pertinent factors, to determine structure suitability. In all cases where the standards are not applicable, maintenance holes must be individually designed and detailed. When any dimension of a maintenance hole exceeds those within the OPS, the maintenance hole must be individually designed and detailed.

- Safety grating shall be required in all maintenance holes greater than 4.0m in depth and in accordance with the OPS. Safety gratings shall not be more than 4.0m apart and shall be constructed in accordance with the OPSDs.

## 5.4 SANITARY SEWER EASEMENTS

The minimum width of easements for pipes shall be determined by the developer's consulting engineer and approved by the Town to account for the number of pipes, pipe size, depth, excavation of open cut method and location of proposed building foundations. In no case shall the easement width be less than 3.0m.

The developer must grant permanent easements for any drainage works which are not within the road allowance, to the Town.

## 5.5 SANITARY SEWER PIPE MATERIAL

Sanitary sewer shall be constructed of polyvinyl chloride, or polyethylene pipes.

Pipe shall be solid wall manufactured in accordance with the latest revision of CSA and mains shall be **green** in colour, lateral connections shall be green or white in colour.

The bedding required for PVC and Polyethylene main sewer and service connection shall be as detailed on the OPSD.

## 5.6 SANITARY SEWER SERVICE CONNECTIONS

All sanitary sewer service connections for single, semi-detached and townhouse dwellings shall be as individual services.

The connection to the main sewer shall be made with an approved manufactured tee. A Town approved manufactured tee is to be used in all cases where the mainline diameter is less than 2 times the lateral diameter.

Field connections to existing mains shall be by strap on cast iron saddle or by insert-a-tee or kor-n-seal.

In new developments and replacement projects, the service connections shall be installed in accordance with the Town's drawings. Standard locations are attached in Section 10.

In addition, for new developments to the above, the service shall be capped at the property line and at each service location a 1.5m long 50m x 100mm (2" x 4") wooden stake shall be planted and have 0.9m (three feet) bury. Stakes shall be painted green and shall bear on its broad side above the ground the letter "S" painted in white.

### 5.6.1 SERVICE SIZES

Service connections for single family, semi-detached and townhouse units shall be 135mm diameter, green in colour, DR-28.

Service connections for multiple family and other blocks, Commercial, Institutional Areas – to be sized individually according to the intended use.

### 5.6.2 SERVICE DEPTHS

The depth of the service connections for single family units and semi- detached units, at the street line, measured from the final grade at the street line shall be:

- Minimum 2.40m
- Maximum 3.00m

Risers shall be used where required based on manufacturers recommendations.

### 5.6.3 VELOCITY AND GRADE

Minimum low flow velocity 0.6m/sec

Minimum service slope is 1% and maximum is 8%.

### 5.6.4 MATERIALS FOR SANITARY SEWER SERVICE CONNECTIONS

Sanitary sewer service connections must be constructed using polyvinyl chloride pipe (PVC) materials as outlined in the above section unless otherwise approved by the Town.

### 5.6.5 LOCATION OF SERVICE CONNECTIONS

Sanitary connections shall be located in accordance with the applicable Town Standard Drawings (attached in Appendix 6).

### 5.6.6 SANITARY LATERAL CLEAN OUT

A clean out must be provided at the property line for all new sanitary laterals as shown in Appendix 2: Standard Service Location and in conformance with Appendix 3: Sanitary Cleanout Detail.

## 5.7 CONSTRUCTION OF SEWERS

### 5.7.1 CAPS

Watertight rubber gasket caps or plugs shall be installed in the ends of the all private drain connections. All caps shall be specified by the pipe manufacturer to insure a watertight seal.

### 5.7.2 FIELD TESTING AND ACCEPTANCE

All field test conducted shall be performed in accordance with the OPSS 410 and in the presence of the Contract Administrator.

#### 5.7.2.1 LEAKAGE

Leakage test shall be carried out on completed sewers 1200mm in diameter and smaller. There shall be no visible infiltration for sewers with a diameter greater than 1200mm.

#### 5.7.2.2 VISUAL INSPECTION

The sewers, maintenance holes and all related appurtenances shall be cleaned of all foreign material either by flushing, the use of cleaning buckets, by hand or by a combination of all three.

The sewers shall be inspected by the Contract Administrator for alignment and obstructions, ponding in gravity sewers will not be accepted.

Regardless of the results of the tests as hereinafter provided, all visible or detectable leaks in sanitary sewers shall be repaired by the Contractor as a prerequisite to acceptance of the sewers.

#### 5.7.2.3 DEFLECTION

Deflection testing shall be carried out on all sewers constructed using plastic pipe.

### 5.7.3 CLEANING AND CCTV INSPECTION OF SEWERS

Inspections shall be carried out using television cameras and video recording equipment as specified in OPSS.MUNI 409. A continuous record of the internal condition of the piping system shall be provided.

All coding shall be in accordance with the requirements of the NASSCO Pipeline Assessment Certification Program (PACP)/(MACP) Version 7.0.3 (Canadian Edition) and OPSS.MUNI 409. Findings shall be included in a .PDF inspection report. The video inspection report is to be in MPG format. Sewer and maintenance hole reports shall be submitted in a Microsoft Access database version 2013 standard PACP/MACP data model.

The nonreturnable digital storage device shall be minimum USB 2.0 compatibility and include the information in points a) and b) below to identify the content. The storage device shall be placed inside a labelled envelope and include a file in either Word or text format and include the following points.

a) Owner’s Name
b) Contract Number or Project Name
c) Sewer Identification Number
d) Region or Municipality
e) Street Name, Park Name or Highway Number
f) Inspection Date

All CCTV inspection operators shall have been certified or re-certified under NASSCO PACP no more than three years prior to commencement of the Contract.

Sewer flushing and cleaning shall be in accordance with OPSS.MUNI 411

Every reasonable precaution shall be made to ensure equipment does not become stuck in the sewer. The Contractor shall be responsible for all costs associated with recovering the equipment.

#### 5.7.3.1 SEWER CLEANING

Sewer section shall be cleaned using a combination unit with a high velocity jet, approved by the Town. Contractors may obtain water from approved hydrants only after obtaining permission from the Town and pay all applicable costs. Any damage to the fire hydrants resulting from misuse shall be the responsibility of the Contractor.

Cleaning equipment shall be capable of removing dirt, grease, rocks, sand and other materials and obstructions from the sewer lines and manholes by use of vacuum system. The Contractor shall be required to make a many pass as necessary.

If cleaning of an entire section cannot be successfully performed from one manhole, it can be assumed an obstruction is present and cleaning efforts will cease and further investigations done.

#### 5.7.3.2 CLEANING PRECAUTIONS

Debris such as dirt, sand, rocks, grease and other solid or semi-solid material, which is a result of cleaning, shall be removed at the downstream manhole of the section being cleaned. The Contractor shall plug, bag and/or screen the sewer at the outlet to prevent materials from being flushed into the downstream reaches. Passing material from manhole to manhole shall not be permitted due to the risk of line plugging. This material shall be removed. At the end of each day back flush the last section of sewer cleaned to ensure no buildup of debris has occurred.

#### 5.7.3.3 DISPOSAL OF MATERIAL

The Contractor shall make provision to properly dispose of all debris in accordance with all provincial legislation and MOE guidelines.

#### 5.7.3.4 RE-INSPECTION

If in the opinion of the Contract Administrator or Town, it is determined that re-inspection is required as a result of inadequate cleaning, the Contractor shall re-clean and re-inspect the sewer at no additional cost to the Town.

#### 5.7.3.5 ACCEPTANCE

Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Town's Public Works Department. If CCTV inspections show the cleaning to be unacceptable, the Contractor is required to re-clean and re- inspect the sewer until accepted by the Town's Public Works Department.

### 5.7.4 FLOW CONTROL AND BY-PASS PUMPING

When interruptions of sewer section flow are necessary to effectively conduct inspections, the Contractor shall, subject to the approval of the Town, control flows using plugging and blocking methods.

The Town reserves the right, when necessary, to request by-passing and dewatering of a sewer to be inspected to ensure that the full diameter of pipe is visible.

The contractor will be responsible for any damage to public or private property resulting from the by-pass operation or lack thereof. This operation may be requested when the flow depth covers the entire lens for approximately 35% of the line.

A sewer line plug shall be inserted into the line at a manhole upstream from the section to be inspected. The plug shall be designed so that all or any portion of the sewage flows can be released during the inspection. Flows shall be reduced in order to inspect the pipe invert. Sewage levels upstream of the plugged section **shall be monitored at all times.** After the work is completed, flows shall be restored to normal.

# 6 STORM DRAINAGE SYSTEMS

## 6.1 GENERAL

The construction of all storm sewer system components and service connection in the Town of Niagara-on-the-Lake shall be in accordance with the current and appropriate Ontario Provincial Standard Specifications and Standard Drawings or as modified herein.

The design of all storm sewer systems shall conform with the latest requirements of the Ministry of the Environment, Niagara Peninsula Conservation Authority and Region of Niagara.

The Developer and/or Consultant shall meet with the Town's Public Works Department prior to commencement of detailed design to establish the acceptable methodology for determination of stormwater design flows, required by the Town and to determine a suitable storm outlet.

Final approval for storm sewer system and alterations to an existing watercourse as well as new outlets and stormwater management facilities are under the jurisdiction of the Ontario Ministry of the Environment and/or Ontario Ministry of Natural Resources and/or Niagara Peninsula Conservation Authority. In addition, outlets to Federal owned lands and waterways are also subject to approval of the Department of Public Works Canada and the St. Lawrence Seaway Authority.

The Consultant should contact these agencies early in the design phase to obtain their requirements.

The following sections provide only the Town of Niagara-on-the-Lake's requirements regarding storm sewer systems.

## 6.2 STORM SEWER DESIGN METHODOLOGY

The design of the storm drainage system shall comprise of both the minor and major system. Storm sewers shall be designed to convey run-off for the City of St. Catharine's five (5) year design storm without surface ponding.

If system is designed to a two (2) year design storm no direct connections will be approved, systems designed to a five (5) year storm gravity service connections will be permitted.

The major system shall convey the City of St. Catharines 100-year design storm overland within the right-of-way leading to the watersheds major outlet. Relief shall be provided in low points to prevent the depth of ponding from exceeding 0.6m.

### 6.2.1. RATIONAL METHOD

Where applicable, the design of the storm sewers for the minor system may be designed according to the rational formula where:

**Q = 2.78 AiR**

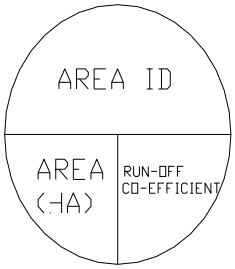
**A = Area (ha)**
**i = Average rainfall intensity (mm/hr)**
**R = Run-off coefficient**
**Q = Run-off quantity (l/s)**

### 6.2.2. WATERSHED AND DRAINAGE AREAS

The watershed area shall be determined from contour plans, existing watershed areas and shall include all areas that naturally drain into the system and shall also consider all lot grading plans for proposed developments.

A plan of the watershed area shall be prepared and shall include all affected streets, lots and watercourses. The proposed storm sewer system shall be shown on this plan including each maintenance hole numbered consecutively for design reference. Maintenance holes shall be located at each and every change of pipe size, grade and alignment.

Maintenance hole shall be the tributary points in design. The areas tributary to each maintenance hole shall be clearly outlined on the storm drainage area plan with the area in hectares (to the nearest tenth) and run-off coefficient or parameter shown in a circle.




In cases where areas of different run-off coefficients are tributary to one maintenance hole, the areas tributary to the maintenance hole shall be individually outlined. The tributary area and run-off coefficient for each area shall be shown as set out above.

In determining tributary areas to maintenance holes, the proposed grading of lots must be considered and taken into account in order to maintain consistency in design.

In the case of large tributary areas under single ownership, such as shopping centres, apartment developments, schools, etc., the design shall be prepared on the basis of the whole area being tributary to the maintenance hole in an abutting storm sewer. When more than one sewer connection will be

necessary to service the property in question, the appropriate area tributary to each sewer connection shall be clearly shown and taken into account in the design of the storm sewer.

In lieu of precise information on development of the whole or any part of a watershed area, the latest approved Zoning By-law and Plans shall be used to select the correct values of the run-off coefficients and parameters to be used in the design and to determine the specific areas where they will apply.

### 6.2.3. RAINFALL INTENSITY

The values of the rainfall intensity shall be determined using the City of St. Catharines IDF curves.

Storm frequency values for both the minor and major systems are as follows:

- Minor System – 5 Year Storm
- Major System – 100 Year Storm (for all watercourses)

Generally inlet time or initial time of concentration is be 10 minutes

### 6.2.4. IDF CURVES AND STORM DEPTHS FOR ST.CATHARINES

#### 6.2.4.1. IDF CURVES

| RETURN PERIOD (YRS) | METRIC A | IMPERIAL A | B | C |
|---|---|---|---|---|
| 2 | 567 | 22.3 | 0.746 | 5.2 |
| 5 | 664 | 26.1 | 0.744 | 4.7 |
| 10 | 724 | 28.5 | 0.739 | 4.3 |
| 25 | 821 | 32.3 | 0.735 | 4.0 |
| 50 | 900 | 35.4 | 0.734 | 3.8 |
| 100 | 980 | 38.6 | 0.732 | 3.7 |

$$i = \frac{A}{(t + C)^B}$$

Where: A ,B ,C = above

i = intensity (mm/hr or in/hr)

t = storm duration (min) and Ratio of time to peak = 0.375

#### 6.2.4.2. STORM DEPTHS (mm)

| STORM DURATION (HR) | RETURN PERIOD (YRS) | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 5 | 10 | 25 | 50 | 100 |
| 1 | 25 | 30 | 33 | 39 | 43 | 47 |
| 2 | 31 | 37 | 41 | 48 | 52 | 58 |
| 3 | 35 | 41 | 46 | 53 | 59 | 65 |
| 4 | 37 | 44 | 50 | 58 | 64 | 70 |
| 6 | 42 | 49 | 56 | 65 | 71 | 79 |
| 12 | 50 | 59 | 67 | 78 | 86 | 95 |
| 24 | 60 | 71 | 80 | 94 | 104 | 114 |

### 6.2.5. RUN-OFF COEFFICIENTS

Values for the run-off coefficient “R” shall be approved by the Town, listed below are recommended run-off coefficients:

| Surface Type or Recommended Land Use | Coefficient |
|---|---|
| Parks | c = 0.25 |
| Schools | c = 0.40 |
| Single Family Residential | c = 0.40 |
| Semi-Detached | c = 0.50 |
| Maisonettes, Townhouses, etc. | c = 0.60 |
| Churches | c = 0.60 |
| Apartments | c = 0.70 |
| Industrial | c = 0.70 |
| Commercial | c = 0.80 |
| Paved Area | c = 0.90 or 1.00 |

## 6.3 TEMPORARY STORM WATER DETENTION

When a storm sewer connection is not available to a particular site, connecting to an existing Town road side ditch may be used as a temporary storm sewer outlet subject to the approval of the Town Engineer and the MOE provided the rate of flow to the ditch does not adversely affect the overall system. The temporary outlet to the ditch must be abandoned at the time of sewer installation. On-site volume detention maybe required and can be accomplished by means of rooftop detention, parking lot detention, oversized pipes or green area detention. MOE, NPCA and/or MNR approvals are required for all systems.

## 6.4 STORM WATER MANAGEMENT REPORT

Is required for all new developments when there is a change in run-off or those of other approving agencies require the implementation of “Stormwater Management Techniques”, two (2) copies of the final Stormwater Management (SWM) Report must be provided to the Town for review. The subdivider must retain a consultant or sub-consultant specializing in the design of SWM systems. Early in the design phase, the SWM consultant shall meet with the Town to review the Town’s concerns regarding safety, operations, maintenance and aesthetics and review possible alternatives. All SWM reports should be designed in accordance with the Stormwater Management Planning and Design Manual published by the MOE inclusive of all amendments and in accordance with the Town’s Landscape and Maintenance Policy (attached in Appendix 1).

The Town will review the final SWM report to ensure that the design parameters are appropriate to the Town of Niagara-on-the-Lake are being used, concerns regarding safety operations, maintenance and aesthetics have been resolved and sufficient design information has been included for future reference by the Town. In most cases, the technical review of SWM report will be under the jurisdiction of the MOE, as they issue the Certificate of Approval. The consultant will be responsible for obtaining all approvals form the governing agencies.

The final SWM Report must contain, but is not limited to the following:

- Discussion of and plan showing post and pre-development drainage patterns for the minor and major event;
- Discussion of the Master Drainage Plan (MDP) and the standard Best Management Practices (BMP) and the reasoning behind the final selections for design (include construction and maintenance costs and schedules).
- Discussion of the hydrologic model used, focusing on its assumptions and limitations as well as the reasoning behind the values used for the required design parameters.
- All design calculations and data on hard copy including determination of flows, stage-storage discharge relationships, anticipated loadings and pollutant removal rates as required.
- Discussion and schedule of required maintenance requirements
- Plan showing area and limits of ponding in major event. Upon meeting the requirements of the Town, the Consultant shall forward the report to the governing agencies for approval.

## 6.5 STORM SYSTEM COMPONENTS DESIGN

### 6.5.1. PIPE

The class and type of pipe and type of pipe bedding shall be shown on the profile for all lengths of sewer. All storm sewers shall be located as shown on the appropriate road cross-section standard attached in Appendix 2. Generally, the pipe sizes shall not decrease from a larger size upstream to a smaller size downstream regardless of the increase in grade. Subject to the approval of the Engineer, radius pipe will be permitted to achieve changes in horizontal alignment. The minimum radius allowed for various diameters of pipe shall be as detailed in the manufacturer's specification. Pipe bedding and class shall be designed to suit ultimate loading conditions.

### 6.5.2. CAPACITY

Manning's Formula shall be used to compute the capacity of storm sewers. The capacity of the sewer shall be calculated on the basis of the pipe flowing full.

### 6.5.3. ROUGHNESS COEFFICIENT

The roughness coefficient to be used for storm sewer pipes shall be:

- Concrete Pipe: n=0.013 for all sizes of pipes
- PVC: n=0.013 for all sizes of pipes
- Corrugated Metal: based on MTO recommended values for n

### 6.5.4. MINIMUM SLOPE OF STORM SEWER PIPE

The minimum size for storm sewer is 300mm diameter. The minimum design velocity for storm sewer is 0.75 m/sec. The following are the minimum slopes which shall be provided for storm sewers:

| Pipe Size (mm) | Minimum Slope (%) |
|---|---|
| 300 | 0.303 |
| 375 | 0.226 |
| 450 | 0.178 |
| 525 | 0.144 |
| 600 | 0.120 |
| 675 | 0.102 |
| 750 | 0.089 |
| 825 | 0.080 |
| 900 | 0.070 |
| 1050 | 0.056 |
| 1200 | 0.048 |
| 1350 | 0.042 |
| 1500 | 0.036 |
| 1650 | 0.031 |
| 1800 | 0.028 |
| 1950 | 0.025 |
| 2100 | 0.023 |

### 6.5.5. VELOCITY

The velocity in storm sewers shall be generally limited to a minimum of 0.75m/sec and a maximum of 6.0m/sec in accordance with MOE guidelines.

### 6.5.6. MINIMUM DEPTH

The minimum cover to the top of pipe shall be 1.20m.

In all cases, the proposed storm sewers shall be installed at sufficient depth to service lands external to the site as determined by the Town.

### 6.5.7. LOCATION

Where practical, storm sewer shall be located, 1.5m from the centerline as shown on the Standard Road Cross Section Drawing. If common trenching is required for the storm and sanitary sewer, the Consultant shall prepare special design standards and provide the Town with the specification for such requirements. Any non-standard design for locations will require the Town's Approval.

### 6.5.8. CROSSINGS

Generally, a minimum clearance of 200mm shall be provided between the outside of the pipe barrels at the point of pipe crossing for sanitary sewers and other utilities except for watermain crossings, where the minimum clearance shall be no less then 500mm.

In the event that the minimum clearances cannot be obtained, then the pipes at the crossing shall be concrete encased to ensure that the pipes are properly bedded.

### 6.5.9. MAINTENANCE HOLES

All maintenance holes are to be constructed in accordance with OPS, lids as per OPSD 401.01 Type A.

- Maintenance holes shall be provided at each change in alignment, grade and pipe material.
- Generally, maintenance holes shall be spaced at:
    - A maximum of 100m for pipe sizes 300mm diameter to 750mm diameter;
    - A maximum of 120m for pipe sizes 825mm diameter to 1200mm diameter;
    - A maximum of 150m for pipe sizes greater than 1200mm diameter.

- All maintenance hole chamber openings shall be located parallel to flow direction

- Storm sewer pipe shall not be turned more than 90 degrees in any maintenance holes. The maximum change in direction of flow in maintenance holes for sewer sizes 1050mm and over shall be 45 degrees. The direction of flow in any maintenance hole will not be permitted at acute interior angles.

- The minimum drop across the maintenance hole for all straight runs shall be sufficient to maintain the design head. The obverts on the upstream side of a maintenance hole shall, in no case, be lower than those on the downstream side.

- All benching inside maintenance holes shall be as determined in the OPSD 1004.01 to a minimum spring line of the pipe unless head losses are excessive and affect the design capacity of the system.

- When the dimensions or details of a maintenance hole exceed those on OPS, the maintenance hole must be individually designed and detailed.

- Safety gratings shall be required in all maintenance holes greater than 4.0m in depth and in accordance with OPS. Safety gratings shall not be more than 4.0m apart and constructed in accordance with the OPSD.

- In all site plan and condominium applications, a ‘service’ maintenance hole shall be required on services larger than 100mm diameter, to be located on private property near the entrance of the service, as close as possible to the property line.

### 6.5.10. INLET & OUTFALL STRUCTURES

Developers should contact the Niagara Peninsula Conservation Authority to ascertain permit requirements.

Inlet and Outlet structures including headwalls, that are not as per OPS, shall be fully designed and submitted in detail.

Grates shall be provided on all inlet and outfall structures 450mm in diameter and larger and shall be fully designed and detailed including locks where applicable.

In general, inlet grates shall consist of vertical parallel bars or rods sloping approximately 45 degrees away from and in the direction of the flow. Outlet grates shall consist of horizontal bars or rods placed perpendicular to the flow. Spacing between the bars or rods shall be as per OPSD 804.05.

### 6.5.11. CATCHBASINS – SPACING AND LOCATION

Roadside Catchbasins shall be precast and constructed as per OPS. Lids as per OPSD 400.020

The maximum spacing of catchbasins shall be as follows:

| Road Gradient | Maximum Spacing |
|---|---|
| 0.5% to 3.0% | 90m |
| 3.0% to 5.0% | 75m |
| 5.0% to 6.0% | 60m |

Location of catchbasins

- Where changes in grade occur, the average gradient shall determine the maximum spacing. Catchbasins shall not be located within 1.5m of the curb depression for a driveway or sidewalk.

- At intersections, catchbasins shall be installed so that no more than 15.0m of gutter will drain past the upstream point of tangency.

- In sags, when drainage is received from more than one direction, double catchbasins shall be installed and the maximum length of gutter contributing form each side shall be 75% of the spacing permitted.

- Catchbasins may be required at the throat section of cul-de-sacs.

- Catchbasins may be required in rear yards to permit drainage to the storm system on the street.

### 6.5.12. CULVERTS

The minimum driveway culvert size is **300mm** diameter with a minimum length of 6m (20 feet), lengths greater than 40m (120 feet) will require catchbasin access points. Culverts required on major system watercourses and municipal drains shall be designed to convey the required flows. (Municipal drains in accordance with the current engineer's report and watercourses in accordance with the NPCA requirements)

### 6.5.13. SEDIMENT AND EROSION CONTROL DEVICES

Erosion and degradation of water occurs during construction and upon full development. The Consultant shall submit to the Town an Erosion – Sediment Control Plan to minimize these effects in accordance with existing MOE, NPCA, MNR and MTO design guidelines.

### 6.5.14. EASEMENTS

The minimum width of easements for pipes shall be determined by the developer's consulting engineer and approved by the Town to account for number of pipes, pipe size, depth, excavation of open cut method and location of proposed building foundations. In no case shall the easement width be less than 3.0m.

The developer must grant permanent easements for any drainage works which are not within the road allowance, to the Town.

### 6.5.15. PIPE MATERIALS (Main Line Sewer)

Mainline storm sewers over 375mm diameter shall be constructed of concrete pipe, 375mm or less shall be PVC Ultra Rib. Corrugated metal, Ultra Rib, HDP, or PVC DR35 or approved equal by Town, piping may be used for culverts. The classification of pipe to be used shall be clearly indicated on the plans.

- Reinforced concrete sewer pipe 300mm in diameter and larger shall be steel reinforced and shall conform to CSA Specification, or latest revision thereof, Class II, III, IV or V, as required.

- Concrete catchbasin leads shall conform to CSA A257.1 for Class 3 extra strength pipe. The use of polyvinyl chloride pipe (PVC) is permitted for catchbasin lead application only. The pipe must be CSA approved and have a minimum SDR of 35.

- Corrugated steel pipe shall conform to A.A.S.H.O. Specifications M218, M136, M190 and M167.

Pipes shall be joined by means of approved rubber gaskets.

### 6.5.16. SERVICE AND CATCHBASIN LEAD SIZING

Storm sewer connections for catchbasin leads within the roadways, multiple family and other blocks, commercial and institutional areas – to be sized individually according to the intended use. Services shall be 100mm diameter and white in colour.

Single Catchbasins with 200mm diameter lead at 0.50% slope is the minimum

Double Catchbasins with 250mm diameter lead at 0.50% slope is the minimum

### 6.5.17. SERVICE DEPTH REQUIREMENTS

The depth of service connections at the street line in residential areas, final grade at street line to be 2.5m.

### 6.5.18. PIPE MATERIAL FOR SERVICES AND CATCHBASIN LEADS

Polyvinyl chloride pipe or polyethylene pipe may be utilized as an alternative to concrete catchbasin leads. Pipe material must be CSA approved with a minimum SDR of 35.

