Township of Brock

Engineering Design Criteria
&
Standard Drawings

prepared by:

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prepared for

Township of Brock

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Revision Information Sheet

The following table indicates all revisions including any additions, deletions and modifications to this manual subsequent to its issuance on June 2018. Revisions to these standards are subject to the approval of the Township Engineer. A written request to change or revise the standards may be submitted to the Director of Public Works for review.

Revision details should include the all related section titles, section numbers and page numbers.

Revision No.	Date	Revision Details	Initials
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1 General Requirements

1.1 Introduction

The Township of Brock Engineering Design Criteria and Standard Drawings presented herein are intended as guidelines for land development and capital horizontal infrastructure projects to ensure uniform design throughout the Municipality. Innovative technological changes that improve or maintain the quality of the design on a life cycle cost basis may be considered at the discretion of the Township.

These standards are to be read in conjunction with the latest editions of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), the Township of Brock Standard Drawings and the Township of Brock Standard Subdivision Agreement. In the case of a discrepancy with OPSS or OPSD, the Township Standards shall prevail.

Prior to commencement of the Engineering design, the Consultant shall obtain copies of the Township of Brock "Design Criteria" and "Standard Detail Drawings" to familiarize themselves with the requirements of subdivision design in the Township of Brock.

It is the applicant's responsibility to obtain and check with the Township of Brock for new revisions. Copies are available for purchase from the Township of Brock or can be downloaded from the web site at www.townshipofbrock.ca; standard drawings are available on CD in PDF format.

In addition to filing appropriate applications with the Region of Durham Planning Department, a subdivision/condominium application and fees must be submitted to the Township of Brock. A Guide to Subdivisions/Condominium Approval setting forth those planning and engineering requirements for this type of approval is available from the Township.

1.1.1 Regional Municipality of Durham

The Regional Municipality of Durham is responsible for all sanitary sewers and watermains that are to be installed on all road allowances and registered blocks and easements within the Region of Durham.

The Regional Municipality of Durham is responsible for all Regional Roads.

The Consulting Engineer shall contact the Region of Durham Engineering Department to obtain copies of the Regional Design Standards for sanitary sewers, watermains and regional roads.

1.2 Definitions

In this document the following definitions shall apply:

"Clerk" shall mean Municipal Clerk of the Township.

"Consultant" shall mean a competent professional engineer or firm of engineers employed by the Developer which is skilled and experienced in municipal work and land development projects and registered with the Association of Professional Engineers of the Province of Ontario, possessing a current Certificate of Authorization to practice professional engineering as required by the Professional Engineers Act.

"Contractor" shall mean the firm of Contractors, the company or individual acting as the Contractor and having entered into a contract with the Developer/Owner to install the services.

"Developer(s)/Owner(s)" shall mean the person(s) entering into the subdivision agreement with the Corporation of the Township of Brock.

"Major Development(s)" shall mean creation of four or more lots, the construction of a building or buildings with a ground floor area of 550 square metres or more, or the establishment of a major recreational use.

"Standard Drawings" shall mean drawings as developed and approved by the Township.

"Township" shall mean the Township of Brock.

"Township Representative" shall mean any person assigned to a project by the Township to carry out work on their behalf. The name of the Representative shall be specified prior to the start of construction on any project.

Abbreviations:

"AWWA" shall mean the American Water Works Association.

"CSA" shall mean the Canadian Standards Association.

"DFO" shall mean the Department of Fisheries and Oceans, Canada.

"LSRCA" shall mean the Lake Simcoe Region Conservation Authority.

"KRCA" shall mean the Kawartha Region Conservation Authority.

"MNRF" shall mean the Ontario Ministry of Natural Resources and Forestry.

"MOECC" shall mean the Ontario Ministry of the Environment and Climate Change.

"MTO" shall mean the Ontario Ministry of Transportation.

"OBC" shall mean the latest version of the Ontario Building Code including regulations.

"OHBDC" shall mean the Ontario Highway Bridge Design Code.

"OPSD" shall mean the Ontario Provincial Standard Drawings.

"OPSS" shall mean the Ontario Provincial Standard Specification.

"Region" shall mean the Regional Municipality of Durham.

1.3 Submissions to Government and Other Agencies

The Consultant shall be required to make all submissions and representations necessary to obtain approval from all other affected authorities (such as DFO, LSRCA, KRCA, MNRF, MOECC, MTO, Region of Durham, Canada Post Corporation, Transport Canada, etc.) and any other agencies for works which fall within their jurisdiction. It is the responsibility of the Consultant to ensure that all correspondence, comments and approvals are provided to the Township.

1.4 Barrier Free Considerations

All design projects throughout the Township must give due consideration to the Accessibility for Ontarians with Disabilities Act (AODA) and the Township of Brock Multi Year Accessibility Plan and must incorporate ways to remove barriers for the public.

1.5 Pre-Consultation Meeting

The Township requires all development proposals to undergo a pre-consultation process to determine all internal & external agency requirements.

1.6 Pre-Servicing Policy for Subdivision Development

Subsequent to Draft Plan Approval and prior to execution of a Subdivision Agreement, the Township may consider agreeing to pre-servicing of a subdivision at the Owner's risk when the following conditions have been met:

a) Written acceptance from the Township for specific works for which pre-servicing can proceed;
b) Engineering drawings have been accepted for construction for the works under consideration;
c) Written approval of various agencies, e.g., MOECC, LSRCA, KRCA, MNR, MTO, Ministry of Citizenship, Culture and Recreation, Region of Durham where they relate to installation of services permitted by pre-servicing;
d) Written confirmation from utility companies that satisfactory agreement has been reached for provision of respective services;
e) Upon approval of the pre-servicing application, the Developer must enter into a Standard Pre-servicing Agreement with the Township;

f) No permission will be given to construct external services prior to full registration unless a Letter of Credit has been deposited with the Township, for the total cost of the services and all restoration, and approval has been granted by Township council. Connections to existing services may not be permitted until the plan is registered;

g) All other documents considered necessary to the works under the Pre-servicing Agreement including 300 mm reserves, easements, etc., must be approved as to form and description;

h) Cash deposits for engineering and legal fees for the Township, in amounts determined by the Township, must be paid to the Township prior to the commencement of any works;

i) Required Insurance Certificate is to be submitted as per Pre-servicing Agreement;

j) A cash deposit or Letter of Credit as security for possible emergency maintenance work by the Township in an amount determined by the Township. The cash deposit is to be returned at the time of registration of the subdivision;

k) Any required zoning by-laws must be in effect;

l) If the underground pre-servicing has been completed prior to the registration of the plan of subdivision, the Township will not require the full value of the Letter of Credit provided an appropriate reduction request has been submitted and approved;

m) Above ground works will not be permitted to commence unless approved by the Township.

1.7 Subdivision Agreement Schedules

1.7.1 Preparation of Subdivision Agreement

The draft of the Subdivision Agreement will be prepared by the Township Solicitor and forwarded to the Township Administrator. The final Subdivision Agreement will be prepared under the direction of the Township Administrator in consultation with various Township departments, who will obtain Council's approval for the execution of the Agreement.

The Township Administrator must be in a position to clear ALL conditions of Draft Plan Approval prior to the preparation of the Final Subdivision Agreement.

NOTE: In conjunction with preparation of the Subdivision Agreement the Developer's Consulting Engineer shall provide the Township with the appropriate number of copies of the following:

a) Ministry of Environment and Climate Change Applications for approval for Township services to be constructed for the proposed subdivision;

b) The name of the person and title and/or company and Mortgagees with whom the Subdivision Agreement will be executed. The Developer's address and telephone number shall be provided;

c) The name, address and telephone number of the Developer's lawyer;

d) A breakdown of the number of units proposed within the subdivision:

i.e.

i. Single-family units
ii. Semi-detached units
iii. Townhouse units
iv. Apartment units
    - one bedroom and bachelor
    - two or more bedrooms;

e) The Reference Plan for the subdivision;

f) The legal description of the subdivision, based on the Reference Plan;

g) The proposed final plan for registration (M-Plan) complete with the street names, lot numbers, surveyor's certificate, Owner's certificate and all other pertinent information required by the registry office;

h) The final draft reference plans for any easements to be granted to the Township;

i) The engineering drawings, acceptable to the Township Engineer;

j) The "M" and "R" Plans reduced to legal size;

k) An O.L.S. certificate in tabular form identifying and certifying that all Lots and corresponding frontages, depths and areas, are in compliance with the appropriate Zoning By-law;

l) A detailed cost estimate of Municipal Services to be constructed for the subdivision. The cost estimate shall be signed and sealed by a Professional Engineer. The estimated cost of Services shall be detailed to show individual items of construction. The total estimated cost of Services shall include the following:

i. Detailed cost of services, per Schedule of Construction Costs (refer to Schedule of Construction Costs in Appendix A);
ii. The actual estimated cost of streetlighting and associated underground distribution system;
iii. Any other miscellaneous expenditures required by the Subdivision Agreement as the Developer's obligation, such as park equipment, park landscaping, development of open space, etc.;
iv. Allowances for contingencies and engineering in the amount of 15% of the estimated cost of services.

This estimate will be used as a basis for calculation of the security to be posted for the development.

m) The Developer shall provide the Township with written confirmation from the following utility authorities that satisfactory arrangements have been made for the installation of services in the proposed subdivision:

- Bell Canada;
- Cable TV Company;
- Canada Post;

- Hydro One;
- Union Gas;
- Region of Durham;
- Any other Authority where required.

In addition to the above, Location Approvals shall also be submitted by the appropriate utility authorities. Where requested, easements shall be provided for utilities, at no cost to the utility company or municipality.

n) Proposed timetable for construction of services.

o) Proposed landscaping plan where necessary or required.

p) Proposed staging plans.

1.7.2 Requirements Prior to Commencement of Construction

Prior to commencement of construction, the Developer's Consulting Engineer shall submit the following information to the Township Engineer for approval (Allow at least two weeks for review). Submission shall include one digital set of the submission, as well as hard copies as specified.

a) Three sets of all construction specifications;

b) The proposed contractor and subcontractors;

c) The contractor's list of suppliers;

d) One copy of the signed contract documents complete with unit prices;

e) All other information specified in the Subdivision Agreement as a requirement prior to commencement of construction or other information required by the Township Engineer;

f) MNRF, LSRCA, KRCA and/or DFO work permits for works within water bodies;

g) Region of Durham authorization.

1.8 Construction

1.8.1 General

Construction for new development works shall be arranged by the developer directly with any contractor who has proper experience and who shall provide Worker's Compensation Board clearance certificates initially and upon request as the work proceeds and prior to release of holdbacks. The developer shall retain a consulting engineer and qualified inspection and testing consultant(s) to oversee construction and certify it is in accordance with applicable standards.

Construction of all works in the Township shall be in accordance with the current "Occupational Health and Safety Act and Regulations for Construction Projects" and other applicable legislation as well as "Traffic Control Manual for Roadway Work Operations".

Construction shall generally conform to Ontario Provincial Standard Specifications and the Township and Ontario Provincial Standard Drawings, as well as the specific contract specifications and drawings prepared for the work and approved by the Director of Public Works.

Construction of sanitary sewers and watermains in the Township shall be done in accordance with Regional Municipality of Durham Standard Specifications for Construction of Regional Services – Division 2 – latest edition. Note other specifications and standards may apply in specific contracts as outlined in the contract documents.

1.8.2 Project Meetings

The Consulting Engineer, Contractor and Township staff shall meet at the construction site at regular intervals as determined by the Township staff during the course of construction to: monitor construction progress, discuss planned construction activity and potential problems, discuss outstanding questions or problems related to the work, and discuss any other business related to the work such as payments, change notices, etc.

1.8.3 Construction Layout

For both new development and municipal projects, construction layout shall be provided by the contractor and verified by the consulting engineer as outlined in the specific contract documentation documents. Construction layout shall be performed in such a way as to provide minimum disruption to the public and maximum opportunity for smooth construction operation and accurate installation of the designed works.

The Consulting Engineer shall be responsible for obtaining “as-built” inverts and ties for all underground services, tees and lateral connections. The “as-built” information shall be checked against the design as the construction proceeds, to discover at an early date any discrepancies so corrective action can be taken if required. Sufficient “as-built” information shall be obtained to allow as-built drawings to be prepared as described in Section 3.15.

1.8.4 Tree and Plant Protection

Trees and plants adjacent to construction zone shall be protected from damage in accordance with requirements outlined in Section 4.15.1.3 – Protection of Existing Trees and Plantings.

1.8.5 Materials Testing

A qualified testing and inspection consultant(s) shall be retained by the Developer to provide the following testing and inspection services:

a) Soils, compaction and asphalt (for bedding, pipe cover, trench backfill, road subgrade, granular and asphalt road pavement materials);

b) Concrete (slump, air entrainment and compressive strength);

c) Reinforcing steel (material strength and placement);

d) Welding (on site and/or at manufacturer premises);

e) Camera inspection of sanitary and storm mains and catchbasin leads (as detailed in the subdivision agreement and as per the Township's instructions on municipal projects).

Copies of all laboratory and field test shall be provided on a weekly basis to the Township inspector along with a cover letter outlining any deficiencies noted through the testing process and describing what corrective measures have been or should be taken. All testing shall be in accordance with OPSS and procedures.

1.8.6 Approved Materials

All construction in the Township shall be done with materials which are on the Region of Durham's Approved Products List. The list is available upon request from the appropriate agency. The list is available at roadauthority.com. Materials must also meet specific requirements outlined in the contract drawings and specifications and are subject to acceptance testing by the developer or the Township.

1.9 Certificate of Completion and Final Acceptance

The term "Certificate of Completion" shall be used to describe the date when the services are complete and acceptable to the Township by by-law subject to the maintenance requirements pursuant to the Subdivision Agreement. "Final Acceptance" shall be the terminology used when the Developer's maintenance requirements have been fulfilled and the Services are acceptable to the Township. "Final Acceptance" of the subdivision shall be the date on which the Council of the Township agrees by by-law that all the conditions of the Subdivision Agreement have been fulfilled, and all maintenance requirements have been completed.

The "Certificate of Completion" and "Final Acceptance" must be requested in writing by the Developer. The dates for "Certificate of Completion" and "Final Acceptance" of the Services in the development shall be established by the Township.

When the services are completed and cleaned to the satisfaction of the Consulting Engineer, he shall advise the Township Engineer in writing the work is complete and shall request an inspection by the Township. The Township and the Township Engineer shall carry out their inspections and shall advise the Consulting Engineer of any items of work requiring further rectifications. When all deficiencies have been corrected to the satisfaction of the Township Engineer, a report shall be forwarded to the Council ("Certificate of Completion") recommending a date for the commencement of the maintenance period. The "Certificate of Completion" may be issued with an attached list of minor deficiencies, if in the Township's opinion the deficiencies will not significantly affect the operation of the services.

Near the end of the maintenance period the services shall be re-inspected by the Consulting Engineer

and all deficiencies found shall be corrected. When the Consulting Engineer is satisfied that the work is complete and acceptable, he shall so advise the Township and shall request a final inspection by the Township Engineer. When all work is completed to the satisfaction of the Township Engineer, a report shall be forwarded to the council recommending "Final Acceptance" of the works.

Reductions in financial securities held by the Township will be considered in accordance with the provisions of the subdivision agreement. Request for reductions should be made in accordance with the sample letter provided in Appendix B.

1.10 Certification Submittals

1.10.1 Lot Grading Certificate

Prior to pouring building footings, an Ontario Land Surveyor must install survey pins in order to accurately locate the foundation.

Prior to a building's superstructure proceeding, the Developer's Engineer or OLS must certify that the final footing and foundation elevations conform to the site grading plans and the Building Code.

Prior to the release of any lot from the conditions of the Subdivision Agreement, the Developer's Consulting Engineer shall provide certification to the Township that the grading and drainage of each lot is in accordance with the approved lot grading and drainage plans.

This certification is to include that:

a) The lot grading plan conforms to the storm drainage plan. Plan and certificate are to be submitted with the building permit application;
b) The final footing and top of foundation are in conformance with the certified grading plan (Tolerance 150 mm);
c) The final grading for each lot conforms to the individual lot grading plan.

See template in Appendix B.

If the final grading differs from the approved lot grading plan, the Consulting Engineer shall provide details of the variance from the approved plans and shall include his recommendations for rectification of the area if required.

A site inspection shall be arranged by the Consultant, with the Township Engineer, to review the grading of lots after completion of sodding.

"As-Built" Lot Grading Plans for each lot shall be submitted to the Township Engineer by the Developer's Consulting Engineer, prior to issuance of a "Final Occupancy Certificate". "As-Built" Lot Grading Plans shall include all requirements identified under Section 4.10.

The Developer and his Consultant shall be responsible for approval and certification of the following:

a) Certification that the block grading plan conforms to the storm drainage plan. The block grading plan and certification shall be submitted with the building permit application;
b) Certification of the final grading for each block conforms to the storm drainage plan and the block grading plan.

2 Submission Requirements

2.1 Introduction

This section outlines the required submissions to be made to the Township.

All submissions are to be coordinated by the Consultant.

Second and Final submissions are not to be made until the Township's comments regarding the first and second submission, respectively, have been received and incorporated.

Prints of drawings for all submissions shall be in accordance with Township standards and each print shall be stamped with the submission number (1, 2 or 3) and date of submission.

Engineering drawings shall be submitted to the Township. Where applicable the Consulting Engineer is advised to review the Region of Durham and MTO design criteria for intersecting roads to determine the requirements for submission of engineering drawings to the Region and MTO.

2.2 Engineering Requirements for Draft Plan Approval

A Preliminary Engineering Submission must be submitted by the Developer's Consultant to the Township in accordance with the Official Plan. This submission must be presented in a readable, comprehensive and professional manner. Any reports must be signed and sealed by a Professional Engineer as applicable.

This Preliminary Submission shall contain the following and be submitted in duplicate:

a) The Draft Plan

The Draft Plan must be in compliance with the Planning Act, as amended, and in a form acceptable to the Planning Departments of the Township and Region. Reductions of the Draft Plan (11" x 17"), to scale, must be submitted;

b) Contour Plan

This plan must be at a scale of no larger than 1:1000 giving contour lines at sufficient intervals to permit assessment of existing surface drainage patterns. Contour intervals shall not be greater than 0.5 m. This plan is to extend to the limits of the drainage area to be served by proposed sanitary and storm sewer systems, including lands beyond the boundaries of the subdivision. For large external drainage areas, separate Contour Plans at a larger scale may be provided. All elevations are to refer to Geodetic Datum;

In addition to showing existing information, the Consultant is required to submit an Area Grading Plan which identifies the overall grading intentions within the Plan of Subdivision. Preliminary road profiles shall be identified on the plan.

It is a requirement of this Municipality that rear to front lot drainage be achieved throughout the Plan of Subdivision (subject to feasibility). The Area Grading Plan shall establish the feasibility of meeting this requirement.

If any lots are to have a berm constructed for the purpose of providing screening or facilitating a noise attenuation feature then the Consulting Engineer shall prepare and submit sufficient cross-sections to demonstrate the lots can be graded in accordance with the Lot Grading criteria and the Lot Grading details of the Standard Drawings;

c) General Plan of Services

This will be a plan based on the Draft Plan and must schematically show the proposed storm and sanitary sewer systems and water mains and their connection to existing systems. Direction of flow must be indicated on all sewers. This plan is to be accompanied by preliminary engineering calculations indicating the quantity of flows at the connection to existing systems and/or at proposed outfalls. Consideration must be given to the whole catchment area to ultimately be developed. Blocks and easements for storm and sanitary sewers, stormwater management facilities and water main systems shall also be shown.

Preliminary road profiles and area grading requirements must also be identified in the Preliminary Report. Blocks of land for community mail centres must be identified on the Draft Plan and the General Plan of Services.

Proposed noise attenuation barriers are to be shown;

d) Drainage Plan

When a natural drainage channel passes through and is affected by the construction of the subdivision, drawings must be submitted to indicate the location and typical cross-sections of the existing channel and of any proposed changes. In general, creek diversions will not be permitted. An erosion-sediment control plan will be required. A preliminary stormwater management plan and report will be required by the Township in accordance with the requirements outlined in this document. The Consultant must submit an outline of the erosion-sediment control plan in accordance with the requirements of these standards.

All drainage designs shall be carried out in general compliance with the MOECC, Stormwater Management Planning and Design Manual – March 2003, as amended.

Any proposed modifications to an existing channel and/or floodplain will require MNRF, DFO,

KRCA and/or LSRCA review and approval. The Consulting Engineer must consult with staff from the appropriate agency(s) and confirm their requirements, prior to proceeding with the preliminary engineering report;

e) Stormwater Management, Erosion and Sediment Control Study

Prior to any major new development, a stormwater management and erosion and sediment control study shall be required. The purpose of the study is to identify measures required to control the quantity, quality and velocity of runoff associated with the development of a specific area. In addition, development proposals must be accompanied by a drainage plan that indicates contours, elevations and the proposed final grades. This drainage plan must be prepared to the specification of and be subject to the approval of the Township. Detailed requirements are outlined in Section 3.16.3;

f) Geotechnical Report

A preliminary Geotechnical Investigation and Report from a qualified Geotechnical Consultant will be required, with particular attention to sub-surface soil and groundwater conditions and the ability of the soils to structurally support underground services, roadways and foundations for residential, commercial, or industrial type structures. The report must determine the elevation of seasonal high groundwater and comment on minimum foundation elevations to avoid buildings constructed below groundwater. Detailed requirements are outlined in Section 3.16.1;

g) Hydrogeological Report

A hydrogeological assessment is required if one or more of the following conditions exist:

i. Stormwater management involves infiltration techniques;
ii. Groundwater table is less than 1m below the lowest basement or 3.5m below the finished floor elevation, and/or significant fluctuations in groundwater table that may affect proposed municipal infrastructure;
iii. Dewatering is required in excess of MOECC daily dewatering volume limits (an MOECC Permit to Take Water will be required);
iv. The development is proposed using individual water supply wells and sewage disposal systems;
v. Detailed requirements are outlined in Section 3.16.2.

h) Open Ditch Road Section - Feasibility

The requirements of this section need to be addressed only in the event an open-ditch roadway is proposed to service the Development. In such case, an Engineering report shall be prepared to assess whether the Development site is suitable for the incorporation of an open ditch drainage

system. Generally, in completing the evaluation, the following aspects of the proposed Development shall be taken into consideration:

i. Lot Frontages;
ii. Land use;
iii. Soils;
iv. Groundwater table;
v. Topography; and,
vi. Utility requirements.

In addition to the above, it may be necessary to take into consideration additional factors, including:

i. Long term maintenance demands;
ii. Traffic control;
iii. Pedestrian movements;
iv. Safety;
v. Economics.

It is suggested that prior to preparation of the report, the Developer's Consulting Engineer meet with Township representatives and the Township Engineer to review site characteristics and determine the scope of investigation necessary specific to the development proposal.

Where Design Criteria as herein identified cannot be met for a specific development proposal, the Consulting Engineer shall employ special design considerations related to road and lotting patterns, storm drainage and outlets, grading, erosion and siltation controls, and protection of Environmentally Sensitive areas. All special design considerations will be subject to the Township Engineer's approval;

i) Private Services

Where development is proposed on privately serviced lots, the developer shall retain qualified consultant(s) who specialize in the design of private wells and sewage systems.

The private water supply system (wells) shall be constructed in accordance with the Ontario Water Resources Act, Durham Region Department of Health and applicable Ontario Regulations.

All private waste disposal systems shall be constructed in accordance with the Ontario Environmental Protection Act, Durham Region Department of Health and applicable Ontario Regulations.

2.3 Additional Reports

The following studies may be required at the discretion of the Township:

2.3.1 Traffic and Transportation Impact Study

Prior to permitting any major new development, a Traffic and Transportation Impact Study shall be required. The purpose of the study is to assess the impact of the proposed development on the transportation system and to identify mitigating measures and design solutions. Detailed requirements are outlined in Section 3.16.4.

2.3.2 Environmental Impact Study

The Environmental Impact Study is required where the proposed project may impact upon the natural environment including, but not limited to, wetlands, woodlots, and natural habitats for threatened and/or endangered species. Detailed requirements are outlined in Section 3.16.5.

2.3.3 Environmental Site Assessment

For any lands that are to be dedicated to or purchased by the Township, an Environmental Site Assessment may need to be completed. Detailed requirements are outlined in section 3.16.6.

2.3.4 Archaeological Assessment

An Archaeological Assessment is required if a resource assessment identifies archaeological resource potential on or adjacent to the site. The Archaeological Report shall assess any significant historical features on the site and recommend a mitigation plan if necessary.

2.3.5 Noise and Vibration Analysis Studies

Prior to development approvals being granted for lands in proximity to a highway, regional, arterial or collector roads, railway lines or noise and/or vibration sources, or for uses that generate a significant amount of noise and/or vibration, a noise and vibration analysis shall be carried out by the applicant in consultation with the appropriate municipality, railway and/or provincial authorities and to the satisfaction of the Township. Detailed requirements are outlined in Section 3.16.8.

All proposed plans of subdivision/condominium within 300 metres of a railway corridor may be required to undertake noise studies, to the satisfaction of the Township and MOECC in consultation with the appropriate railway and shall undertake appropriate measures to mitigate any adverse effects from noise that were identified.

All proposed development, with the exception of minor development such as a severance or infilling, within 75 metres of a railway corridor may be required to undertake vibration studies and shall be to

the satisfaction of the Township and MOECC in consultation with the appropriate railway and shall undertake appropriate measures to mitigate any adverse effects from vibration that were identified.

All proposed development adjacent to railways shall ensure appropriate safety measures such as setbacks, berms and security fencing are provided, to the satisfaction of the Township in consultation with the appropriate railway.

2.4 First Engineering Submission

Once the draft plan and supporting documents are acceptable to the Township, the proponent may proceed to make their initial engineering submission.

The initial submission of drawings to the Township shall contain the following information in digital format (pdf) as well as hard copy comprised of the number of copies shown:

Please note the proponent is responsible for confirming submission requirements for the Region of Durham approval.

2.4.1 Engineering Submission

a) Letter of Retainer from the Consulting Engineer stating that they have been engaged for the design and general construction inspection of all works and coordination of sub-consultants according to the terms of the Subdivision Agreement (an example is in Appendix B);

b) Drawings and Documents:

i. Certified Information Checklist
ii. Approved Draft Plan (1);
iii. Proposed plan for registration showing all lot and block numbering and dimensioning (2);
iv. Lot Grading Plan (3);
v. Area Rough Grading Plan (3);
vi. Erosion and Sediment Control Drawings (3);
vii. Storm Drainage Plan (3);
viii. Storm sewer design sheets, computer printouts and detail calculations for pipe strength and bedding (3);
ix. General Plan of Services (3);
x. Sanitary Drainage Plans (3) (For Submission to Region);
xi. Sanitary sewer design sheets and calculations (3) (For Submission to Region);
xii. All plan and profile drawings (3);
xiii. Park Grading Plan (3);

xiv. Detail drawings other than the Township Standard Drawings or OPSD (3);

xv. Subdivision Phasing Plan (if applicable) (3);

xvi. Water supply and distribution report providing calculations to support the design of the distribution works including main sizes, fire flows and anticipated flows and pressures for domestic and other users (2) (for submission to Region);

xvii. Storm Water Management Report (2);

xviii. Storm Water Management Operation & Maintenance Report (2);

xix. Storm Water Management Plans and Details (2);

xx. Geotechnical Report (2);

xxi. Traffic Impact Study (2);

xxii. Illumination calculations (2);

xxiii. Noise and vibration studies (if required);

xxiv. Arborist Report (if required);

xxv. Archaeological Assessment (if required);

xxvi. Preliminary "R" plans showing proposed easements (4);

xxvii. Streetscape or tree planting plans for boulevards (2);

xxviii. Utility Plans

xxix. Supplementary hydrogeologist's reports as required by the Township (2);

xxx. Cash deposits in accordance with Planning Fees By-law No. 1290-94-PL, for the review of engineering drawings and preparation of the Subdivision Agreement and related schedules.

The above information will be reviewed by the Township and one set of drawings and calculations will be returned to the Consulting Engineer with the required revisions noted.

c) A letter from the Consultant, summarizing the contents of the submission and certifying that the design conforms with the Township Engineering Design Criteria;

d) A summary of lot area and frontage for each Lot/Block to be developed to confirm By-law compliance prior to registration and Building Department Administration;

e) Complete information checklists Form A2 (Appendix C).

2.4.2 Municipal Structures Submission

When a new roadway structure is proposed, a specific submission related to the structure is required, which includes the following information.

a) Two copies of the General Arrangement drawing(s), prepared in general accordance with the MTO Structural Manual, including the roadway structure plan, profile, elevation and cross sections;

b) Two copies of the Design Report, which includes but is not limited to the description of the works, how the detail was arrived at, different options and cost analysis/least expensive alternate;

c) Two copies of the Design Criteria Sheet, which includes but is not limited to the type/class of roadway, volume of traffic, geometric information and cost estimate;

d) Two copies of the Geotechnical Report;

e) Two copies of the Hydrology Report;

f) A letter from the Engineer responsible for the design, which certifies that:

   i. The bridge type, length and width are appropriate;

   ii. CHBDC/OHBDC requirements are met;

   iii. Ministry standards have been followed;

   iv. The most economical life cycle cost solution has been selected for the site;

g) The structural design drawings and details included as part of the Subdivision Agreement shall be stamped and signed by the Engineer who designed the roadway structure and by the professional engineer who checked the structural design drawings.

2.4.3 Parks and Landscaping Submission

a) A Letter of Retainer from the Consulting Landscape Architect stating that they have been engaged for the design and complete general construction inspection of all landscape works, plus an outline of the items contained within the submission (see sample in Appendix B);

b) A covering letter from the Consulting Engineer stating that the landscape work is in conformity with the proposed grading and municipal services for the development, plus an outline of the items contained within the submission;

c) Two copies of the following drawings (where applicable):

   i. Existing Natural Features Assessment;

   ii. Tree Survey/Vegetation Analysis and Tree Preservation Plan;

   iii. Streetscape and Buffer Planting Plans;

   iv. Detailed Park Development Plans;

   v. Stormwater Management Pond Planting Plan.

2.5 Subsequent Submissions

Subsequent submissions shall be made, as required, until the drawings and designs are acceptable to the Township. The design of the underground electrical distribution system shall be completed by Hydro One. This design shall be submitted to the Township and shall be approved prior to the final approval of the engineering drawings. The design of the Bell telephone system, Cable TV system and gas mains shall follow the same format as the Hydro One requirements. The design of the

streetlighting system shall be done by a licensed electrical Engineer retained by the Owner.

All utility information is to be shown on a Composite Utility Plan, prepared by the Consultant.

The following submissions shall be compiled and submitted to the Township simultaneously, comprised of the number of copies shown.

A letter from the Consultant, summarizing the contents of the submission and addressing each of the comments from the revised submission.

2.5.1 Second Engineering Submission

a) First Submission Drawings "red lined" by the Township from the First Submission Review;
b) Copies of all other applicable approval agencies comments;
c) Complete sets of all revised drawings, proposed M- and R- Plans (2);
d) Original plus one copy of MOECC application forms, signed by the Developer and the Consulting Engineer (Stormwater – Township, Water and Sanitary – Region);
e) Copies of the Subdivision Agreement Schedules pertaining to Engineering Submission (2);
f) Streetlight design plans (2);
g) Composite Utility Plans (2);
h) In addition to storm sewers, sanitary sewers and water mains, MOECC approval is required for proposed engineered channels, storm water detention ponds and storm water management features. The Township will not sign the MOECC Application until satisfied with the engineering design. It is the Consultant's responsibility to forward the complete application to the MOECC.

2.5.2 Parks and Landscaping Submissions

a) A covering letter from the Consulting Landscape Architect outlining the submission contents;
b) Two sets of revised landscape drawings as per Township comments;
c) One complete set of landscaping cost breakdowns.

2.6 Issued for Construction Submission

After the original drawings have been approved and signed by the Public Works Department and returned to the Consulting Engineer, the following shall be forwarded to the Public Works Department prior to construction commencement.

Please note the proponent is responsible for confirming submission requirements for the Region of Durham approval.

a) Three complete sets of the approved engineering drawings including a fully coordinated Utility Coordination Plan;

b) Two reduced format (Half Scale) sets of the approved engineering drawings;

c) One loose copy each of the General Plan of Service and Storm Drainage Plan;

d) CD/DVD containing high quality scanned electronic files (.PDF) of all Township signed “Issued for Construction” drawings, or CAD generated PDFs with the Township signature information typed in, and “Issued for Construction” indicated within the title block;

e) Two copies of the final revised reports (i.e.: Stormwater Management Report and Operation & Maintenance Manuals), including digital copies;

f) Three prints of the R-Plan proposed for the registration of easements;

g) Deeds for all grants of easement and for all properties to be conveyed to the Township, all property signed and executed by the Owner and Mortgagees, if applicable.

After the Subdivision Agreement has been signed, but prior to commencement of construction of the municipal services, the developer shall provide one complete set of contract documents to the Township.

Please note the proponent is responsible for confirming submission requirements for the Region of Durham approval.

3 Drawing And Report Requirements

3.1 Specifications for Engineering Drawings:

Size:

- Drawings to be Metric Standard A1 (566 mm x 801 mm) or Imp. equivalent.

Format:

- Same as Township standard sheets unless otherwise approved.

Materials for Preliminary Submissions:

- Bond
- Black Ink (permanent)

Materials for Final Submission and "as-constructed" drawings:

- Bond for Final Submission
- Black Ink (permanent)
- Digital copies on CD (pdf & dwg. files)

3.2 General Drawing Requirements

All engineering drawings shall be prepared in metric and in a neat and legible fashion. The design information presented on these drawings shall be completed in ink.

The standard Township title block as shown in the detail drawings shall be used on all engineering drawings. A title sheet is required for the engineering drawings.

All General Plans, Lot Grading Plans, Area Rough Grading Plans, Plan and Profile drawings and Detail Drawings shall be prepared on standard A1 sheets. Storm and Sanitary Drainage Area Plans may be completed on larger sized drawings in order that the entire drainage system being designed may be presented on one sheet.

The lot numbering and block identification on all engineering drawings shall be the same as shown on the Registered Plan for the area.

All elevations shown on the engineering drawings are to be of geodetic origin. Aerial photo interpretation methods for securing existing contours and elevations will not be accepted by the Township for base plan information on engineering drawings. A local benchmark note must appear in

each drawing.

All data shall be referred to the closest geodetic bench mark which shall be noted on the plans. Site bench marks shall be established and described and detailed on plans. The drawings shall incorporate horizontal control grid lines based on the Universal Transvers Mercator (UTM) NAD 83, Zone 17N coordinate system. Any new benchmarks or horizontal control monuments established within limits of the project (by the developer as required in the subdivision agreement or by other means) shall be added to the drawings prior to submission of as-built drawings.

Stamps, tapes and stick-on labels shall not be used except for the Professional Engineer's stamp, which must be signed and dated prior to the final submission. All engineering drawings shall be stamped by a Professional Engineer.

The Township or Region will provide maintenance hole identification numbers by marking up the first submission drawings. Subsequent submissions shall have the Township numbers on all drawings and on the sewer design sheets.

A north arrow and key plan shall be included on all drawings.

Existing information shall be shown light or background line weight. Proposed information shall be shown bold or foreground line weight.

In general east-west streets shall have zero chainage at their westerly limit and north-south streets shall have their zero chainage at their southerly limits. Chainage on a plan-profile shall increase from left to right.

3.3 Computer Aided Drawings (CAD)

Digital software compatible with AutoCAD shall be used to prepare all drawings, in accordance with industry accepted standards and protocols.

3.4 General Plan of Services

A "General Plan of Services" drawing showing aboveground services and appurtenances shall be prepared for all developments at a maximum scale of 1:1000.

When more than one "General Plan of Services" drawing is required for any development then the division of drawings shall reflect the limits of the Registered Plans as closely as possible. Where more than one plan is prepared, a supplementary "General Plan of Services" at a smaller scale shall be prepared to show the entire plan of subdivision on one drawing.

The reference Geodetic Benchmark and the Site Benchmarks to be used for construction shall be identified on the General Plan of Services.

A Key Plan at a scale of 1:10,000 shall be shown on all “General Plan of Services” drawings and the area covered by the drawing shall be clearly identified.

A drawing index shall be shown on all “General Plans of Services” to identify the Plan and Profile Drawing number for each street or easement shown.

All road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as shown on the Registered Plan.

All existing services, utilities and abutting properties are to be shown in light or background weight lines.

All services to be constructed are to be shown on the “General Plan of Services” in solid lines.

Dimensioning of utilities and roadways is not required on the “General Plan of Services”.

All sites for parks, schools, churches, commercial and industrial development must be shown.

If a subdivision encroaches on an existing floodplain, the approved fill line restrictions and setbacks must be shown, as specified by the MNRF and/or LSRCA and KRCA.

General Plans shall indicate, but not be limited to the following:

a) Roadways with curb lines and street names;
b) Water mains and appurtenances, with notes showing sizes;
c) Maintenance holes with numbers (in accordance with Township and Regional identification);
d) Sewers with notes showing sizes, and direction of flow;
e) Signage – school;
f) traffic control;
g) future land use;
h) Barricades;
i) Fencing indicating height and type;
j) Retaining walls;
k) Catchbasins;
l) Community mail boxes with number of units serviced;
m) Hydro vaults, streetlights, sidewalks;
n) Pavement Markings.

3.5 Storm Drainage Plans

Watershed Area

The watershed area shall be determined from contour plans and shall include all areas that naturally drain into the system and any fringe areas not accommodated in adjacent storm drainage systems, as well as other areas which may become tributary by reason of regrading. This information shall be confirmed with the Township Engineer prior to the start of the design of the internal servicing of the site.

External Areas

A plan shall be prepared to a scale of 1:1,000 or 1:2,000 dependent upon the size of the watershed area, to show the nature of the drainage of the lands surrounding the development site and to show all external drainage areas that are contributory to the drainage system for the development. The external drainage areas shall be divided into smaller tributary areas and the area and the location to which the tributary area is considered to drain in the design shall be clearly shown. The plan shall clearly show all existing contours used to justify the limits of the external drainage areas.

In lieu of precise information on development on the whole or any part of a watershed area, the latest Zoning By-law and Official Plan issued by the Township shall be used to determine the correct values of the run-off parameters to be used for all external areas in the design and to determine the specific areas to which these values apply.

This external drainage area shall be prepared and shall be submitted to the Township Engineer at the functional report stage and prior to the commencement of the detailed storm sewer design.

Internal Areas

An internal storm drainage plan shall be prepared to a scale of 1:1,000 and shall include all streets, lots, blocks and other lands within the development. The proposed storm sewer system shall be shown on this plan with all storm structures numbered consecutively from the outlet. These maintenance holes shall be the tributary points in the design and the area contributing to each maintenance hole shall be clearly outlined on this plan. The area, in hectares, of each contributing area (to the nearest hundredth) and the run-off parameter used shall be shown in a circle located within the contributing area. In cases where areas of different run-off parameters may be tributary to the same maintenance hole, the areas and the parameters shall be separately indicated on the plan.

In determining the tributary area to each maintenance hole, the proposed grading of the lots must be considered to maintain consistency in the design.

In the case of large areas under single Ownership or blocks requiring future site plan agreements, the design shall be prepared on the basis of the whole area being contributory to one maintenance hole in

the abutting storm sewer unless more than one private storm connection is necessary to serve the property, in which case the appropriate are tributary to each connection shall be clearly shown and taken into account in the storm sewer design.

The storm drainage plan shall indicate but not be limited to the following:

a) Existing contours;
b) Drainage patterns of adjacent lands;
c) Run-off coefficients and areas (ha) of tributary areas outside the development and for each section of the storm sewers within the development;
d) Direction of run-off;
e) Street names;
f) Storm structure numbers;
g) Sewer sizes, slope and directions of flow;
h) Any catchbasins or swales, on the lots or blocks, required to collect the run-off;
i) Temporary or permanent quantity and quality storm water management facilities;
j) Major and minor overland flow routes;
k) Culverts and other drainage appurtenances.

3.6 Sanitary Drainage Plans

All tributary areas used for the determination of the design flows shall be shown on a plan at the scale of 1:1,000. The plan shall indicate the land use, area and population density or number of units.

Standard sanitary sewer design sheets shall be used to compute the design flow for each leg of sewer. Each sanitary drainage area on the plan shall show an identification number along with population and area.

The plans shall be prepared in accordance with Region of Durham Standards.

3.7 Grading Plans

3.7.1 Area Grading

Drawing size: (594 x 841 mm) A1

Scale: 1:500 for single-family or semi-detached urban areas, 1:200 for multi-family areas and 1:1000 for rural estate areas.

The specified lot grade shall be shown at a location 8 m from the street line. For “split” type drainage patterns, the specified rear of house grade shall be shown. The specified minimum basement floor

elevation for each lot shall also be shown.

The grading plans shall indicate, but not be limited to the following:

a) All lots and blocks within the subdivision, numbered in accordance with the plan proposed for registration;
b) Existing contours at maximum 0.5 m intervals within the subdivision and extended outside the subject lands far enough to determine the existing drainage pattern;
c) Driveway, water service box locations and building envelopes;
d) Elevations at existing trees, structures, watercourses, etc.;
e) Centerline elevations of proposed and existing roads at 20 m intervals;
f) Proposed elevations at front and rear building envelope;
g) Proposed elevations are to be shown for all lot corners and intermediate points of grade change. On large blocks, a proposed elevation is to be shown at 15 m intervals along the frontage of the block and at reasonable intervals along the sides and rear of the block to clearly illustrate the grading of the block in relation to the surrounding lands and house types;
h) Proposed elevations at sideyard highpoints if applicable;
i) Proposed 0.5 m contours for grading within large blocks and parks;
j) Proposed grades for major and minor overland flow routes;
k) Lot fabric of subject lands including lot, block and easement description;
l) Physical structures such as fencing, retaining walls, etc.
m) An arrow indicating the direction of the surface water run-off from all lots;
n) All swales, other than the normal side yard swales, along with percent grade and the invert elevation of the swale at regular intervals;
o) All rear yard catchbasins including the rim elevation of the catchbasin and the invert elevation of the outlet pipe;
p) All terracing required with the intermediate grades specified;
q) All rear lot surfaces shall be constructed to a maximum lot grade of 12% (calculated from the difference in lot elevations between the rear wall of the house and property line - embankments included);
r) The lot grading plan shall make note of the Township Standard Drawings that are applicable to the grading of the development. The Township reserves the right to refuse any house type, which is incompatible with the lot grading design, specified for a lot;
s) A 0.6 m wide strip shall be left undisturbed along the boundary of the subdivision next to adjacent properties unless grading is required to eliminate drainage problems on adjacent properties. Such grading must be stipulated on the approved Lot Grading Plan. Silt Control fencing shall be shown within the undisturbed strip along the boundary of the subdivision;
t) Lot drainage is to be self-contained within the subdivision limits, where possible;

u) Proposed locations for building envelopes and envelopes for private sewage disposal systems;

v) All proposed easements for registration;

w) Heights of proposed retaining walls, fences etc.

Existing elevations are to be shown on adjacent lands approximately 15 metres, or greater if required, from the subdivision limit to enable assessment of the grading between the subdivision and the adjacent areas. The interval of those elevations shall be dependent upon the degree of development of the adjoining lands with the developed areas required the most information. The Lot Grading Plan must provide for drainage problems on adjacent property which can only be solved by permitting drainage through the subdivision.

The lot grading plan shall note all existing slopes that are to be left in an undisturbed state. Temporary fencing shall be required along the top of these slopes to prevent disturbances to the existing vegetation.

3.7.2 Individual Lot Grading

Prior to application for a building permit, individual lot grading plans for each lot shall be approved by the Developer's Consultant prior to submission to the Township Engineer. Three (3) copies of the lot grading plans shall be provided to the Township and display the following information:

a) Lot description including Registered Plan Number;

b) Dimensioned property limits and house outline location with all setbacks shown;

c) House type; normal, side split, back split, etc.;

d) Finished first floor elevation;

e) Finished garage floor elevation;

f) Finished and original grades over septic tile beds;

g) Finished basement floor elevation (all locations);

h) Elevation of underside of footings;

i) Top of foundation wall (all locations);

j) Existing and proposed lot grades for each of the corners of the lot and intermediate points of grade change;

k) Existing trees to be maintained;

l) Driveway locations, widths and proposed grades;

m) Finished road grades adjacent to lot;

n) Location of house entrances;

o) Location of walkways;

p) Arrows indicating the direction of all surface drainage and swales;

q) Location and elevation of swales, along with % grade and inverts at regular intervals;
r) Patios, decks and/or porches;
s) Terraces, retaining walls and tree wells;
t) Location of accessories (propane tanks, a/c unit, generators, hot tubs, pools etc.);
u) Location and dimensions of all easements;
v) All yard catchbasins with rim and invert elevations;
w) Curb cut locations;
x) Hydrants, street lights, Bell and cable TV pedestals, hydro transformers;
y) Location and type of any private sewage disposal system and reserve areas and private wells;
z) Location of neighbouring wells and sewage disposal systems;
aa) Approval from Durham Region Health Department for Private Sewage System;
bb) Location of all road features along frontage and flankage of lots (curb lines, catchbasins, sidewalks, etc.);
cc) Lot grading certificate by Developer's Engineer in accordance with the Subdivision Agreement requirements;
dd) Site benchmark as shown on approved Engineering Drawings;
ee) Proposed driveway culverts with size, type, invert and slope information;
ff) Number of front and rear entry step risers;
gg) Engineered fill level is to be shown where applicable;
hh) Minimum setback from building to Average Annual High Water (AAHW) mark of all water bodies within the Lake Simcoe watershed (where applicable);
ii) Minimum naturalized buffer from the AAHW (where applicable);
jj) Accessory buildings;
kk) Existing contours at maximum 0.5 m intervals within the subdivision and extended outside the subject lands far enough to determine the existing drainage pattern;
ll) Standard Notes.

3.8 Plan and Profile Drawings

Plan and profile drawings are required for all roadways, blocks and easements where services are proposed within the development, for all outfalls beyond the development to the permanent outlet, for all boundary roadways abutting the development and for other areas where utilities are being installed below grade.

