

October 4, 2013

RESS, EMAIL & COURIER

Ontario Energy Board
P.O. Box 2319
27th Floor
2300 Yonge Street
Toronto ON M4P 1E4

Attention: Ms. K. Walli, Board Secretary

Dear Ms. Walli:

Re: EB-2013-0233 – Application by East Durham Wind, Inc. (“East Durham”) to determine location of distribution facilities within road allowances

We are counsel to East Durham. We are writing in response to the Board’s letter dated October 2, 2013 requesting two points of clarification with respect to the record in the above noted proceeding.

1. *The Board requires the Applicant to provide a more detailed response to [Board staff interrogatory No. 2(ii)] by providing the analysis that underpins the determination of the “1-4 meter” parameter and to submit any relevant documentation that supports the request.*

In response to Board staff interrogatory No. 2(ii), East Durham responded that, in the experience of East Durham and its parent company NextEra Energy Resources, LLC, municipalities and counties generally prefer that collection line infrastructure in road right of ways be buried 1-4 meters from abutting property lines in order to provide sufficient space to facilitate future road improvements and signage.

There are various reasons why, in East Durham and NextEra’s experience, municipalities and counties generally prefer this 1-4 meter corridor. These jurisdictions typically follow the common utility practice to locate infrastructure in road allowances such that the infrastructure is safely set back from existing obstacles and in locations that maximize the potential for the future use of the road allowances. In this regard, there are various reasons why these jurisdictions tend to support a 1 meter setback from the adjoining property, including the following:

- given the trenching and related equipment necessary to bury underground distribution facilities, the 1 meter setback allows such equipment to be operated in a fashion that minimizes any potential interference with fences, trees or shrubbery along the property lines (in fact, given the equipment involved, it is unlikely that the distribution facilities could be installed any closer than the one meter setback due to these obstacles);

- placing the distribution facilities at least 1 meter away from the adjoining property helps minimize the risk that the distribution facilities, or any machinery or other equipment used on the adjoining property, will be damaged if work is conducted near the edge of the adjoining property; and
- to the extent there are or may be cables on either side of the property line, the 1 meter setback helps ensure that such cables can be operated at the same time without interfering with each other.

There are also various reasons why these jurisdictions tend to prefer that infrastructure be located within a narrow corridor located as close as reasonably possible to the adjoining property line (such as East Durham's proposed location which, generally speaking, would extend to approximately 4 meters from the adjoining property line). For example:

- as mentioned in the original response to Board staff interrogatory No. 2(ii), keeping the distribution facilities in a corridor that is as close as possible to the adjoining property allows future work (such as sign placement, road widening, etc.) to occur near the travelled roadway without interfering with the distribution facilities, or vice versa; and
- keeping the distribution facilities in such a corridor also allows the facilities to be worked on as far as possible away from the travelled portion of the road allowance, which helps minimize the potential for interference with traffic on the roadway, which in turn helps increase traffic safety.

We understand that certain municipalities and counties in the vicinity of the Municipality of West Grey have adopted policies for the location of underground infrastructure that are consistent with the considerations above (and therefore with East Durham's proposed location for its distribution facilities). In particular, the County of Grey, in which the Municipality of West Grey is situated, has issued a Policy for Utility Placement on Grey County Rights of Ways (the "Policy", attached at Appendix A). The Policy is written for utilities companies that are installing, among other things, new telephone, cable, telecommunication and gas pipelines in the County Rights of Way. The section of the Policy that speaks to the placement of utilities in the right of ways states the following:

- "Utility plants are usually confined to a two (2) metre horizontal strip along the highway where possible";
- "The horizontal strip should be adjacent to the right-of-way limit, unless that location is already occupied by another utility, trees, or other obstacles"; and
- "The two (2) metre strip must be as close to the right of way limit as possible, and not closer to the roadway or pavement than the centre of the roadside ditch".

In essence, the Policy states the County's preference for underground utilities to be placed in a relatively narrow corridor located as close as possible to the right of way line (i.e. as close as possible to the abutting property line), subject to the presence of existing utilities, trees or other obstacles, but not closer to the roadway or pavement than the center of the roadside ditch. The Policy therefore reflects the considerations noted above, and is consistent with the proposed location for East Durham's distribution facilities.

Similarly, the Municipality of Lampton Shores has issued Infrastructure Design Guidelines and Construction Standards (attached at Appendix B), which indicate the municipality's preference that cable utilities be placed approximately 1.5 meters from the adjoining

property line (see in particular page 44, section 10.5 and the cross-section in Appendix B). This policy is also consistent with the considerations noted above, as well as East Durham's proposed location.

We are not aware of an equivalent Municipality of West Grey policy setting out its preference for the location of East Durham's distribution facilities within West Grey road allowances. That said, the proposal submitted by East Durham in Part 2.0 of the Argument in Chief is consistent not only with the considerations of common utility practice (as described above), but also with the policies of certain nearby municipalities and counties, including the County of Grey in which the East Durham project is situated.

Finally, as noted in East Durham's response to Board staff interrogatory No. 3(i), the narrow corridor that East Durham has proposed for the distribution facilities is supported by numerous environmental, social, technical and economic studies conducted as part of the renewable energy approval process. And as noted in East Durham's Reply Submission in this proceeding (see in particular Section 4.0, Pages 6-9 of that Reply), East Durham has proposed as narrow a corridor as possible to ensure that East Durham can appropriately address any engineering, environmental, health and safety or other practical challenges that may arise during the actual construction of the distribution system.

2. *The Board requires the Applicant to indicate whether the map provided as part of its Argument-in-Chief is accurate with respect to the segment of the line along Baptist Church Road.*

We can confirm that the area in question (i.e. the area in the top left hand corner of the map that is marked in blue but that appears to originate on private lands) is actually within the municipal right-of-way. Please see an updated map attached at Appendix C that shows the corrected view.

Yours truly,



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Appendix A



Policy and Procedures

Subject Title: UTILITY PLACEMENT POLICY ON GREY COUNTY RIGHT-OF-WAYS

Corporate Policy (Approved by Council):

☐

Policy Ref. No.: ROADS 01-10

Administrative Policy (Approved by CAO):

☐

By-Law No. :

Date Approved: February 2, 2010

Name of Dept.: Transportation and Public Safety

Staff Report: TAPSR-14-10

Authority:

The utility company (i.e telephone, cable, telecommunication, gas pipelines, etc) is required to submit a request to the County for the approval of any new installation or change to an existing installation.

Utility Plans:

Plans submitted for approval of a utility installation must show the location and extent of the proposed installation. Plans for an installation which crosses under a County Road shall include a key plan, detail plan and profile.

After construction of any utility, as-constructed plans shall be prepared by the utility company and forwarded to the County. The County Director or his representative may also allow the utility company to confirm in writing that the utility was installed in accordance with the original approved drawing.

Procedure:

Where a utility company has received approval to place a plant within the County right-of-way, the utility is expected to conform to the approved location. Any revisions to the approved location that are found to be necessary after approval must be brought to the attention of the Director or his designate prior to placing the plant. The utility company or that company's sub contractor must file a notification of field work with the County a minimum of twelve (12) hours prior to commencing work on a County Road allowance. The form is available at www.grey.ca/government-administration/taps/permit-forms-information/ . The completed form must be faxed to 519-376-0967, or e-mailed to roads@grey.ca prior to proceeding with the work.

For any excavation on the hot mix or surface treated portion of the County road, a "Utility Excavation Permit" is required prior to proceeding with the work. The permit can be applied for by contacting the Director of Transportation and Public Safety, or his designate. The permit fee is \$100.00 and must be paid prior to commencing the road cut.

Location:

Utility plants are usually confined to a two (2) metre horizontal strip along the highway where possible.

The horizontal strip should be adjacent to the right-of-way limit, unless that location is already occupied by another utility, trees, or other obstacles.

The two (2) metre strip must be as close to the right of way limit as possible, and not closer to the roadway or pavement than the centre of the roadside ditch. Any exceptions must be negotiated between the parties involved PRIOR to the start of construction.

Buried Crossings:

Underground conduits may be used for the crossing of County Roads.

Method of Placing Utility:

County Road crossings must be made by pushing, tunneling, or boring under the pavement in a manner that does NOT disturb the travelled surface of the road crossings. The use of a "torpedo" or similar device is prohibited unless authorized by the Director or his representative. The Director may consider approving this method when the road bed material and other conditions so indicate. It shall be noted that if the torpedo becomes lodged in the roadbed, recovery by open cutting of the pavement will not be permitted and the unit may have to be abandoned.

Major and minor jacking and boring pits should be located at the bottom of the ditch line and back slopes of the ditch, or beyond the toe of slope in a fill area. Jacking and boring pits are prohibited within 3.0 metres from the travelled portion of the roadway.

When a trench is dug on the shoulder or surface of the road, the gravel material should be kept separate from underlying materials and replaced in reverse order. Material being replaced into the trench is to be placed in 150 mm (6") layers and compacted to 100% standard proctor density. If the granular material becomes contaminated or is deemed to be unsuitable due to excessive moisture, organic matter or frost, it shall be replaced with new granular material.

The applicant shall be responsible for the removal and disposal of all surplus or contaminated excavated material. All material must be disposed of outside of the County right-of-way unless the County gives permission to place the material on County property. Any material placed on County property must be leveled and trimmed to the satisfaction of the County.

Depth of Cover:

The standard depth for buried plant shall be not less than 1.2 metres below the travelled portion of the roadway. Buried plants below the bottom of the roadside ditch and other areas within the road allowance shall not be less than 0.75 metres.

Restoration:

The right-of-way and adjacent disturbed areas shall be restored to the same condition as that prior to placing the new plant. Any future settlements or other deficiencies deemed by the Grey County Transportation and Public Safety Director or his representatives to have occurred as a result of the utility installation and after consultation or a site review with the utility company will be repaired promptly by the utility company or by the County at the expense of the utility company.