### 6.5.19. STORM DRAINAGE AND STORM SEWER CONNECTIONS TO MULTIPLE FAMILY, COMMERICAL AND OTHER BLOCKS

Parking lots, driveways, and/or other hard surfaced areas servicing multiple family, commercial and other blocks, shall be drained by a properly designed internal drainage system (including catchbasins, maintenance holes and pipe) which shall connect to the storm sewer system or other Town approved outfalls.

### 6.5.20. ROOF LEADERS AND FOUNDATION DRAINS

Roof drains should discharge at the front and rear of the building onto splash pads with flows directed away from the building foundations without erosion or inconvenience to others. Connection from sump pumps and foundation drains shall be approved by the Town based on the sizing of the sewers. Direct connections by gravity will be allowed if the storm sewer was designed for a 5-year storm event.

# 7 WATER DISTRIBUTION SYSTEM

## 7.1 GENERAL

The construction of all watermains, appurtenances and service connections in the Town of Niagara-on-the-Lake shall be in accordance with the current and appropriate Ontario-Provincial Standard Specifications and Standard Drawings, the American Water Works Association Standards or as modified herein.

Determination of watermain design and design flows shall conform to the latest edition of the Ontario Ministry of the Environment "Guidelines for the Design of Water Storage Facilities, Water Distribution Systems, Sanitary Sewage Systems and Storm Sewers" and the Regional Municipality of Niagara Public Works Department's "Guidelines for the Design and Construction of Sewer and Watermain Systems".

Private services and fire hydrants shall not be connected to Regional watermains. A parallel watermain, connection to other watermains, individual supply wells, etc. must be installed to service properties adjacent to Regional watermains. Only in exceptional cases will these connections be allowed. Special arrangements must be made with the Regional Municipality of Niagara and it must be clearly demonstrated that an alternate supply is not available.

## 7.2 HYDRAULIC DESIGN

### 7.2.1. SYSTEM PRESSURES

The maximum sustained operating pressure shall not exceed 100PSI (700kPa). Where pressures in localized area are above this level, pressure-reducing valves shall be installed as per the Ontario Building Code on each individual property.

The distribution system shall be sized to meet normal peak demands and fire flow requirements. Under conditions of simultaneous maximum day and fire flow demands, the pressure shall not drop below 20PSI (140kPa). Under normal operating conditions, the pressure shall not drop below 40PSI (275kPA).

The Town may require the consulting engineer to verify the existing distribution system is sufficient to supply and above requirement to the development. The Developer is responsible for all associated costs for verifying the above.

All watermains shall be capable of withstanding minimum design pressures of 150PSI (1035kPA) regardless of the working pressure in the system or the rating necessary to meet the structural requirements of the trench condition. (Design Pressure = maximum sustained internal hydrostatic pressure to which the pipe is to be subjected, excluding transient pressures).

## 7.3 WATERMAIN AND APPURTENANCES

### 7.3.1. WATERMAIN SIZING

The design period of watermain sizing purposed shall be 50 years, using the ultimate land use as predicted by the Town, Planning Department, and as shown on the Town's Official Plan.

Sizes and looping of watermains will be determined at the preliminary stage of the development. However, the minimum watermain diameter shall be 150mm. The following are the minimum size requirements:

### 7.3.2. DEPTH OF COVER

The minimum depth of cover to watermains should not be less than the depth of frost penetration.

Generally, the depth of cover shall be **1.7 metres** measured in a vertical plane above the pipe from the top of the pipe to the finished ground elevation.

It will be the responsibility of the developer or the consultant to justify any reduction in the depth of cover less than 1.50 metres by submitting a report outlining the reasons of the reduction and alternative frost protection measures to be taken.

### 7.3.3. VERTICAL SEPARATION BETWEEN WATERMAINS AND SEWERS

Under normal conditions, the vertical separation between the crown of the sewer and the bottom of the watermain shall be at least 500mm.

### 7.3.4. HORIZONTAL SEPARATION BETWEEN WATERMAINS AND SEWERS

Under normal conditions, watermains shall be laid with a horizontal separation of at least 2.4metres from any sewer or sewer maintenance hole. The distance shall be measured from the nearest edges.

### 7.3.5. SEPARATION OF WATERMAIN AND SEWERS – SPECIAL CONDITIONS

Under unusual conditions, where a significant portion of the construction will be in rock, where it is anticipated that severe dewatering problems will occur, or where congestion with other utilities will prevent a clear horizontal separation of 2.4 metres, a watermain may be laid closer to a sewer, provided that the elevation of the crown of the sewer is at least 500mm below the bottom of the watermain. Such separation shall be in-situ material or compacted backfill.

Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to watermain

standards of construction and shall be pressure tested to assure water tightness.

In rock trenches, facilities should be provided to permit drainage of the trench to minimize the effects of impounding of surface water and/or leakage from sewers in the trench.

### 7.3.6. CROSSING OF WATERMAINS OVER AND UNDER SEWERS

Under normal conditions, watermains shall cross above sewers with sufficient vertical separation to allow for proper bedding and structural support of the watermain and sewer main.

When it is not possible for the watermain to cross above the sewer, the watermain passing under a sewer shall be protected as follows:

- A vertical separation of at least 500mm shall be provided between the bottom of the sewer and crown of the watermain
- The sewers shall be adequately supported to prevent excessive deflection of joints and settling.
- The length of watermain shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

### 7.3.7. UTILITY CROSSINGS

Where watermains cross over or under utilities other than sewers, the clearance and type of crossing provided shall conform to the requirements of the particular utility involved and provide proper bedding and structural support of the watermain and utility.

### 7.3.8. DEAD ENDS

Where possible, the distribution system shall be designed to eliminate dead-end sections. Where dead-ends cannot be avoided, they shall be provided with a fire hydrant, flushing hydrant or a 50mm blow-off for flushing purposes. No service connections are permitted downstream of the terminal flushing point.

### 7.3.9. WATER QUALITY

The preferred minimum chlorine residual as mandated by the Ministry of the Environment is 0.20mg/L for free chlorine at any point in the distribution system. A free chlorine residual of less than 0.05mg/L is reportable to the MOE and the Medical Officer of Health and require remedial action as prescribed in current Ontario Regulations.

Although the Town has primary responsibility to ensure that the minimum chlorine residuals are maintained in the distribution system, the distribution system must be designed to mitigate the degradation of chlorine residuals.

The Town reserves the right to require watermain looping and/or automatic flushing devices to facilitate the maintenance of chlorine residuals.

## 7.3.10. LINE VALVES

Generally, the sizes of the line valves shall be the same size as the watermain.

Gate valves shall be used on all watermains 350mm diameter or less in size. Butterfly valves shall be used on all watermains of 400mm diameter and greater.

All valves shall be of the approved type with non-rising stem and a 50mm square operating nut opening counterclockwise.

### 7.3.10.1. NUMBER, LOCATION AND SPACING OF LINE VALVES

Generally, a minimum of two valves are required at a tee intersection and a minimum of three valves are required at a cross intersection. In new developments the valves shall be located at the point where the projections of the street line intersect the watermain. Valves and boxes and chambers shall be located in boulevards whenever possible.

Line valves shall be located such that 30 houses can be shut-off from another block and isolated from the system. In no case shall the spacing exceed 305 metres. Valves shall be located at every intersection.

Line valves on feeder mains shall be located in accordance with existing and future servicing requirements. The maximum distance between valves shall not exceed 762 metres.

Line valves on watermain replacements in pre-existing developments may be located as close as practical to mainline tees and crosses (providing a nest of valves).

When possible, hydrant tees shall be located within 2 metres of line valves to facilitate effective watermain flushing.

Final approval of these locations by the operating authority is required.

Gate valves shall be epoxy coated with resilient coated wedge. Acceptable manufacturers are Clow, Mueller and AVK.

## 7.3.11. AIR RELEASE VALVES

Hydrants at high points are preferred.

Air release valves shall be placed at all significant high points of the distribution system. In addition, an attempt shall be made to locate hydrants

at high points or at dead ends, thereby eliminating the need for vacuum-air relief valves and/or blow-offs.

### 7.3.12. DRAIN VALVES

Drain valves shall be located at the low points of all watermains of 600mm diameter and greater.

### 7.3.13. VALVE BOXES AND CHAMBERS

All valves 350mm diameter and smaller shall have valve boxes and specified direct bury operators shall be used.

All valves 400mm diameter and larger shall be installed in valve chambers.

The tops of valve boxes and valve chamber maintenance hole covers shall be set flush with finished grade. The top of the roof slab of valve chambers shall be at least 0.60 metres below the profile of the finished pavement. Valves shall be operable from the surface by way of valve boxes through the chamber roof slab.

Chambers or pits containing valves, blow-offs, meters or other such appurtenances to a distribution system shall not be connected directly to any sanitary or combined sewer, nor shall blow-offs or air-relief valves be connected directly to any such sewer.

Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, to adsorption pits or to a sump within the chamber where ground water level is above the chamber floor or storm sewer. In order to minimize the total number of chambers on any project, care should be exercised in locating the line valves, air relief's, drains, etc., with a view to combining these functions in a single chamber.

### 7.3.14. FIRE HYDRANTS

Fire protection for institutional and commercial developments shall be reviewed upon applications. However, all fire flow requirements of the Fire Underwriters Survey for Water Supply for Public Fire Protection (1999) shall be met.

Hydrants shall be installed on all watermains 150mm diameter and larger with the following maximum allowable spacing (measured along the roadway centerline):

- 150 metres in residential areas, or to provide for a maximum hose length of 75 metres;
- 75 metres in industrial and commercial areas to provide for a maximum hose length of 37.5 metres;

All hydrants installed on watermains shall be installed with 150mm diameter anchor tee, secondary valve and box.

The preferred locations for the fire hydrants are:

- at street intersections
- on the same side of the road as the watermain
- at the end of cul-de-sacs and other permanent dead end watermains
- consistently on the same side of the road as the existing and future fire hydrants
- at the dividing property line between adjacent properties
- at high points

Fire hydrant leads must be installed perpendicular to the road and/or the watermain.

Refer to Appendix 3 for the minimum clearance from above ground obstructions to fire hydrants. Minimum clearances shall be as follows:

- 1000mm behind
- 3000mm on each side
- Clear zone 1000mm wide from the curb line to the front of the hydrant
- A visually unobstructed zone extending out 45 degrees on either side of the hydrant from the hydrant to curb line.

## 7.3.15. WATER SERVICE CONNECTION

In new developments, the service connections shall be installed in accordance with the Standard Drawings terminating at the property line, standard drawings are attached in Appendix 3.

### 7.3.15.1. WATER SERVICE SIZES

The minimum size for service connections shall be 19mm diameter.

Service connections for multiple family dwellings shall be sized to provide capacity equivalent to 19mm diameter connection to each dwelling unit.

Service connections for blocks, commercial and industrial areas shall be sized according to the intended use.

### 7.3.15.2. WATER SERVICE LOCATION

Water service connections shall not be located under a driveway, if possible. The location of water service connections for single family and semi-detached lots shall suit the house style in accordance with the Standard Drawing attached in Appendix 3.

### 7.3.15.3. WATER SERVICE DEPTH

Curb and gutter roads – water service connections shall be installed 1.7metres minimum below finished grade.

Open ditch and unimproved roads – in no case shall the cover of the water service connection be less than 1.7metres.

#### 7.3.15.4. MAINSTOPS

All domestic water service connections shall have main stops installed at the watermain equal to the water service connection diameter.

#### 7.3.15.5. CURB STOPS AND BOXES

All service connections shall have curb stops and boxes installed at the property line. Operating rod shall be stainless steel.

### 7.3.16. CORROSION PROTECTION

Non-metallic watermain with metallic valves and fittings and non-metallic service laterals, shall have one zinc Z-24-48 anode attached to the tracing wire per 100 metres of main, at an average of 100m spacing.

### 7.3.17. WATERMAIN MATERIALS

All materials must be new and unused and type and quality approved for use by the Town's Public Works Department.

#### 7.3.17.1. PVC PIPE

Class 150 DR18 PVC pipe 150mm through 300mm shall conform with AWWA standard C-900-75. Outside diameter of pipe must conform with cast iron pipe diameters. Pipe lengths will be 6.0metres in length with bell gasket joints.

Tracer wire (8 gauge) must be used with all PVC and polyethylene applications, including services as applied in accordance with manufactures specifications.

#### 7.3.17.2. POLYETHYLENE PIPE

Class 150 DR18 PVC pipe 150mm through 300mm shall conform with AWWA standard C-900-75. Outside diameter of pipe must conform with cast iron pipe diameters. Pipe lengths will be 6.0metres in length with bell gasket joints.

Tracer wire (8 gauge) must be used with all PVC and polyethylene applications, including services as applied in accordance with manufactures specifications.

#### 7.3.17.3. INSULATION

Where insulation is required due to depth of main, SM3 Styrofoam insulation shall be used.

The width of polystyrene board required should be determined by use of the following formula:

W = (F-X) – Y

- W – is required width of Styrofoam in feet
- F – frost free depth in feet + 1.0 foot for safety factor
- X – depth in feet from grade to the top of the Styrofoam
- Y – clearance between the underside of the Styrofoam and the hop of the pipe in feet (min. 6 inches)

The required thickness is suggested that a minimum 2 inches thickness be provided for every foot reduction in the frost-free depth.

### 7.3.17.4. FITTINGS

#### 7.3.17.4.1. CAST IRON & DUCTILE

These fittings shall be cement mortar lined, with mechanical joint or as otherwise specified by the Public Works Department.

#### 7.3.17.4.2. PVC

All PVC fittings shall be Class 150 PVC for C900 PVC pipe 100mm diameter through 200mm diameter, DR 18 AWWA C900.

### 7.3.17.5. VALVES

All valves shall be as follows or approved by the Town's Public Works Department.

All valves shall be **Clow, AVK or Meuller.** 400 mm diameter valves and beyond shall be the butterfly type. **NOTE:** Resilient seat gate valves will be accepted only when specified by the Town's Water Department. Tapping valves shall be flanged to mechanical joints, AWWA approved.

All valves shall open **left hand (counter clockwise**) and shall have **50mm (two inch) square operating nuts**, unless otherwise specified by the Town's Water Department.

Valve boxes shall be 130mm (5 ¼ inch) complete with support plate**.** All valve boxes must be of sufficient length to be at least 300mm above finished grade when fully extended, unless otherwise specified by the Town's Water Department.

Valve chambers must conform to OPSD specifications or pre-fab type Town approved equal.

### 7.3.17.6. HYDRANTS

All hydrants and control valves shall be as follows or Town approved equivalent in accordance with Town Standard drawings.

All hydrants shall be**, Clow Brigadier McAvity M67 with 2 -2½ inch hose nozzles and 1 pumper nozzle with Storz connection** and shall be complete with M.J.boot and anchor tee bolted to the secondary valve. **All hydrants shall be for 1.80m (six feet) depth of trench, unless otherwise specified by the Town. Drain ring bolts and nuts to be stainless steel type 304. Drain holes shall be open unless specified. All hydrants shall be painted yellow.** Hydrants shall have a 150mm (six inch) diameter mechanical joint boot. Hydrants shall measure a maximum of 150mm (six inch) from flange to ground elevation.

The required secondary control valve shall be a 150mm (six inch) **Clow, Mueller or AVK,** with mechanical joints. Hydrant branch piping shall be Class 150 SDR18 PVC unless otherwise specified by the Town.

Where hydrants do not conform with the finished ground grade the proper length extension will be inserted wither at the drain ring flange before backfilling or the ground line flange with proper road extension.

Should the hydrant require a shorter barrel due to a necessary grade change in the main the proper length barrel will be installed before backfilling the hydrant trench.

### 7.3.17.7. SERVICES

For the installation of 19mm, 25mm, 38mm and 50mm diameter water service lines within the Town of Niagara-on-the-Lake.

The contractor must supply all materials for the complete installation of the service line. All materials must be new and unused. The materials to be used are as follows:

Pipe for service lines from 19mm to 50mm diameter inclusive shall be Type “K” soft copper and shall conform to ASTM B88.

All service pipe shall be of new manufacture. Kinked, crushed or distorted tubing will not be accepted.

### 7.3.17.8. SERVICE SADDLES

To tap 19mm and 25mm services in asbestos cement pipe and PVC pipe, saddles shall be stainless steel with double stainless-steel bolts. Outlets will have AWWA threads. Saddles manufactured by Cambridge Brass, Ford, Mueller, Robar or MPG are acceptable.

To tap 38mm and 50mm services in cast iron pipe, asbestos cement pipe and PVC pipe saddles shall be stainless steel with double stainless-steel bolts. Outlets will have AWWA threads. Saddles manufactured by Cambridge Brass, Ford, Mueller, Robar and MPG are acceptable.

#### 7.3.17.9. MAIN STOPS

Main stops shall be brass, AWWA thread inlet, and compression outlet. Main stops manufactured by Cambridge Brass, Ford or Mueller are acceptable.

When service saddle is required the main stop shall be the same size as the 38mm to 75mm service line, bronze, round way, with AWWA standard thread inlet and female iron pipe thread outlet, similar or equal to **Emco Series 15914.** A plastic pipe to iron pipe coupling or adaptor will be required.

#### 7.3.17.10. CURB STOP

All curb stops shall be as follows or Town approved equivalent. All curb stops shall be ball valve type with both ends compression.

All curb stops on the open end must be protected with the use of a plastic cap or plug.

#### 7.3.17.11. COUPLING AND ADAPTORS

All couplings and adaptors shall be Town approved.

#### 7.3.17.12. CURB BOX

All curb boxes shall be as follows or Town approved equivalent.

Curb boxes shall be extension type with regular ribbed cover marked “WATER”, hexagon plug, S/S operating rod, brass cotter pin and suitable for a 1.5m (five foot) to 1.8m (six foot) trench.

For 19mm and 25mm curb stops, the curb box shall be **Emco Series D-1**.

For 38mm and 50mm curb stops the curb box shall be **Emco Series D-2.**

## 7.4 SERVICE INSTALLATION

All service lines, 50mm or smaller must be soft type K copper.

19mm and 25mm main stops for services when tapped in main must not exceed 45 degrees for the horizontal centre line of the main.

Saddle clamps and tapping sleeves for 38mm services and larger must be tapped in horizontal to the centre line of the main.

When the service lines are installed in a subdivision or any other location where the pipe is not continued past the curb stop into a building, the location of the curb box must be indicated.

At each curb box location, a 1.5m long 50mm X 50mm wooden stake shall be planted and shall have 0.9m bury. Stakes shall be painted blue and each shall bear, on its broad side above the ground, the letter “W” painted in white.

The owner is responsible for the preservation of the marker stakes, any damage or displaced stakes being replaced and accurately positioned by him in the above manner, at his own expense.

## 7.5 BEDDING, COVER MATERIAL AND BACKFILL

Bedding material shall be 100mm of Granular ‘A’, limestone screening or fine traffic bund. Cover material shall be 300mm of Granular ‘A’, limestone screening or fine traffic bund. Backfill in roads and driveways shall comprise of select native material and compacted to 100% SPD., subdivisions and existing roads bedding material shall be Granular ‘A’, all in accordance with OPSS 514.

## 7.6 CORROSION PROTECTION

All metallic pipe, fittings, etc., installed underground must be thoroughly coated with asphalt base paint and wrapped with 6mm polyethylene film taped in place. The polyethylene wrapping must not cover the drain ring on fire hydrants. Zinc cathodic protection to be installed, where required, by the Town.

## 7.7 INSTALLATION

The installation of watermain and appurtenances shall be in strict accordance with OPS and as outlined herein. Failure to follow the correct procedures will result in the Town refusing to place the water system in service.

### 7.7.1. NOTIFICATION

The Contractor shall notify the Town at least 48 hours prior to the commencement of any work that may affect the existing water distribution system.

### 7.7.2. INTERRUPTION OF SERVICE

No valve or other control on the existing system shall be operated for any purpose by the contractor, without the permission and supervision by the Town’s Public Works Department. **The Water Department Staff will operate all valves, hydrants, blow-offs and curb stops.**

Mains may only be shut off at times designated by the Public Works Department. Town will prepare notice for affected customers, that will be distributed by the contractor at least 24 hours before the shut-off.

### 7.7.3. JOINTING

Pipes shall, in general, be jointed in strict conformance with the recommendations of the manufacturer of the pipe in use, OPSS 701

### 7.7.4. DISINFECTION WATER LINES

Shall be completed in accordance with C651-14 AWWA Standard for Disinfection.

### 7.7.5. CHARGING AND FLUSHING OF MAINS

The Contractor shall charge and flush the new mains when so instructed. Mains shall only be charged under the supervision of the inspector. The contractor shall be responsible for satisfactory disposal of all water used in the flushing.

### 7.7.6. INSTALLING SERVICE MATERIALS

After the service line is installed and connected to the watermain, the curb box set in place, and the service line is connected to the consumer's water line at the road limit, the installation must be inspected by the Water Department's inspector before the trench is backfilled. Where services have been installed by means of boring or tunneling, the contractor shall expose both ends of each to enable its length to be measured.

All live taps must be inspected by a licensed operator to be designated by the Town.

# 8. LOT GRADING AND DRAINAGE POLICY

## 8.1. GENERAL

The following statements of objectives of the Lot Grading and Drainage Policy for Subdivisions are used as the premise upon which the policy contained herein is based.

- To ensure the establishment and certification of a grading scheme for developed lands by means of relative ground elevations in accordance with good drainage practices.

- To determine a point in time up to which the Town and subdivider/developer/builder are responsible for the establishment of the grading scheme and after which the maintenance of the grading and drainage becomes the owner's responsibility.

- To ensure maintenance of, or acceptable revisions to, the grading and drainage scheme established on lands developed under this policy through the Building permit applications for future works which require excavation. (i.e. garages, in ground swimming pools, building additions, etc.)

- To ensure surface drainage is self-contained within the lands being developed and to ensure surface drainage from or on adjacent lands is accommodated or not adversely affected.

- The grading, drainage and building construction should be such that unanticipated storm water does not enter the sanitary sewer system.

- The grading and drainage on lands developed under this policy should be congenial with nature and thus preserved the natural terrain as much as possible.

- Grading and drainage schemes shall include erosion and sediment control measures.

## 8.2. REQUIREMENTS UNDER THE POLICY

All subdivision agreements for the development of subdivisions in the Town of Niagara-on-the-Lake shall include the following requirements. These requirements apply to the entire subdivision with the exception of the blocks which are under site plan control.

## 8.3. SUBDIVISION GRADING REQUIREMENTS

### 8.3.1. SUBDIVISION GRADE CONTROL PLAN

The design consultant shall prepare, as part of the engineering drawings for the subdivision, a subdivision grade control plan for the purpose of controlling

the overall drainage pattern through the establishment of relative surface elevations in accordance with good drainage practices.

At the time of execution of the Subdivider's Agreement, the Subdivider shall convey the Town, at his expense and in a form satisfactory to the Town Solicitor, easements for all rear yard catchbasins and leads.

### 8.3.2. SUBDIVIDER'S GRADING DEPOSIT

At the time of execution of the Subdivider's Agreement or phase thereof, the Subdivider shall deposit with the Town as surety for carrying out the provisions of the Subdivision Grade Control Plan. The deposit shall be either cash or a letter of credit in a form suitable to the Town. The Subdivider's Grading Deposit shall be returned to the Subdivider upon inspection by the Town to ensure that this work has been properly carried out as set out in the following section, subject to any amounts retained under the following item.

Should the Town become aware of drainage problems arising as a result of non-compliance to the requirements of this policy, the Town will inform the Subdivider's Design Consultant who will be responsible for resolving the problem, acting as the Subdivider's Representative for all

### 8.3.3. SUBDIVIDER'S RESPONSIBLITY

It shall be the Subdivider's responsibility to ensure that the grading of lots within the subdivision is in accordance with the latest revision of the Subdivision Grade Control Plan. In this regard, the Subdivider shall ensure that all offers to purchase lots within the subdivision include a statement outlining the responsibility of subsequent owners to adhere to the Lot Grading and Drainage Policy.

### 8.3.4. REVISIONS TO SUBDIVISION GRADE CONTROL PLAN

Prior to acceptance of the subdivision by the Town, any requests for revision to the Subdivision Grade Control Plan to accommodate proposed or as constructed deviations from the plan, shall be made in writing by the design Consultant to the Town.

A revision will only be granted by the Town if deemed reasonable.

A fee shall be charged to the Subdivider for any revisions required in this regard; the amount of the fee shall be dependent upon the extent of the required revisions.

### 8.3.5. GRADING REQUIREMENTS PRIOR TO BUILDING PERMITS

The Consultant shall certify that the following grading works shall be completed prior to the issuance of any building permits:

- Installation, to grade, of all rear yard catchbasin including connections to the main sewers;

- Rough grading of all lots and blocks to generally conform to the Subdivision Grade Control Plan;

- Construction and sodding of all drainage swales and other erosion control devices deemed necessary.

### 8.3.6. AS-CONSTRUCTED DETAILED LOT GRADING PLAN

Upon completion of the grading as noted in the above section, prior to landscaping or fencing, the Builder shall be required to submit to the Town one copy of the As-constructed Lot grading plan which shall indicate the finished elevations of the grade control points.

This "As-constructed Detailed Lot Grading Plan" shall be prepared and certified by a Professional Engineer or an Ontario Land Surveyor.

## 8.4. TECHNICAL REQUIREMENTS FOR SUBDIVISION GRADE CONTROL PLANS

Subdivision Grade Control Plans shall be prepared in conformance with this section, and with regard to the Design Guidelines set out in the following sections of the policy. All elevations are relative to the geodetic benchmark elevation(s).

The subdivision Grade Control Plan shall be prepared at a scale of 1:500, be on a standard A1 (596mm X 841mm) size sheet, and clearly illustrate the following:

- Legend, north direction, name of subdivision, location, description and elevation of geodetic benchmark(s), date of preparation of plan and any subsequent revisions clearly identified in the revision column;

- Property boundaries and lot and block numbers or designations;

- Existing and proposed contours and elevations;

- Existing elevations and drainage from lands adjacent to the subdivision and, if the drainage from these lands is towards the proposed subdivision, the existing information shall be obtained to the high point of this drainage or at least to the adjacent street;

- Location of sewer maintenance holes, hydrants, sidewalks, catchbasins, and rear yard catchbasins;

- Proposed elevations at the centre line of the finished road and relative data showing distances and slopes between these elevations;

- Existing and proposed ground elevations at the corner of each lot or block with suitable intermediate elevations as required;

- Existing and proposed ground elevations at the house, apron at front and rear of house or top of foundation (in order that not more than 0.3m of the foundation is exposed);

- Location, elevation, and longitudinal slopes at the invert of swales together with rear yard catchbasins elevations and drainage arrows showing the direction of swale drainage;

- Any drainage obstruction such as berms, retaining walls, sound barriers, silt traps, vegetation, etc.

