

2023

LOT GRADING AND DRAINAGE INFRASTRUCTURE DESIGN STANDARD

D703



FOREWORD

This document was prepared by the City of Barrie under the direction of a Technical Review Committee. The objective of the manual update is to better reflect current and emerging standards and technology, legislation and best practices as they exist in 2016. It will be necessary to update the manual from time to time as regulations, design practices and technologies continue to evolve. Current legislation shall be followed at all times.

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1 INTRODUCTION

1.1 Background

The City of Barrie (City) Lot Grading and Drainage Infrastructure Standard presented herein replaces the 1987 City of Barrie Lot Grading and Drainage Control procedures Manual. The 1987 manual has undergone several revisions since its inception, the most recent being in 1997.

Various Legislation, including both Acts, and Regulations have influenced the development of this manual; they include (but are not limited to) the ongoing updates for effective stormwater management, the intensification objective under the Growth Plan for the Greater Golden Horseshoe and the Barrie-Innisfil Boundary Adjustment Act.

Regulation of lot grading ensures that surface water and shallow groundwater is effectively managed in a manner that does not negatively affect adjacent properties. Lot grading should be designed and constructed so that surface water flows away from buildings, over grassy surfaces where possible, to an appropriate receiving area which could be a natural water feature or a constructed infiltration implement. This will promote infiltration, reduce the velocity of runoff and prevent nuisance flooding.

This manual has been prepared to provide technical and procedural guidance to designers and constructors on the acceptable surface drainage and shallow groundwater control, practices and techniques that are required by the City of Barrie.

The aim of this manual is:

- Guide effective stormwater management in order to control nuisance flooding, erosion, and negative effects on water quality and prevent sedimentation loading to receiving watercourses
- Protect and consequently enhance the City's watercourses and lakes (Little Lake and Lake Simcoe).

This manual sets out the minimum standards and provides guidance regarding the design of surface water drainage plans. It is not the City's intention to discourage or limit innovative solutions with respect to lot grading. Designers are encouraged to present to the Engineering Department any alternative approaches to meet or exceed the desired drainage results. The guidelines presented within this document are the requirements of the City of Barrie's Engineering and Building Services Departments. These requirements are not intended to restrict any other special requirement of the City of Barrie.

This manual should be used in conjunction with the terms of applicable Subdividers Agreements and/or Site Plan Agreements issued by the City of Barrie. This information will be a supplement to the current City of Barrie Stormwater Infrastructure Standard, the City of Barrie Site Alteration By-Law and Infrastructure Standard Drawings. The Infrastructure Standard Drawings pertinent to this manual have been included as Appendix A. All applicable provincial and federal regulations will govern over the design guidelines that are included in this manual.

1.2 Definitions

"Adjacent" beside, abutting or contiguous to.

"Body of Water" any flowing or standing water caused naturally or by design.

“City” the Corporation of the City of Barrie and any person assigned to a project by the City to carry out work on their behalf. The name of the Representative shall be specified prior to the start of any construction project.

“Commercial” the use of a building or lot for the storage, display or sale of goods or services, and includes hotels, motels, inns, or rental cottages.

“Consulting Engineer” qualified professional engineers authorized to practice in Ontario. The Consulting Engineer shall act on behalf of the Developer/Owner.

“Developer” the registered Developer of the Lands for which a Development Agreement has been registered.

“Development”, as defined within the Conservation Authorities Act:

- The construction, reconstruction, erection or placing of a building or structure of any kind;
- Any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure;
- Site grading; or,
- The temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere.

“Development Agreement” the agreement between the City and the Developer relating to the development of the land in accordance with the Planning Act.

“Drainage” the natural or artificial removal of surface and sub-surface water from an area to a preferred receiving area.

“Erosion” the detachment and movement of soil, sediment or rock fragments by water, wind, ice or gravity.

“Fill” any type of imported or relocated material deposited or placed on the Site.

“Finished Grade” the approved elevation of ground surface of the Site upon which Fill has been placed or grade of land that has been altered.

“Foundation Drain” (also known as weeper or weeping tile) is a perforated pipe installed at the base of a building foundation in order to drain away excess groundwater; Used to prevent groundwater from building up against a foundation, thus protecting the foundation from leaking or shifting.

“Groundwater” is water located beneath the ground surface in soil pore spaces and in the fractures of rock formations. Groundwater is recharged from, and eventually flows to, the surface naturally; natural discharge often occurs at watercourses, seeps and wetlands.

“Hazard Limit” the outer extends of land that could be unsafe for development because of naturally-occurring processes associated with flooding, erosion, dynamic beaches or unstable soil or bedrock.

“Industrial” land or buildings for the storage, distribution, processing, assembly or recycling of wholesale products, goods or materials, or for activities relating to transportation, extraction, manufacturing, construction, warehousing, assembly or general repair.

“Institutional” land or buildings for nonprofit or public purposes including but not limited to, hospitals, government buildings, religious institutions, churches, public schools, colleges, cultural centers, libraries and public recreational and park buildings.

“Landscape Architect” the Professional Landscape Architect duly qualified and a member in good standing of the Ontario Association of Landscape Architects retained by the developer/owner.

“Limit of Tree Preservation” is defined by the plan(s) approved by the City for preservation of trees on the subject lands or within the vicinity of the proposed development in accordance with the requirements of the City’s Tree Preservation Bylaw

“Lot Grading and Drainage Plan” a plan that details and specifies the design elevations, surface gradients, swale locations and other drainage information that are required for lot grading.

“Parkland” is generally understood to be comprised of open space or environmentally protected land.

“Provincial Planning Act” sets out the ground rules for land use planning in Ontario and describes how land uses may be controlled, and who may control them.

“Regional Flood Plain” the area flooded during the regional storm event (Hurricane Hazel); Regulated by the respective Conservation Authority for the development.

“Residential” developments of homes ranging from single family homes to apartments and condominiums.

“Residential Infill Lot” developments either previously undeveloped single lots or the redevelopment of a lot.

“Residential Subdivision” developments with the division of lands for the purpose of constructing homes.

“Retaining Wall” a structure that has been designed and constructed to resist the lateral pressure of soil where there is a change in ground elevation.

“Subdividers Agreement” defines the obligations and duties of the Owner with respect to the subdivision of lands.

“Sub-Structure” the following building components; foundation wall, footings, floor slab, garage floor/slab.

“Swale” a depression in the ground surface, utilized for the purpose of infiltrating and/or conveying surface drainage.

“Topsoil” means the upper portion of soil, usually dark coloured and rich in organic material.