General Conditions:

1. The utility company shall contact the office of the Grey County Transportation and Public Safety Director or his representatives and arrange a site meeting to view the proposed location of major installations prior to submitting proposed drawings for approvals.
2. Three copies of the Municipal Consent (MC) are to be sent to the Grey County Transportation and Public Safety Director or his representatives for approval. Approval signatures must be received prior to commencing construction.
3. The utility company is responsible for identifying existing private and/or municipal drains and utilities, which lie within the right-of-way. Drains and utilities, which are damaged as a result of utility plant installations, must be repaired by the utility company to the satisfaction of the owner(s) and at no cost to the County.
4. The utility company must give the County forty-eight (48) hours notice prior to commencing the work on major projects by contacting the office of the Grey County Transportation and Public Safety Director at 519-376-7337. The name and telephone number of the utility company's representative responsible for the fieldwork is to be recorded when notice of commencement or work is made.
5. The utility company or its designated contractor shall perform any work on the County road right-of-way as per Occupational Health and Safety Act and Regulations for Construction Projects and comply with the section titled traffic Control and the Ontario Traffic Manual Book 7.
6. The County will not be responsible for damage to existing plants that are located closer than one (1) metre away from guide rail posts or road signs.
7. The utility shall have an insurance policy holding the County harmless with respect to any liability which, in the opinion of the Grey County Transportation and Public Safety Director, resulted from the utility installation.
8. The County will contribute towards the costs for relocations made necessary by County road construction projects as per existing statutes or franchise agreements however, in no case will pay more than 50% the cost of labour and equipment.
9. This policy does not supersede any obligation that the utility companies have as a result of existing statutes or franchise agreements.
10. The County will not be held responsible for damage to utilities when County maintenance crews are replacing guideposts and road signs on the shoulder of the County Road.

11. The County will not be held responsible for damage to utilities during normal maintenance ditching and culvert cleaning operations.

Appendix B

**MUNICIPALITY OF
LAMBTON SHORES**

INFRASTRUCTURE

**DESIGN GUIDELINES
AND
CONSTRUCTION STANDARDS**

JANUARY 2002

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MUNICIPALITY OF LAMBTON SHORES

INTRODUCTION

The following Infrastructure Design Guidelines and Construction Standards provide a means of standardization for the design and construction of sanitary and storm sewers, watermains and roads in the Municipality of Lambton Shores.

These standards have been developed with the intention of identifying which items should be considered in the design and construction of the various services to be provided in the development. However, reference should also be made to existing standard methods of design outlined in the Municipal Engineers Association Design Manual, Ministry of Environment Design Manual, Ministry of Transportation Geometric Design Standards (Roads) and the Ontario Provincial Standard Specification and Drawing Manuals.

The following guidelines and standards should be applied wherever possible in the design and construction of the various services outlined herein. Where deviations in the standards are warranted, the necessary approvals outlining the changes must be obtained from the Municipality of Lambton Shores.

Periodic revisions or additions to these guidelines and standards may occur. All users are required to keep their copy of the guidelines and standards current by obtaining all revisions and additions from the Municipality as they become available.

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SECTION 1 – GENERAL

1.1 PURPOSE

The purpose of these guidelines and standards is to aid in the standardization of the design and construction of municipal services for residential, commercial and industrial areas and developments in the Municipality of Lambton Shores.

The report is also intended as a guide for developers, builders and the general public in the development process for subdivisions, developments by severance, and for individual site developments.

1.2 DESIGN GUIDES

These guidelines and standards should be followed wherever possible. Should special or unique conditions occur, minor deviations from these guidelines and standards may be considered and are subject to the written approval of the Municipality's Engineer. In addition, the Municipality reserves the right to require compliance with one or more of the standards and processes included herein, to require variations from these standards at the Municipality's discretion and to require additional information, standards, services, etc. further to those included herein. For example, the Municipality may require higher standards to accommodate higher density developments, collector and arterial roads, heavy industry, etc.

These guidelines and these standards are to be used in conjunction with standard engineering practices and design tests as well as the standards, regulations, design manuals and guidelines of the Municipal Engineers' Association (MEA), Municipal Electrical Association, Ontario Hydro Distribution Standards, Ministry of Environment & Energy (ENV), Ministry of Transportation (MTO), Ontario Provincial Standard Drawings and specifications (OPSD), (OPSS), various other government Ministries and other regulatory agencies.

1.3 DEVELOPMENT PROCESSES AND APPROVALS

Depending on the location and nature of the development, the Developer may be required to obtain approvals from various other regulatory agencies including (but not limited to) one or more of the following and in addition to and/or prior to obtaining approval from the Municipality's Engineer.

- a) the Ministry of Environment & Energy (ENV)
- b) the Ministry of Transportation (MTO)
- c) the Ministry of Natural Resources (MNR)
- d) the Ministry of Municipal Affairs (MMA)
- e) the Lambton Health Unit
- f) the County of Lambton
- g) the Ausable Bayfield Conservation Authority (ABCA)

It is the responsibility of the Developer to provide the Municipality with suitable written documentation of approval from the regulatory agencies.

The development will be subject to the requirements of one or more Municipal by-laws such as:

- a) the Zoning By-law
- b) the Official Plan
- c) the Building By-law
- d) the Site Plan Control By-law
- e) Sewage By-laws
- f) Grading By-laws
- g) Occupancy Permit By-law

The Developer shall be required to enter into a Development or Subdivision Agreement with the Municipality and pay fees to the Municipality such as application fees for Zoning and Official Plan amendments, severances and development agreements, development charges and such other fees as may be required.

1.4 **ENGINEERING**

The Developer shall retain a Professional Engineer licensed in the Province of Ontario for the design of all services, the preparation of plans and specifications and the supervision and inspection of all construction of the works.

The Developer may be required to submit a hydrogeological study and/or geotechnical report prepared by a Geotechnical Engineer. Elevations of ground surface at bore holes and test pits shall relate to geodetic datum. The geotechnical report may be required to address the suitability of the soils at the site and shall make recommendations pertaining to the use of native soils for trench backfill, roadway pavement design, earthworks for site grading, and comments on foundation design. Where such reports are required, a minimum of two copies of each shall be submitted to the Municipality.

The Developer's Engineer and Planner must consider the overall servicing and development of adjacent lands in the watershed which may be affected by the development, when submitting the development proposal. Where applicable, such considerations and recommendations concerning existing sanitary sewage treatment plants, sewage collection systems, storm water management, water supply/storage and distribution facilities, pumping stations, and oversizing of mains, as well as traffic studies may be required to be submitted by the Developer. The layout of internal roads should also consider the future development of abutting lands. The Developer may be required to enter into agreements with the Municipality concerning such items as development charges, cost sharing for oversizing and front-end financing to allow for proper and orderly future development of the neighbouring lands as well as the proposed site.

For all developments, the Developer's Engineer shall submit sufficient copies of the preliminary design brief, outlining the proposed design criteria as well as commenting on and making recommendations on any previous reports or studies completed for the area of proposed development. In addition the pre-design brief should address all necessary preliminary investigations and explorations, include an analysis of existing conditions and of all possible alternatives, including financial considerations and of all preliminary estimates of cost, as a basis for conclusions and recommendations to be included in the report to the Municipality, for review. The minimum requirements of the applicable statutes, by-laws, Ministries and regulatory agencies must be satisfied.

The Developer's Engineer shall provide evidence of Professional Liability Insurance from their Engineer's Professional Liability Insurance Insurer, in the amount of \$1,000,000 (minimum), prior to the review of any reports/briefs by the Municipality of Lambton Shores.

1.5 **UTILITIES**

The Developer shall coordinate the installation of utilities including T.V. cable, Ontario Hydro, Bell Canada and Union Gas. These utilities shall be installed in accordance with the "Typical Cross-Sections", as noted in Appendix B.

SECTION 2 –SUBMISSION OF PLANS, REPORTS AND STUDIES

2.1 **SUBMISSION PROCEDURE**

All submissions of plans, specifications, documents, reports, studies, preliminary design criteria proposals, etc. shall be made to the Clerk of the Municipality in sufficient quantities as may be required for distribution by the Clerk to such persons as the Public Works Superintendent, Building Official, Planner, Municipality's Consulting Engineer, Fire Department, Hydro etc.

2.2 **GENERAL PLAN REQUIREMENTS**

All drawings shall be done on polyester film and shall be standard A-1 Metric drawing size (594mm x 841mm). All drawings are to be signed and sealed by a Professional Engineer. General plan layout shall be in accordance with standard engineering practice. All elevations on grading plans, site plans, servicing plans, and profiles, etc. shall relate to Geodetic Survey of Canada Datum.

2.3 **DRAWINGS TO BE SUBMITTED**

In general, the following drawings are required for subdivision developments. Some of the following may also be required for individual site plan control developments.

- a) A key plan, to scale of not less than 1 : 10,000 showing the general location of the development to be serviced.
- b) One or more general servicing plans, to a scale of not less than 1 : 2,000 showing all services to be constructed, including storm sewers, sanitary sewers, the water distribution system, roads, street lighting systems and sidewalk.
- c) A lot grading plan, to a scale of not less than 1 : 1,000 and including sufficient areas of adjacent land with contours where applicable to illustrate total drainage patterns.
- d) Plan and profile drawings for each street to be constructed, reconstructed, widened, etc., and for each service easement to a scale of 1 : 500 horizontally and 1 : 50 vertically.
- e) A storm drainage area plan to a scale of not less than 1 : 2,000 and including all interior and exterior tributary areas which contribute to the storm sewer and/or storm water management design. Storm sewer design charts shall be included on the storm drainage plan or submitted on a separate sheet, where applicable. The design charts should include criteria used for design.
- f) A sanitary drainage area plan, to a scale of not less than 1 : 2,000 and including all interior and exterior tributary areas. Where applicable sanitary sewer design charts shall be included on the sanitary drainage plan or submitted on a separate sheet, where applicable. The design charts should include criteria used for design.
- g) Such other drawings showing notes, details, typical sections, etc. as may be necessary for the proper construction of the works, such as:

- i) typical road cross-section
- ii) typical lot grading section
- iii) typical swale details
- iv) geotechnical report information
- v) legend
- vi) storm sewer outfall structures/erosion protection and sedimentation controls
- vii) materials
- viii) trench details
- ix) pumping facilities
- x) storm water management systems and facilities
- xi) water pumping and storage facilities; water distribution systems; design data and calculations including domestic and fire design flows used, location of fire demand flows and resulting head loss in each section of the distribution system; and any other information or plans which the Municipality may require
- xii) details of other items not covered by the OPSD, etc.