- Existing trees and vegetation, as they affect proposed drainage and catchbasin schemes, and which are to be saved;

- If any lots or blocks are not suitable for the construction of certain types of buildings or features (i.e. split-levels, walkout basements, etc.) because of the sanitary sewer depth, grading and drainage pattern, this should be clearly indicated on the plan and appropriate apron elevations shown.

- Downspout discharge locations (front & rear)

- Sump Pump Discharge (rear)

## 8.5. TECHNICAL REQUIREMENTS FOR DETAILED LOT GRADING PLANS

Detailed Lot Grading Plans for individual lots shall be prepared in conformance with this section, and with regard to the Design Guidelines set out in the following section of the policy.

- The plan shall be at a scale of 1:200

- The plan shall be on legal size sheet, or a standard A1 size sheet if required.

- The plan shall include the identification and certification information.

- The plan shall clearly illustrate the following:

    - Shape and dimension of lot;
    - House location and shape (type);
    - Abutting street names;
    - Existing or proposed curbs, catchbasins, sidewalks, utility plant, hydrants, driveway location(s) within the municipal road allowance;
    - Proposed walkways, patios, decks, porches, chimneys, environmental control units (air conditioners, heat pumps, etc.), swimming pools, etc.;
    - Existing tree's – to be saved and to be removed.
    - Location of proposed entrances, outside stairwells and window-wells;
    - Location of easements for rear yard catchbasins and leads or other utilities.

Drainage and Grading Information

- Specific lot grading with drainage arrows to indicate direction of surface drainage flow;
- Location and direction of flow of swales;
- Existing or proposed geodetic ground elevations at each corner of the lot, at high and low points, at changes in slope of ground, where a change in the direction of low occurs, at the corners of the house, and at entrances to outside stairwells;
- Existing or proposed elevation of the centre line of road, sidewalk or top of ditch abutting the subject lands;
- Elevations of top of foundation and apron elevations;
- Elevation for finished garage floor and entrance elevations, if different from floor elevations;
- Elevation of the rim of any rear yard or on site catchbasin(s) to which flow form the lot is directed;
- Ground elevations on adjacent lands, if drainage is to cross these lands to a catchbasin or other outlet on these lands;
- Location of downspouts and direction of discharge. (NOTE: NO downspouts shall be directed so as adversely affect adjacent property or outlet directly to driveways);
- Location of terraces and retaining walls;
- Any slope which exceeds three horizontals to one vertical, including side slopes of swales;
- Elevation of top step of outside stairwells (to be a minimum of 150mm above the adjacent ground).
- Location of sump pump discharge (rear).

## 8.6. DESIGN GUIDELINES FOR SUBDIVISION LOT GRADING

The following guidelines should be considered when designing the grading on lots.

- All surface drainage, including downspout discharge, shall be directed away from the building(s), including adjacent existing or future building.

- Unless otherwise stipulated, the lot shall have a minimum slope of 2% and a maximum slope of 6%. Average slopes between 6% and 10% can be achieved by combining a 6% maximum slope with a 3 to 1 slope at the rear of the lot/block

- Should the average slope exceed 10%, the Town's Public Works department may require a retaining structure to reduce the grade differential to an acceptable amount. Notwithstanding the above,

elevation changes exceeding one metre in height shall require a retaining structure.

- The maximum slope between the dwelling unit and the side property line shall be 3 to 1. Otherwise, appropriate steps or retaining structures shall be required.

- Difference between top of foundation elevation and the apron elevation should be between 0.24 and 0.30m.

- Terraces between lots shall be located on the lower lot with the top of the terrace slope at the lot line.

- Drainage flows shall be confined to defined swales which shall be located as far from the dwelling units as possible.

- Swales shall have a minimum grade of 1% and a maximum grade of 6%.

- The swale depth shall not exceed 500mm.

- The side slope of swales shall not be steeper than 3 to 1.

- The alignment of swales shall not change more than 45 degrees unless otherwise approved.

- Rear yard swales shall be located:

    - Centered on the rear lot line if adjoining lots are within the same subdivision;

    - Entirely on the subject lot if the adjoining land is outside the subdivision.

- The maximum length of a rear yard swale from the high point to the outlet (rear yard catchbasin or another suitable outlet) shall be 60 metres unless otherwise approved. This maximum length of swale may be varied at the discretion of the Town depending on the lot size, topography, and drainage area.

- The maximum flow allowed in a side yard swale shall be that from two backyards. If backyards are of a usually large size, the Town may require that drainage be directed by rear yard swales.

- Generally speaking, all semi-detached and minimum sized lots shall have rear lot drainage schemes. Side yard swales shall only be permitted with approval of the Town, if the construction of such swales can be accommodated properly.

- The minimum grade on driveways shall be 2%. The desirable maximum grade on driveways shall be 8% with an absolute maximum grade of 10%.

- Depressed driveways sloping toward the dwelling units are not allowed.
- Side and back entrances and stairwells shall not be located adjacent to main swales or downspouts.
- Window-wells should preferably be avoided but where they are required, special care shall be taken to ensure that surface water form overland flow and other sources such as downspouts shall not enter these wells. The edge of the window-well shall be higher than the adjacent ground.
- The brick-line must be at least 150mm above the finished grade.
- Downspouts must discharge via splash pads (concrete or other suitable material to grass surfaces). These splash pads shall extend a distance at least 1 metre away from the building.
- Downspouts must direct the flow away from the building, not onto walks or driveways and not onto adjacent property.
- All lot grading must conform to “split” drainage design unless otherwise approved by the Town.

# APPENDIX 1 – LANDSCAPING STANDARDS

## 1.1. LANDSCAPE GUIDELINES FOR DEVELOPMENT

## 1.2. LANDSCAPE & MAINTENANCE GUIDELINES FOR SWM PONDS AND FACILITIES – PW DRA-004A

## 1.3. STREET TREE GUIDELINES

# 1.1.
# LANDSCAPE GUIDELINES FOR DEVELOPMENT

# Landscape Guidelines for Development Applications
# Niagara-on-the-Lake

**Introduction:**

Landscaping has fundamentally become an essential and integral part of urban design as it fulfills important physical, environmental and ecological functions. These functions are considered indispensable to achieving a healthy and invigorating lifestyle, which provides recreational, educational, aesthetic and environmental benefits to residents.

Municipalities often influence the shape, size, form, pattern and maintenance regime of the urban landscape by following simple landscape management options that are enforceable through various regulatory tools such as, zoning controls, site plan and sub-divisional control agreements, and awareness campaigns.

This Landscape Guidelines serves as a guide for landscaping developments associated with site plans, sub-divisions, and includes requirements for streetscapes, parking areas and certain types of buildings.

**Limitations:** The Landscape Guidelines provides a reference framework to assist applicants during the development review process. The plan is intended to encourage a higher level of landscape quality while at the same time providing the necessary flexibility to encourage creativity. While establishing minimum landscape design standards, it is not the intent of the Landscape Guidelines to dictate specific planting styles, themes or arrangements.

The Landscape Guidelines is to be applied to all development projects.

The Landscape Guidelines do not address the following:

1. Wetland, ravines, ponds & streams and agricultural lands.
2. Hydro right-of-ways, vacant railway lands, vacant or underutilized lots and road allowances other than within a site plan or subdivision proposal.
3. Regional parks, trail systems, sports parks, neighbourhood parks, theme parks and other park systems.
4. Rural and Urban roads systems, pedestrian ways and other transportation routes other than those that fall within a site plan or subdivision proposal.
5. Preparation, installation and maintenance methods for tree types and plants listed or recommended in the Guidelines.

If any of the above were to form part of a site plan or subdivision on which a developmental approval is applied for, the applicant will be required to consult with the of Director of Planning & Development Services and internal staff regarding the landscape treatment of these elements.

# A. Landscape Requirements and General Guidelines

**1 Basic Requirements** A Landscape Plan, submitted as part of a development application, shall be a detailed and comprehensive plan that adequately demonstrates the desired landscaping program in terms of location, size and scale, function, theme and similar attributes. The plan shall provide the Town with a clear understanding of the landscaping program. Following the basic principals of preparing Landscape Plans, the applicant will:

1.1 Formulate plans on the basis of these Guidelines.
1.2 Aim to conserve natural areas and resources.
1.3 Maximize natural water storage and infiltration opportunities within the landscape unit.
1.4 Protect slopes and channels during landscape design.
1.5 Include a tree protection plan, as required.

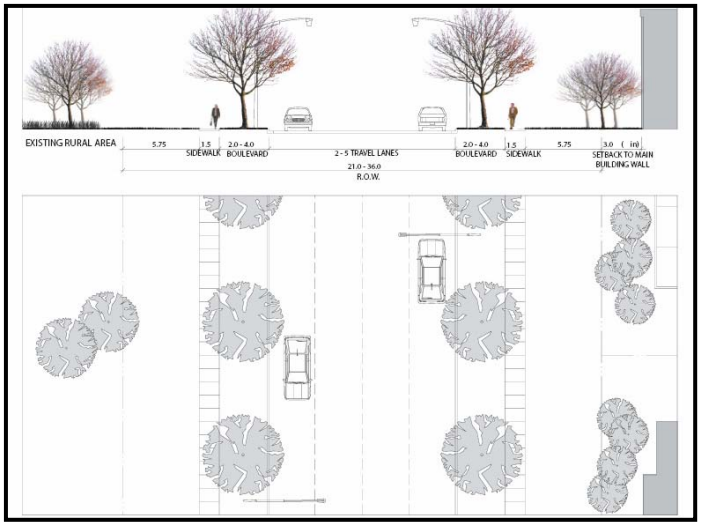
**2 Purpose of the Landscape Guidelines**

The purpose of the Landscape Guidelines is to establish requirements for achieving:

2.1 A healthy and attractive environment, in accordance with recognized urban design principles and horticultural & environmental management practices, with the objective of promoting and protecting the natural identity of Niagara-on-the-Lake.
2.2 A safe pedestrian environment.

**3 Submission Requirements** Five sets of landscape drawings are to be submitted along with the application for Site Plan Control. For Subdivisions approval of a Landscape Plan will be required for street trees, parks and public spaces.

3.1 Refer to the Development Guide for;
3.1.1 Details on submission, format and specifications of the Landscape Plan requirements,
3.1.2 Details on information to be provided on the Landscape Plan.




**4 General Design Requirements**

4.1 Where these Guidelines come in conflict with the Town Zoning By-law requirements the Town Zoning By-law shall prevail.
4.2 In urban areas, include in your design, a 1.5-metre public sidewalk along the entire length of the property's street frontage.
4.3 Lighting may form part of the Landscape Plan. Lighting Plans for building and streets are also to be submitted separately, indicating type and specification.

4.4 Prepare your Landscape Plan keeping in mind the recommendations outlined in the Glendale Urban Design Study, Village of St. David's Urban Design Guidelines, Virgil Streetscape Plan, Queenston Secondary Plan and Queen Picton Heritage District Conservation Plan, if your property is located in any of these areas.

4.5 Include in your plan a schedule showing the number, type of trees, plants and shrubs and their size specifications.

4.6 Depict boundary and width dimensions of all proposed planting beds.

4.7 Integrate open space design into the plan i.e. playgrounds, easements.

4.8 Trees and shrubs shall be planted so that at maturity they do not interfere with under/above ground services and safety sight areas. Consideration should be given to impact on adjacent property.

4.9 Impending damage to public infrastructure due to spread of tree root systems must be a consideration.

4.10 Trees that have a life span of more than 60 years, are clean, strong, and insect and disease resistant are preferred.

4.11 Include slope treatment, if required, to contain erosion and reduce runoff.

4.12 No permanent structures, except signs, sidewalks, benches, utility boxes and footpaths may be located in landscape strips or buffer areas.

## B. Landscape Design Guidelines

These Guidelines are to be applied where possible on all streets, boulevards, medians, sight triangles, parking areas, residential and non-residential developments and will include buffering, screening, foundation planting and front and rear yard landscaping.

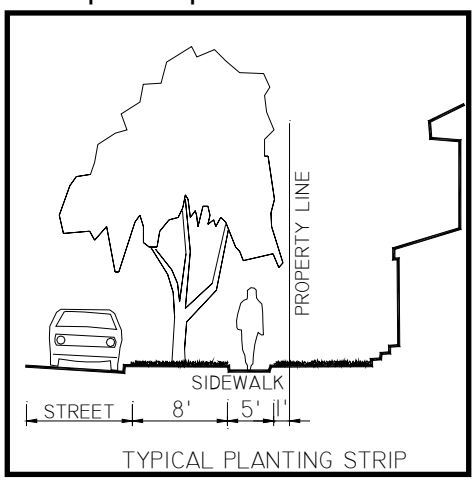
**1 a) Streets & Boulevards**

Many factors affect design along streets, which include: extent of use by pedestrians, speed and volume of vehicular traffic, shape and size of sidewalk and function and intent of the street. A good Landscape Plan should be designed to maintain the use and character of the street. The following are recommended, (Refer to spacing standard where necessary).

1.1 Use deciduous tree species with a minimum 50mm (2 inches) caliper to align both sides of a public and at least one side on a private street. Plant trees in a row to create a continuous street edge even where the width of the right of way varies. Use different species with similar characteristics, i.e. color and form.

1.2 Planting should not be random in pattern or choice of tree species. Depending on the species, location and function, the recommended distance between trees along public streets is 9.00-12.00 metres (30-40 feet), with spacing adjusted for driveways, signposts, hydrants and light poles as required.

1.3 The width of the boulevard on either side of the paved portion of the road should dictate the type and form of trees to be planted. For example, a narrow width will suggest the use of tree species with a narrow form at maturity.




1.4 Trees planted along pedestrian corridors should have a tall canopy to allow visibility at pedestrian level. Similarly all street trees shall be selected and planted to maintain vehicular sight distance.

1.5 Trees selected for lining commercial properties should minimize obstruction of views to retail signs, and have appropriate form and character to enhance the look and appeal of the property.

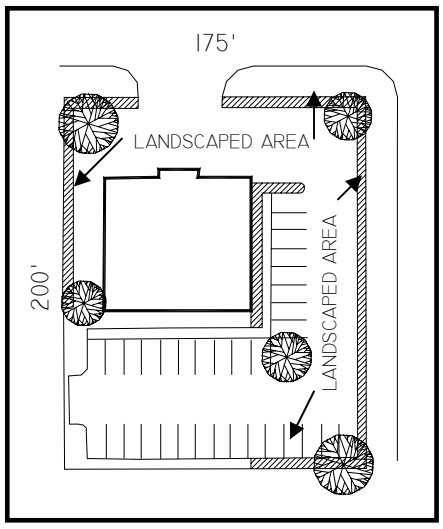
1.6 Street trees should not obstruct views of traffic lights, traffic signs and notices and directions intended for traffic view.

1.7 Tree planting should be avoided on utility easements. If trees come in conflict with signs, utility boxes, light poles, hydrants etc, adjust choice of trees to suit conditions.

1.8 Specific spacing of street trees may be dependant on site conditions. Refer to table 1 for further details.

**b) Street Interface Landscaping Treatment (**On Regional Roads and Provincial Highways)

Street interface treatment will be required for all non-residential and multi-residential developments that front on Regional Roads or Provincial Highways and are located across the street or adjacent to a residentially zoned area. Due to their high traffic location and visibility, enhanced landscaping will be required for these developments in addition to the overall landscaping requirement as outlined under section 9.2 and 9.3, of these Guidelines. Landscaping is primarily to be concentrated in the front yard but landscaping along yards that have a visible sight line from the street is acceptable, if the area constituting the front yard is insufficient to accommodate the entire landscaping requirement under this section.




1.1 Based on the premise that the deeper the lot, the greater is the potential for landscaping along the frontage, the following is recommended:

1.1.1 For lots upto 60 metres (200 feet) of depth, 2.44 $m^2$ (8 $ft^2$) of landscaping is required per linear frontage of the lot.

1.1.2 A subsequent increase of an additional 1.52 $m^2$ (5 $ft^2$) of landscaping per linear frontage of the lot is required for every 30 metres (100 feet) increase in lot depth.

1.2 Parking in the front yard should be minimal and screened from view by appropriate landscape.

1.3 One (1) shade tree or two (2) ornamental trees for every 46 $m^2$ (500 $ft^2$) of landscaped area should be planted with the option of substituting the above with 10 and 5 shrubs for each type of tree, as long as the substitution does not exceed 1/3 of the tree requirement.

1.4 Landscaping in the rest of the area may constitute ground cover, shrubs and other planting material.

1.5 If a residential use abuts the property a 3 metres (10-foot) vegetative buffer strip will be required along the abutting property line, in addition to the required landscaped area.

## 2 Medians Sight Triangles and Sight Lines

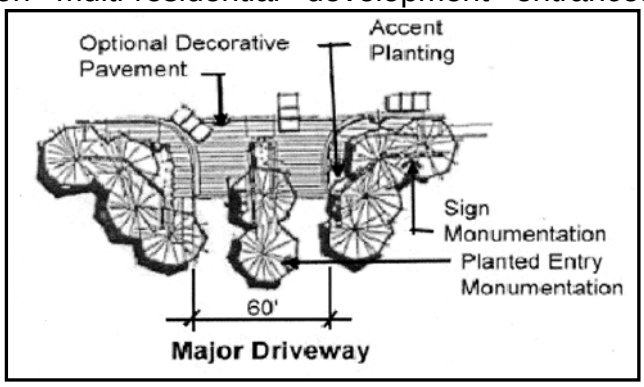
In a subdivision or multi-residential development the landscape elements within a median should include planting of large-scale trees, shrubs, ground cover and hardscape areas. Maintenance of medians sight triangles and sight lines within the subdivision and multi-residential sites is by the developer, resident association, or owner.

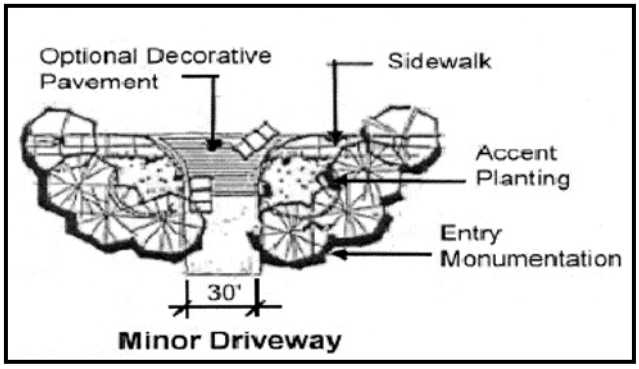
2.1 Central medians at subdivision multi-residential development entrances should be developed using low shrubs and plants, not more than 80cm (30 inches) in height at maturity.

2.2 Shrubs and ground covers on medians should be planted keeping in mind traffic safety and visibility and limited to 80cm (30 inches) in height.

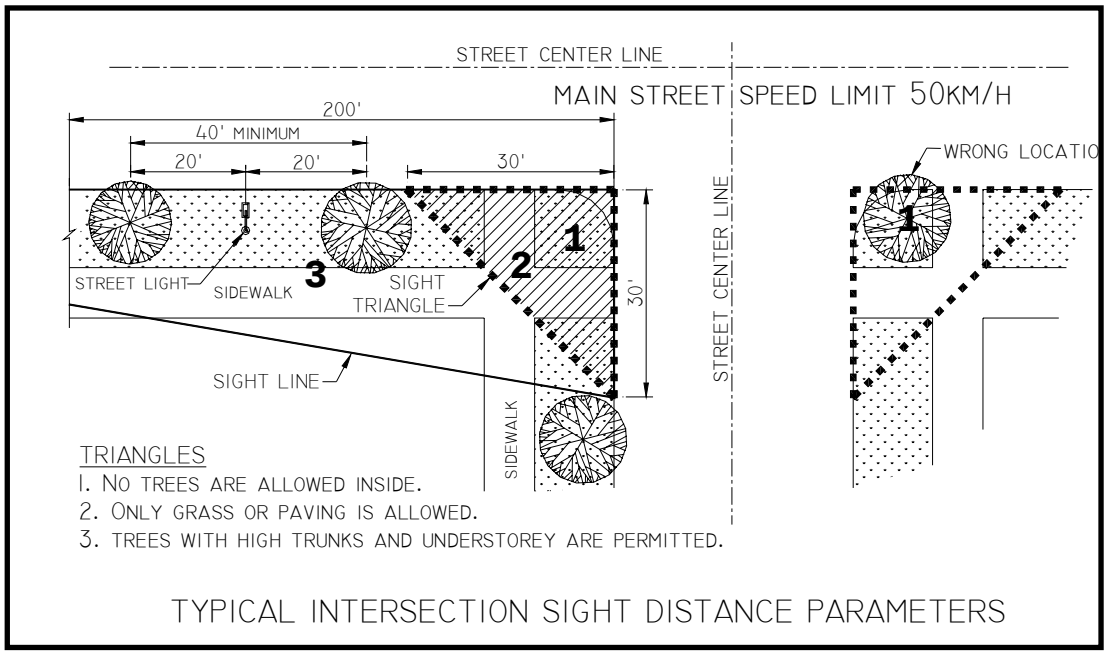
2.3 Landscaping of at least 75 % of the medians is encouraged at major entry points in conjunction with decorative paving treatment within the entry and exit lanes.

2.4 Trees or high shrubs should not be planted closer than 9 metres (30 feet) from the intersecting curb face at the intersection and street corners within the sight triangle.



2.5 The distance of sight lines along a main street intersection will depend on the speed limit posted on the street. For example, for a 50 kilometer/hr posted




speed limit the distance of the sight line along the main street is 60 metres (200 feet). With the exception of deciduous trees with high canopy cover, only shrubs up to 80cm (30 inches) are permitted within the sight line. The Town Public Works department should be consulted on the sight line dimensions if required.

## 3 Parking Lots

Landscaping of parking lots is done to reduce potentially negative visual effects and to enhance the aesthetic effects of the parking lot.

**a) Tree Planting**

3.1 Provide landscaping to achieve a minimum 50% shade, at maturity, in parking lot by providing medium or large-scale trees at 12-15 metres (40-50 feet) apart within raised planting beds.

3.2 A large scale tree with an approximate 15 metres (50 feet) canopy spread is to be planted to provide shade along parking perimeters while a medium scale tree with a canopy spread of 10-12 metres (35-40 feet), is recommended on end parking islands and dividing medians between two parking bays.

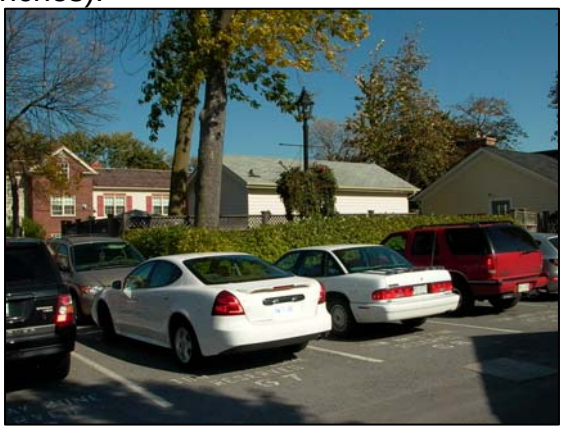
3.3 For landscaping of interior parking lots refer to table 2 attached.

**b) Shrub Planting** (Screening)

New parking lots or additions to parking lots in non-residential, multi-residential and other developments that are adjacent to arterial roads, collector streets and highways must be screened. Screening is also essential if the development is across a street from a residential zone. The interior of parking lots that are required to be screened also need to be landscaped with trees if the parking lot has more than 15 parking spaces along a single row.

3.1 Where parking faces a major public street, landscaping in combination with low walls, decorative berms and shrubs should be used for screening.

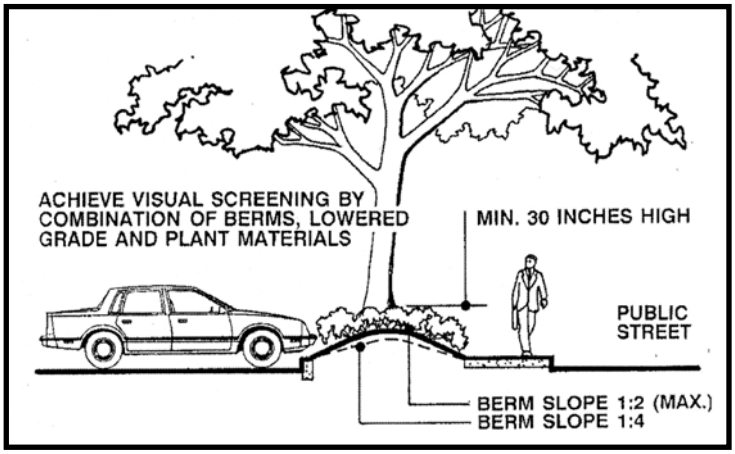
3.2 Parking screens (shrub screen) should be planted between sidewalks and parking areas and between streets and parking lots, and have an eventual maturity height exceeding 80cm (30 inches).



3.3 Planting of parking lot shrub screens along the entire length of the parking lot frontage is preferred. Where it is not possible, due to ground conditions, to provide a screen along the entire frontage, such planting should be no less than along 2/3 of the frontage.

3.4 A width of 1.82 metres (6 feet) separation between the lot line and parking lot should be maintained, where possible, to allow for effective shrub and tree planting.

3.5 Structures, walls or fences may also be used either individually or in combination to achieve the same results as landscaping, but their height is to be restricted to 1.828 metres (6 feet) except along the frontage where its height is to be no more than 90cm (36 inches).




3.6 Screening may also be achieved by a combination of berms, lowered grade and plant material with a height exceeding 80cm (30 inches) at maturity.

3.7 All parking areas with five or more parking spaces must be screened from residential or public land use like parks, playgrounds, streets etc.

