



— Township of —

**SEVERN**

## **ENGINEERING STANDARDS**

Engineering Drawings, Reports & Submission  
Requirements

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# 1 Introduction

The purpose of this section is to outline the minimum requirements for engineering drawings, reports, and submissions to be made to the Township. These are provided as a general guideline to ensure consistency in all municipal capital as well as land development projects within the Township. This is not to be considered an exhaustive list and shall not relieve the practitioner of the responsibility of ensuring a completed product demonstrating competent engineering and full compliance with all applicable legislation.

Practitioners are advised to consult with the Township to ensure that they understand the Township's expectations for the submissions related to their specific project. Practitioners are also advised to review the Ministry of Transportation and/or County of Simcoe requirements, where applicable, as they may differ from those contained herein.

All drawings, reports, and studies must be prepared and signed by qualified practitioner(s) with appropriate licenses, certifications, and/or designations in their respective field of expertise.

All drawings, reports, and submissions must be approved by the Township prior to implementation. Any materials submitted may be subject to peer review at the Township's discretion. Where the material is related to a land development application, the cost of the peer review will be at the applicant's expense.

## 2 Deviation from Standards

If the practitioner deems that a deviation from these standards is required, they must make a formal request to Township, complete with a memorandum identifying the proposed deviation along with an explanation of the rationale behind the requirement and how it will be of benefit. The Township may approve or reject any/all requests and the practitioner must comply with that decision. If a deviation is approved, a copy of the written approval must be included with any submissions to the Township.

## 3 Submission Process

The following subsections provide an overview of the submission process. Additional details and specific requirements are provided in subsequent sections.

### 3.1 First Submissions

A complete first submission, including all drawings and supporting reports, as required, shall be submitted to the Township in digital format. At a minimum, a detailed topographic survey and development of base plans showing existing and proposed features is required. The submission will be circulated and reviewed by all relevant departments and stakeholders. Comments will then be provided back to the practitioner. The Township will make best efforts to consolidate comments prior to their release.

### 3.2 Second and Subsequent Submissions

Second and subsequent submissions are not to be made until the Township's comments regarding the first or previous submission have been provided and addressed.

If comments remain unaddressed and/or significant progress in the development of the design is not demonstrated in a second or subsequent submission, the Township may, at their discretion, elect to return the submission to the practitioner without review.

All second and subsequent submissions must be accompanied by a letter from the practitioner that itemizes how each of the previous submission comments have been addressed as well as any new changes to the submission.

### 3.3 Final Submission

Once all comments have been addressed to the Township's satisfaction, a final submission must be provided that includes a digital copy of all drawings (PDF and AutoCAD/Civil 3D), reports, permits, approvals, tender documents, cost estimate, etc.

### 3.4 As-Built or Record Drawing Submissions

Upon the completion of construction, and at additional intervals in the case of land development projects, a complete set of as-built or record drawings, whichever may be required by the Township, shall be submitted to the Township in digital (PDF and AutoCAD/Civil 3D) format. In the case of record drawings, the drawings shall be signed and sealed as a confirmation of review and accuracy by the practitioner.

The Township will review the drawings and provide any comments back to the practitioner to address, as necessary.

Record drawing requirements are provided in Section 4, below.

## 4 Drawing Requirements

This section is intended to provide general guidance on the minimum requirements for various drawings that may be required to be completed in support of a project. This is not considered to be an exhaustive listing. All drawings may not be required for a given project and, conversely, there may be additional drawing requirements depending upon the nature of the project, site specific conditions, and other factors. The required drawings should be confirmed with the Township prior to commencement of any design work.

### 4.1 General

All drawings shall be prepared in metric, using AutoCAD, Civil 3D or other appropriate software for the intended use. Drawings shall be standard A1 (594 mm x 841 mm) size. The drawing scale may vary depending upon the drawing purpose, as further discussed below, but must provide for ease of review and legibility.

All geodetic data shall reference the NAD 83 UTM Zone 17 coordinate system. A minimum of one local benchmark must be provided.