“Watercourse” means a natural or man-made channel or swale in which water flows, either continuously or intermittently with some degree of regularity.

1.3 Format of Document

This document is organized into the following six (6) sections with the intent to provide the user with lot grading design guidelines and standards, and guidance when submitting site plans and plans of subdivision for approval.

Development Class and Approvals – Summary of the types of development, regulation controls, types of plans required and approval mechanisms.

Legislation – A review of current acts, regulations and by-laws which form the basis for most of the existing municipal, regional, provincial and federal guidelines, policies and criteria.

Design Criteria – Municipal standards and design guidelines pertaining to site development.

Lot Grading and Drainage Plans – The City's requirements for submission of Plans for proposed works.

Construction Requirements – Municipal standards and design guidelines pertaining to site construction and final certifications.

Appendices – A collection of detailed information related to the municipal policies and guidelines is provided in a series of appendices at the back of this document.

1.4 Legislation

Site development policies and design guidelines provided in this document were developed based on applicable legislation including but not limited to the following:

- City of Barrie Site Alteration By-Law, Property Standards By-Law and Right of Way By-Law
- City of Barrie Storm Drainage and Stormwater Management Policies and Design Guidelines
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment
- Lake Simcoe Protection Plan
- Barrie – Innisfil Boundary Adjustment Act
- LSRCA Watershed Development Guideline
- NVCA Development Review Guidelines
- Ministry of Municipal Affairs and Housing Provincial Policy Statement
- Ontario Building Code Act, 1992
- Municipal Act
- Planning and Development Act
- Canadian Environment Assessment Act

2 DEVELOPMENT CLASS AND APPROVALS

The following is a summary of the types of development, regulation controls, types of plans required, and approval mechanisms within the City of Barrie.

1. Residential Subdivision
 - a. Regulated by the Subdivider's Agreement
 - b. Plans shall be prepared by a Professional Engineering Consultant
 - c. Reviewed and approved by the City's Engineering Department (Development Services)
2. Residential Infill Lot (Apartment/Condominium up to a four-plex)
 - a. Control is regulated by the City's Building By-Law and this Policy
 - b. A plan must be prepared by an Ontario Land Surveyor, Architect or the owner, provided a suitable benchmark elevation is utilized
 - c. Reviewed and approved by the City's Building Services Department
3. Residential (Apartment/Condominium larger than four-plex), Commercial or Institutional
 - a. Regulated by a Site Plan Agreement
 - b. Plans shall be prepared by Professional Engineering Consultant
 - c. Reviewed and approved by the City's Engineering (Development Services) and Building Services Departments
4. Industrial
 - a. Control is regulated by a Site Plan Agreement or the City's Building By-Law and this Policy
 - b. Plans shall be prepared by Professional Engineering Consultant
 - c. Reviewed and approved by the City's Engineering (Development Services) and/or Building Services Departments

3 DESIGN CRITERIA

3.1 Responsibilities of the Consulting Engineer

The Consulting Engineer must demonstrate, within the submission to The City, that the soil type and structure and the natural drainage pattern has been studied and the development has been designed to complement these natural features. This means that each lot and block within a development will be evaluated to determine areas most suitable for the construction of buildings and roads as well as effective drainage of land within the development.

If there is a requirement for a Fill Management Plan as set out in the current City of Barrie Site Alteration By-Law the Consulting Engineer shall ensure that all imported fill meets said plan. Imported fill, is required to meet the soil, groundwater and sediment standards referred to in Ontario Regulation 153/04 (as amended).

The Consulting Engineer shall coordinate with a Landscape Architect in areas where preservation is required within the proposed development area to ensure lot grading reflects the established limit of the preservation area. Grading, utilities and drainage structures are not permitted within the established limits of preservation.

All Lot Grading Design requires individual or block Lot Grading Certifications from a qualified Consulting Engineer.

3.2 General

The City's objective is to ensure that the property owner (i.e. resident) will have maximum use of their property while still providing effective drainage within the development. The following criteria should be used in the preparation of all lot grading plans;

Although maximum limits are specified herein, grading design should avoid maximum grades unless there are no alternatives;

Surface drainage from residential lots or commercial blocks shall not be permitted to drain into parkland without prior approval from the City's Engineering Department;

Proposed grading of any site will not interfere with, or significantly alter existing drainage patterns, and shall not increase discharge to adjacent lands, including those with surface water features or other environmentally sensitive areas;

Grades are required to match the adjacent properties and/or approved lot grading;

Drainage shall be managed by the use of swales, and provide positive drainage away from buildings;

Proposed elevations that define the grading of the property are to be shown on the General Lot Grading Plan;

Grading shall not be permitted to occur within defined preservation limits as per the approved Tree Preservation Plans in accordance with Park Standard [P1235](#) Limit of Tree Preservation for Development Approvals. Lot grading must meet existing grades at the defined limit of preservation; and,

Prior to the placement of sod, there is to be a minimum of 200mm of screened, friable topsoil, free of stones, sticks and other debris as per 5.2.1 Table 1 of this manual. The topsoil is to be fine graded and raked prior to the placement of sod.

Refer to Lot Grading for Residential Lots, [D704](#) to [D709](#).

3.2.1 Residential Subdivision

The following requirements are additional and specific to Subdivision Developments:

Final elevations shall conform to the approved subdivision General Lot Grading Plan;

All new developments shall be designed in order to protect properties from stormwater damage by incorporating appropriate stormwater management and lot grading practices;

New subdivision designs must define any hazard limits produced by regulatory storm (1:100 year) and/or regional storm on watercourses for pre- and post-development conditions, as required by the City, Ministry of Natural Resources and Forestry (MNRF) and Conservation Authorities;

New developments shall not encroach into the regional flood plain;

Basements will be protected from flooding of local surface runoff via lot grading and setting of openings into the building;

The lot grading design shall provide for the temporary drainage of all blocks of land within the subdivision that are intended for further development under a Site Plan Control;

The boulevard area fronting all developed sites shall be reinstated to the satisfaction of the City's Engineering Department (i.e. Driveways paved and boulevards sodded); and,

All areas beyond the plan of subdivision, which are disturbed during construction, shall be restored to the satisfaction of the City in accordance with the City of Barrie Right of Way By-law.

3.2.2 Residential Infill (Apartment/Condominium up to Four-Plex) Lot Development

The following requirement is additional and specific to Infill Lot Developments:

The grading of residential infill lots that are being developed through severances shall be in accordance with the conditions set out in this document, the City of Barrie Site Alteration By-law and City of Barrie Zoning By-laws and applicable Development Agreements.