Plan and profile drawings are to be drawn to a horizontal scale of 1:500 and a vertical scale of 1:50 and are to include the following:

a) Complete legend;

b) All existing or future services, utilities and abutting properties are to be shown in light or background weight lines;

c) All services to be constructed are to be shown in solid lines;

d) The profile portion of the drawing shall be a vertical projection of the plan portion whenever possible;

e) All road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as on the Registered Plan;

f) All curb and gutter and sidewalks shall be shown and dimensioned on the plan portion of the drawing;

g) Where multiple drawings are required for one street, match lines must be used with no overlap or duplication of information;

h) Where intersecting streets or easements are shown on a plan and profile, only the diameter of the pipe and direction of flow of the intersecting sewers shall be shown;

i) On profile portion of drawings the type of sewer, diameter, length and grade shall be shown;

j) On profile portion of drawings the water main diameter and length, shall be shown;

k) Only the type, direction of flow and diameter of pipe shall be shown in the plan portion;

l) All maintenance holes shall be shown on the plan and on the profile portions of the drawing and be identified by chainage and I.D. number and shall also be referred to the applicable Standard Drawing or to a special detail on the profile portion of the drawing. All invert elevations shall be shown on the profile with each having reference to the north arrow;

m) All sewer maintenance holes which have safety platforms are to be noted;

n) All drop connections are to be noted and referred to the Standard Drawing;

o) All catchbasins and catchbasin connections shall be shown. Catchbasins are to be numbered for easy reference. All rim and invert elevations for rear lot catchbasins are to be shown;

p) All water mains, hydrants, valves, etc. shall be shown, described and dimensioned on the plan portion of the drawing. In addition, the water main shall be plotted to true scale size on the profile portion of the drawing and shall be described;

q) The location of all storm, water and sanitary service connections shall be shown on the plan portion of the drawing using different symbols for each service. These services need only be dimensioned when the location differs from the standard location as shown on the Township Standard Drawings. The connections to all blocks in the development shall be fully described and dimensioned (size, length, grade, invert elevations, materials, class of pipe, bedding, etc.);

r) The centreline of construction with the 20 metre stations noted by a small cross shall be shown on the plan portion of the drawing;

s) The original ground at centreline and the proposed centreline road profile shall be plotted on the profile. The proposed centreline road profile shall be fully described (length, grade, P.I. elevations,

vertical curve data, high point chainages, low point chainages, etc.);

t) Details of the gutter grades around all 90 degree crescents, intersections and culs-de-sac shall be provided on the plan portion of the drawing as a separate detail at a scale of 1:100;

u) Special notes necessary to detail construction procedures or requirements are to be shown;

v) Chainage for the centreline of construction are to be shown on the profile portion of the drawing. The P.I., B.H.C., E.H.C., B.V.C. and E.V.C. chainages are to be noted;

w) The basement elevation of all existing dwellings on streets where sewers are to be constructed shall be noted on the profile;

x) All existing services, utilities and features are to be shown on the plan portion. Those services and utilities below grade that are critical to the new construction shall also be shown in the profile. Test holes may be required to determine actual elevation of these services and utilities;

y) Profiles of roadways shall be produced sufficiently beyond the limits of the proposed roads, to confirm the feasibility of possible future extensions;

z) The location of all luminaire poles shall be clearly shown on the plan portion;

aa) The proposed location and type of all street name and traffic control signs shall be shown on the plan portion;

bb) Proposed locations and types of all trees to be shown on the plan portion;

cc) Where possibility of conflict with other services exist, connections are to be plotted on the profile or a crossings chart included;

dd) The detail information from all borehole logs is to be plotted on the profile drawings and located on the plan;

ee) The proposed pavement structure design shall be noted on the plan portion of the drawing;

ff) All plan and profile drawings are to be prepared so each street can be filed separately. The street names shall be identified on the plan portion of the drawings.

3.9 Composite Utility Plan

The Composite Utility Plan shall be prepared in the same format as “General Plan of Services” and show all the same aboveground information as well as the proposed location of driveways, Bell, Hydro, Gas, Cable TV and community mailboxes. All locations must be established and resolved by the Consulting Engineer in conjunction with the Utility companies and in accordance with the locations shown on the typical cross-section.

3.10 Detail Drawings

The Township Standard Drawings shall be utilized whenever applicable. The use of the latest revision of the Ontario Provincial Standard Drawings may be utilized as specified in this document or when approved by the Township Engineer. These drawings shall be reproduced as part of the engineering

drawings for the development and must be referred to by number on the affected plan and profile drawings. The Consulting Engineer shall be responsible to check the suitability of the details provided on these standard drawings for the application proposed. Individual details shall be provided by the Consulting Engineer for all special features not covered by the Township Standard Drawings. These special details shall be drawn on standard sized sheets and shall be included as part of the engineering drawings. The minimum scale to be used for any special maintenance hole or sewer detail shall be 1:25.

3.11 Parkland Development Drawings

General Requirements

The Developer shall be responsible to prepare a detailed Grading Master Plan for approval by the Township, for all lands to be dedicated for park purposes. This plan shall show all existing trees and features that are in conformity with the end use of the park and that are to remain. All other trees shall be removed by the Developer subject to Township approval. Prior to preparing park development plans, the Developer shall meet with Township staff to review Township recreational needs, i.e. soccer pitches, ball diamonds, etc.

This Master Plan shall be prepared at a scale of 1:500 and form part of the approved Engineering Drawings, indicating the following, at a minimum:

a) Existing contours;
b) Drainage structures and direction of overland drainage;
c) Species and size of existing plant material to remain and be protected;
d) Species and size of plant material to be removed;
e) Proposed underground services, as required;
f) Layout of all proposed recreation facilities;
g) Layout of parking lot and spaces (including handicapped parking);
h) Layout of all trails;
i) Proposed site amenities including benches, bike racks, trash receptacles, signs, washrooms;
j) Perimeter fencing;
k) Park lighting;
l) All surface treatments;
m) All proposed plant materials.

A Park Development Cost Estimate based on estimated quantities with corresponding unit prices is required along with the drawing submission.

3.12 Trails and Walkways

Drawing requirements for trails and walkways will be determined in conjunction with the Township at the time the need is identified.

3.13 Landscaping

3.13.1 General Requirements

All landscape plans shall be drawn and stamped by a Full Member of the Ontario Association of Landscape Architects. All landscape plans shall be drawn at a minimum scale of 1:500.

The landscape documents may include the following drawings:

a) Existing Natural Features Assessment;
b) Tree Survey/Vegetation Analysis;
c) Tree Preservation Plan and Details;
d) Streetscape and Buffer Planting Plans and Details;
e) Detailed Park Development Plans and Details;
f) Trails Master Plans and Details;
g) Landscape Restoration Plans and Details;
h) Stormwater Management Facility Planting Plan.

Detailed Cost Estimates will be required for all approved landscape plans. This estimate will be used for security purposes. All streetscape plans shall be consistent with the Township Engineering Design Criteria and will require Township approval before implementation of the plans.

The Streetscape Plan shall show the following:

a) Existing trees and natural features to remain;
b) Building envelopes, driveways and sidewalks;
c) Walkways, trails and easements;
d) Required fencing including privacy, acoustic and chain link;
e) Proposed plantings;
f) Entry features;
g) Location of street lighting;
h) Location of public utility boxes and easements and hydrants;
i) Heights of existing and proposed retaining walls, fences etc.

Construction details will be required for all landscape elements to be implemented as part of the development.

Any required Landscape Restoration Plans and Stormwater Management Facility Planting Plans will require both the Township's and the Conservation Authority's approval prior to implementation of the plans.

Developers are required to display approved landscape plans at the sales pavilions for the homebuilders in the new subdivision.

3.13.2 Notes for Streetscape Submission Drawings

The following notes pertaining to layout requirements are to be included on all streetscape submission drawings:

NOTE 1

Depicted on this plan are the species and the approximate location of street trees. Once driveways, utilities and light standards have been installed, the exact location of street trees will be staked on site by the Landscape Architect and approved by the Township prior to planting.

NOTE 2

Minimum clearances for Street Trees (when trees are planted 1.5 m from the curb):

a) 2.0 m from water hydrants;
b) 2.0 m from driveways;
c) 2.0 m from neighbourhood mailboxes;
d) 3.0 m from hydro transformers;
e) 5.0 m from streetlight poles;
f) 15.0 m minimum from street line (street intersection as measured from back of curb) and behind the daylight triangle as per the Geometric Design Standards for Ontario Highways;
g) 18.0 m from face of all warning signs.

When the minimum distances noted above are not achievable, street trees may be planted in an alternate location, 0.5 m from the property line (0.8 m behind the sidewalk) and adjacent to any fences. In cul-de-sac locations the street tree may be planted just inside the private property line. If a tree is planted in an alternate location, the minimum clearances above must still be maintained.

NOTE 3

The tree pits and planting beds for all trees and shrubs located within 1 metre of underground utilities are to be hand dug.

NOTE 4

Minimum clearance for fences from fire hydrants is 1.0 m.

NOTE 5

All plant material must conform to the Canadian Standards for Nursery Stock and must be guaranteed for a minimum period of 24 months following acceptance of the work by the Township.

3.13.3 Notes for Naturalization Submission Drawings

The following layout note is to be included on the submission drawings for all areas to be naturalized:

NOTE 1

All plantings and hard landscape features are to be staked out on site and approved by the Landscape Architect and Township prior to installation. Any deviations from the approved landscape plans require prior Township approval.

3.14 Erosion Sediment Control Plan

Drawings

ECSP Drawings shall be comprised of, and include the following:

a) Scale at 1:500 or 1:1000;
b) Location of buildings, existing and proposed, within and adjacent to the property;
c) All natural features within and adjacent to the property (woodlots, watercourses, valley lands etc.);
d) Trees to be preserved;
e) Existing contours at 0.5 m intervals;
f) Proposed interim and final elevations;
g) Areas to be disturbed;
h) Direction of overland flow;
i) Staging of construction and implementation of control measures;
j) Proposed erosion and sediment control measures (silt fence, check dams, sediment basins, interceptor swales, stone mud mats, etc.);
k) Topsoil stockpile locations with estimated quantities, maximum height and side slopes;

l) Detail drawings.

Report

A brief report shall accompany the drawings which, at a minimum, outline staging of construction and implementation of the proposed erosion and sediment control measures, a description of measures to be undertaken, silt basin calculations, features to be protected and an inspection and maintenance program.

The report shall also recommend measures to control dust such as road cleaning, watering, work restrictions on windy days, minimizing disturbed areas and other measures.

3.15 As-Built Drawings

3.15.1 General

The "As-Built" drawings constitute the original engineering drawings that have been amended to incorporate the construction changes and variances in order to provide accurate information on the works as installed in the development.

The Registered Plan Number for the subdivision must be clearly shown on all "As-Built" "General Plan of Services".

3.15.2 "As-Built" Field Survey

The "As-Built" revisions shall be based upon a final survey of all the subdivision services and the consulting Engineer's construction records. The final survey of the subdivision services shall include a field check of the following items:

a) Location and invert elevations of all sewer maintenance holes;
b) Distances between all sewer maintenance holes;
c) Location of all roadway catchbasins;
d) Location, rim and invert elevations for all rear yard and lot catchbasins;
e) Location of all sidewalks and curbs;
f) Location and ties to all valve boxes and valve chambers;
g) Location of all hydrants;
h) Location and ties to all special water main appurtenances (bends, tees, dead ends, etc.);
i) Road centreline elevations every 20 m;
j) Site benchmarks;
k) Location of all service connections to all lots and blocks and location of connection from nearest downstream maintenance hole (i.e. 0 +023);

l) Sewer pipe sizes;

m) Location of all fencing constructed as part of the subdivision services.

3.15.3 Drawing Revisions

The original drawings shall be revised to incorporate all changes and variances found during the field survey and to provide the ties and additional information to readily locate all underground services.

All sewer and road grades are to be recalculated to two decimal places.

All Street line invert elevations of storm and sanitary house connections to each block shall be noted on the drawing.

All street names, lot numbering and block identification shall be checked against the Registered Plan and corrected if required.

The "As-Constructed" revision note shall be placed on all drawings in the revision block. The title sheet of the Engineering Drawings shall be clearly marked with "As-constructed".

The Contract Number, if applicable, shall be added to the drawings.

Tolerances

A maximum vertical plotting tolerance of 0.2 m on the 1:50 vertical profile portion of the drawings and a maximum horizontal plotting tolerance of 1 m on the 1:500 scale drawing shall be considered acceptable without replotting.

All sewer lengths are to be shown to the nearest 0.5 m.

The information shown on the "As-Built" drawings may be checked by the Township at any time up to two years after final acceptance of the subdivision and if discrepancies are found between the information shown on the drawings and the field conditions, then the drawings will be returned to the Consultant for rechecking and further revision.

The consultant shall be required to explain in writing any major difference between the design and the "As-Built" data and to provide verification that alteration does not adversely affect the design of the subdivision services.

Submissions

Upon completion of all construction work and the "As-Built" revisions, the original drawings shall be submitted to the Township for their permanent records.

The submission of the "As-Built" drawings to the Township must be completed before "Final

Acceptance" of the subdivision will be given.

The Consulting Engineer shall provide a written declaration to the Township stating that all subdivision works have been constructed in accordance with the terms of the Subdivision Agreement, approved Engineering Drawings and the Township's Design Criteria, prior to "Final Acceptance".

Drawings supplied in a digital format shall conform to the most recent requirements and AutoCAD standards of the Township.

3.15.4 Storm Sewers

All actual storm system invert elevations shall be indicated on the "as-built" drawings. If the difference is greater than 150 mm from the design vertical alignment, affected portions of the sewer or overland drainage route shall be redrawn in profile. Any maintenance hole which differs from the proposed horizontal location by more than 1.50 m shall be redrawn in both plan and profile.

In addition the following shall be indicated on the "as-constructed" drawings:

a) Pipe/culvert size, grade, type, class;
b) Chainage from MH along main to service tees.

NOTE: If as-built grade of sewer differs by more than 1.0% of the design grade, the Consultant shall submit revised hydraulic calculations.

3.15.5 Sanitary Sewers

In accordance with Region of Durham requirements.

3.15.6 Water Mains

In accordance with Region of Durham requirements.

3.15.7 Roadways

All actual roadway centre line elevations, at a maximum 20 m interval, shall be indicated on the "as-built" drawings. Gutter elevations shall be indicated for cul-de-sacs and intersections to show drainage into storm system. If horizontal road alignment changes more than 1.5 m or vertical geometry changes greater than 150 mm the plan and/or profile shall be redrawn as appropriate.

In addition the following shall be indicated on the "as-built" drawings:

a) Driveways, lay-bys, curb depressions;
b) Road signage;

c) Lane marking and stop bar locations.

3.16 General Report and Study Requirements

It should be noted the following is the minimum realignment. The reports may need to include additional detail to address site specific conditions.

3.16.1 Geotechnical Reports

In new developments, the Owner shall engage a Geotechnical Engineering Consultant to prepare a report on the existing soil conditions which is to include:

a) The identification, description and limits of the existing soil regimes, including the extent of topsoil and its suitability for reuse;

b) The suitability of native materials for trench backfill;

c) The conditions under which the native material may be used as trench backfill;

d) The procedures to be used for high moisture contents and water table levels, which may affect the proposed servicing or structural works of the concerned area and surrounding lands;

e) The extent of native material which is unsuitable for trench backfill and the procedure for dealing with it such that it will not affect the structural stability of the proposed municipal services;

f) Areas and procedures to be followed where blasting may be required with due consideration to surrounding structures and services;

g) The road material depths for pavement design;

h) Any special recommendation for bedding materials;

i) Potential corrosive or chemical problems that may affect services or structures (e.g. high sulphates) and the method of resolving such problems;

j) Recommendations in dealing with filling conditions within the road allowances, on building lands, in the construction of berms etc.;

k) Identification of problem areas and recommendations for mitigating procedures regarding the stability of existing slopes and the extent of unstable soils or conditions;

l) Any special recommendations to be followed in the design and construction of building foundations including recommended foundation elevations in relation to the groundwater elevation;

m) The engineering properties of the native material including frost susceptibility, natural moisture content, compaction characteristics, relative density and structural integrity;

n) Recommendations for achieving proper compaction;

o) Recommendations for dealing with deep excavation of trenches, requirements for method of dewatering including rate of dewatering and need for permits;

p) Recommendations for dealing with septic or well systems that may be affected by the proposed building and servicing works;

q) Confirmation that sufficient boreholes have been taken to establish definite requirements and recommendations for the servicing and building works. General Soils Report must identify minimum bearing capacity of the native soil (i.e. 75 kPa) preferably on a hole-by-hole basis. Boreholes located in the area of proposed underground municipal services are to be taken to a depth of at least one (1) meter below the deepest trench.

Requirements and recommendations contained within this report along with borehole logs and grain size analysis of the native soils are to be incorporated by the engineering consultant into his first submission to the Township Engineer. Any such requirements and recommendations that are not so incorporated are to be drawn to the Township's attention with specific reasons.

During construction, the Owner is to retain a geotechnical consultant to supervise the installation of bedding and the backfilling of all trenches within road allowances and easements. A trench backfill certification is required to indicate that sufficient tests have been carried out to obtain a representative report as to the compaction of the backfill and they find the backfill to be in compliance with Township specifications and requirements.

A final subgrade certification is to confirm that the final subgrade conditions are equal to or better than those anticipated in the preparation of the pavement design. If these conditions are less than what was anticipated, the Owner and the Township are to be immediately advised with a new pavement design recommendation.

Where grading operations require the placement of "engineered fill" the Geotechnical Engineer must certify that the fill located at 1.0 m below finished grade and deeper has been sufficiently compacted to assure a minimum bearing capacity of 75 kPa and a 98% Standard Proctor Density.

3.16.2 Hydrogeological Reports

Hydrogeological studies for proposed projects shall be completed to characterize the groundwater regime from a site specific and regional perspective in order to address the following:

a) Impacts to existing well water supplies within the project area;

b) Soil permeabilities and associated properties where the design of septic systems are concerned;

c) Groundwater impact assessment to area aquifers from construction activities and/or discharge of waste or wastewater;

d) Test wells and associated testing in accordance with MOECC D-5-5 guidelines to address water taking impact sustainability;

e) Impacts to nearby surface water bodies;

f) Specific technical review of well field or wellhead capture zones;

g) Mitigative measures to protect against any quantitative and qualitative impacts from the development;

h) Recommendations regarding foundation drainage (suitability of groundwater recharge vs connection to storm sewers (4.2.4.6).

For general road and servicing construction, the report should consider depth of services and identify likely areas where dewatering will be required, the rate of dewatering, requirements for dewatering, permits, and the strategy to achieve the required groundwater levels.

Hydrogeological studies for proposed projects must be conducted by a qualified Professional Engineer and/or Geoscientist.

3.16.3 Stormwater Management Plans

Where a Stormwater Management Plan is required; the study should assess the impacts of development on receiving water, both before and after construction, with respect to flooding, pollution, erosion and sedimentation.

At a minimum, the following details must be included in the report:

a) Background Information;
b) Stormwater Management Targets and Objectives;
c) Design Criteria refer to 4.2.3;
d) Existing Drainage Conditions
e) Pre-Development Drainage Plan
f) Proposed Drainage Conditions
g) Post-Development Drainage Plan;
h) Design of SWM Controls;
i) Erosion and Sediment Control;
j) Calculations, Tables, Figures, Modeling, and Drawings; and
k) Operations and Maintenance Manual.

A detailed operations and maintenance manual will be required as part of the design of each facility, including inspection checklists, maintenance descriptions and projected frequency, as well as recommendations for facility cleanup. The manual should be completed in accordance with the MOECC Stormwater Management Planning and Design Manual.

Stormwater Management Plans for proposed projects must be prepared by a qualified Professional Engineer.

3.16.4 Traffic & Transportation Impact Study

Where a Traffic and Transportation Impact Study is required, such a study shall address the following considerations where applicable:

a) Transportation capacity assessment and intersection capacity analysis;
b) Site trip generation, distribution, travel mode selection and assignment of the transportation network;
c) Access management, including site access location, design and implications for off-site improvements;
d) Site access evaluation and optimization including traffic operations and safety assessments;
e) Pedestrian and cycling access;
f) Traffic control devices, including signal warrants and vehicular/pedestrian signage;
g) Speed management;
h) Parking demand and layout;
i) Roadway and intersection illumination;
j) Commercial vehicle movement; and,
k) Consideration for transit.

Traffic and Transportation Impact Studies for proposed projects must be prepared by a qualified Professional Engineer.

3.16.5 Environmental Impact Assessment Study

Where the preparation of an Environmental Impact Assessment is required, the report shall be prepared in accordance with an agreed upon Terms of Reference and to the satisfaction of the Township and/or the Region of Durham, in consultation with the respective Conservation Authority. The scope of the required Environmental Impact Assessment should be determined through discussions with the appropriate Conservation Authority prior to its commencement. The Township may determine that a peer review should be conducted of the submitted Assessment. The Township shall select and retain a qualified environmental consultant, at the expense of the proponent, to conduct the peer review.

All Environmental Impact Assessments shall be prepared by experts qualified in the fields of ecology, biology, hydrology, hydrogeology and/or environmental planning and shall be prepared in accordance with a work plan that has been approved by the Township in consultation with the relevant agencies. The work plan shall identify the boundaries of the area to be studied and may include lands beyond the limit of the lands proposed for development. The objective of the assessment is to identify and asses the potential impacts of a specific development proposal on the natural features and functions and

linkages of the potentially affected areas and to ensure that the proposal complies with the policies and intent of this Plan.

The Environmental Impact Assessment shall generally include, but is not necessarily limited to, the following:

a) a detailed evaluation of the site including the key natural heritage or hydrologic features, functions and the linkages between features;
b) a characterization of the existing adjacent natural heritage features and functions;
c) a detailed description of the proposed development of land use activity;
d) an assessment of the expected direct, indirect and cumulative impact of development on the functions, attributes and linkages for which the area was identified;
e) an evaluation of the extent that development can be accommodated within or adjacent to the natural heritage feature without negative impact to the natural heritage feature;
f) recommendations to avoid or mitigate impacts and identification of opportunities for restoration and/or enhancement;
g) establishing specific boundaries and buffers to protect the natural heritage features;
h) a strategy for implementing the recommended mitigation measures; and,
i) an evaluation of the need for a construction and post-construction monitoring plan to measure the potential effect on the natural heritage feature(s).

3.16.6 Environmental Site Assessment

If required, a Phase I ESA shall be undertaken by a "qualified person" as defined in O. Reg. 153/04 (or the latest revision thereof) and a report shall be completed in accordance with the requirements set out in the same regulation as well as the guidelines published by the Canadian Standards Association (CSA). The report shall include, but not be limited to:

a) Confirmation of Insurance coverage;
b) Certification that the person undertaking the assessment and completing the report is a "qualified person";
c) The "qualified person's" opinion as to whether a Phase II ESA is warranted based on the findings of the Phase I ESA;
d) If the "qualified person's" opinion is that a Phase II ESA is not required, the report shall expressly include a statement that "in his/her opinion and based on the findings of the Phase I ESA, a Phase II ESA is not necessary"; and
e) Confirmation that the report may be relied upon by the Township in making the decision to accept ownership of the property.

3.16.7 Archaeological Assessment

The study shall follow the Ontario Ministry of Tourism and Culture guidelines for determining the archaeological potential of the area impacted by construction. As a minimum, the report shall follow the requirements of a Phase 1 Archaeological survey and proceed with Phase 2 and 3, if necessary. The Archaeological Report shall also consider "Built Heritage" and provide an inventory of any historically or culturally significant structures within the affected area. The Area Historical Society shall be contacted during the preparation of the report and the report shall include any comments they may have on the affected area.

Archaeological assessments shall be completed by a licensed Archaeological Consultant.

3.16.8 Noise and Vibration Study

The study should include but is not limited to the following:

a) Details of assessment criteria;
b) Methods and assessment locations;
c) Identification and analysis of the impact of noise & vibration from the proposed development on surrounding properties;
d) Identification and analysis of the impact of noise & vibration from surrounding sources on the proposed development;
e) Identification and analysis of the impact of noise & vibration generated within the proposed development on itself;
f) Recommendations for noise mitigation and any adjustments to the site plan and design as necessary to comply with relevant regulations and standards including the need for Environmental Compliance Approval with the MOECC.

Noise & Vibration studies for proposed projects must be conducted by a qualified Professional Engineer and/or accredited Acoustics expert.

4 Servicing Design Requirements

4.1 Introduction

The purpose of this section is to outline the minimum design requirements for the construction of municipal services in the Township. These requirements are intended to provide guidance to the designer and do not relieve the Owner and its Consultant of the responsibility for submitting a completed product demonstrating competent engineering design in full compliance with all applicable legislation.

Any deviation from the minimum Township standards shall be specifically referred to by the applicant and/or his agent with a copy of written approval of the Township attached.

4.2 Storm Drainage System

4.2.1 General Requirements

To assist in the attainment of proper drainage, the Township has set the following objectives for drainage management within its boundaries:

a) Prevent loss of life and minimize property damage and health hazards;
b) Prevent inconvenience from surface ponding and flooding;
c) Prevent adverse impacts on the local groundwater systems and base flows in receiving watercourses;
d) Prevent downstream flooding and erosion;
e) Prevent pollution discharges to watercourses;
f) Prevent soil losses and sediments to sewer systems and waterbodies from construction activity;
g) Prevent impairment of aquatic life and habitat;
h) Promote orderly development in a cost-effective manner.

4.2.2 Planning

The Township Official Plan designates those lands adjacent to existing watercourses and related valleys within an Open Space land use classification. In some cases, where there is risk to life and/or property, Open Space lands are designated as Hazard Lands. Open Space and Hazard land areas may be left in a natural state or developed for active/passive recreational activities (e.g. walkway, trails, etc.).

Where lands to be developed are adjacent such areas, the Township may require, as a condition of approval, that:

a) Valleys or watercourses be dedicated to the appropriate public authority, as determined by the municipality, as a condition of draft plan approval;

b) A conservation buffer strip, the width of which may vary, from the stable top of the valley bank be respected. As noted above, the Township, as a condition of approval, may require it to be dedicated to the appropriate public authority, as determined by the municipality. Please note these lands may not be considered part of the parkland dedication requirements set forth in the Planning Act. In the event such a strip of land remains in private ownership the Township will protect same through agreements and zoning provisions.

Stormwater management facilities are not acceptable as part of the parkland dedication requirements and Hazard lands may not be acceptable as part of the parkland dedication requirements.

The Township discourages watercourse diversions, alterations, piping and channelization except where these are needed for flood and/or erosion control. Permits for such work shall be obtained under existing legislation from the Township of Brock, and the Ministry of Natural Resources and the local Conservation Authority.

4.2.3 Storm Water Management

The storm water management requirements generally must reflect distinct solutions and vary depending upon the watershed, and in some cases the storm sewer shed, that the site is located in. Site-specific requirements can be obtained from the Township. A storm water management report will be required for all development applications.

Site specific storm water management reports shall be consistent with existing Watershed Planning Studies and Master Drainage Plans prepared in support of the Official Plan and / or Secondary Plan areas.

In general, stormwater management and drainage designs shall be in accordance with the MOECC Stormwater Management. Planning & Design Manual – March 2003 or latest version and MTO Drainage Design Standards – January 2008 or latest version.

Where applicable, storm water management designs must also be in accordance with LSRCA or KRCA requirements, Lake Simcoe Protection Plan and DFO policies and all approvals must be obtained accordingly.

In general, storm water management reports shall address the following:

a) Storm water quantity;
b) Storm water quality;
c) Sediment and erosion control;
d) Baseflow maintenance.

Stormwater management work that is established to serve new major development shall not be permitted unless the works have been designed to satisfy the Enhanced Protection level specified in Chapter 3 of the MOECC's "Stormwater Management Planning and Design Manual 2003" as amended from time to time. This policy does not apply if the works are intended to serve an infill development or a redevelopment within a settlement area if it is demonstrated the works incorporate the most effective measures in the circumstances to control the quality and quantity of stormwater related to the development or redevelopment.

Quantity Control

The Township implements a Major and Minor system approach to storm water conveyance and control, comprised as follows:

Minor (convenience) System - 5 yr return period - surface swales, roadside ditches, curb and gutters, catchbasins and storm sewers.

Major (overland) System -100 yr return period - streams, valleys, man-made channels, roadways, roadside ditches and ponds.

Since development almost invariably increases run-off from any storm due to the increase in impervious surfaces, it will usually be necessary to compensate by exercising control on the quantity of urban run-off. The only exception will be when it can be proven the increased run-off will not do any harm. The Township takes a flexible approach to encourage ingenuity and the development of superior communities. At the same time, the Township endorses the "Blue-Green Concept" whereby the open spaces provided by Hazard Lands, major systems and valleys are integrated into a continuous green belt for the beneficial use of both the public and water transport.

Post-to-pre quantity control shall be provided unless otherwise directed by the Township or Conservation Authority, or unless otherwise indicated in an approved master drainage plan or watershed plan. Under certain circumstances where the proposed development is located in close proximity to Lake Simcoe and where there are no downstream land owners, the post-to-pre peak flow control requirements may be waived subject to approval by the Township and Conservation Authority.

In general, quantity control measures are to be designed in accordance with the MOECC Stormwater Management Planning and Design Manual – March 2003 or latest version.

Wet ponds are the preferred method for stormwater quality and quantity control.

In addition to introducing pond storage into a storm water management system, increased flows resulting from increased impervious areas may be mitigated by utilizing measures such as: discharging rainwater leaders onto grassed areas, providing temporary rooftop and parking lot storage, or using grassed swales rather than piped flow. Specific requirements for parking lot and/or rooftop storage are outlined in Section 6.4.3 – Stormwater Management.

The use of rainwater harvesting (e.g. rain barrels, cisterns, etc.) where the roof leaders are allowed to be disconnected shall be encouraged wherever feasible to not only reduce stormwater runoff but to conserve the potable water supply as the captured rain water can be used for irrigation purposes.

Underground storage tanks and 'superpipe' systems of storm water storage are discouraged as part of the municipal system due to inherent long term, high replacement and maintenance costs and will only be considered in exceptional cases.

Joint use facilities i.e. detention ponds over recreational playing fields and passive parks, will be considered on an individual basis subject to suitably designed control measures and the intended park use.

As a guideline to be used until Master Drainage Plans are prepared for each watershed, the degree of control on the quantity of run-off from a proposed development shall be as follows:

- The post-development peak flow shall not be greater than the corresponding pre-development peak flow for the 1:5 year, 1:10 year, 1:25 year and 1:100 year storms. Other regulatory agencies may require other storm flows to be analyzed (i.e. 2 year and/or Regional flows).

Other factors, such as snowmelt run-off with large volume and longer duration and potential adverse downstream effects due to uncoordinated timing of peak flows must be considered when designing storm water management facilities.

Note that for specific sites with downstream constraints, more stringent requirements may be established by the Director of Public Works.

Runoff Quantity

Rural Catchments – shall be modelled with OTTHYMO using the SCS 24 hr design storm to generate peak flow value.

Urban Catchments – shall be modelled with OTTHYMO using the Chicago 4 hr design storm.

In general, the SCS design storms should be used for determining the hydrographs for undeveloped watersheds and for checking detention storages required for quantity control. The Chicago design storms should be used for determining hydrographs in urban areas and also for checking detention storage. In many cases, the consultant will be required to run both sets of design storms to make sure that the more stringent is used for each individual element of the drainage system (pipe flow, street flow, channel flow, detention storage).

The time step for discretization of the design storm can vary according to the size of the sub-watershed, but must not exceed the estimated time of concentration. The maximum rainfall intensity should be compatible with that of real storms on record.

All parameter assumptions used in the OTTHYMO input shall be clearly identified in the storm water management report.

Quality Control

In general, water quality controls are to be designed in accordance with the MOECC Stormwater Management Planning and Design Manual – March 2003, or latest version, and the LSRCA Technical Guidelines for Stormwater Management – April 2013 or latest.

Prior to initiating design, the Consultant shall contact the Township Engineer for acceptability of specific measures in consideration of long term maintenance and effectiveness.

As per Ontario Regulation 219/09 regarding water quality and phosphorus loading to Lake Simcoe, all new SWM facilities shall provide as a minimum the Enhanced level of protection as specified in the Stormwater Management Planning and Design Manual (MOECC, 2003). Ontario Regulation 219/09 may not apply to infill developments and the redevelopment of one or more properties if the applicant can demonstrate to the satisfaction of the Director (MOECC) that it is impractical to achieve the Enhanced level of protection. In addition, it shall be demonstrated that through an evaluation of anticipated changes in phosphorus loadings between pre-development and post-development conditions how the phosphorus loadings shall be minimized.

Specific pond design requirements which are particular to the Township are as follows:

Pond Requirements

The design of stormwater management ponds shall be completed with consideration of the following aesthetic and landscape design criteria:

a) Stormwater management dry ponds shall be designed to limit the maximum depth of water to 1.8 m above the lowest point of the stormwater basin. An additional 0.3 m freeboard is required above the maximum flood level. The maximum depth of the extended detention zone shall not exceed 1.0 m above the lowest point of the pond;
b) Maximum side slope will be 5:1 from the bottom of the dry pond to the limit of maximum extended detention, with a minimum horizontal length of 3.0 m. The minimum allowable gradient on the bottom of the basin shall be 1.0% and the maximum gradient shall be 5%;
c) Stormwater management wetlands shall be designed to limit the maximum depth of water to 2.1 m above the lowest point of the stormwater basin excluding micropools. An additional 0.3 m freeboard is required above the maximum flood level. The maximum depth of the extended detention zone shall not exceed 1.0 m above the permanent pool elevation. Maximum peak flow attenuation zone shall not exceed 1.8 m above the permanent pool elevation. The permanent pool depth shall range between a minimum depth of 0.15 m to a maximum depth of 0.45 m;

d) A maximum 5:1 slope below the permanent pool level shall be permitted around the entire stormwater management wetland. A maximum 5:1 slope above the permanent pool level shall be permitted around the entire stormwater management wetland. The slope shall extend from the permanent pool level, to the limit of maximum extended detention. The horizontal distance of this slope must be a minimum of 3.0 m;

e) Stormwater management wet ponds shall be designed to limit the maximum depth of water to 3.3 m above the lowest point of the stormwater basin. An additional 0.3 m freeboard is required above the maximum flood level. The maximum depth of the extended detention zone shall not exceed 1.0 m above the permanent pool elevation. The permanent pool depth shall range between a minimum depth of 1.0 m to a maximum depth of 1.5 m;

f) A maximum 5:1 slope below the permanent pool level shall be permitted around the entire stormwater management wet pond. The horizontal distance of this slope must be a minimum of 3.0 m. A slope commencing from this point to the lowest point of the stormwater basin shall be a maximum of 3:1. A maximum 5:1 slope above the permanent pool level shall be permitted around the entire stormwater management wet pond. The slope shall extend from the permanent pool level to the limit of maximum extended detention. The horizontal discharge of this slope shall be a minimum of 3.0 m;

g) Fencing of stormwater management facilities shall be minimized. Where stormwater management facilities to be owned by the Township abut private property, fencing may be required at the discretion of the Township. At a minimum, demarcation of property boundaries is required. Fencing and/or property demarcation shall be to Township standards;

h) In situations where existing natural areas are proposed to be used for stormwater management, exemptions to the depth and slope criteria may be provided to minimize disturbance to the natural feature, at the discretion of the Township;

i) Designed pedestrian access areas shall not exceed a maximum slope of 12:1;

j) Inlet Structure - All efforts will be made to ensure storm sewer inlets into the facility are to be designed such that the invert is at or above the normal water level (permanent pool elevation). The Township will only consider submerged inlets when no other reasonable option is available.

k) Outlet Structures – bottom draw outlet structures shall be used in all instances and shall be located a minimum of 1.0 m off the facility bottom;

l) Pond liner – a geotechnical investigation for the facility shall be completed detailing the need for liners and/or construction related methodologies in the event groundwater is encountered;

m) Top of berm – perimeter berms shall have a minimum of 3.0 top width where trail or maintenance access is not located on the berm. Anything narrower shall be substantiated by a Soils Consultant;

n) Overflow spillway – shall be incorporated to provide relief to the system in the event of a severe storm event or blockage of the drainage system. The 100 year storm flows or maximum facility design storm flows, shall be used in the overflow design assuming the facility is full and all outlets from the facility are 100% blocked. A 0.15 m freeboard to the top of slope around the perimeter of

the facility from the emergency water level elevation shall be maintained. The invert of the spillway shall be at or above the 100 year or highest design water level within the facility;

o) Warning signage – warning signage is to be installed near pedestrian traffic routes or walkways located adjacent to or within the stormwater management block. The number of signs to be provided will be determined by the Township on a site by site basis;

p) Notwithstanding the above slope and depth criteria, in the case of headwall design, the depth of water related to adjoining side slopes may vary and fencing is required for safety purposes;

q) Areas subject to the collection of contaminants or spills shall be fitted with adequate oil/grit separators;

r) Maintenance access requirements are to be determined on a site-by-site basis, however, the following general criteria are recommended: Controlled maintenance access routes shall be provided to both inlet and outlet structures and forebays. A minimum 3.0 m wide surface to accommodate maintenance vehicles within a minimum 10 m turning radius (inside radius) and a flat 10 m loading areas is required. Maintenance access routes shall not exceed a maximum slope of 10:1. The design of maintenance routes and loading areas shall be to the approval of the Public Works Department;

s) Sediment drying area may be required adjacent to the forebay area to facilitate dewatering of sediment prior to removal to an approved disposal location;

t) Maintenance by-pass shall be provided via a maintenance hole upstream of the entry to the pond to divert all flow from the pond during maintenance and sediment removal procedures;

u) Where a detention or retention pond or water quality pond is proposed, the outlet structures must be designed as much for ease of operation as for hydraulic efficiency. All operational outlet structures shall be of the free-flow ungated type; under no circumstances will gate or valve or stoplog structures be acceptable except that a valve will be permitted in the emergency drain for a retention pond. The inlets and outlets must be protected to prevent child and major debris access. The area at the downstream end must be protected against erosion by channel lining and/or an energy dissipator;

v) While such ponds will normally be designed not to be overtopped, the dam creating the pond must be designed to safely pass the flows resulting from the Regional Storm.

Water Quality Treatment Units

Where a stormwater management pond is not practical, consideration will be given to the use of oil/grit separators or stormwater quality treatment units. The units must be designed to provide 80% TSS removal for 90% of the annual runoff volume for the site using a fine particle size distribution. Oil/grit separators and other stormwater quality treatment units should be used in conjunction with additional quality control measures to provide a treatment train approach. Supporting calculations and anticipated maintenance requirements shall be provided to the Town along with certification of the design by a Professional Engineer. Additional documentation may be required on a case-by-case basis.

4.2.4 Storm Sewer Design

General

Storm sewers, designed and constructed in accordance with the most recent requirements and specifications of the Township, shall be of adequate size and depth to provide service for the development of lands within the upstream watershed and/or for the drainage of any areas designated by the Township. Storm drainage shall be directed to an outlet considered adequate in the opinion of the Township and applicable agencies.

Channel works, bridges, culverts and all other drainage structures or works shall be designed, approved and constructed in accordance with the most recent drawings and specifications of all applicable agencies having jurisdiction, such as the Township, MOECC, LSRCA, KRCA, MTO, MNR, DFO, Region of Durham, etc.

4.2.4.1 Hydrology and Design Flows

Storm sewers shall be designed to drain all lands based on the Rational Method. The Rational Method calculations must be checked using a model approved by the Township Engineer where the drainage area is greater than 10 hectares. The larger of the flows is to be used in the design of the sewer system unless approved otherwise.

Q = 0.0028 C I A where: Q = Flow in cubic metres per second
A = Area in Hectares
C = Run-off coefficient
I = Intensity in mm/hr

Storm sewers shall generally be designed to accommodate 1:5 year storm flows.

Consideration will be given to using a 1:10 year storm for high value commercial development and for downtown business areas. In such cases, the Township may require some internal control in the form of temporary ponding parking areas furthest away from the building or underground storage. The Township may require the Developer to provide a maintenance hole located at the street line to control discharges into the storm sewer system.

Intensity of Rainfall

The intensity of rainfall is to be determined from the Intensity-Duration-Frequency values from the MTO IDF curve lookup tool.

Where $I = A \times t^B$ and I is in mm/hr, t is time of concentration in minutes; A and B are as follows:

Storm Return Period	A	B
2 year	20.6	-0.695
5 year	27.7	-0.693
10 year	32.3	-0.693
25 year	38.2	-0.693
50 year	42.5	-0.693
100 year	46.8	-0.693

Time of Concentration

The minimum initial time of concentration is to be 10 minutes.

Pre-Development Areas:

To calculate the initial time of concentration (tc) for upstream, undeveloped lands, the following formulas may be used: Bransby-Williams, Airport Method etc. The most appropriate method will be determined at the discretion of the Township.

Run-off Coefficient

The following is a list of run-off coefficients typically used to design storm sewers using the Rational Method:

Parks over 4 hectares	0.20
Parks 4 hectares and under	0.25
Single-family Residential (Urban)	0.45
Single-family Residential (Suburban)	0.40
Semi-detached Residential	0.60
Townhouses, Maisonettes, Row Houses, etc.	0.70
Apartments	0.75
Schools and Churches	0.75
Industrial (rural)	0.75
Industrial (urban)	0.90
Commercial	0.90
Heavily Developed Areas	0.90
Paved Areas	0.95

The Engineer shall use run-off coefficients as deemed appropriate based on a site-by-site basis. Calculations in support composite run-off coefficients may be requested by the Township.

A minimum run-off coefficient of 0.55 is to be used for undeveloped upstream area where future residential development is expected and 0.75 where future industrial, high-density residential or commercial development is expected.

For return period of more than 10 years, increase values as follows:

25 years	+10%
50 year	+20%
100 year	+25%

Drainage Area

Drainage systems must be designed to accommodate all upstream drainage areas considering interim and ultimate conditions.

It should be noted agricultural field tiles exist in many areas of the Township. The existence of tiles on or near land to be developed must be determined and if present the proposed drainage system must be designed to accommodate or relocate the tiles to ensure the original function is maintained.

4.2.4.2 Pipe Sizing and Specifications

Pipe Capacities

Manning's formula shall be used in determining the capacity of all storm sewers. The capacity of the sewer shall be determined on the basis of the pipe flowing full.

The value of the roughness coefficient 'n' used in the Manning's formula shall be as follows:

a)	Concrete pipe	0.013
b)	Concrete box culverts	0.013
c)	Corrugated metal 68 x 13 mm corrugations	0.024
d)	PVC pipe	0.013
e)	HDPE smooth wall ribbed pipe	0.013

Flow Velocities (Flowing full)

For circular pipes the minimum acceptable velocity is 0.75 m/s and the maximum acceptable velocity is 4.5 m/s.

Minimum Sizes

The minimum size for an on-street storm sewer shall be 300 mm.

Minimum Grades

Regardless of flow velocities obtained, the minimum design grades for pipe storm sewers shall be as follows:

Sewer Size	Concrete Pipe
up to 375 mm	0.40%
450 mm to 525 mm	0.30%
600 mm to 1,200 mm	0.20%
1,200 mm and over	0.15%

Depth of Storm Sewers

The depth of a deep storm sewer shall be sufficient to provide a suitable outlet for the building foundation weeping tiles. The minimum cover to the top outside pipe barrel of a deep storm sewer shall generally be 2.5 to 3.0 metres depending on the storm service connection requirements. The minimum cover to the top outside pipe barrel of a shallow storm sewer system shall not be less than 1.5 metres from the centreline of the roadway unless alternate measures are implemented as approved by the Township Engineer.

Location

The storm sewers shall be located as shown on the standard Township road cross-section drawings. This standard location shall be generally 1.5 m off the centreline of the road allowance. In the case of crescents, looped and curvilinear streets, this standard location may be varied to the extent that the storm sewer remains on the same side of the centreline of the street (i.e., north or east) to avoid crossing the sanitary sewer trenches at the changes in direction of the street.

Pipe Crossings

A minimum clearance of 0.20 m shall be provided between the outside of all, pipe barrels at all points of crossing. In cases where the storm sewer crosses a recent utility trench at an elevation higher than the elevation of the utility, a support system shall be designed in accordance with the Region of Durham Standard Drawing S-200.030, or alternatively the original trench will be re-excavated to the top of the utility and shall be backfilled with non-shrinkable fill (low strength concrete) to adequately support the storm sewer. When the storm sewer passes under an existing utility, adequate support shall be provided for the utility during and after construction to prevent damage to that utility.

Radius Pipes

Radius pipe shall be allowed for storm sewers 975 mm in diameter and larger provided that a maintenance hole is located at the beginning or at the end of the radial section. The minimum centre

line radius allowable shall be in accordance with the minimum radii table as provided by the manufacturers.

Limits of Construction

Sewers shall be terminated with a maintenance hole at the subdivision limits when external drainage areas are considered in the design. The design of the terminal maintenance holes must allow for the future extension of the sewer.

When external areas are not included in the sewer design, the sewer shall extend at least half way across the frontage and/or flankage of any lot or block in the subdivision.

Sewer Alignment

Storm sewers shall be laid in a straight line between maintenance holes unless radius pipe has been designed. Joint burial (common trenching) with sanitary sewers will be considered when supported by the recommendations of a soils report prepared by a qualified Geotechnical Engineering Consultant.

Changes in Pipe Size

No decrease of pipe size from a larger size upstream to a smaller size downstream will be allowed regardless of the increase in grade or reduction of material roughness.

Pipe Material Classification and Bedding

All storm sewer mains shall generally be constructed of reinforced concrete with suitable strength class recommended by the Consultant. Smooth wall ribbed PVC or HDPE pipe may be used for mains up to 900 mm diameter. Storm sewer leads from catchbasins shall be constructed with concrete pipe or PVC pipe or HDPE pipe.

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. For rigid pipe, Class B" bedding (compacted Granular A bedding with granular over the sewer) in accordance with the applicable OPSD shall be used.

Embedment for flexible pipe shall be homogeneous granular in accordance with OPSD 802.010.

Alternate granular materials for pipe bedding may be specified, subject to the approval of the Township, however clear stone bedding is generally not permitted. In areas where it is difficult to control the infiltration of ground water into the sewer trenches clear stone may be considered provided it is completely wrapped in a suitable geotextile, selected and installed in accordance with the manufacturer's requirement.