One or more of the above drawings which are to become part of the construction drawing package, shall include sufficient legal survey monumentation, dimensions, etc. to enable the Contractor and/or Engineer to locate and/or layout the road rights-of-way, easements, and/or lot corners, as may be required.

Figure 1 lists items in the form of a checklist which may be required on subdivision plans and/or individual site development plans.

2.4 **FINAL APPROVAL / SUBMISSION**

After final approval has been given by the Municipality and all other regulatory agencies, and after all plan/documentation revisions have been made by the Developer's Engineer, a final (full & complete) submission of plans and documentation shall be made to the Municipality in sufficient quantities as the Municipality may require for distribution as noted in Clause 2.1 above. No construction shall proceed until such submission is made by the Developer and has been accepted as satisfactory by the Municipality.

Such final submission shall include the latest revision of all plans, storm sewer design charts, sanitary sewer design charts, water distribution system analysis, copies of Certificates of Approval (eg. for sewage works, for water works) from the Ontario Ministry of the Environment & Energy, structural approval from the Ministry of Transportation where required, etc.

The plans shall contain sufficient information so that the Municipality can be

reasonably assured of such details (without having to refer to the Developer's/Contractor's Contract documents) as pipe locations, pipe sizes, materials, locations of services, road structure, pipe bedding, trench backfill materials, etc. For purposes of approval by the Municipality, information shown on the plans shall be deemed to take precedent over conflicting or alternate information listed in the Developer's/Contractor's Contract documents.

Any changes to approved plans, which are proposed by the Developer or his agents, must be resubmitted to the Municipality for review and approval prior to such changes being made in the installation.

2.5 **"CONSTRUCTION RECORD" DRAWINGS**

"Construction Record" drawings are to be submitted to the Municipality to show the services and works as they were actually constructed. The Developer shall provide the Municipality with one complete set of "construction record" polyester film reproductions of all the drawings applicable to the project and three sets of whiteprints. "construction record" drawings shall include water service locations with ties, and chainages of private drain connections measured from the nearest downstream manhole.

As well as the submission of "construction record" drawings on polyester film and the whiteprints, the Municipality may require "construction record" drawings to be submitted in a digitised form satisfactory to the Municipality. In general, computer disks shall satisfy the following requirements:

- a) 3.5" high density disks or recordable CD's (CD-R) of acceptable quality
- b) WINDOWS format (latest version)
- c) AutoCad (latest version) file format to be: ASCII DXF, BINARY DXF, OR DWG
- d) A written summary of the disk/CD contents in standard ASCII file format shall be entered on each disk/CD.
- e) A paper copy summary of the disk/CD contents including index of file names and a summary of each file shall be submitted with each disk/CD.
- f) Disks/CD's shall be labelled as to project name and date completed.

If a file size exceeds the disk capacity and a utility program was used to reduce the file size, the person who submitted the drawings, shall make available to the Municipality for a one time restoration, the utility program used to reduce file size, to enable the Municipality to enter the drawings on the Municipality's computer system. If drawings were created in a program other than AutoCad, it is the responsibility of the person submitting the drawings to ensure that the conversion to the suitable format readable by AutoCad, is free from error.

2.6 **LOT SERVICING**

Services for individual residential lots shall be as follows:

- a) Water services shall be installed on the centreline of single lots and 1.0m (3.0') to the right and left of centreline for semi-detached lots.
- b) Sanitary private drain connections (PDC) shall be installed 3.0m (10.0') right of centreline for single lots and 3.0m (10.0') right and left of centreline for semi-detached lots.
- c) Telephone, Cable TV and electric services are to be installed in a common trench as noted in Appendix B.
- d) Driveways shall be located on the opposite site of the lot to that of a padmounted transformer, hydrant or street light pole where possible and shall be perpendicular to the road.
- e) Each property shall be provided with a sanitary PDC of a minimum diameter of 125mm (5") having a minimum slope of 2%.
- f) Roof water leaders and foundation weeping tile shall not be connected to the sanitary sewer.
- g) Roof water leaders shall not be connected to the storm sewers. Foundation weeping tile shall not be connected to the storm sewers. All houses shall have a sump pump installed, discharging to a drainage swale which preferably drains to the rear of the lots.
- h) No part of the driveway shall encroach upon the property boundaries when extended from the edge of the right-of-way to the roadway.
- i) If a concrete driveway is installed, expansion joints are to be installed at both sides of the sidewalk and at the curb. A construction joint is also required at the property line.
- j) Trees shall be installed 1.5m behind the property line, a minimum of 4m from all other services.

SECTION 3 - STORM SEWERS

3.1

GENERAL

Storm sewers shall be provided to service all of the lands in the Plan of Subdivision

or Development Plan and shall be located in the street right-of-way or in an approved easement. The storm sewer outlet must be carried to a sufficient outlet so that no damage is done to lands or roads because of the existence of said outlet. All lots and blocks in the plan must be connected to the storm sewer. Storm sewers shall be designed to accept all drainage from the contributing area, including upstream areas which shall be determined by the subdivider's Engineer and be subject to the approval of the Municipality's Engineer.

Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD) and Municipal Engineer's Association (MEA) guidelines shall govern, where applicable.

3.2 **STORM WATER MANAGEMENT**

3.2.1 **Design Guidelines**

Current Storm Water Management Design Standards, require restricting storm water flows outletting from a development to existing values. The impact of future flow on downstream facilities should be no greater than at present.

On the other hand, current inadequate outlet facilities may have an impact on future upstream flooding. Any outlet deficiency should be corrected at or before the time of upstream development. Additional costs would be assessed to development subject to any cost sharing agreement negotiated with the Municipality.

Subject to the requirements of the Conservation Authority having jurisdiction, it is recommended that any submission of a proposed plan of subdivision or development include detailed storm water management plans which should comply with the following design guidelines:

- Design storm sewer pipe system to 2 Year storm return period for pipe flow condition.
- Keep development maximum outlet flows to predevelopment values for the 2 to 100 Year return period.
- Detain the first 13 mm of rainfall generated runoff from all new development for a period of 24 to 48 hours to improve sediment removal.
- For large site developments, utilize about 5% of the proposed development lands for storm water ponding in order to satisfy retention and storage requirements. This will ideally be located in the lower areas. Areas utilized for temporary storm water storage should possibly be utilized as passive park or low use recreational land.
- Design development to maximize the travel time of storm water over pervious, rough and/or fairly flat surfaces. Maximizing the use of rear lot drainage is one such technique.
- Use of shallow grassy swales for storm water conveyance is recommended. They can be used beside roadways in conjunction with curbs, as well as for rear lot

drainage.

- Utilizing inlets for temporary ponding and buried perforated pipe covered with porous material (granular or topsoil material) for infiltration may also be considered.

3.3 **DESIGN FLOWS**

3.3.1 **Runoff Computations**

The Rational Formula is to be used to determine the quantity of storm runoff. The use of other empirical runoff formulae must be approved by the municipality's Engineer. The Rational Formula is:

Where

Q	= 2.78 AIR
Q	= Peak flow in L/s
A	= Area in hectares
I	= average rainfall intensity in millimetres per hour for a duration equal to the time of concentration for a particular storm frequency
R	= Runoff coefficient (see section 3.3.5)

3.3.2 **Drainage Area**

The drainage area to be used in the design of a storm sewer system must include all those areas which will reasonably or naturally drain to the system.

The area term in the Rational Formula represents the total area tributary to the point on the storm sewer under consideration.

3.3.3 **Rainfall Intensity**

The rainfall intensity I, shall be determined from Yarnell Precipitation Formula for Intensity-Duration-Frequency curves as follows, or current applicable Environment Canada rainfall intensity duration curves.

$$\left. \begin{array}{l} \text{2 year storm } I = 25.7 \times t^{-0.66} \\ \text{5 year storm } I = 36.3 \times t^{-0.611} \end{array} \right\} \text{Yarnell Formula}$$

Where I = rainfall intensity (mm/hr)
t = duration time (hrs)

3.3.4 **Design Storm Frequency**

The design storm frequency shall be a 2 year storm for residential lands and a 5

year storm for industrial or commercial lands.

3.3.5 Runoff Coefficients

The value of runoff coefficient R, is to be taken from the following:

Asphalt or Concrete Surfaces	0.90
Roof Areas	0.90
Single Family Residential	0.35 to 0.75
Semi-Detached Residential	0.40 to 0.75
Apartments	0.50 to 0.70
Light Industrial	0.50 to 0.80
Heavy Industrial	0.60 to 0.90
Neighbourhood Commercial	0.50 to 0.70
Playgrounds	0.20
Parks	0.20
Unimproved	0.20

3.3.6 Time of Concentration

The time of concentration is the time required for flow to reach a particular point in the sewer system from the most remote part of the drainage area. It includes not only the travel time in the sewers, but also the inlet time, or time required to flow overland into the sewer system. The inlet time shall be taken as 20 minutes unless calculations indicate a shorter or longer time is applicable. Supporting calculations shall be submitted to the Municipality's Engineer for review.

3.4 SEWER DESIGN

3.4.1 Flow Formula and Roughness Coefficient

3.4.1.1 The Manning Formula is to be used for calculating sewer capacity and selecting pipe sizes, and is as follows:

$$Q = \frac{7.855 \times 10^{-6}}{n} \times D^2 \times R^{2/3} \times S^{1/2}$$

Where Q = flow capacity of sewer (L/s)
 D = inside diameter of pipe (mm)
 R = hydraulic radius of pipe (mm)
 S = sewer slope (m/m)
 n = Manning roughness factor

The Manning roughness coefficient shall be as follows:

smooth walled pipe	0.013
corrugated metal pipe	0.024
corrugated metal pipe with 25% paved inverts	0.020
corrugated metal pipe fully paved inverts	0.013

3.4.2 Allowable Flow Velocities

Minimum velocity = 0.90 m/s

Maximum velocity = 6.0 m/s

3.4.3 Minimum Pipe Sizes

A) Storm sewers - 250 mm

B) Catch basin leads

single - 200 mm

double - 250 mm

C) Connections - 150 mm

A decrease in pipe size from a large size upstream to a small size downstream will not be allowed regardless of grade increases.