3.2.3 Residential (Apartment/Condominiums larger than Four-Plex), Commercial, Institutional

The following are additional and specific to the above noted Lot Developments:

The side slopes on all ditches shall not exceed a maximum 3 parts horizontal to 1 part vertical (3:1);

Drainage swales shall be minimum 2% grade within the building envelope, the building envelope shall be deemed the surrounding area within 20m of any building or to the property line; and,

Drainage swales beyond the building envelope may be less than 2% under certain circumstances as approved by the Engineering Department (Development Services).

3.2.4 Industrial

The following requirements are additional and specific to Industrial Lot Developments:

The side slopes on all ditches shall not exceed a maximum 3:1;

Drainage swales shall be minimum 2% grade within the building envelope, the building envelope shall be deemed the surrounding area within 20m of any building or to the property line; and,

Drainage swales beyond the building envelope may be less than 2% under certain circumstances as approved by the Engineering Department (Development Services).

3.3 Grades

Grass surfaces shall have a minimum acceptable gradient of 2% and maximum of 33%.

A minimum grade of no less than 2% and no more than 5% is required adjacent to buildings. The minimum Table Distance required at the rear of the building is 5.0m, and along one side is 0.6m where applicable zoning requirements permit.

A 0.6m to 1.0m wide grassed path, with a 2% slope away from the house, shall be constructed along one side of the building (typically the garage side) to allow for proper access to rear yards.

The average front or rear yard gradient shall not exceed 15%. This gradient shall be determined by dividing the elevation difference by the measured distance from the rear edge of the house to the front or rear lot line. Should the site constraints require the gradient to exceed 15% yard stepping and terracing will be required using 3:1 slopes.

All retaining wall structures placed in areas where the grade separation exceeds 1.5m in vertical height are to be constructed of material suitable to the Engineering Department.

Driveway grades shall be between 2.0% and 7.0%. The City may allow driveway grades up to 8.0% but only in exceptional cases where on-site constraints prohibit the use of lesser grades.

Driveways with reverse slopes are not permitted.

All driveways must be offset a minimum of 0.6m from the property line to prevent blockage of drainage swales.

Within industrial, commercial and institutional sites, the desirable surface grade for a parking area shall be between 2 to 4% in order to prevent ponding or refreezing of meltwater in pavement undulations;; minimum recommended grade shall be no less than 1.0%; the maximum slope on a parking area or driveway shall be 7.0%.

Parking lots should be graded away from building entrances and in such a way that major drainage pathways do not cross heavily used areas of the parking lot.

The proposed driveway location must not be in conflict with existing or proposed utility services. The distance between the edge of the driveway and above ground utility structure is to be 1.5m.

All boulevard areas shall be graded with a constant slope to the street limit, minimum slope to be 2.0%; maximum slope to be 7.0%.

All boulevards, including ditches are required to be sodded up to the property line. Prior to the placement of sod, topsoil shall be placed in accordance with Section 5.2.

All water boxes, maintenance hole frames and grates, valve boxes etc. shall be set at finished grade of the topsoil.

Exterior cladding and window sills being used shall be a minimum of 150mm above finished grade.

Window wells, where required shall be directly connected to a weeping tile system using a 100mm drain pipe filled with 19mm clear stone, and installed with a filter sock to prevent sediment from entering the weeping tile. The top and sides of the drain pipe shall be covered with not less than 150mm of crushed

stone or other coarse clean granular material containing no more than 10% of material that will pass through 4mm sieve.

Deviations due to on site constraints must receive written approval from the City's Engineering Department.

3.4 Rear Lot Catch basins

Rear lot catch basins and associated heavy walled rigid piping are to be contained within a City of Barrie easement and shall outlet directly to a municipal maintenance hole/catch basin at the street/property line.

The use of rear lot catch basins (within an easement) shall require the written approval of the City's Engineering Department prior to installation and may only be used when on-site constraints do not permit drainage into street level storm devices.

Rear lot catch basins and outlet pipes should be located on the same lot with the center of the catch basin and catch basin leads 0.6m minimum offset from the property line or tree preservation limit (Park Standard [P1235](#) Tree Preservation Limit Development Approvals).

The maximum ponding depth over rear lot catch basins shall not exceed 0.3m.

Refer to [D706](#) Lot Drainage Rear Yard Catch basins.

3.5 Swales

Drainage flows from one lot shall not enter onto another lot unless confined to common swales and are part of an overall subdivision grading plan (swales from one lot to another should flow directly) or the outlet is established on title in the form of a drainage agreement or easement to the satisfaction of the City.

Driveways shall not be used as outlets for any swales.

3.5.1 Side Yard Swales

The maximum flow which may be discharged into a side yard swale or any road allowance shall be no more than three (3) backyards or 60m (approximate area of 500m²). Individual lot drainage is preferred. Refer to [BD708](#),

Side yard swales shall have a minimum depth of 150mm and maximum depth of 200mm, with maximum side slopes no greater than 3:1.

3.5.2 Rear Yard Swales

All rear yard drainage shall be directed away from the houses in defined swales which outlet at the curb, sidewalk or a catch basin. Refer to [D704](#).

Rear yard swales shall have a minimum depth of 150mm, and maximum depth of 200mm, with maximum side slopes no greater than 3:1.

The maximum flow allowed in a rear yard swale shall be from six (6) rear yards and in no case will the swale lengths be greater than three (3) lot widths for single and semi-detached houses. For townhouse units, eight (8) rear yards and a maximum swale length of four (4) unit widths will be permitted; the maximum length of rear yard swales is to be no greater than 60m.

Where an upper lot drains into a lower lot, an intercepting swale will be located on the property line, in such a manner as to divert the drainage to the side yard swale of the lower lot. Refer to [D707](#).

3.6 Rainwater Leaders and Sump Pumps

In order to minimize the flow rate from foundation drains/weeping tile, piezometer measurements shall be collected as part of the development's Geotechnical/Hydrogeological Report Investigations prior to design and construction to determine the seasonal high groundwater level.

Low Impact Development facilities shall be considered where appropriate.

The underside of the floor slab should be set 0.5 m higher than the seasonal high groundwater level,

Sump pumps must discharge as permitted within the City of Barrie Storm Drainage and Stormwater Management Policies and Design Guidelines.

Rainwater leaders should be configured in accordance with [D709](#) to promote infiltration (if soils permit). Leaders shall not discharge into impervious areas directly connected to the storm sewer (e.g. driveways, parking areas).