The width of trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless additional bedding or higher strength pipe is used. Where poor

soil conditions and high ground water levels are present, the Consulting Engineer shall prepare Special Designs, for the Township's approval.

a) Reinforced concrete pipe shall conform to the requirements of OPSS.MUNI 1820;
b) Polyvinyl chloride (PVC) Pipe Products shall conform to the requirements of OPSS 1841. The pipe must be manufactured with factory assembled spigot gasket and integral bell joints;
c) Polyethylene Pipe products shall conform to the requirements of OPSS 1840.

Testing and Acceptance

All newly constructed storm sewers shall be CCTV inspected upon satisfactory completion of all other testing, prior to the Township Engineer's recommendation for issuance of the "Certificate of Completion".

All storm works shall be thoroughly flushed and/or cleaned of debris and all pipes shall have a CCTV inspection as per OPSS 409 as part of the final acceptance inspections.

4.2.4.3 Maintenance Hole Requirements

Maintenance holes must be precast concrete and shall be designed and constructed in accordance with the most recent OPSS and OPSD. Where the standard drawings are not applicable, the maintenance holes shall be individually designed and detailed.

Location and Spacing

Maintenance hole shall be located at each change in alignment, grade or pipe material, at all pipe junctions, at the beginning or end of all radius pipe sections and at intervals along the pipe to permit entry for maintenance to the sewer.

Maximum Spacing

The maximum spacing between maintenance hole shall be as follows:

Pipe Size	Maximum Maintenance Hole Spacing
600 mm or less	120 m
675 mm and over	150 m

Maintenance Hole Design

a) All maintenance hole chamber openings shall be located on the side of the maintenance hole parallel to the flow for straight run maintenance hole, or on the upstream side of the maintenance hole at all junctions;

b) The direction of flow in any maintenance hole shall not be permitted at acute interior angles;

c) Safety gratings shall be provided in all maintenance hole when the depth of the maintenance hole exceeds 5 m. The maximum spacing between safety gratings shall not exceed 5 m;

d) The obverts on the upstream side of maintenance hole shall not be lower than the obvert of the outlet pipe;

e) The maximum change in direction of flow in maintenance hole, for sewer sizes 900 mm diameter and over, shall be 45°;

f) Where the difference in elevation between the obvert of the inlet and outlet pipes exceed 0.9 m, a drop structure shall be placed on the inlet pipe, in accordance with the OPSD;

g) All storm sewer maintenance hole shall be benched to the obvert of the outlet pipe on a vertical projection from the spring line of the sewer, all in accordance with the standard detail drawing;

h) The minimum width of benching in all maintenance hole shall be 230 mm;

i) Maintenance hole in boulevards shall be located, wherever possible, a minimum of 1.5 m from the face of curb or other service;

j) Minimum size of any maintenance hole stack shall be 685 mm square;

k) Frost strapping as per OPSD 701.100 shall be installed on all maintenance hole;

l) When any horizontal dimensions of a maintenance hole exceeds 3.6 m, the maintenance hole must be individually designed and sufficiently detailed to permit poured in place construction;

m) Maintenance hole steps shall be solid aluminum in accordance with OPSD 405.020;

n) Subdrain connections shall be in accordance with OPSD 809.010.

Frames and Covers

Frames and covers shall be in accordance with OPSD 401.010.

All maintenance holes, located within the travelled portion of a roadway, shall have the rim elevation set flush with the surface of the base course asphalt. The concreting and setting of the frame and cover shall be completed in accordance with the details provided in the standard drawing. A maximum of 300 mm of modular rings shall be permitted on maintenance hole in new subdivisions. No concrete shall extend over the edge of the maintenance hole.

Prior to the placement of the final lift of asphalt, maintenance hole frames shall be reset to final elevations. Adjustments shall be in accordance with OPSD 704.010.

All maintenance holes, located within the curb line, shall be finished in accordance with OPSD 600.070 to ensure positive drainage.

Head Losses and Drops

Suitable drops shall be provided across all maintenance hole to compensate for the loss in energy due

to the change in flow velocity and for the difference in the depth of flow in the sewers.

In order to reduce the amount of drop required, the designer shall, wherever possible, restrict the change in velocity between the inlet and outlet pipes to 0.6 m/s.

Hydraulic calculations shall be submitted for all junction and transition maintenance hole on sewers where the outlet is 1,050 mm or greater. In addition, hydraulic calculations may be required for maintenance hole where the outlet pipe is less than 1,050 mm dia. if, in the opinion of the Township Engineer, there is insufficient invert drop provided across any maintenance hole.

Regardless of the invert drop across a maintenance hole as required by calculations, the obvert of the outlet pipe shall not be higher than the obvert of the inlet pipe at any maintenance hole location.

The minimum drops across maintenance hole shall be as follows:

Change of Direction	Minimum Drop (mm)
0	30
1° to 45°	50
46° to 90°	80

Where the difference in elevation between the obvert of the inlet and outlet pipes exceed 0.9 m, a drop structure shall be placed on the inlet pipe, in accordance with the OPSD.

Frame and Grate

All maintenance hole covers shall be as per OPSD 401.010 with Type A closed cover.

Benching

All benching shall be as per OPSD 701.021.

4.2.4.4 Catchbasin Requirements

Location and Spacing

Catchbasins shall be selected, located and spaced in accordance with the conditions of design. The design of the catchbasin location and type shall take into consideration the lot areas, the lot grades, pavement widths, road grades and intersection locations.

All catchbasins and their leads shall be of the single, double or backyard type. To ensure that the capture or inlet capacity matches that of the storm sewer, the spacing of catchbasins on streets may be varied.

If detailed analysis of the major-minor system and SWM analysis of the pipe system indicate the need for inlet controls, additional constrictions should be implemented. Since reduction in the size of the standard catchbasin covers is not desirable, an orifice plate can be located in the catchbasin.

Catchbasins shall be generally located upstream of sidewalk crossings at intersections and upstream of all pedestrian crossings. Catchbasins shall not be located in driveway curb depressions. Double catchbasins shall be required when the catchbasin intercepts flow from more than one direction.

Rear lot catchbasins and connections shall be located as outlined in the lot grading criteria. In general, the catchbasin and the catchbasin connections shall be located entirely on one lot.

Catchbasins shall be selected, located and spaced in accordance with the conditions of design. The design of catchbasin location and type shall take into consideration the contributing drainage areas, lot grades, pavement widths, road grades and intersection locations. The acceptable spacing requirements shall be as follows:

Maximum Spacing Pavement Width	Maximum Spacing 4% Grade or Less	Greater than 4%
8.5 m	90 m	60 m
11.0 m	80 m	55 m
Over 15.0 m	60 m	40 m

Notwithstanding any requirements for spacing of inlets, the maximum impervious area calculated by multiplying the area times the runoff coefficient to be connected to a single catchbasin inlet shall be 0.18 impervious hectares (example 0.2 ha at 0.9 runoff coefficient). Similarly, the maximum impervious area for a double catchbasin shall be 0.36 impervious hectares.

Catchbasins Types

Catchbasins must be pre-cast concrete in accordance with the applicable OPSD.

Special catchbasins and inlet structures shall be fully designed and detailed by the Consulting Engineer.

Double catchbasins are to be installed at the low point of any road.

Catchbasin Leads

For single catchbasins, the minimum size of connection shall be 300 mm and the minimum grade shall be 1.0%.

For double catchbasins, the minimum size of connection shall be 375 mm and the minimum grade shall be 1.0%.

For rear lot catchbasins, the minimum size of the connection shall be 300 mm and the minimum grade shall be 1.0%.

In general, catchbasins located in close proximity to a maintenance hole shall have their leads connected to the maintenance hole. Long catch basin connections (in excess of 20 m) shall be connected to a maintenance hole or, alternatively, the lead can be connected to the sewer as per OPSD 1006.010 or 1006.020 and a 1,200 mm maintenance hole catchbasin used in lieu of the normal 600 mm square catchbasin.

Frame and Grate

The frame and cover for catchbasins in roadway or walkway areas shall be as detailed in OPSD 400.020. Catchbasins located in grassed areas shall have a Birdcage Grate per OPSD 400.120.

All catch basins, located within the curb line, shall be finished in accordance with OPSD 600.070 to ensure positive drainage.

Catchbasins at Intersections

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

Elevations for Catchbasin Frames and Grates

All catchbasins located within the travelled portion of a roadway, shall have the frame elevation set flush with the surface of the base course asphalt. The adjusting and setting of the frames and grates shall be completed in accordance with the details provided in OPSD 704.010 upon placement of surface course asphalt.

Temporary asphalt curbing shall be placed behind all catchbasins within the travelled portion of the roadway at the stage of base course asphalt. Asphalt curbing shall be placed in accordance with OPSD 601.010 - Type “D”, between the two adjacent expansion joints as shown on the Standard Drawing.

Prior to placing surface course asphalt, temporary asphalt curbs shall be removed and replaced by concrete curb in accordance with OPSD 600.070.

4.2.4.5 Roadside Ditches

All new urban roads shall be curb and gutter unless otherwise approved by the Director of Public Works.

Rural roads shall conform to Township Standard Drawing No. 403 unless otherwise approved by the Director of Public Works. Rural roadside ditches shall be designed as follows:

a) 3:1 front slope and minimum 2:1 backslope (3:1 desirable).

b) Inverts shall be minimum 150 mm below the granular/sub-grade interface where it daylights into the ditch unless an invert subdrain is designed to pick up subgrade drainage.

c) Desirable minimum longitudinal ditch grade shall be 1.0% with absolute minimum being 0.5%.

d) Ditch grades greater than 3.0% shall have staked sod protection, or other means of protection; and,

e) Ditches greater than 5.0% shall have hand laid rip rap protection.

4.2.4.6 Rainwater Leaders, Foundation Drains and Storm Connections

Rainwater Leaders

Rainwater leaders on all single family and semi-detached residential units shall be discharged onto grassed or garden areas and away from wells or tile bed areas. Rainwater leaders shall not encroach over other adjacent private lands.

The rainwater leaders draining the rear halves of all townhouses shall be discharged onto grassed or garden areas. The rainwater leaders draining the front halves of all townhouses shall be connected to the storm sewer system and the roof area must be included in the calculated imperviousness ratio.

Pre-cast concrete splash pads shall be placed at each rainwater leader downspout.

The rainwater leaders from all commercial, industrial, institutional and high density residential buildings should be discharged onto grassed or garden areas, if possible and if acceptable to the Township.

Foundation Drains

The Township may require connection of foundation weepers by gravity to the storm sewer system where it exists, provided that the elevation of the basement floor is at least 0.60 m above the elevation of the storm sewer obvert at the building envelope. (In some cases, this may require shallow basements.) All basements shall be 0.5 m above the 1:100 year storm hydraulic grade line on the site.

Where gravity connection of weepers to storm sewers is not possible, the Township requires that a sump pump system be installed in the building with the discharge line connected to the storm sewer at street line or to grade where soil conditions allow adequate infiltration. A backwater preventer valve and a siphon break valve, approved by the Township must be installed in the sump pump discharge line to prevent backflow into the basement.

In every case, the underside of footing shall be set above the seasonal high ground water level as determined in the geotechnical report.

Where sump pumps are installed in residential developments with open ditches, discharge pipelines shall not be placed within the Township's ditch lines of the road allowances. Sump pump discharge pipelines shall be directed to rear or side yard drainage swales.

4.2.5 Channel, Culvert and Overland Flow

For channel, culvert, bridge and/or erosion control projects the proponent is responsible for obtaining all necessary approvals from the governing agencies, such as the LSRCA, KRCA, MNR, DFO and/or MOECC.

4.2.5.1 Culverts and Bridges

Culvert and Bridge Hydraulic Capacity

Only arterials and collectors should, if feasible, be permitted to cross the major system watercourses. It is also recommended that designers consider the need to design culverts and bridges on such arterials and collectors for at least the 1:100 year storm flow, if not for the Regional Storm flow. If smaller culverts or bridges are provided, the backwater effects for the 1:100 year and Regional Storm flows must be determined. Concrete box culverts shall be designed and placed for all watercourse crossings subject to the approval of the Township. Ministry of Natural Resources, DFO, LSRCA and/or KRCA approval under their regulations may be required for watercourse/valley crossings.

Road Classification	Design Flood Frequency
Arterial	1:100 Year to Regional
Collector	1:50 Year
Urban Local	1:25 Year
Rural Local	1:25 Year
Temporary Detour	1:10 Year
Driveway	1:5 Year

All culverts must be of sufficient length to provide for a preferred 5:1 (minimum 3:1) slope off the driving surface to the ditch invert. All driveway culverts require entrance approval.

Bridges and other major drainage structures shall require special designs as determined by the Township. Hydraulic calculations will be required.

The frequency and magnitude of flooding or erosion shall not be increased on upstream or downstream properties.

Minimum culvert sizes shall be in accordance with MTO Highway Drainage Design Standards (2008) or latest version.

Culvert materials shall be selected in accordance with the procedure outlined in the MTO gravity pipe manual (April 2014) or latest version.

4.2.5.2 Open Channels

The proposed criteria for an open channel design shall be submitted to the Township for approval prior to the actual design being undertaken. Open channels shall be defined as major system overland flow channels, minor system outfall channels or natural channels. Major system overland flow channel designs may be required to accommodate the Regional storm or the 100-year storm for new development.

The Consulting Engineer shall also be responsible for obtaining the approval of the design from MNR, DFO, LSRCA, KRCA and MOECC, as required, if the open channel concept is favourably considered.

"Natural" channel design criteria will be determined on a site by site basis. The following guidelines must be considered:

Open Channels	Minimum Velocity	Maximum Velocity
Grass lined - Natural	0.7 m/s	1.5 m/s
Grass lined - Maintained	0.7 m/s	1.5 m/s
Gabion lined	0.7 m/s	2.5 m/s
Concrete lined	0.7 m/s	4.0 m/s

The minimum side slopes of channels shall be three in the horizontal plane to one in the vertical plane. The designer shall provide for dry weather flow in the design of open channels. The maximum velocity for sod lined channels shall be 1.25 m/s and for concrete lined channels shall be 2.5 m/s, for the 100 year or Regional Storm flow.

Open channels shall only be considered at the discretion of the Township Engineer when the design flow exceeds 14.0 m^3/s.

Dry weather flow inverts of open channels are to be designed with concrete or terra-fix blocks, subject to the Township Engineer's approval.

4.2.6 Watercourse Erosion and Bank Instability

Where erosion or bank instability is already evident in an area to be developed or re-developed, the Township requires that the situation be stabilized by appropriate remedial measures. Where

development will potentially cause significantly increased downstream erosion, the Township also requires the Developer to mitigate further damage by appropriate remedial and preventative measures.

Where designing remedial erosion or bank stabilization works, preservation of the watercourse dynamics and natural valley aesthetics must be secondary only to achieving a sound technical solution. The proposed design shall reference the MNR Natural Channel Design Manual. A normal bank flow channel has a capacity of about the 1:2 year flood. Protection to this level will be adequate provided care is taken to prevent any damage by higher floods and provided that the channel bank is not coincident with a higher valley bank. In this latter case, it may be necessary to protect the bank to a level as high as the 1:100 year flood or even the flood resulting from the Regional Storm.

The proposed criteria for an erosion or bank stability design shall be submitted to the Township for approval prior to the actual design being undertaken.

4.2.7 Overland Flow Routes

An overland flow route continuous to the nearest major channel must be established through all areas and shall be contained within either the road right-of-way or by easements.

If the overland flow route travels across downstream property not municipally owned, the developer must obtain the necessary agreement(s) from downstream owner(s) accepting the increased quantity of runoff.

The depths of flooding permitted on streets while acting as part of the minor drainage system, generally design for the 1:5 year storm, are as follows:

a) There shall be no curb overtopping.
b) On local roads, the flow may spread to the crown.
c) On collector roads, the flow spread must leave one lane free of water.
d) On arterial roads, the flow spread must leave one lane in each direction free of water.

The depths of flooding permitted on streets and at intersections during the 1:100 year storm are as follows:

a) No building shall be inundated at the ground line, unless the building has been flood proofed;
b) For all classes of roads, the depth of water at the gutter shall not exceed 0.3 m.

Flow across road intersections shall not be permitted for minor storm. To meet the criteria for major storm run-off, low points in roads must have adequate provision for the safe overland flow.

4.2.8 Inlet/Outlet and Special Structures

Inlet and outlet structures shall be fully designed on the engineering drawings. The details provided shall include the existing topography, proposed grading and the work necessary to protect against erosion.

Inlets

Inlet structures shall be fully designed by the Consulting Engineer when OPSD structures are not deemed suitable. Inlet grates shall generally consist of inclined parallel bars or rods set in a plane at approximately 180 degrees with the top away from the direction of flow. Gabions, riprap or concrete shall be provided at all inlets to protect against erosion and to channel the flow to the inlet structure.

Hydraulic design calculations for inlet structures must be performed in accordance with guidelines established by the Ministry of Transportation Drainage Manual.

The design of any culvert on a new or reconstructed watercourse where an inlet grating is required must provide a measure of safety and minimize the risk of entanglement or entrapment of a person.

Outlets

The OPSD headwall standards shall be used for all storm sewers up to 2,400 mm diameter. For sewers over 2,400 mm the headwalls shall be individually designed. All headwalls shall be equipped with a grating (OPSD 804.050) over the outlet end of the pipe and a railing across the top of the headwall for the protection of the public. All headwalls with an exposed face height of 1 m or greater shall incorporate a railing or fence in accordance with OBC requirements.

All outlets shall blend in the direction of flow of the watercourse with the directional change being taken up in the sewer rather than the channel.

Storm sewer outfalls shall not be connected to existing or proposed road crossing culverts. Storm sewer outfalls must be terminated at separate headwall structures, adjacent to the outlet side of road crossing culverts.

Gabions, Terra-fix blocks, riprap, concrete or other erosion protection shall be provided at all outlets to prevent erosion of the watercourse and the area adjacent to the headwall. The extent of the erosion protection shall be indicated on the engineering drawings and shall be dependent upon the velocity of the flow in the storm sewer outlet, the soil conditions, the flow in the existing watercourse and site conditions.

4.3 Roadways

4.3.1 Street Classification

All roadways in new developments shall be classified according to the traffic volume expected and to the intended use of the roadway. For predominantly residential areas three classifications shall be noted as follows: Local, Minor Collector or Major Collector. For industrial areas the streets shall be classified Local or Major Collector dependent upon length of street, traffic volume expected and expected amount of truck traffic. Arterial roadways shall be classified as divided or undivided. The proposed classification of all streets in the development shall be confirmed with the Township prior to the commencement of the design.

The following table is presented as a guide to the determination of the street classification.

Table 1: Street Classification

CRITERIA	LOCAL	COLLECTOR	ARTERIAL
Source Provided	Land Access	Land Access	Traffic
Movement	Traffic Movement	Transit Routes	Transit Routes
Length of Trip	Short	Medium	Long
Flow	Interrupted	Interrupted	Through
Interconnections	Local	Local Collector	Collector
Arterial	Collector	Arterial	Freeway
Estimated A.A.D.T.	0– 1,000	1,000 – 3,000	over 3,000

4.3.2 Construction Standard (Curb and Gutter vs. Open Ditch)

The following table is presented as a guide for the determination of the road standard to be used in new developments.

Table 2: Road Standard

Land Use	Priority Road Standard
Urban Residential	curb and gutter
Urban Industrial	curb and gutter
Rural Residential	open ditch
Rural Industrial	open ditch

The table shall be considered as a guideline only. Where an open ditch road section is proposed for a new development, prior to the Township's acceptance, the Consultant shall be required to investigate and address whether the site is suitable to accommodate an open ditch roadway. The investigation shall be carried out in accordance with the requirements outlined in accordance with the requirements outlined in Section 2.2 (h) of this document, prior to Draft Plan approval.

Should the Developer propose to deviate from the priority road standard, the Township will give consideration to the request subject to the receipt of documentation outlining the reason for deviation.

4.3.3 Bicycle Lanes

The requirements for bicycle lanes are to be discussed at the planning stage and within the traffic impact study.

The design for bicycle lanes shall be in accordance with the transportation association of Canada Urban Supplement to the Geometric Design Guide for Canadian Roads and Ontario Traffic Manual Book 18. Dedicated bicycle lanes are not required on local streets.

4.3.4 Pavement Design

In general, pavement design shall be completed by the geotechnical consultant in accordance with the most recent Township Standards, OPSS and OPSD.

The minimum pavement design for all streets in new subdivisions shall be as detailed on the Standard Drawings. In all cases, a qualified Geotechnical Consultant shall be engaged by the Developer to sample, test and design a suitable pavement section for each particular site. Soil sampling shall be carried out in the presence of the Geotechnical Consultant at intervals not exceeding 60 metres along the centreline of the subdivision road. The composition and design thickness of the pavement section shall be determined from:

a) Mechanical sieve analysis of the subgrade soil;
b) Frost susceptibility;
c) Drainage; and
d) Traffic volumes.

Copies of all test results and proposed road designs shall be submitted with the Engineering Drawings. In no case will a pavement design less than the minimum Township Standard as shown on the standard drawing for the particular road classification be considered acceptable.

Prior to the placement of asphalt pavement, the Consulting Engineer must submit to the Township Engineer for approval, the asphalt pavement mix designs. The pavement design must be sufficient to provide for ultimate wheel loads over the road, prior to placement of surface course asphalt.

Table 3: Minimum Pavement Design Thickness

Minimum Pavement Design Thickness					
Class	Type	Asphalt		Granular 'A'	Granular 'B'
		Option 'A'	Option 'B'		
Local	Residential	40 mm – HL3 50 mm – HL8	40 mm SP12.5 50 mm SP19.0	150	300
	Industrial	40 mm – HL3 (HS) 80 mm – HL8	40 mm SP12.5 80 mm SP19.0	150	450
Collector	Residential	40 mm – HL3 (HS) 50 mm – HL8	40 mm SP12.5 50 mm SP19.0	150	450
	Industrial/ AADT>3,000	40 mm – HL3 (HS) 80 mm – HL8C	40 mm SP12.5 80 mm SP19.0	150	450

4.3.5 Geometric Design Requirements

Table 4: Road Classification

	Road Classification				
	Residential			Industrial	
	Local		Collector	Local	
	Rural	Urban	Minor	Rural	Urban
Design Element					
ROW Width (m)	23.0	20.0	20.0	26.0	20.0
Road Width (m) (face of curb)*Note 1*	7.0*	8.0	10.0	8.0*	10.0
Design Speed (km/h)	50	50	60	50	50
Posted Speed (km/h)	50				
Stopping Sight Distance (SSD)	65	65	85	65	65
horizontal curve radius (m)	90	90	130	90	90
maximum grade (%)	8	8	8	8	8
minimum grade *Note 2*	0.5 *	0.5	0.5	0.5 *	0.5
vertical curve - minimum 'K'					
crest curve	8	8	15	8	8
sag curve - unlit	12	12	18	12	12
sag curve - illuminated	8	5	12	8	8
cross fall from centerline	2%				
Standards at Intersections					
	Intersecting Roads				
Design Element	local - local	local - collector	collector - arterial		
intersection angle (degrees)	70-110	70-110	80-100		
curb radius - minimum (m)	5	7.5	15		
daylight rounding - min. (m) *Note 3*	5	5	*		
max grade for through road (%)	3.5	3	2		
tangent on approach (from limit of daylighting) - min (m)	30	50	75		

NOTES:

1. Rural road widths are measured to edges of pavement
2. Rural roadways may require higher minimum centerline grades than criteria shown as dictated by permissible ditch grades and depths
3. daylighting requirements for all other intersection types shall be designed by the Consultant according to each particular situation

4.3.5.1 Horizontal Curves

Horizontal alignment is to conform to the requirements as outlined in Table 1. In general, "right angle bends" will not be permitted on local streets except in the case of "Courts" or "Crescents" serving no more than 50 residential lots. Where permitted, these bends must not have a deflection angle greater than 110 degrees.

4.3.5.2 Vertical Curves

All points of grade change in excess of 1% shall be designed with vertical curves as outlined in the current Ministry of Transportation of Ontario publications. The minimum visibility curves to be used are outlined in the geometric details for each roadway classification in Table 1. The minimum tangent length of any road grade shall be 9 metres.

4.3.5.3 Backfall at Intersecting Streets

At all street intersections the normal crossfall of the major street shall not be interrupted by the crown line of the minor street. A 1 to 2 per cent backfall shall be provided on the minor street at all street intersections. This backfall shall continue to the end of the curb return radii to facilitate proper drainage of the intersection. Overland flow routing of storm drainage through the intersection must be maintained.

4.3.5.4 Curb Return Radii at Intersections

The curb return radii at street intersections shall conform to the dimensions presented in Table 4.

4.3.5.5 Daylighting Requirements at Intersections

Daylighting at all intersection quadrants shall be included in the road allowances to provide for uniform boulevard widths. Such daylighting shall be included on the proposed plan for Registration (M-Plan) and on all engineering drawings.

For local roads intersecting local roads, the minimum daylighting requirement shall be a radius of 5 metres. For all other intersections, the size of the daylighting or visibility triangle is a function of the number and width of lanes, the various design speeds on the intersecting roads and the R.O.W. widths on both roads. The Consulting Engineer shall submit detailed calculations for sizing of daylighting triangles at these intersections in accordance with the design criteria prepared by the Ministry of Transportation Ontario, Chapter E (at Grade Intersections).

4.3.6 Cul-de-Sacs

Permanent cul-de-sacs shall be constructed in accordance with the details provided in OPSD 500.020 or 500.030 and shall be designed with a minimum grade of 1% from the centre of the bulb to the curb.

Minimum gutter grades of 1% shall be maintained along the flow line of all gutters around the cul-de-sac. The design road grade on the cul-de-sac shall be such that the drainage is directed away from the end of the cul-de-sac and towards the beginning of the bulb area where catchbasins are to be located. All cul-de-sacs, bulbs and intersections shall be detailed at a scale larger than the road plan. The details shall show gutter, crown and other grades sufficient to determine that the road will properly drain and shall be used as a basis for layout.

The maximum permitted length of cul-de-sac shall depend on the density of development. The length of cul-de-sac shall be determined and measured from the nearest intersecting street to the beginning of the bulb, and the following criteria shall be used as a guideline.

Type of Development	Maximum Length of Cul-de-sac
Single Family	300 m
Semi-detached	250 m
Townhouse/Row Housing	200 m

4.3.7 Temporary Turning Circles

Temporary turning areas will be considered whenever a road is to be continued in the future in a phased Plan of Subdivision. Details for the requirements of temporary turning areas are provided in the Standard Drawings.

4.3.8 Driveway Entrances

Minimum Driveway Design with Curbs

The Developer is responsible for the grading, gravelling and the paving of all driveways from the curb to the streetline or to the sidewalk where sidewalks are proposed within the development.

The minimum consolidated depth requirements for the granular base and asphalt in driveways shall be as follows:

a) Single-Family Residential:

Asphalt – 50 mm of HL3 asphalt
Granular base – 150 mm of Granular 'A'
Alternative
- deep strength asphalt
- 75 mm HL8 base course
- 50 mm HL3 surface course

(G.B.E.= 255 mm)

b) Commercial, Light Industrial and Apartments:	Asphalt – 50 mm of HL8 base course – 40 mm of HL3 base course Granular base – 225 mm Granular 'B' – 150 mm Granular 'A' (G.B.E.= 480 mm)
c) Heavy Industrial Driveways:	Asphalt – 75 mm of HL8 base course – 40 mm of HL3 base course Granular base – 300 mm Granular 'B' – 150 mm Granular 'A' (G.B.E.= 580 mm)

Equivalent depths of deep strength asphalt will be permitted as a substitute for the pavement specified in (b) and (c).

Urban driveways shall be in accordance with OPSD 350.010 or 351.010.

Alternate types of driveways (i.e. paving stones, concrete pads, etc.) will be subject to approval by the Township Engineer.

Driveway Approaches with Open Ditches

The Developer is responsible for the grading, gravelling and paving of all driveways from the edge of pavement of the roadway to the street line.

The minimum consolidated depth requirements for the granular base in Residential driveways shall be as follows:

- 250 mm Granular 'A'

The minimum consolidated depth requirements for the granular base in Commercial, Industrial and Apartment Driveways shall be as follows:

- 375 mm Granular 'A'

Rural driveways shall be in accordance with OPSD 301.010 or 301.020.

The minimum length of each residential C.S.P. driveway culvert shall be 6.0 metres and the minimum diameter shall be 400 mm. The maximum length of residential driveway culverts shall be 9.0 metres. The maintenance and repair of such culverts shall remain the responsibility of the Developer until such time as the Works have been accepted by the Township.

The construction of driveway headwalls at each end of the driveway culvert will not be permitted.

Access to hydrants across ditches shall be in accordance with Region of Durham Standards.

Access to utility poles across ditches shall be in accordance with OPSD 217.060.

Driveway Grades

The maximum permissible design grade for any driveway on private lands shall be 8%. These maximum grades are not recommended and should be employed only in exceptional cases where physical conditions prohibit the use of lesser grades. The minimum driveway grade shall be 1.0%. The use of negative grade driveways is actively discouraged. Negative sloping driveways will only be considered in estate residential developments under special circumstances. Where negative sloping driveways are used, a positive slope of at least 2.5 % must be maintained from the garage over a minimum distance of 10.0 metres.

Driveway Depressions

The width and location of the depressions in the curb and gutter for single-family residential driveways shall be as detailed on the Standard Drawing with particular attention being placed on the location of the garage and the direction of traffic flow. Driveway cuts shall be located at a minimum distance of 1.0 metre from any side lot line. Driveway depressions are to be placed when concrete curb and gutter is initially poured. Double driveway depressions (6.0 metres minimum width) are to be placed for all single-family residential lots.

Mutual driveways between two adjoining properties shall have continuous curb depression.

The width and location of the driveway depressions for apartment, commercial, and industrial driveways shall be detailed on the engineering drawings. These driveways shall be designed to accommodate the anticipated vehicular traffic without causing undue interference with the traffic flow on the street. The maximum width of any driveway depression for commercial, apartment or industrial driveways shall be 9.0 metres. All apartment, commercial and industrial driveways shall be provided with barrier curbs constructed to blend into the roadway curb and gutter.

Concrete Curb and Gutter

Driveway depressions shall be formed in the curb according to the details and locations as shown on the standard detail drawings. If the driveway depression should be improperly located, then that section of depressed curb which is improperly located shall be broken out and shall be replaced with a normal curb and gutter section. The concrete capping of a depressed curb shall not be permitted. The new driveway depression at this location can be formed by cutting the back of the curb with a curb cutting machine providing the existing section is free from cracks and other defects and the entrance is to a single-family residence. For multiple-family, commercial, industrial, apartment and other entrances the existing curb and gutter shall be completely removed and replaced with a steel reinforced depressed curb section in accordance with the detail on the standard drawing.

The minimum clear distance between the edge of driveway and a utility structure or hydrant shall be 1.2 m.

4.3.9 Special Road Works

Whenever it is necessary to cut through an existing Township road, the Developer's Contractor will be responsible for properly compacting the backfill material and restoring the surface pavement to its original conditions immediately upon completion of backfilling operations.

Road Occupancy Permits

The contractor shall secure a road occupancy permit from the Township before commencing works. The contractor shall also be responsible for securing all utility locates.

Before making detours, permission is required from the Township Public Works Department. Where the road is not part of the Township Road system, approval from the appropriate road authority will also be necessary. In all cases the Fire, Police Departments, School Bus Companies and Ambulance Service must be notified by the Developer or his Contractor.

All work will be done in accordance with ordinances and By-laws of the Township.

4.3.10 Surface Course Asphalt Placement

Prior to placement of surface course asphalt, the following works must be completed:

a) All sidewalk, curb and boulevard work;
b) Raise maintenance hole and catchbasin frames;
c) Install delineation for raised frames 40 mm above asphalt lift;
d) Flush and sweep surface and evenly apply tack coat;
e) Base course asphalt pad as required in accordance with OPSS;
f) Final sewer video inspection;
g) Place surface course asphalt in accordance with OPSS.

The following conditions must also be met:

a) A minimum period of one year has expired from the completion date for the placement of the base course asphalt;
b) 85% of the dwellings have received unconditional Occupancy Certificates;
c) All undeveloped lots are rough graded in accordance with the approved lot grading plans;
d) All service connections for multiple-family, commercial, institutional or other blocks are installed; and
e) The approval of the Township Engineer is obtained in writing.

4.3.11 Curbs and Gutters

Where constructed to an urban cross-section, new Township streets shall be constructed with semi-mountable curb and gutter to OPSD 600.060 on local roadways and barrier curb and gutter to OPSD 600.040 on collector or higher order roadways. Prior to final acceptance all curb blemishes will be rectified by removing a minimum 1 m section of curb and replacing.

A driveway entrance is required for each lot. Curb depressions are required at each intersection as per OPSD 310.030.

A minimum of 300 mm of Granular 'B' material compacted to 95% Standard Proctor Density will be required as a base for all curb installations.

Minimum grade on curb is 0.75% desirable, 0.5% absolute minimum.

– Two stage curb will be permitted for subdivision developments.

Reconstruction

Concrete curb and gutter as per OPSD 600.040 to be used on Reconstruction Capital Projects unless approved otherwise by the Director of Public Works. Concrete curb and gutter on the high side of superelevated urban roadways to be according to OPSD 600.040.

4.3.12 Subdrains

In general, 100 mm dia. perforated, filter cloth wrapped plastic corrugated subdrains will be required to run continuous along both sides of all roads with curb and gutter as per OPSD 216.021. It will be the responsibility of the Developer to justify deviation from this standard by submitting a "Soil Drainage Report" from a recognized independent Geotechnical Consultant. Subdrains may be omitted if it can be shown to the satisfaction of the Township Engineer that the subgrade is sufficiently permeable to ensure adequate drainage of the road base.

4.3.13 Boulevards

All boulevard areas are to be graded according to the details shown on the Township Standard Detail Drawings and to the satisfaction of the Township Engineer. In order to minimize construction problems for the utility companies, the grade of the boulevard shall be constant from the back of the curb to the street limit. Terracing or embankments within the road allowance on new subdivision streets shall not be permitted. The final grade of sod placed within the boulevard areas shall match and not exceed the finished grade of top of concrete sidewalk and curb.

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

Clean weed-free topsoil shall be placed on all boulevard areas that are to be sodded. The minimum depth of topsoil required shall be 100 mm.

No. 1 nursery sod shall be used for all boulevard areas that are to be sodded.

4.3.14 Restoration

Roadway restoration where utilities are cut into existing roadways shall be in accordance with the Region of Durham Standard Drawing S-200.020 with asphalt cuts perpendicular to the direction of travel.

4.4 Street Name and Traffic Signs

4.4.1 Plan

The proposed location and type of all street name and traffic control signs shall be shown on Plan and Profile Drawings.

4.4.2 Street Name Signs

All street name signs will be supplied and installed by the Township with all costs charged to the Developer.

Location

Street name signs shall be placed at each intersection and shall identify each street at the intersection. The location of the street name signs are shown in the Township Standard Drawing.

4.4.3 Traffic Control and Advisory Signs

Traffic control and advisory signs shall be located as shown on the Township Standard Drawings. In cases where the positioning of the signs is not covered by the standard drawings, the location must be in conformance with the Manual of Uniform Traffic Control Devices for Ontario or the Highway Traffic Act Regulations for Ontario.

All signs shall be mounted approximately at right angles to the direction of and facing the traffic that they are intended to serve. On curved alignments the angle of placement should be determined by the course of the approaching traffic rather than by the roadway edge at the point where the sign is located. Signs for different purposes should not be placed closer together than 30 m.

Type

All traffic control and advisory signs shall conform to the current revised standards of the Manual of Uniform Traffic Control Devices for Ontario.

Erection

All traffic control signs shall be mounted on galvanized steel punch out type or uniflange type posts, 3.65 m. in length. Channel posts shall be a minimum 14 gauge thick and a minimum width of 45 mm. The posts shall be pre—punched with a minimum of 24 holes at 50 mm centres compatible with standard bolthole arrangements for traffic control signs. Signs shall be individually erected on separate posts.

Traffic control signs must be erected by the Developer at the completion of the base course asphalt road construction and prior to the issuance of Building Permits. Signs must be maintained by the Developer until "Final Acceptance" by the Township.

Upon completion of base course asphalt, the Developer shall place signage at each point of ingress/egress to the subdivision stating the following:

"THIS ROAD UNASSUMED BY THE TOWNSHIP OF BROCK USE AT OWN RISK"

Each sign shall be 450 mm wide by 600 mm high with black letters on yellow reflectorized background, mounted on "U' channel posts, 3.65 metres in height.

4.5 Roadway Markings

Pavement marking shall be installed on both the base and surface course. Pavement markings shall be painted conforming with the Standards of the Ministry of Transportation of Ontario, Book 11 (Pavement, Hazard and Delineation Markings) at all intersections school crossings, walkway and railway crossings to clearly indicate the proper traffic zones, lanes and stop lines.

Lane markings are to be organic solvent based or water borne traffic paint complete with glass beads. All lane marking applications to new asphalt require two applications of paint. The second application shall not be applied until the first is tack free. Pavement marking are to conform to OPSS 710 and OPSS 1713 and OPSS 1714.

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

Local streets do not require centreline pavement marking, but stop bars are required with a minimum of 15 metres centerline marking.

These pavement markings will be installed on both the topcoat of asphalt and the base coat of asphalt. All roadway markings shall be installed in accordance with OPSS 710.

4.6 Traffic Signals

Traffic Signals are to be designed on a site-specific basis.

4.7 Street Lighting

Streetlights are required for all roadways and most walkways in the Township "Settlement Areas," as defined in the Official Plan, and other locations as directed by the Township Engineer. Systems are the responsibility of the Developer to design and construct. Streetlight system designs, including a photometric plan for the proposed layout shall be prepared by a qualified Electrical Consultant engaged by the Developer and submitted to the Township for approval. The design shall be completed in general accordance with Transportation Association of Canada, "Guide for Design of Roadway Lighting" Volume 1 & 2.

The Developer shall arrange with Hydro One for the connection of all lighting systems. The estimated cost of the total installation must be approved by the Township Engineer. The Developer shall provide easements wherever they are required.

The street lighting system is to consist of two types of lighting standards and these are post-top luminaires and horizontal type luminaires for local and collector roadways. The entire system must be energized prior to the release of building permits.

4.7.1 Street Light Locations

Where possible, pole locations are to be placed on the projection of side lot lines. Where super mail boxes are proposed within a plan of subdivision, street lights must be located immediately adjacent to the super mail boxes.

Adequate illumination at all intersections must be provided.

No street lights should be placed within 3.0 m of a transformer.

On curving roadways, lights are to be placed on outer radii where possible.

Proposed lighting levels adjacent to Provincial and Regional roads are to be reviewed and approved by the appropriate road authority.

Table 5: Residential Subdivisions

Type of Road	Road Width	Arrangements	Fixture Type	Spacing
Local-Open Ditch	Varies	One Side	Horizontal Type Luminaire	45.0 m
Local-Curbs	Varies	Staggered	Decorative Post-Top Luminaire	29.0 m
Minor Collector	Varies	Staggered	Horizontal Type Luminaire	29.0 m

Table 6: Industrial Subdivisions

Type of Road	Road Width	Arrangements	Fixture Type	Spacing
Local	7.0-9.5	One Side	Horizontal Type Luminaire	40.0 m

4.7.2 Light Source, Fixture and Pole

All luminaires shall comply with all applicable requirements of CSA Standard C22.2 No. 9, "General Requirements for Luminaires".

Horizontal luminaires shall be a minimum 35 Watt MiniView LED Cobrahead (SVS-35W16LED4K-G2-Led-UNV-DM6-RCD-6Y3) with 80 Watt Roadview LED roadway luminaire (RVS-80W48LED4K-R-LE2-UNIV-DM6-PH8-G4) used at intersections. Luminaires are to produce white light and must be "dark sky" friendly.

Decorative luminaires shall be MetroScope (MPTR-55W48LED-4K-ES-LES-120-COLTY)

Each light shall be controlled by a dusk to dawn photo electric cell.

Poles shall be 9.0 m length direct bury spun concrete per OPSD 2410.010.

Mounts shall be 2.4 m length tapered aluminum per OPSD 2420.01.

4.7.3 Approval and Construction

Approval of plans for streetlighting must be obtained from the Township. Electrical Safety Authority (ESA) approval for the installed street lighting system must be obtained by the Developer. The Developer must guarantee and maintain the lighting until final acceptance of the development. The Township, upon energization of the streetlighting, will pay energy charges.

4.8 Pedestrian Ways

The Township promotes active transportation throughout the municipality. The Developer may be required to construct trail systems in accordance with the Regional Cycling Plan.

4.8.1 Sidewalks

The Developer may be required to design and construct sidewalks. Sidewalks shall comply with the Accessibility for Ontarians with Disabilities Act, 2005 (AODA) and the Township of Brock Multi Year Accessibility Plan.

The location requirements for sidewalks in new subdivisions shall be confirmed with the Township prior to commencing the detailed design. Sidewalks will only be required in new subdivisions located in urban settings (villages, hamlets). In general, sidewalks are required on both sides of all arterial and collector roadways and at least one side of all local streets. For local roadways, the locations of schools, parks, churches, commercial establishments etc., the length of street, traffic volume expected and the number of dwelling units serviced will be used as criteria in determining whether sidewalks are required on one or two sides of the street.

The sidewalk shall conform to details and dimensions as per OPSD 310.010 and shall be installed at locations as shown on the typical road cross sections. The width of sidewalks for streets is 1.50 metres.

The sidewalks shall be increased in thickness at all driveway locations as per OPSD 310.010. In cases where the sidewalk has been constructed prior to the establishment of an entrance to other than a single-family residence then the existing sidewalk shall be removed and shall be replaced with a thickened sidewalk section with wire mesh reinforcing in accordance with the Standard Drawing.

At street intersections the curb and the sidewalk shall be depressed to meet the roadway elevation as per OPSD 310.030.

When a sidewalk is constructed adjacent to a curb and gutter a keyway shall be provided along the back of the curb to support the sidewalk, as per OPSD 310.020.

The Township requires that all concrete sidewalks be constructed as indicated on the approved Engineering Drawings, prior to the release of the first conditional or unconditional Occupancy Certificate in accordance with the Township's Subdivision Agreement and in any event no later than one year after the completion of base course asphalt.

Temporary asphalt sidewalks shall be in accordance with the Township Standard Drawing.

4.8.1.1 Location

Sidewalks shall be constructed as shown on the Township's Road Cross-Section Standards. Where there are no other determining factors dictating location, sidewalks shall generally be placed on north and east sides of the street. Streetlight poles, when not staggered, should be located on the same side as the sidewalk. Local roads shall have, as a minimum, a sidewalk constructed on one side of the right-of-way and Arterial/Collector Roads shall have sidewalk on both sides

4.8.1.2 Specification

Sidewalks shall be constructed according to OPSD 310.010, 310.020, 310.030, 350.010, 351.010 and OPSS 351. Concrete sidewalks shall be placed on a minimum 150 mm compacted granular A base.

4.8.2 Trailways

The Developer may be required to design and construct a trail system or pathways/linkages to existing trail systems. The trail network shall be designed and constructed in accordance with the recommendation and construction specifications stipulated within the Region of Durham Cycling Plan.

Proposed trails should link together local points of interest, all open space amenities, civic institutions and connect to the regional trails network. To the extent possible the route should utilize public open spaces, unopened right-of-ways, blocks and easements away from roadways. In the event trails are located along roadways additional right-of-way width may be required by the Township.

Entrance points to the trail system should be marked with signage coordinated with the Township.

4.8.3 Trailway Bridges

Bridges to be constructed along off-road trail corridors shall be designed on a site by site basis based on the expected year round usage as approved by the Township. As a minimum, bridges intended for use by pedestrians and small recreational vehicles shall be designed in accordance with the MNRF Snowmobile Bridge Design Guidelines. Designs shall be consistent with the Region of Durham Cycling Plan.

4.9 Fencing

Fencing shall be in accordance with the most recent requirements and specifications of the Township as shown on the standard drawings.

Fencing is required:

a) Alongside yard flankage and/or rear yards backing onto roadways unless noise attenuation barriers are required;

b) Along public walkways in accordance with Township Standards;
c) Parks, ponds and open space blocks;
d) Adjacent to commercial, industrial or institutional land uses;
e) As designated by the Township Engineer;
f) Acoustic fencing per approved report.

The minimum requirements for residential chain link fence heights is in accordance with the following:

Adjacent Land Use	Fence Height (m)
Parklands	1.8
Hazard lands	1.8
Open channels	1.8
Cemeteries	1.8
Public Walkways	1.8 in front of dwellings
	1.8 between dwellings and rear yards
Municipal Facilities (Arenas, Firehalls, Libraries, etc.)	1.8
School Yards	1.8 subject to Board approval
Pools	1.8
Storm ponds	1.8 where required

All chain link fencing shall be galvanized.

Fencing along Regional or MTO roadways shall be in accordance with Region or MTO Standards.

All wood privacy fences shall be in accordance with the Township standard drawing.

4.10 Lot Grading

4.10.1 General Requirements

The grading of all lots and blocks in new developments must be carefully monitored by the Consulting Engineer in order to provide sites that are suitable for the erection of buildings and to provide satisfactory drainage from all lands within the development. In this regard, the design of the grading for all developments will be of primary concern to the municipality and the following criteria shall be used in the preparation of all lot grading plans for new development in the Township.

All lot drainage shall be designed to conform to the Stormwater Management Report, overall Lot Grading Plan for the subdivision and Township standards. The Developer shall be responsible for performing the grading of lots to the satisfaction of the Township.

The feasibility of achieving the above-noted grading objectives must be considered when establishing the overall development fabric (lot, road layout, etc.) prior to the granting of Draft Plan Approval.