The standard Township of Severn title block shall be used on all engineering drawings. A digital template can be obtained from the Township.

A title sheet is required for all engineering drawing submissions and must include the name of the project, a project location key map, project/contract number, the revision or purpose of the drawing set (i.e. First Engineering Submission, 90% Submission, Issued for Construction, etc.), and the date of submission.

A drawing list or index must also be provided.

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

## 4.2 General Notes

A drawing containing general requirements of the project shall be provided. This shall include, but may not be limited to:

- a) General design criteria and construction requirements that are applicable to the project, including those related to the roads, sewers, and watermain.
- b) Any Township policies or requirements related to the project, such as hours of work, permitting, access, etc.
- c) Conditions or requirements of other agencies such as utilities, County of Simcoe, MTO, MNRF, DFO, etc.

## 4.3 Plan and Profile Drawings

Plan-profile drawings are required for all roadways, blocks, and easements where servicing, utilities, or other underground infrastructure are proposed or where there are proposed ditches and outfalls.

In general, east-west roadways shall have zero chainage at their westerly limit and north-south roadways shall have their zero chainage at their southerly limits. The intersection of centrelines of roadways shall be used as zero chainage. Chainage on a plan-profile shall increase from left to right.

Plan-profile drawings are to be drawn to a horizontal scale of 1:250 and a vertical scale of 1:50. A horizontal scale of 1:500 may be permitted in some cases, but must be confirmed with the Township prior to commencing design. All stationing and elevations on plan-profile drawings must be shown with accuracy to two decimal points.

The profile portion of the drawing must line up with a form a vertical projection of the plan portion.

Where multiple drawings are required, match lines must be used with no overlap or duplication of information.

Plan-profile drawings and are to include, as a minimum, the following:

- a) A complete legend, key plan, north arrow, and street names.
- b) All existing roadways, services, utilities, and abutting properties.
- c) All proposed works to be constructed.
- d) All property boundary information, including road allowances, lots, blocks, easements and reserves. Municipal addresses or lot numbering must also be shown.
- e) Pertinent information from a geotechnical investigation, including borehole locations, approximate groundwater elevation, and soils information.
- f) On the plan portion:
  - All roadways, shoulders, ditches, curb and gutter, sidewalks, trails, boulevards, and driveways shall be shown and dimensioned.
  - All horizontal curvature data, including intersection radii.
  - All watermain, including appurtenances such as fire hydrants, valves, tees, bends and fittings.
  - All sanitary and storm sewers as well as culverts are to be shown complete with type, length, diameter, and grade as well as direction of flow arrows. Maintenance holes shall be shown and labelled with an ID number. Catch basins and catch basin connections shall be shown, including stationing, ID number, reference to OPSD or Special Detail, top of grate elevation, and inverts for all connections with directional reference to the north arrow. All top of grate and invert elevations for any ditch inlet or rear lot catch basins are to be shown.
  - The location of all water, sanitary, and storm service connections shall be shown, complete with typical details of type and size. Services to blocks of land must be fully detailed and dimensioned (size, length, grade, invert elevations, materials, class of pipe, bedding, etc.).
  - The location of all aboveground utility poles, pedestals, transformers, street and traffic lights.
  - The location and type of all street name, traffic control, and information signs.
  - The location and type of all trees and plantings.
  - All additional features, including but not limited to, headwalls, retaining walls, handrails, guiderails, stairs, surface treatments, etc.
  - References to other drawings, as necessary.
  - Any other special notes or details required for construction.