3.4.4 Minimum Grades for Pipes

The minimum grades for storm sewers based on "n" = 0.013 are as follows:

250 mm	0.56%
300 mm	0.44%
375 mm	0.32%
450 mm	0.26%
525 mm	0.21%
600 mm	0.18%
675 mm	0.15%
750 mm & larger	0.13%

825mm	0.011%
900mm & larger	0.10%
150 mm connections	2.0%
200 mm leads	1.0%

3.4.5 Depth of Cover

The minimum cover over catchbasin leads shall be 1250 mm based on proposed finished grade. Main storm sewers shall be installed with a minimum of 1.50 metres of cover.

3.4.6 Manhole Spacing

Manholes shall be placed at all changes in grade, changes in alignment (except for curvilinear sewers) and on straight runs at the following intervals:

- A) Sewers 250 mm to 450 mm - 120 m
- B) Sewers greater than 450mm - 150 m

3.4.7 Manhole Design

Manholes are to be designed in accordance with Ontario Provincial Standard Drawing and Specifications.

An appropriate "energy drop" is required at all manholes at which a change in direction of the sewer occurs. For bends of 45 degrees and 90 degrees, the minimum required drop of the inverts across the manhole is 0.03 m and 0.06 m respectively.

3.4.8 Separation of Sewers from Potable Water Lines

Storm sewers and watermain constructed parallel to each other should be constructed in separate trenches maintaining a minimum clear horizontal distance of 2.5 m.

3.4.9 Catch Basins

- A) Catch basins shall be installed with sumps.
- B) Catch basins to be 1.5 m clear of any driveway curb depression.
- C) With a normal 2% road crossfall either side of the centreline, the following maximum catch basin spacings will apply:
- D) Double catch basins at all low points and/or curb inlet catch basin overflow plates

should be considered on steep gradients (OPSD 400.9). Overflow plates require a modified catch basin precast unit (600mm x 840mm).

<u>Road Gradient</u>	<u>Road Width</u>	<u>Maximum Spacing</u>
0.35 to 0.5% *	8.5 m	45 m
	15.0 m	40 m
0.6 to 3.0%	8.5 m	90 m
	15.0 m	70 m
3.1 to 5%	8.5 m	75 m
	15.0 m	55 m
5.1 to 6%	8.5 m	60 m
	15.0 m	45 m

Where changes in gradient occur, the average gradient should determine the maximum spacing.

* 0.50% road gradient is the recommended minimum

3.4.10 Storm Sewer Gratings and Manhole Frames

Inlets and outlets of storm sewers which are accessible to the public shall be provided with projective gratings, for pipe sizes 450 mm or greater.

Metal lift rings to adjust manhole cover to finished grade are not permitted. Curb inlets in drive over curb locations should be recessed into the curb with a curb setback formed as a barrier curb transition section to accommodate the overflow plate.

3.4.11 Sewer Separation at Crossings

A minimum 150 mm clearance is required between outside pipe barrels at all pipe crossings. Where storm sewer crosses sanitary sewer or watermain, separation requirements as per Ministry of Environment Policy "08-02-01" shall apply.

3.4.12 Sewer Easements

All sewer easements must be a minimum of 6.0 m wide for one (1) sewer, 7.60 m wide for two (2) sewers in the same trench and 9.0 m wide for two (2) sewers in separate trenches.

3.4.13 Storm Sewer Outlets

Storm sewer outlets to existing or proposed trunk sewers, municipal drains or natural watercourses inside or outside the development will be installed by the developer. In no case will an

outlet be allowed to a natural watercourse or municipal drain which does not have sufficient capacity for the proposed discharge. The developer will be required to ensure that development does not cause interference with the riparian rights of properties upstream or downstream from the development.

3.5 **MATERIALS FOR CONSTRUCTION**

3.5.1 **Storm Sewers**

Pipe materials for storm sewers, catch basin leads and sewer connections shall be reinforced concrete, or PVC and shall conform with OPSS Standards. Alternative materials must be approved by the Municipality.

3.5.2 **Manholes**

Manholes are to be precast or cast-in-place concrete structures with cast iron frames and covers and shall be designed in accordance with OPSD and OPSS..

3.5.3 **Catch Basins**

Catch basins are to be precast or cast-in-place concrete structures with cast iron grates and shall be designed in accordance with OPSD and OPSS and shall have sumps.

3.5.4 **Pipe Bedding and Cover Materials and Trench Backfill Materials**

These materials shall be designed by the Developer's geotechnical engineer and material type and composition requirements indicated on the plans.

SECTION 4 - SANITARY SEWERS

4.1 GENERAL

Where sanitary sewer outlets are available to service the lands in the plan of subdivision, sanitary sewers shall be provided for all of the lands in the plan of subdivision and shall be located in the street right-of-way or in an approved easement. All lots and blocks in the plan of subdivision must be connected to the sanitary sewers.

Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) and Ministry of the Environment (MOE) guidelines shall govern where applicable.

4.2 HYDRAULIC DESIGN

4.2.1 Residential Flow

The following criteria shall be used in determining peak flows for municipal sewer design for residential areas, including single and multiple housing, mobile home parks, etc.

A) Design Population

For purposes of estimating future sewage flow rates, reference should be made to the Official Plan. The Official Plan will contain future population densities and land uses.

Unless otherwise stated, a population density of at least 3 people per unit is to be used.

B) Average Daily Domestic Flow

Average daily domestic flow, exclusive of extraneous flows, shall be 400 L/cap.d.

C) Peak Rate of Flow

Peak domestic sewage flows to be calculated by the following equation:

$$Q(d) = \frac{PqM}{86.4} + IA$$

where $Q(d)$ = peak domestic flow L/s

P = design population in thousands

q = average daily per capita domestic flow in L/cap.d.

M = peaking factor derived from Harmon Formula

$$M = 1 + \frac{14}{4 + P^{1/2}}$$

The minimum peaking factor is 3

I = Unit peak extraneous flow in L/ha.s

A =Gross tributary area in hectares

4.2.2 Commercial and Institutional

Commercial and Institutional flows should be based on historical records when available. Where no records are available, the preliminary unit values below should be used, exclusive of extraneous flows. For tourist and commercial establishments, a minimum flow of 28 m³/ha.d should be used in the absence of reliable flow data. Final unit flows will be negotiated with the Municipality on a project by project basis.

<u>Facility</u>	<u>Sewage Flow</u>
Shopping Centres	2500-5000 L/1000 m ² day based on total floor area
Hospitals	900-1800 L/bed.day
Schools	70-140 L/student.day
Travel Trailer Park	340 L/space.day (minimum without water hook-ups) 800 L/space.day (minimum with indiv. water hookups)
Campgrounds	225-570 L/campsite.day
Mobile Home Parks	1000 L/space. day
Motels	150-200 L/bed space. day
Hotels	225 L/bed space. day

4.2.3 Industrial Flow

Peak sewage flow rates from industrial areas vary greatly with the extent, the type of industry, the provision of in-plant treatment or regulation of flows, and the presence of cooling waters in the discharge etc. In the absence of accurate flow data, the following preliminary sewage flow allowances may be used. Final unit flows will be negotiated with the Municipality on a project by project basis.

Light industry	35 m ³ /ha.day
Heavy industry	55 m ³ /ha.day

4.2.4 Infiltration

The infiltration rate into the sewers shall be taken as 0.20 litres/sec/hectare for residential, commercial and industrial lands.

4.3 SEWER DESIGN

4.3.1 Flow Formula and Roughness Coefficient

The Manning Formula is to be used for calculating sewer capacity and selecting pipe sizes, and the roughness coefficient (n) of not less than 0.013 is to be used for smooth-wall pipe materials.

The Manning formula is as follows:

$$Q = \frac{7.855 \times 10^{-6}}{n} \times D^2 \times R^{2/3} \times S^{1/2}$$

where Q = Flow capacity of sewer (L/s)
 D = Inside diameter of pipe (mm)
 R = Hydraulic radius of pipe (mm)
 S = Sewer Slope
 n = Manning roughness coefficient

4.3.2 Allowable Flow Velocities

Minimum velocity = 0.6 m/s
 Maximum velocity = 3.0 m/s

4.3.3 Minimum Pipe Sizes

A) Sanitary sewers - 200 mm
 B) Connections - 125 mm

4.3.4 Minimum Slopes for Pipes

The minimum slopes for sewer are as follows:

200 mm	0.42%
250 mm	0.28%
300 mm	0.22%
375 mm	0.15%
450 mm	0.12%
525 mm	0.10%
600 mm	0.08%
675 mm	0.67%

750 mm	0.058%
125 mm connections	2.0%

4.3.5 Depth of Cover and Alignment

Sanitary sewers are to be located 1.5 m off centreline of street (i.e. 3 m offset from storm sewer) and are to be installed with a minimum depth of cover to the top of the sewer from the road surface of 2.5 metres.

4.3.6 Manhole Spacing

Manholes shall be placed at all changes in grade, align changes in alignment (except for curvilinear sewers) and on straight runs at the following intervals:

A)	Sewers 200 mm to 450 mm	-	120 m
B)	Sewers 525 mm or greater	-	150 m

4.3.7 Hydraulic Losses at Manholes

The following minimum allowances shall be made for hydraulic losses incurred at sewer manholes:

-	straight run	grade of sewer
-	45 deg. turn	0.03 m
-	90 deg. turn	0.06 m

4.3.8 Separation of Sewers from Potable Water Lines

Storm sewers and watermains constructed parallel to each other should be constructed in separate trenches maintaining a minimum clear horizontal distance of 2.5 m.