4.10.2 Lot Grading Design – Residential

a) The specified lot grade shall be calculated in accordance with the Lot Grading Detail Sections included in the Township Standard Drawings;

b) The front yards of all lots shall be graded to drain towards the street. Exceptions for shoreline development will be considered on a site by site basis;

c) Suitable drainage easements shall be provided where municipal drainage is impeded by development. Requirements will be reviewed by the Township on a site by site basis;

d) Rear to front lot grading is preferred and a maximum of three rear lots shall outlet between any two lots;

e) All boulevard areas shall be graded with a constant slope from the curb to the street limit (minimum slope to be 2%, maximum slope to be 5%) and all water boxes, maintenance hole covers, valve boxes, etc. shall be set flush with the finished sod surface;

f) All rear yard drainage shall be directed away from the houses in defined swales which outlet at the curb, sidewalk or a rear yard catchbasin. Overland flow routes must be provided for all rear yard catchbasins which will protect all structures in the event of catchbasin blockage or a major storm event;

g) The drainage from all the lands within the subdivision limit is to be provided for internally with drainage over abutting lands being permitted only in exceptional cases at the discretion of the Township Engineer;

h) The grading along the limit of the subdivision shall be carefully controlled to avoid disturbance to the adjoining areas. In general, lot drainage should be directed away from top of banks or valley slopes;

i) The lot grading design shall provide for drainage problems on adjacent property that can be best resolved by permitting drainage through the subdivision;

j) All lot surfaces shall be constructed to a minimum grade of 2.0%;

k) All lot surfaces shall be constructed to a maximum average lot grade of 12% (calculated from the difference in lot elevations between the rear wall of the house and property line - embankments included). A minimum of 6 metres adjacent to the rear of the house shall be graded at 2% - 5% slope;

l) Maximum slope between all terraces and embankments shall be 3:1 when the vertical difference does not exceed 1 metre and 4:1 when the vertical differences exceed 1 metre. Between successive terraces, an intermediate level area of at least 1.50 metres in width must be provided;

m) The lot grading design shall provide for the temporary drainage of all blocks of land within the subdivision that are intended for future development under site plan agreements or park development plans;

n) The maximum flow allowable to any side yard swale shall be that from the equivalent of 3 lot or 0.5 hectares, whichever is less;

o) The maximum area contributing to a rear yard swale that may be discharged directly onto a road allowance shall be the equivalent of 1 rear yards or 0.50 hectares, whichever is less;

p) Swales providing internal drainage from each lot shall have a minimum slope of 2.0%;

q) The maximum length of a rear yard swale between outlets shall be 60 metres. Rear yard swales shall have a minimum slope of 2.0%;

r) Minimum depth of any swale to be 250 mm;

s) Maximum depth for a rear yard swale to be 750 mm;

t) Maximum depth for a side yard swale to be 450 mm;

u) Maximum side slope on any swale shall be 3:1;

v) All drainage swales shall be located on lot lines unless the adjacent property is not undergoing development. In such cases drainage swales shall be located entirely within the lot being developed;

w) Driveways shall not be used as outlets for any swales;

x) Each lot shall have at least one side yard with a maximum slope of 2% for 1.5 m continuous width from front to rear yard;

y) The grade around houses shall be a minimum of 2% away from houses from a point 150 mm below top of foundation wall or as required by OBC;

z) Minimum Basement Elevation (MBE) for typical lots shall be determined based on the highest of the following:

   i. 1.0 m above San obvert;
   ii. 0.5 m above 100-yr HGL;

   Generally, rear yard catchbasins shall be eliminated wherever possible. When required, rear yard catchbasins and outlet pipes shall be located such that the outlet and the catchbasin are located entirely on the same lot. In general, rear yard catchbasins shall be located 2.0 metres from the lot line;

aa) The maximum number of lots drained by a rear lot catchbasin shall be 5;

bb) Driveway grades shall be designed and constructed at a minimum of 2% and maximum of 8% grade. Driveway locations shall not extend beyond lot line projections within the right-of-way.

4.10.3 Sodding

The subdivision shall be sodded according to the following:

a) All swales, ditches, drainage easements, and slopes 10% or greater shall be sodded using 100 mm top soil and No. 1 nursery sod;
b) All residential lots shall have a minimum of 100 mm top soil and seed with variety and coverage approved by the Township;
c) Where the combined side yard between buildings is less than 1.5 m the surface treatment shall be 75 mm of clear stone over a vegetation suppressing geotextile;
d) All slopes greater than 10% shall be staked.

4.10.4 Retaining Walls

Retaining walls shall be constructed according to the following:

Retaining walls considered “Designated Structures” within the scope of the Ontario Building Code (OBC) will require a building permit from the Township of Brock Building Department. All other structures shall require engineering drawings stamped by a licensed professional engineer and shall conform to the following requirements: For the purposes of this section, the height of a retaining wall shall be measured from the finished ground level to the highest point of the wall and, if the height on one end of the wall is different from the height on the other end, the greater of the two shall apply.

a) Where retaining walls are required they shall be constructed on the higher lot such that the wall and tie-back do not cross property lines;

b) If a retaining wall is required, a detailed drawing indicating the design, location, property line, height, tiebacks, etc. shall be submitted for approval. Construction details of retaining walls, including filter fabric and subdrain or alternative drainage, must be noted on both area grading and individual lot grading drawings and approved by the Township. Subject to detailed design and review at the building permit stage retaining walls may be either removed or added to the Lot Grading Plan;

c) Retaining walls must be stone with stackable connection blocks to provide an acceptable structural design;

d) Retaining walls that are less than 1 m in height are permitted to be constructed of stackable stone (Risi Stone or approved equal); walls greater than 1 m must be Redi-Rock (or approved equal) retaining walls;

e) A minimum setback of 500 mm should be maintained from retaining wall tiebacks to the foundation of any structure. If the grading does not permit this setback, a Professional Engineer, licensed in the province of Ontario, shall provide a detailed design for Township's consideration;

f) All retaining walls with an exposed face height of 1 m or greater shall be designed and certified by a Professional Engineer, licensed in the province of Ontario specializing in structural engineering. The design must be accompanied by calculations clearly demonstrating that it is structurally satisfactory for the particular location and soil type;

g) Any and all retaining walls shall have their construction certified by the Design Engineer prior to the release of grading securities and to commence the maintenance period;

h) All retaining walls with an exposed face height of 1 m or greater shall incorporate a chain link fence 1.8 m (or approved equivalent) high. The structural stability of the retaining wall in use must be able to withstand any extra forces exerted by the fence as well as the earth loads;

i) The detailed drawing shall include the following notes and illustrate:

    i. A weeping tile and outlet locations shown;

    ii. A filter cloth envelope surrounding the compacted free draining granular material;

    iii. Sufficient top of wall and bottom of wall elevations;

    iv. Type and material of wall;

    v. A cross-section for the length, type, and location of any tie-backs;

    vi. Surcharge load used and appropriate design calculations including global stability analysis;

    vii. A swale at the top of wall, if drainage directs to the wall;

    viii. The location, type, and fastening of the 1.5 m chain link fence meeting the manufacturer’s recommendations.

j) For tiered walls, a minimum platform of 1.0 m from the face of the lower wall to the toe of the higher wall shall be provided;

k) Where the retaining wall is located between two private properties being developed by different developers, at different times or as infill development in an existing area, where permission is not obtained from the adjoining property owner, the retaining wall (and fence, if applicable) shall be placed wholly on the property under development, including footings/drainage backfill;

l) Retaining walls shall be constructed entirely on private property, not on property to be assumed by the Township.

Shop drawings will be required for the retaining walls and appurtenances prior to construction. The retaining wall manufacturer and designer shall provide structural approval by a Professional Engineer licensed in Ontario to the satisfaction of the Township

The Safety fencing required for the retaining walls shall be designed with a top and bottom rail and be designed by a Professional Engineer licensed in Ontario for placement on top of the retaining wall as per the retaining wall manufacturer's specifications. Material, post spacing, brace posts, and wire mesh shall be designed and approved by a structural engineer to the satisfaction of the Township to meet industry standards for strength and safety requirements applicable to the Development location.

The Township of Brock Building Department shall be notified 48 hours prior to the construction of all retaining walls in order to arrange for an inspection.

4.10.5 Area Grading

4.10.5.1 General Requirements

Where earth cuts and fills in excess of 400 mm are required within the lots and blocks of the new development, area rough grading must be performed prior to road construction.

In general, blocks intended for future development, such as institutional and commercial uses, shall be graded to preliminary grades and drain appropriately, compatible with adjacent roadways and abutting properties and complete with appropriate re-stabilization and erosion and sediment control measures as described in this document.

4.10.5.2 Construction Requirements

Prior to commencing rough grading, the Developer must implement the approved erosion and sediment control plans as outlined in this document.

The Developer and his Engineer shall control the placement of imported fill material on registered lots where private sewage disposal systems are required. Imported fill material placed on registered lots must meet or exceed the original ground's capability to support a private sewage disposal system.

Where the proposed grading plan identifies fill over registered lots, 'Engineered Fill" shall be placed and supervised by the Consulting Engineer.

All block grading shall conform to the storm water management report. The Developer shall be responsible for the grading of blocks until assumption of the subdivision.

4.11 Easement and Block Requirements

4.11.1 General Requirements

The Township and/or Region of Durham shall require conveyance of easements or dedication of blocks, without consideration and free and clear of all liens and encumbrances, to the minimum width requirements, or greater as determined by the Township Engineer, in the following circumstances:

Outlet Structures From Ponds

Where required, the Developer must secure additional downstream easements, in favour of the Township, in order to achieve sufficient outlets for detention or retention ponds. Where external easements are required for downstream improvements, the Developer shall provide such easements at no cost to the Township of Brock.

Easement Dedications

Rear and side yard swales designed to convey external or municipal drainage.

Block Conveyances

Rear and side yard piped storm drainage systems, including catchbasins, french drains, maintenance holes and other appurtenances.

Storm sewers, (other than private connections).

Where underground services are required beyond the limits of a subdivision or site plan.

All overland flow routes, open channels, and defined drainage systems accommodating a major storm.

Walkways and bicycle paths.

Valleys, streams, open channels, watercourses (whether flowing or intermittent), seepage areas, wetlands, natural bodies of water and floodplain lands identified by the Township as being environmentally significant requiring protection or designated as hazard or open space lands.

Stormwater management facilities, including detention and retention ponds, water quality control facilities and infiltration facilities which are to be owned and operated by the Township.

4.11.2 Easement Width Requirements

Easements must be located on one side of the common lot line between adjacent lots. Pipes shall be centered on the easement. The easements will not be permitted to straddle common lot lines. Buildings, including footings or building extensions, will not be permitted to encroach over the limits of the Township's easements.

The minimum width of permanent easements for lot drainage swales shall be 4.0 metres. Additional easement widths may be required depending on the critical depth of swales proposed. Drainage swales to be centered over easements.

4.11.2.1 Regional Service Easements

Easements for regional water and sewers shall be in accordance with Durham Region Engineering Standards.

4.11.3 Block Width Requirements

Blocks of land shall be of sufficient dimension to accommodate the proposed facility, access from a public right-of-way and maintenance requirements.

The minimum width of blocks of land for open drainage channels shall be the width of top of open channel plus 7.5 m along one side of the channel for maintenance requirements.

Valley lands (crest of slope to crest of slope) may be contained within blocks of land to be conveyed to the Township, as a condition of development. Blocks of land in this case shall include 3.0 m platform widths on both sides. Blocks of land will not be considered as part of parkland dedication requirements.

Where two pipes are to be located on one block, the minimum width of the block shall be the width of block required for the larger of the two pipes plus 1/2 the width of block for the smaller pipe, rounded to the next 1.0 m increment. Additional block width may be required to ensure adequate separation between the two pipes and a minimum separation of 3.0 metres between the block limit and the nearest pipe.

4.11.3.1 Storm Sewer Mains

The minimum width of blocks for storm sewers shall be in accordance with the following:

Size of Pipe	Depth of Invert	Minimum Width of Block
250 to 375 mm	3.0 m maximum	6.0 m
450 to 675 mm	3.0 m maximum	6.0 m
750 to 1500 mm	3.0 m maximum	6.0 m
1650 mm and up	4.0 m maximum	4.0 m plus 3 times O.D. of pipe

4.11.3.2 Storm Connections for Rear Yard Catchbasins

The minimum width of blocks for leads to rear yard catchbasins shall be 5.0 metres for pipe sizes ranging from 250 mm to 450 mm in diameter. For pipe sizes greater than 450 mm, the above criteria shall apply. The lead shall be centered on the easement.

4.12 Erosion and Sediment Control

4.12.1 General Requirements

Prior to commencement of any work on site, the Owner is required to implement an Erosion and Sediment Control Plan (ESCP) consisting of a report and drawing(s) as required, to be approved by the Township Engineer. This is in order to effectively reduce on-site erosion and prevent off-site transport of silt, both overland and via the municipal storm sewer system, or into treed and / or environmentally sensitive areas within or external to the development. The ESCP shall include provision to minimize windblown dust and to minimize and manage mud tracking on to adjacent roads.

All erosion and sediment controls are temporary measures constructed prior to any other site work which shall be maintained until assumption of the subdivision. Prior to assumption of the subdivision all temporary measures shall be removed and any disturbed areas stabilized.

Erosion and sediment control measures shall be designed in accordance with Provincial guidelines and the requirements herein.

4.12.2 ESCP Measures and Requirements

The ESCP must address specific requirements for each stage of construction as follows:

a) Clearing and grubbing;
b) Topsoil stripping and rough grading;
c) Construction of services;
d) Street and building construction.

Additional requirements may be necessary where creek or stream crossings for underground services, bridge or culvert construction across active streams, channel diversions and outfalls to active streams

are encountered. Plans shall outline measures to reduce impact on the streams including the timing of construction activities to minimize disruption as required by LSRCA, KRCA, MNR and DFO.

All disturbed ground left inactive shall be stabilized by seeding, sodding, mulching or covering or by other equivalent measure. The period of time shall not exceed 30 days unless otherwise authorized by the Township.

The phasing of individual developments must be taken into account during the design of the control measures including locations for topsoil stockpiles. A primary consideration will be to expose the least possible area of land for the shortest possible timeframe.

All installed erosion and sediment control measures shall be inspected by the Consultant once per week and after each rainfall of 1 cm or greater. Inspection reports shall be forwarded to the Township Engineer within 5 days of inspection.

Typical accepted measures to mitigate erosion during construction are as follows:

Silt Fence

Silt fencing shall be installed wherever surface runoff drains onto adjacent properties, completely around the base of topsoil stockpiles and along the perimeter of all other areas sensitive to sediment accumulation (e.g. watercourses, valleys, woodlots, areas to remain undisturbed etc.).

Silt fence shall be in accordance with OPSD and consistent with LSRCA or KRCA requirements. Installations shall be specified as “Light Duty” or “Heavy Duty” according to the application.

Topsoil Stockpile Protection

Stockpiles shall be located so the toe of the slope is a minimum of 10 m away from a roadway, drainage channel or residential lot. The maximum side slopes shall be 1.5 horizontal to 1.0 vertical.

Runoff shall be controlled by light duty sediment control fence or other approved measures. If remaining for more than 30 days, stockpiles shall be stabilized by vegetative cover or other means.

The maximum stockpile height shall be approved by the Township in consideration of the surrounding land uses and duration the stockpile is to be in place

Sediment Basins, Interceptor Swales

Temporary sediment basins shall be constructed on sites having a disturbed drainage area of greater than 4 hectares. Basins may also be required for smaller areas of disturbance which are sensitive in nature as required by the Township Engineer.

The basin shall be designed to settle out particles that are 0.04 mm in diameter or larger from surface water runoff and storm sewer flows and shall be sized to meet LSRCA or KRCA criteria of minimum 125 m^3/ha, 24hr detention and 125 m^3/ha permanent pool storage volume or the ultimate pond criteria.

Ponds are to have filter fabric / clear stone wrapped perforated riser outfalls with anti-seepage collars and rip rap overflow weirs.

Rock Check Dams

To be installed in swales and ditches in accordance with OPSD 219.210 and 219.211 where runoff drains to adjacent properties.

Catchbasin Controls

Buffers are to be provided according to Township Standard Drawings.

Catchbasins shall be cleaned when the sump is full and before sediment accumulates to within 300 mm of the outlet lead.

Stone Pad Construction Access (Mud Mat)

In order to reduce the tracking of mud onto paved streets, a pad of crushed stone shall be constructed at the site entrance and exit leading onto any existing road in accordance with the Township standard drawing.

4.13 Utilities

4.13.1 General Requirements

The appropriate utility company or their approved contractor shall install the services for Bell, Hydro, Gas, and Cable TV. The Developer must bear the cost of any surcharges for underground installation made and must grant any necessary easements for their services.

Utility crossings for new roads shall be placed prior to placement of granular road base material. Utility crossings for existing roads shall be cut and reinstated in accordance with the Township Standard Drawing.

Compaction of backfill for utility trenches shall be 95% Standard Proctor Dry Density.

4.13.2 Location of Utilities

The location of utilities within the road allowances shall be as detailed on the Township Standard Drawings. Utility drawings shall be submitted to the Township Engineer for approval of utility locations.

All utility wiring is to be housed underground or direct buried. Hydro transformers are to be housed in suitable enclosures and mounted on transformer pads installed at the final surface of ground. Hydro transformer pads must be placed in locations detailed on the Township Standard Drawings. Bell telephone and Cable TV junction boxes are to be mounted at the surface in approved standard enclosures, provided by the appropriate utilities. Hydro transformer pads and Bell telephone and Cable TV junction boxes are in general to be located adjacent to common lot lines.

4.13.3 Electrical Design Requirements

Electrical distribution systems shall generally be designed as buried systems. All requirements for the design of the electrical distribution and street lighting system shall be agreed upon with Hydro One.

4.13.4 Electrical Services Plan

It is the Developer's responsibility to make direct arrangements with Hydro One to design and construct the primary and secondary electrical distribution system, together with all necessary plans.

The Developer is responsible to engage a qualified electrical consultant to design the streetlight electrical distribution system and submit plans to the Township for approval by the Township Engineer. The Developer is responsible to arrange and perform the installation of the streetlight system in accordance with Hydro One requirements.

The design of parking lot illumination must be in accordance with the guidelines of the Illuminating Engineering Society of Canada.

To confirm the average maintained lighting level and the absolute minimum lighting level, a computer printout of the lighting levels throughout the parking lots may be required. The computer printout must identify lighting levels at property lines and 10 m beyond property lines in all directions in order for the Township Engineer to assess light trespass. Lighting levels at property lines shall not exceed 5.0 percent of the average maintained lighting level over the site.

Where Site Plan proposals abut Regional or Provincial roads, lighting level plans with supporting computer printouts shall be submitted to the respective road authorities for their approval, if required.

Resulting lighting levels must be produced for the following elevations where development is proposed adjacent to residential areas:

a) at grade;
b) 2.0 m above grade;
c) 3.0 m above grade.

4.14 Canada Post

The Engineer must communicate directly with Canada Post for locating of their proposed facilities. All proposed locations must be shown on the Composite Utility Plan. Any temporary placement of post boxes must be placed in accordance with the approved final location.

4.14.1 Community Mail Box Requirements

In general, community mail centres and/or site individual super mail boxes shall be placed in locations approved by the Township. Community mail centres shall be suitable located in a plan of subdivision in consultation with Canada Post Corporation. The design of the community mail centre must incorporate such criteria as pedestrian safety, traffic flow and aesthetics. The Township may require the Developer to furnish the following amenities within the community mail centre:

a) Park benches;
b) Fencing;
c) Garbage containers;
d) Landscaping;
e) Pedestrian lighting;
f) Concrete pad or interlocking stone finished surface;
g) Architectural controlled kiosks;
h) Architectural controlled canopies over clusters or super mail boxes;
i) Adjacent car bays parallel to the travelled portion of the roadway.

All details associated with community mail centres shall be identified on the Engineering Drawings and will be subject to the approval of the Township Engineer. The Developer shall be responsible for constructing community mail centres within residential subdivisions, prior to the issuance of the first Building Permit with the exception of model homes.

In areas where site individual super mail boxes are proposed within a residential subdivision, the locations will be subject to the approval of the Township Engineer. In general, individual super mail boxes shall be located near the rear lot line of flankage lots on concrete pads. The location of super mail boxes shall in no way restrict sight lines at intersecting roads. When establishing the spacing of street lighting within a residential subdivision, consideration must be given for the placement of a street light adjacent to the location of super mail boxes. Parallel car bays shall also be located adjacent to super mail boxes to ensure a continuous traffic flow. The length of bays will be governed in general by the number of super mail boxes. Architectural controlled canopies shall also be constructed at the Developer's expense over each group of super mail boxes.

All amenities associated with site individual super mail boxes shall be constructed ad the Developer's expense. All associated details must be shown on the Engineering Drawings and will be subject to the approval of the Township Engineer.

The approval of Canada Post Corporation with respect to location of community mail centres and/or site individual super mail boxes will be required prior to the approval of the Engineering Drawings by the Township Engineer.

4.15 Landscaping

4.15.1 General Streetscape Standards

The Developer is responsible to plant trees along all road allowances in and abutting the development in accordance with the specifications established pursuant to the Subdivision Agreement. Tree locations on Regional or MTO roads must be confirmed with the Region of Durham or MTO.

The developer is required to prepare a landscape design prepared by a qualified professional landscape architect to be approved by the Township on a site by site basis.

4.15.1.1 Locations

Trees shall be planted adjacent to the road allowance over registered lots. Trees shall be planted at a setback of at least 3.0 metres from the property line on private property.

At least one tree shall be planted in front of each semi-detached and single-family dwelling and townhouse unit and at 15.0 m maximum intervals adjacent to all multiple-family lots, blocks and parklands. Where the lot frontage exceeds 25 metres, a second tree per lot shall be planted.

Trees shall be placed along the flankage of all lots at the same spacing interval required for the frontages. For all industrial roads, trees must be planted at a maximum interval of 25.0 m. A minimum of two trees shall be placed along the flankage side of each corner lot.

Trees shall be so located that development of a natural mature tree form in any species or variety used will not conflict with other essential street functions and services.

No trees or shrubs shall be planted within sight triangles at intersections, directly over any underground utilities or directly under any overhead utilities. No trees shall be planted upstream of light standards mounted with traffic signs. New street trees shall be planted to meet the following minimum clearance requirements:

a) 2 m from driveways;
b) 1.5 m from utility pedestals;
c) 1.5 m from concrete base of any cabinets;

d) 2 m from community mail boxes (no evergreens permitted);

e) 3 m from fire hydrants;

f) 3 m from hydro transformers;

g) 5 m from light standards for small or flowering trees;

h) 8 m from light standards for large or shade trees;

i) 15 m from stop signs or end of curb radii at intersections.

The above clearance requirements are considered guidelines for the planning of new streetscapes, and shall be listed on the design drawings. It should be noted that on-site adjustments of spacing and/or species may be required in the field to suit specific site conditions. However, these adjustments shall be approved by the Township prior to their implementation. The contractor/applicant shall be responsible for locating all existing underground and overhead utilities and services prior to any excavation.

Trees shall be placed so that its mature form will not conflict with other essential services and functions.

Timing of Construction

All trees are to be placed during either the spring or fall dormant season in unfrozen soil.

Quality and Source

All trees shall be #1 quality nursery grown stock, 2.25 m to 4.0 m in height with a minimum trunk diameter of 70 mm measured at a minimum of 1.0 m above ground level. All trees shall be free from physical damage, insects, pests and diseases and must have at least three quarters of the root system intact. All trees must meet with the standards of the Canadian Nursery Landscape Association.

Boulevard Tree Species

The following list includes suggested urban tolerant, low maintenance street trees approved for use within the Township. Alternatives hardy to Zone 5 or lower will be considered on a site by site basis, subject to Township review and approval.

Table 7: Tree Species

Species	Common Name	Collector	Residential
Acer x freemanii 'Jeffersred'	Autumn Blaze Maple	▪	▪
Acer x freemanii 'DTR 102'	Autumn Fantasy Maple	▪	▪
Acer saccharum cvs.	Sugar Maple Cultivars		▪

Species	Common Name	Collector	Residential
Celtis occidentalis	Hackberry		▪
Gleditsia triacanthos var. inermis 'Shademaster'	Shademaster Honeylocust	▪	▪
Gleditsia triacanthos var. inermis 'Skycole'	Skyline Honeylocust	▪	▪
Pyrus calleryana 'Glen's Form'	Chanticleer Ornamental Pear		▪
Quercus macrocarpa	Bur Oak		▪
Quercus rubra	Red Oak	▪	▪
Tilia cordata cvs.	Littleleaf Linden Cultivars		▪
Tilia x flavescens 'Glenleven'	Glenleven Linden		▪
Ulmus cvs.	Elm Cultivars	▪	▪

4.15.1.2 Screening

A screening acceptable to the Township, suitable for the purpose shall be placed adjacent to the rear or side property lines of all lands abutting collector or arterial roads where 0.30 m reserves are provided. The screening shall be placed on the 0.30 m reserve. The species and spacing of proposed tree screening shall be submitted to and approved in writing by the Township Engineer prior to the commencement of the planting programs. All tree screening shall be installed during the Spring or Fall dormant season.

The following list of coniferous trees, includes, but does not limit those acceptable for the purpose of screening and buffering:

Large Coniferous Trees

- Austrian Pine
- Red Pine
- White Pine
- Colorado Blue Spruce
- Canadian Hemlock
- Japanese Larch
- Silver Fir
- White Spruce

Small Coniferous Trees

- Mountbatten Juniper

- Wichita Blue Juniper
- Bristle Cone Pine
- Holmstrup Cedar
- Emerald Cedar

Coniferous Shrubs

- Catawbiense Rhododendron
- Mugho Pine
- Pfitzer Juniper
- Japanese Yew
- Globe Cedar

All forms of screening and buffering shall be identified on the engineering drawings and will be subject to the Township Engineer's approval.

4.15.1.3 Protection of Existing Trees and Plantings

The Region of Durham By-law 27-2008 shall govern clearing of woodlots.

All trees not designated for removal in the vicinity of construction activity shall be protected against damage using a suitable fence. Unless otherwise specified in the construction documents, trees shall be protected in accordance with OPSS 801 – Construction Specification for the Protection of Trees. The fence shall be a minimum of 1.2 m in height and supported by steel poles along the tree drip line. Equipment shall not be parked, repaired or refueled, construction materials shall not be stored, and earth materials shall not be stockpiled within the drip line of the protected trees. The contractor shall ensure the construction operations do not cause flooding or sediment deposits on areas where trees are located.

Where work within the drip line of trees not designated for removal is required, the operations of equipment shall be kept to the minimum necessary to perform the work. Prior to commencement of work, a plastic snow fence barrier shall be installed in accordance with OPSD 220.010 – Barrier for Tree Protection. Any trees damaged by the contractor's operations shall be repaired in accordance with OPSS 801.07.03 or replaced at the discretion of the Director of Public Works.

4.15.2 General SWM Facility Standards

The Developer is required to prepare a landscape design for the SWM facility. The design should be prepared in accordance with the LSRCA/KRCA Specifications, if required. The design shall be prepared by a qualified professional landscape architect.

4.16 Parkland Development

Plan

The Developer shall be responsible to prepare a detailed Grading Master Plan for all lands to be dedicated for park purposes. This plan must be submitted to and approved by the Township. This plan shall show all existing trees and features that are in conformity with the end use of the park and that are to remain. All dead trees and other features not in conformity to the end use of the park shall be removed by the Developer. Prior to preparing park development plans, the Developer shall meet with the Township staff to review Township recreational needs, i.e. soccer pitches, ball diamonds, etc.

The said Plan shall form part of the approved Engineering Drawings.

Services

The Developer shall provide a water service connection and sanitary sewer and storm sewer lateral connections to the street line for the park, if required by the Township. Metering requirements for water service connections shall be confirmed with the Region of Durham.

Where required by the Township, underground primary or secondary electrical cables shall be placed from the road allowance to designated locations within parkland.

Grading

The park shall be fine graded in accordance with the approved grading plan with particular care being taken to avoid damage to those trees or features that are to remain. All graded areas shall be covered with a minimum of 100 mm of approved topsoil and shall be seeded and fertilized in accordance with the specifications of the Township Engineer. All topsoil stripped from parklands shall remain on-site and not be removed or sold. The seed mixture proposed shall be approved by the Township prior to placement. All park blocks less than 0.4 ha. in size shall be sodded on 100 mm. of topsoil. All stones and debris shall be removed and disposed of by the Developer prior to the seeding or sodding of any park.

The Developer shall provide chain link fencing along park boundaries or walkways as required by the Township. Building materials or equipment cannot be stored on parkland and parkland shall not be used as a dumpsite. Stripped topsoil from lots or blocks other than the parkland shall not be stockpiled on parkland or other Township blocks.

Timing of Construction

All park blocks must be graded and seeded or sodded within one year of the completion of the base course asphalt road construction in the area adjacent to the park. Seeding must be carried out during the desirable months for seeding being May, August or September. Boulevard grading and sodding on

road allowances adjacent to parklands shall be completed at the same time as the park seeding.

Maintenance

The Developer shall be responsible for the maintenance, fertilizing and mowing of the parklands until "Final Acceptance".

5 Site Plan Developments

5.1 General Requirements

Site Plan Agreement

The authority for the Township to require a developer to enter into a Site Plan Agreement is found within the Planning Act and the Official Plan. Site plan control does not apply to single-family dwellings, semi-detached and duplex dwellings, nor agricultural buildings and structures. The need for a site plan agreement is usually a decision of Council based on a recommendation from staff.

In the event that a Site Plan Agreement is required the Developer should be aware that an application form and fee must be submitted to the municipality. Additional information can be found in the "Site Plan Approval Application Guide" (attached to the application form). In addition, reference should be made to Planning Fees By-Law No. 1290-94-PL which identifies the fees for site plan approval including the need for a Financial Agreement with the municipality to cover its consulting costs if deemed necessary.

Region of Durham and MTO

The Region of Durham is responsible for all Regional Roads, and MTO for all Provincial Highways. Where proposed works abut Region and/or provincial roads, proponents of developments under site plan control shall secure approval from the Region of Durham and/or MTO, where necessary.

The Region of Durham Works Department is responsible for all municipal water and sanitary sewerage systems. Accordingly, those applications which would have an impact on those services must discuss their plans with Regional staff.

The Developer is encouraged to discuss the proposal with the Region prior to making formal application since the Township cannot issue a building permit until these requirements are addressed.

Township of Brock Requirements

Drawings showing grading and the location, size, grade, invert elevations, material and bedding requirements for all storm service connections shall be prepared and submitted to the Township for approval.

5.2 Submission Requirements

Professional Engineer

The Developer shall retain a qualified Professional Engineer to prepare all engineering drawings and

to supervise the construction of all engineering services. The Consulting Engineer shall act as the Developer's representative in all matters pertaining to the design and construction of the services in the development. The requirement for a Professional Engineer to carry out design services for a site plan shall only be specific to those developments where storm services, grading works, roadworks in public right-of-way and retaining walls are proposed.

Submission Sets

Three (3) Site Plan drawing sets and supporting calculations shall be submitted to the Township, for approval by the Township Engineer, comprised of the following:

a) Site Plan;
b) Site Grading Plan;
c) Site Services Plan;
d) Drainage Area Plan;
e) Erosion and Sedimentation Control Plan;
f) Landscaping Plan.

Depending on the complexity of the proposed development, requirements of the above drawings may be combined, or waived, at the discretion of the Township Engineer.

Additional Site Plan drawings shall be prepared when requested by the Township. Prior to receiving a building permit, all plans must be approved by the Township.

A Road Occupancy Permit must be obtained from the Township, Public Works Department before any construction is initiated on a public road allowance under the jurisdiction of the Township. Payment of fees and securities for permanent restoration must be made to the Town before this permit is issued to a qualified contractor.

Supporting documents may be required as follows; Stormwater Management Report, Traffic Impact Assessment, Functional Servicing Report, Noise Report, Environmental Assessment Report, Natural Heritage Evaluation and Archaeological Impact Study as determined on an individual site plan basis.

5.3 Drawing Requirements

5.3.1 General Requirements

All Site Plan drawings shall be prepared from one base plan prepared at a minimum scale of 1:500 and which contains the following information:

a) A key plan at a scale of 1:10,000 showing the site location;

b) A north arrow;
c) Site statistics;
d) Street names, lot and Registered Plan numbers, and property dimensions;
e) Road widenings;
f) Easements;
g) Vehicular loading and parking facilities ;
h) The outline of all buildings with the building numbers and unit numbers indicated and garage locations within the unit;
i) Storage areas and enclosures for garbage and waste materials;
j) Fire routes, truck delivery, waste removal and other large vehicle drive paths;
k) Walkways and ramps;
l) Proposed roadways /driveways and all points of access;
m) Adjacent lands;
n) Existing land features (trees, watercourses, roads, services, etc.);
o) The reference benchmark (geodetic) used to establish vertical control and the site benchmarks to be used for construction;
p) Proposed garbage enclosure(s);
q) All other accessory items (propane tank, a/c units, generators, etc.).

5.3.2 Site Servicing Plan

The Site Services Plan shall show, at a minimum, the location, size and grade (as applicable) of the following services and information:

a) All existing underground services on the streets and easements adjacent to the property;
b) Storm and sanitary service connections to the property with grade and invert information;
c) Water main connections to the property;
d) The basement and finished floor elevations of all proposed buildings;
e) Storm, sanitary and watermain services with length, grade, material and bedding requirements to be constructed within the development;
f) Proposed sanitary and storm maintenance holes with invert and rim elevations;
g) Hydrants, valves and water meters within the development;
h) Sanitary, storm and water service connections to individual units, as applicable;
i) Roof water leaders and method of discharge;
j) All construction notes required to describe the construction detail or requirements;
k) The locations of prime and reserve tile-bed areas, including mantles where required;

l) Proposed wells;

m) Illumination standards;

n) Proposed landscape features;

o) Proposed garbage enclosure.

5.3.3 Site Grading Plan – Commercial and Industrial Use

The site grading plan shall show, as a minimum, the following information:

a) Centreline grades at 20 m intervals along all existing streets bounding the property and existing grades;

b) A legend indicating which are existing and proposed elevations;

c) Contours at maximum 0.5 m intervals to indicate the existing elevations of the site. These contours are to extend to a minimum distance of 15 m. beyond the property limits to indicate the grading and drainage patterns of the adjacent lands;

d) All building elevations to be established and referenced to a “Finished First Floor” or “Finished Entrance Floor” elevation and a “Finished Basement Floor” elevation;

e) The location of wells, waste disposal tile bed areas, etc.;

f) Cross sections as required to clarify the proposed grading, particularly in relation to adjacent lands;

g) Proposed elevations on paved areas, around proposed buildings, along swales, along roadways, parking areas, driveways, catchbasin rim elevations, and any other elevations necessary to establish the grading and drainage patterns for the development. Arrows to be used to indicate direction of the surface drainage;

h) A typical roadway cross section to indicate the pavement and granular base design;

i) Roadway dimensions and curb radii;

j) Concrete curbs, sidewalks, walkways;

k) Embankments, retaining walls, stairs, play areas, swimming pools, etc.;

l) Curb depressions, with dimensions;

m) All maintenance holes, catch basins, hydrants, valves to be shown by a symbol.

5.3.4 Site Grading Plan – Residential Use

Site grading design and drawings prepared for infill residential developments, which are subject to Site Plan Control shall be completed in accordance with residential lot grading requirements in Section 4.10. Drainage easements (particularly for shoreline development) may also be required in accordance with Section 4.11.

All shoreline development must be completed in accordance with the Lake Simcoe Protection Act where applicable.

5.3.5 Drainage Area Plan

Only if it is deemed necessary by the Township, a plan shall be prepared to a scale of 1:1,000 or 1:2,000 dependent upon the size of the watershed area, to show the nature of the drainage of the lands surrounding the development site and to show all external drainage areas that are contributory to the drainage system for the development. The external drainage areas shall be divided into smaller tributary areas and the area and the location to which the tributary area is considered in the design shall be clearly shown. The plan shall clearly show all existing contours used to justify the limits of the external drainage areas.

In lieu of precise information on development on the whole or any part of a watershed area, the consolidated Official Plan shall be used to determine the correct values of the run-off parameters to be used for all external areas in the design and to determine the specific areas to which these values apply.

An internal storm drainage plan shall be prepared to a scale of 1:200 proposed storm sewer system shall be shown on this plan with all maintenance holes numbered consecutively from the outlet. The maintenance holes shall be the tributary points the design and the area contributing to each maintenance hole shall be clearly outlined on this plan. The area, in hectares, of each contributing area (to the nearest hundredth) and the run-off parameter used shall be shown in a circle located within the contributing area. In cases where areas of different run-off parameters may be tributary to the same maintenance hole, the areas and the parameters shall be separately indicated on the plan.

5.3.6 Erosion & Sediment Control Plan

Drawings

ECSP Drawings shall be comprised of, and include the following:

a) Scale at 1:500 or 1:1000;
b) Location of buildings, existing and proposed, within and adjacent to the property;
c) All natural features within and adjacent to the property (woodlots, watercourses, valley lands etc.);
d) Trees to be preserved;
e) Existing contours at 0.5 m intervals;
f) Proposed interim and final elevations;
g) Areas to be disturbed;
h) Direction of overland flow;
i) Staging of construction and implementation of control measures;

j) Proposed erosion and sediment control measures (silt fence, check dams, sediment basins, interceptor swales, stone mud mats, etc.);

k) Topsoil stockpile locations with estimated quantities, maximum height and side slopes;

l) Detail drawings.

Report

A brief report shall accompany the drawings which, at a minimum, outline staging of construction and implementation of the proposed erosion and sediment control measures, a description of measures to be undertaken, silt basin calculations, features to be protected and an inspection and maintenance program.

The report shall also recommend measures to control dust such as road cleaning, watering, work restrictions on windy days, minimizing disturbed areas and other measures.

5.3.7 Landscaping Plan

A Landscaping Plan shall be prepared by a qualified Landscape Architect if required by the Township. The Landscaping Plan shall show all landscaping details as required by the Site Plan Agreement. A schedule of plant species and sizes is to be identified on the landscaping plan.

All maintenance holes, catchbasins, hydrants, valves, streetlights and other servicing features that appear above grade shall also be shown on the landscaping plan.

5.4 Design Requirements

5.4.1 Site Grading Design

a) The drainage of the site is to be self-contained;

b) The grading of the site is to be compatible with the elevation of the surrounding lands;

c) All grassed embankments shall have a maximum slope of 3:1;

d) The grade of grassed or other landscaped areas shall have a maximum slope of 10% and a minimum slope of 1%;

e) Swales on grassed areas shall have a minimum slope of 1.5% and a maximum slope such that the velocity for the flow contained does not exceed 1.25 metres per second;

f) The maximum suggested length for any drainage swale is 75 m;

g) The minimum depth for any drainage swale shall be 300 mm;

h) The maximum depth for any drainage swale shall be 750 mm;

i) The maximum side slope on any drainage swale shall be 3:1;

j) All driveways shall have positive drainage from the streetline to the roadway.

5.4.2 Site Servicing Design

Site Servicing Design

a) All sanitary and storm sewers shall be designed in accordance with the requirements of the Ontario Building Code and the Township. The provisions of the Ontario Water Resources Act, R.S.O., 1990, may apply to sanitary and storm sewer works;

b) All storm sewers shall be located within the limits of the roadway with storm service connections being provided for the roof water leaders along the front of the building.

   Weeping tile foundation drains shall be connected to the storm sewer, where available;

c) All storm sewer connections shall be sized according to the requirements of the Ontario Plumbing Code and shall be installed on a minimum grade of 2.0%. Goss traps shall be placed in parking lot catchbasins, located adjacent to fuelling areas. The rainwater leaders draining the rear halves of all townhouses shall be discharged onto grassed or garden areas.

   The rainwater leaders draining the front halves of all townhouses shall be connected to the storm sewer system and the roof area must be included in the calculated imperviousness ratio.

   Precast concrete splash pads shall be placed at each rainwater leader downspout, all in accordance with the Standard Detail Drawing.

   The rainwater leaders from all commercial, industrial, institutional and high density residential buildings should be discharged onto grassed or garden areas, if possible and if acceptable to the Township. Alternatively rainwater leaders may be directed to on-site detention facilities to achieve an equivalent controlled discharge rate of 42 litres per second per hectare of roof area.

d) Yard catchbasins shall be provided where required for drainage of landscaped areas;

e) Catchbasin maintenance holes may be used for roadway drainage;

f) All water mains shall be designed in accordance with the requirements of the Ontario Plumbing Code, and Township of Brock Fire Department.

   The water main design shall be submitted to the Township of Brock Fire Department for approval of the water main layout and the hydrant locations. The provisions of the Ontario Water Resources Act may apply to the water main works;

g) Where requested, easements for utilities shall be provided at no cost to the utility company.

Roadway Design

a) All roadways shall be designed in accordance with the most recent engineering requirements of the Township;

b) The minimum pavement design for all multiple—family roadways shall be:

   i. Subgrade compacted to 95% proctor density;

ii. 450 mm. compacted depth of Granular 'B';
iii. 150 mm. compacted depth of Granular 'A' ;
iv. 50 mm. compacted depth of HL8 Asphalt base course;
v. 40 mm. compacted depth of HL3 Asphalt surface course.

c) All driveways in multiple-family projects shall be paved with asphalt or an approved alternate from the edge of the roadway to the garage. The minimum asphalt pavement design for all driveways shall be:

i. Subgrade compacted to 95% proctor density;
ii. 150 mm. compacted depth of Granular 'A';
iii. 50 mm. compacted depth of HL3 asphalt.

d) The minimum width of a multiple-family roadway for two way traffic with no street parking shall be 6.0 m from E/P to E/P;

e) All roadways serving multiple-family projects shall be designed to facilitate passage of emergency and service vehicles. Curb returns having an 8.0 m radius and inside bends having at least a 15.0 m radius is required. On dead end streets provision shall be provided for vehicle turning;

f) The minimum grade for any multiple-family roadway shall be 0.5% and the maximum grade shall be 6%;

g) The minimum grade for any driveway in the multiple-family project shall be 1% and the maximum grade shall be 6.0%. This maximum grade creates an undesirable condition and should be used only when necessary due to site conditions;

h) The location of driveway entrances on Township roads shall be such that the minimum sight distance is maintained on the Township's road in both directions. The following criteria will apply to new driveway entrances:

Posted Speed Limit	Minimum Sight Distance
km/h	Metres
40	45
50	65
60	90
70	120
80	150

5.4.3 Parking Design

When designing the layout of parking lots, the designer shall consider the turning requirements for delivery vehicles and emergency vehicle access. They should also take into account queue development at the entrance, pedestrian flow through the parking area, and dropped curb with ramps at convenient locations for wheelchair accessibility.

The designer shall meet the requirements identified in the Township Zoning By-law as well as setbacks from property line.

Grading

The grading of parking areas should not be less than 1% and not more than 7%. Grades perpendicular to parked vehicles should not exceed 4%. The grading shall provide for an overland flow route to an adequate drainage outlet without exceeding a ponding depth of 0.25 metres anywhere on the parking lot.

Parking Spaces

Parking space dimensions shall be in accordance with the Township zoning by-law section 10.18.

Barrier free parking spaces are to be provided in accordance with Township By-law requirements. All barrier free parking spaces are to be signed with the accessible parking symbol painted on the asphalt of each space and with the by-law sign posted in front of each space.

All access ramps to sidewalks shall be located so they are in line with the access aisle and not obstructed by any parking space.

Parking spaces are to be delineated with 0.1 m wide yellow paint lines.

Layout

The parking lot layout shall provide an area for snow storage that does not impact accessible parking; does not reduce the total parking spaces by more than 5%; and has consideration for the features of the landscaping plan.

Where monolithic curb and sidewalk is used in a parking area, the minimum width of the sidewalk is to be increased to 1.8 metres if a car bumper may overhang the curb.

Security and Lighting

Parking areas are to be located in highly visible areas of the site. For illumination of parking spaces, aisles and driveways, the lighting shall be arranged to divert the light away from adjacent properties and streets and shall be downcast. See Section 4.7 for additional design criteria.

5.4.4 Drainage Design

Stormwater Management

Stormwater management techniques shall be employed on all sites in accordance with requirements identified in this document.

As a guideline, the degree of control on the quantity of run-off from a proposed development shall be:

The post-development peak flow shall not be greater than the corresponding pre-development peak flow for the 1:5 year, 1:10 year, 1:25 year and 1:100 year storms. Other regulatory agencies may require other storm flows to be analysed (i.e. 2 year and/or Regional flows). Note for specific sites with downstream constraints, more stringent requirements may be established by the Director of Public Works.

Where on site stormwater quantity controls are required, the design shall use the following as a guideline:

a) A control device (orifice) must have a diameter of no less than 75 mm in order to prevent clogging of the opening;
b) Control devices shall be installed on the upstream side of the maintenance hole;
c) Storm connections from the building roof and foundation drains must be made downstream of the maintenance hole and/or catchbasin inlet controls;
d) Ponding limits and available storage are to be depicted on the site servicing drawings, and the maximum ponding depth in parking areas is not to exceed 250 mm;
e) An overland flow route shall be clearly marked on drawings. The grading of parking lots and landscaped areas must provide a safe path for the overland flow route to the surrounding municipal right of way during storms exceeding the design storm event;
f) Roof drains should be selected to give a minimum discharge of 0.042 cms/ha of roof area;
g) Details and concepts are to conform to the Urban Drainage Design Guidelines, set out by the MOECC;
h) On-site stormwater management facilities may require an Environmental Compliance Approval from the MOECC. Two completed MOECC Application forms are to be submitted to the Township signed by the developer and consultant, in accordance with MOECC requirements;
i) Oil-Grit Separators (OGS) are required on sites where there is a potential for hazardous spills (e.g. fuel filling areas). On other site plans, OGS's will be assessed on a site by site basis as deemed not feasible based on the watershed constraints. Where OGS's are deemed unwarranted, a cash in lieu contribution may be considered, subject to the approval of the Director of Public Works;

j) Where parking lot detention is used in industrial, commercial, institutional and high density residential developments, the controlled discharge rate from parking lots shall not be greater than 250 litres per second per hectare of asphalt and shall not be less than 195 litres per second per hectare of asphalt. Goss traps shall be placed in parking lot catchbasins where there are nearby fuelling areas.

5.4.5 Erosion & Sediment Control Design

In accordance with Section 3.14 & 4.12.

5.4.6 Landscape Design

In accordance with Section 3.13 & 4.15.

5.5 Financial Securities

A cash deposit or letter of credit (LC), in a Township approved format, is required for all engineering works both on and off site in order to secure the acceptable performance and completion of all works detailed on the engineering plans.

The applicant's engineering consultant shall provide a detailed cost estimate and supporting information for the engineering portion of the financial security. Items to be included in the detailed cost estimate include, but are not limited, to the following:

a) Storm sewer system;
b) Concrete curbing;
c) Concrete transfer pad for a garbage/recycling bin enclosure;
d) Concrete sidewalks;
e) Granular base and sub-base materials;
f) Granular driving surface or pavement for parking areas and internal road system;
g) Retaining walls;
h) Regulatory fencing;
i) Erosion control measures;
j) Stormwater management works;
k) Road cleaning; and road damage.