- Plan view drawings shall extend a sufficient distance beyond the limits of the proposed work to confirm the feasibility of the connections, transitions, and possible future extensions.

g) On the profile portion:

- the original ground at centreline and proposed centreline profile elevations at a minimum 20 m intervals. Additional proposed centreline profile details, including length and grade of profile, points of intersections, vertical curve data, high point chainages and elevations, low point chainages and elevations, etc.
- The type, length, diameter, and grade of all sanitary and storm sewers as well as culverts.
- All maintenance holes, including stationing, ID number, reference to OPSD or Special Detail, inverts for all connections with each having directional reference to the north arrow, and any external drop structures or safety platform requirements.
- Diameter and flow direction for any intersecting sewers.
- Basement elevations of existing dwellings where sewers are proposed to be constructed.
- The type, diameter, and depth of cover for all watermain.
- All hydrants, valves, tees, bends and fittings on the watermain.
- Existing underground services and utilities that are critical to and/or may conflict with the new construction. Subsurface Utility Engineering investigations, including test holes, may be required to determine actual location and elevation of these services and utilities.
- Where possibility of conflict with other services exists, crossing details and requirements are to be shown or a crossings chart included.
- Profiles shall extend a sufficient distance beyond the limits of the proposed work to confirm the feasibility of the connections, transitions, and possible future extensions.

#### 4.4 Removals Plans

Where there are existing roadways, servicing, or other infrastructure that will require removal as part of construction, detailed removals plans shall be prepared to depict the extent of work required.

#### 4.5 General Servicing Plans

When requested, and particularly for land development projects, a general servicing plan shall be prepared at a maximum scale of 1:1,000. Where this scale would require more than one "General Servicing Plan" to cover the entire project, a smaller scale may be accepted, or alternatively multiple plans shall be provided.



A Key Plan at a scale of 1:10,000 shall be included and the area covered by the drawing shall be clearly identified within the key plan.

A drawing index shall be shown to identify the Plan and Profile Drawing number for each street or easement shown.

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

- a) All road allowances, lots, blocks, easements and reserves. All sites/blocks for parks, schools, churches, commercial and industrial development must be shown.
- b) Roadways and street names.
- c) All aboveground works, including curb and gutter if applicable, sidewalks, trails, signage, barricades, fencing, retaining walls, community mailboxes, utilities, streetlights, boulevard trees, etc.
- d) All underground works, including watermain, sanitary, storm sewers, culverts, inlets/outlets, etc.
- e) All existing services, utilities and abutting properties are to be shown in light or background line weight.
- f) Floodplain limits and approved fill line restrictions, if applicable.

## **4.6 Drainage Area Plans**

### **4.6.1 Sanitary Drainage Area Plans**

Sanitary Drainage Area Plans shall be prepared at a maximum 1:1,000 scale, unless otherwise approved by the Township. It is preferred to have one overall plan that covers the entire project and, if necessary, supplemental separated plans to better depict the information.

The sanitary drainage area plan shall include, but may not be limited to, the following:

- a) Roadways, easements, and blocks where there is sanitary servicing. Street names and block numbering shall be provided.
- b) Proposed sanitary sewers, including length, size, and grade as well as maintenance hole and service locations.
- c) Delineated drainage areas within the project limits contributing to each segment of pipe, marked with the area, number of units, and density.
- d) Any contributing external drainage areas and populations.

The information on all sanitary drainage area plans shall match that contained within the sanitary sewer design sheets.

#### 4.6.2 Storm Drainage Area Plans

Storm Drainage Area Plans shall be prepared at a maximum 1:1,000 scale, unless otherwise approved by the Township. It is preferred to have one overall plan that covers the entire project and, if necessary, supplemental separated plans to better depict the information.

For the predevelopment scenario, the watershed area shall be determined 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 will establish the external drainage areas and this information shall be confirmed with the Township prior to commencing the design.

The pre-development storm drainage area plan shall depict the nature of the existing drainage areas within and surrounding the project limits and shall clearly show all existing contours or other information used to justify the limits of the external drainage areas.

In lieu of precise information related to watershed areas, the latest Zoning By-law and/or Official Plan issued by the Township may be used to determine the correct land use, which can then be used to identify suitable values for the run-off parameters for any external areas.

For the post-development scenario, a storm drainage area plan shall be prepared and shall include all proposed roadways, lots, blocks and other lands associated with the project. The proposed storm sewer or storm drainage system shall be shown on this plan.