3.7 Retaining Walls

Retaining walls are generally not accepted within new resident development plans of subdivisions. Every effort should be made during the design process to allow for site grading that does not require the use of retaining walls; however, should site constraints within a new development require the utilization of retaining walls, the City of Barrie's Engineering Department will evaluate the retaining wall design on a lot by lot basis. If the use of retaining walls within the new development receives City approval. All retaining walls that support Municipal infrastructure shall be constructed on Municipal property; retaining walls that are supporting private land must be constructed on private property.

When retaining walls are deemed necessary they should be clearly identified (in size, material and height) on the proposed lot development plan.

A handrail is required on all retaining walls exceeding a vertical height of 1.0 m as per Section 9.8 of the Building Code or at the discretion of the Engineering Department in addition to the Building Code requirements.

All retaining walls adjacent to public property shall be constructed of materials suitable to the Engineering Department, if over 1.0m in height a building permit is required.

All retaining walls over 1.0 m in height must be offset from the property line by a minimum of 0.6 m. Retaining walls 1m and under may be located at the property line with no offset (this is a zoning requirement).

Retaining walls over 1.0 m in vertical height requires the submission of a detailed drawing accompanied with the certification of a Professional Structural Engineer. Manufacturer's specifications are acceptable.

3.8 Snow and Ice Considerations

Snow pile storage volume should range from 500 to 1,500m³ per hectare of parking lot (approximately 3 to 8% of paved area). Snow pile location shall be outlined on the lot drainage plan.

Meltwater runoff from snow piles should be directed away from high traffic areas and into catch basins. Catch basins or other stormwater collection design features should be laid out directly downgradient from

snow storage areas such that the distance meltwater travels before being removed from the lot's surface is minimized. Meltwater collected by catch basins downstream from snow storage piles should be routes through an oil grit separator to reduce meltwater contaminant loads, as snow storage piles typically contain high concentrations of oil, sediment and other contaminants.

Snow pile storage areas should be clearly delineated and marked with signage to inform winter contractors and the public of the snow pile storage location. Location of signage shall be marked on the lot drainage plan.

Snow pile storage areas should be located in areas receiving large amounts of solar radiation to promote melting and should be located so that they are easily accessible for plows and other mechanical snow and ice removal machinery.

Snow storage piles should be located along downgradient edges of the parking lot and positioned as far away from major pedestrian destinations as possible to prevent meltwater runoff into high traffic areas.

4 LOT GRADING AND DRAINAGE PLANS

4.1 General Lot Grading Plan

The Consulting Engineer will be required to submit a General Lot Grading Plan for all areas within the plan of subdivision. The approved General Lot Grading Plan would then be the basis for development of all lots or blocks within that subdivision. Upon receipt, the Plan will be reviewed and comments will be provided by the Development Services Branch of the Engineering Department. Approval of the plan will be issued to the Consulting Engineer once all comments have been satisfactorily addressed.

The preliminary submission shall consist of four (4) hard copies of the "General Lot Grading Plan". The plan must include the following (an example plan can be found in Appendix 'B'):

- Key plan indicating the area of the proposed development;
- Drawings at a scale of 1:500 or 1:1000;
- Legend including all symbols and elevation formats shown on the plan, North arrow;
- Street names of all roads within and bordering the proposed development;
- Lot numbers, plan numbers or municipal addresses;
- All existing and proposed easements;
- All elevations shall be referred to the City's Control Monument Network (2 vertical and 2 horizontal) and shall be in geodetic metric datum (NAD83);
- Existing contours to be shown at a maximum interval of 0.5m, and shall extend 10m beyond the limits of the property/development;
- Borehole locations with stabilized groundwater elevations;
- Locations of catch basins, maintenance holes, hydrants, valves, streetlights, transformers, telephone pedestals, sidewalk walkways, super mailboxes and hydro poles;
- Defined limits of tree preservation in accordance with the approved Tree Preservation Plans;
- Location of existing and proposed buildings, including those on adjacent lands;
- Proposed ground elevations at the building;
- Details showing the style of the proposed building, with detail for each style indicating orientation, typical relative high point, overall slope through the property limits;
- Proposed and existing elevations at lot corners;
- Intermediate grade change points;
- Direction of flow on lot lines;
- Any underground drainage must be identified;
- Identify all lots where engineered fill has been placed or will be placed;
- Surface water runoff for all lots and roadways indicating direction of flow;
- Location and grade of swales;
- Water courses and drainage ditches;
- Typical grading cross-sections for all distinct lot drainage and configurations;
- Proposed centerline elevations and right of way limit elevations at 20m intervals along roads;
- Crossfall for boulevards;
- Retaining walls (if proposing see Section 3.7), top and bottom elevations and locations;
- Well and septic locations (if applicable); including dimensions for septic locations;
- Entrance locations to the property and adjoining properties as well as those on the opposite side of roadways;

- Location of any Railway Lines or Pipe Lines, showing all offsets;and,
- Area regulated by Conservation authority (if applicable).

4.2 Proposed Lot Development

After approval of the General Lot Grading Plan and prior to the issuance of building permits, the Consulting Engineer is required to submit to the Building & By-Law Services Department for approval a Proposed Lot Development Plan for the lots for which a building permit is desired. The design criteria for lot grading and drainage requirements are outlined in Section 3: Design Criteria.

It is expected that the detailed Proposed Lot Development Plans would generally conform to the General Lot Grading Plan. All deviations which are certified by the Consulting Engineer and subsequently approved by the City would require a revision to the General Lot Grading Plan.