The supporting information shall include material quantities, unit prices, site plan and a grading and site servicing plan.

The applicant shall be responsible for removing mud and other debris that accumulates on the public streets during construction. If the applicant does not comply with the Township's notification to clean

the affected streets within twenty-four hours, then the Public Works Department shall have the right to clean the affected streets at the sole expense of this applicant by use of a corresponding portion of the aforementioned financial security.

5.6 "As-Constructed" Drawings

After all construction is complete, the design drawings shall be amended to incorporate the changes and alterations made during construction in order that the drawings as amended represent the services and conditions as constructed. Four hard copy sets of "As-Constructed" drawings must be submitted to the Township, as well as a digital set in pdf and dwg.

5.7 Certification

Upon completion of construction the Consulting Engineer shall provide written certification to the Township that all works have been constructed in accordance with the approved plans and specifications and in accordance with good engineering practices.

The wording is to be followed by the Professional Engineers stamp and signature.

5.8 Final Inspection

Upon completion of all construction the Developer shall request the Township to carry out a final inspection of the works. All deficiencies found during this final inspection shall be immediately corrected by the Developer. This final inspection is carried out for the benefit of the Township and shall in no way relieve the Developer of his obligations under the Condominium Act and the Site Plan Agreement.

6 Landscaping Implementation Procedures

Once the infrastructure of the subdivision is in place and housing is under construction, the developer must hire a landscape contractor to install the approved landscape components. The landscape architect shall inspect and certify the installation.

6.1 Streetscape Works

The developer is required to hire a contractor to install the landscape elements called for in the approved landscape plans. The Consulting Landscape Architect will inspect the work, report on progress to the Township and provide the Township with as-built drawings. An important part of the Landscape Architect's duties will be to maintain a Summary Chart documenting the history of each new tree planted in the parcel of land being developed. At the appropriate times, the Township will conduct its own inspections. All streetscape works are to be guaranteed and maintained until assumption of services or 24 months whichever is longer.

6.2 Naturalization Works

As with streetscape works, the process begins with the developer hiring a contractor to install the landscape elements called for in the approved landscape plans. The developer's landscape architect will supervise the work and report on progress to the Township. At the appropriate times, the Township will conduct its own inspections. All naturalization works are to be guaranteed and maintained until assumption of services or 24 months whichever is longer.

6.3 Maintenance Agreement for Naturalization Areas

Carrying out a maintenance program for the first two years after planting the naturalization areas will significantly reduce the mortality rate of the trees, shrubs, grasses, etc. and help to establish healthy vegetative cover.

At the time of planting, the planting details and specifications should be followed faithfully. This means, among other things, the proper transportation and handling of plant material, the use of fertile planting soil, the proper staking of trees and the proper installation of rodent protection.

Maintenance shall include:

a) Apply appropriate fertilizer to promote growth;
b) Prune dead or diseased tissue;
c) Remove dead plant material;
d) Replace dead coniferous naturalization species to maintain a minimum live-stocking standard of 90%;

e) Replace dead deciduous and shrub naturalization species to maintain a minimum live-stocking standard of 90%;

f) Suppress weed growth around new trees and shrubs by adding mulch and/or removing weeds by hand. Weeds shall not be cut down with a power trimmer.

An assessment of plant material is to be carried out annually by the Landscape Architect between mid-July and early September and reported to the developer, the contractor and the Municipality in the form of a Naturalization Assessment Report. Plant vigour can be determined by a visual inspection of the current year's foliage.

The initial inspection and assessment will be conducted in the summer following the planting. It will take account of the survival and condition of the plants. It will also include a summary of the maintenance operations performed. Finally, the assessment will propose any additional maintenance measures thought necessary, and recommended where, the following spring, plants need to be replaced or new plants added.

The second assessment will be conducted the following year, and will provide similar information to the first.

The third and final assessment will take place just prior to assumption. The final report will provide a complete summary of the initial plantings, as well as a record of the replacements and maintenance services carried out during the guarantee period. The report will also make note of any additional work that should be performed prior to the Township conducting their own final inspection.

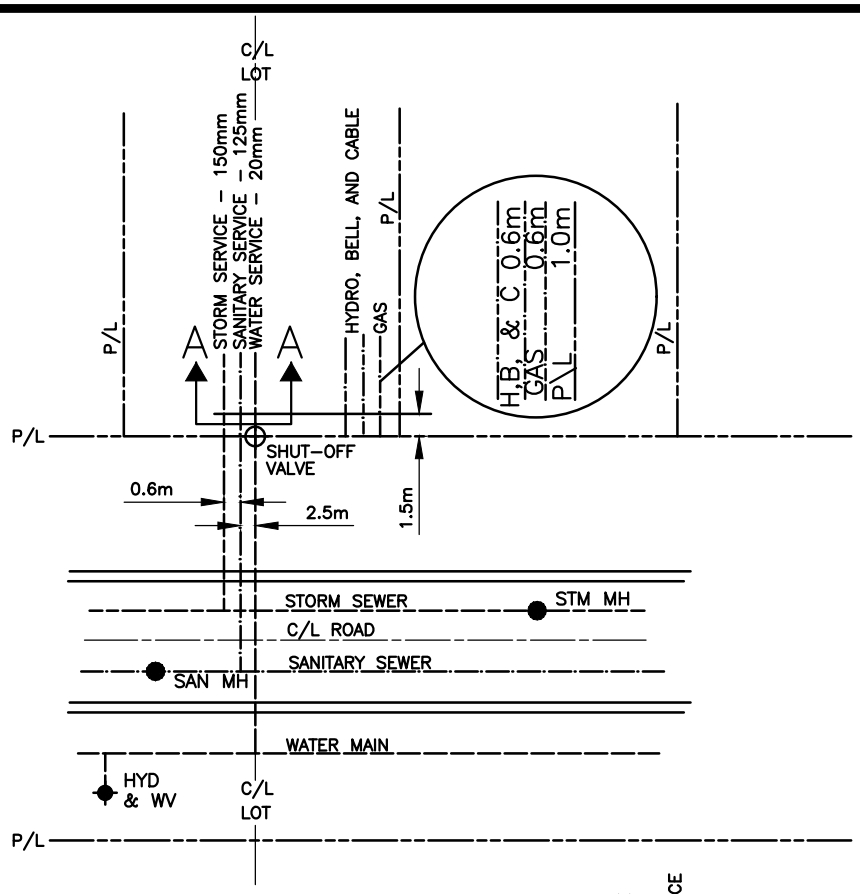
7 Standard Drawings - Index

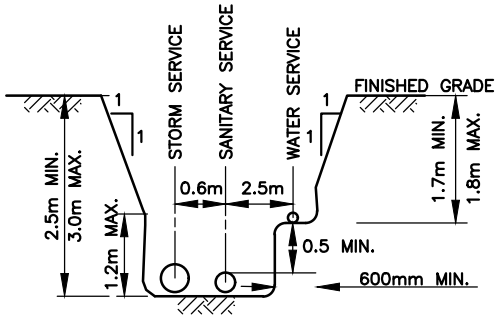
In general, OPSD's shall be used and referenced by the designer. The suitability of any particular OPSD shall be determined by the Township Engineer.

The Township Standard Drawings which form part of this document have been developed to reflect specific requirements of the Township and shall take precedence over OPSD's.

Number	Description	Revision Date
100	Miscellaneous	
161	Service Location – Single Family Residential	June, 2018
162	Service Location – Semi-Detached Residential	June, 2018
163	Service Location – Freehold Townhouse Units	June, 2018
164	Service Location – Commercial, Industrial and Multi-Residential	June, 2018
171	Supports for House Connections and Catch Basin Leads	June, 2018
200	Roadways	
201A	Rural – Local improvement (Open Ditch)	June, 2018
201B	Rural – (Paved) Local Residential	June, 2018
203	Rural – (Un-Paved) Local Improvement	June, 2018
208	Urban – Local Residential	June, 2018
209	Urban – Collector Residential	June, 2018
214	Rural – Local Industrial	June, 2018
215	Urban – Local Industrial	June, 2018
217	Rural – Residential Cul-De-Sac	June, 2018
223	Temporary Turnaround Residential – Urban	June, 2018
224	90° Bulb Detail	June, 2018
300	Walkways, Fencing	
311	Chain Link Security Fence	June, 2018
313	Wood Privacy Fence	June, 2018
320A	Pedestrian Walkway –Urban	June, 2018
320B	Vehicle Access/Pedestrian Walkway Gate	June, 2018
321	Pedestrian Walkway – Rural	June, 2018
331	Standard Street Name and Regulatory Signs	June, 2018
345	Joint Utility Trench and Road Crossing Sections	June, 2018

400	Lot Grading	
400	Typical Legend for Lot Grading Plan	June, 2018
401	Front Lot Drainage	June, 2018
402	Rear Lot Drainage	June, 2018
403	Rear Lot Drainage for Walkout or Back Split House	June, 2018
404	Front Lot Drainage for Front Split House	June, 2018
405	Shoreline Drainage	June, 2018
406	Typical Shoreline Lot Grading Cross-Section	June, 2018
500	Drafting/Notes	
500	Standard Plan Sheet	June, 2018
502	General – Construction Notes	June, 2018
503	Notes – Storm Sewers	June, 2018
504	Notes – Roads	June, 2018
600	Silt Control	
602	Sediment Control Measure at Catchbasins & Catchbasin Manholes	June, 2018
603	Construction Entrance Mat	June, 2018
700	Street Lighting, Utilities	
700	Town and Country Post-Top Luminaire	June, 2018
702	Horizontal Type Luminaire	June, 2018
900	Landscaping	
901	Deciduous Tree Planting	June, 2018
910	Coniferous Tree Planting	June, 2018
911	Shrub Planting	June, 2018





SECTION A–A

SCALE: NTS

NOTES:

1. SERVICE TO EXTEND 1.5m INSIDE PROPERTY LINE.
2. UNDER NO CIRCUMSTANCE SHALL SERVICES CROSS ONE ANOTHER.
3. EACH HOUSE MUST BE SUPPLIED WITH A SEPARATE 150mmø STORM SEWER SERVICE LATERAL. COMMON SERVICE CONNECTIONS WITH Y's WILL NOT BE PERMITTED. P.V.C. PIPE TO BE OTHER THAN WHITE.
4. THE MINIMUM SIZE FOR STORM DRAIN CONNECTION SHALL BE 150mø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE STORM SEWER TO THE BUILDING ENVELOPE.
5. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE. P.V.C. PIPE TO BE WHITE.
6. ALL UNDERGROUND SERVICE CABLES TO BE PLACED MINIMUM 1.0m BELOW FINISHED GRADE AT LOTS.
7. SHUT-OFF VALVES TO BE PLACED ON PROPERTY LINE.
8. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED.

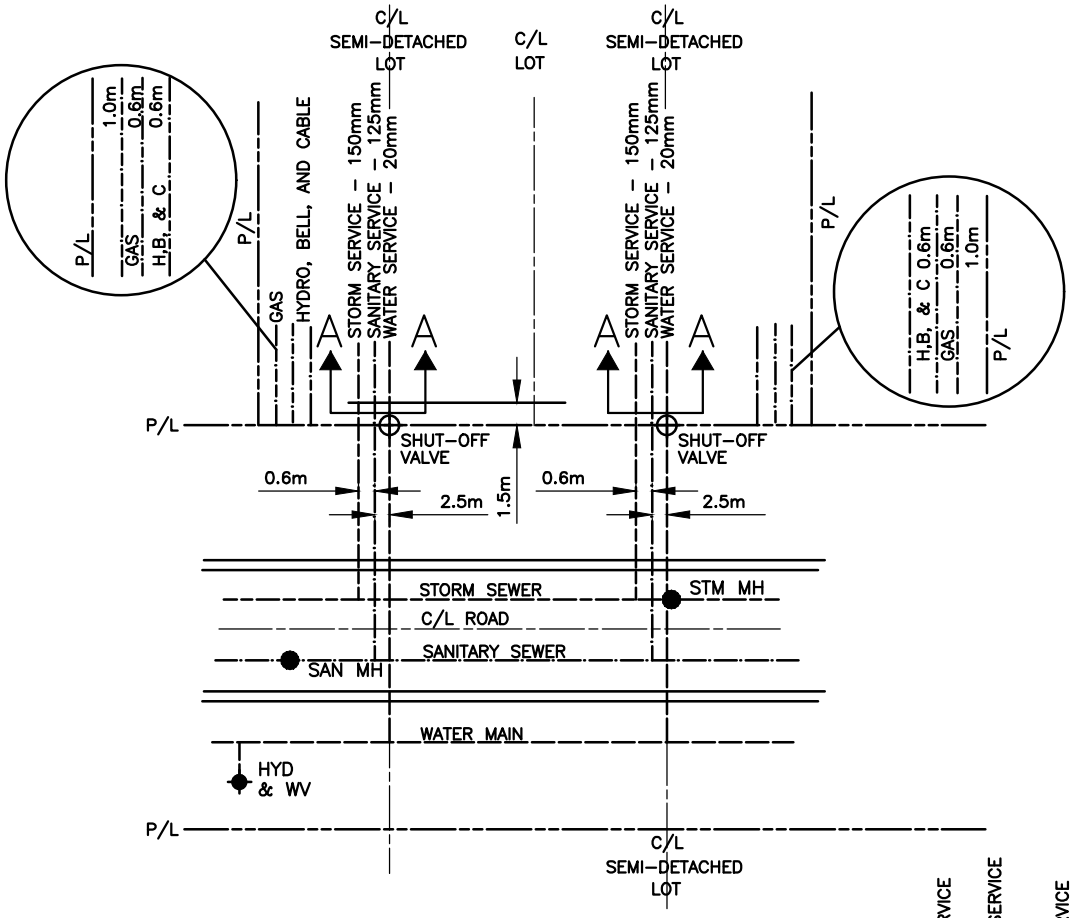
NO.	REVISION	APR'D	DATE

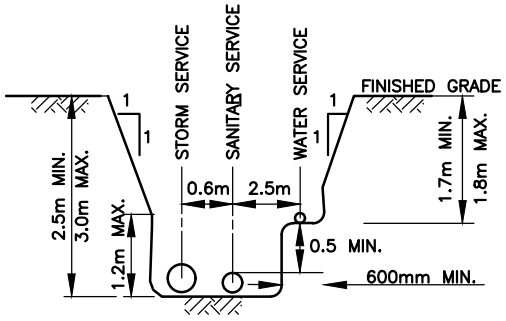
TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

SERVICE LOCATION
SINGLE FAMILY RESIDENTIAL

STD. No. 161





SECTION A–A
SCALE: NTS

NOTES:

1. SERVICE TO EXTEND 1.5m INSIDE PROPERTY LINE.
2. UNDER NO CIRCUMSTANCE SHALL SERVICES CROSS ONE ANOTHER.
3. EACH HOUSE MUST BE SUPPLIED WITH A SEPARATE 150mmø STORM SEWER SERVICE LATERAL. COMMON SERVICE CONNECTIONS WITH Y's WILL NOT BE PERMITTED. P.V.C. PIPE TO BE OTHER THAN WHITE.
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5. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE. P.V.C. PIPE TO BE WHITE.
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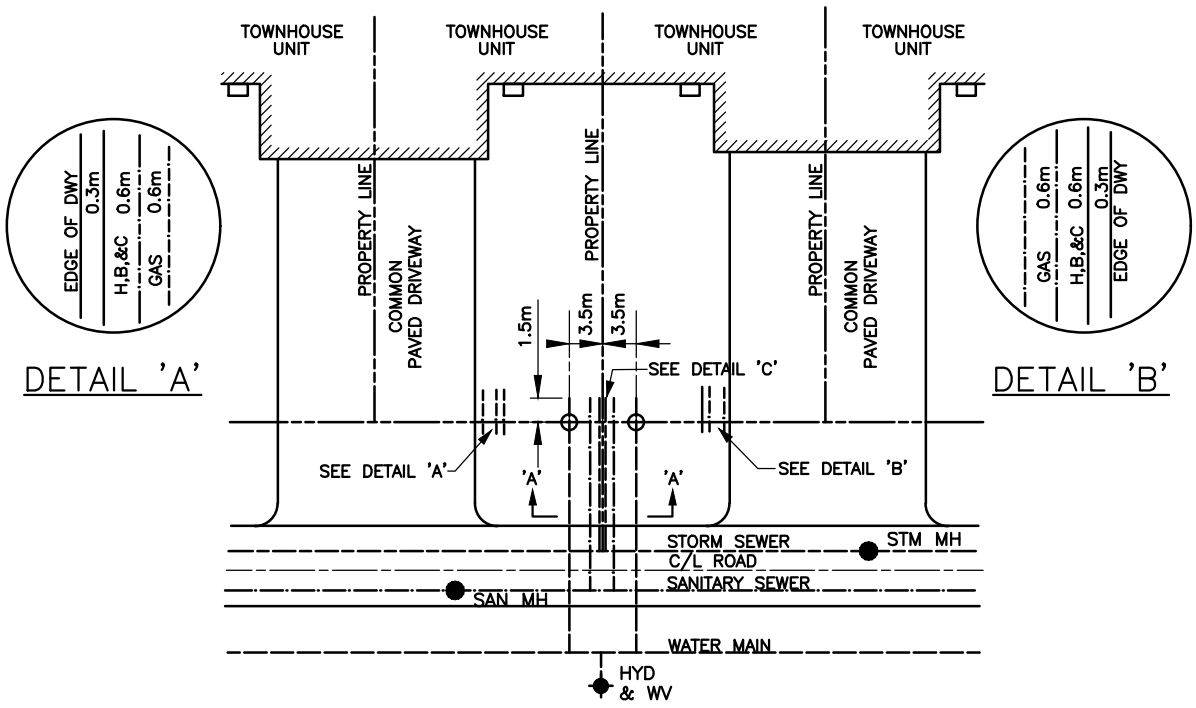
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

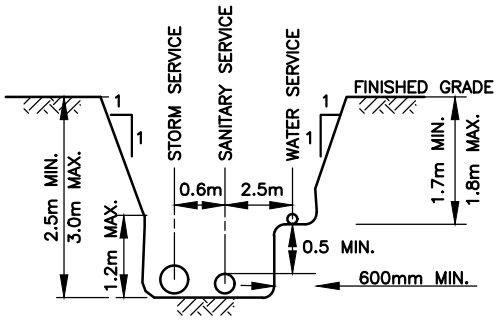
SERVICE LOCATION
SEMI DETACHED RESIDENTIAL

STD. No. 162



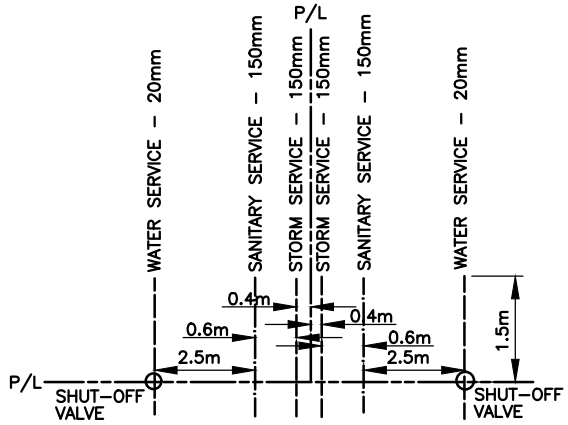
DETAIL 'A'

DETAIL 'B'



SECTION A–A

SCALE: NTS



DETAIL 'C'

SCALE: NTS

NOTES:

1. SERVICE TO EXTEND 1.5m INSIDE PROPERTY LINE.
2. UNDER NO CIRCUMSTANCE SHALL SERVICES CROSS ONE ANOTHER.
3. EACH HOUSE MUST BE SUPPLIED WITH A SEPARATE 150mmø STORM SEWER SERVICE LATERAL. COMMON SERVICE CONNECTIONS WITH Y's WILL NOT BE PERMITTED. P.V.C. PIPE TO BE OTHER THAN WHITE.
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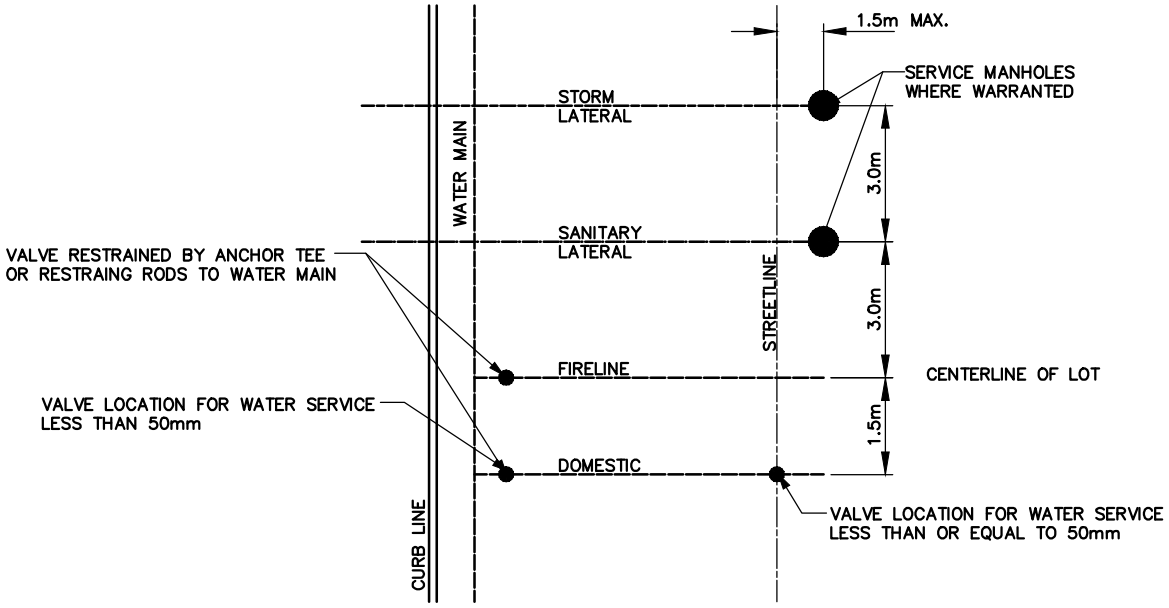
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

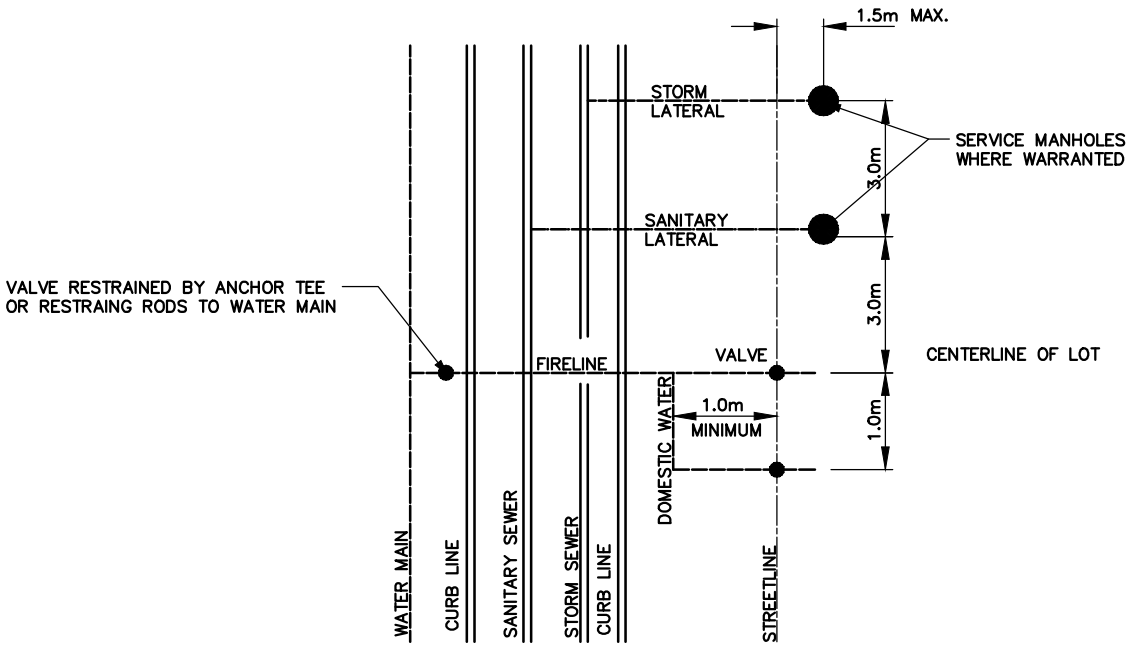
APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

SERVICE LOCATION
FREEHOLD TOWNHOUSE UNITS

STD. No. 163



SHORT SIDE CONNECTION



LONG SIDE CONNECTION

NOTE:

1. SERVICE LOCATIONS TO BE CONFIRMED WITH TOWNSHIP ENGINEER.

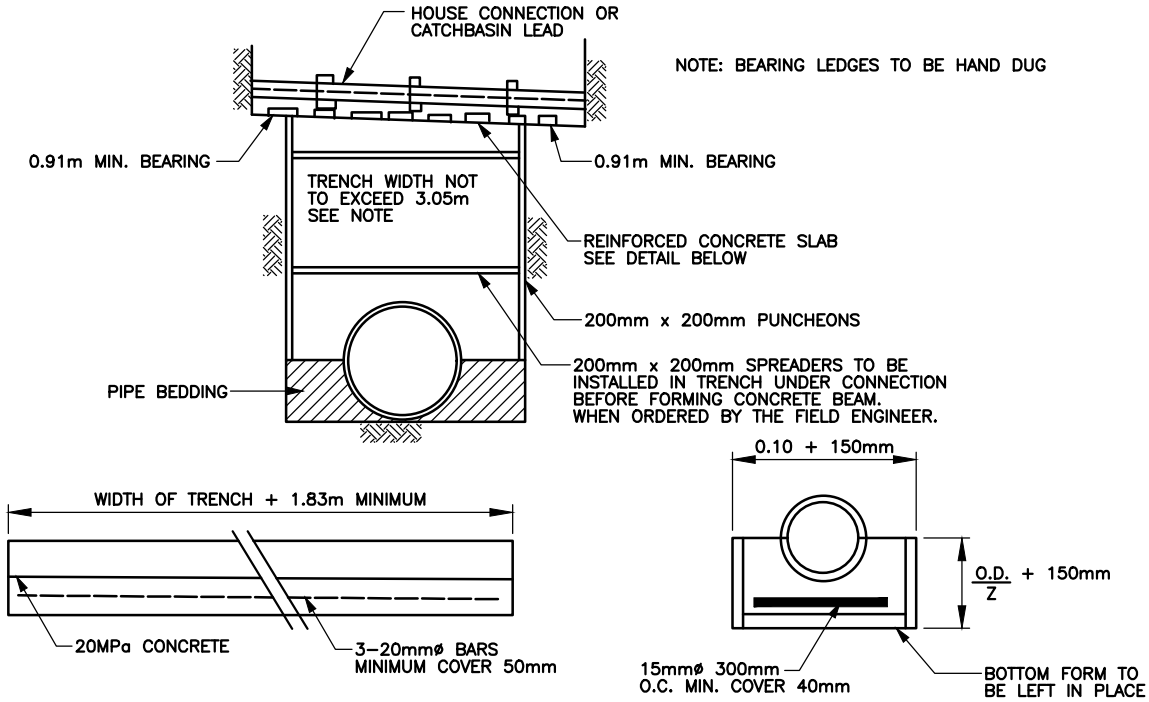
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

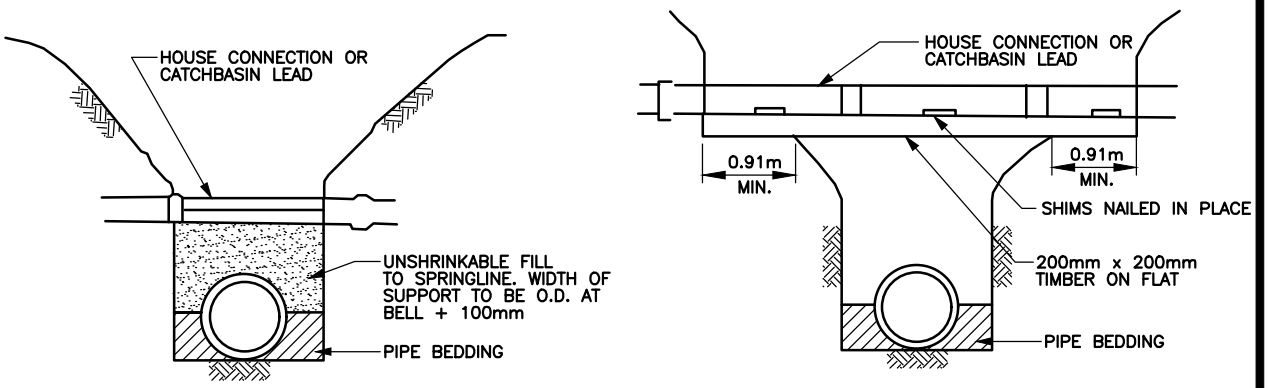
SERVICE LOCATION –
COMMERCIAL, INDUSTRIAL AND MULTI–RESIDENTIAL

STD. No. 164



REINFORCED CONCRETE SUPPORT FOR HOUSE CONNECTIONS AND CATCHBASIN LEADS WHEN WIDTH OF TRENCH EXCEEDS 1.52m BUT LESS THAN 3.05m

NOTE: WHEN WIDTH OF TRENCH EXCEEDS 3.05m METHOD OF SUPPORTING HOUSE CONNECTIONS AND CATCHBASIN LEADS WILL BE AS DIECTED BY THE FIELD ENGINEER.



SUPPORT FOR CONNECTION CROSSING TRENCH WHEN WIDTH OF TRENCH IS LESS THAN 1.52m

NOTES:

1. .WHERE HOUSE CONNECTIONS OR CATCHBASIN LEADS CROSS A SEWER TRENCH, THEY WILL BE SUPPORTED ON A NEW 20mm x 200mm TIMBER WHICH HAS A MINIMUM BEARING OF 0.91M AT EACH END ON UNDISTURBED GROUND. CONNECTION MUST BE PROPERLY SHIMMED OR BEDDED ON 20MPa CONCRETE FILL TO SPRINGLINE AS PER DETAILS.
2. TO BE USED WHEN INSTALLING SEWER OR WATERMAIN ON EXISTING R.O.W.
3. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS.
4. FOR ALL CROSSING OF GAS MAINS, CONTRACTOR TO CONTACT GAS COMPANY FOR LOCATES AND INSPECTIONS.

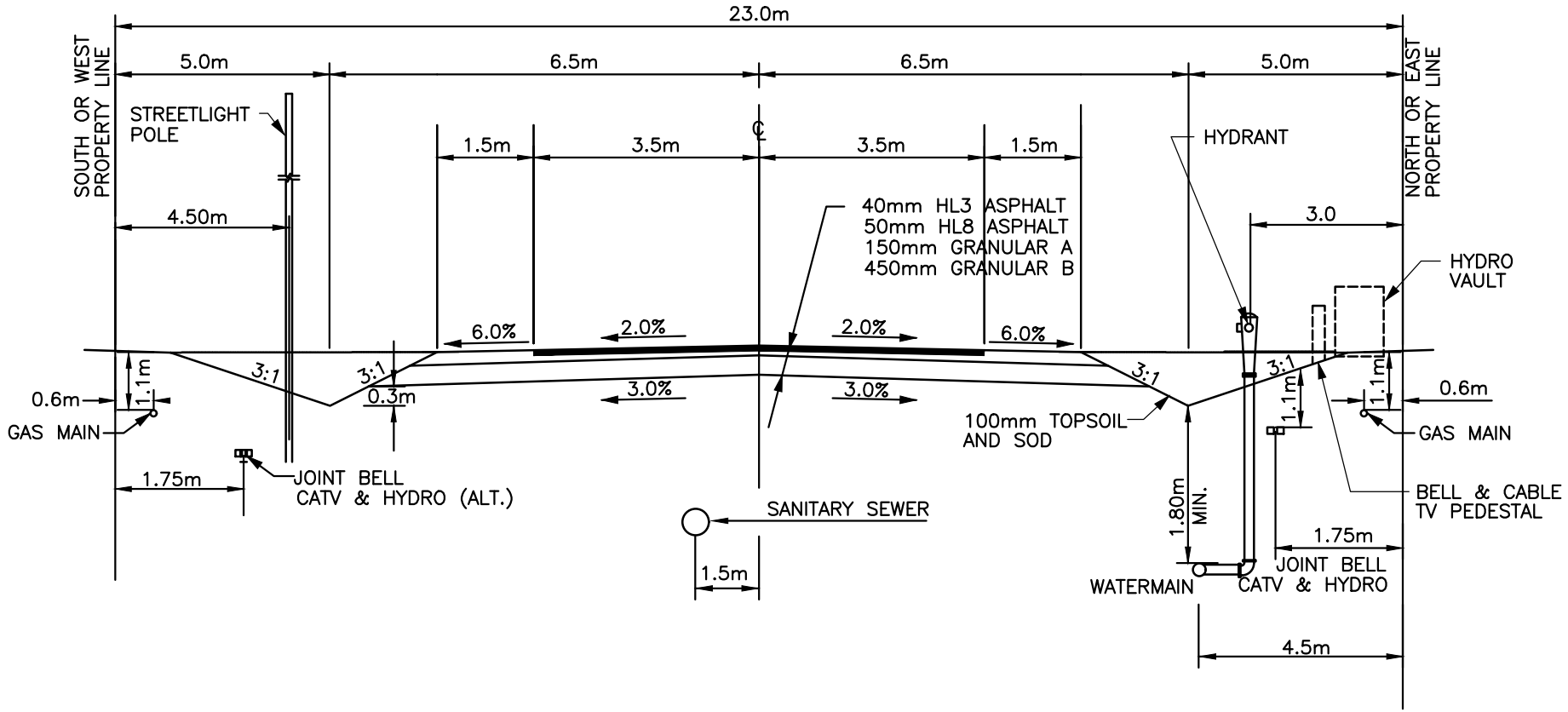
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

SUPPORTS FOR HOUSE CONNECTIONS AND CATCH BASIN LEADS

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 171



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. ALL WATER CURB STOPS TO BE PLACED ON PROPERTY LINE.
5. A 3.0m WIDE PLATFORM AREA SHALL BE CONSTRUCTED FOR EACH FIRE HYDRANT. THE MINIMUM CULVERT LENGTH SHALL BE 6.5m AND THE MINIMUM DIAMETER SHALL BE 400mm. PLATFORM AREAS SHALL BE RESTORED WITH 100mm TOPSOIL AND SOD.
6. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

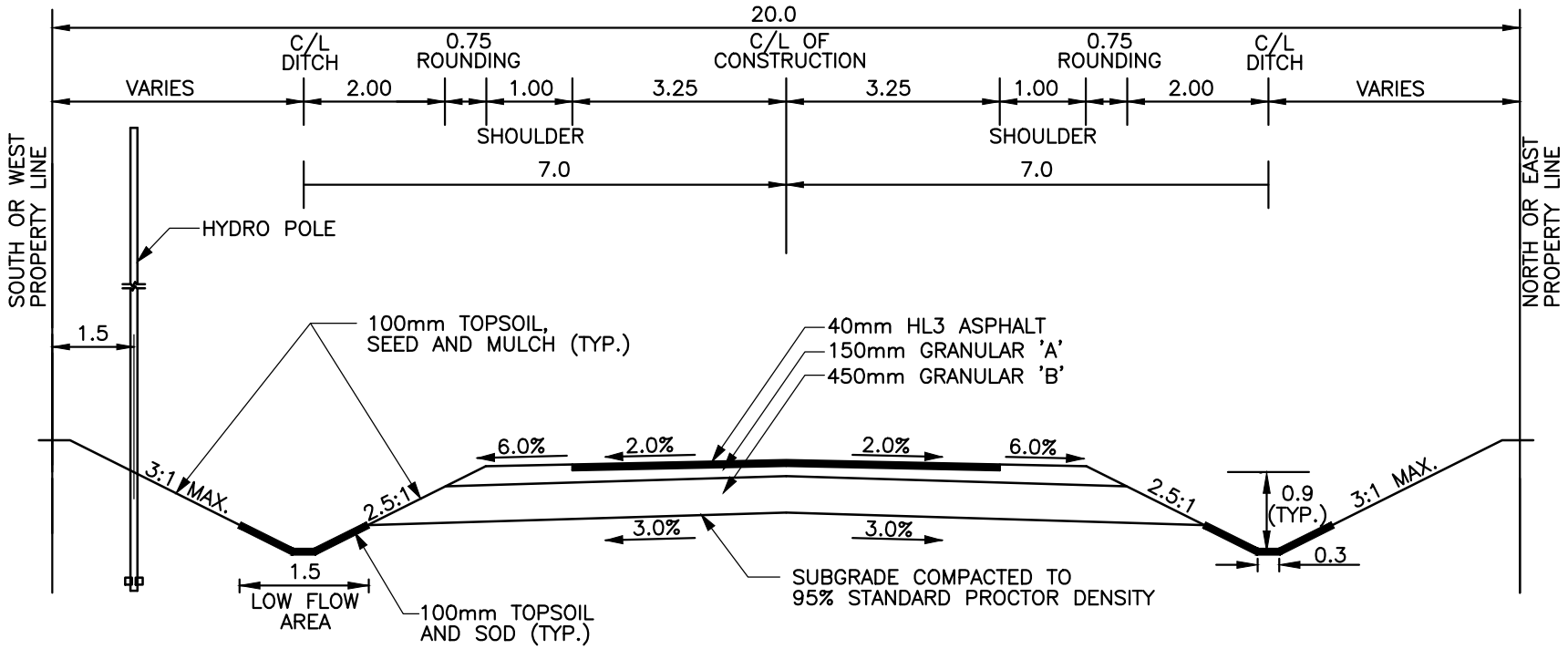
RURAL (PAVED) – LOCAL RESIDENTIAL

23.0m ROAD ALLOWANCE
7.0m ASPHALT SURFACE

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 201A

"NOT FOR NEW DEVELOPMENT"

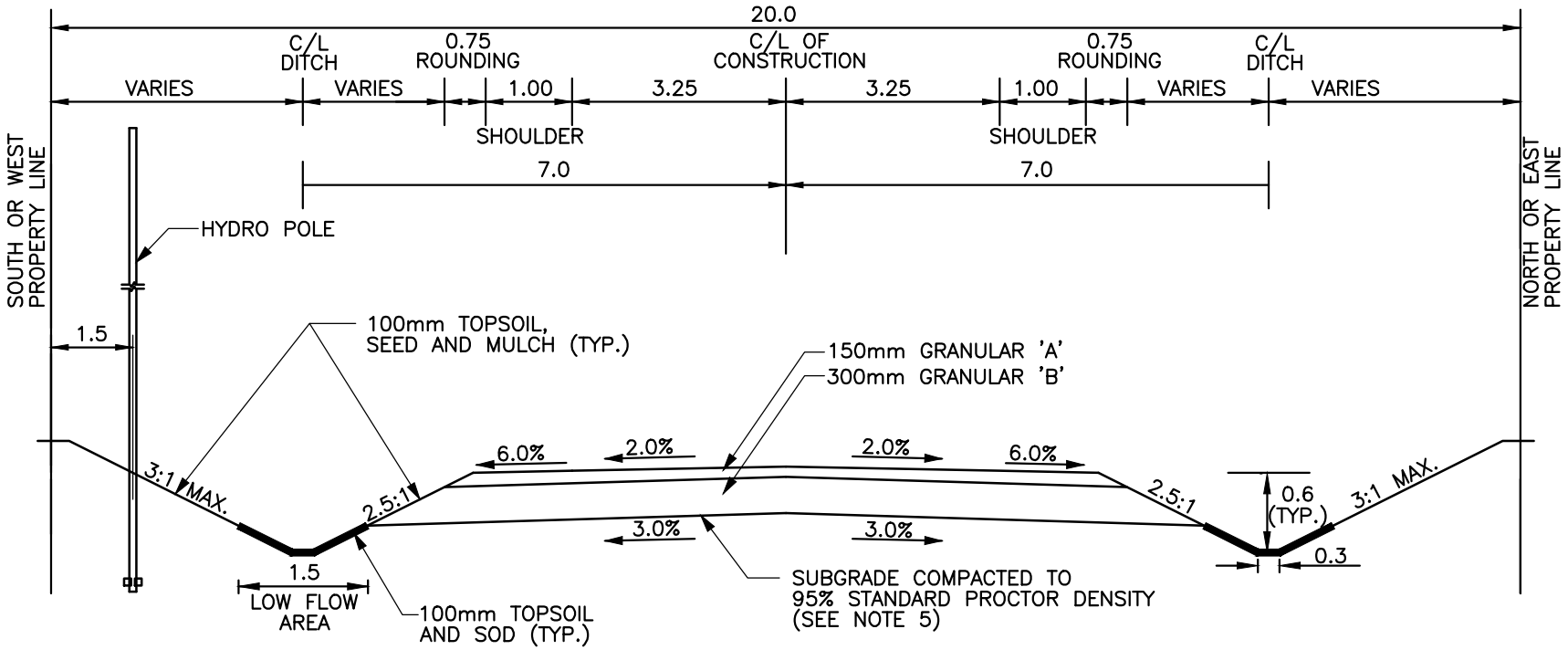


NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
3. NURSERY SOD TO BE PLACED IN LOW FLOW AREA OF DITCHES ONLY. SEED AND MULCH TO BE PLACED IN ALL OTHER LOCATIONS IN THE RIGHT-OF-WAY.
4. THIS ROAD SECTION IS ONLY TO BE USED TO UPGRADE EXISTING ROADS CONSTRUCTED AND OPENED PRIOR TO DECEMBER 31, 1965. THE PURPOSE OF THIS ROAD SECTION IS TO OUTLINE MINIMUM STANDARDS TO ENABLE ASSUMPTION BY THE TOWNSHIP.
5. GEOTEXTILE ON SUBGRADE IF REQUIRED BY SUBGRADE CONDITIONS.

NO.	REVISION	APR'D	DATE	TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
					DRAWN: SMM	SCALE: NTS
				RURAL – LOCAL IMPROVEMENT 6.5m RURAL ROADWAY WITH OPEN DITCHES	STD. No. 201B	

"NOT FOR NEW DEVELOPMENT"



NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
3. NURSERY SOD TO BE PLACED IN LOW FLOW AREA OF DITCHES ONLY. SEED AND MULCH TO BE PLACED IN ALL OTHER LOCATIONS IN THE RIGHT-OF-WAY.
4. THIS ROAD SECTION IS ONLY TO BE FOR PRIVATE ROADS AND EXTENSIONS OF UNOPENED RIGHT OF WAYS WITH LESS THAN 50 VEHICLES PER DAY.
5. GEOTEXTILE ON SUBGRADE IF REQUIRED BY SUBGRADE CONDITIONS.