4.3.9 Sewer Easements

All sewer easements must be a minimum of 6.0 m wide for one (1) sewer, 7.60 m wide for two (2) sewers in the same trench and 9.0 m wide for two (2) sewers in separate trenches.

4.3.10 Sewer Connection Cleanouts

Requirements for Municipal cleanouts at property line on connections will be determined on a project by project basis.

4.3.11 Sewer Connection Types

Sewer connections shall be type I, II or III based on depth.

4.4 **MATERIALS FOR CONSTRUCTION**

4.4.1 **Sanitary Sewers**

Pipe materials for sanitary sewers and sewer connections shall be PVC and shall conform with OPSS standards. Alternative materials must be approved by the Municipality.

4.4.2 **Manholes**

Manholes are to be precast or cast-in-place concrete structures with cast iron frames and covers and shall be designed in accordance with OPSD and OPSS. Metal lift rings to adjust manhole covers to finished grade are not permitted.

4.4.3 **Pipe Bedding and Cover Materials and Trench Backfill Materials**

These materials shall be designed by the Developer's geotechnical engineer and material type and composition requirements indicated on the plans.

4.5 **SEWER TESTING FOR LEAKAGE**

Sanitary sewers shall not exceed the following permissible infiltration and exfiltration rates:

Exfiltration

(a) **Up and including 900 mm diameter pipe**

1.4 litres per 25 mm of conduit barrel internal diameter, per 30 metres of line length, per hour with a 0.6 metre head of water above the highest pipe. The above rate is to be increased by 10% for every additional 0.6 metre head.

(b) **Greater than 900 mm diameter pipe**

2.3 litres per 25 mm of conduit barrel internal diameter, per 30 metres of line length per hour with a 0.6 metre head of water above the highest pipe. The above rate is to be increased by 10% for every additional 0.6 metre head.

Infiltration

(a) **Up to and Including 900 mm diameter pipe**

1.1 litres per 25 mm of conduit barrel internal diameter, per 30 metres of line length, per hour.

(b) Greater than 900 mm diameter pipe

2.3 litres per 25 mm of conduit barrel internal diameter, per 30 metres of line length, per hour.

The above requirements for pipe sizes up to and including 900 mm in diameter conform to the minimum requirements as set by the Ontario Ministry of the Environment. The requirements for pipe sizes larger than 900 mm in diameter conform to the requirements of A.S.T.M. Designation C-443, latest edition.

SECTION 5 - WATERMAINS

5.1 GENERAL

Where a waterworks is available to lands to be subdivided, the subdivider shall construct a water distribution system as part of the servicing requirements.

Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD), American Water Works Association (AWWA) and the Ministry of the Environment (MOE) shall govern where applicable.

5.2 HYDRAULIC DESIGN

5.2.1 Design Water Demand

The water requirements in the design of the distribution system are to be based on the following four basic needs:

- (a) Residential water demand
- (b) Commercial and Institutional water demands
- (c) Industrial water demands
- (d) Fire demands

Water supply systems should be designed to satisfy the greater of either of the following demands:

- (A) Maximum day plus fire flow
- (B) Peak rate (maximum hourly demand)

The maximum day demand is the average usage rate on the maximum day. The fire flow demand will vary with the size of the area and density of development and shall comply with: "Water Supply For Public Fire Protection – A Guide to Recommended Practice (latest edition)" as issued by Fire Underwriters Survey and Insurance Bureau of Canada (c/o Insurers' Advisory Organization – Toronto). The peak rate demand is the short-term demand placed upon the system by usage other than fire fighting. The peak rate demand is usually taken as the average water usage over the maximum hour.

5.2.2 Unit Consumption Rates

a) Residential Water Demands

For the purposes of design, the average daily per capita water demands shall be 400 L/cap.d.

Peak usage rates for residential purposes will vary in accordance with the guidelines published by the Ministry of the Environment.

b) Commercial and Institutional Water Demands

Commercial and Institutional flows should be based on historical records when available. Where no records are available, the preliminary unit values below should be used. For tourist and commercial establishments, a minimum flow of 28 m³/ha.d. should be used in the absence of reliable flow data. Final unit values will be negotiated with the Municipality on a project by project basis.

<u>Facility</u>	<u>Water Usage (av.daily)</u>
Shopping Centres	2500-5000 L/1000 m ² day based on total floor area
Hospitals	900-1800 L/bed. day
Schools	70-140 L/student.day
Travel Trailer Parks	340 L/space.day (minimum without water hookups) 800 L/space.day (minimum with indiv. water hookups)
Campgrounds	225-570 L/space.day
Mobile Home Parks	1000 L/space.day
Motels	150-200 L/bed space.day
Hotels	225 L/bed space. day

For estimation of peak demand rates, an assessment of the water using fixtures is generally necessary and a fixture-unit approach is required. A peak rate factor of 4 will apply to campground areas.

c) Industrial Water Demands

Peak water demand from industrial areas vary generally with the extent, the type of industry. In the absence of accurate flow data, the following preliminary flow allowances may be used. Peak usage rates will generally be 2 to 7 times the average usage rate. Final unit rates will be negotiated with the municipality on a project by project basis.

Light industry	35 m ³ /ha. day
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Heavy industry 55 m³/ha.day

d) Fire Demands

The minimum fire flow shall be determined on a project by project basis. The system must be simultaneously capable of satisfying the maximum day demand.

5.3 **SYSTEM PRESSURE**

5.3.1 Minimum Operating Pressures

The distribution system shall be sized so that under maximum hourly demand, the pressures are not less than 275 kPa. Under conditions of simultaneous maximum day and fire flow demands, the pressure should not be less than 140 kPa.

5.3.2 Transient Pressures

The distribution piping system shall be designed to withstand the maximum operating pressure plus the transient pressures to which it will be subjected. Transient pressures are caused by rapid valve operation, pump start-up and shut-down, power failures, etc.

As a minimum allowance in the distribution system, the pipe and joint strength shall be such that it can withstand the maximum operating pressure plus the pressure surge that would be created by instantaneous stoppage of a water column moving at 0.6 m/s.

5.4 **FRICTION FACTORS**

The Hazen-Williams Formula is to be used in the design of water distribution systems. The following Hazen-Williams "C" values shall be used for the design of water distribution systems, regardless of materials:

<u>Diameter</u>	<u>C-Factor</u>
150 mm	100
200 mm/250 mm	110
300 mm/600 mm	120
Over 600 mm	130

5.5 **MINIMUM PIPE SIZES**

5.5.1 Watermains

The minimum size of watermain shall be 200 mm except for the following cases:

- (A) Watermains in systems not required to carry fire flows;
- (B) Beyond the last hydrant on cul-de-sacs

5.5.2 Water Services

The minimum pipe size for water service connections is 20 mm.

5.6 SYSTEM LAYOUT

5.6.1 Grid Design

The water distribution system shall be designed to eliminate dead-end sections. Where dead-end mains cannot be avoided, the section shall be provided with a fire hydrant or blow-off.

5.6.2 Valve Placement

Shut-off valves shall be placed as follows:

At "T" intersections	at least 2
at cross intersections	at least 3
on straight runs	intervals not greater than 250 m

5.6.3 Hydrant Requirements

In residential areas, the line spacing for hydrants shall be not greater than 150 m. For areas other than residential, consult the appropriate water commissions.

Fire hydrants must be installed only on watermains capable of supplying fire flow requirements. The hydrant leads shall be 150 mm diameter pipe. Location and number of hydrants is subject to the approval of the Fire Chief.

5.6.4 Depth of Cover

The minimum depth of cover over watermains and service connections shall be 1.7 m.

5.6.5 Cross-Connection Control

No connection shall be made between a potable public water system and any well or

private water system.

If, in the opinion of the Municipality's Engineer or of the respective Commissions, a hazard could exist in a proposed water service, a backflow preventer shall be installed in such water service line.

5.7 **PIPE DESIGN**

5.7.1 **Pipe Materials**

The following are acceptable materials for watermain:

- Ductile Iron (cement lined) AWWA C151 and C104
- Polyvinyl Chloride AWWA C900

Additional pipe materials may be submitted by the developer for review by the Municipality's Engineer.

Pipe class and type of material shall be submitted to the Municipality for approval. A solid 12 gauge two copper tracerwire must accompany the full length of the watermain for locating purposes. Provide cathodic protection where directed by the Municipality

5.7.2 **Restraints**

Adequate restraint shall be provided to prevent pipe movement and to prevent joint failure by jointing methods or thrust blocking capable of resisting the forces involved.

3.7.3 **Bedding and Backfill**

Bedding and backfill requirements shall be consistent with the pipe material, class and soil conditions in the installation location.

5.8 **APPURTENANCES**

5.8.1 **Hydrants**

All hydrants used on distribution systems shall be of the dry barrel type manufactured in accordance with requirements of AWWA C-502. Hydrants are to OPEN counter-clockwise (LEFT) and be 3 way with steamer port STORZ connection.

5.8.2 **Valves and Valve Chambers**

All valves to be used on the water distribution system and secondary valve on fire hydrants shall be as follows:

- Gate valves shall be manufactured in accordance with AWWA C500, suitable for direct burial with resilient seats and stainless steel nuts and bolts.
- Gate valves 300 mm in diameter or larger shall be installed in precast valve chambers with features as directed by the Municipality. All smaller valves shall have suitable valve boxes.

5.8.3 Water Services

Water services shall be a minimum of 20 mm internal diameter and shall be equipped with approved corporation stop and curb stop with stainless steel rod and pin and 20mm hexagonal brass cap plug. Service pipe shall be Type "K-Soft" (ASTM B88) or polyethylene Class 160. All services shall be connected to PVC watermain using stainless steel broad band saddles. Hydro services shall not be grounded to water services.

5.9 ACCEPTANCE OF WORK

5.9.1 Pressure and Leakage Test

The distribution system and services shall be back flow protected and pressure-tested to 1050 kPa for a period not less than 2 hours. All leaking joints, fittings or appurtenances shall be tightened and all defective materials shall be removed and replaced. The maximum allowable leakage is 1.85 litres per day per mm of diameter per Km of length and all necessary steps to reduce the leakage to the allowable amount shall be taken.