The storm drainage area plans shall include, but may not be limited to, the following:

- a) Existing contours and drainage patterns of project lands and surrounding lands.
- b) Roadways, easements, and blocks where there is proposed storm drainage or servicing. Street names and block numbering shall be provided.
- c) Proposed ditches, swales, culverts, storm sewers, including length, size, and grade as well as maintenance hole, catch basins, and any service locations.
- d) Delineated drainage areas external to and within the project limits contributing to each segment of pipe, marked with a catchment area ID, tributary area, and runoff coefficient.
- e) Temporary or permanent quantity and quality stormwater management facilities.
- f) Major and minor overland flow routes.

In cases where areas of different run-off parameters may be tributary to the same point, the areas shall be shown separately or weighted averages and calculations shall be provided.

The information on all storm drainage area plans shall match that contained within the storm sewer design sheets and/or the SWM modeling software used.

## 4.7 Storm and Sanitary Design Sheets

Where required by the Township, the storm and sanitary sewer design sheets for the project must be displayed on a separate drawing within the submission set.

## 4.8 General Grading and Detailed Lot Grading Plans

Grading plans shall be prepared to demonstrate how a project will maintain suitable drainage while tying into surrounding areas.

For road projects, drawings shall be prepared to show details of the gutter grades around all 90-degree crescents, intersections and cul-de-sacs. Additionally, road cross-sections may be required on separate drawings to illustrate tie ins at property line and at driveways or entrances.

For land development projects, overall general grading plans shall be prepared at 1:500 for single-family or semi-detached urban areas, 1:200 for multi-family areas, and at 1:1,000 for rural estate areas.

The general grading plans shall include, but may not be limited to, the following:

- a) All lots, blocks, and easements within the development, numbered in accordance with the plan proposed for registration.
- b) Existing contours at maximum 0.5 m intervals within the site and extended outside the site far enough to show existing drainage patterns.
- c) Tie in elevations at property limits. A 0.6 m strip shall be left undisturbed along the property boundary next to adjacent properties unless grading is required to eliminate drainage problems on adjacent properties. Silt Control fencing shall be shown within the undisturbed strip along the property boundary.
- d) Building envelopes, driveways, service locations.
- e) Centreline elevations of proposed and existing roads at 20 m intervals.
- f) Proposed elevations at front and rear building envelope.
- g) Proposed elevations at the corners of each lot and block and intermediate points of grade change.
- h) Proposed 0.5 m contours for grading within large blocks and parks.
- i) Proposed grades for major and minor overland flow routes.
- j) Physical structures such as fencing, retaining walls with elevations, etc.
- k) Existing and proposed culverts, storm sewer, and drainage structures, with elevations.
- l) Arrows indicating the direction of the surface water run-off.
- m) All swales, other than the normal side yard swales, along with percent grade and the invert elevation of the swale at regular intervals.
- n) All terracing required with the intermediate grades specified.

#### 4.8.1 Detailed Lot Grading Plans

As a requirement of building permit applications, a separate detailed lot grading plan must be prepared for each individual lot to demonstrate that the proposed building can be constructed and drainage patterns can be maintained in accordance with the overall general grading plans. The detailed lot grading plans shall include, but may not be limited to, the following:

- a) Scale of 1:250.
- b) Development name, lot number, municipal address, as applicable.
- c) Plan Designer, Engineer, and/or architect information, including seal.
- d) Benchmark, north arrow, and key plan.
- e) Legend.
- f) General notes, as applicable.
- g) Lot dimensions.
- h) Centreline of road elevation (minimum of one).
- i) Driveway location, width, grade.
- j) Location of all underground services (water, sanitary, storm) or designated areas for wells and septic systems.
- k) Location of all aboveground features with offset dimensions to confirm no conflicts.
- l) Building envelope/area of disturbance.
- m) Building style (i.e. bungalow, walkout, etc.) and model.
- n) Building elevation details (USF, TFW, FF, T/S, etc.).
- o) Number of risers at all doors.
- p) Decks, including elevation, dimensions, risers to house and risers to grade.
- q) Drainage arrows identifying direction of drainage.
- r) Existing and proposed elevations within the site, including at all lot corners, building corners, changes in grade and matching specified grades from overall general grading plans.
- s) Minimum grade of 2% for swales to a maximum of 3:1.
- t) Amenity area at rear shall be constructed to a maximum grade of 12 % for 6 m behind the house. Remaining area may have slopes of 3:1 maximum.
- u) Location of sump pump discharge and eavestrough downspouts.
- v) Any yard catch basins, including elevations, inverts, and easements.
- w) Any retaining walls, including top/bottom elevations, excavation limits, tie backs, barriers, etc.
- x) Vegetation or tree preservation areas and offsets.