NO.	REVISION	APR'D	DATE

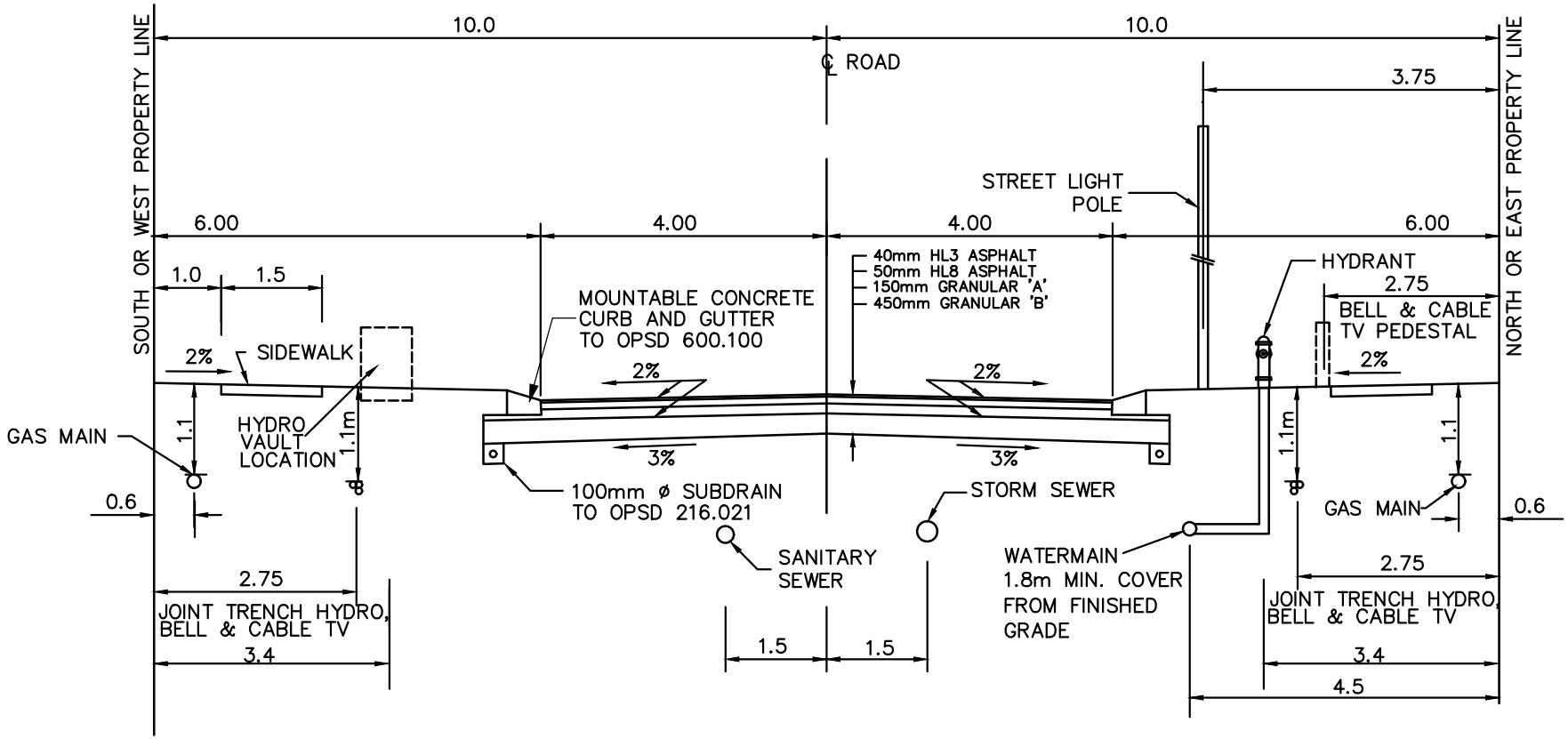
TOWNSHIP OF BROCK

RURAL (UN-PAVED) - LOCAL IMPROVEMENT

6.5m RURAL ROADWAY WITH OPEN DITCHES

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 203



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. WHERE ONE SIDEWALK IS CONSTRUCTED IT SHALL BE ON THE NORTH AND EAST SIDE OF THE ROAD.
5. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

NO.	REVISION	APR'D	DATE

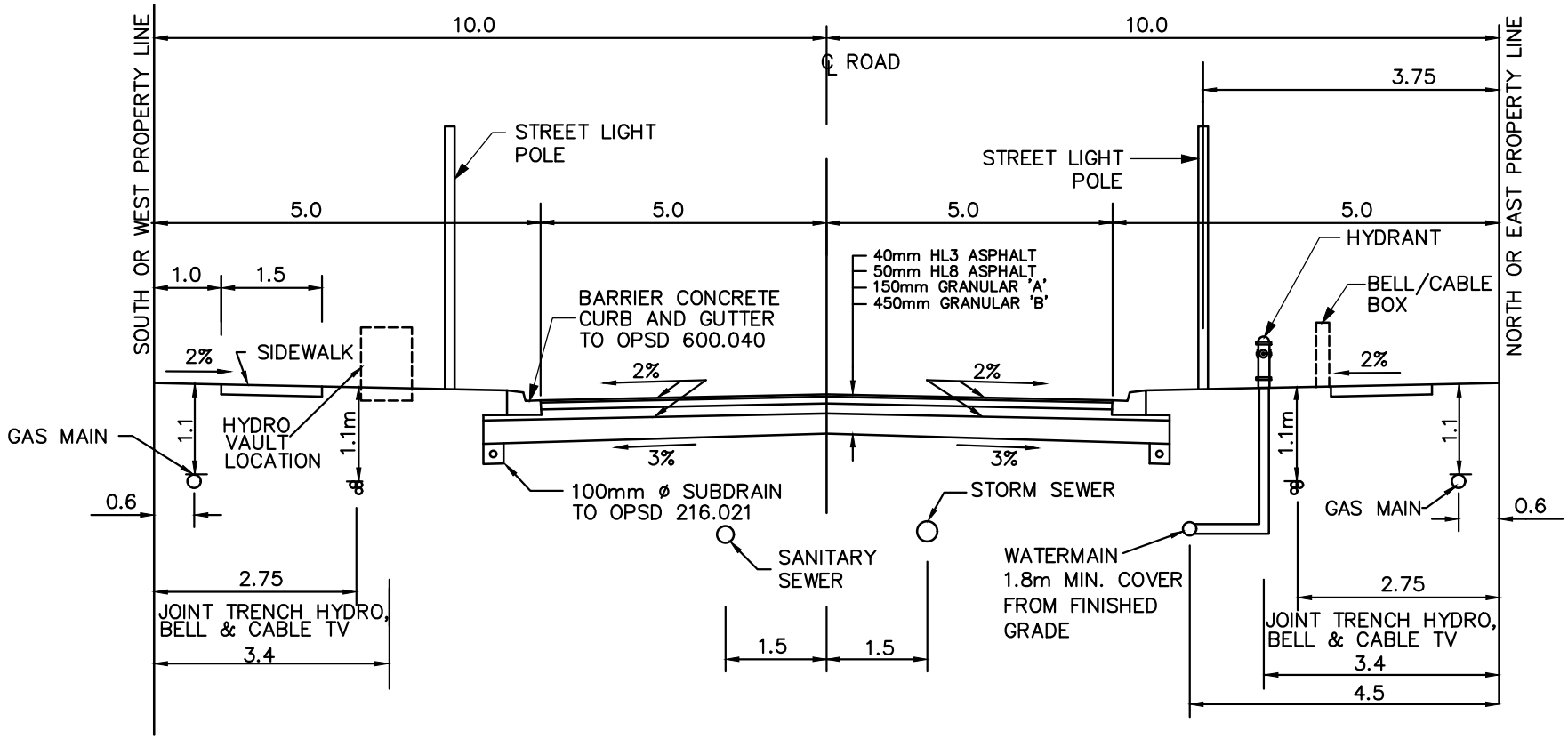
TOWNSHIP OF BROCK

URBAN – LOCAL RESIDENTIAL

20.0m ROAD ALLOWANCE
8.0m ASPHALT SURFACE

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 208



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. WHERE ONE SIDEWALK IS CONSTRUCTED IT SHALL BE ON THE NORTH AND EAST SIDE OF THE ROAD.
5. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

NO.	REVISION	APR'D	DATE

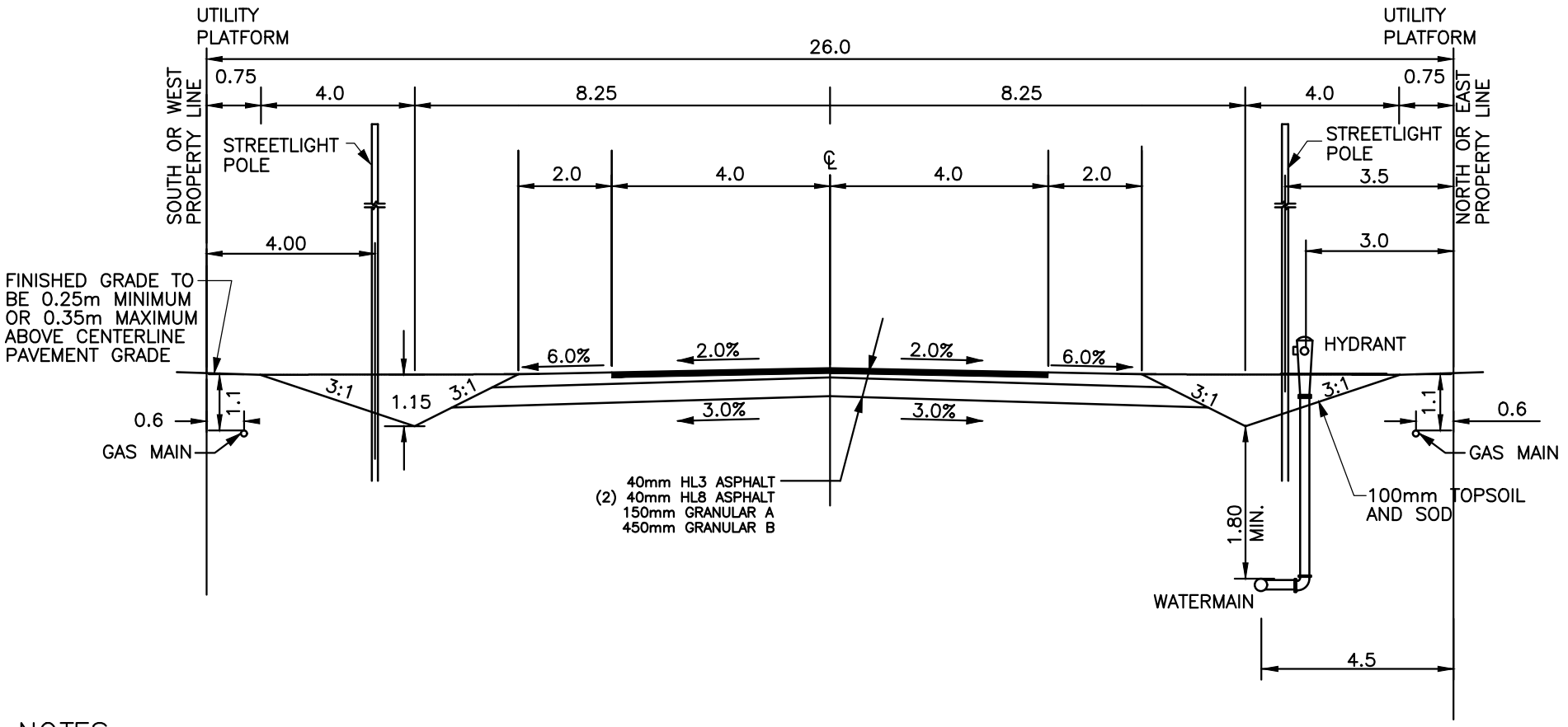
TOWNSHIP OF BROCK

URBAN – COLLECTOR RESIDENTIAL

20.0m ROAD ALLOWANCE
10.0m ASPHALT SURFACE

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 209



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. CURB STOPS FOR WATER SERVICES TO BE PLACED ON PROPERTY LINE.
5. A 3.0m WIDE PLATFORM AREA SHALL BE CONSTRUCTED FOR EACH FIRE HYDRANT. THE MINIMUM CULVERT LENGTH SHALL BE 6.5m AND THE MINIMUM DIAMETER SHALL BE 400mm. PLATFORM AREAS SHALL BE RESTORED WITH 100mm TOPSOIL AND SOD.
6. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

NO.	REVISION	APR'D	DATE

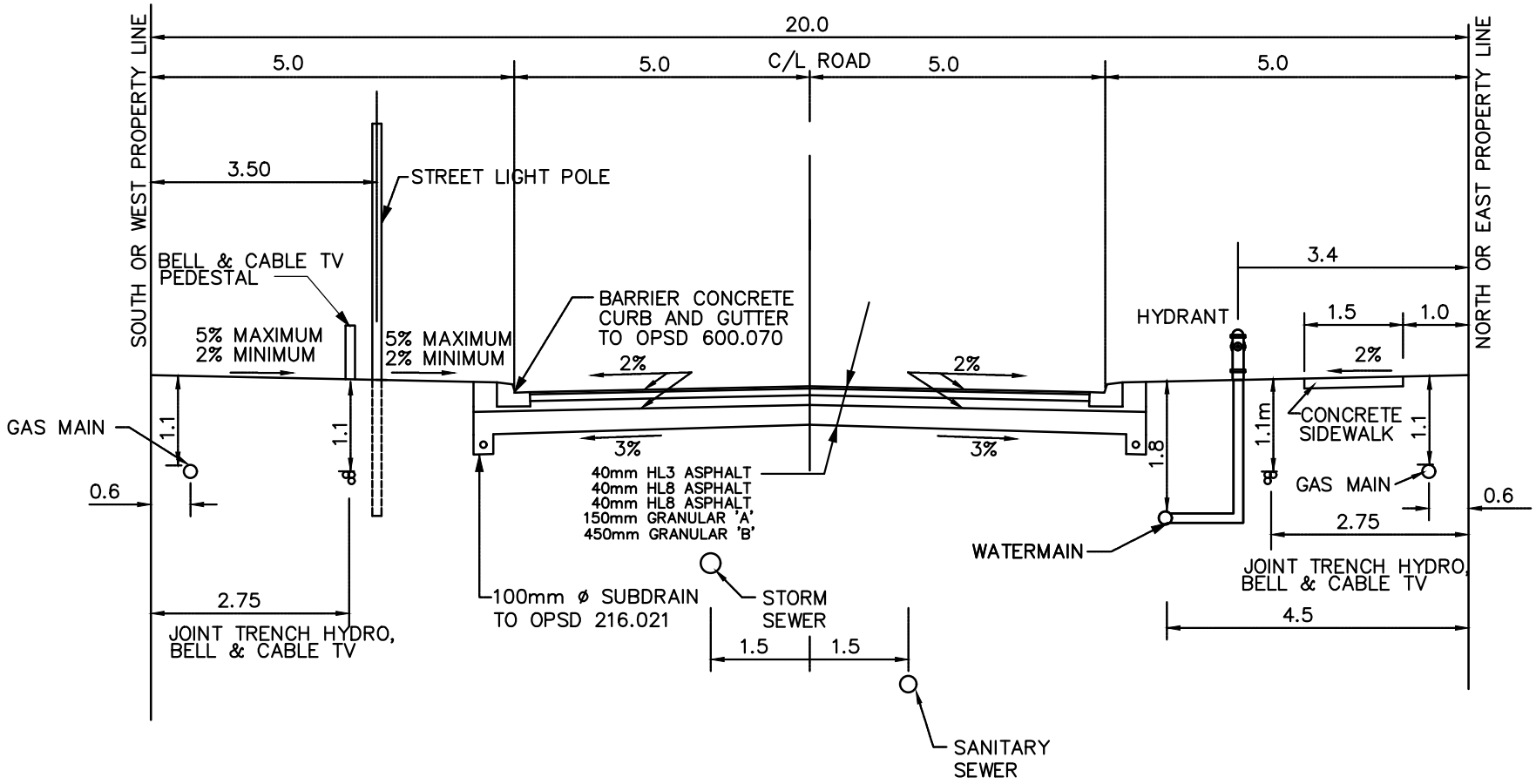
TOWNSHIP OF BROCK

RURAL – LOCAL INDUSTRIAL

26.0m ROAD ALLOWANCE
8.0m ASPHALT SURFACE

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 214



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. WHERE ONE SIDEWALK IS CONSTRUCTED IT SHALL BE ON THE NORTH AND EAST SIDE OF THE ROAD.
5. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

NO.	REVISION	APR'D	DATE

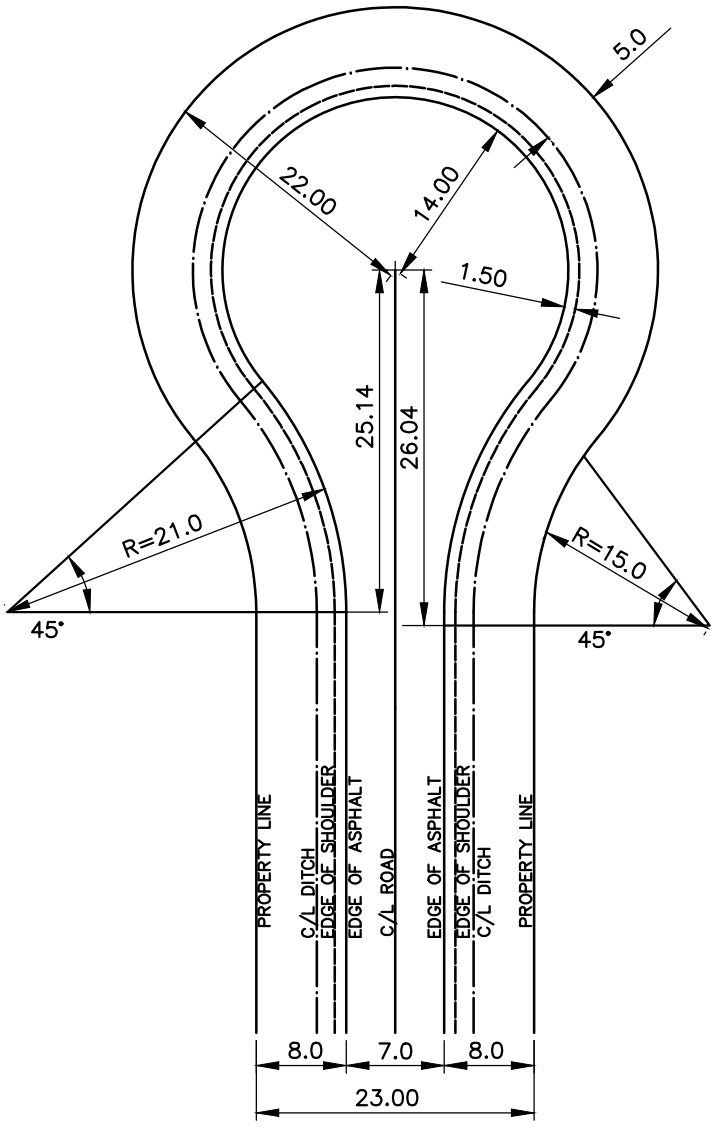
TOWNSHIP OF BROCK

URBAN – LOCAL INDUSTRIAL

20.0m ROAD ALLOWANCE
10.0m ASPHALT SURFACE

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 215



NOTES:

1. DETAIL OF GRADING OF BULB AREAS OF CUL-DE-SAC TO BE SHOWN ON PROFILE DRAWINGS.
2. CUL-DE-SAC DRAINAGE TO BE DIRECTED TOWARDS THE BEGINNING OF THE BULB. MINIMUM DITCH GRADE TO BE 2%.
3. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

NO.	REVISION	APR'D	DATE

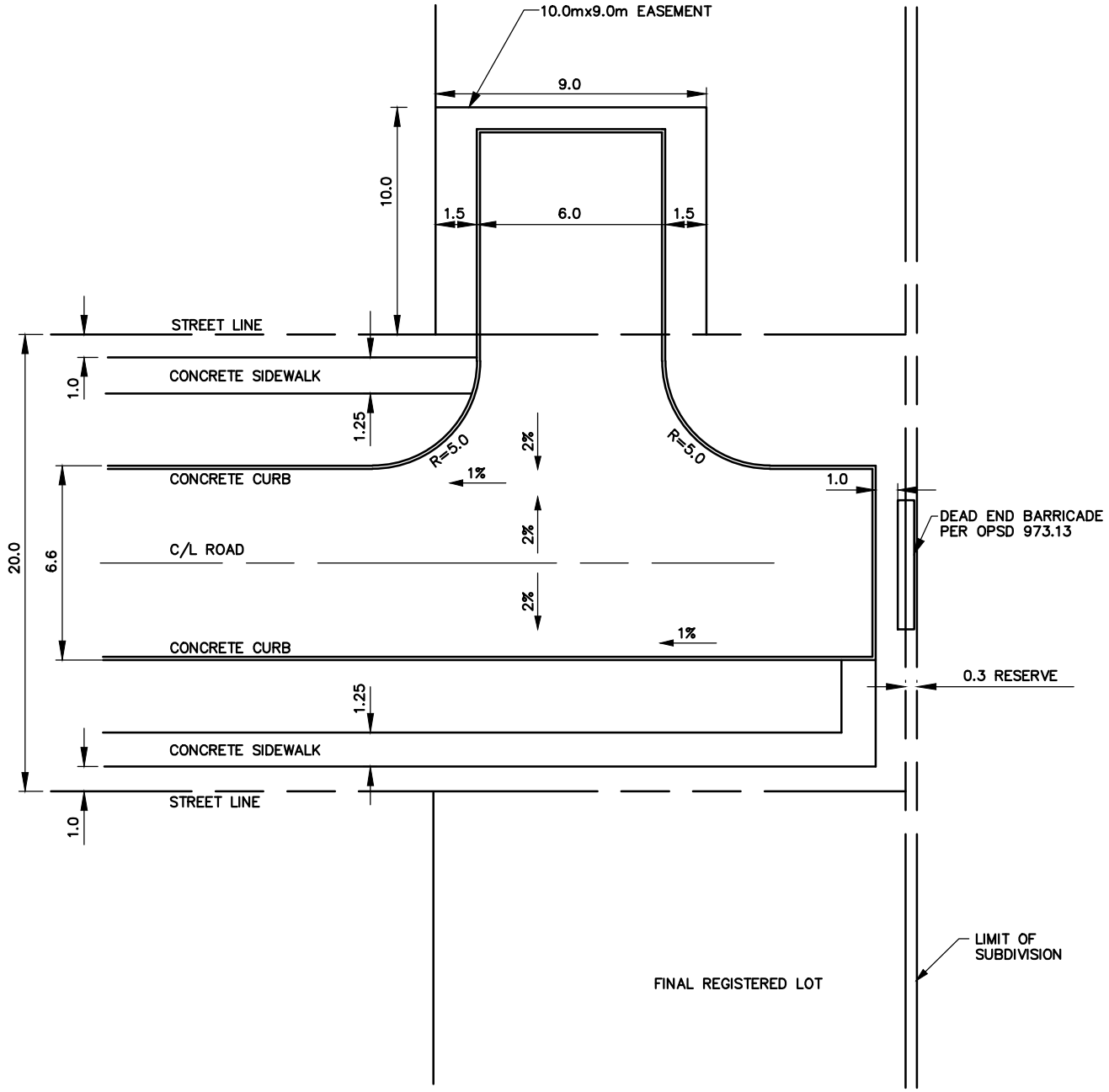
TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

RURAL – RESIDENTIAL CUL-DE-SAC

23.0m ROAD ALLOWANCE
7.0m ASPHALT SURFACE

STD. No. 217



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. GUTTER TO BE DETAILED ON ENGINEERING DRAWINGS. MINIMUM GRADE TO BE 1%.
3. THE LOCATION OF SIDEWALK TO BE DETAILED ON THE ENGINEERING DRAWINGS.
4. ALL CURB RADII ARE TO FACE OF CURBS.

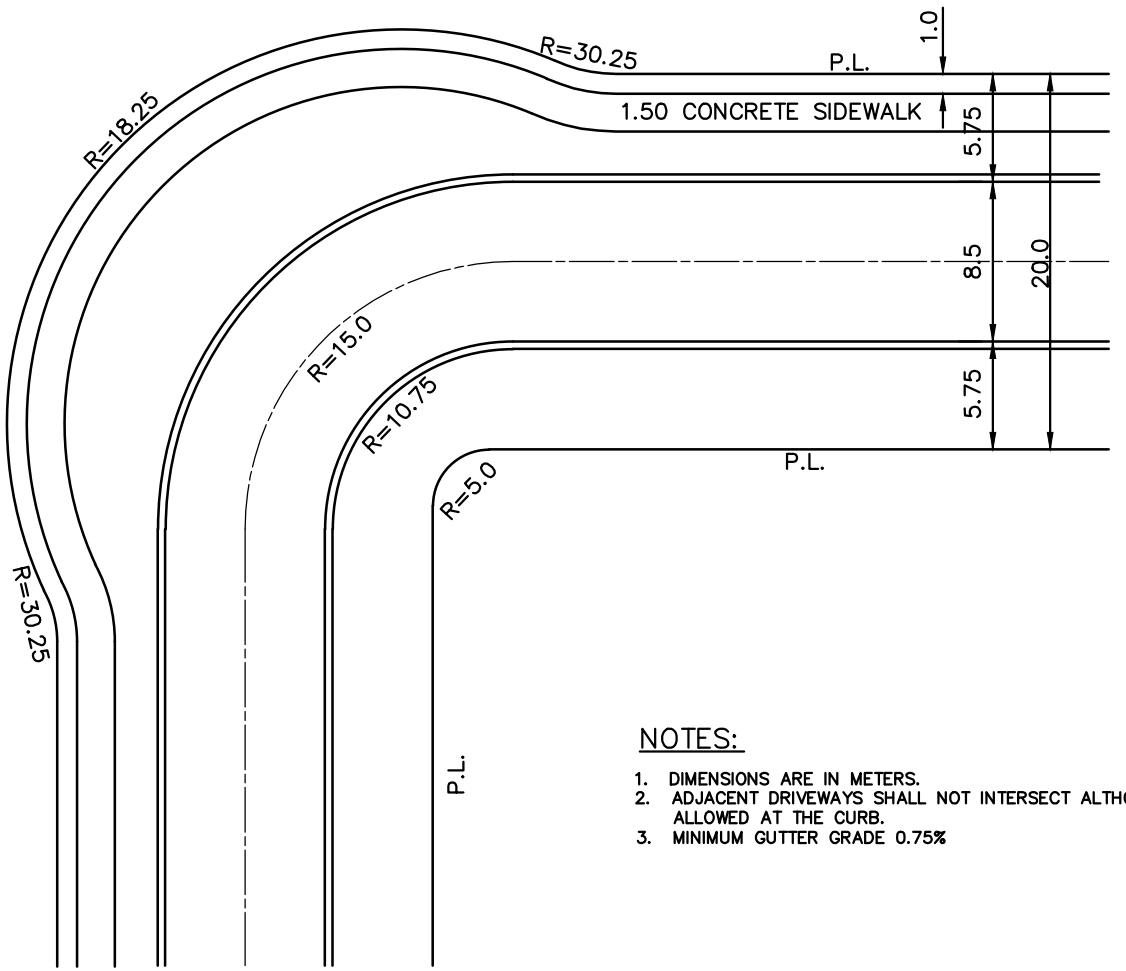
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

TEMPORARY TURNAROUND RESIDENTIAL – URBAN

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

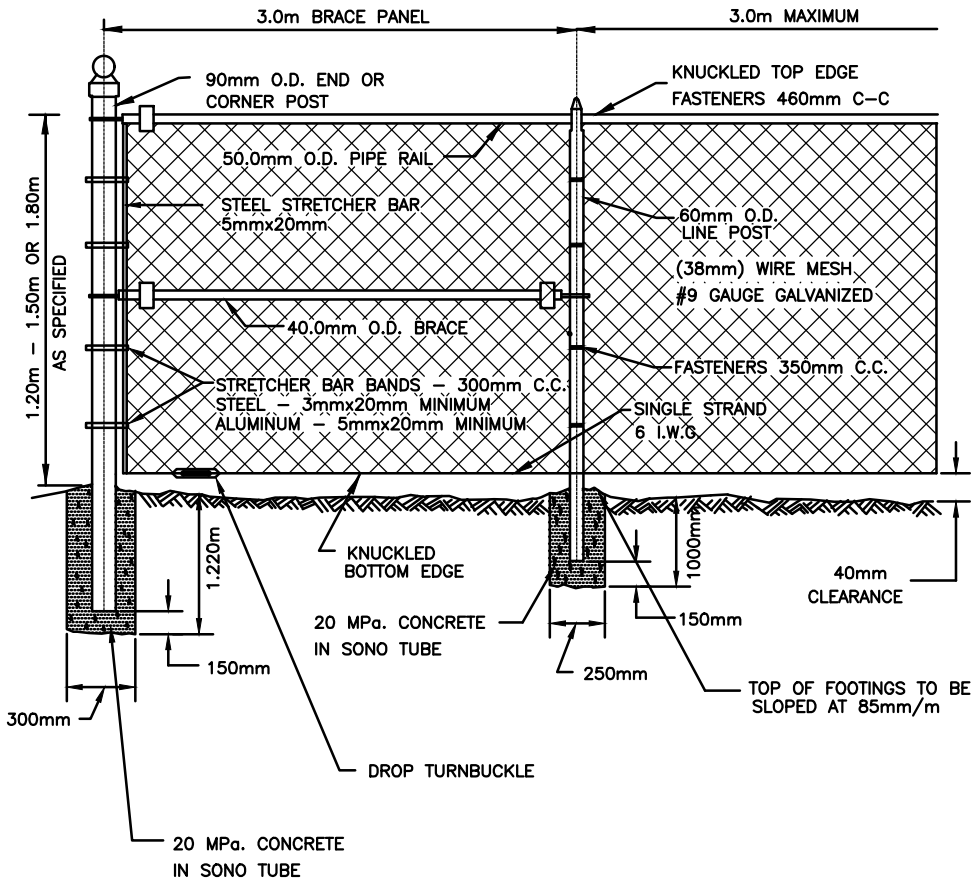
STD. No. 223



NOTES:

1. DIMENSIONS ARE IN METERS.
2. ADJACENT DRIVEWAYS SHALL NOT INTERSECT ALTHOUGH DOUBLE ENTRANCES MAY BE ALLOWED AT THE CURB.
3. MINIMUM GUTTER GRADE 0.75%

NO.	REVISION	APR'D	DATE	TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
					DRAWN: SMM	SCALE: NTS
				90° BULB DETAIL 20.0m ROAD ALLOWANCE 8.5m ASPHALT SURFACE	STD. No. 224	



NOTES:

1. LENGTH OF POSTS

FENCE POST LOCATION	1.20m FENCE	1.50m FENCE	1.80m FENCE
END, CORNER OR RESTAINING	2.30m	2.60m	2.90m
LINE POST	2.05m	2.36m	2.65m

2. FASTENERS – 6 I.W.G. GALVANIZED STEEL OR ALUMINUM WIRE.
3. ALL POSTS, PIPE RAILS AND FASTENERS TO BE GALVANIZED.
4. BRACE RAILS TO BE ELIMINATED ON 1.20m HIGH FENCE.
5. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS.
6. FENCE FABRIC SHALL BE TYPE 1 STEEL FABRIC 3.0mm DIA. STEEL WIRE, STYLE 3 LIGHT STEEL WIRE, GALVANIZED BEFORE WEAVING.
7. FENCING REQUIREMENTS FOR PUBLIC WALKWAYS ARE TO BE RANGE FROM 1.2m TO 1.8m. A FENCE HEIGHT OF 1.2m IS TO BE SPECIFIED BETWEEN STREETLINE AND THE FRONT OF THE DWELLING. FENCING HEIGHTS BEYOND THE FRONT OF THE DWELLING ARE TO 1.8m.

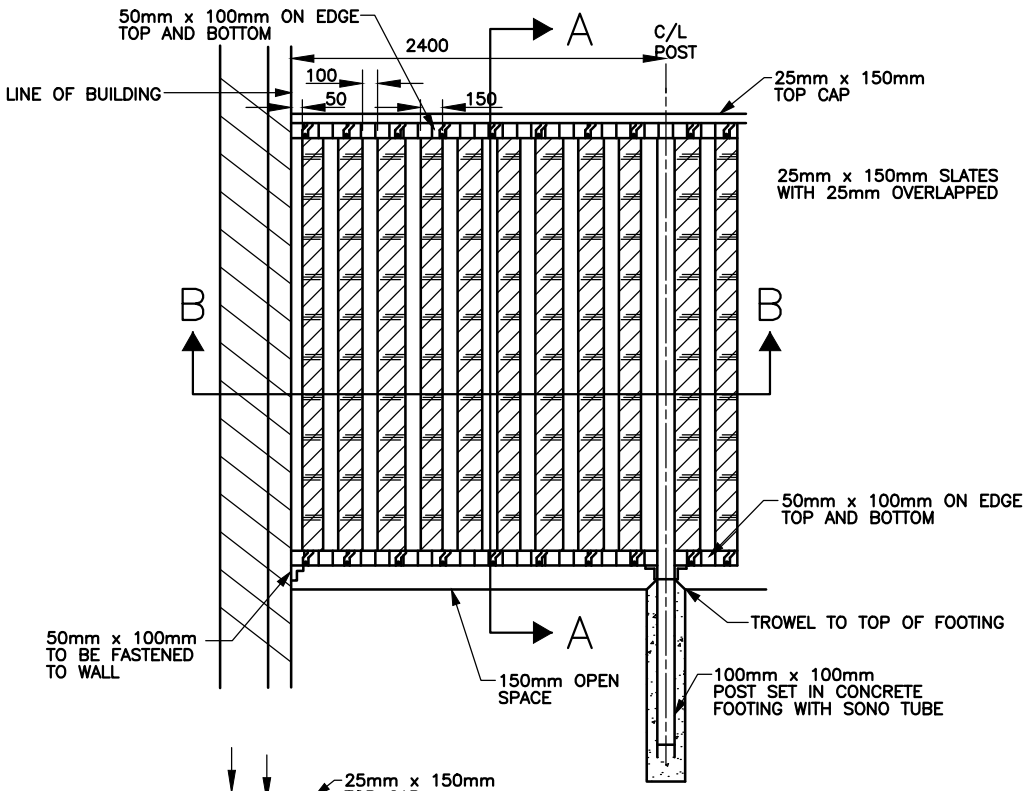
NO.	REVISION	APR'D	DATE

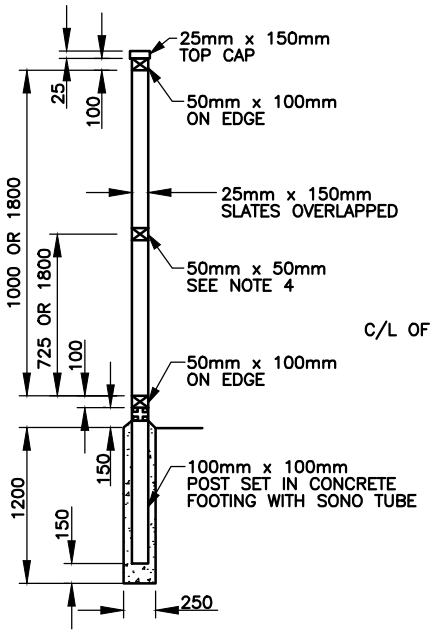
TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

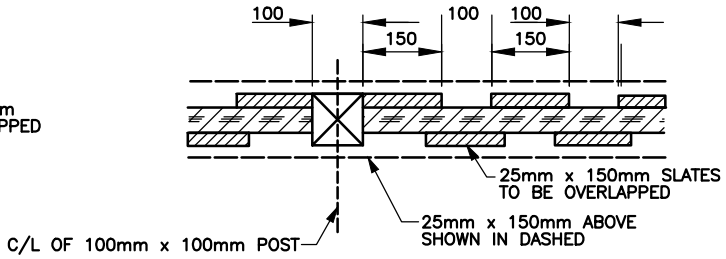
CHAIN LINK SECURITY FENCE

STD. No. 311





SECTION A–A



SECTION B–B

NOTES:

1. USE CONSTRUCTION GRADE CEDAR OR PRESSURE TREATED. DO NOT USE SPRUCE OR HEMLOCK.
2. USE APPROVED WOOD STAIN.
3. USE STEEL ZINC COATED TWISTED NAILS No. 11 GUAGE 64mm x 76mm.
4. FOR FENCE 1.8m OR HIGHER 50mm x 50mm MUST BE USED AS SHOWN IN SECTION A–A.
5. USE GALVANIZED FENCE BRACKETS.
6. FOR WALKWAYS, THE FENCE HEIGHT SHOULD BE 1.0m HIGH BETWEEN STREETLINE AND FRONT WALL OF DWELLINGS ON ADJACENT LOTS AND 1.8m FOR THE REMAINDER.
7. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

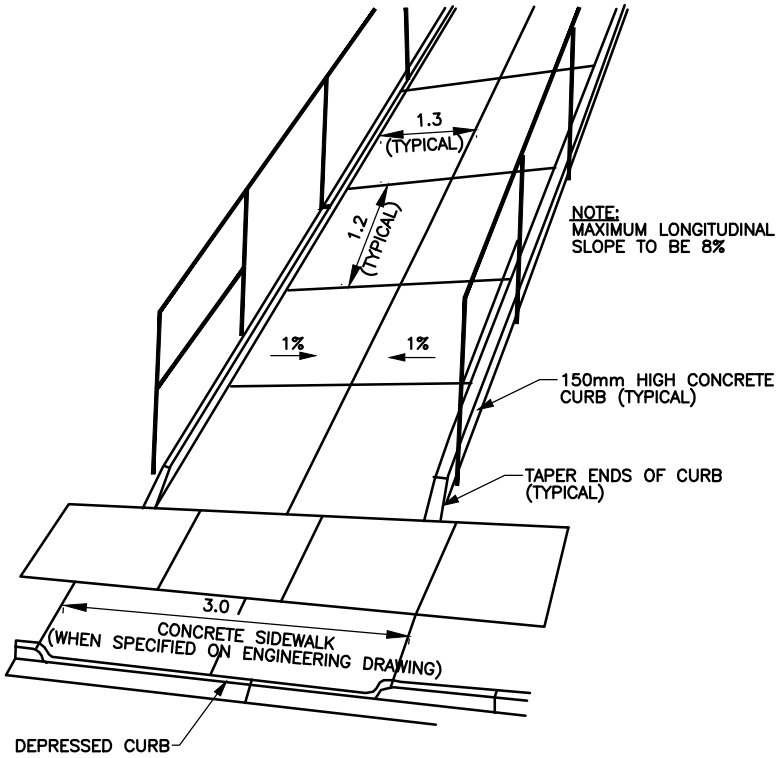
NO.	REVISION	APR'D	DATE

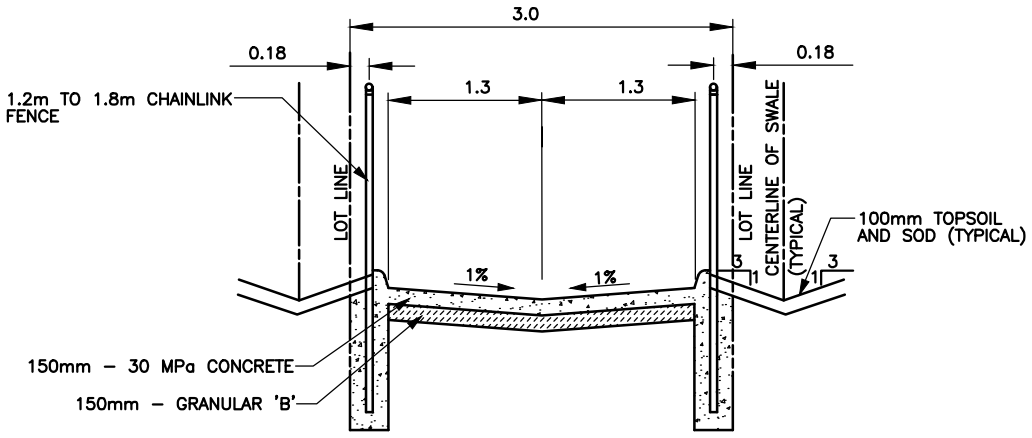
TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

WOOD PRIVACY FENCE

STD. No. 313





PLAN

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
2. SECURITY LIGHTING OF WALKWAYS TO BE PROVIDED. DESIGN OF LIGHTING WILL BE SUBJECT TO APPROVAL BY THE TOWNSHIP OF RAMARA.
3. ALL CONCRETE WORK TO CONFORM TO OPSS-1350.
4. MAXIMUM SAW CUT JOINT SPACING TO BE 4.5m.
5. CONCRETE POST FOOTINGS TO BE SEPARATE FROM CURB.
6. THIS DETAIL MAY BE USED FOR OVERLAND FLOW ROUTE.

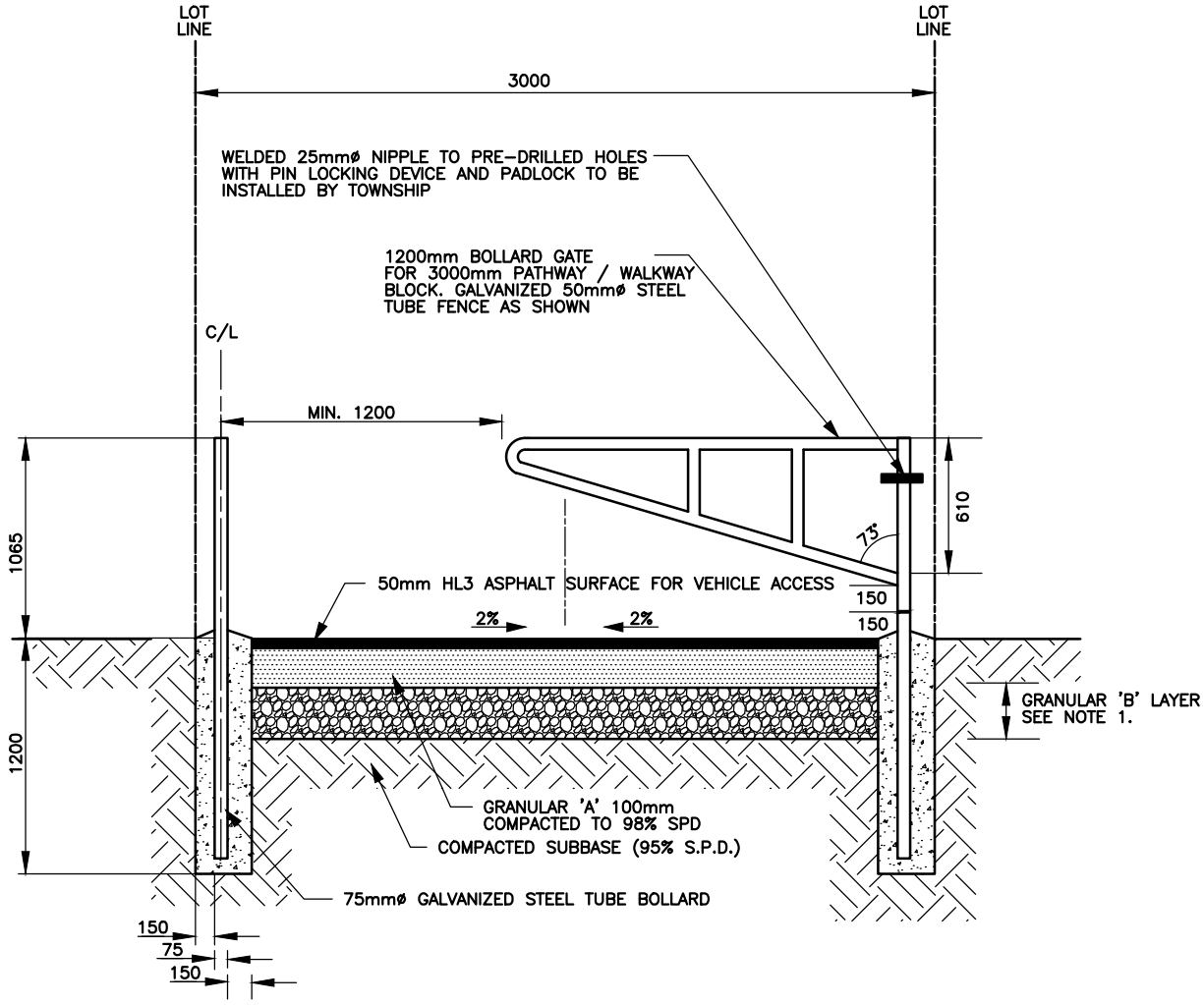
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

PEDESTRIAN WALKWAY – URBAN

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 320A



NOTES:

1. 200mm GRANULAR 'B' COMPACTED TO 100% S.P.D. TO BE PROVIDED ONLY WHEN MAINTENANCE OR EMERGENCY VEHICLE ACCESS.
2. 100mm GATE SLEEVE RESTS ON 75mmø GALVANIZED POST.
3. ADD SPURS (LAGS) TO BOTH GALVANIZED POLES TO PREVENT THE TUBING FROM TURNING IN THE CONCRETE FOOTING.
4. FOR 6.0m EMERGENCY ACCESS / WALKWAY TWO (2) STANDARD BOLLARD GATES ARE REQUIRED.
5. ALL SWING GATES TO BE INSTALLED ON RIGHT-HAND SIDE AT ENTRY AND AT LEAST 2500mm IN FROM SIDEWALK EDGE OR 6000mm IN FROM CURB EDGE.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

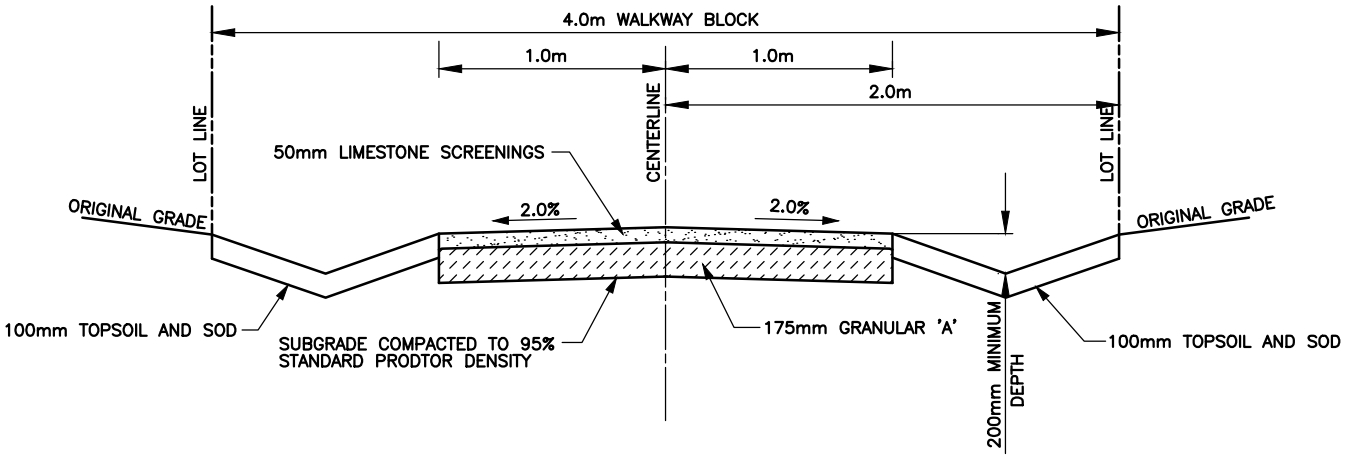
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

VEHICLE ACCESS / PEDESTRIAN WALKWAY GATE

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 320B



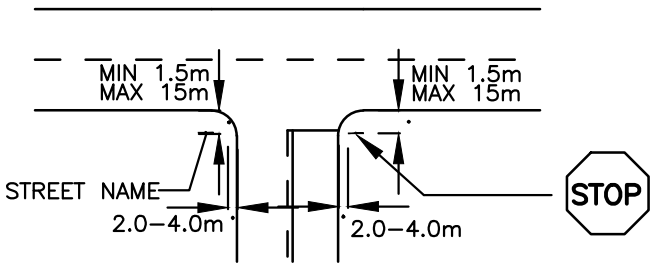
NOTES:

1. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
2. PROPOSED LONGITUDIAL GRADE OF WALKWAY TO BE IDENTIFIED ON ENGINEERING DRAWINGS. MINIMUM LONGITUDINAL GRADE TO BE 1.5%.