When the installation is completed and the leakage test and pressure test results are satisfactory, the system shall be thoroughly swabbed and flushed to remove all debris and unwanted material. The system shall be disinfected using a chlorine solution maintained at a minimum concentration of 50 mg/l throughout the length of the pipeline. The residual concentration at the end of 24 hours shall be at least 25 mg/l. If tests of the solution are satisfactory, the contents of the pipeline shall be flushed out completely and recharged by normal municipal water. Samples of the recharge water in the system shall be analysed for contamination and the system shall not be put into operation until test results indicate no contamination. Disinfection procedures shall be repeated as necessary.

All testing and disinfection shall be carried out by the developer in the presence of the Municipality's representative.

5.9.2 Valve Boxes and Curb Boxes

The top of all valve boxes and curb boxes must be set to finished grade. Curb boxes must be set plumb and be 150 mm to 300 mm from the street line toward the centreline of the road.

5.9.3 Hydrants

Hydrants are to be set plumb, with nozzles parallel to edge of pavement or curb line, and pump connection facing pavement.

Flange at base of hydrant is to be set at finished grade to 100 mm above finished grade.

SECTION 6 - ROADS

6.1 GENERAL

Paved roads and concrete curbs and gutters shall be provided in the Plan of Subdivision. Existing street allowances, which provide access to the subdivision shall be constructed or improved as determined by the Municipality's Engineer.

Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD), Municipal Engineer's Association (MEA) guidelines, Transportation Association of Canada and Ministry of Transportation guidelines shall govern where applicable.

6.2 DESIGN

In general, the following design criteria shall be adhered to unless otherwise approved by the Municipality's Engineer.

6.2.1 Pavement Widths and Right-of-Way Widths

The following information outlines right-of-way widths, pavement widths (face to face of curb) for the various street classifications:

<u>Type</u>	<u>Lane Width</u>	<u>Parking Lane</u>	<u>Min Total Width</u>	<u>Right-of-Way</u>
Local Residential	3.0 m	2.5 m	8.5 m	20 m
Industrial Commercial	3.5 m	2.5 m	9.5 m	20 m to 26 m

The street classification will be determined by the Municipality's Engineer.

6.2.2 Minimum Road Gradients

The minimum allowable road gradients is 0.5% and maximum is 5% (8% absolute). In the case of curves, the minimum gradient applies to the longest gutter (min. grade at intersection curb radii 0.8%). Vertical curves are required where the algebraic difference in grades is greater than 1.0%. Minimum length of vertical curve shall not be less than 45m.

6.2.3 Standard Geometrics

	Minor <u>Local</u>	<u>Local</u>
No. of Units	<25	<100
Traffic Volume (AADT)	<200	<1000
Min Boulevard Width	3.15 m	3.15 m
Min Cul-de-Sac Pavement Radius (residential)	15.0 m	15.0 m
Min Cul-de-Sac Radius at property line (residential)	19.0 m	19.0 m
Min Stopping Sight Dist.	60.0 m	60.0 m
Pavement Crossfall	2.0%	2.0%
Pavement Thickness *		
Hot Mix Asphalt	75 mm	90 mm
Granular "A"	150 mm	150 mm
Granular "B"	250 mm	300 mm
Maximum allowable beam deflection (Benkleman)	2.5 mm	1.8 mm

* Minimum requirements in the absence of a Geotechnical Engineer's report.
Off –site road improvements (existing street widenings, turning lanes, tapers, traffic island, signals, sidewalks ... etc. including traffic studies ... etc.) will be determined on a project by project basis.

6.2.4 Intersection Radii

The minimum % radii at edge of pavement required at intersections are as follows:

<u>Street Classification</u>	<u>R.O.W. Widths</u>	<u>Minimum Radius</u>
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30

Local to local	20 m	9.0 m residential
	20 m	11.0 m industrial
Local to collector	20 m	9.0 m residential
	20 m	11.0 m industrial

6.2.5 Street Patterns

Where possible:

- intersecting streets at right angles
- no jogged intersections
- intersections not closer than 60m (200ft).
- avoid long cul-de-sacs
- minimize through traffic

6.2.6 Curb and Gutter

Barrier concrete curb and gutter is required on all streets. Alternative curb types will be considered by the Municipality's Engineer. A roll type curb may be installed on cul-de-sacs with approved transitions. All curbs shall be in accordance with OPSS and OPSD Specifications. All curb cuts shall be installed at the time of construction and locations shall be in accordance with zoning by-law side yard setbacks for interior and exterior yards.

6.3 MATERIALS FOR CONSTRUCTION

6.3.1 Concrete

The concrete curb and gutter is to be placed on a Granular "A" base of not less than 150 mm thick. Concrete is to be 25 MPa at 28 days and air entrainment capabilities of 6%+/-1%. Contraction joints are to be provided every three (3) meters. Expansion joints every nine (9) meters; on both sides of catch basins; and, at the beginning and end of circular curves. The use of asphaltic concrete curb will not be permitted.

General specifications for concrete shall be according to OPSS. A mix design shall be submitted to the Municipality's Engineer for approval.

6.3.2 Asphalt

General Specifications for asphalt shall be OPSS. The top course of asphalt shall be 35/40 mm of HL3 and the base course shall be 40/50 mm of HL5. Asphalt shall be compacted to 97% of the marshall density of the mix design. Granulars used in asphalt shall conform to OPSS.

6.3.3 Granular "A"

Granular "A" shall conform to OPSS. Granular "A" shall be compacted in roadways to 100% Standard Proctor maximum Dry Density. Sieve analysis shall be performed on the proposed material to ensure conformance with the specification before the material is placed on the roadway.

6.3.4 Granular "B"

Granular "B" shall conform to OPSS. Granular "B" shall be compacted in roadways to 100% Standard Proctor Dry Density. Sieve analysis shall be performed on the proposed material to ensure conformance with the specification before the material is placed on the roadway.

6.4 CONSTRUCTION

6.4.1 Trench Compaction and Subgrade Compaction

All sewer and water trenches and utility trenches within the roadway shall be compacted to at least 95% Standard Proctor Dry Density up to 1 metre below first road grade and 98% up to subgrade level.

The subgrade shall be proof rolled and compacted to at least 98% Standard Proctor Dry Density. Imported materials for subgrade shall be compacted to at least 98% Standard Proctor Dry Density.

All topsoil shall be removed under roadways and curb and gutters. All subgrade to be approved by a Geotechnical Engineer.

6.4.2 Boulevard Grading

All boulevards between the curb and street line shall be fine graded. The slopes on boulevards shall be not less than 2% and not greater than 6%. All debris, rubbish and junk shall be removed from the street right-of-way before final acceptance of the subdivision.

6.5 STREET NAME SIGNS

Street identification signs shall be as noted herein:

Street name signs are to be located on the southwest corner of all street intersections unless otherwise specified. Street signs shall be mounted on separate poles from regulatory signs. The street sign poles shall generally be on the opposite side of the street from regulatory signs. At "Tee" intersections, where it is not possible to locate a street sign on the southwest corner, the street sign poles shall generally be located across the intersection opposite the centreline of the intersecting street.

Regulatory sign posts shall be hot dipped galvanized steel "U-Flange" sign posts. Street sign posts shall be 60mm (2 3/8") diameter minimum, galvanized steel posts approximately

3.4 metres (11') long or longer if required. Posts shall be embedded in concrete or driven into the ground to a depth of at least 1.0m (3.3'). Regulatory signs, post locations and sign mounting heights shall be in accordance with the Highway Traffic Act and Regulations (latest version) Metal posts, regulatory traffic signs and street signs shall be as supplied by Owl Light Trillium, Clemmer Industries Ltd., Fortran Traffic Systems Limited or approved equal. In general, street signs shall be centre-mounted on top of posts. However, at major intersections the Municipality of Lambton Shores may require street signs to be mounted on street light poles (see below). In general, the mounting height of street signs (from ground to bottom of sign) shall be 2.3 to 3.3 metres (7.5' to 10.8').

Except as noted below, street name plates shall be extruded aluminium blades with heat activated application of "engineering grade" reflective vinyl to the blank. Lettering shall be reflective white on a reflective green background with lettering on both sides of the sign.

At intersections with traffic islands and/or signalised intersections, the Municipality of Lambton Shores may require street signs to be installed at more than one corner of the intersection and/or at traffic islands/medians. In these situations, the Municipality may require street signs to be mounted on street light poles. These signs shall be fabricated from flat, heavy gauge (0.8") aluminium sign blanks with reflective white lettering on a reflective green background on one side of the sign, and shall be mounted to light poles with two centre hole brackets and 3/4" x 0.02" thick stainless steel strapping.

Lettering shall be done by the heat application of die cut letters, or by the heat-fixed screening process where the quantity of signs having the same name exceeds five, subject to the approval of the Public Works Superintendent. Lettering shall be upper case standard block condensed style. Lettering size and sign blank height shall be as follows:

Local / collector streets

150mm (6") high sign blank

- 75mm (3") high street name
- 50mm (2") high ST., AVE., etc.

Street name signs and traffic signs satisfying the requirements of the Municipality and Ministry of Transportation shall be located in accordance with M.T.O. criteria.

6.6 **SIDEWALKS**

The Municipality will determine where sidewalks are required to be installed at the Developer's expense.

Sidewalk shall be required as follows.

- a) on both sides of all collector streets;
- b) on both sides of any street on which a school property fronts;
- c) on one side of local residential streets, except cul-de-sacs and

crescents which contain less than 20 residential unity, may not require sidewalks;

- d) both sides of streets abutting parkland may require sidewalk on both sides: each situation to be considered on a case by case basis

Sidewalks and curbs shall be depressed at street intersections to permit easy passage of wheelchairs, etc. Sidewalks shall be installed in conjunction with curb installation and prior to driveway construction, final lot grading and boulevard restoration.