## 4 Buffering Requirements

Vegetative landscape buffers are required along the rear and side boundaries of non-residential development adjacent to residential zoned areas. Multi residential dwellings will also be required to provide vegetative landscape buffers when the

development is adjacent to single detached or semi-detached residential areas. Buffering is to be used to screen above ground structures or objects. In addition to perimeter walls and fences, hedges and trees are also required. One tree is required for every 6 metres (20 feet) of linear distance of the buffer length. Also see bufferyard landscaping under Multi-residential.

4.1 For an effective interface between commercial/industrial and residential uses, a 3 metre (10 ft.) wide vegetative landscaped buffer is required.

4.2 All interface buffering between commercial/industrial/agricultural uses and residential uses shall provide 1 large-scale tree for each 18.5 $m^2$ (200 $ft^2$) of landscaped area.

4.3 When an earth berm is used as a buffer, the height shall be a minimum of 1.5 metres (5 feet) with a 2:1 slope that is appropriately landscaped with plant material suitable to manufactured slopes.

**5 Screening:** Screening forms an integral part of an urban landscape and is required to screen above ground essential utility fixtures, storage and collection centres, service station and parking lots from residential property. It may also be effectively used to screen buildings for purposes of privacy, noise reduction and aesthetics.

**a) Storage Areas and Above Ground Services**

5.1 All above ground utility equipment, storage facilities, trash and garbage enclosures and other collection areas should be adequately landscaped by means of a wall, fence or landscaping or a combination thereof. In case of usage of masonry wall, vines may be required. Fences used for screening will be limited to a height of 1.8 metres (6 feet.)

5.2 A 1 metre (3 feet) wide planting area adjacent to above ground utility equipment such as backflow devices and elevated utility boxes may be provided for adequate screening.

5.3 75% of above ground equipment is to be screened.

5.4 Avoid planting large trees or trees with a deep and large root spread near or above ground utility boxes, services and hydrants.

5.5 Enclosures designed for garbage collection centres on properties designated, under Part IV and V of the Ontario Heritage Act will require a Heritage Permit.

**b) Foundation Planting.** The screening of building edges can be achieved by using low growing planting material such as flowering plants and shrubs which will soften the vertical scale of the building.

5.1 Avoid asphalt edges at base of buildings and establish aesthetically appealing plant bases that enhance the architecture of the building

5.2 Foundation planting areas adjacent to the building edges are recommended to be a minimum of 1.5 metres (5 feet) wide and should include a combination of ground cover, shrubs and flowering plants.


**c) Parking Screens**: See Section 3(b) Parking Areas- Shrub Planting.

## 6 Service Stations

6.1 On a corner lot, a minimum area of 14 $m^2$ (150 $ft^2$) is to be landscaped at the street corner sight triangle location. Heights of ground cover plant material should be no more than 80 cm (30 inches).

6.2 On a lot within a commercial centre, a 1.5 metres (5-foot) wide planting bed is to be provided along 2/3 of the interior perimeter boundaries and a 3 metres (10-foot) wide bed along all street property lines. Beds should be planted with plants that have multi-season interest.

6.3 1 medium scale tree is to be provided for every 18.5 $m^2$ (200 $ft^2$) of landscaped area.

## 7 Service Areas

7.1 A see-through buffer, which functions as a partial visual separator to soften the appearance of loading and service areas is recommended.

7.2 A mix of low canopy type deciduous trees, coniferous trees and broadleaf evergreens can also be used as an effective screen for service areas.

7.3 Where berms are used for screening the slope shall not exceed 2:1.

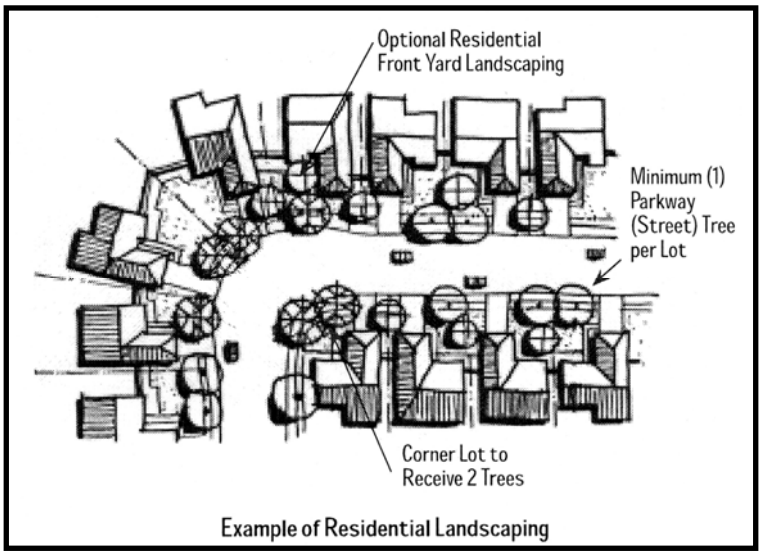
## 8 Loading Bays

Loading bays shall be fully screened from residential properties and from street view using one or a combination of the following methods.

8.1 Orient the building design and layout to screen loading bays from adjacent residential properties and right-of-ways;

8.2 Provide a 3-metre (10 ft.) wide and a minimum 1.5 metre (5 ft.) high vegetative landscape buffer between subject property and adjacent residential properties and right-of-ways. Buffers may include a combination of fencing or landscape berms not less than 2 metres (6 Ft.) in height.

**9 Residential**: Generally, in all residential areas, whether single/semi-detached, multi-residential or mobile home park, the landscape along streets should include at least one medium or large-scale tree per lot and two medium or large-scale trees per corner lot. Emphasis should be given to create a 'characteristic' type of planting in a symmetrical pattern.

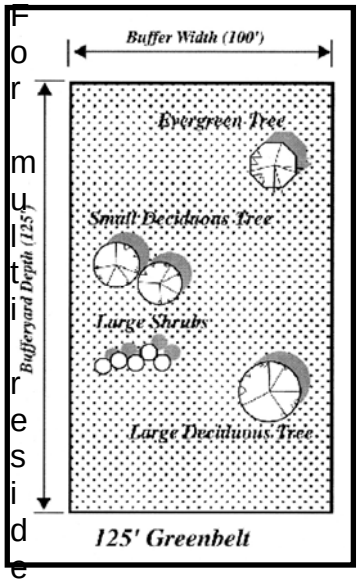


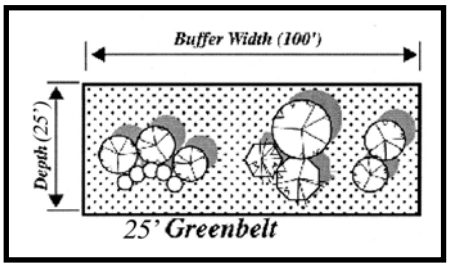
Example of Residential Landscaping

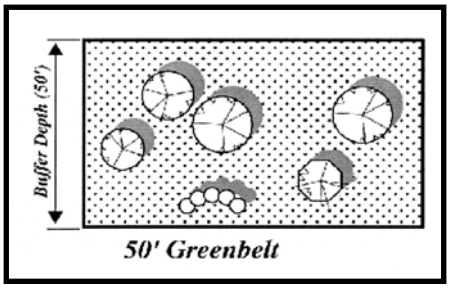
9.1 **Single Detached Residential**. (Residential Streets). While front yard landscaping is optional for residential lot owners, a site plan or subdivision plan that provides for single detached residential lots should have at least one medium to large-scale street tree per lot and 2 street trees per corner lot.

9.2 **Multi-Residential**:

9.2.1 A 25% minimum landscaped area is required for Multi-residential area.




For multi-residential units, where an interface is required with a single or semi-detached residential zone, the bufferyard should be adequately landscaped and evenly distributed with deciduous trees and coniferous evergreens grouped together in groups of no less than three trees. Shrubs should be in groups of no less than five.

9.2.2 The diagrams given above are illustrations to show that the intensity and scale of landscaping treatment of bufferyards depends on its width and depth. A narrower bufferyard will require greater intensity of

landscaping with a cluster type of tree and shrub arrangement, while larger bufferyards can have a more dispersed tree and shrub arrangement.

9.2.3 Bufferyard landscaping will also be required in yards occupied by water retention ponds and Storm water facilities.

9.2.4 The intent of landscaping bufferyards in multi residential units is not to totally obscure the buildings, but to create a softening effect.

9.2.5 Front yard landscape treatment should include a clustering of trees and shrubs around well-prepared planting beds.

9.3 **Non-Residential.** The landscaping requirements for all non residential uses (commercial, industrial and institutional areas) will vary from site to site and may require additional landscaping or landscape setbacks in order to provide upgraded landscape elements along a designated traffic corridor, parking lots, outdoor storage and collection centres. These may be in the form of screens, foundation planting, manufactured slopes and buffers to act as an interface between conflicting land uses. Where the Town Zoning By-law indicates a higher landscape cover than recommended below, the percentages indicated in the Zoning By-law are to be followed.

9.3.1 **Commercial.** As a general rule, a minimum of 20% of all developed properties in commercial areas are required to be landscaped, with the exception of civic centres where 25% is to be landscaped. It is noted that this minimum standard may not be achieved within the core areas of the Old Town, Virgil and St. Davids.

9.3.2 **Institutional.** As a general rule, a minimum of 20-25% of all developed property in Institutional areas is required to be landscaped.

9.3.3 **Industrial**

9.3.3.1 As a general rule, a minimum of 20% of all developed property in industrial areas is required to be landscaped with the exception of the business parks where a Landscape Plan is to be formulated in consultation with and approved by, Director Planning & Development Services.

9.3.3.2 All cargo containers, loading bays, storage areas, machinery and above ground utilities and services are to be visually screened off from a street. A 3 metres (10 ft.) wide vegetative landscaped buffer planted with coniferous evergreens and screening plants should be used to screen adjacent property.

9.3.3.3 Where industrial development abuts an arterial or Collector Street, the building setback as per zoning By-law should be completely utilized for landscaping with the exception of entranceways and signage.

9.3.3.4 Where industrial development does not abut an arterial or Collector Street, the building setback as per zoning should also be utilized for landscaping.

9.3.3.5 Landscape open spaces that serve as outdoors amenity areas for industrial staff with appropriate screens/trees/plants.

9.4 **Surface treatments.** Ground level treatments will include irrigated and non-irrigated turf, organic and non-organic mulches and low-height plant materials–ground covers, annuals and perennials. Functional inter-relationship between type and use should be appropriately defined. For example,

9.4.1 **High foot traffic and recreation areas** should be considered for growing turf suited for such abuse. Turf should provide the ground cover for medians, tree lawns, setbacks and landscape strips to an extent of 50%. The remainder may consist of planting bed area with at least a 75% plant cover at maturity, paved walkways, play areas etc.

9.4.2 **Ground cover** in combination with appropriate shrub planting in lieu of turf is to be used for solving problematic conditions such as steep slopes, irregularly shaped areas and for providing visual linkage of different plant types and sizes.

9.4.3 **Mulches** can be provided in all non-turf planting areas to a minimum depth of 75mm (3 inches) and non-organic mulches such as gravel, rock, cobbles and stones may be provided in areas of high wind.

# TABLES

## TABLE # 1 Recommended Spacing Standard

| **Object** | **Spacing/Distance/Area** |
|---|---|
| Tree interval along streets | 9-12 mts. (30-40 feet) |
| Tree from intersections (corner triangles) | 9 mts. (30 feet) |
| Tree from fire hydrant | 3 mts (10 feet) |
| Tree from street light | 4.5 mts (15 feet) |
| Tree from service walks, driveways and utilities | 1.5 mts (5 feet) |
| Tall shrubs 3-6 mts (10-20 feet) | Space 1 plant every 2 mts (6.5 feet) |
| Medium shrubs 1-2 mts (3-6 feet) | Space 1 plant every 1 metre (3.28 feet) |
| Small shrubs and Groundcover < 1 mts (3) feet | Space 1 plant every 0.5 metre (1.6 feet) |
| Tree interval in parking areas | 12-15 mts (40-50 feet) |
| Tree along Medians | 40 feet (1200 $ft^2$. of median space) |
| Trees along public streets adjacent to single detached or Semi-detached residential units | One every lot frontage<br>Two trees for every corner lot |
| Trees along perimeters of sites that act as buffers (Make appropriate choice to suit purpose) | 1 tree every 20 feet apart on a 3 metre (10 feet) wide raised planting bed. |
| Screening of services, loading bays etc<br>(Make appropriate choice to suit purpose) | Evergreens @ 3 metres (10 feet) apart on a 3 metre (10 feet) wide planting bed. |
| Non/multi- residential (interface) front yard | 1 shade/2 ornamental tree every 500 $ft^2$. |
| **Tree Setback** | **Distance** |
| On major arterial road | 6 mts. (20 feet) |
| From edge of driveway | 1.5 mts (5 feet) |
| From stream or designated fish habitats | 7.5 metres (34 feet) |
| **Object Distance** | **Height** |
| Plants/shrubs within sight distance triangle | Less than 80cm (30 inches) |
| Screens for parking (screening from public road) | More than 80cm (30 inches) |

| **Street trees on landscape strips** | **Utility location** | **Minimum tree planting interval** | **Tree Type** |
|---|---|---|---|
| Where no sidewalk exists, trees to be 1.2-1.5 mts (4-5 feet) from street pavement | Buried utilities<br><br>Overhead | 9-12 mts. (30-40 feet)<br><br>4.5-6.0 mts (15-20 feet) | Large<br><br>Small |
| Where detached sidewalk exists with width of Landscape Strip >2.4mts (8 feet) | Buried utilities<br><br>Overhead | 9-12 mts. (30-40 feet<br><br>4.5-6 mts (15-20 feet) | Medium<br><br>Small |
| Where detached sidewalk exists with width of Landscape Strip 1.8-2.4 mts (6-8 feet) | Buried utilities<br><br>Overhead | 7.6-9 mts (25-30 feet)<br><br>4.5-6 mts (15-20 feet) | Medium<br><br>Small |
| Where detached sidewalk exists with width of Landscape Strip 1.2-1.8 mts (4-6 feet) | Buried utilities<br><br>Overhead | 4.5-6 mts (15-20 feet)<br><br>4.5-6 mts (15-20 feet) | Small<br><br>Small |

# TABLES

## TABLE # 1 Recommended Spacing Standard-Continued

| | | | |
|---|---|---|---|
| Where attached sidewalk exists trees to be planted 1-1.5 mts (3-4 feet) from sidewalk if possible. | Buried utilities<br><br>Overhead | 9-12 mts. (30-40 feet)<br><br>4.5-6 mts (15-20 feet) | Large<br><br>Small |
| **Miscellaneous** | | | |
| Minimum tree caliper/size on streets at time of planting | | 50mm (2 inches) | |
| Spread of tree at mature height for parking areas with not more than 1/3 overlap of foliage | | 15 metres (50 feet) canopy spread for parking perimeter<br>10-12 metres (35-40 feet) canopy spread for end island planters | |
| End island in parking lot that requires a tree | | 15 parking spaces | |

## Table #2
## Recommended - standards for Interior parking lots

| **Parking lot size** | **No. Of double loaded rows** | **Minimum % to lot landscaping** |
|---|---|---|
| 15 spaces or less | None | Optional |
| 16-160 spaces | None | 5 % |
| More than 160 spaces | One | 5 % |
| | More than one | 10% |
| 120-149% of minimum required spaces | None | The above plus 5% |
| 150 or more of minimum required spaces | None | The above plus 10% |
| For every 18.5 $m^2$ (200 $ft^2$) of internal parking lot landscaped area | | One large-scale tree.<br>75% of required trees to be large/ medium scale |
| For every six parking spaces | | One tree |
| Distance of trees from curb or planting edge | | 1 mts (3 feet) |

# DEFINITION

Unless otherwise specifically defined in the context of this document the definition of the following shall be:

| | | |
|---|---|---|
| 1 | **Bufferyard** | An open space in a multi-family residential development between the building and the adjacent property line of a single detached or semi-detached residential zone. It could be either at the rear or at the sides of the multi-family residential building. |
| 2 | **Buffer Strip** | A strip of land (often including undisturbed vegetation) where structures are not allowed and normally constitutes an open space normally used as an vegetative interface to resolve conflict between different and diverse land uses and along or adjacent to roads, trails, watercourses and recreation sites with the intent to preserve or enhance aesthetic and fulfil other required functions. |
| 3 | **Berm** | A strip of mounded topsoil which provides a visual screen. |
| 4 | **Ground Cover** | Planting material that generally does not exceed 30cm (12 inches) in height and will provide 100% surface coverage within two growing seasons of initial planting. |
| 5 | **Landscaped Area** | Planting area set apart for planting grass, shrubs, trees or similar living material, including land in an arcade, plaza, parking lot or pedestrian area. |
| 6 | **Landscape Strip** | Any part of a public or private street right of way lying between the pavement/curb and the property line but does not include the sidewalk. |
| 7 | **Parking Lot** | An off street, ground level open space used for the temporary parking of motor vehicles, including necessary access drives, lanes and parking stalls, but does not include car ports garages or driveways that serve detached residential dwelling units, parking garages and structures. |
| 8 | **Parking Lot Landscape Interior** | Landscape that is within or extends into the parking lot but excludes landscaping that is required in any setback area, landscaped area between the building and the parking lot that does not extend into the parking area. |
| 9 | **Tree- Ornamental** | A small tree of shade, beauty and of landscape value intended to provide an aesthetically enhanced landscape due to its ornamental qualities |
| 10 | **Tree- Small** | A tree that normally attains a height of less than 9 metres (30 feet) at maturity. |
| 11 | **Tree- Medium** | A tree that normally attains a height ranging between 9-18 metres (30-60 feet) at maturity. |
| 12 | **Tree- Large** | A tree that normally attains a height of more than 18 metres (60 feet) at maturity. |
| 13 | **Tree-Shade** | Trees that are normally decidious, have a large canopy spread and provide sufficient shade as a result of its form/habit. |

# 1.2.
# LANDSCAPE & MAINTENANCE GUIDELINES FOR SWM PONDS AND FACILITIES – PW DRA-004A

TOWN OF NIAGARA-ON-THE-LAKE

# POLICY

*POLICY NO.* **PW-DRA-004A**
*SUPERSEDES NO. PW-DRA-004*

TITLE: ***Landscape & Maintenance Guidelines for Stormwater Management Ponds & Facilities***

APPROVAL DATE: **April 10, 2006**
EFFECTIVE DATE: **April 11, 2006**

PURPOSE:
To establish a landscaping ***and maintenance*** policy for open storm water management pond facilities.

POLICY STATEMENT:
Landscaping designs for storm water management ponds must create a generally safe yet natural environment, incorporate a cost effective water resources management approach, be consistent with the ecosystem, aesthetically pleasing, ecologically diverse and provide passive and active pursuits when they can be incorporated with a larger overall community or area plan.

The following details are to be followed:

1. Generally the overall grading of the pond will be in accordance with current Ministry of the Environment and Niagara Peninsula Conservation Authority requirements.

2. The landscape materials (trees, shrubs & plants) shall be planted in accordance to the attached profile drawing identified as Appendix "A", and cover a minimum of 25% of the facility area (excluding permanent pool area).

3. The landscape materials shall conform to the following:
a) The entire facility area shall have a minimum of 50 mm of topsoil, and hydro seeded with the following grass mixture, at a rate of 2.0kg/100m2.
30% Tall Fescue (Festuca arundinacea)
30% Creeping Red Fescue (Festuca rubra)
15% Perennial Ryegrass (Lolium perenne)
15% Birdsfoot Treefoil (Lotus corniculatus)
5% Annual Ryegrass (Lolium multiflorum)
5% White Clover (Trifolium repens)

b) Upland/Floodfringe Planting: Plantings shall consist of native tree species identified in Appendix "B". The combinations and density of the plantings will also have regard for the adjacent land uses.
c) Shoreline Fringe: Plantings shall consist of native tree species identified in Appendix "C".
d) Aquatic Fringe: Plantings shall consist of plant species identified in Appendix "D".

4. Fencing, consisting of black vinyl chain link materials 1.5m in height will be provided adjacent to residential lots. ***Where the safety risk can be minimized, preference will be given to a natural barrier, consisting of a dense perimeter vegetation together with flatter pond side slopes noted in # 5.*** The vegetation may consist of strategically planted thorn-bearing trees and shrubs such as hawthorn and raspberry. However, fencing may be necessary in critical areas such as headwalls or in other areas with significant changes in grade.

5. Walkways, trails and other amenities such as fountains, benches, and rock walls may be incorporated into the facility design when the facility is an integral part of an overall trail/pedestrian system or adjacent to a municipal park. In cases where trails and other amenities are incorporated into the facility, the following design parameters ***and requirements*** must be provided:
i) Paths shall not be located lower than the 5-year storm event water elevation.
ii) A minimum buffer of 5m from 0.3m above the 100 year storm elevation to the property line.
iii) Side slopes adjacent to wet facilities must be 5:1 maximum and for dry facilities 4:1 maximum.
iv) Facility must be posted to warn public of potential safety hazards relating to the operation of the facility.
***v) Identify extra life cycle maintenance costs associated with these amenities.***

6. The facility shall display a sign, appropriately located, identifying the facility purpose, maintenance level, and municipal phone number.

7. The landscape plan, ***including amenities, if applicable,*** must be prepared by a qualified Landscape Architect, reviewed by the Public Works and Parks & Recreation Departments, and approved by ***Council.***

8. The maintenance of the facility shall be carried out by the Town's Public Works Department and primarily consist of grass mowing, and litter cleanup on a monthly basis, April to October. Additional maintenance to the landscape materials, fencing and other amenities shall be carried out as required.

9. The facility inlet and outlet structures together with the downstream watercourse shall be inspected annually and repaired as required.

# 1.3.
# STREET TREE GUIDELINES

April, 2020

# Street Tree Guidelines

The selection of trees for individual locations is a difficult process. A rigorous site analysis is required when making species selections. Different species are suitable for different sites. Factors to consider include:

**Site factors** – physical limitations caused by human structures and activities, including proximity of buildings, width of tree lawns, presence of hard surfaces, above and belowground utilities, salt pollution, and soils;

**Social factors** – environmental benefits and wildlife benefits including diversity, aesthetics, public safety, and the absence of negative social externalities such as excessive fruiting, shedding bark, and bad odors;

**Economic factors** – establishment, maintenance, and removal costs, including not only the cost of purchase and planting, but also the survival rate during the establishment period, and maintenance costs, including required pruning, susceptibility to insects and diseases, and ability to damage adjacent infrastructure such as sidewalks.

The following list is included in an attempt to assist with the species selection process. In approving the species listed it is recognized that not all listed trees are suitable for all locations. Carefully select the species that possess the characteristics that most closely meet the environmental conditions of each site. The list has been prepared using a number of references and you are encouraged to consult these references and provide input with respect to other species for consideration.

Though all trees must have a minimum caliper of 50mm at a point 15cm above the soil line, there is some flexibility in terms of tree size depending on availability.

**Approved Street Trees:**

1. Freeman maple (*Acer* x *fremanii*) and cultivars
2. Red maple (*Acer rubrum*) and cultivars
3. Red oak (*Quercus rubra*)
4. Sugar maple (*Acer saccharum*) and cultivars

## Acceptable Alternate Street Trees:

1. Ginkgo (*Ginkgo biloba*) male only
2. Thornless common honeylocust (*Gleditsia triacanthos* f. *inermis*)
3. Japanese tree lilac (*Syringa reticulata*)
4. London planetree (*Platanus* x *acerifolia*)
5. Sycamore (*Platanus occidentalis*)
6. Tuliptree (*Liriodendron tulipifera*)
7. Kentucky coffeetree (*Gymnocladus dioicus*) seedless cultivars only
8. Ironwood (*Ostrya virginiana*)
9. Swamp white oak (*Quercus bicolor*)

## Prohibited Street Trees:

1. Manitoba maple (*Acer negundo*)
2. Norway maple (*Acer platanoides*)
3. Willow (*salix*)

Note: the above list is not a comprehensive list of trees to be considered; it is a list of the trees that are commonly planted.

**References:**


Bassuk, Nina, Curtis, Deanna F., Marranca, BZ and Neal, Barb (2009) Recommended *Urban Trees*

Dirr, M.A. (2009) Manual *of Woody Landscape Plants*

Dirr, M.A. and Warren, Keith S. (2019) The *Tree Book*

Farrar, J. L. (2017) Trees *in Canada*

Sibley, David Allen (2009) The *Sibley Guide to Trees*

Trowbridge, Peter J. and Bassuk, Nina L. (2008) Trees *in the Urban Landscape*

Watson, Gary W. and Himelick, E. B. (2013) The *Practical Science of Planting Trees*

# APPENDIX 2 – ROAD STANDARDS

## 2.1. ROAD CLASSIFICATION MAP

## 2.2. URBAN STREET DESIGN POLICY – PW-RDS-009A

## 2.3. STANDARD UTILITY LOCATION PLANS

## 2.4. ENTRANCE BY-LAW 1873-87

# 2.1.
# ROAD CLASSIFICATION MAP

# THE TOWN OF NIAGARA-ON-THE-LAKE

## TRANSPORTATION MASTER PLAN STUDY


## PROPOSED ROAD CLASSIFICATION AND JURISDICTION

**FIGURE E.4**

DELCAN

# 2.2.
# URBAN STREET DESIGN POLICY
# PW-RDS-009A

TOWN OF NIAGARA-ON-THE-LAKE

# POLICY

*POLICY NO.* **PW-RDS-009A**
*SUPERSEDES NO. PW-RDS-009*

TITLE: ***Urban Street Design***

APPROVAL DATE: **May 9, 2005**
EFFECTIVE DATE: **May 10, 2005**

## PURPOSE:

To provide direction to the Public Works Department on the standards to be employed in the design and construction of streets in new plans of subdivision and the reconstruction of existing streets within the Town's five urban communities.