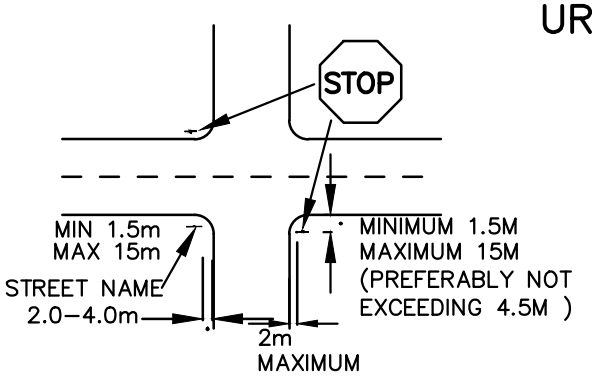
NO.	REVISION	APR'D	DATE

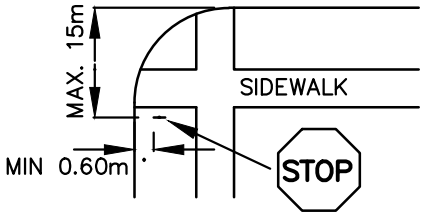
TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
	DRAWN: SMM	SCALE: NTS
PEDESTRIAN WALKWAY – RURAL	STD. No.	321

RURAL

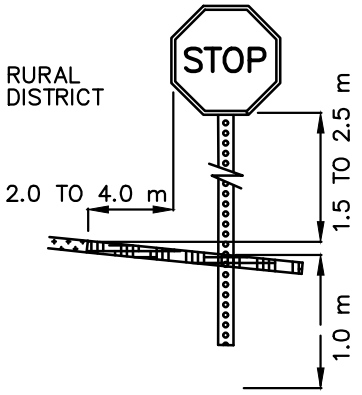


URBAN

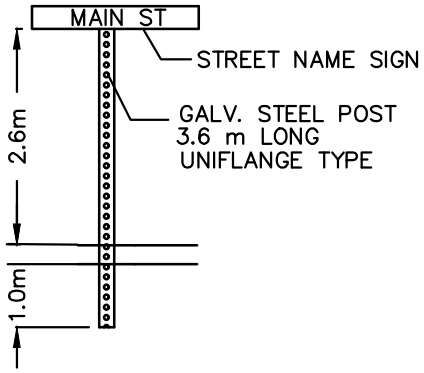




STOP SIGN



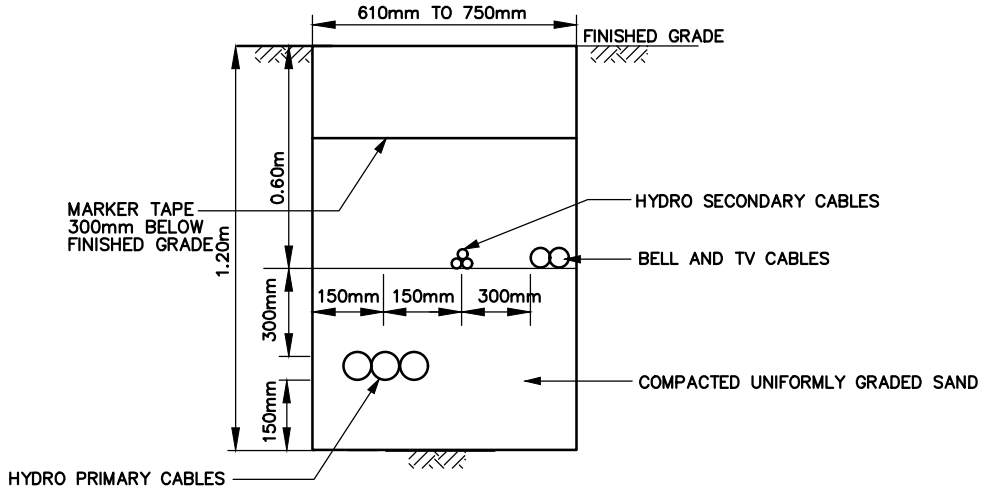
STREET SIGN



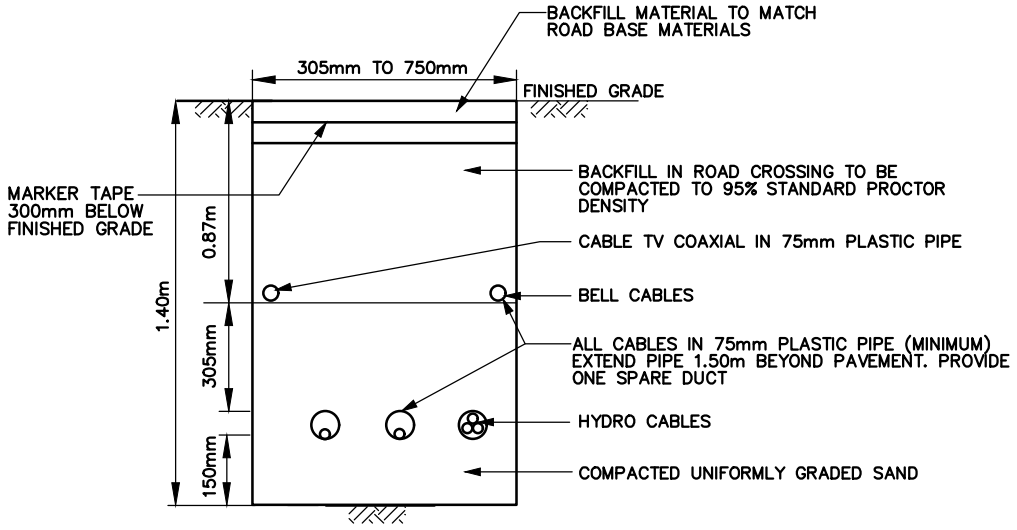
1. ALL REGULATORY SIGNS SHALL BE ON ALUMINUM BLANKS WITH HI–INTENSITY BACKGROUND AND LEGEND IN ACCORDANCE WITH CURRENT MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND HIGHWAY TRAFFIC ACT.
2. ALL SIGNS ARE TO BE MOUNTED ON UNIFLAGE TYPE GALVANIZED STEEL POST WITH DIRECT EMBEDDED OR BREAKAWAY BASE TYPE INSTALLATIONS.
3. STREET NAME SIGNS MATERIAL TO BE 160mm HIGH EXTRUDED ALUMINUM BLADES. STREET SIGNS TO BE MOUNTED ON SEPARATE POST IN QUADRANT OTHER THAN STOP SIGN.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
	DRAWN: SMM	SCALE: NTS
STANDARD STREET NAME AND REGULATORY SIGNS	STD. No.	331



TYPICAL JOINT USE TRENCH

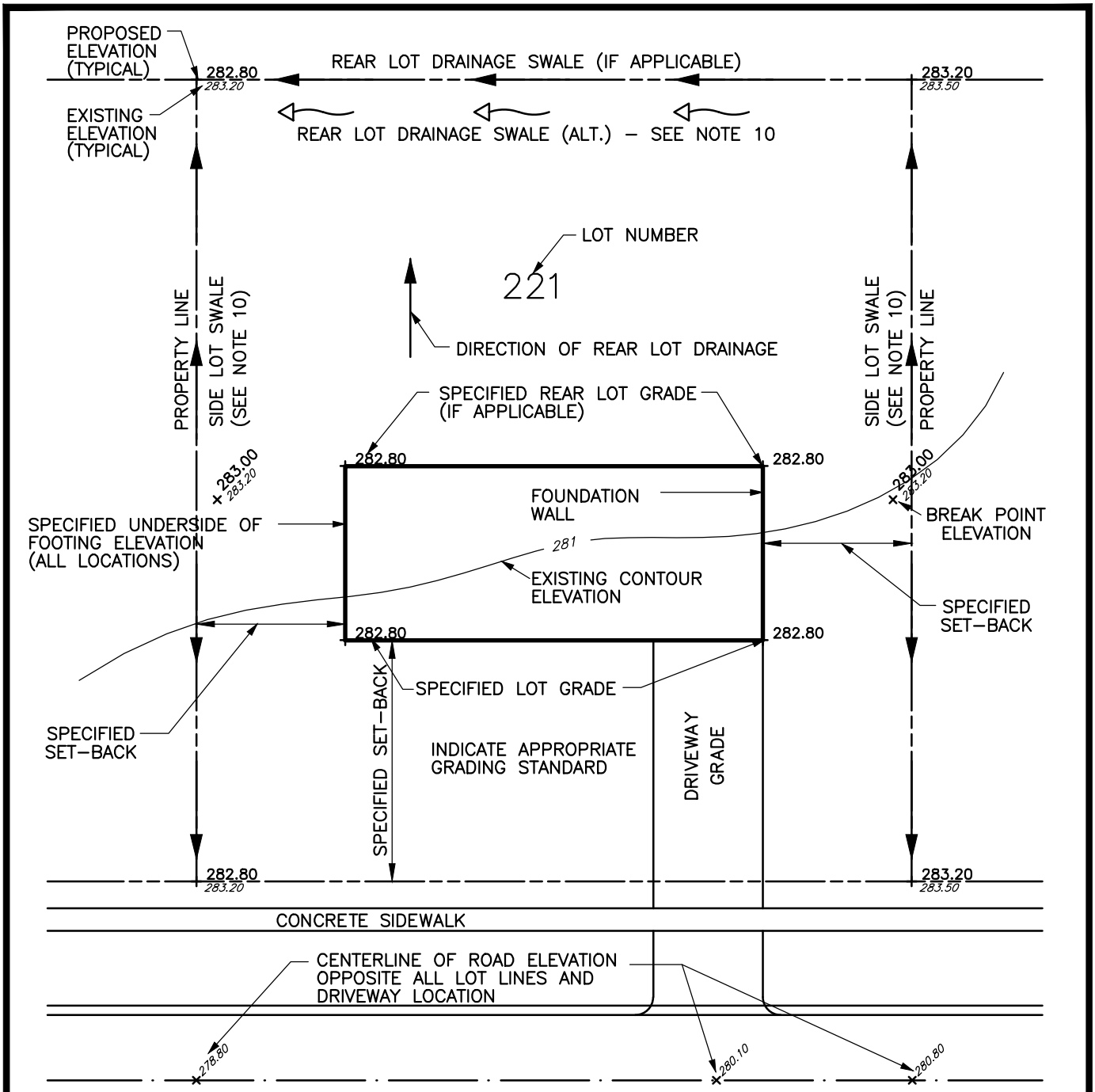


TYPICAL ROAD CROSSING

1. BACKFILL TO CONSIST OF 150mm OF CLEAN MASON SAND ABOVE CABLES/DUCTS AND CLEAN NATIVE MATERIAL.
2. WARNING TAPE TO BE PLACED PRIOR TO PLACING THE FINAL 300 mm OF BACKFILL.
3. JOINT TRENCH ON OPPOSITE SIDE OF WATERMAIN.

NO.	REVISION	APR'D	DATE

	TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
		DRAWN: SMM	SCALE: NTS
	JOINT UTILITY TRENCH AND ROAD CROSSING SECTIONS	STD. No.	345



NOTES:

1. ALL CATCHBASIN LOCATIONS MUST BE SHOWN ON GRADING PLAN.
2. ALL EASEMENTS MUST BE SHOWN ON GRADING PLAN.
3. PROVIDE MAIN FLOOR AND BASEMENT ELEVATIONS.
4. SPECIFY PROPOSED GRADES ON SWALES.
5. IDENTIFY PROPOSED LOCATION AND DIMENSION OF SEPTIC TILE BED AND RESERVE BED AREAS,
6. PROVIDE REGISTERED PLAN NUMBER.
7. MAXIMUM DRIVEWAY GRADE TO BE 6%.
8. SHOW SERVICE LATERAL INVERT ELEVATION AT STREET LINE AND CURB STOP LOCATION (WHEN APPLICABLE)
9. SHOW ALL UTILITY INSTALLATIONS IN BOULEVARD.
10. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

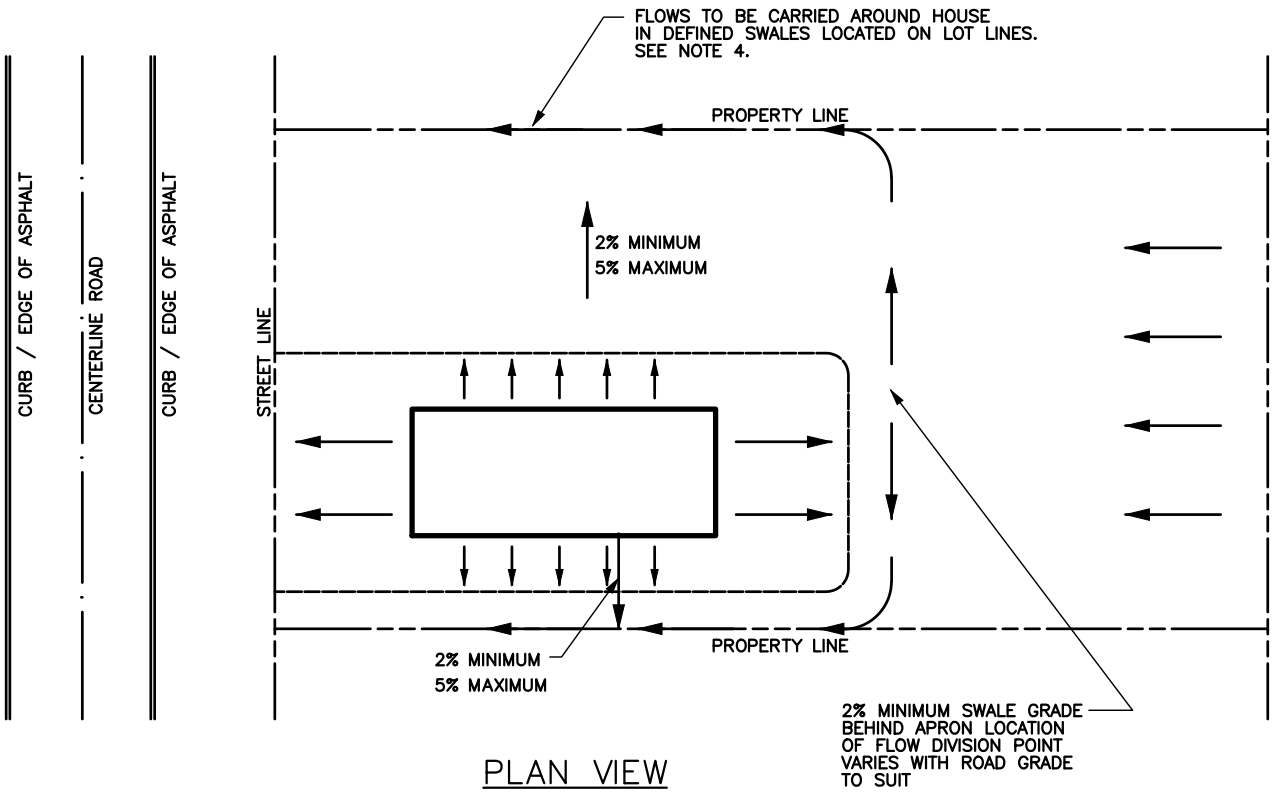
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

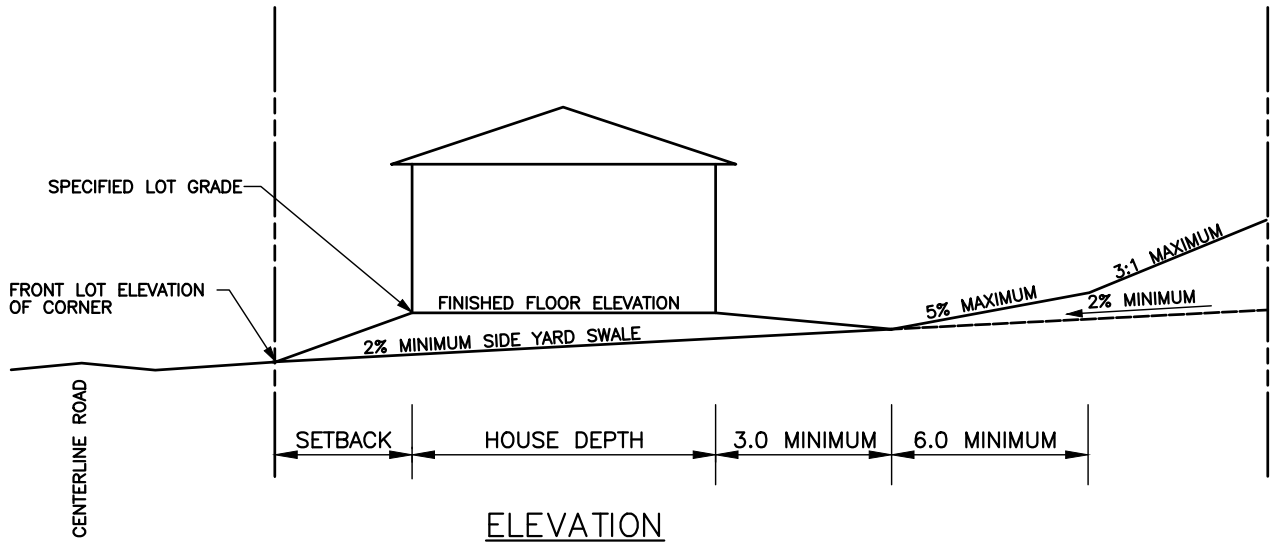
APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

TYPICAL LEGEND FOR LOT GRADING PLAN

STD. No. 400



PLAN VIEW



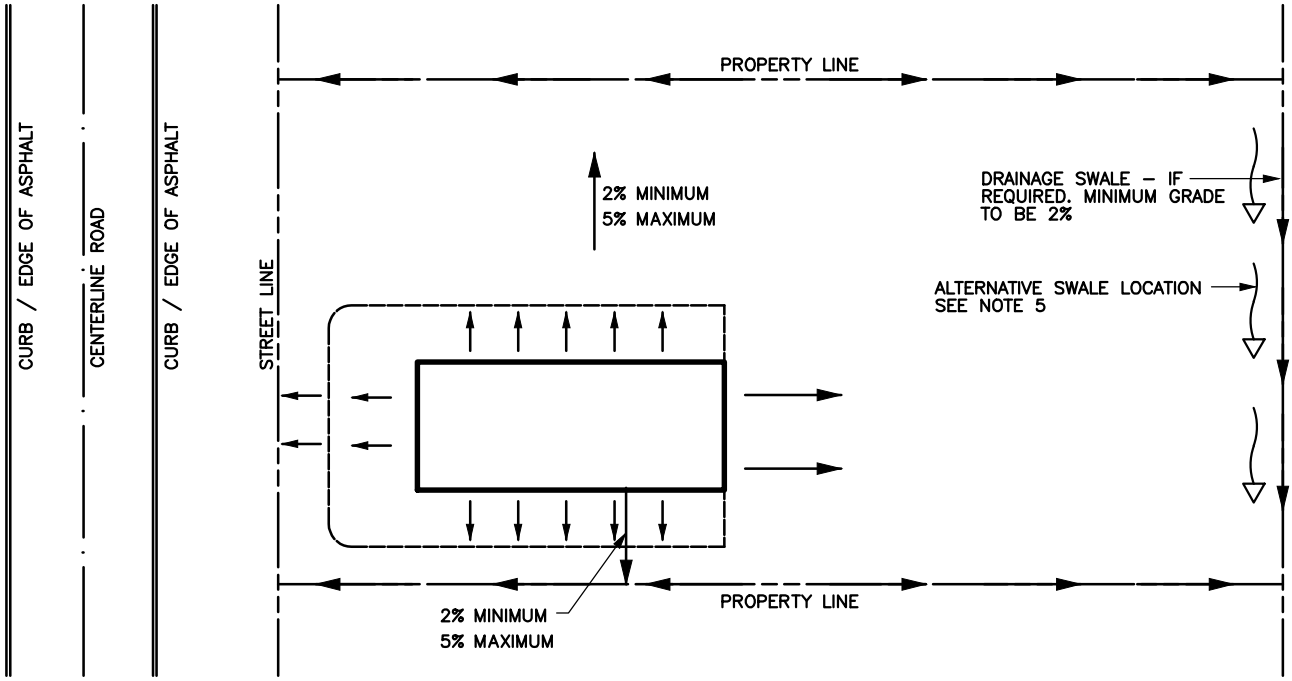
ELEVATION

NOTES:

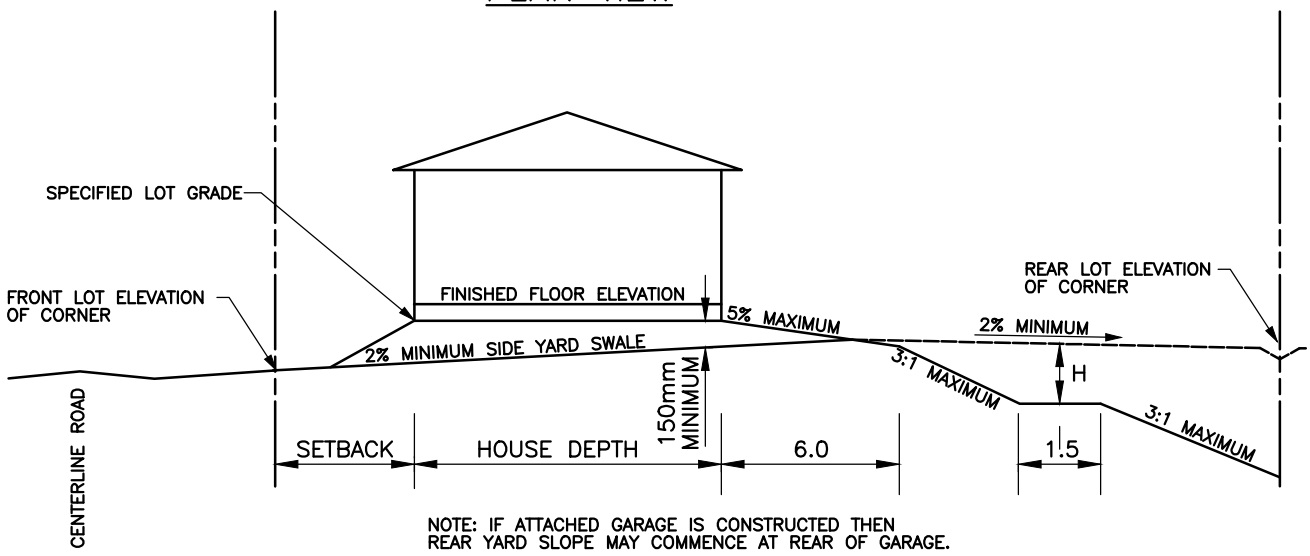
1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR ANY SIDEYARD SWALE.
3. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
4. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D: BWL	DATE: JUN/18
	DRAWN: SMM	SCALE: NTS
FRONT LOT DRAINAGE	STD. No.	401



PLAN VIEW



ELEVATION

NOTES:

1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR ANY SIDEYARD SWALE.
3. 'H' DIMENSION TO BE 1.8m MAXIMUM, UNLESS UNDISTURBED EXISTING SLOPE. TERRACE CAN BE ELIMINATED ON SLOPES OF 4:1 OR LESS.
4. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
5. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

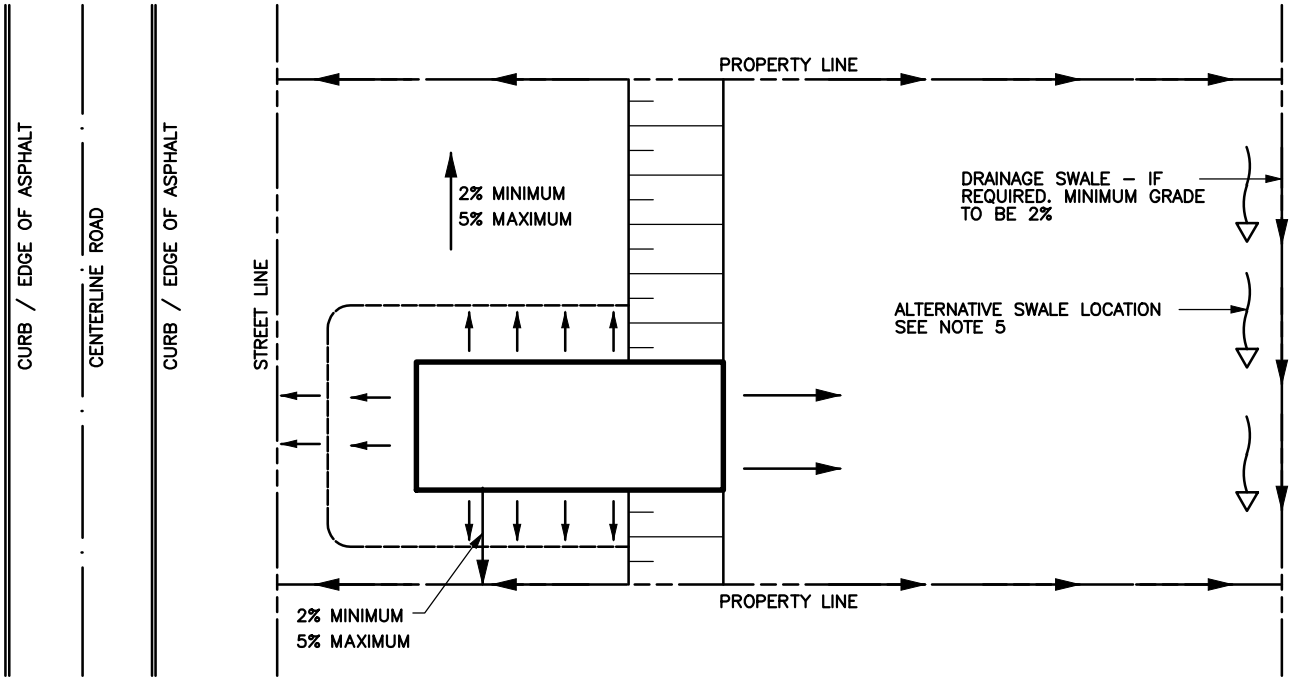
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

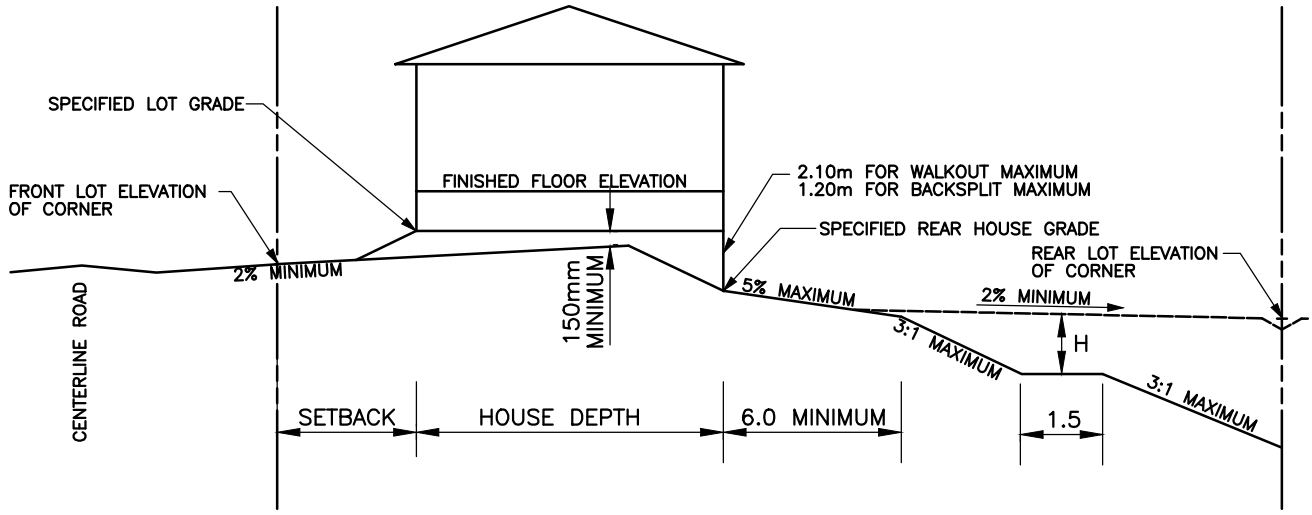
APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

REAR LOT DRAINAGE

STD. No. 402



PLAN VIEW



ELEVATION

NOTES:

1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. 'H' DIMENSION TO BE 1.8m MAXIMUM, UNLESS UNDISTURBED EXISTING SLOPE. TERRACE CAN BE ELIMINATED ON SLOPES OF 4:1 OR LESS.
3. REAR HOUSE GRADE MUST ALSO BE SPECIFIED ON LOT GRADING PLANS WHEN THIS HOUSE TYPE IS PROPOSED.
4. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
5. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

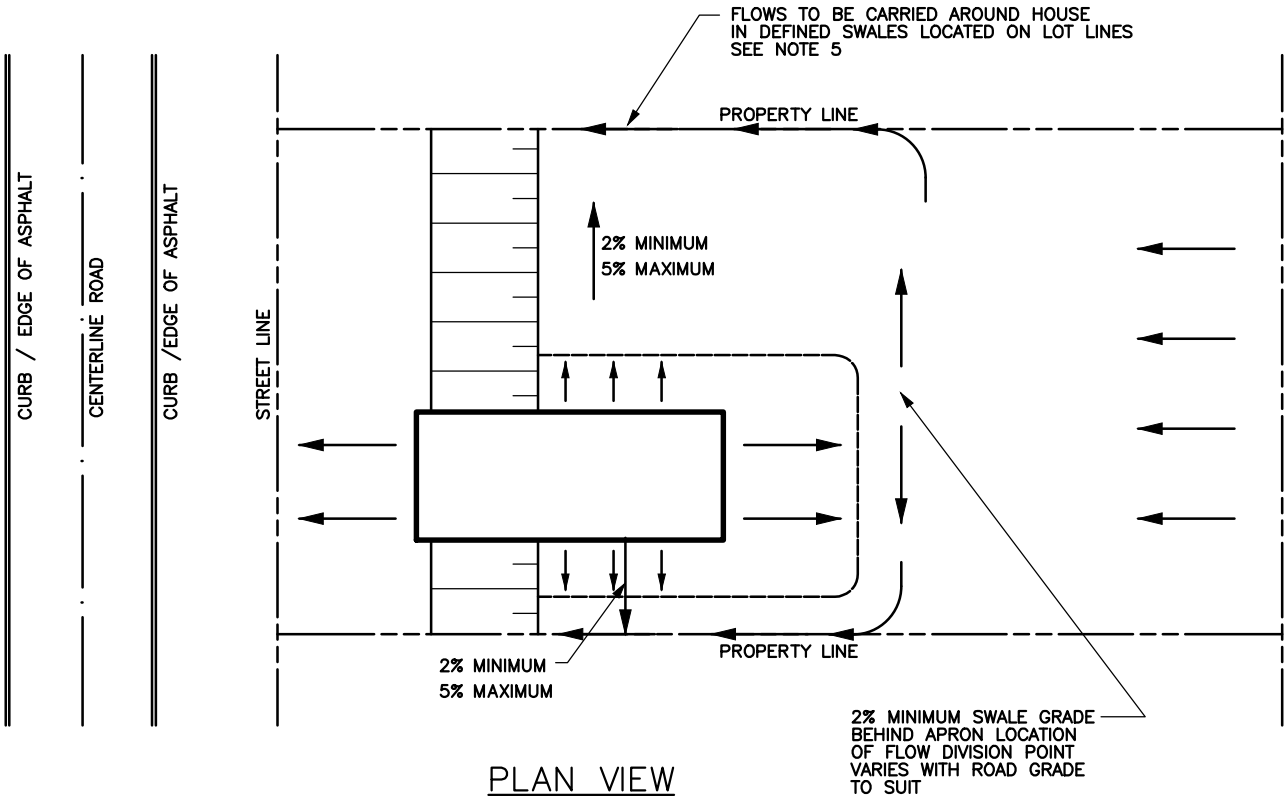
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

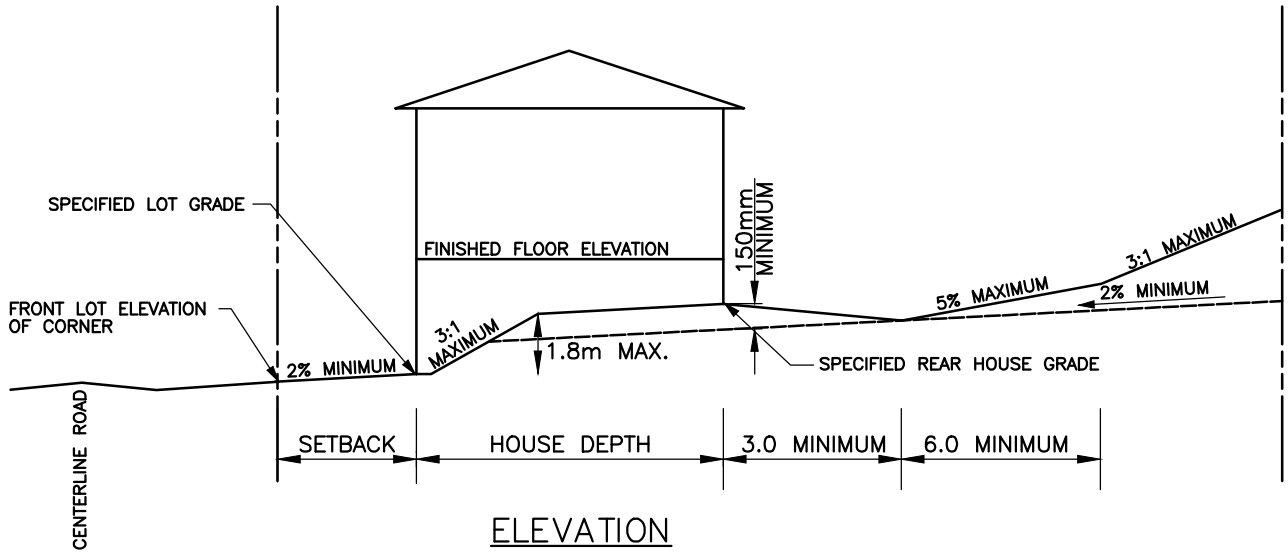
APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

REAR LOT DRAINAGE FOR WALKOUT OR BACK SPLIT HOUSE

STD. No. 403



PLAN VIEW



ELEVATION

NOTES:

1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR ANY SIDEYARD SWALE.
3. REAR HOUSE GRADE MUST BE SPECIFIED ON LOT GRADING PLANS WHEN THIS HOUSE TYPE IS PROPOSED.
4. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
5. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

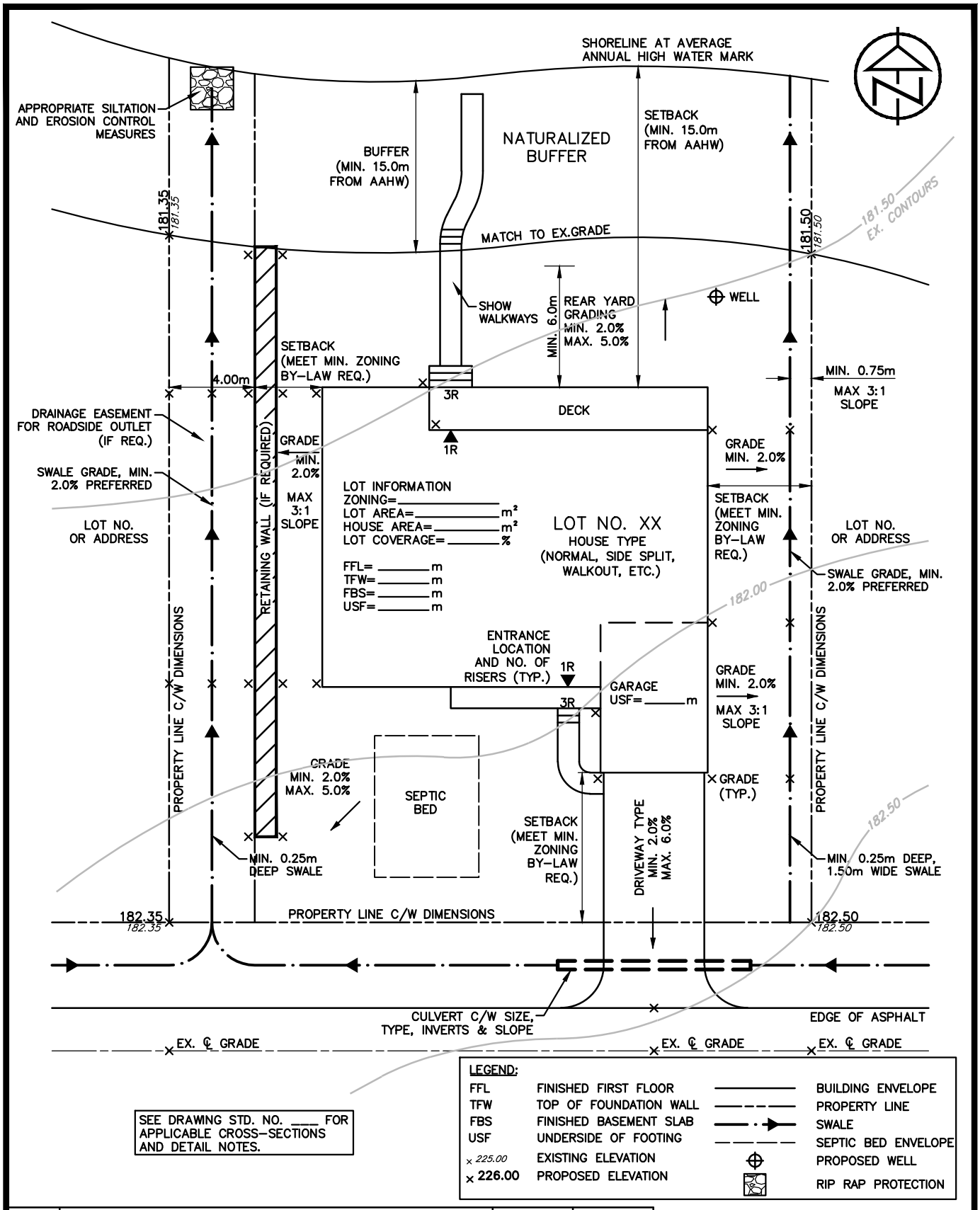
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

FRONT LOT DRAINAGE FOR FRONT SPLIT HOUSE

STD. No. 404



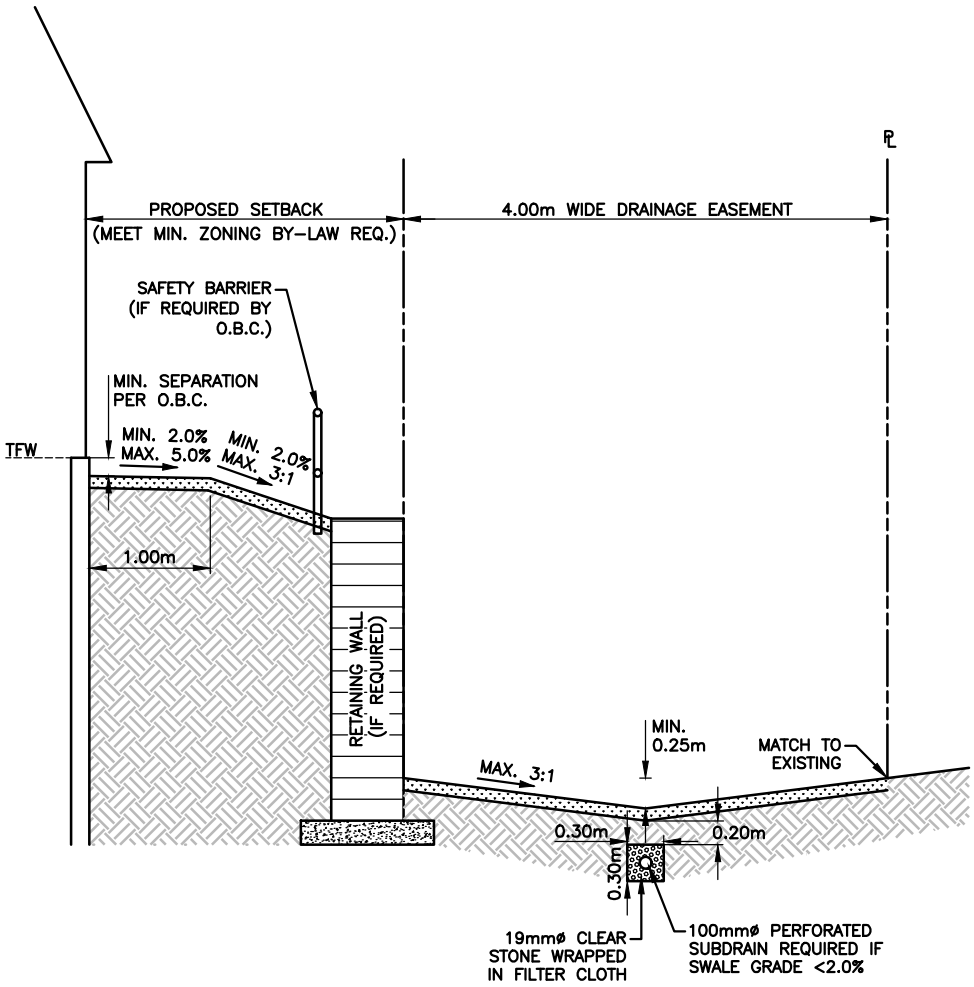
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

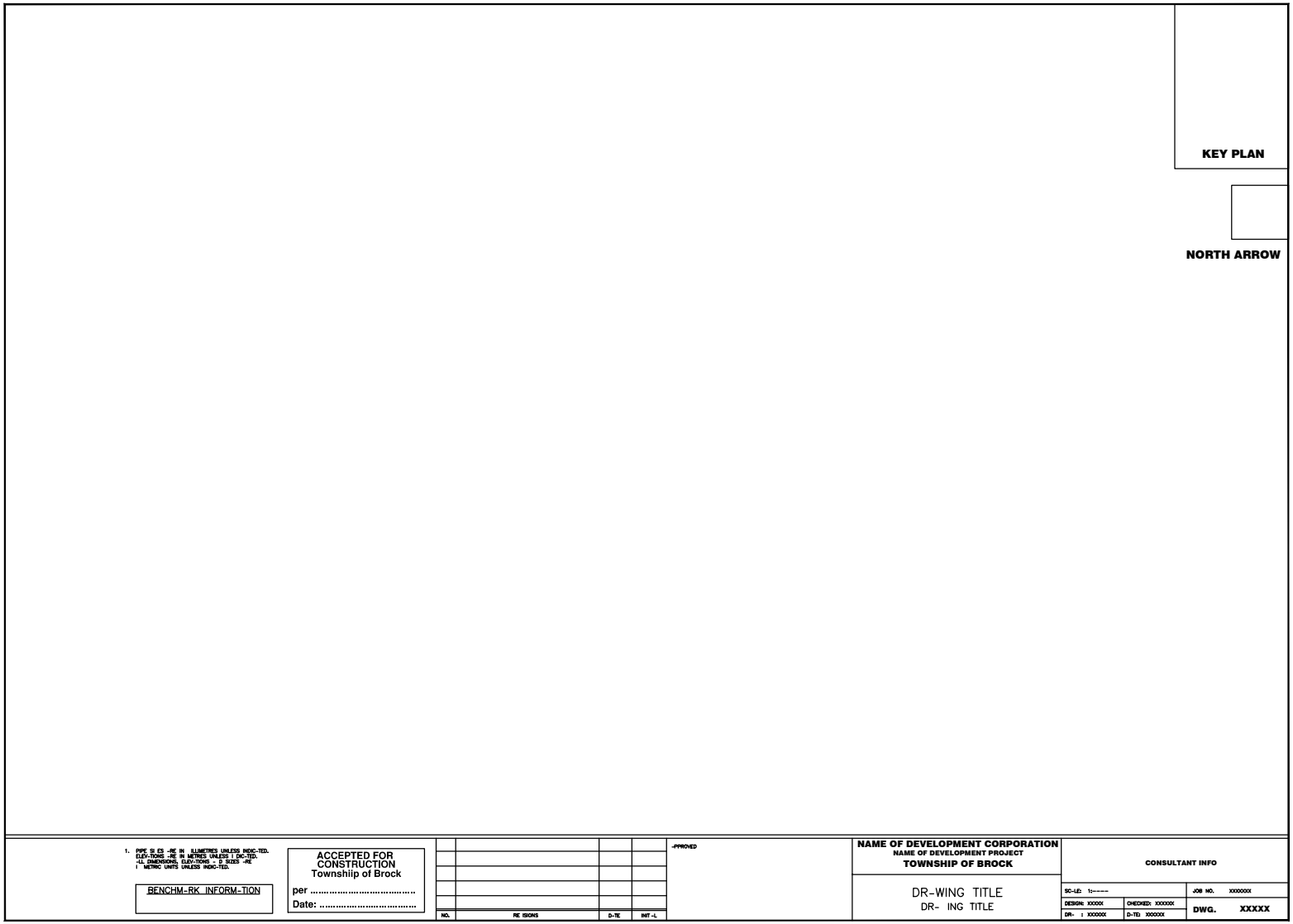
TYPICAL SHORELINE LOT GRADING PLAN

STD. No. 405



NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
	DRAWN: SMM	SCALE: NTS
TYPICAL SHORELINE LOT GRADING CROSS-SECTION	STD. No.	406



NO.	REVISION	-PR'D	D-TE

TOWNSHIP OF BROCK

ST-ND-RD PLAN SHEET
(HORIZONT-L TITLE BLOCK)

-PR'D: BWL	D-TE: JUN/18
DR-WN: SMM	SC-LE: NTS

STD. No. 500

GENERAL – CONSTRUCTION

A. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH TOWNSHIP OF BROCK, O.P.S.D. AND O.P.S.S. WHERE CONFLICT OCCURS, TOWNSHIP STANDARD TO GOVERN.

B. TRENCH BACKFILL (OPSD 802.XXX AS APPLICABLE) TO BE SELECT NATIVE MATERIAL OR IMPORTED SELECT SUBGRADE TO OPSS 1010.

C. BACKFILL TO BE PLACED IN MAXIMUM 200 mm THICK LIFTS AND COMPACTED TO 95% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD).

D. PIPE BEDDING TO BE GRANULAR 'A' PIPE COVER TO BE GRANULAR 'B' MAX. AGGREGATE SIZE 25mm FOR RIGID PIPE AND GRANULAR 'A' FOR FLEXIBLE PIPE. (MINIMUM BEDDING DEPTH 150 mm, MINIMUM COVER 300mm, COMPACTED TO A MINIMUM 95% SPMDD).

E. CLEAR STONE WRAPPED IN FILTER FABRIC CAN BE SUBSTITUTED FOR BEDDING MATERIAL IF APPROVED BY THE TOWNSHIP OF BROCK.

F. ALL MAINTENANCE HOLES ARE 1500 mm DIAMETER UNLESS OTHERWISE SPECIFIED.

G. ALL TOPSOIL AND EARTH EXCAVATION TO BE STOCK PILED OR REMOVED TO AN APPROVED SITE AS DIRECTED BY THE TOWNSHIP OF BROCK ENGINEER.

H. THE OWNER'S ENGINEER SHALL PROVIDE BENCH MARK ELEVATIONS AND HORIZONTAL ALIGNMENT REFERENCE FOR THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DETAILED LAYOUT OF THE WORK.

I. ALL PROPERTY BARS TO BE PRESERVED AND REPLACED BY O.L.S. AT CONTRACTOR'S EXPENSE IF REMOVED DURING CONSTRUCTION.

J. ALL MAINTENANCE HOLE AND CATCHBASIN FRAMES AND COVERS TO BE SET TO BASE COURSE ASPHALT ELEVATION AND RAISED PRIOR TO PLACEMENT OF FINAL COURSE ASPHALT TO THE SATISFACTION OF THE TOWNSHIP.