Dependent upon Development Type the City requires that the Proposed Lot Development Plans be designed by a Professional Engineer, Landscape Architect or Ontario Land Surveyor as outlined in Section 2.0. The required details and content of the Lot Development Plans must include the following (example can be found in Appendix 'D'):

- Key plan indicating the area of the proposed development;
- Drawings shall be at a scale of 1:200 or 1:250 for a single lot;
- Legend including all symbols and elevation formats shown on the plan, North arrow;
- Street names of all roads within and bordering the proposed development;
- Lot numbers, plan numbers or municipal addresses;
- Indication of lots with engineered fill;
- All existing and proposed easements;
- Legal survey distances around the perimeter of the property(ies);
- All elevations shall be referred to the City's Control Monument Network (2 vertical and 2 horizontal) and shall be in geodetic metric datum (NAD83);
- Identify areas of high groundwater as identified in the Geotechnical Investigation Report and show borehole locations with groundwater elevations;
- Locations of catch basins, maintenance holes, hydrants, streetlights, transformers, telephone pedestals, sidewalk walkways, hydro poles and trees;
- Approved limits of preservation including existing trees to be preserved in accordance with the Tree Preservation Plan(s) and/or the Tree Inventory;
- Location of existing and proposed buildings, including those on adjacent lands;
- Proposed building elevations; proposed ground elevations at building corners, top of footing elevation, minimum basement floor elevation, top of foundation wall elevation, finished first floor elevation, finished garage floor/slab elevation, underside of footing elevation, top and bottom of step footings with grades at these locations and estimated seasonal high groundwater elevation;
- Indicate all building types on all drawings (i.e. semi-detached (SD), Walkout (WO), Backsplit (BS) etc.);
- Locations of entrances to buildings;
- Location of patios, decks or porches;
- Location of terraces;
- Required number of risers at all entrances to dwellings;
- Include table showing the underside of footing elevation and stabilized groundwater elevation;

- Required table land at rear of the building (5.0m table and at 2.0% minimum, 5.0% maximum slope);
- Details showing the style of proposed building, with detail of each style indicating orientation, typical relative high point, overall slope through the property limits;
- Proposed and existing elevations at lot corners;
- Intermediate grade change points;
- Direction of flow on lot lines;
- Surface water runoff for all lots and roadways indicating the direction of flow;
- Location and grade of all swales, other than the normal side yard swales, are to be shown with the invert elevations at regular intervals (i.e. centerline of each lot for rear yard swales);
- Proposed elevations on the swales where grade changes in elevation adjacent to the building corners;
- All 3:1 slopes (terracing) required shall be shown with the intermediate grades specified;
- All rear yard catch basins shall be shown along with the top of grate elevation and the invert elevation of the outlet pipe;
- Locations of rain leader discharge points;
- The specified lot grade (apron elevation) shall be shown at a location 6m minimum from the street line. For split type drainage patterns, the specified rear house grade shall also be shown;
- The specified lot grade elevation at the building (apron elevation) shall be a minimum of 0.3m above the lowest lot corner in accordance with all other grading specification in these standards;
- Location of any stormwater control device;
- Underground drainage must be identified on the plan and it must be taken to an outlet to the satisfaction of the Engineering Department of the City of Barrie;
- All culverts shall be designed and shown on the Lot Grading Plans identifying culvert diameter, gauge, minimum length and type;
- In rural areas, show ditch elevations,
- All water courses, culverts and drainage ditches;
- Location, material and top and bottom elevations of all proposed and existing retaining walls (see Section 3.7) including grade elevations for berms;
- Location of any proposed acoustic fencing and masonry columns and/or entrance features in accordance with Landscape Plans including grade elevations;
- Proposed centerline of road elevations and curb elevations adjacent to the lots at 20 m intervals across the frontage;
- Locations of municipal walkways and proposed grade;
- Indication of Railway Lines and Pipe Lines within 30m of the property line;
- Location of sump pump discharge. Unless approved by the City's Engineering Department, only one sump pump shall discharge per swale;
- Location of any septic tanks and wells located on the property; and,
- Identify the slope of all driveways (2.0% minimum, 7.0% maximum).

4.3 Approval of Site Alteration

Site Alteration approvals are subject to the terms of the Site Alteration By-Law.

5 CONSTRUCTION REQUIREMENTS

The guidelines presented within this document are the requirements of the City of Barrie's Development Services Branch of the Engineering Department. These requirements are not intended to restrict any other special requirement of the City of Barrie.

All erosion and sediment control measures shall be implemented in accordance with the current City of Barrie Site Alteration By-Law.

5.1 Grading

All grading shall be completed throughout the property in accordance with Section 3 – Design Criteria of this document and conditions outlined in the Development Agreement.

The Consulting Engineer shall complete an inspection upon completion of rough grading, prior to the placement of topsoil and prior to the placement of sod.

Final grading of the property shall be inspected and certified by the Consulting Engineer in accordance with Section 6.0 Certifications of this document.

Deviations (50mm tolerance) from the approved lot development plan shall be certified by the Consulting Engineer and approved by the City's Engineering Department.

If the inspection reveals any deficiencies, the Developer's Consultant will notify the Developer what further work is required and notify the Development Services Field Coordinator.

It is the Developer's responsibility to ensure the required work is completed in accordance with their Consultant's recommendations.

5.2 Topsoil and Sodding

The Developer shall be responsible for the placement of topsoil and sod, in required areas (as per the approved grading plan) and shall ensure that all lots are sodded and comply with the City's topsoil requirement and lot grading criteria.

Unless otherwise noted on the approved grading plan, the entire lot shall be sodded with the exception of areas within the defined Tree Preservation Limit as per the approved Tree Preservation Plan(s). Where tree preservation fencing has been installed, written authorization to remove the fencing must be received from the City of Barrie's Parks Planning and Development Sections pending a site inspection by the Developer's Landscape Architect prior to the removal of said fencing to accommodate the placement of sod.

5.2.1 Topsoil

Prior to the placement of sod, there is to be a minimum of 200mm of screened, friable topsoil, free of stones, sticks and other debris. The topsoil is to be fine graded prior to the placement of sod.

Topsoil must meet or exceed the current Ontario Provincial Standard Specification (OPSS) No. 802 and be in accordance with the topsoil requirements of the City of Barrie as outlined below. Topsoil shall be imported to the site except where topsoil stripped under a separate item meets the specification for topsoil contained within OPSS 802, which is considered to be the minimum requirement.

The contractor shall arrange for testing of the topsoil source pile by an accredited laboratory, and the topsoil must conform to the parameters within Table 1 pg.14, test results must be submitted prior to topsoil placement:

Table 1: Acceptable Topsoil Parameters

Parameter	Unit of Measure	Requirement
pH		5.5 – 7.5
Organic Matter,	%	4 – 15
Total Salts	mmhos/cm	<1.5
Phosphorous	ppm	10 – 60
Potassium	ppm	80 – 250
Calcium	ppm	1000 – 4000
Magnesium	ppm	100 – 300
Chloride	ppm	<100
Sodium	ppm	<200
Sodium Absorption	Ratio	<15
Sand Fraction	%	20 – 75
Silt Fraction	%	5 – 50
Clay Fraction	%	5 – 30
Atrazine	ppm	<0.05

One representative topsoil sample shall be obtained and tested for every 4000m² (800m³ at 200mm placement depth) of topsoil that is intended for use on the site as recommended by the Toronto Regional Conservation Authority (Preserving and Restoring Healthy Soil Best Practices for Urban Construction V1, June 2012) . The samples that are submitted shall be a representation of the entire stockpile (inside/outside). All test results must be submitted to the City prior to the placement of topsoil.