6.7 **ACCEPTANCE OF WORK**

6.7.1 **Concrete**

The Subdivider shall provide compressive cylinder test results, from a Geotechnical Engineer, for concrete used in the work. Such testing shall be performed by a recognized testing company. Visual inspection and impact hammer tests may be made on the concrete by the Geotechnical Engineer.

The Municipality's Engineer may also require tests by coring and taking compressive, petrographic and entrained air tests on the cores obtained. Provided that no defective work is indicated by such inspections, the whole cost of coring and testing shall be borne by the Municipality. If defective work is indicated by such inspections, the subdivider shall bear the total cost of the inspections and testing.

6.7.2 **Pavements - Evaluation of Pavements**

The subdivider shall provide test results from a Geotechnical Engineer for asphalt used in the works. The testing shall be performed by a recognized testing company. The testing required should include compaction testing and sampling and testing to ensure the asphalt cement content conforms to the limits specified in the approved mix design.

Prior to acceptance, pavement deflections shall be measured using the Benkleman Beam.

The subdivider shall be responsible for conducting the beam tests and the costs of such beam tests shall be borne by the subdivider. The test results shall be submitted to the Municipality's Engineer for approval.

SECTION 7 - LOT GRADING

7.1 GENERAL

Subdivisions and/or developments shall be graded in accordance with the following specifications. Lot grading plans shall be prepared by the developer and approved by the municipality along with the subdivision servicing drawings.

7.2 LOT GRADING DETAILS

1. Yard surfaces shall have a minimum of 2%.
2. Drainage flows shall be directed away from houses.
3. Drainage flows which are carried around houses are to be confined in defined swales located as far from the house as possible.
4. Desirable swale depth to be 225 mm. Minimum swale depth to be 150 mm. Maximum swale depth to be variable, but dependent on location and safety considerations. Swale width: 1.8m. (1.0m from property line).
5. Grades
 - a) Minor swales (providing drainage for up to 4 lots) minimum grade shall be 2% (in special cases, 1%).
 - b) Major swales (providing drainage for more than 4 lots) minimum grade shall be 1%.
6. The maximum flow allowable in a side yard swale shall be that from 4 backyards.
7. The maximum flow in rear yard swales shall be that from 10 to 15 backyards deepening on lot size and grade. The maximum length of a rear yard swale without outlet shall be 90 metres. The maximum area contributing to the rear yard swale shall be 0.5 hectare. The maximum flow in rear yard swales which may be discharged onto the road allowance, is that from 6 backyards.
8. No front yard catch basin shall be allowed.
9. Driveways: optimum grade: 3 – 4%
maximum grade: 10% (optimum max. 8%)
Walks: optimum cross slope: 2%
10. Maximum slope ratio for all terraces and banks shall be 3:1 (3 horizontally to 1 vertically).
All other site areas: optimum gradient: 4%
Minimum gradient: 1%
11. Where retaining walls are required, they shall be placed on private property unless otherwise approved by the Municipality.
12. The minimum height of basement openings (i.e. basement window sills) shall be 300 mm minimum above finished road centreline elevation unless otherwise approved by the Municipality (such as with rear yard “walk-out” basements).

See “Sample” site plan including checklist in Appendix B.

As a condition of obtaining building permits, builders shall be required to submit site plans with sufficient detail and elevations in accordance with the requirements of Figure 1 “Subdivision Requirements Checklist” and in accordance with the approved subdivision grading plan. Further, builders will be required to submit to the Municipality lot grading certificates signed and sealed by a Professional Engineer/ Ontario Land Surveyor at two stages of construction:

- a) top of footing or top of foundation;
- b) finished grading.

Each certificate shall provide certification that the appropriate stage has been constructed in accordance with the approved plans, prior to construction proceeding to the next stage.

Lot grading plans on infill lots may be prepared by a Professional Engineer or an Ontario Land Surveyor.

See “Typical Lot Cross-Sections and Plan” details in Appendix B.

SECTION 8 – PARKLAND / LANDSCAPING

8.1 **GENERAL**

When open space or parkland dedication is required pursuant to the Planning Act or the Subdivision Agreement, the areas so designated shall be identified on the Subdivision plans with sufficient details, notes and typical sections as may be required to identify lot grading, drainage, landscaping, access and other details as may be required. The Subdivider shall grade, topsoil, seed, landscape and otherwise prepare the parkland and open space areas to a condition which is acceptable to the Municipality for assumption. Access for maintenance must be incorporated into the layout.

8.2 **PASSIVE AND ACTIVE RECREATIONAL USES**

The design and site preparation of the parkland and open space shall take into account the intended and future passive and/or active recreational uses in accordance with the Municipality's requirements. Where possible, natural features including topography, vegetation and trees, soil conditions, watercourses, drainage, and orientation to sun and wind, should be carefully considered in the design and layout of the parkland areas. The shape of the site must be suitable for the future layout of official sized sports fields if active usage is required. Narrow strips and triangular pieces of land are generally not acceptable. Natural wooded areas, stream and creeks will be considered on an individual basis and may be desirable where organized recreation uses are not suitable. Boggy lands are generally not acceptable for park purposes except where the area can be defined as a conservation type park area subject to the approval of the Municipality. Open water courses are generally not acceptable for proposed active playground areas.

8.3 **SITE CLEARING AND SECURITY**

No topsoil shall be removed from the site. The parkland and open space areas shall be fenced or otherwise made secure during land development and house construction activities to prohibit the removal of topsoil and the dumping of debris and unauthorized fill.

All rubbish, rocks, boulders, tree stumps and other debris shall be removed from the site. The burning or burying of such materials on the site shall be permitted only if approved by the municipality. Dead trees shall be cut and stumps removed. Trees which are to remain shall be adequately protected during land development.

8.4 **SITE GRADING / DRAINAGE**

Park drainage and grading plans shall be submitted to the Municipality at the same time as the servicing drawings and shall meet the following minimum standards.

DRAINAGE:

- a. Drainage of Parkland dedications shall be self contained such that areas drain to channels or swales which outlet to catch basins and storm sewers or other

suitable outlet, so that park drainage does not adversely affect other properties.

- b. Swales should have gently sloping sides and should be used wherever possible rather than steep sided ditches. The minimum slope of channel and swale inverts shall be 1.5%. Maximum sideslope permitted is 4:1.
- c. Maximum depth to bottom of channel shall be 1 metre. Minimum depth of swale shall be 200mm.
- d. Except for natural watercourses, in general, catch basins shall be provided in open channels and swales at maximum intervals of 100 metres.
- e. Swales or open ditching shall not cross the entrance way into the park area.
- f. Natural wetland areas may require special attention and preservation.

GRADING:

- a. In general, the minimum grade for grassed areas shall be 2%. However, areas to be developed for future soccer or baseball facilities may have grades less than 2%. Subsurface drainage may be required.
- b. Grassed slopes shall not have gradients steeper than 4:1 so as to allow safe use of moving equipment.
- c. All lands must be satisfactorily graded before the lands will be accepted by the Municipality for park purposes.
- d. Grading or natural contours which result in undrained areas are not acceptable. If overland drainage cannot be modified, catch basins and pipe will be required.
- e. The Developer shall do all rough grading and filling where required, under all landscaped areas, to establish the sub-grade parallel to the finished grades indicated on the grading plans, to allow sufficient topsoil depth. All soft and unstable areas below sub-grade, shall be excavated and filled with compacted select fill material.
- f. All areas shall have uniform slopes between points for which finished grades are indicated on the plans or between such points and existing grades. Grades shall be smoothly rounded at top and toe of slopes.
- g. Sub-grade shall be scarified to minimum depth of 75mm to produce an even, loose textured surface free of all stones, roots, branches, etc. larger

than 50mm in diameter.

- h. Topsoil shall be loose textured and free of all stones, roots, branches, etc. larger than 50mm in diameter.
- i. The minimum depth of topsoil under seeded areas shall be 150mm. When additional topsoil exists on site, it shall not be removed from site, but shall be used to increase overall finished topsoil depth, or to construct other landscaping features proposed.

8.5 **SEEDING**

Prior to seeding, a formulation of appropriate fertilizer shall be applied at the manufacturers recommended rate to initiate leaf growth and root development. Grass seed shall be a certified seed, meeting the requirements of The Seeds Act for Canada No. 1 Seed. It shall be a mixture which is suitable for the soil conditions, etc. of the site. The seeding periods, in order of preference are:

- i) August 15 to September 15
- ii) Early Spring to May 30

At the time of inspection for acceptance, grass shall be well established and in vigorous growing condition. Unacceptable areas shall be reseeded by the Developer. The Developer shall regularly mow the grass after good growth has been established and shall control weeds as required, prior to assumption of the site by the Municipality.

8.6 **WALKWAYS**

Where walkways are required through parklands, they shall be 1.5m wide and constructed of a 150mm depth of well-compacted chip and dust over geotextile fabric.

8.7 **FENCING**

Where permanent fencing is required within or along parkland boundaries, it shall be 1.8 meters high and shall meet the material specifications as outlined in the easement details (Appendix B).

8.8 **TREE PLANTING**

Where possible, mature healthy trees should be preserved. The subdivision plans and park land plans should clearly indicate existing wooded areas and/or single trees where appropriate, and shall indicate those trees/areas to be preserved.

If required by the Subdivision Agreement, the Developer shall plant trees at the standard location 1.5m behind property line, on private property, at an approximate spacing of 20 metres (one tree per residential lot). In lieu of tree planting, the Subdivider may make a cash-in-lieu payment to the Municipality, based on a rate of \$7.50 per meter of frontage and flankage.

If required by the Subdivision Agreement, the Subdivider shall establish a buffer zone of trees to abut a road allowance to separate and screen non-compatible land uses. Such buffer zones in road allowances, shall consist of a continuous row of trees in a location specified by the Municipality of Lambton Shores.

In all cases where tree planting is required, the Subdivision plans shall clearly indicate on the park land plans or separate landscaping plans, the tree type, size, spacing, location etc.

Planting, staking, watering, pruning and maintenance of new plant stock shall be the responsibility of the Subdivider until such time as the Subdivision is assumed by the Municipality.