K. THE CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS FOR THE SUPPLY OF TEMPORARY WATER AND POWER.

L. DEWATERING TO BE CARRIED OUT IN ACCORDANCE WITH OPSS–517 AND 518 TO MAINTAIN ALL TRENCHES IN A DRY CONDITION. CONTRACTOR RESPONSIBLE FOR OBTAINING M.O.E.C.C. PERMIT IF REQUIRED.

M. ALL ENGINE DRIVEN PUMPS TO BE ADEQUATELY SILENCED, SUITABLE FOR OPERATION IN A RESIDENTIAL DISTRICT.

N. DISTURBED AREAS TO BE REINSTATED TO PREVIOUS CONDITION OR BETTER.

O. THE CONTRACTOR IS RESPONSIBLE FOR PRESERVATION OF ALL EXISTING FACILITIES AS WELL AS ALL UTILITY COMPANIES PRIOR TO COMMENCING WORK AND CO–ORDINATE CONSTRUCTION ACCORDINGLY.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

GENERAL – CONSTRUCTION NOTES

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 502

STORM SEWERS

A) M.H., CBMH AND DICBMH TO OPSD – 701.XXX (AS APPROPRIATE) C/W SUMP UNLESS NOTED OTHERWISE.

B) STEPS TO OPSD 405.010.

C) M.H. FRAMES AND GRATES TO OPSD–401.01 OPEN COVER.

D) C.B.'S TO OPSD – 705.010, 705.020

E) DICB'S TO OPSD – 705.030, 705.040, 706.010, 706.020, 706.030, 706.0.0

F) C.B. AND CBMH FRAMES AND GRATES TO OPSD – 400.020 AND REAR LOT 400.120.

G) PIPE SUPPORT AT M.H.'S, CB'S AND CBMH'S TO OPSD – 708.020.

H) C.B. LEADS – 300mm DIA SINGLE AND 375mm DIA DOUBLE TO OPSD – 708.010, 708.030.

I) PROTECTION DURING CONSTRUCTION TO OPSD – 219.XXX.

J) BEDDING AND COVER TO OPSD – 802.010. (FLEXIBLE PIPE) GRANULAR 'A' EMBEDMENT MATERIAL OR OTHER APPROVED HOMOGENEOUS GRANULAR MATERIAL OR OPSD – 802.030, 802.031 AND 802.032 (RIGID PIPE) GRANULAR 'A' BEDDING AND GRANULAR 'B' (MAXIMUM AGGREGATE SIZE 25mm) COVER.

K) TRENCH BACKFILL TO BE SELECT NATIVE MATERIAL AS APPROVED BY ENGINEER OR IMPORTED GRANULAR MATERIAL.

L) BACKFILL AND EMBEDMENT MATERIAL TO BE COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THE MATERIAL'S SPMDD.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

NOTES – STORM SEWERS

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 503

ROADS

A) SUBGRADE AND BOULEVARD MATERIAL TO BE COMPACTED TO A MINIMUM DRY DENSITY OF AT LEAST 95% SPMDD. SUBGRADE TO BE PROOF ROLLED AND CERTIFIED PRIOR TO PLACING GRANULAR 'B'.

B) GRANULAR 'A' AND 'B' BASE TO BE COMPACTED TO 100% OF THE MATERIAL'S RESPECTIVE SPMDD.

C) ROADWAYS TO BE CONSTRUCTED WITH MIN. 300MM GRANULAR 'B' TYPE 1, 150 MM GRANULAR 'A', AND 50 MM HL8 BASE 40 MM HL3 SURFACE COURSE ASPHALT. ALL SUBDRAINS TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 405.

D) SELECT SUBGRADE MATERIAL, OR IMPORTED GRANULAR MATERIAL APPROVED BY THE ENGINEER, COMPACTED TO 98% S.P.M.D.D. TO BE USED AS FILL IN ALL AREAS WHERE PROPOSED PIPE INVERTS ARE HIGHER THAN EXISTING GRADE OR AS INSTRUCTED BY THE ENGINEER.

E) ALL GRANULARS AND ASPHALT MATERIALS AND PLACEMENT TO BE IN ACCORDANCE WITH OPSS 314 AND OPSS 310

F) JOINTS WITH EXISTING ASPHALT TO BE SAW CUT STRAIGHT PRIOR TO PLACING ASPHALT AND DENSO TAPE APPLIED TO EXISTING ASPHALT.

G) STOP SIGNS AND STREET SIGNS TO TOWNSHIP STANDARDS.

H) REINSTATEMENT OF ALL DISTURBED BOULEVARDS TO INCLUDE REGRADING, 100mm TOPSOIL AND SOD TO OPSS 570 AND 571.

I) CONCRETE CURB AND GUTTER TO OPSD 600.030 OR OPSD 600.070 AND OPSS 353

J) CONCRETE SIDEWALK TO OPSD 310.010, 310.030 AND OPSS 351. SUBBASE TO CONSIST OF MINIMUM 150 mm OF GRANULAR 'A'.

K) 150 mm DIAMETER PIPE SUBDRAINS SHALL BE PROVIDED AS PER STANDARD 210 ON BOTH SIDES OF THE ROAD (WHERE APPLICABLE).

L) SUBDRAIN TO BE INSTALLED 200 mm BELOW CURB IN GRANULAR 'A' TRENCH AND CONNECTED TO EACH CB OR CBMH.

M) SUBDRAINS TO BE PERFORATED OTHER THAN THE 2.0 m SECTION IMMEDIATELY UPSTREAM OF ALL STRUCTURES WHICH SHALL BE NON–PERFORATED.

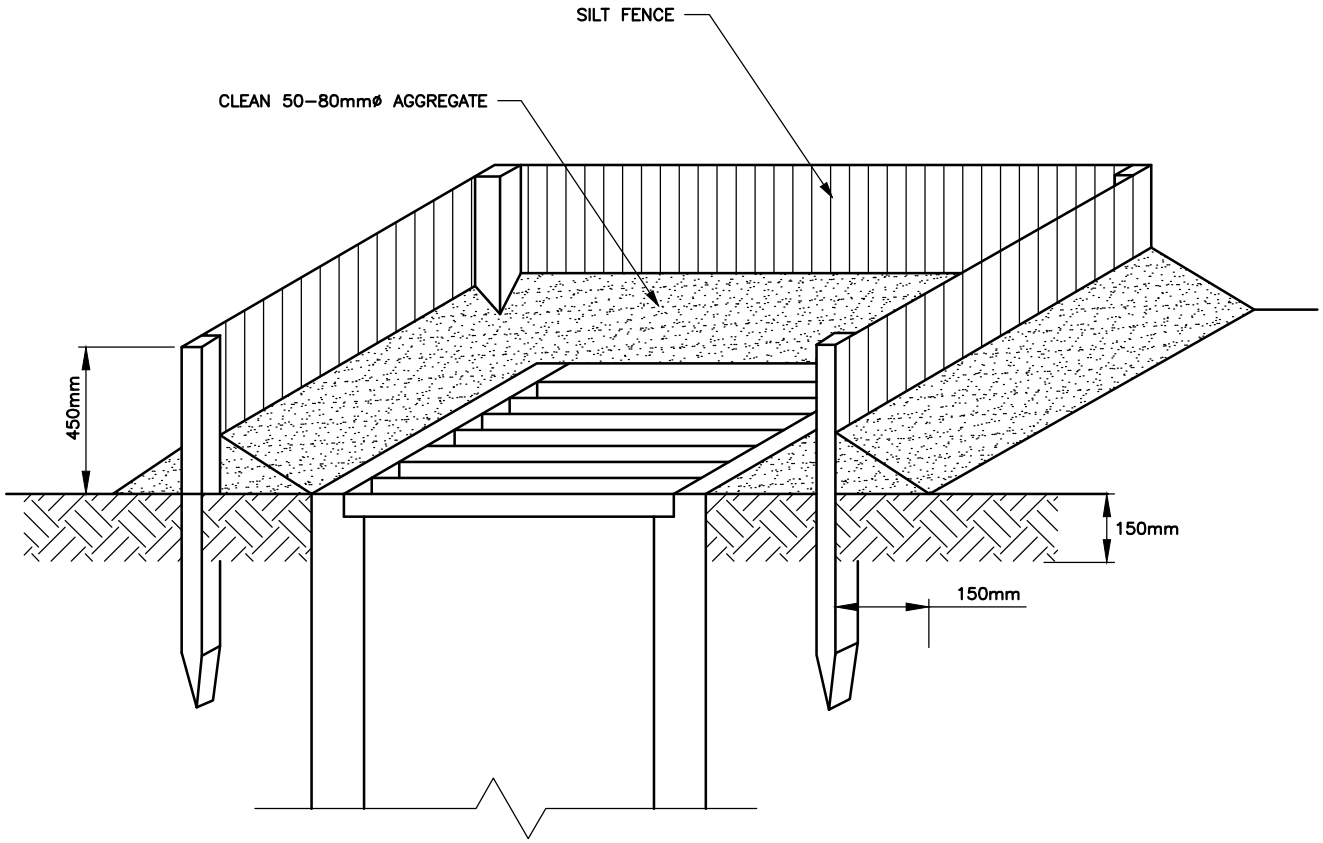
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

NOTES – ROADS

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

STD. No. 504



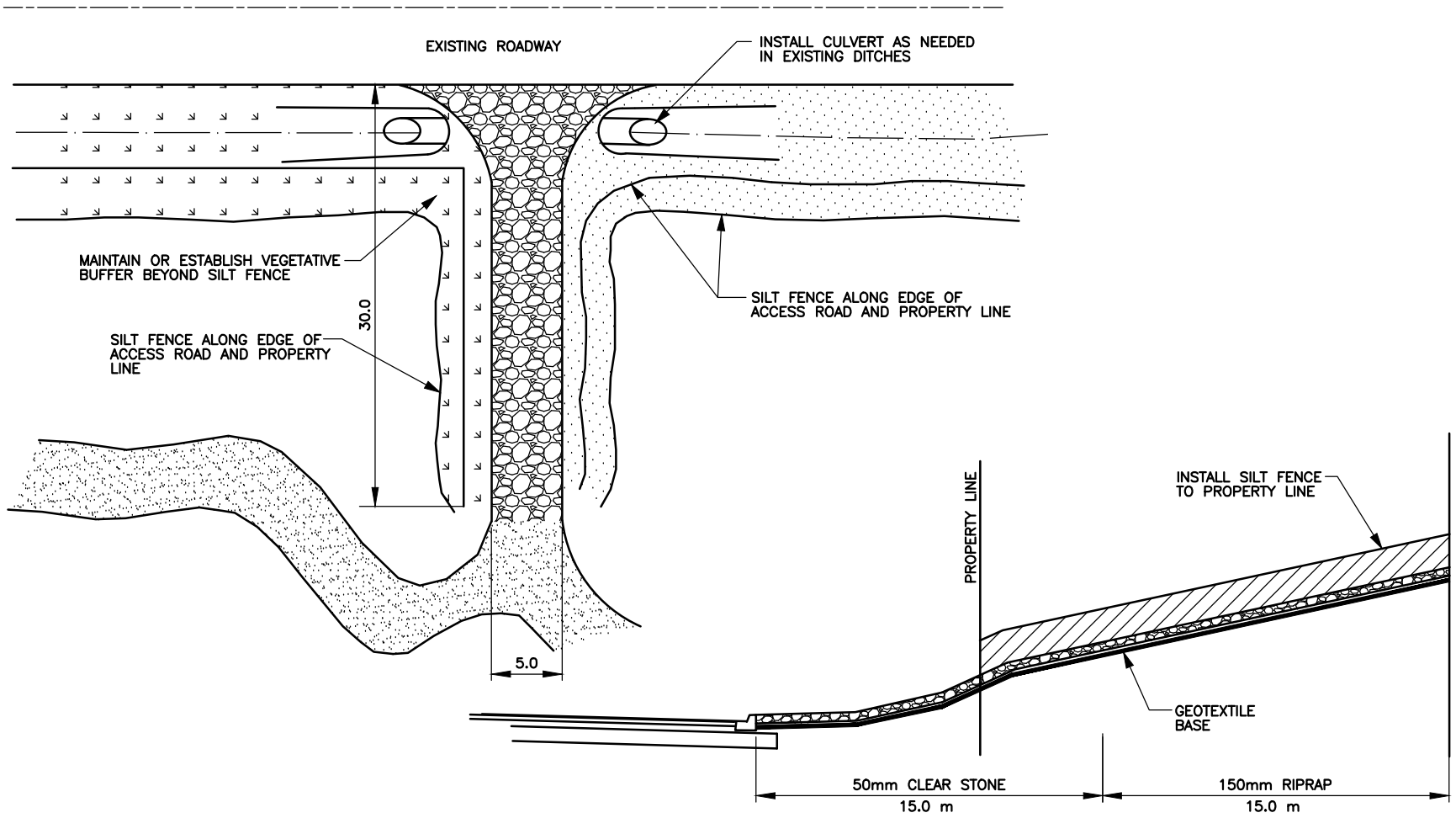
NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK

APR'D: BWL	DATE: JUN/18
DRAWN: SMM	SCALE: NTS

SEDIMENT CONTROL MEASURE AT CATCHBASINS AND CATCHBASIN MANHOLES

STD. No. 602

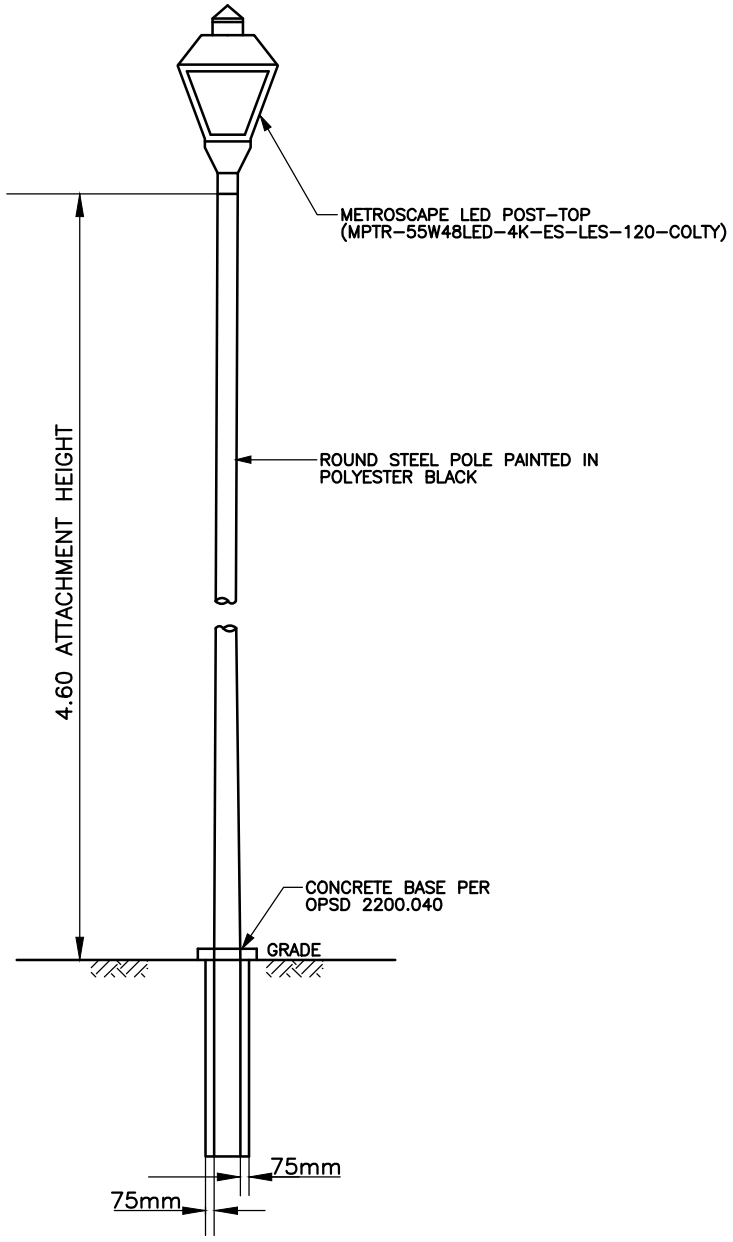


NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. PURPOSE OF CONSTRUCTION MAT IS TO MINIMIZE TRANSPORTATION OF SEDIMENT ONTO ROADWAYS.
3. CONSTRUCTION MAT IS TO BE INSTALLED AS THE FIRST STEP IN THE SITE ALTERATION PROCESS.
4. CONSTRUCTION MATS ARE REQUIRED WHERE PAVED ROADS ARE WITHIN 300m OF THE SITE.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
	DRAWN: SMM	SCALE: NTS
CONSTRUCTION ENTRANCE MAT	STD. No.	603

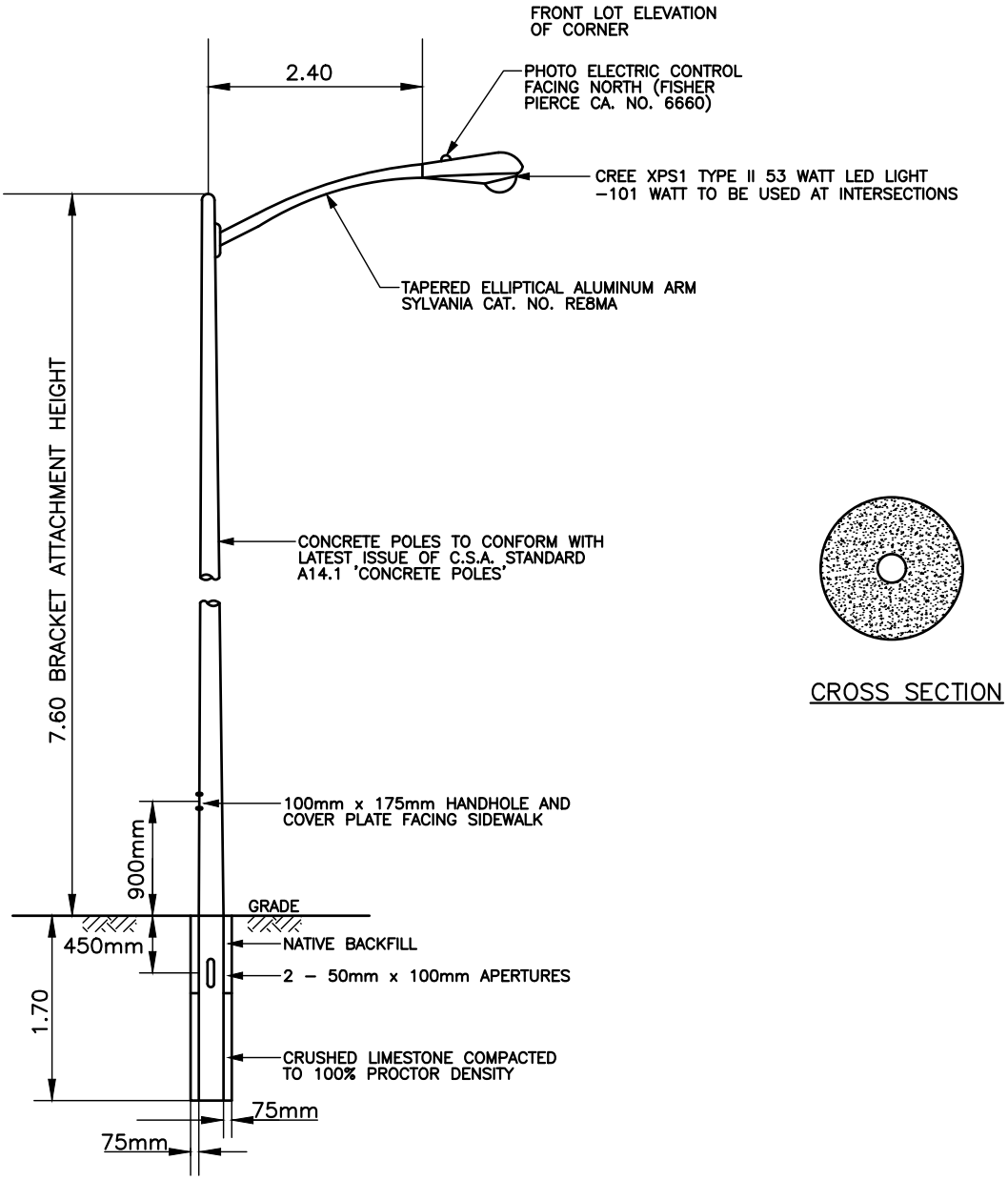


NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
	DRAWN: SMM	SCALE: NTS
TOWN AND COUNRTY POST-TOP LUMINAIRE	STD. No.	700



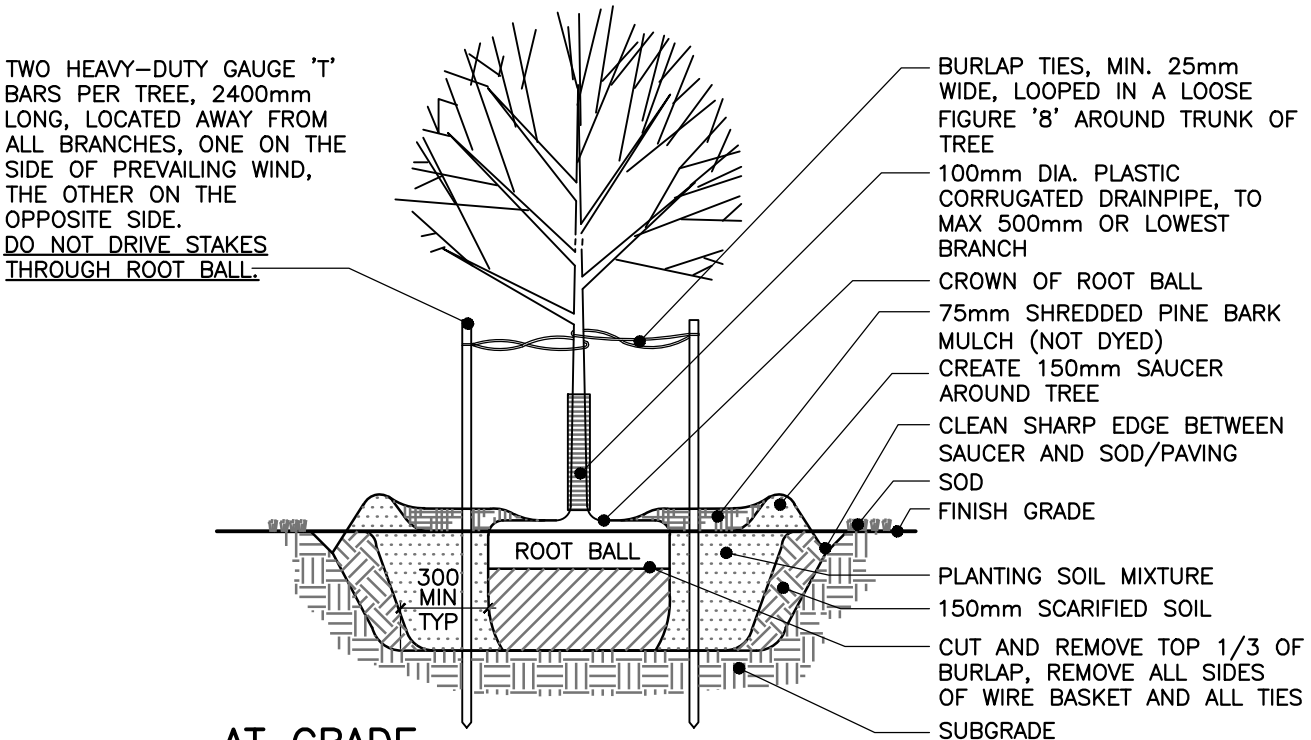
CROSS SECTION

NOTES

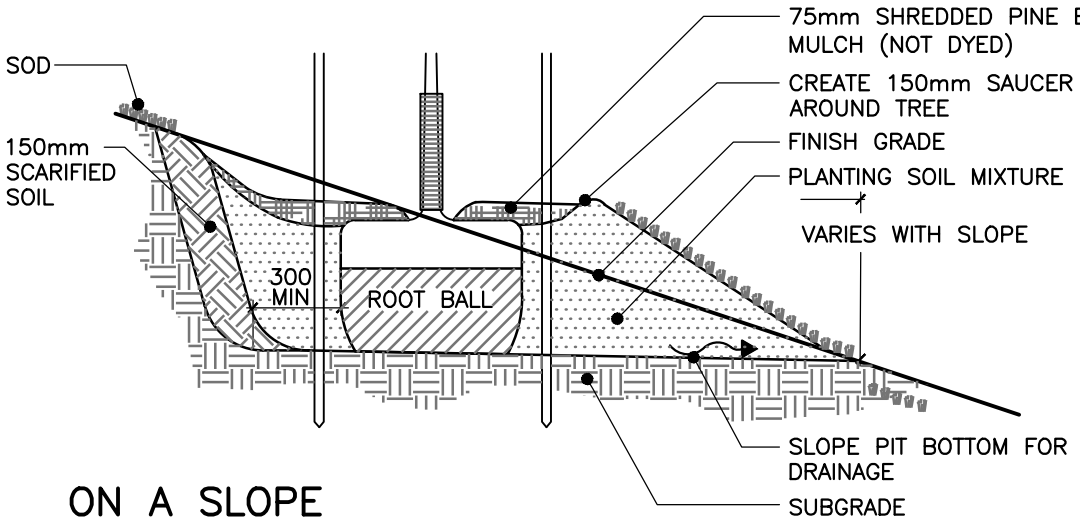
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. S/L WIRING TO LOOP UP TO HANDHOLE CONNECTION TO LUMINAIRE WIRING BY MEANS OF ESNA FUSE AND CABLE CONNECTOR.

NO.	REVISION	APR'D	DATE
1	LED LUMINAIRE	TC	JAN/14

TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
	DRAWN: SMM	SCALE: NTS
HORIZONTAL TYPE LUMINAIRE	STD. No.	702



AT GRADE



ON A SLOPE

NOTES

1. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
2. POSITION CROWN OF ROOT BALL 50mm ABOVE FINISH GRADE TO ALLOW FOR SETTLING.
3. DO CORRECTIVE PRUNING TO RETAIN NATURAL FORM OF TREE AS DIRECTED BY THE LANDSCAPE ARCHITECT.
4. FOR TREES PLANTED WITHIN PLANTING OR SHRUB BEDS, DELETE SAUCER AROUND BASE OF TREE.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
6. NO TREE PITS SHALL BE LEFT OPEN OVERNIGHT.
7. TREE GUARD REQUIRED FOR PLANTINGS IN URBAN AREAS.

NO.	REVISION	APR'D	DATE

	TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
		DRAWN: SMM	SCALE: NTS
	DECIDUOUS TREE PLANTING	STD. No.	901

NOTES

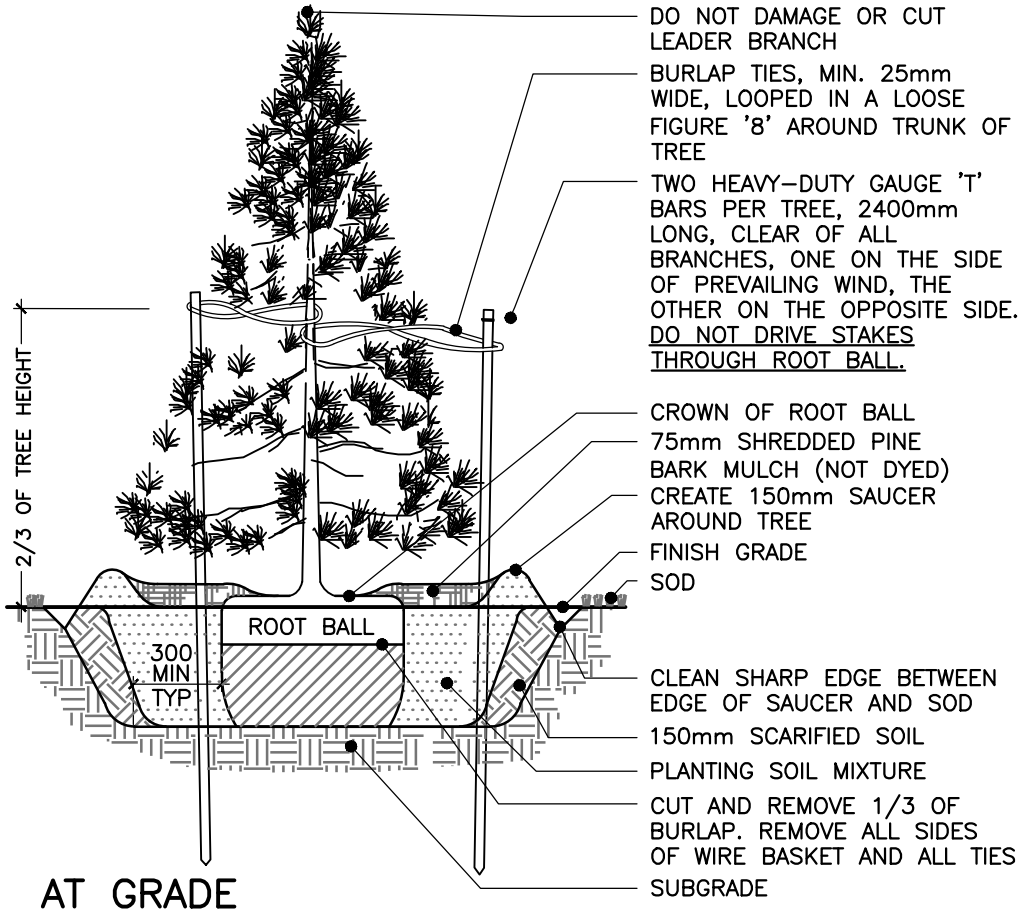
1. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.

2. POSITION CROWN OF ROOT BALL 50mm ABOVE FINISH GRADE TO ALLOW FOR SETTLING.

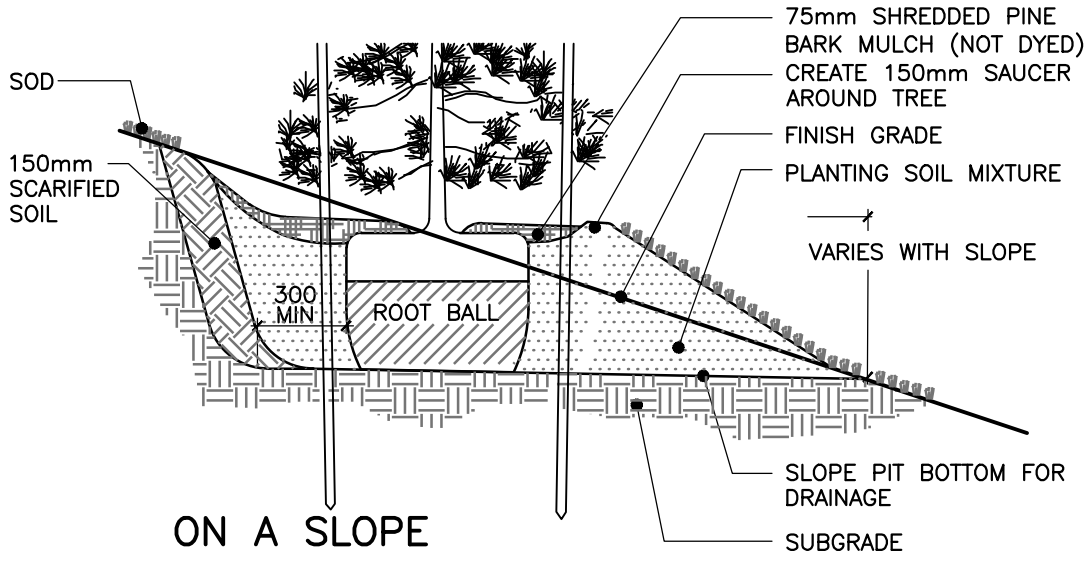
3. FOR TREES PLANTED WITHIN PLANTING OR SHRUB BEDS, DELETE SAUCER AROUND BASE OF TREE.

4. ALL DIMENSIONS IN MILLIMETRES.

5. NO TREE PITS SHALL BE LEFT OPEN OVERNIGHT.



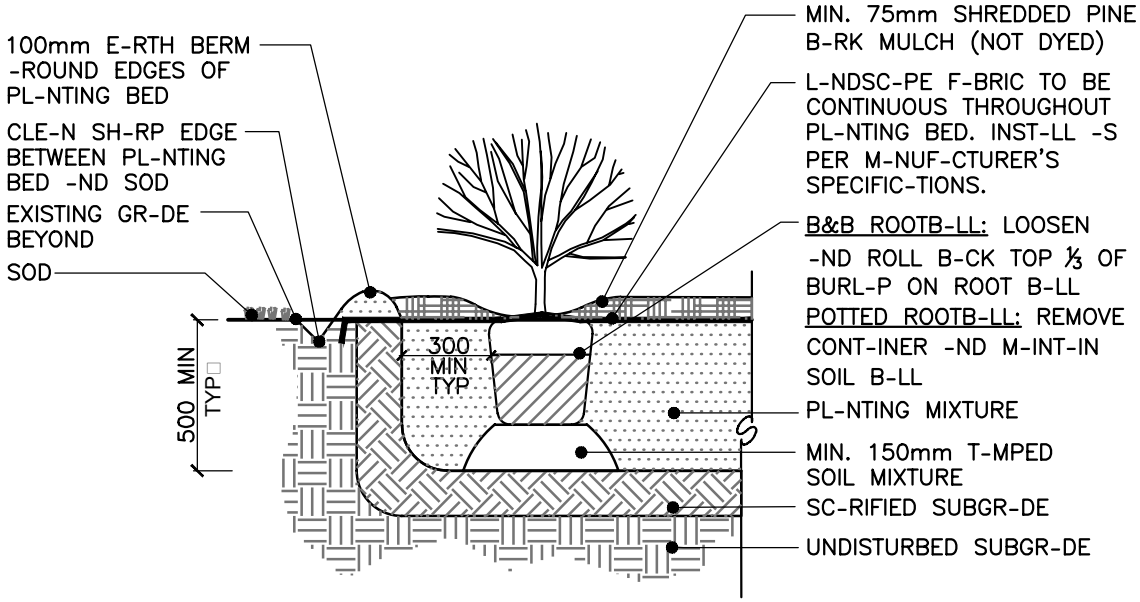
AT GRADE



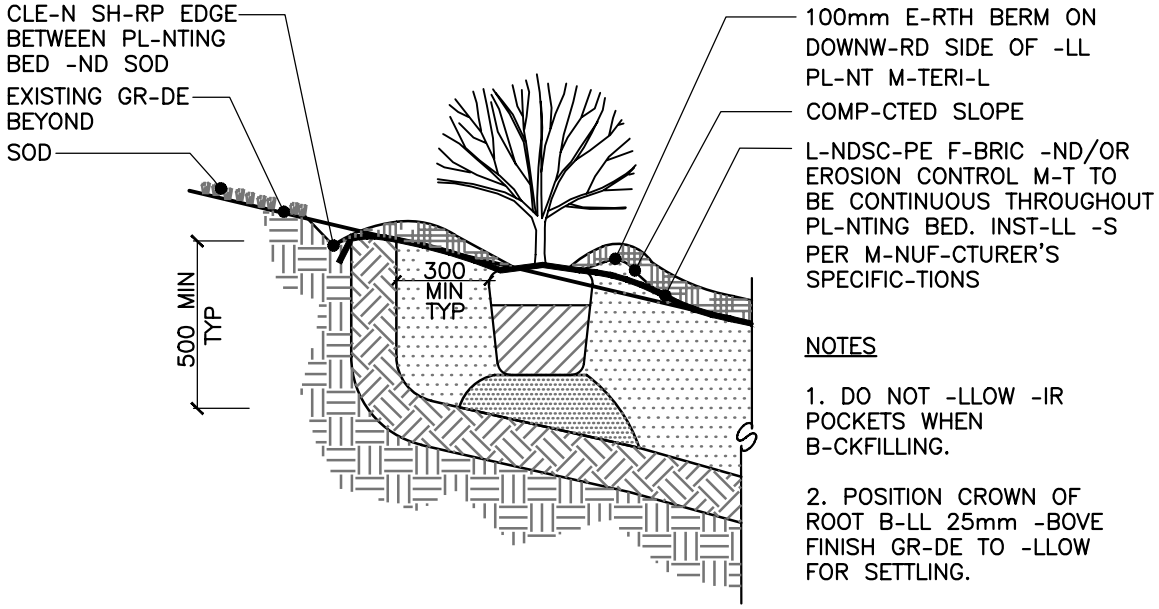
ON A SLOPE

NO.	REVISION	APR'D	DATE

	TOWNSHIP OF BROCK	APR'D: BWL	DATE: JUN/18
		DRAWN: SMM	SCALE: NTS
	CONIFEROUS TREE PLANTING	STD. No.	910



TYPIC-L SHRUB PL-NTING



PLANTING ON 3:1 SLOPE DET-IL

NOTES

1. DO NOT -LLOW -IR POCKETS WHEN B-CKFILLING.

2. POSITION CROWN OF ROOT B-LL 25mm -BOVE FINISH GR-DE TO -LLOW FOR SETTLING.

3. -LL DIMENSIONS IN MILLIMETRES.

NO.	REVISION	-PR'D	D-TE

	TOWNSHIP OF BROCK	-PR'D: BWL	D-TE: JUN/18
		DR-WN: SMM	SC-LE: NTS
	SHRUB PL-NTING	STD. No.	911

APPENDIX A:
SCHEDULE OF CONSTRUCTION COSTS

SCHEDULE OF CONSTRUCTION COSTS

SUBDIVISION: DEVELOPER: CONSULTING ENGINEER or LANDSCAPE ARCHITECT (where applicable):

SUMMARY

A. Municipal Works

Internal Work

Rough Grading	$_____
Sanitary Sewers	$_____
Water main	$_____
Storm Drainage Works	$_____
Storm Water Management Facilities	$_____
Curb and Sidewalk	$_____
Roads to Base Asphalt	$_____
Top Asphalt	$_____
Street Lights	$_____
Street Signs and Barricades	$_____
Streetscape, Landscaping and Boulevard Sodding	$_____
Fencing	$_____
Culverts	$_____
Driveway Entrances	$_____
Sub-Total	$_____

External Work

Water main	$_____
Sanitary Sewer	$_____
Storm Sewer	$_____
Roads to Top Asphalt	$_____
Sub-Total	$_____
Internal & External Sub-Total	$_____
Engineering and Contingencies allowance 15%	$_____
Sub-Total	$_____
HST (13%)	
Total	$_____

B. Township of Brock Administration Fees

To be calculated by the Township in accordance with Township with Bylaw Number 1290-94-PL, as amended.

C. Notes:

1. Lot grading deposits and related fees are posted with the Township at the time of building permit application, in order to secure adequate lot grading and drainage is maintained to the satisfaction of the Township of Brock.

APPENDIX B:

SAMPLE LETTERS – REQUEST FOR REDUCTION IN LETTER OF CREDIT & LETTER OF RETAINER & LOT GRADING CERTIFICATE

Sample Request For Reduction in Letter of Credit

Date:

Township of Brock
1 Cameron Street E.
Cannington, ON L0E 1E0
Attention: Township Engineer

Re: (Name of Subdivision)
Plan.

On behalf of the Owners of the above development, we submit the following request for a reduction in the amount of the letter of credit held by the Township as performance and maintenance security, for your consideration and approval.

We have attached hereto a summary listing the value of the work completed to date, based upon Schedule of Construction Costs of the Subdivision Agreement revised as noted to reflect all required alterations to the works. The current value of securities is calculated as follows:

Value of outstanding work (incl. contingency)		$_____
15% of completed work		$_____
Subtotal		$_____
15% Engineering and Contingency		$_____
13% HST		$_____
Subtotal		$_____
	Total	$_____

We are also attaching a Statutory Declaration by the Owner that all outstanding accounts relative to work in this subdivision have been paid.

Yours very truly,

(Signature of Engineer), Name of Engineering Firm

Sample Retainer Letter

(Engineer's Letterhead/Landscape Architect)

Township of Brock
1 Cameron Street E.
Cannington, ON L0E 1E0
Attention: Township Engineer

Re: (Name of Subdivision/Site Development)

1. Retainer

This will confirm our firm has been retained by (name of company) to act as consulting engineers/landscape architects for the (name of project).

2. Engineering Provisions

In submitting this letter, we confirm we have read the engineering provisions of the Township of Brock for developments and can confirm the writer is experienced in the field of (municipal engineering services/landscape architecture).

3. Terms of Retainer

The terms of our retainer with the (name of company) are as follows:

a) Plans and Specifications – Prepare plans and specifications for the construction of all storm water and sanitary services and general lot grading, etc.
b) Cost Estimate – Prepare cost estimates for the construction from the engineering drawings.
c) Approvals – Obtain all necessary approvals to construct.
d) Coordination – Coordinate the installation of services to avoid conflicts with regards to telephone, cable T.B., underground hydro, electrical services, as well as any other services shown on the engineering drawings.
e) Composite Utility Plan – Prepare a "Composite Utility Plan" for the above services.
f) On-Site Inspections – Perform all on-site inspections for municipal and internal servicing and provide general supervision during construction.
g) Certification – Certify the construction of the municipal and internal servicing is in accordance with the accepted design drawings and specifications.
h) As Constructed Drawings – Submit certified "as constructed" drawings after acceptance of the municipal and internal services.

i) Change in Retainer – If at any time during the project:

   i. The terms of our retainer are change by our client, or

   ii. If we become aware that we will not be able to give post-construction certification, we will notify you within 24 hours.

Yours truly,

(Signature of Engineer), Name of Engineering Firm

CC: Township Solicitor – (for the project)
Township Planner – (for the project)

NOTES TO THE ABOVE:

1. The consulting engineer's letter must SPECIFICALLY MENTION those services which the person is providing, i.e. Design, Inspection, approval, etc.

Sample Lot Grading Certificate

WHEREAS, Sentence 9.14.6.1 of Ontario Regulation 413/90, made under the authority of the Building Code Act, requires the building shall be located and the building site graded so water will not accumulated at or near the building and will not adversely affect adjacent properties.

I,_____ hereby certify I have conducted a field review of the site and find it to be in compliance with the approved Site Grading Plan submitted and reviewed by the Township of Brock.

Application Number:_____ Project Description

Project Location:

Lot Number: _____ Plan Number:

Name of Owner (in full):

Owners Address:

Postal Code: _____ Telephone Number:

Consultant:

Signature of Grading Consultant:_____ Date:_____

Affix Seal Below

APPENDIX C:
FORM A2 – INFORMATION CHECKLIST

FORM A2

INFORMATION CHECKLIST FOR DETAILED

ENGINEERING SUBMISSIONS TO THE TOWNSHIP OF BROCK

1. General Information

1.1 Applicant

Name (attach proof)

Address | City/Province

Postal Code | Telephone Number | Fax Number (or email)

1.2 Consultant

☐ Same as Owner ☐ Different than owner (provide details)

Name

Address | City/Province

Postal Code | Telephone Number | Fax Number (or email)

1.3 Description of Lands | "I" Number

Lot and Concession, Township, Municipality | 18 T--

2. Information Checklist

Documentation	Information Provided		If no, give reason
a) Certified Information Checklist	☐Yes	☐ No	
b) Copy of Approved Draft Plan	☐ Yes	☐ No	
c) Copy of Proposed Plan for Registration	☐ Yes	☐ No	
d) Consultant's Declaration Statement	☐ Yes	☐ No	
e) General Plan(s) of Services	☐ Yes	☐ No	
f) Lot Grading Plan(s)	☐ Yes	☐ No	
g) Area Rough Grading Plan(s)	☐ Yes	☐ No	
h) Erosion and Sediment Control Drawing	☐ Yes	☐ No	
i) Storm Drainage Plan(s)	☐ Yes	☐ No	
j) Supporting Calculations (Storm)			
– hydraulic gradeline calculations (100 year storm)	☐ Yes	☐ No	
– minor/major storm system	☐ Yes	☐ No	
– hydraulic calculations storm sewer design sheet(s)	☐ Yes	☐ No	
– pipe strength and sewer bedding requirements	☐ Yes	☐ No	
k) General Plan of Service	☐ Yes	☐ No	
l) Sanitary Drainage Plans	☐ Yes	☐ No	

FORM A2

INFORMATION CHECKLIST FOR DETAILED

ENGINEERING SUBMISSIONS TO THE TOWNSHIP OF BROCK

	m) Supporting Calculations (Sanitary) – hydraulic gradeline calculations (100 year storm) – minor/major storm system – hydraulic calculations storm sewer design sheet(s) – pipe strength and sewer bedding requirements	 ☐ Yes ☐ Yes ☐ Yes ☐ Yes	 ☐ No ☐ No ☐ No ☐ No	
	n) Plan and Profile Plan	☐ Yes	☐ No	
	o) Park Grading Plan(s)	☐ Yes	☐ No	
	p) Detail Drawing(s)	☐ Yes	☐ No	
	q) Subdivision Phasing Plan	☐ Yes	☐ No	
	r) Water Supply & Distribution Plan	☐ Yes	☐ No	
	s) Stormwater Management Report	☐ Yes	☐ No	
	t) Stormwater Management Operation & Maintenance Report	☐ Yes	☐ No	
	u) Stormwater Management Plans	☐ Yes	☐ No	
	v) Geotechnical Investigation Report	☐ Yes	☐ No	
	w) Traffic Impact Study	☐ Yes	☐ No	
	x) Illumination Calculation	☐ Yes	☐ No	
	y) Noise & Vibration Study	☐ Yes	☐ No	
	z) Arborist Report	☐ Yes	☐ No	
	aa) Archaeological Assessment	☐ Yes	☐ No	
	bb) Preliminary R-Plans	☐ Yes	☐ No	
	cc) Streetscape Planting Plan(s)	☐ Yes	☐ No	
	dd) Utility Coordination Plan(s)	☐ Yes	☐ No	
	ee) Supplementary Hydrogeologist's Report(s)	☐ Yes	☐ No	
	ff) Cash Deposit to Municipality	☐ Yes	☐ No	

FORM A2

INFORMATION CHECKLIST FOR DETAILED

ENGINEERING SUBMISSIONS TO THE TOWNSHIP OF BROCK

3. Statement/Signatures	3.1 Statement by I_____ of _____ Consulting Engineer Consulting Firm do hereby confirm that I am skilled and experienced in municipal work and land development projects. I am registered with the Professional Engineers of Ontario and possess a current certificate of authorization to practise professional engineering in accordance with the Professional Engineers Acts. By affixing my signature and seal hereto, I hereby warrant that the engineering information submitted is complete, check by me personally and has been prepared in a manner meeting or exceeding normal engineering standards of practice. _____ Consulting Engineer Seal