5.2.2 Sod

In accordance with OPSS 803, after placing, sod shall be rolled to ensure that there are no air pockets in the sod and that the sod has good direct contact with the topsoil. The sod shall also be watered by the developer for a sufficient amount of time to ensure that the sod is alive and viable.

6 LOT DEVELOPMENT PLAN CERTIFICATION

Upon completion of approvals and inspections, the Consulting Engineer shall provide the City with certification letters (as per Sections 6.1 and 6.2) advising that all areas required, conform to the approved lot grading plan and the approved detailed lot development plan.

6.1 Certification of As-Constructed Substructure

The As-Constructed Substructure shall be certified in accordance with the approved detailed lot development plan prior to the commencement of construction of the superstructure; such certification would be a standard form letter, an example of which is shown in Appendix 'D'.

During the construction phase, it is the responsibility of the Consulting Engineer to certify to the Building & By-Law Services Department that the As-Constructed Substructure elevations (confirmed by survey shots) of the top of foundation wall, underside of footing and top of footing elevations are as per the approved lot development plan.

Any non-conformance of foundation elevations shall be brought to the City's attention for further direction prior to proceeding with any further construction. Deviations from the approved top of foundation wall elevations if approved require a revision to the proposed lot development plan and subsequent approval by the City of Barrie.

6.2 Certification of As-Constructed Lot Grading

The Consulting Engineer will be responsible to certify that the as-constructed lot grading and the location and elevation of any rear lot catch basins or other drainage appurtenances, if installed, are in conformance with the Lot Development Plan. Such certification would be a standard form letter, an example of which is shown in Appendix 'E', accompanied by an as-constructed copy of the Lot Development Plan.