New plant stock shall satisfy the following minimum standards:

- a) Deciduous trees:
 - 2.5 to 3.0 m (8 to 10 ft) in height
 - 50 mm in calliper (measured at 300mm above the ground)
 - well branched
- b) Coniferous trees:
 - 1.0 to 1.5m (3 to 5 ft) in height
- c) Shrubs:
 - 1.0m at time of planting
 - closely spaced (when used for screening)

Plant stock shall be carefully planted in accordance with standard nursery practice and the detail and drawings included with the approved subdivision plans. Plantings shall be done during periods suitable with respect to local weather conditions and established horticultural practice.

SECTION 9 – STREET LIGHTING

9.1

GENERAL

All subdivisions shall be provided with streetlights as required by this section. Lighting systems shall be designed in accordance with the “Guide for the Design of Roadway Lighting” as published by the Roads and Transportation Association of Canada and the “Design Manual for Highway Illumination” as published by the Ministry of Transportation.

9.2 **GENERAL LIGHTING REQUIREMENTS**

In general, street lighting shall be high pressure sodium luminaries with posts located opposite the lot lines perpendicular to the street, where possible. The first light poles should be installed to a maximum of 10 metres (33') from the curb of the intersecting streets.

Poles may be base mounted or direct burial type. The Developer's Engineer shall be required to provide details, specifications of the proposed lighting system and materials including Engineer's detail drawings of concrete bases and/or pole embedment. Where direct buried poles are approved for use, the Municipality may require concrete embedment to ensure that poles are securely installed. See OPSD 2200.01, 2225.01, and 2230.01 for concrete footing and “direct buried” details.

Underground wiring for street lighting shall be used.

The following are recommended general lighting requirements and are to be read in conjunction with the Typical Cross-Sections in Appendix B for road width and pole location:

- a) Residential
 - mounting height: 5.5 metres (18.0')
 - lamp: 100 Watt HPS
 - pole spacing: 30 metres (100')
- b) Commercial
 - mounting height: 8-10 metres (25' – 33')
 - lamp: 100 Watt HPS
- c) Industrial
 - mounting height: 12 metres (40')
 - lamp: 150 Watt HPS
 - pole spacing: 50 metres (165')

9.3 **DESIGN CRITERIA**

The following are recommended standards. Pole spacing, mounting height, etc. may vary with such conditions as staggered pole arrangements, intersections, cross walks, turning lanes and median mounting.

The following illumination criteria should also be considered in conjunction with averaging factors, extent of lighting coverage, luminance levels, glare, etc. The Subdivider's Engineer may be required to submit photometric data for lighting system design, particularly for collector and arterial streets.

TABLE 1

ROADWAY / AREA CLASS	ILLUMINANCE CRITERIA			
	AVG. ILLUMINANCE		UNIFORMITY RATIO	
	Foot Candle (fc)	Eav (lux)	Maximum Avg. / Min.	Maximum Max./Min.
Local:				
Residential	0.6	6	6:1	12:1
Commercial	0.9	10	3:1	6:1
Industrial	0.6	6	6:1	12:1
Collector:				
Residential	0.9	10	3:1	6:1
Commercial	1.2	13	3:1	6:1
Industrial	0.6	6	3:1	6:1
Arterial:				
Residential	1.1	12	3:1	6:1
Commercial	1.5	17	3:1	6:1
Industrial	0.8	9	3:1	6:1

9.4 DECORATIVE STREET LIGHTING

For subdivision areas exceeding 20 hectares (50 acres), decorative street lights and poles may be used. Where decorative street lighting is used, the subdivider shall provide the municipality with additional fixtures and poles for stockpiling purposes, at the rate of 5% of the number used in the subdivision.

Decorative street lights shall have 100 Watt HPS bulbs for local residential and commercial applications. Luminaire housings and poles shall be finished black or nostalgia bronze. Mounting height shall be 5.5 metres for local residential applications.

- a) Luminaires shall be post top mounted:
 - Crouse-Hinds Dayform Century – Type CTRD
 - GTE Sylvania Nostalgia Decorative – Type NLCP
 - Or approved equivalent
- b) Poles shall be:
 - GTE Sylvania Nostalgia Decorative Aluminum Lighting Pole –

- Type NP (base mounted)
- Powco Steel Products Limited octagonal steel Series 7000 (direct burial or base mounted)
- or approved equivalent

9.5 **LOCAL RESIDENTIAL STREET LIGHTING**

For local residential street lighting where nostalgia type street lights are not used, street lighting shall be as follows or approved equal:

- a) Post top luminaires shall be:
 - Cooper Industries Promenade – Type PR 100 Watt, HPS bulb, Type V, or approved equal
- b) Poles shall be:
 - GTE Sylvania Aluminum Post-top Pole Type PF direct burial or base mounted (aluminium finish), or
 - Pole-Lite Ltd., Tapered (4x6) Aluminum Lighting Pole PRT -64-18-188 (direct buried on base mounted)

9.6 **COLLECTOR, COMMERCIAL, INDUSTRIAL LIGHTING**

All street lighting other than local residential and nostalgia style commercial street lighting, shall be cobra-head style luminaires mounted on tapered elliptical arms with 1.8m (6') reach for local and 2.4m (8') reach for collector streets and arterial streets.

- a) Luminaires shall be as follows or approved equal:
 - GTE Sylvania R47 series HPS
 - Crouse-Hinds OV series HPS
 - Landmark
- c) Pole types for all other 8m, 10m, 12m mounting heights shall be as follows or approved equal, and shall satisfy OPSS/OPSD requirements:
 - i) aluminium poles (round tapered aluminium, aluminium finish, direct buried or basemounted):
 - GTE Sylvania Canada Ltd: tapered elliptical arm 'E' poles
 - Pole-Lite Ltd: tapered elliptical arm pole Series TEA
 - ii) steel poles (solid shaft, round or octagonal, tapered, galvanized steel, base mounted):
 - Pole-Lite Ltd.: (round) Type 700
 - Powco Steel Products Ltd.: (octagonal) Series

- iii) spun concrete (round cross-section with natural smooth concrete finish, direct buried):
 - Stress/Crete Limited : Style 120
 - Central Precast Products (1979) Ltd.: Style 10

SECTION 10 - UTILITY LOCATION

10.1 **GENERAL**

The "Municipal Works Design Manual" will serve as a guide in establishing utility locations within the street right-of-way. The following offsets will apply for the storm and sanitary sewers and watermains.

10.2 **STORM SEWERS**

Storm sewers to be located 1.5 m off centreline of street, 3 m offset from the sanitary sewer alignment.

10.3 **SANITARY SEWERS**

Sanitary sewers to be located 1.5 m off centreline of street, 3 m offset from the storm sewer.

10.4 **WATERMAINS**

Watermains to be located 4.7 m from property line in boulevard.

10.5 **OTHER UTILITIES**

Location of all other utilities, i.e.) telephone, gas, cable etc. Shall be in accordance with typical cross section drawings as shown in Appendix B

APPENDIX A

APPENDIX 'A'

FIGURE 1**Subdivision Requirements Checklist**

This checklist of items to be shown on the plans for subdivisions and/or individual site developments is intended as a guide only. The degree of detail and exclusion of one or more items from the list will vary with the nature and complexity of each development and at the discretion of the Municipality. The Municipality also reserves the right to add additional requirements.

1. legal survey information including lot dimensions, lot line bearings, legal description of property, abutting road allowance widths, easements, lot numbers, street names;

2. north arrow; (required on all plans) _____
3. locations, orientations, massing and uses of all buildings and structures, proposed and existing on the site (proposed buildings may not be required on subdivision plans); _____

4. locations, of municipal services abutting this property (eg. in the road allowance) including, sidewalks, curbs, gutters, watermains, storm sewers, catch basins, manholes, sanitary sewers, hydro poles, telephone poles, light standards, buried cables, Bell pedestals, fire hydrants, gas mains, hydro transformers; _____

5. location of all existing trees on the side of the road allowance abutting the property;

6. access ramps, driveway locations, widths, the surfacing of such areas (eg. asphalt), and curbing; _____
7. on-site vehicular loading and parking facilities, the surfacing of such areas, and curbing;

8. on-site sidewalk and walkway, ramp areas, including the surfacing of such areas; _____

9. lighting, floodlighting facilities; _____
10. retaining walls, walls, fences, hedges, trees, shrubs and other landscaping areas, including

all planting strips as are required by the zoning by-law (less detail may be required on subdivision plans); _____

11. vaults, central storage, collection areas and enclosures for storage of garbage; _____

12. site grading including original ground elevations and/or contours and sufficient proposed finished elevations on site to adequately illustrate the finished site elevations in relation to abutting properties and roads, and to adequately illustrate existing and finished lot drainage and grading; (This will require elevations on adjacent properties and road allowance.) This includes final elevations at lot corners, swales, at the front and rear of buildings where applicable, and at the centreline of roads. Proposed underside of footing, top of foundation, basement window sill and basement walk-out elevations shall be shown. Direction of surface flows and swales shall be shown by arrows.

13. storm water drainage areas and facilities including private storm sewers, catch basins, catch basin leads, manholes, ditches, watercourses, culverts, rainwater leaders, Agreement Drains, Municipal Drains, Storm Water Management Facilities, etc.;

14. erosion and sedimentation control details; _____

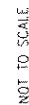
15. sanitary sewage drainage areas and facilities including private sanitary sewers ,manholes, storage tanks, treatment facilities, sanitary private drain connections;

16. sign locations and details, including entrance and exit signs; (This may be more applicable to individual site plan developments.)

17. others including any sewer, road works or other facilities which the municipality may require to be ; _____

ADDITIONAL COMMENTS: _____

APPENDIX B



Sambutan Shores

[illegible]

APPENDIX C

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Appendix C



East Durham

- Legend**
- Turbine Location
 - Collection - RTN
 - Collection - Private
 - Other Road
 - County Road
 - Provincial Road
 - Parcel Boundaries

Date: 10/20/2013
Projection: NAD 83, UTM Zone 18N
Data: 10/20/2013
Proprietary and Confidential