## POLICY STATEMENT:

The following guide will be used by the Public Works Department in applying the appropriate standard cross-section for urban street design in each of the respective urban communities. Reference should be made to the appended cross-sections as these relate to each of the following urban areas:

Niagara Urban Service Area

- The Niagara Urban Service Area includes all lands within the urban boundary of Niagara/Old Town (Schedule "B" of the Town's Official Plan).
- Roadside drainage approach (cross-sections 4, 5 or 6) or similar hybrid for redevelopment or new development in the "older sections of the Old Town", including Chautauqua, primarily to maintain heritage character.
- Curb and gutter standard (cross-section 1) for streets zoned as commercial.
- Curb and gutter standard (cross-section 1) for the Queen-Picton Heritage Conservation District being a high traffic area, except the north side of Prideaux Street, the south side of Platoff Street, the north side of Byron Street, and the east side of Wellington Street from Picton to Byron.
- Curb and gutter standard (cross-section 1) for all other redevelopment and new development.

**Virgil**

- Curb and gutter standard (cross-section 1) throughout.

**Glendale**

- Curb and gutter standard (cross-section 1) throughout.

**Queenston**

- Roadside drainage approach (cross-section 4, 5, 6) as with Old Town. This is appropriate with the historic character, and the typical narrow right-of-way.

**St. Davids**

- Roadside drainage approach (cross-sections 4, 5 or 6) will be considered as a pilot project for new development on the East side of Four Mile Creek.
- Roadside drainage approach (cross-sections 4, 5 or 6) for reconstruction of existing streets.
- Curb and gutter standard (cross-section 1) for all new development on the West side of Four Mile Creek.

**ATTACHMENTS:**

**Street cross-sections as follows:**
**Cross-section No. 1 – Urban Local Residential (curb and gutter)**
**Cross-section No. 4 – Roadway with Minimal Shoulders and Swales**
**Cross-section No. 5 – Roadway with Minimal Shoulders, Swales and Underdrain**
**Cross-section No. 6 – Gravel Shoulder for Parking Roadside Drainage with Catchbasin**

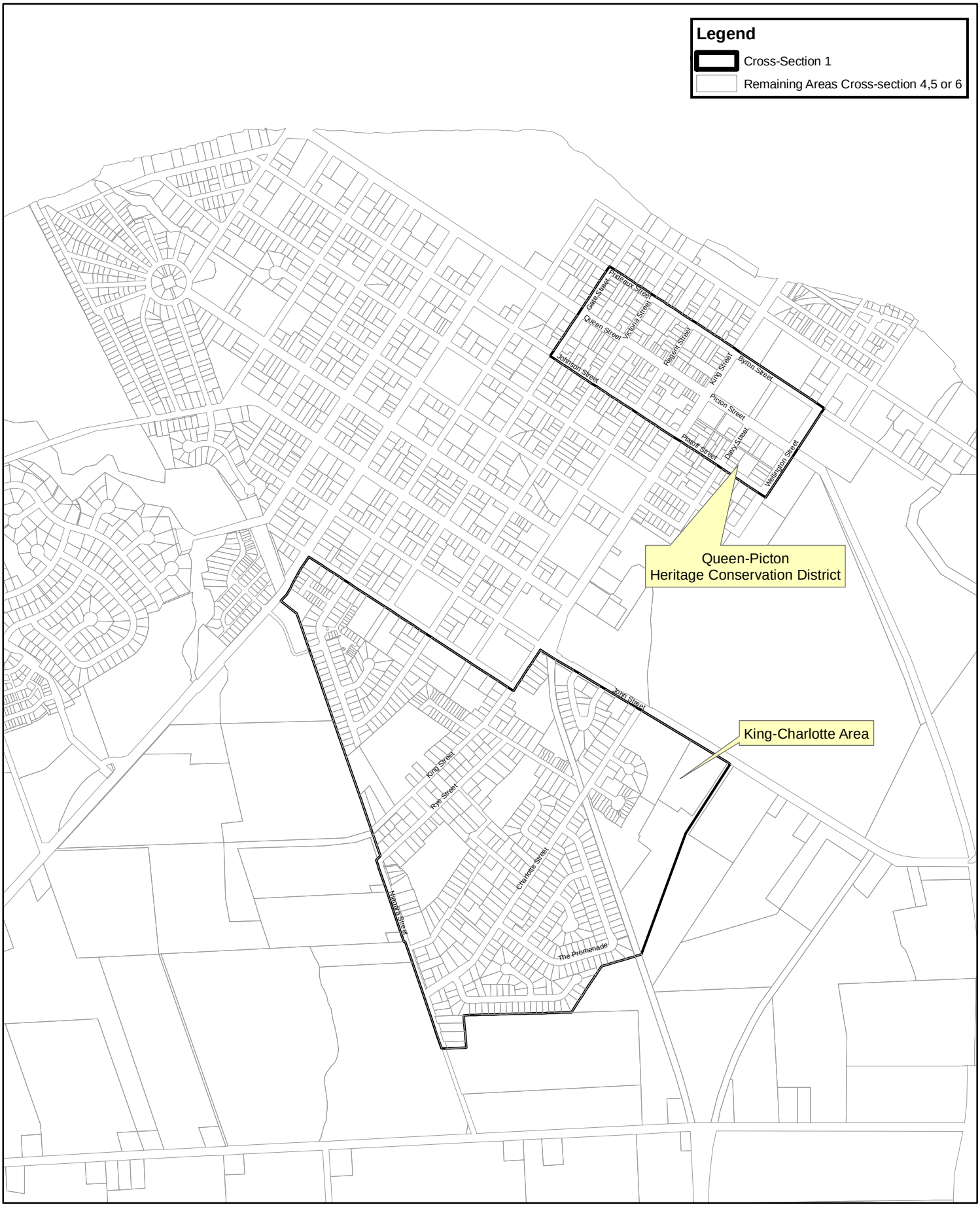
**Map illustrating the areas of the Niagara Urban Service Area (Queen-Picton Heritage Conservation District and King-Charlotte Area) to which Cross-section No. 1 shall apply.**

Public Works Department - Engineering
Mike Komljenovic
Last Revision : May 10,2005

1:15,000

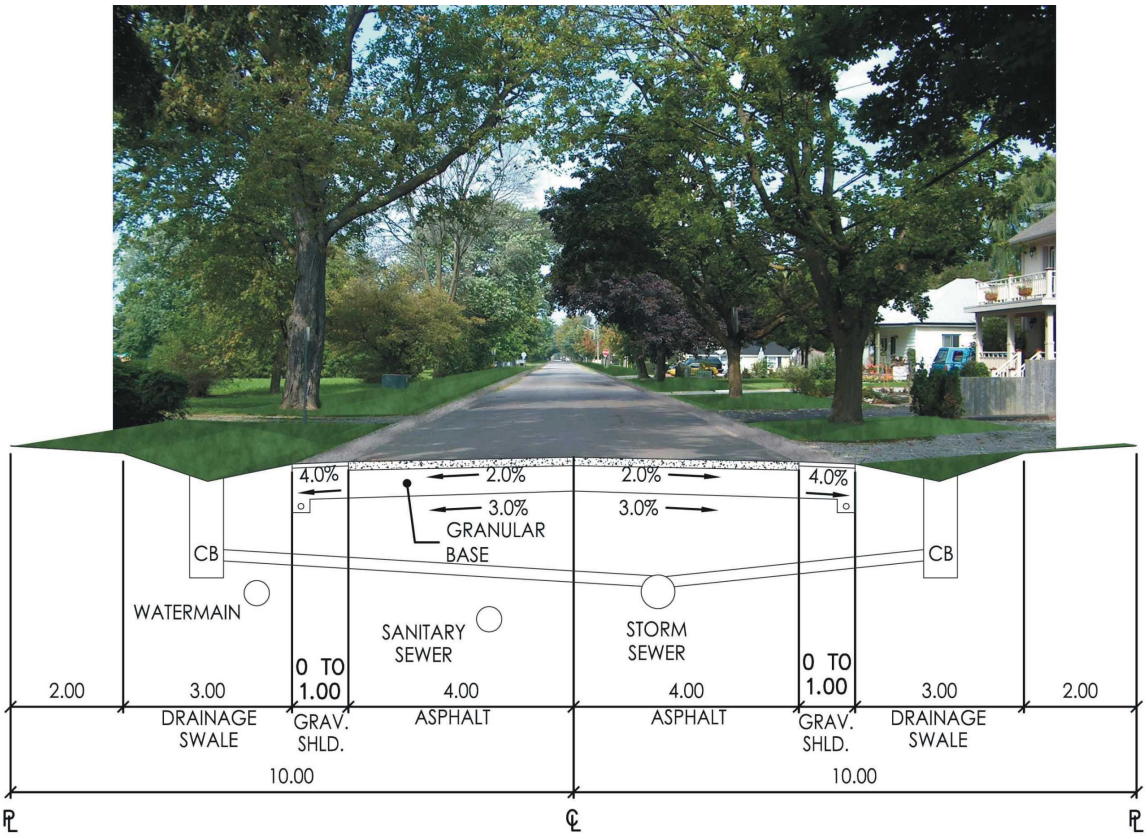
# Town of Niagara-on-the-Lake

## Urban Street Design - Niagara Urban Service Area



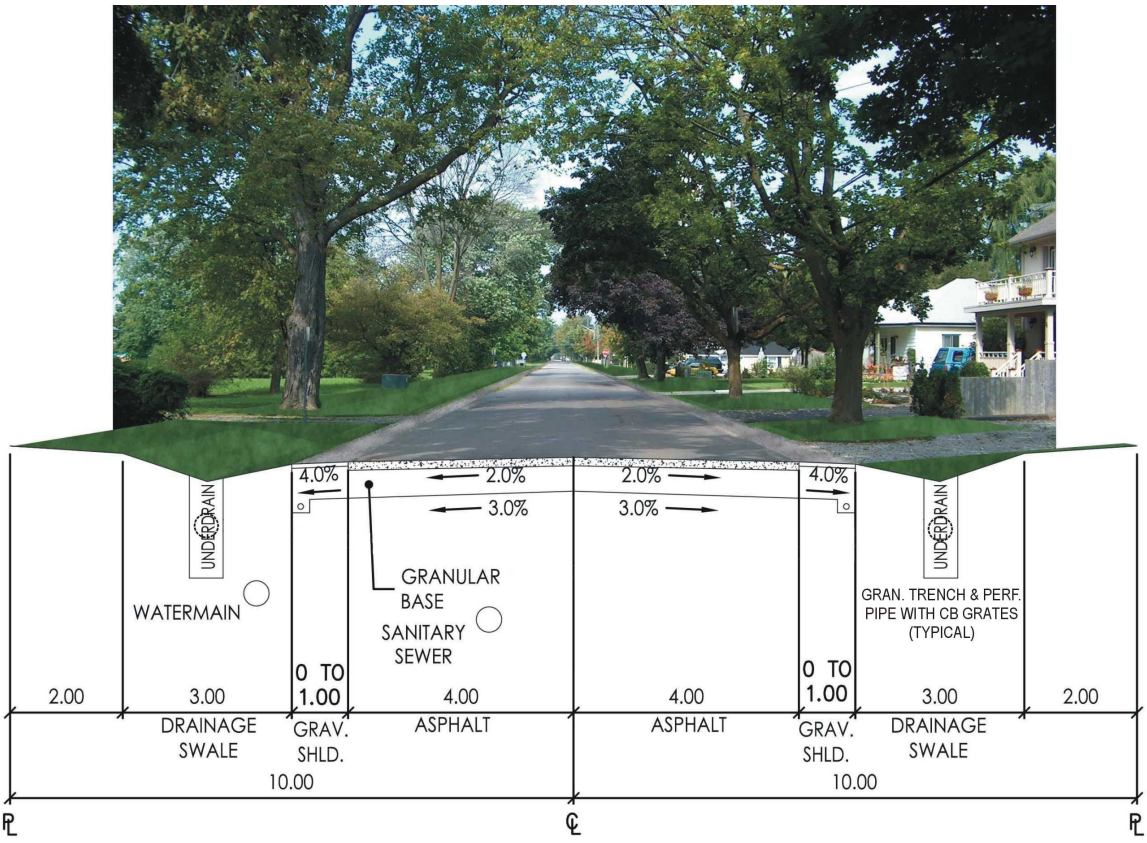

# CROSS SECTION No. 1
# URBAN LOCAL RESIDENTIAL
# (CURRENT STANDARD)

- AESTHETIC
  - URBAN STANDARD
  - BOULEVARD & TREES PROTECTED, FLAT GRADING IN BOULEVARD
  - FIRM LINES; HARD EDGES WITH ROADWAY DIVIDED BY CURB
- COST
  - MEDIUM COST
- FUNCTION
  - CONTROLS PARKING AND VEHICLE TRAVEL ON STREET WITH CURB
  - SIDEWALK ON ONE OR BOTH SIDES FOR PEDESTRIAN TRAVEL
  - TYPICALLY NEED TO LOWER CENTRELINE OF EXISTING STREET FOR DRAINAGE TO THE STREET
- DRAINAGE
  - NEEDS STORM SEWER AND OUTLET
- MAINTENANCE
  - MINIMAL- DRAINAGE AND SNOW REMOVAL CONFINED TO STREETS
  - SNOW REMOVAL ON SIDEWALK




# CROSS SECTION No. 4
# ROADWAY WITH MINIMAL SHOULDERS AND SWALES

- AESTHETIC
  - HAMLET CHARACTER
  - CAN ACCOMMODATE ROADSIDE TREE PROTECTION
  - HOMEOWNER FRONTAGE IMPACT IS MINIMAL
  - CATCHBASINS IN SWALES AND/OR SMALL CULVERTS UNDER DRIVEWAYS
- COST
  - 3RD LEAST EXPENSIVE
- FUNCTION
  - ROADWAY IS FUNCTIONAL FOR TRAVEL
  - SHOULDER PARKING IS ACCOMMODATED AND COMPATIBLE WITH SHALLOW SWALES
  - COMPATIBLE WITH SIDEWALKS ON ONE OR BOTH SIDES
  - LOWERING OF ROAD CENTRELINE NOT TYPICALLY REQUIRED
- DRAINAGE
  - NEEDS, AT LEAST, SHALLOW STORM SEWER AND OUTLET AVAILABLE
  - SWALE DEPTH OF 150mm TO 200mm
- MAINTENANCE
  - SHOULDER AND SWALE MAINTENANCE ONGOING
  - HEAVY SNOWFALL AND MELT MAY REQUIRE HAND CLEARANCE OF CATCHBASINS AND CULVERTS FOR DRAINAGE
  - BOULEVARD REPAIR REQUIRED OCCASIONALLY FOR DAMAGED SOD



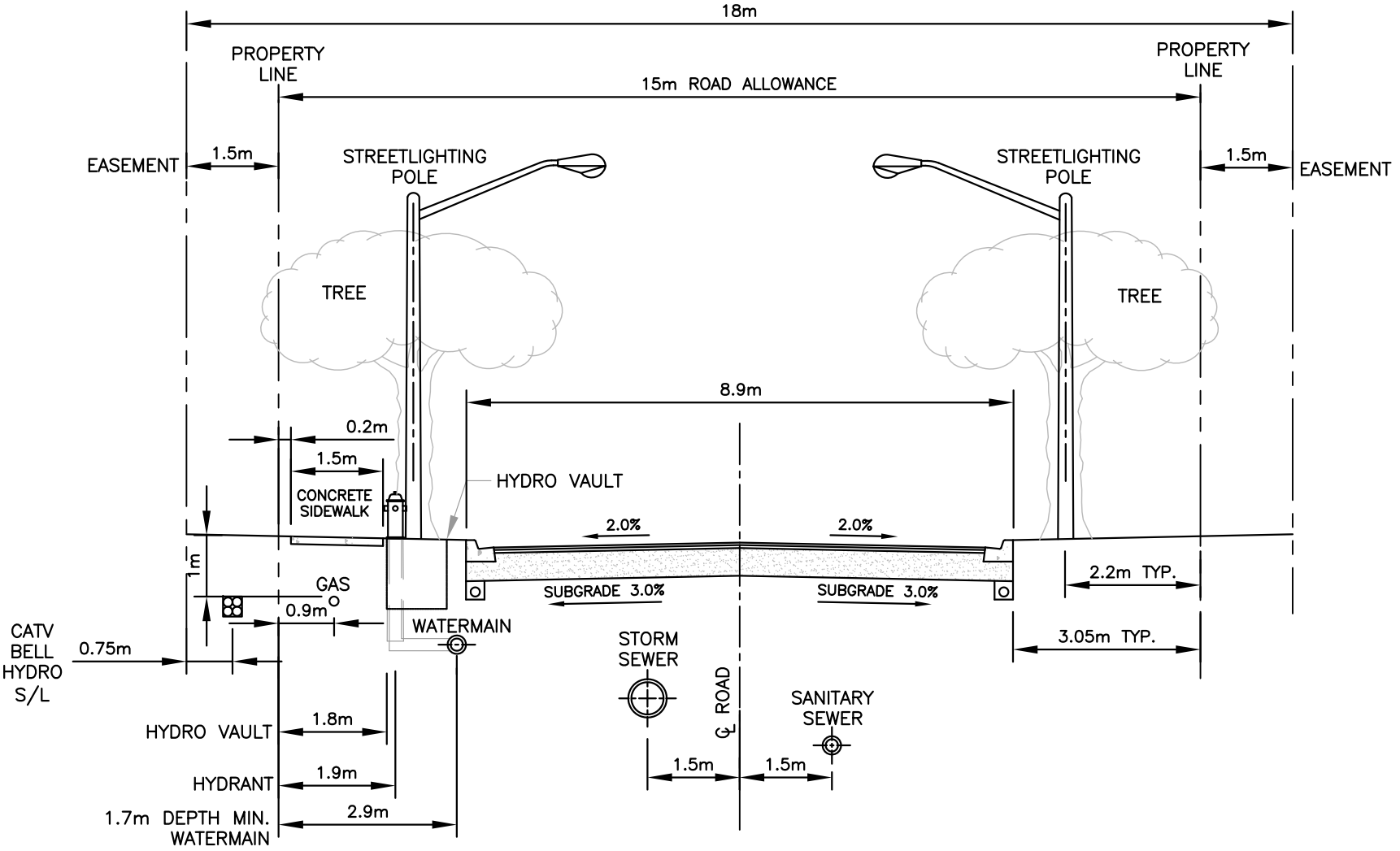

# CROSS SECTION No. 5
# ROADWAY WITH MINIMAL SHOULDERS, SWALES AND UNDERDRAIN

- AESTHETIC
  - HAMLET CHARACTER
  - CAN ACCOMMODATE ROADSIDE TREE PROTECTION
  - HOMEOWNER FRONTAGE IMPACT IS MINIMAL
- COST
  - 2ND MOST EXPENSIVE
- FUNCTION
  - ROADWAY IS FUNCTIONAL FOR TRAVEL
  - SHOULDER PARKING IS ACCOMMODATED AND COMPATIBLE WITH SHALLOW SWALES
  - COMPATIBLE WITH SIDEWALKS ON ONE OR BOTH SIDES
  - LOWERING OF ROAD CENTRELINE NOT TYPICALLY REQUIRED
  - ALLOWS FOR INFILTRATION OF SOME STORM WATER INTO GROUND
- DRAINAGE
  - NEED PERIODIC CATCHBASINS FOR SWALE FLOWS AT SELECT LOCATIONS
  - NEED TO EMPTY DRAINS AT CROSS STREETS INTO STORM SEWERS OR OTHER OUTLETS
  - OCCASIONAL POOLING OF WATER IN SWALES WITH SEEPAGE INTO UNDERDRAIN
- MAINTENANCE
  - SHOULDER AND SWALE MAINTENANCE ONGOING DEMAND
  - HEAVY SNOWFALL AND MELT MAY REQUIRE HAND CLEARANCE OF CATCHBASINS


# CROSS SECTION No. 6
# GRAVEL SHOULDER FOR PARKING
# ROADSIDE DRAINAGE WITH CATCHBASINS

- AESTHETIC
  - HAMLET CHARACTER
  - ROADSIDE TREES NOT IMPACTED
  - HOMEOWNER IMPACT IS MINIMAL (BOULEVARD GRADING ONLY)
  - SOFT LIMIT OF SHOULDER TO BOULEVARD AREA
- COST
  - 2ND LEAST COST
- FUNCTION
  - ROADWAY IS FUNCTIONAL FOR TRAVEL AND PARKING
  - LOWERING OF ROAD CENTRELINE NOT TYPICALLY REQUIRED
  - CAN ACCOMMODATE SIDEWALKS ON ONE OR BOTH SIDES FOR PEDESTRIANS
  - ENCROACHMENT OF CARS ON SODDED BOULEVARDS IS EXPECTED OCCASIONALLY
- DRAINAGE
  - SHALLOW STORM SYSTEM OR LOCAL OUTLET MUST BE READILY AVAILABLE
  - DRAINAGE AT EDGE OF SHOULDER AND BOULEVARD
- MAINTENANCE
  - SHOULDER AND SOD MAINTENANCE IS ONGOING
  - DRAINAGE FROM HEAVY RAIN WILL REQUIRE SHOULDER MAINTENANCE
  - BOULEVARD REPAIR REQUIRED OCCASIONALLY FOR DAMAGED SOD

# 2.3.
# STANDARD UTILITY LOCATIONS PLANS




NOTE: LOCATIONS SHOWN ARE APPLICABLE ON BOTH SIDES OF THE STREET

Niagara-on-the-Lake EST.1781

# STANDARD UTILITY LOCATION PLAN
## (15m R.O.W./8.5m PAVEMENT - NEW SUBDIVISION)

*TOWN OF NIAGARA-ON-THE-LAKE*
*DEPARTMENT OF ENGINEERING*

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| DATE | 2017–11–05 |
| SCALE | N.T.S. |
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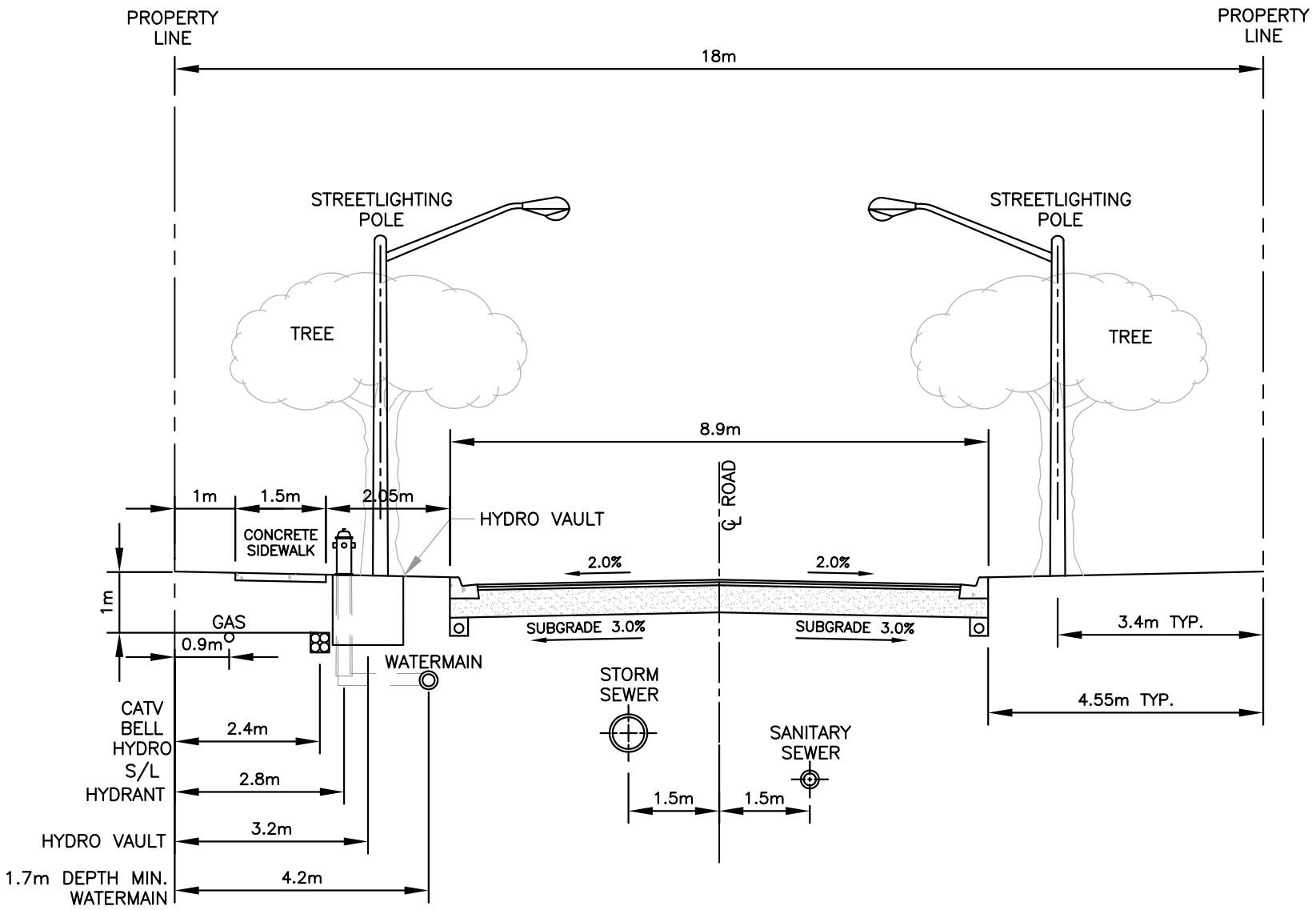