APPENDIX A

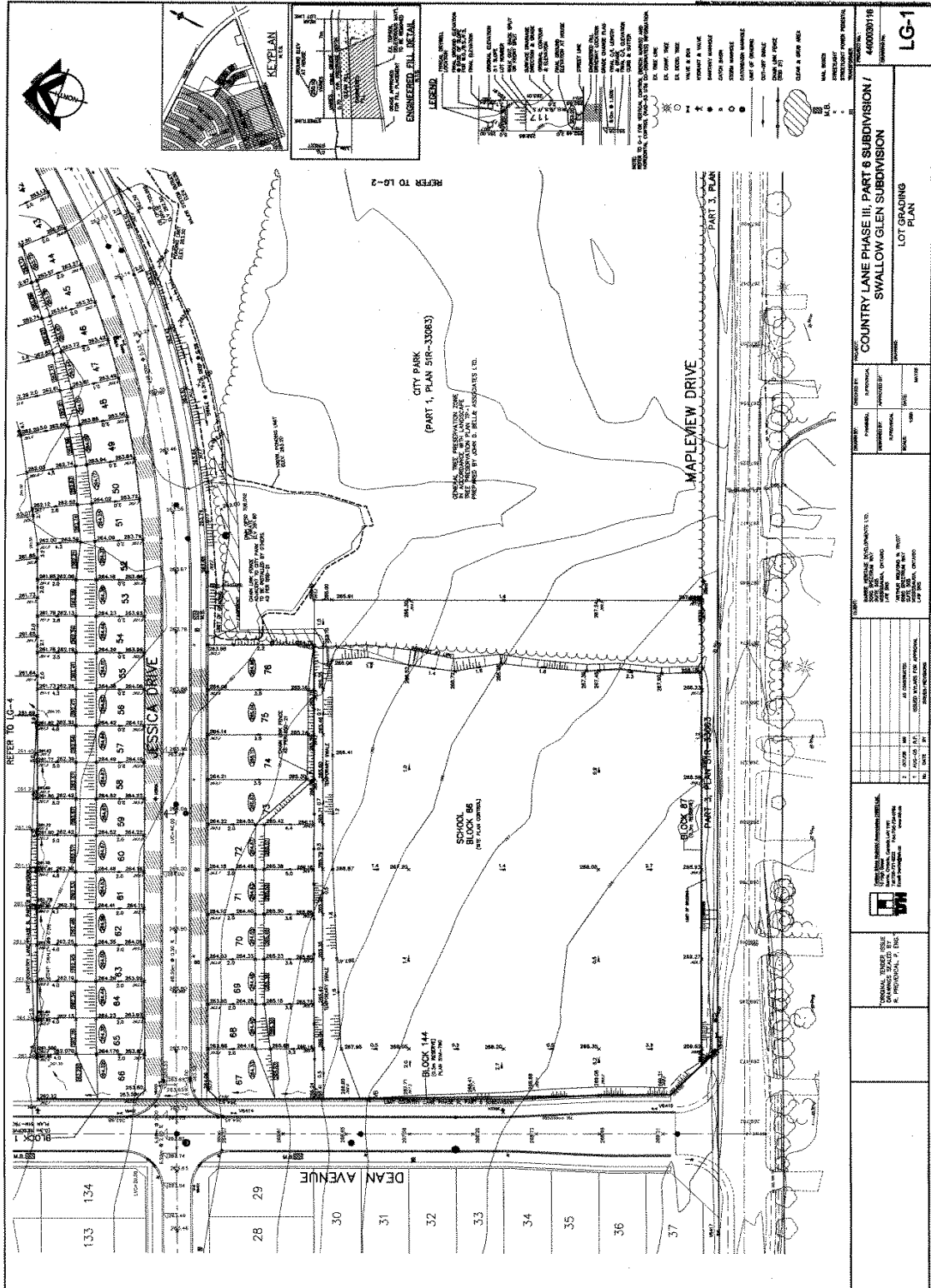
INFRASTRUCTURE STANDARD
DRAWINGS



GENERAL LOT GRADING PLAN



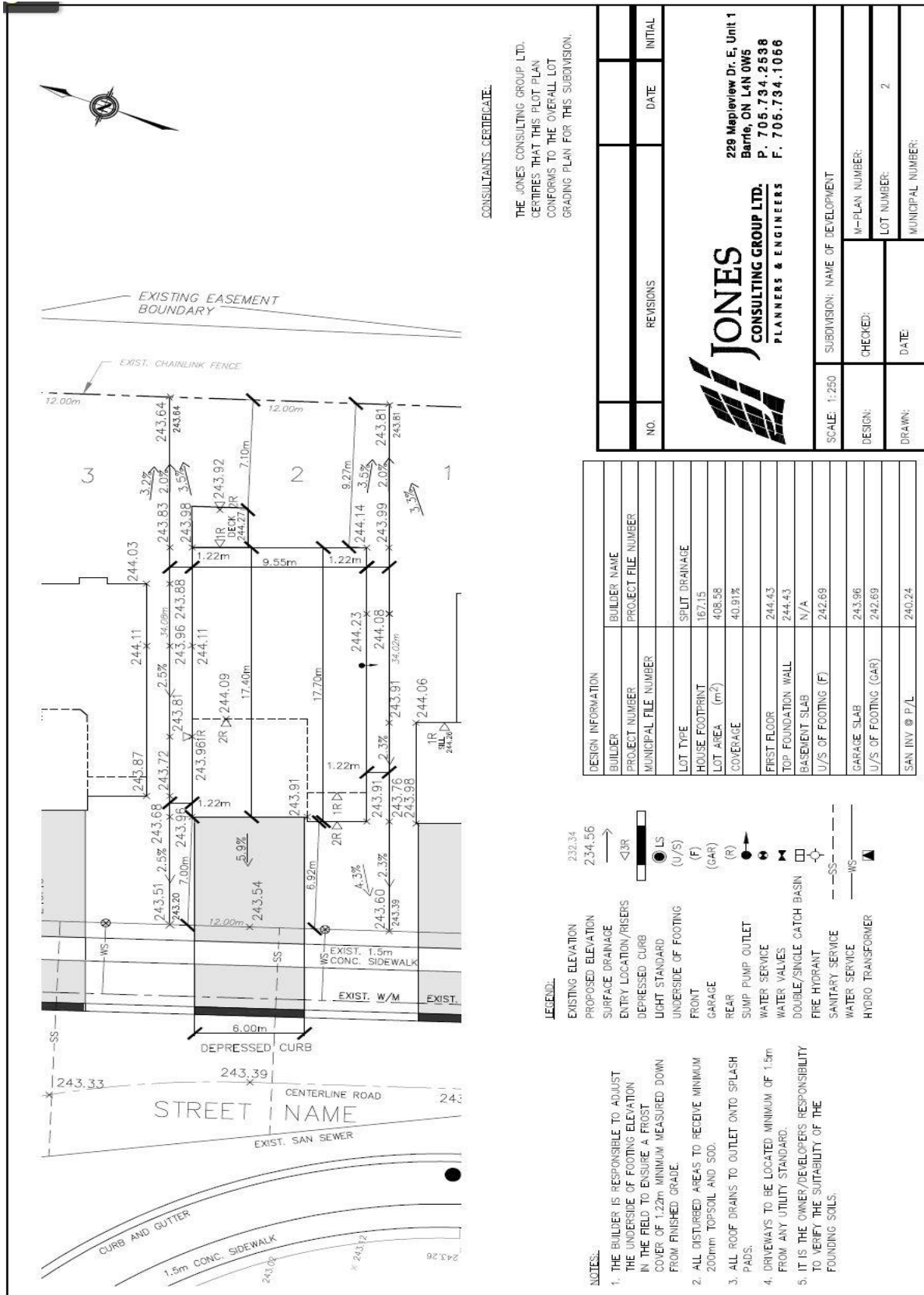
The general lot grading plan provided here is only intended as a reference to show the type and level of detailed grading information required under these guidelines. Specific elevations shown may not be in conformance with current guideline standards and therefore should not be referred to for specific grading requirements under these guidelines.



LOT DEVELOPMENT PLAN



The general lot grading plan provided here is only intended as a reference to show the type and level of detailed grading information required under these guidelines. Specific elevations shown may not be in conformance with current guideline standards and therefore should not be referred to for specific grading requirements under these guidelines.



CONSULTANTS CERTIFICATE:
 THE JONES CONSULTING GROUP LTD.
 CERTIFIES THAT THIS PLOT PLAN
 CONFORMS TO THE OVERALL LOT
 GRADING PLAN FOR THIS SUBDIVISION.



229 Mapleview Dr. E, Unit 1
 Barrie, ON L4N 0W5
 P. 705.734.2538
 F. 705.734.1066

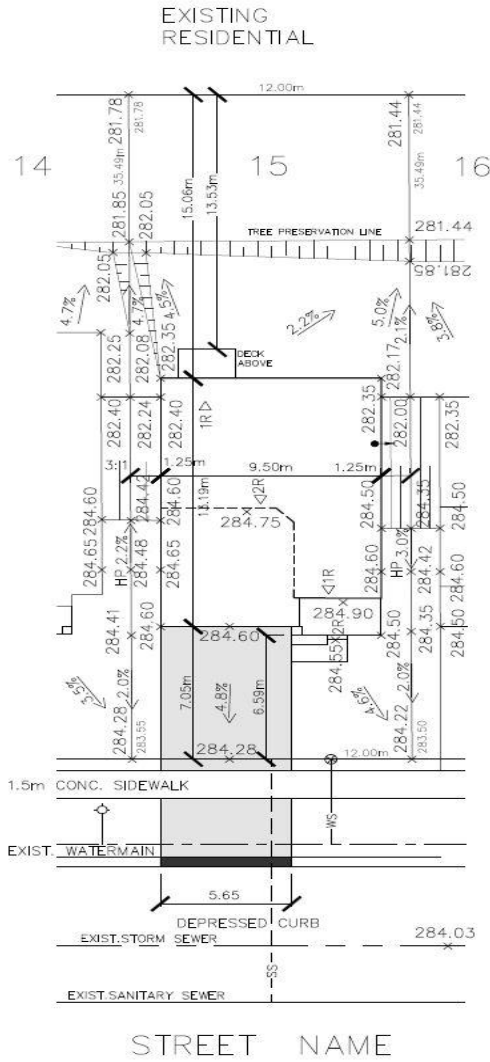
NO.		REVISIONS		DATE	INITIAL

SCALE: 1:250	SUBDIVISION: NAME OF DEVELOPMENT
DESIGN: _____	CHECKED: _____
DRAWN: _____	DATE: _____
	M-PLAN NUMBER: _____
	LOT NUMBER: 2
	MUNICIPAL NUMBER: _____