NOTE: LOCATIONS SHOWN ARE APPLICABLE ON BOTH SIDES OF THE STREET

Niagara-on-the-Lake EST.1781

# *STANDARD UTILITY LOCATION PLAN (18m R.O.W./8.5m PAVEMENT - NEW SUBDIVISION)*

***TOWN OF NIAGARA-ON-THE-LAKE***

***DEPARTMENT OF ENGINEERING***

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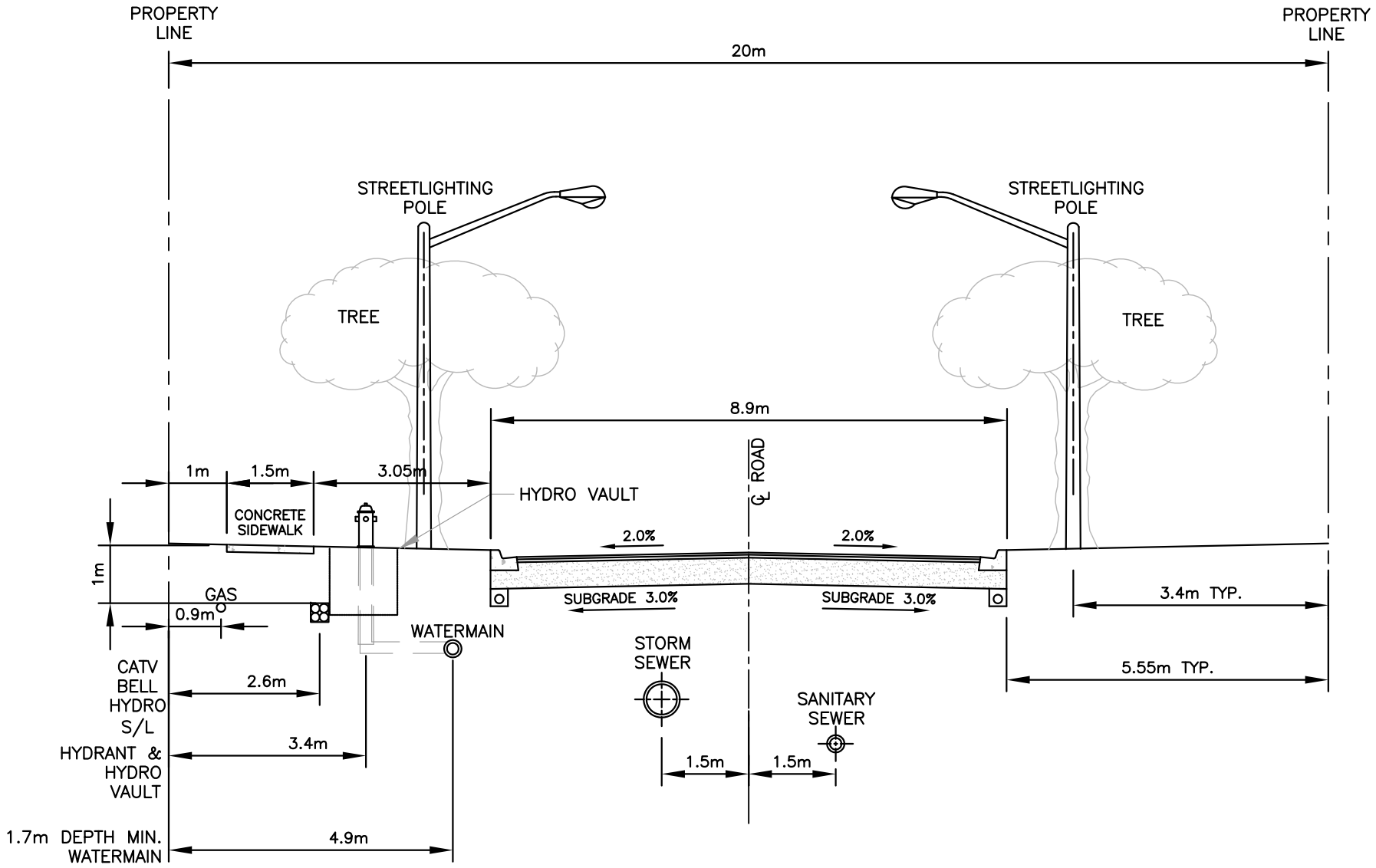


NOTE: LOCATIONS SHOWN ARE APPLICABLE ON BOTH SIDES OF THE STREET

Niagara-on-the-Lake EST.1781

# *STANDARD UTILITY LOCATION PLAN (20m R.O.W./8.5m PAVEMENT - NEW SUBDIVISION)*

*TOWN OF NIAGARA-ON-THE-LAKE*
*DEPARTMENT OF ENGINEERING*

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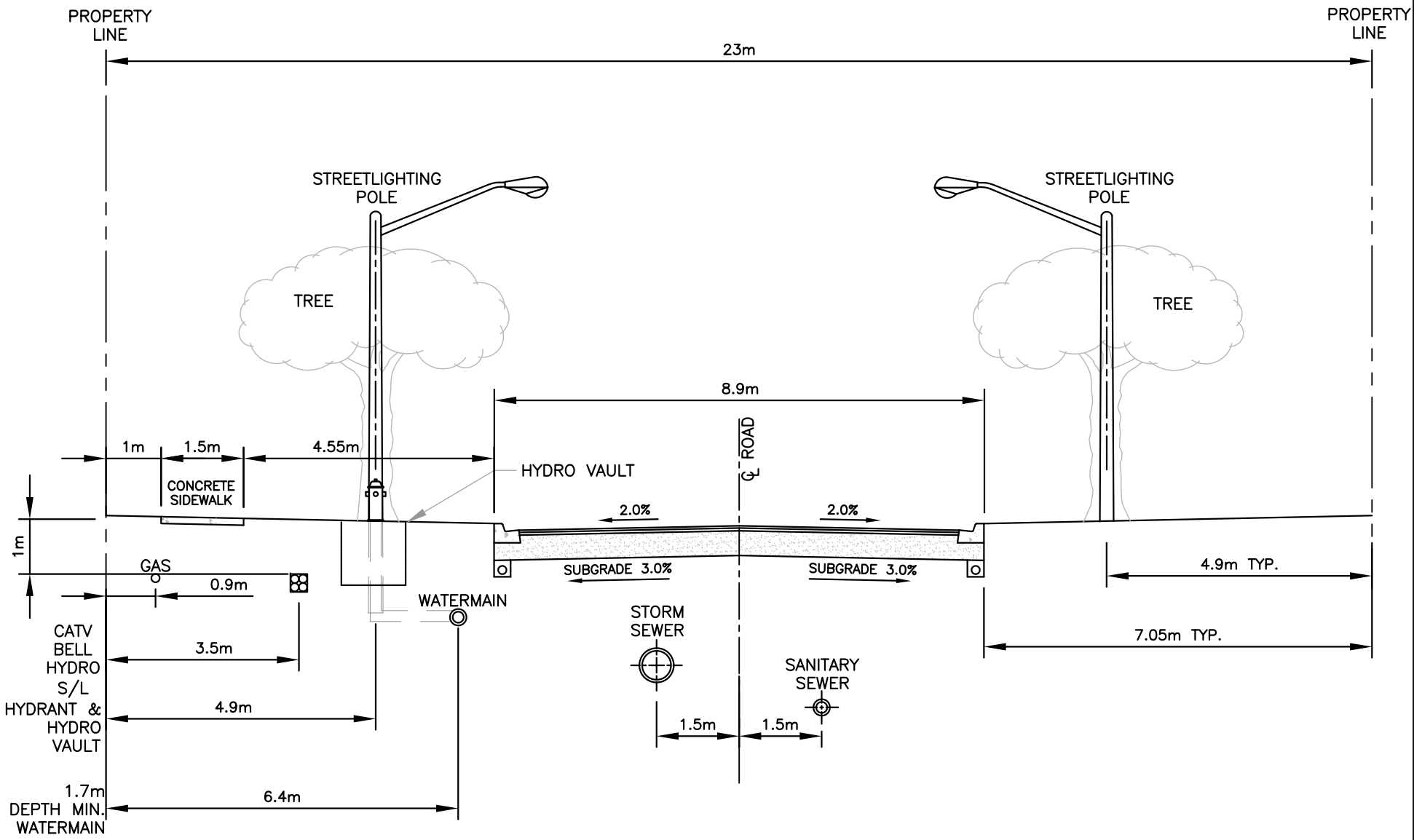


NOTE: LOCATIONS SHOWN ARE APPLICABLE ON BOTH SIDES OF THE STREET

Niagara-on-the-Lake EST.1781

# STANDARD UTILITY LOCATION PLAN
# (23m R.O.W./8.5m PAVEMENT - NEW SUBDIVISION)

**TOWN OF NIAGARA-ON-THE-LAKE**
**DEPARTMENT OF ENGINEERING**

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| DATE | 2017–11–05 |
| SCALE | N.T.S. |
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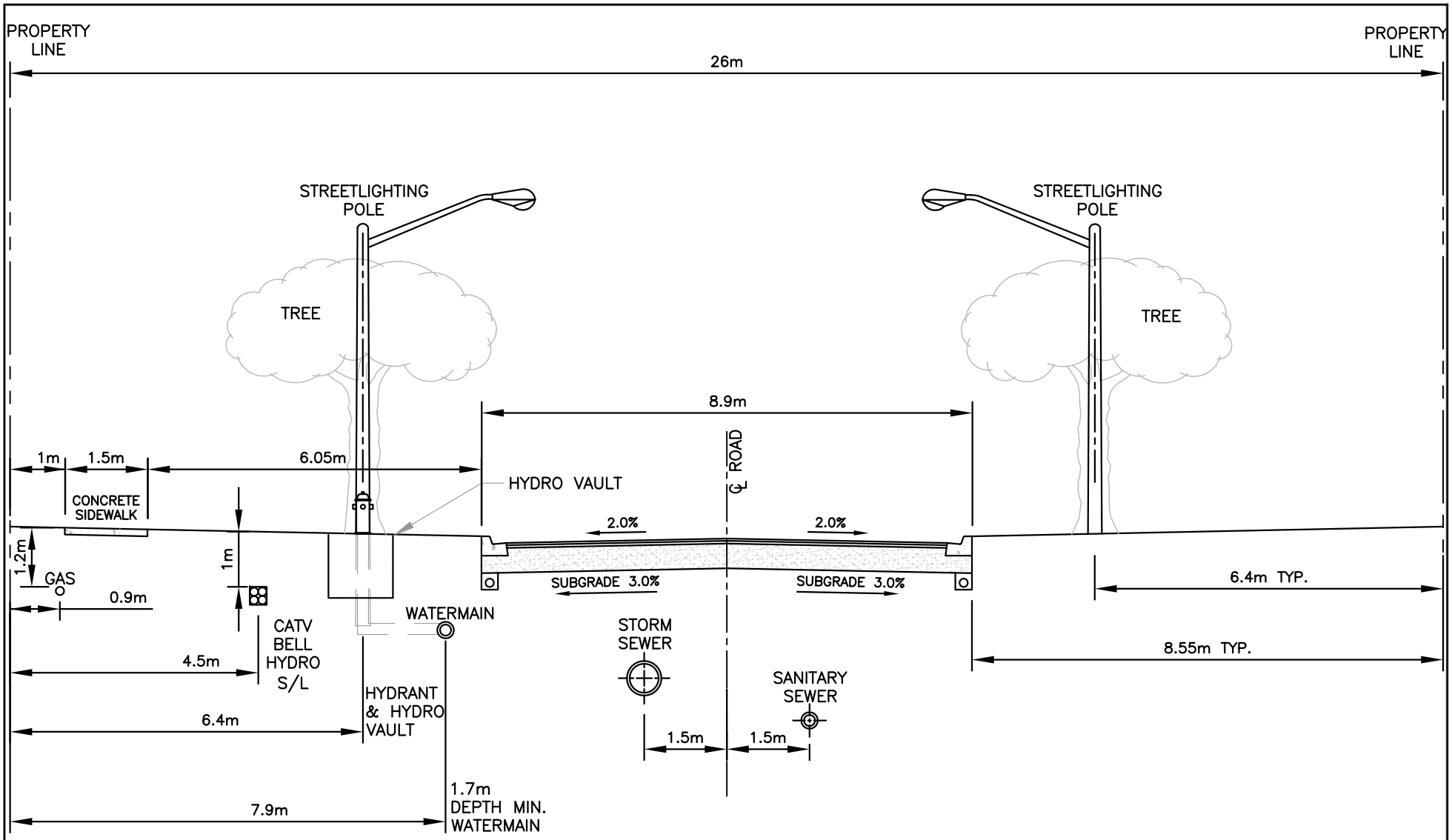


NOTE: LOCATIONS SHOWN ARE APPLICABLE ON BOTH SIDES OF THE STREET

Niagara-on-the-Lake EST.1781

# *STANDARD UTILITY LOCATION PLAN (26m R.O.W./8.5m PAVEMENT - NEW SUBDIVISION)*

*TOWN OF NIAGARA-ON-THE-LAKE*
*DEPARTMENT OF ENGINEERING*

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| SCALE | N.T.S. |
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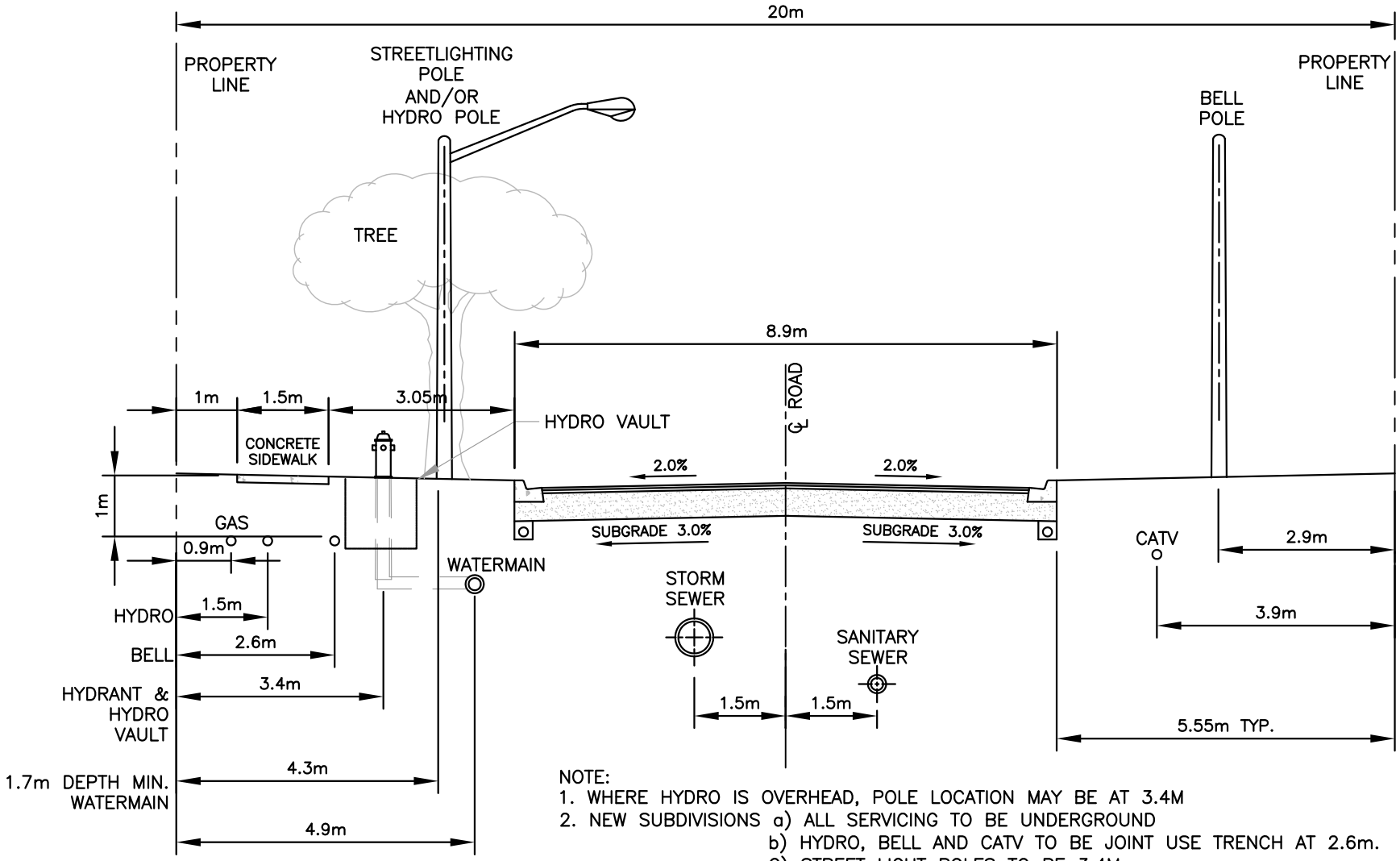


NOTE:
1. WHERE HYDRO IS OVERHEAD, POLE LOCATION MAY BE AT 3.4M
2. NEW SUBDIVISIONS a) ALL SERVICING TO BE UNDERGROUND
   b) HYDRO, BELL AND CATV TO BE JOINT USE TRENCH AT 2.6m.
   C) STREET LIGHT POLES TO BE 3.4M
3. OTHER ROADS – BELL, catv AND HYDRO SHOULD BE JOINT USE AT EITHER BELL OR HYDRO LOCATION
4. TREES – PREFERABLY ON PRIVATE PROPERTY, OTHERWISE AT 3.0m LINE
5. LOCATIONS SHOWN ARE APPLICABLE ON BOTH SIDES OF THE STREET
6. IF CURB AND GUTTER IS NOT PRESENT, THE 8.9 METRE CORRIDOR MUST BE MAINTAINED FOR FUTURE ROAD RECONSTRUCTION
7. IF PROPOSED UTILITIES STANDARD LOCATION IS IN USE BY ANOTHER UTILITY, THEN THAT UTILITY LOCATION SHALL BE USED

Niagara-on-the-Lake EST.1781

# *STANDARD UTILITY LOCATION PLAN (EXISTING SERVICED URBAN AREA)*

***TOWN OF NIAGARA-ON-THE-LAKE***
***DEPARTMENT OF ENGINEERING***

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| DATE | 2017–11–05 |
| SCALE | N.T.S. |
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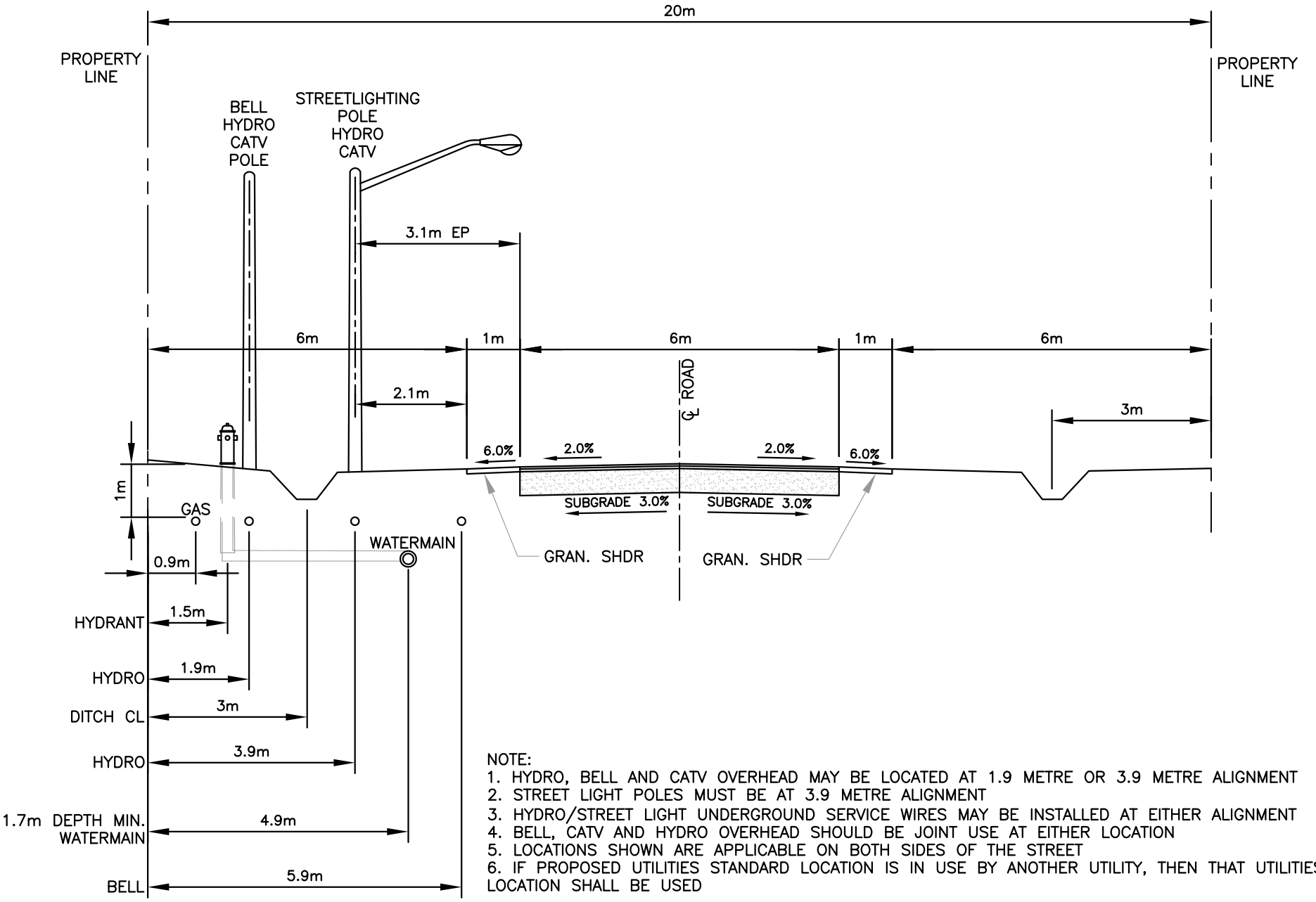



NOTE:
1. HYDRO, BELL AND CATV OVERHEAD MAY BE LOCATED AT 1.9 METRE OR 3.9 METRE ALIGNMENT
2. STREET LIGHT POLES MUST BE AT 3.9 METRE ALIGNMENT
3. HYDRO/STREET LIGHT UNDERGROUND SERVICE WIRES MAY BE INSTALLED AT EITHER ALIGNMENT
4. BELL, CATV AND HYDRO OVERHEAD SHOULD BE JOINT USE AT EITHER LOCATION
5. LOCATIONS SHOWN ARE APPLICABLE ON BOTH SIDES OF THE STREET
6. IF PROPOSED UTILITIES STANDARD LOCATION IS IN USE BY ANOTHER UTILITY, THEN THAT UTILITIES LOCATION SHALL BE USED

Niagara-on-the-Lake EST.1781

# *STANDARD UTILITY LOCATION PLAN (PROPOSED RURAL AREA)*

***TOWN OF NIAGARA-ON-THE-LAKE***

***DEPARTMENT OF ENGINEERING***

| | |
|---|---|
| DATE | 2017–11–05 |
| SCALE | N.T.S. |
| REF. No. | |
| DWG No. | |

# 2.4.
# ENTRANCE BY-LAW 1873-87

C O R P O R A T I O N

OF THE

TOWN OF NIAGARA-ON-THE-LAKE

BY-LAW NO. 1873-87

A BY-LAW TO ESTABLISH A POLICY AND PROCEDURES FOR THE DESIGN, CONSTRUCTION, MAINTENANCE AND FEES FOR ENTRANCEWAYS ONTO MUNICIPAL ROADS

WHEREAS the Municipal Act, R.S.O. 1980, Chapter 302, Section 208 (17) and amendments therto authorizes Municipal Councils to pass by-laws regulating the size and mode of construction of culverts and bridges that cross any drain or watercourse situated on any highway under the jurisdiction of the municipality;

AND WHEREAS Section 315 (6) authorizes Municipal Councils to pass by-laws for prohibiting the obstruction of ditches and culverts;

AND WHEREAS Section 104 allows every Council to pass by-laws and make regulations for the health, safety, morality and welfare of the inhabitants of the municipality;

AND WHEREAS it is deemed to be in the best interest of the property owners safety and well-being to establish entrance policies and regulations in the Town of Niagara-on-the-Lake;

NOW THEREFORE BE IT ENACTED AS A BY-LAW OF THE CORPORATION OF THE TOWN OF NIAGARA-ON-THE-LAKE as follows:

1. THAT the "Policy and Procedures for Design, Construction, Maintenance and Fees for Entranceways onto Municipal Roads" attached hereto as Schedule "A" be and it is hereby adopted.

2. THAT By-law 569-75 be and it is hereby repealed.

SCHEDULE "A" TO BY-LAW 1873-87

**TOWN OF NIAGARA-ON-THE-LAKE**

# POLICY AND PROCEDURES FOR THE DESIGN, CONSTRUCTION AND MAINTENANCE OF ENTRANCEWAYS ONTO MUNICIPAL ROADS

## I INTRODUCTION

The purpose of this policy is to provide guidelines for municipal staff in the approval and construction of entranceways onto the municipal road system.

This policy shall provide for the design of safe and efficient access from properties fronting on municipal roads.

Where particular entranceways cannot be accommodated by the provisions of this policy or where extenuating circumstances prohibit the strict adherence to the terms of this policy the Works Superintendent is authorized to issue alternative design or installation criteria where he is of the opinion that the safety and efficiency of the municipal road system is not jeopardized.

## II ENTRANCES

For the purpose of this policy "entrance" shall mean a driveway, gate, entranceway or other structure or facility designed, constructed or used as means of access to any portion of the municipal road system.

Prior to work commencing on the construction of an entrance it shall be required that an entrance permit be issued by the Works Superintendent.

## III CLASSIFICATION OF ENTRANCES

In order to provide appropriate design criteria it shall be necessary that each entrance be classified in one of the following categories based on the land use served by the entrance.

Cont'd.

1. Commercial/Industrial - generally, an entrance shall be classified as Commercial/Industrial where the land use served is of a retail commercial, commercial/industrial, or industrial nature as determined by the Works Superintendent or his designate. It shall also include apartments or multi-family dwellings where six or more separate self-contained dwelling units are proposed.
2. Residential Entrance - a residential entrance is classified as such when the entrance serves a private residence or a multi-family dwelling containing not more than six separate self-contained dwelling units.
3. Farm Entrance - is an entrance used for access to agricultural fields, buildings, barns or out buildings but not to premises on which a residence is located.

## IV RESTRICTIONS REGARDING ENTRANCES

A commercial/industrial entrance shall be designed and constructed in accordance to the Ministry of Transportation and Communications Commercial Site Access Standards established by the Ministry.

1. A commercial/industrial entrance where the speed limit is 80 km/h or more is prohibited:
   (a) on a curve more than 1 degree, 30 minutes
   (b) on a hill where the grade is greater than 4%
   (c) in any location where clear vision is less than 240 m in each direction from which traffic may approach.
2. A commercial/industrial entrance in an area where the speed limit is less than 80 km/h is prohibited:
   (a) on a curve of more than 6 degrees
   (b) on a hill where the grade is more than 6%
   (c) in any location where clear vision is less than 90 m in each direction.
3. An entrance at approach to bridge or other structure:
   In an area where an entrance is proposed adjacent to a bridge or other structure which interferes with the clear vision of traffic the Works Superintendent may restrict the location of the proposed entrance to that distance from the bridge or other structure which he deems advisable.