DESIGN INFORMATION	
BUILDER	BUILDER NAME
PROJECT NUMBER	PROJECT FILE NUMBER
MUNICIPAL FILE NUMBER	
LOT TYPE	SPLIT DRAINAGE
HOUSE FOOTPRINT	167.15
LOT AREA (m ²)	408.58
COVERAGE	40.91%
FIRST FLOOR	244.43
TOP FOUNDATION WALL	244.43
BASEMENT SLAB	N/A
U/S OF FOOTING (F)	242.69
GARAGE SLAB	243.96
U/S OF FOOTING (GAR)	242.69
SAN INV @ P/L	240.24

- LEGEND:**
- EXISTING ELEVATION: 232.34
 - PROPOSED ELEVATION: 234.56
 - SURFACE DRAINAGE:
 - ENTRY LOCATION/RISE:
 - DEPRESSED CURB:
 - LIGHT STANDARD:
 - UNDESIRED OF FOOTING (U/S):
 - FRONT GARAGE:
 - REAR GARAGE:
 - SUMP PUMP OUTLET:
 - WATER SERVICE:
 - WATER VALVES:
 - DOUBLE/SINGLE CATCH BASIN:
 - FIRE HYDRANT:
 - SANITARY SERVICE:
 - WATER SERVICE:
 - HYDRO TRANSFORMER:

- NOTES:**
- THE BUILDER IS RESPONSIBLE TO ADJUST THE UNDERSIDE OF FOOTING ELEVATION IN THE FIELD TO ENSURE A FROST COVER OF 1.22m MINIMUM MEASURED DOWN FROM FINISHED GRADE.
 - ALL DISTURBED AREAS TO RECEIVE MINIMUM 200mm TOPSOIL AND SOD.
 - ALL ROOF DRAINS TO OUTLET ONTO SPLASH PADS.
 - DRIVEWAYS TO BE LOCATED MINIMUM OF 1.5m FROM ANY UTILITY STANDARD.
 - IT IS THE OWNER/DEVELOPERS RESPONSIBILITY TO VERIFY THE SUITABILITY OF THE FOUNDING SOILS.



CONSULTANTS CERTIFICATE:

THE JONES CONSULTING GROUP LTD.
 CERTIFIES THAT THIS PLOT PLAN
 CONFORMS TO THE OVERALL LOT
 GRADING PLAN FOR THIS SUBDIVISION.

DESIGN INFORMATION	
BUILDER	BUILDER NAME
PROJECT NUMBER	PROJECT FILE NUMBER
MUNICIPAL FILE NUMBER	
LOT TYPE	WALKOUT
HOUSE FOOTPRINT	118.60
LOT AREA (m ²)	425.90
COVERAGE	27.70%
FIRST FLOOR	285.10
TOP FOUNDATION WALL	284.60
BASEMENT SLAB	282.56
U/S OF FOOTING (F)	282.33
GARAGE SLAB	284.75
U/S OF FOOTING (GAR)	283.38
SAN INV @ P/L	N/A

NO.	REVISIONS	DATE	INITIAL



229 Mapleview Dr. E, Unit 1
 Barrie, ON L4N 0W5
 P. 705.734.2538
 F. 705.734.1066

SCALE	1:250	SUBDIVISION	NAME OF DEVELOPMENT
DESIGN	CHECKED:	M-PLAN NUMBER	15
DRAWN:	DATE:	LOT NUMBER:	
		MUNICIPAL NUMBER:	

- LEGEND:**
- EXISTING ELEVATION: 232.34
 - PROPOSED ELEVATION: 234.56
 - SURFACE DRAINAGE: [Symbol]
 - ENTRY LOCATION/REIERS: [Symbol]
 - DEPRESSED CURB: [Symbol]
 - LIGHT STANDARD: [Symbol]
 - UNDERSIDE OF FOOTING: [Symbol]
 - FRONT GARAGE: (F) (GAR)
 - REAR GARAGE: (R) (GAR)
 - SUMP PUMP OUTLET: [Symbol]
 - WATER SERVICE: [Symbol]
 - WATER VALVES: [Symbol]
 - DOUBLE/SINGLE CATCH BASIN: [Symbol]
 - FIRE HYDRANT: [Symbol]
 - SANITARY SERVICE: [Symbol]
 - WATER SERVICE: [Symbol]
 - HYDRO TRANSFORMER: [Symbol]

- NOTES:**
- THE BUILDER IS RESPONSIBLE TO ADJUST THE UNDERSIDE OF FOOTING ELEVATION IN THE FIELD TO ENSURE A FROST COVER OF 1.22m MINIMUM MEASURED DOWN FROM FINISHED GRADE.
 - ALL DISTURBED AREAS TO RECEIVE MINIMUM 200mm TOPSOIL AND SOD.
 - ALL ROOF DRAINS TO OUTLET ONTO SPLASH PADS.
 - DRIVEWAYS TO BE LOCATED MINIMUM OF 1.5m FROM ANY UTILITY STANDARD.
 - IT IS THE OWNER/DEVELOPERS RESPONSIBILITY TO VERIFY THE SUITABILITY OF THE FOUNDING SOILS.

CERTIFICATION OF AS-CONSTRUCTED
SUBSTRUCTURES



City of Barrie
Building & By-Law Services Department
70 Collier Street
P.O. Box 400
Barrie, Ontario
L4M 4T5

Attention: Director of Building & By-Law Services

Dear Sir:

Re: Subdivision No.: R.P.:
Lot of Block No.: Building Type:
Certification of As-Constructed Sub-Structure

This is to certify that the as-constructed elevations of the top of the foundation wall, underside of footing, top of footing, garage floor elevation, floor slab and lowest opening have been confirmed by survey shots and are in conformity with the approved lot development plan, dated _____.

Yours truly,

Consulting Engineer

CERTIFICATION OF AS-CONSTRUCTED
LOT GRADING



City of Barrie
Engineering Department
70 Collier Street
P.O. Box 400
Barrie, Ontario
L4M 4T5

Attention: Director of Building Services & By-Law Services

Dear Sir:

Re:	Subdivision No.:	R.P.:
	Lot of Block No.:	Building Type:
	Certification – As Constructed Lot Grading	

I have verified the as-constructed lot elevation for the above noted lot through field survey methods, as shown on the attached drawing and hereby certify that: (select one of the following statements)

- a) The as-constructed lot grading is in conformance with the approved lot development plan;
- b) The as-constructed lot grading, while not in conformance with the lot development plan, would satisfactorily meet current City of Barrie lot grading and drainage criteria and generally satisfy the intent of the General Lot Grading plan;
- c) The as-constructed grades as shown will produce adequate surface drainage without any detrimental effect to the existing drainage patterns or adjacent properties.

Yours truly,

Consulting Engineer