Cont'd.

## V GENERAL SPECIFICATIONS

### 1. FOR CULVERT ENTRANCEWAYS

The minimum culvert length of an entranceway shall be 6 m, and if laid in sections, no section shall be less than 2 m, and in no case shall a culvert exceed 12 m in length. The pipe diameter shall be determined by the Works Superintendent or his designate based on site conditions, but in no case shall a culvert be less than 300 mm in diameter.

Generally, the bottom of the culvert shall be installed 1/10 of the diameter of the pipe below the stream bed, however, the Works Superintendent or his designate may alter this specification based on site characteristics.

The travelled portion of the entranceway shall be backfilled with a minimum of 200 mm of granular "A" from the edge of the travelled roadway to the culvert, and 150 mm over the culvert. The ends from entrance bed to toe of slope shall be backfilled with earth or stone, and at a minimum ratio of 1.5:1.

No head walls shall be permitted on culverts less than 900 mm in diameter unless otherwise approved by the Works Superintendent.

No entrance shall be installed in such a manner as to permit surface water from adjacent lands to be discharged onto the travelled portion of a municipal road.

The culvert shall be constructed of either corrugated iron pipe or an approved polyethylene material.

All culverts must be installed by the Town of Niagara-on-the-Lake on the owners behalf and at the applicable unit cost and length with the exception of Municipal Drains and where a Municipal Drain is located on a road allownace and also used as a road ditch. The Town will assume the responsibility of all future maintenance relating to the culvert.

Cont'd.

2. FOR CURB AND GUTTER ENTRANCES

The location and width of the curb cut shall be in accordance with Section VI.

The property owner shall be responsible for the cost of any alterations required on the existing concrete curb. All alterations will be done by the Works Department on a standard lineal meter cost adopted by the Town annually. The cost of the alterations or repairs will be paid at the time of filing the entrance permit.

3. Schedule 'A', attached hereto, shall form the basis of design and construction for culvert installation. A copy of Schedule 'A' shall be attached to each Permit for Entranceway issued, accompanied by such specifications or instructions deemed appropriate by the Works Superintendent or his designate.

4. The property owner shall be responsible for the construction and maintenance of the entrance surface from the edge of the travelled roadway to the street line.

## VI NUMBER, LOCATION AND SIZE OF ENTRANCEWAYS

1. Number (subject to the conditions of By-law 500A-74)
   (a) within the first 30 m of frontage not more than two (2) entranceways,
   (b) for each additional 30 m of frontage not more than one (1) additional entranceway.

2. Location
   (a) in the case of a corner lot, an entranceway shall be located a minimum of 8 m measured from the exterior lot line to the closest point of the entranceway or curb cut along the property line,
   (b) it is recommended that an entranceway be located a minimum .5 m from an interior lot line measured along the front property line to the closest point of the entranceway or curb cut.

Cont'd.

3. Size (with existing curb and gutters, subject to the conditions of By-law 500A-74, Section 3.19 (d))
   (a) ingress and egress to and from the premises shall be provided by means of an entranceway at least 4 m but not more than 10 m in perpendicular width
   (b) the maximum width of any joint ingress and egress driveway ramp measured along the street line shall be 10 m.
   (c) Commercial/industrial entrances will be subject to individual review.

4. Separation
   Entranceways on the same property shall have a minimum separation of 8 m.

5. Angle
   The projected centreline of an entranceway shall meet the projected centreline of a roadway at an angle not less than 60 degrees (By-law 500A-74).

## VII PERMIT PROCEDURES

Permit application forms shall be made available through the Building and Public Works Department.

The Chief Building Official will require an entrance permit prior to issuing a new building construction permit.

All permits shall be issued by the Works Superintendent.

All commercial/industrial entranceway applications shall be accompanied by appropriately scaled drawings to adequately detail the proposed design of the entranceway.

## VIII DITCH TILING

There shall be no tiling of an open ditch adjacent to the municipal road system without the express written approval of the Works Superintendent. All installations must be installed by the

Cont'd.

Town of Niagara-on-the-Lake on the owners behalf based on the actual cost of labour and materials. A deposit will be required with each application.

Any tiling exceeding 40 m in length will require a catch basin to collect road drainage and provide access to the culvert for proper maintenance.

## IX PERMIT CONDITIONS

1. A permit may be revoked by the Works Superintendent where the owner does not adhere to the conditions of issuance or construction.

2. If the class of entranceway should change because the property use it serves so changes, the Works Superintendent may direct such alterations be carried out that will bring the entranceway into compliance with this policy or other applicable legislation.

3. The Works Superintendent shall be entitled to take such actions as he may deem necessary to maintain the safety of the municipal road system and to ensure the proper function of entranceway culverts.

# APPENDIX 3 – WATER SYSTEM STANDARDS


3.1. STANDARD SERVICE CONNECTION LOCATION

3.2. WATER METER CHAMBER DETAIL – 16MM, 19MM OR 25MM

3.3. WATER METER CHAMBER DETAIL – 38MM OR 50MM

3.4. WATER METER CHAMBER DETAIL – 100MM TO 250MM

3.5. WATER SAMPLING STATION

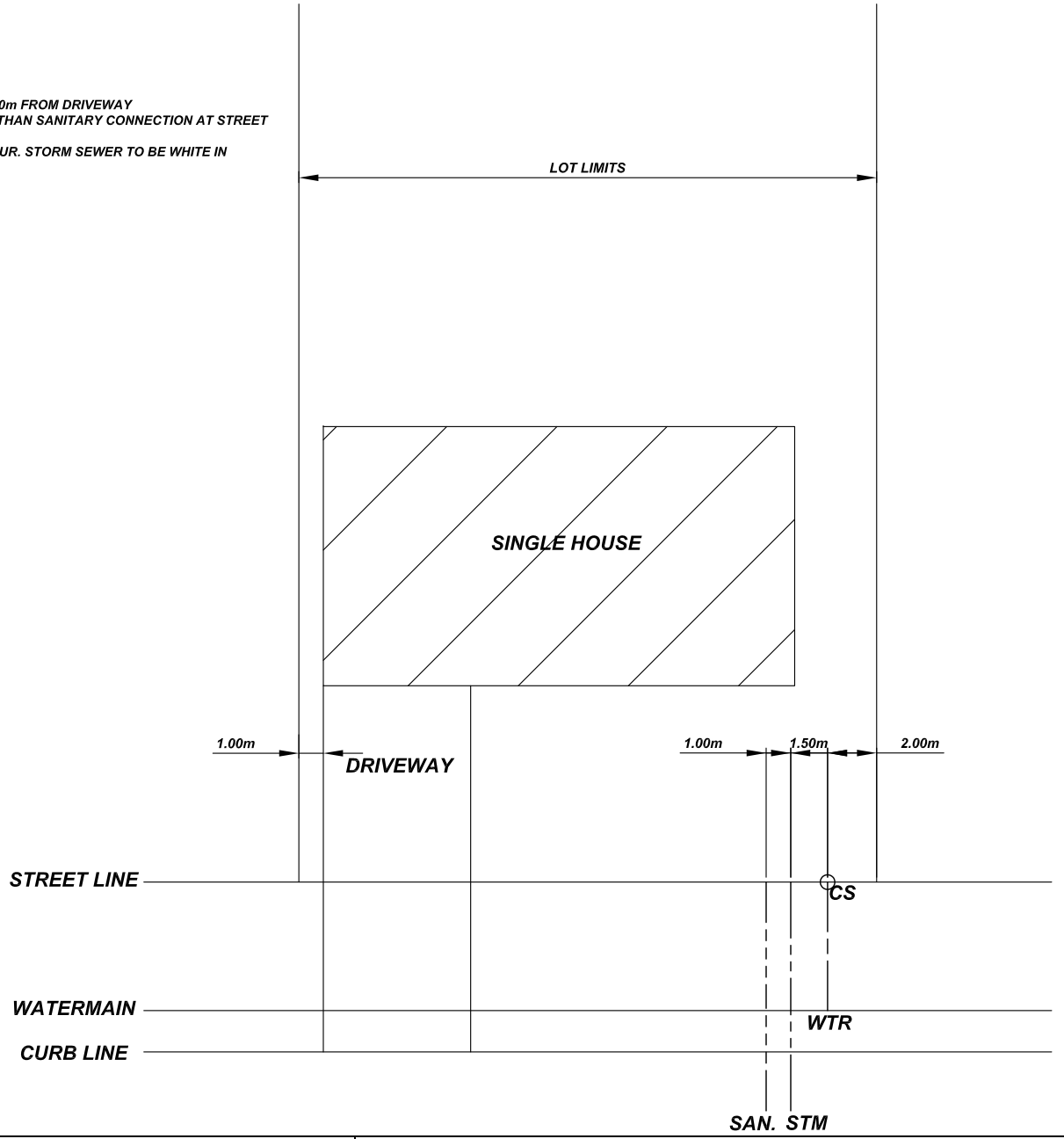
3.6. VALVE LOCATION REPORT

3.7. SERVICE CARD

3.8. HYDRANT CLEARANCE ZONE

# 3.1.
# STANDARD SERVICE CONNECTION LOCATION

NOTE:
1. ALL SERVICES TO BE LOCATED AS SHOWN
2. WATER SERVICE MUST BE A MINIMUM OF 1.0m FROM DRIVEWAY
3. STORM CONNECTION TO BE 0.15m HIGHER THAN SANITARY CONNECTION AT STREET LINE
4. SANITARY LATERAL TO BE GREEN IN COLOUR. STORM SEWER TO BE WHITE IN COLOUR.

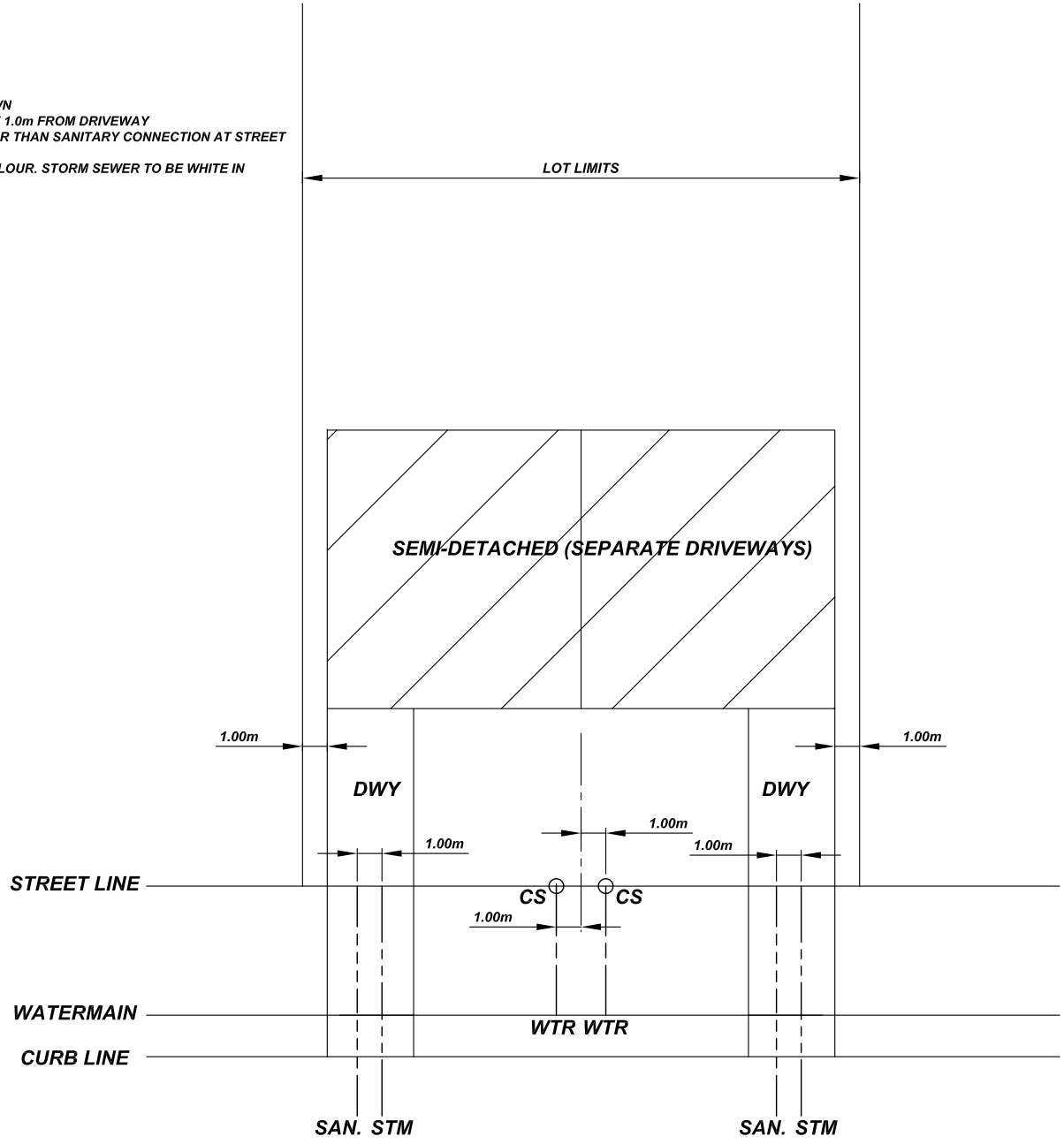



# SINGLE HOUSE SERVICING LAYOUT

TOWN OF NIAGARA-ON-THE-LAKE
DEPARTMENT OF ENGINEERING

| | |
|---|---|
| DATE | 2017–11–05 |
| SCALE | N.T.S. |
| REF. No. | |
| DWG No. | |

NOTE:
1. ALL SERVICES TO BE LOCATED AS SHOWN
2. WATER SERVICE MUST BE A MINIMUM OF 1.0m FROM DRIVEWAY
3. STORM CONNECTION TO BE 0.15m HIGHER THAN SANITARY CONNECTION AT STREET LINE
4. SANITARY LATERAL TO BE GREEN IN COLOUR. STORM SEWER TO BE WHITE IN COLOUR.



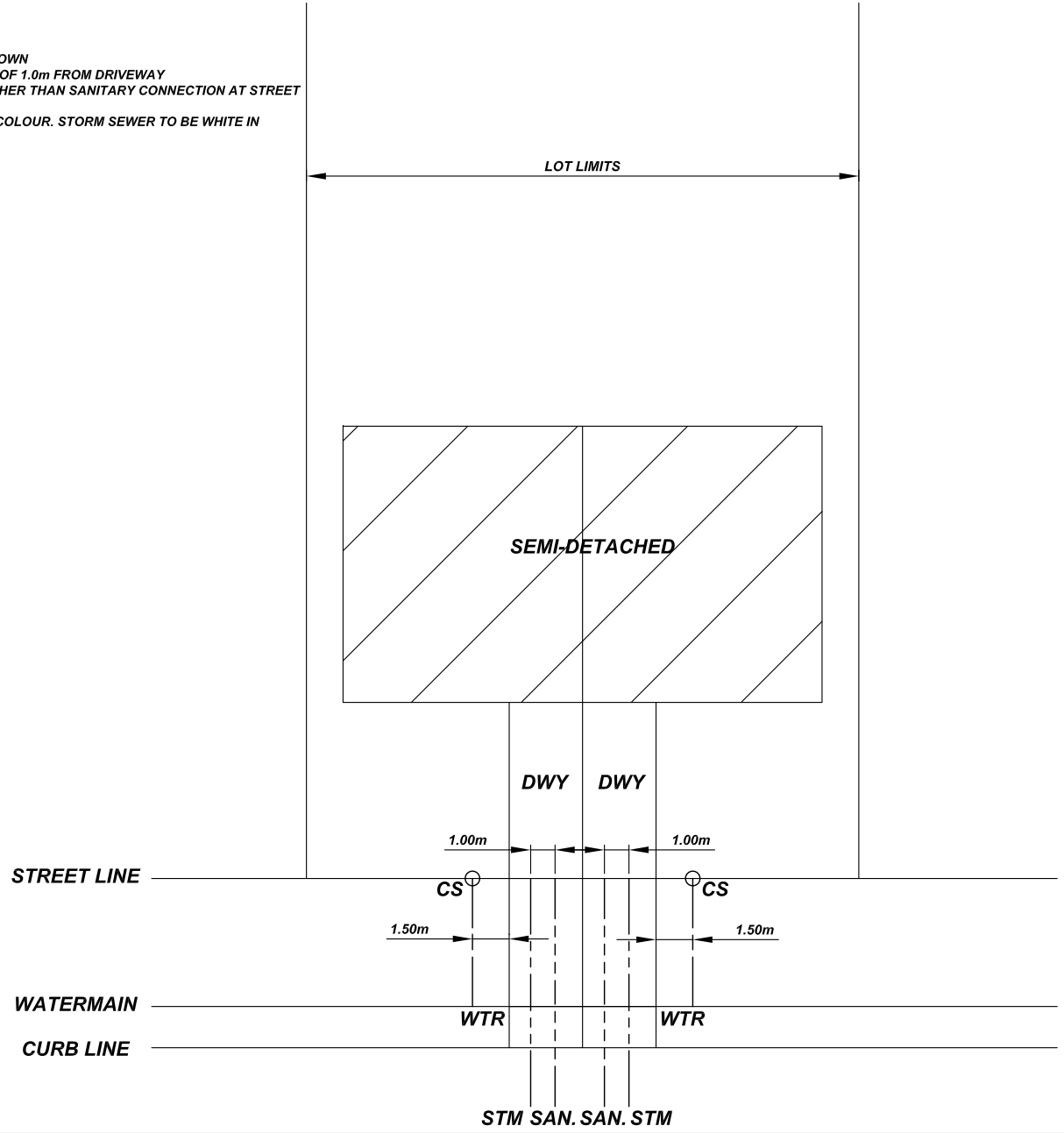

Niagara-on-the-Lake EST.1781

# SEMI-DETACHED (SEPARATE DRIVEWAYS) SERVICING LAYOUT

TOWN OF NIAGARA-ON-THE-LAKE
DEPARTMENT OF ENGINEERING

| | |
|---|---|
| DATE | 2017–11–05 |
| SCALE | N.T.S. |
| REF. No. | |
| DWG No. | |

NOTE:
1. ALL SERVICES TO BE LOCATED AS SHOWN
2. WATER SERVICE MUST BE A MINIMUM OF 1.0m FROM DRIVEWAY
3. STORM CONNECTION TO BE 0.15m HIGHER THAN SANITARY CONNECTION AT STREET LINE
4. SANITARY LATERAL TO BE GREEN IN COLOUR. STORM SEWER TO BE WHITE IN COLOUR.



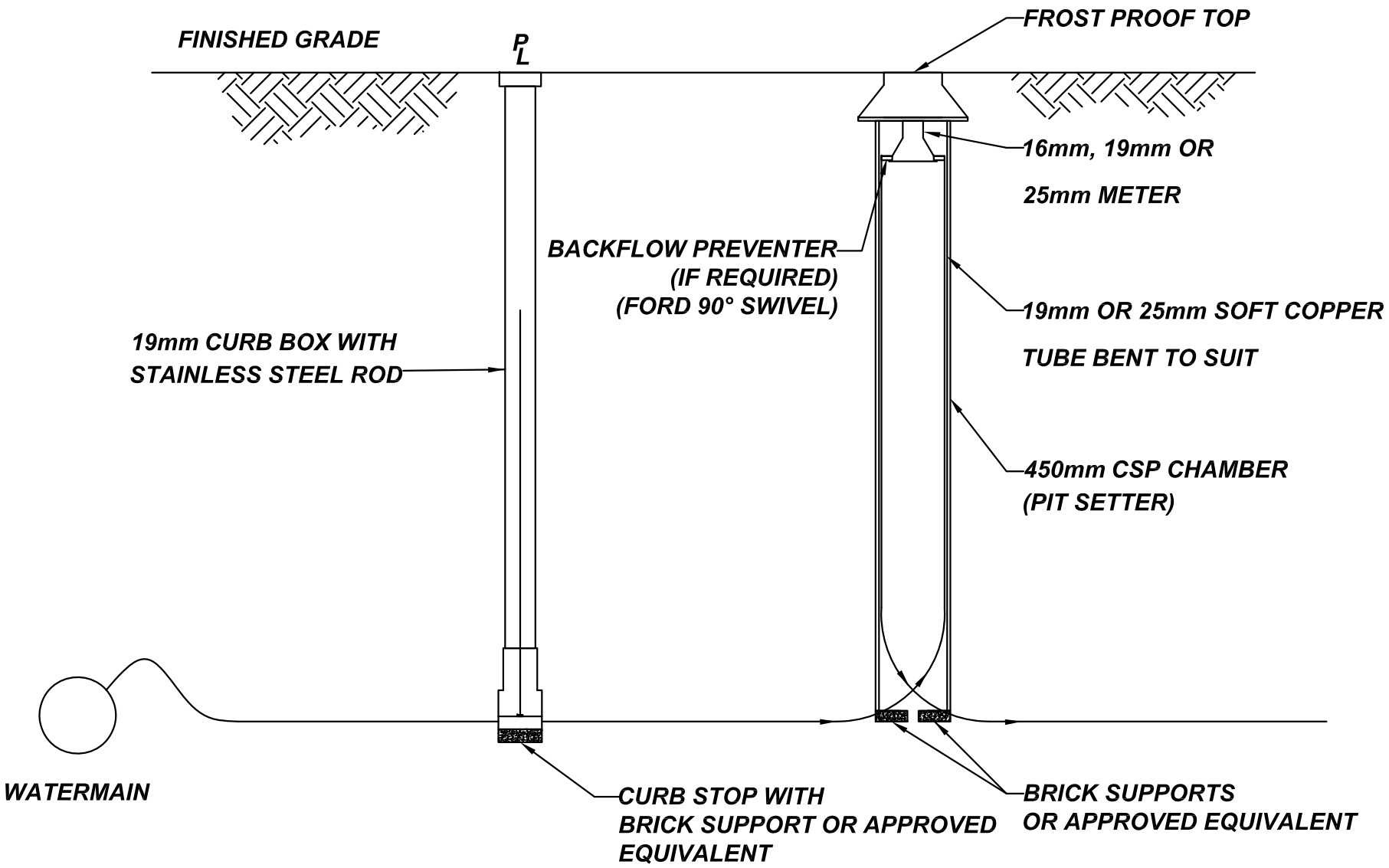

Niagara-on-the-Lake EST.1781

# SEMI-DETACHED SERVICING LAYOUT

TOWN OF NIAGARA-ON-THE-LAKE
DEPARTMENT OF ENGINEERING

| | |
|---|---|
| DATE | 2017-11-05 |
| SCALE | N.T.S. |
| REF. No. | |
| DWG No. | |

# 3.2.
# WATER METER CHAMBER DETAIL – 16MM, 19MM OR 25MM



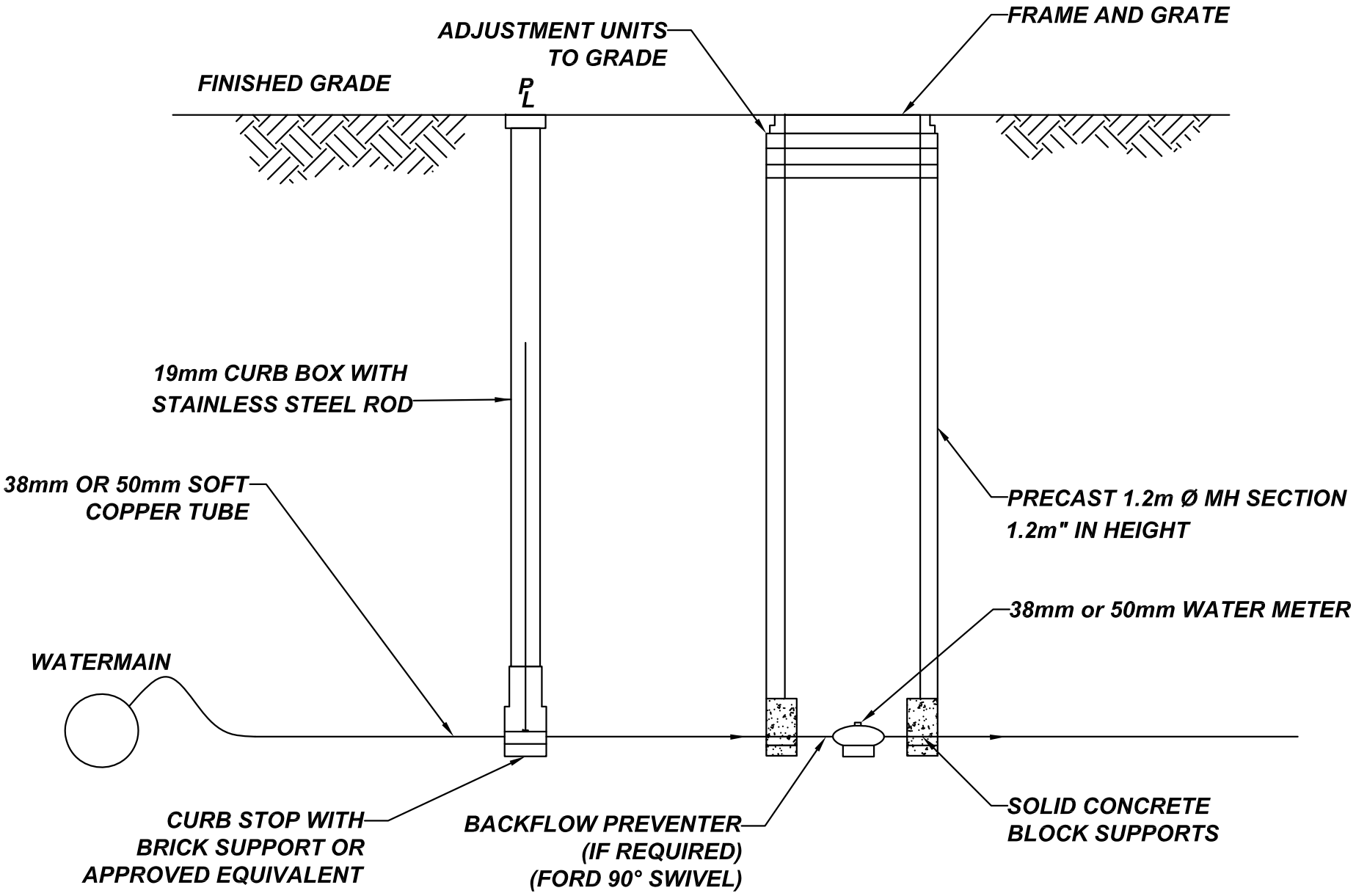

Niagara-on-the-Lake EST.1781

# WATER METER CHAMBER DETAIL

*16mm, 19mm or 25mm METERS*

| | |
|---|---|
| DATE | 2015–01–29 |
| SCALE | NTS |
| REF. No. | - |
| DWG No. | - |

# 3.3.
# WATER METER CHAMBER DETAIL – 38MM OR 50MM



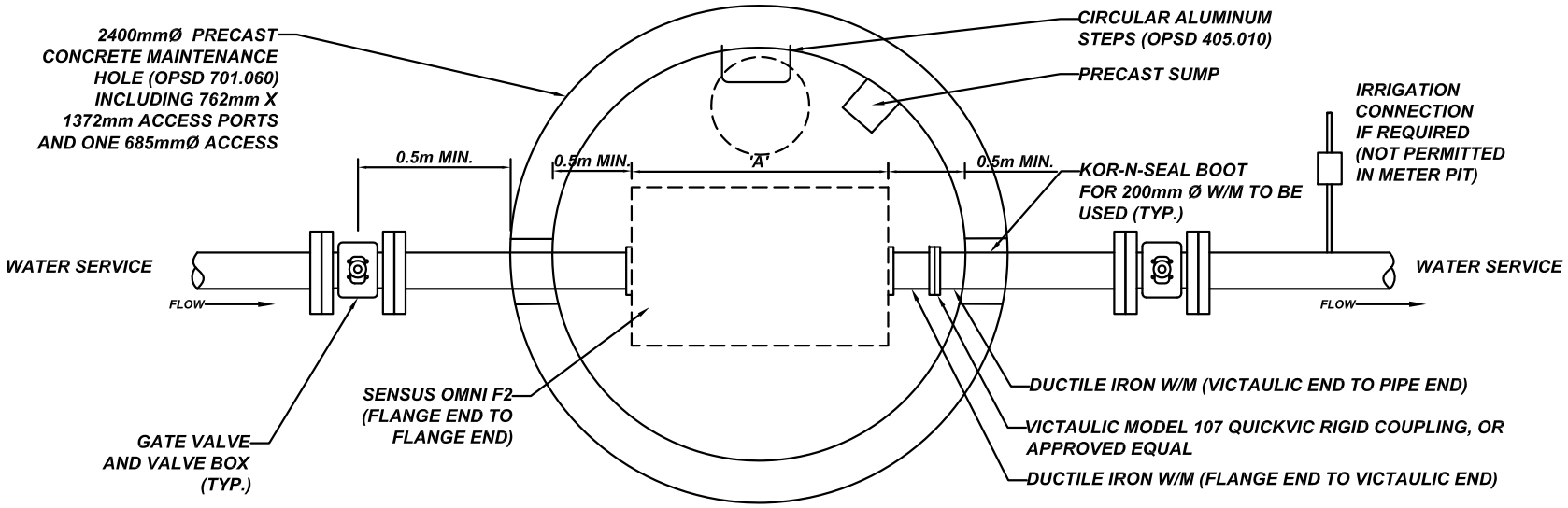

Niagara-on-the-Lake EST.1781

# WATER METER CHAMBER DETAIL

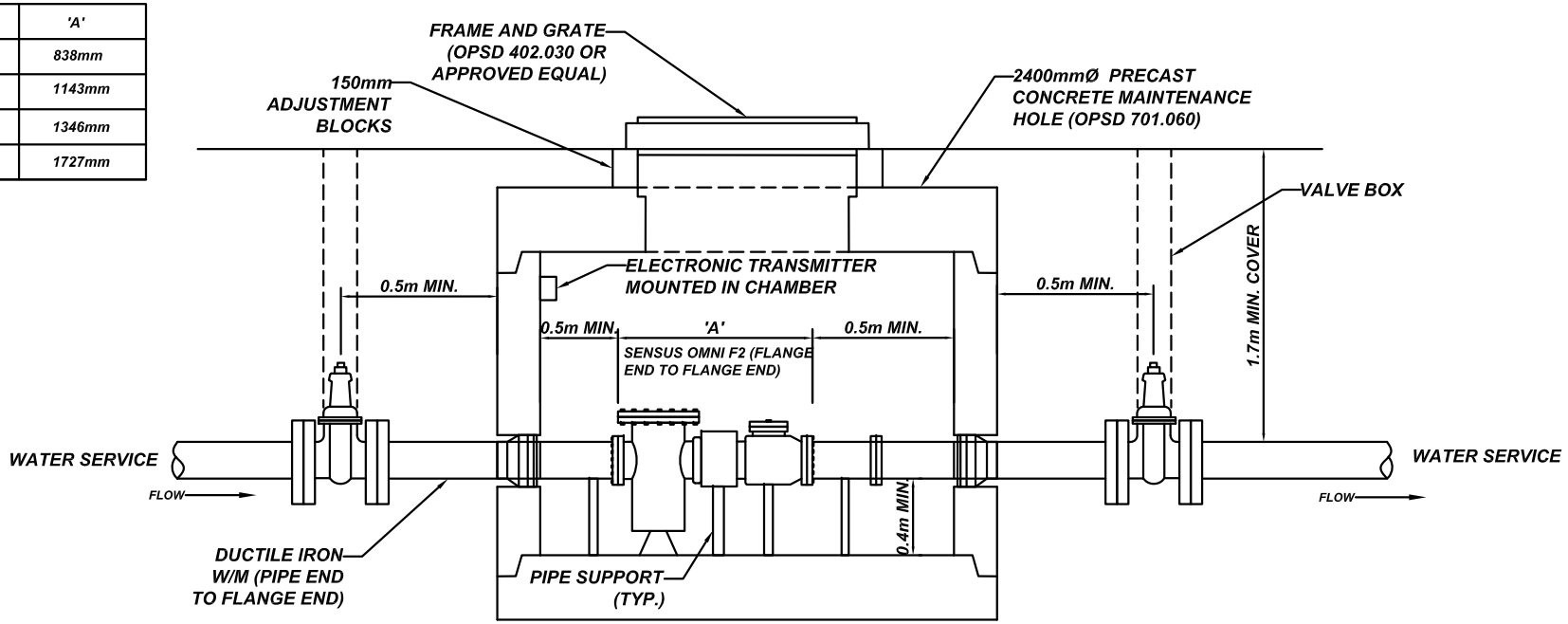
*38mm or 50mm METERS*

| | |
|---|---|
| DATE | 2015–01–29 |
| SCALE | NTS |
| REF. No. | - |
| DWG No. | - |

# 3.4.
# WATER METER CHAMBER DETAIL – 100MM TO 250 MM




| METER SIZE | 'A' |
|---|---|
| 100mm | 838mm |
| 150mm | 1143mm |
| 200mm | 1346mm |
| 250mm | 1727mm |

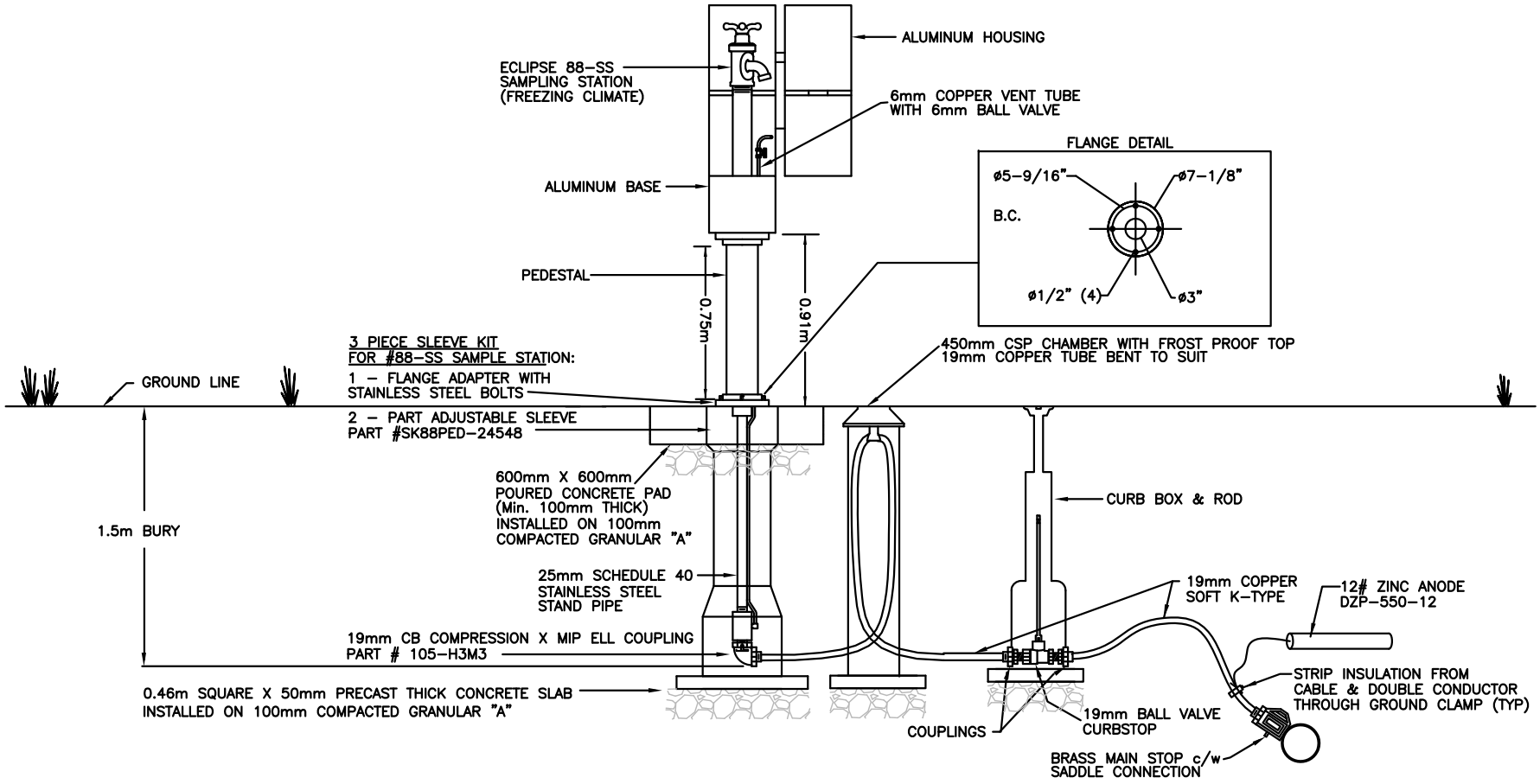



Niagara-on-the-Lake EST.1781

# WATER METER CHAMBER
# WATER SERVICES 100mm to 250mm

| | |
|---|---|
| DATE | 2020–05–01 |
| SCALE | NTS |
| REF. No. | - |
| DWG No. | - |

# 3.5.
# WATER SAMPLING STATION




NOTE:

1. SAMPLING STATIONS SHALL BE FURNISHED WITH A 19mm FIP INLET AND A 19mm UNTHREADED NOZZLE.
2. ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, NON-REMOVABLE, ALUMINUM-CAST HOUSING.
3. WHEN OPENED, THE STATION SHALL REQUIRE NO KEY FOR OPERATION.
4. A COPPER VENT TUBE WILL ENABLE EACH STATION TO BE PUMPED FREE OF STANDING WATER TO PREVENT FREEZING AND TO MINIMIZE BACTERIA GROWTH.
5. ALL WATER PIPING COMPONENTS WILL BE EITHER BRASS (LEAD FREE) OR STAINLESS STEEL, NO GALVINIZED STEEL PERMITTED.

Niagara-on-the-Lake EST.1781

# *WATER SAMPLING STATION*
# *ECLIPSE NO. 88-SS*

| | |
|---|---|
| DATE | 2020-05-01 |
| SCALE | NTS |
| REF. No. | - |
| DWG No. | - |

# 3.6.
# VALVE LOCATION REPORT

# TOWN OF NIAGARA-ON-THE-LAKE

## VALVE LOCATION REPORT

LOCATION:_____

_____

INSTALLATION BY:_____

VALVE TYPE: _____

VALVE MANUFACTURER: _____

OPENS (Direction): _____

No. OF TURN TO OPEN: _____

INSTALLATION DATE:_____

INSPECTION BY:_____

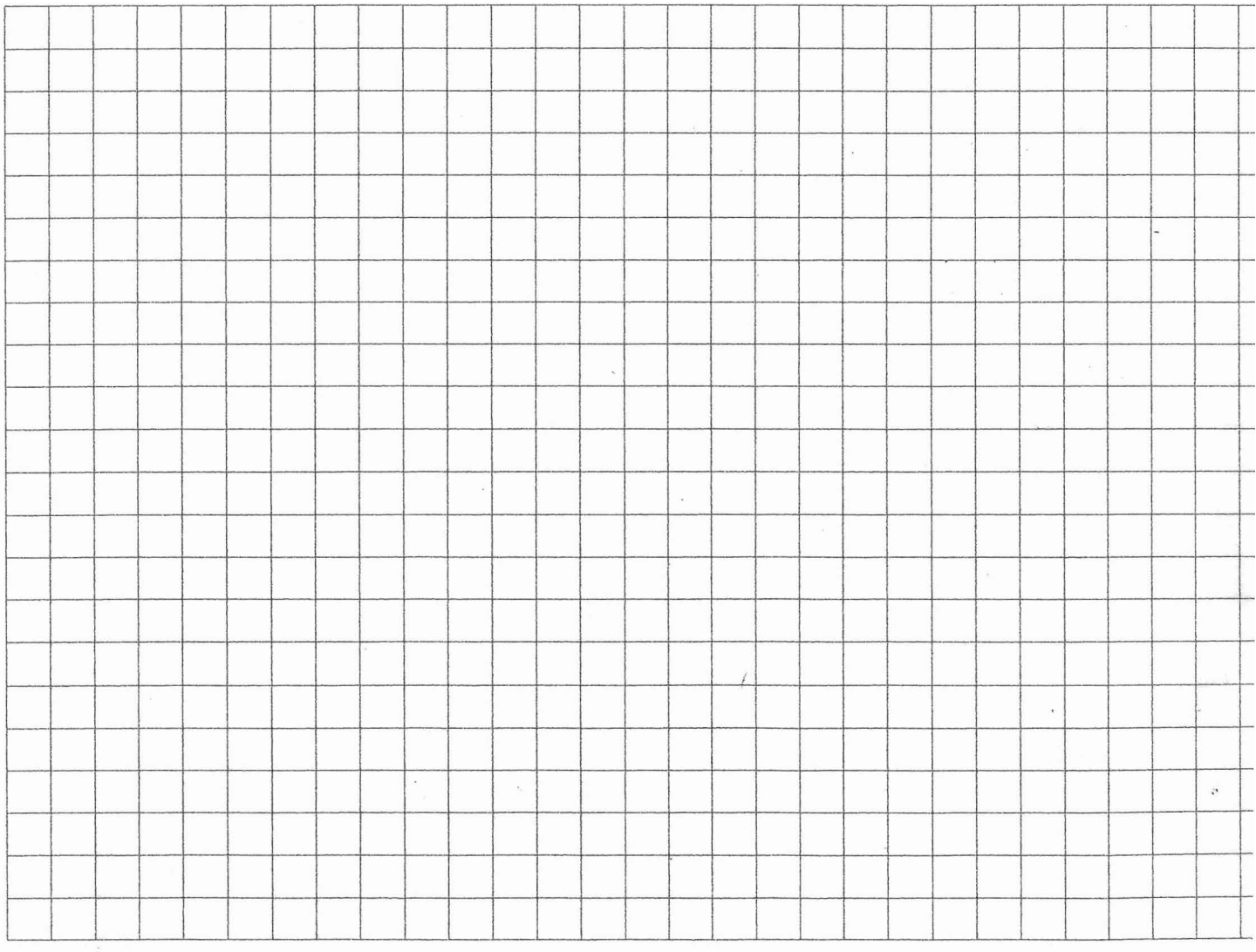
NOTES: _____

_____

_____

_____

_____



# 3.7.
# SERVICE CARD

# SERVICE LOCATION CARD

Niagara-on-the-Lake EST.1781

LOT NUMBER

PLAN NUMBER

ROLL NUMBER

ADDRESS _____

METER ID# _____ SERIAL # _____ WATER ACCOUNT # _____

NOTES FOR LOCATION _____

## TROUBLE CALLS

DATE REMARKS

INSTALLATION TYPE _____
SANITARY, STORM, WATER

MATERIAL _____

SIZE _____

DATE INSTALLED _____

INSTALLED BY _____

INSPECTION _____

DATE APPROVED

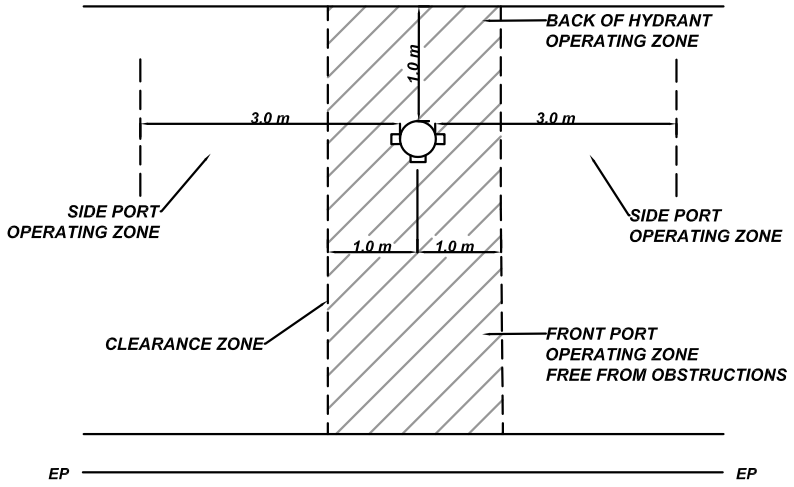
N

SAN DEPTH AT PL _____

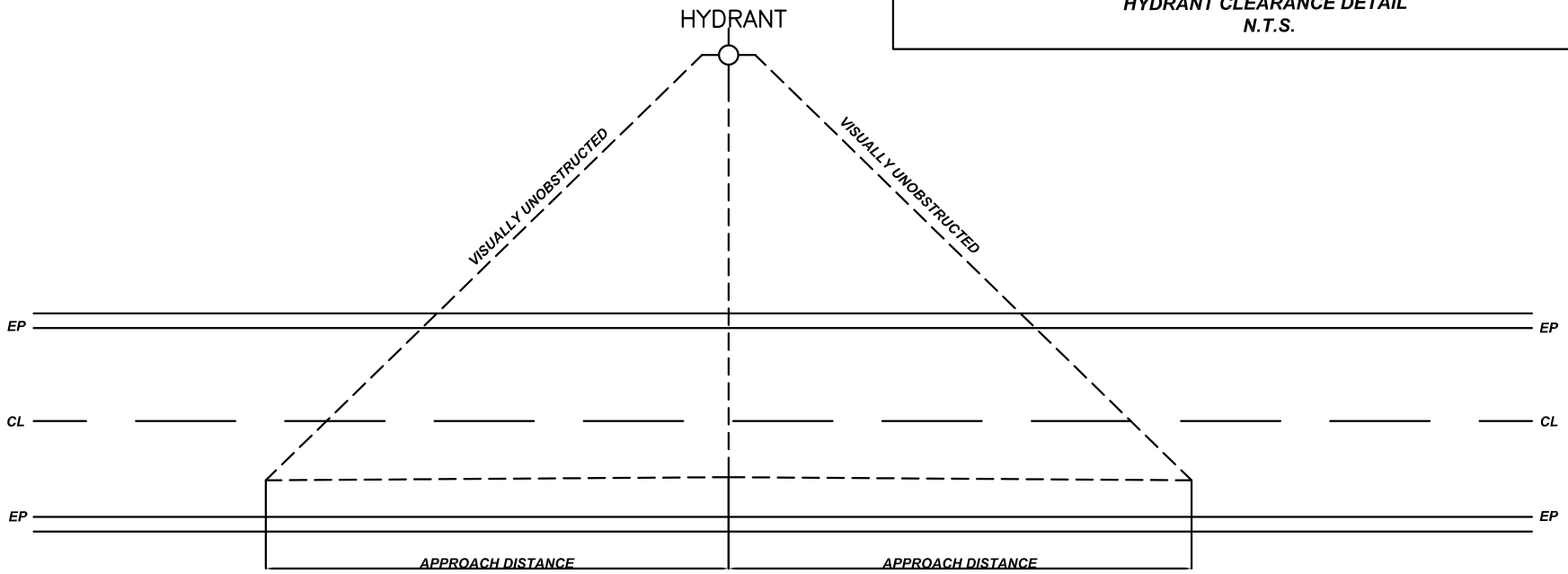
STM DEPTH AT PL _____

STREET

# 3.8.
# HYDRANT CLEARANCE ZONE




**HYDRANT CLEARANCE DETAIL**
**N.T.S.**




Niagara-on-the-Lake EST.1781

# HYDRANT CLEARANCE ZONE

| | |
|---|---|
| DATE | 2019–01–09 |
| SCALE | NTS |
| REF. No. | - |
| DWG No. | REV 1 |

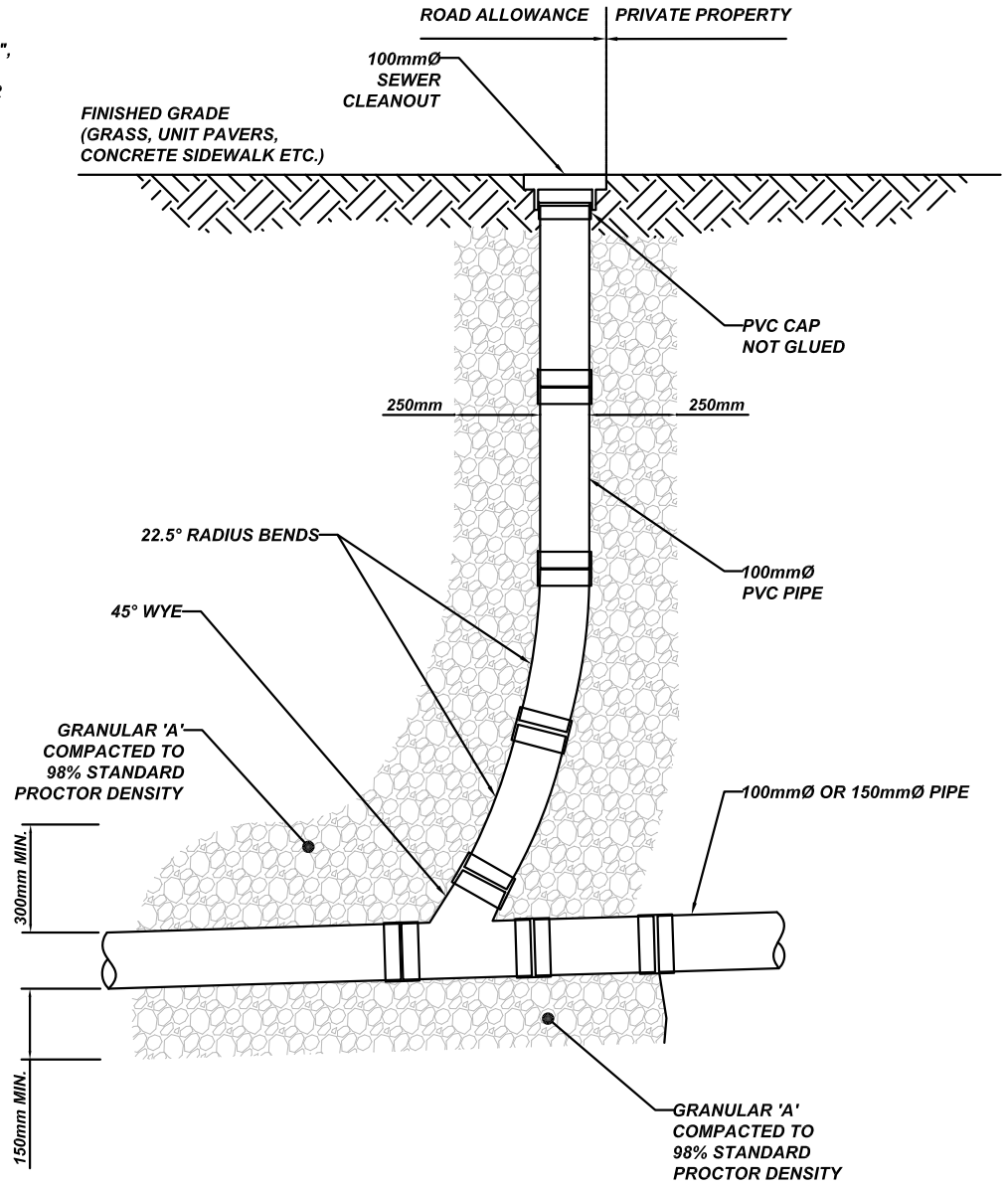
# APPENDIX 4 – SEWER SYSTEM STANDARDS

## 4.1. SANITARY CLEANOUT DETAIL

# 4.1.
# SANITARY CLEANOUT DETAIL

*NOTES:*

1. *INSTALL 100 mm CLEANOUT MARKED "SEWER CLEANOUT", BOLTED.*
2. *USE DOMCAST DF44 SEWER CLEANOUT SURFACE BOX OR APPROVED EQUAL.*
3. *THIS CONFIGURATION FOR HOUSE CONNECTIONS ONLY.*




Niagara-on-the-Lake EST.1781

# SANITARY CLEANOUT DETAIL

| | |
|---|---|
| DATE | 2020–05–01 |
| SCALE | NTS |
| REF. No. | - |
| DWG No. | - |