- y) Identified as fire break or engineered fill lot.
- z) Zoning information.

Additional details and drawing requirements related to Building Permit applications can be found in the Township's Building By-Law.

#### 4.9 Landscaping/Streetscaping Drawings

All landscaping and streetscaping plans shall be drawn at a minimum scale of 1:500.

As part of a project, the Township may first require the preparation of a tree inventory, assessment, and preservation plan. The details from this including significant or endangered species, preservation areas, edge management requirements, buffers, fencing, and signage must be shown on any landscaping and streetscaping plans.

Accordingly, the detailed landscaping/streetscaping plans shall include but may not be limited to the following:

- a) Right of ways, lots, blocks, and easements.
- b) Building envelopes, driveways, and entrances.
- c) Sidewalks, trails, pathways, and associated details.
- d) Fencing, including privacy, acoustic, chain link.
- e) Location of other aboveground features, including utility poles, pedestals, fire hydrants, retaining walls, barriers, signage, etc.
- f) Proposed lighting.
- g) Proposed trees and plantings, including a list of botanical names, common names, caliper/size, and quantity.
- h) Restoration requirements.
- i) Stormwater Management facility planting requirements and associated details.
- j) Construction notes and details.
- k) All barrier-free requirements.

The following notes pertaining to layout requirements must be included on all landscaping/streetscaping 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 (trees to be planted on private property, 2m offset from the front lot line):

- a) 2.0 m from fire 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 street light 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.

**NOTE 3:** The tree pits and planting beds for all trees and shrubs located within 1.0 m of underground utilities are to be hand dug.

**NOTE 4:** Minimum clearance for fences from fire hydrants is 2.0 m.

**NOTE 5:** All plant material must conform to the Canadian Standards for Nursery Stock and must be guaranteed for a minimum period of 12 months following acceptance of the work by the Township.

Where applicable, the following note must also be added:

**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 Township approval.

#### 4.10 Parkland Development Drawings

Where required by the Township, a detailed Park Master Plan shall be prepared for all lands to be dedicated for park purposes. Prior to preparing park development plans, the practitioner shall meet with Township staff to review Township recreational needs.

A Master Plan shall be prepared at a scale of 1:500, indicating the following, at a minimum:

- a) existing contours at maximum 0.5 m intervals.
- b) drainage structures and direction of overland drainage.
- c) species and size of existing vegetation 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 barrier free parking).
- h) layout of all sidewalks, trails, pathways, and connections.
- i) proposed site amenities, including benches, bike racks, trash receptacles, signs, washrooms, playground equipment.
- j) perimeter fencing.

- k) park lighting.
- l) all surface treatments.
- m) all proposed plant materials.

#### **4.11 Trail and Walkway Plans**

Where required, separate trails and/or walkway plans shall be prepared to depict location, geometry, grading, access, fencing, signage, and all other construction details.

#### **4.12 Pavement Markings and Signage Plans**

These drawings are to be prepared at a scale of 1:500 to depict the proposed pavement markings and signage to be applied to the proposed construction work. The plans shall include, but may not be limited to the following:

- a) Complete legend.
- b) Roadways, shoulders, curb and gutter, sidewalk, trails, boulevards, driveways and entrances.
- c) Proposed pavement markings, including centreline of road, edge lines, lines for turning lanes, stop bars, crosswalks, and all other painted lines and symbols.
- d) Location and type of all proposed signage, including OTM references as applicable.

#### **4.13 Utility Coordination Plans**

Where required by the Township, a Utility Coordination Plan or Composite Utility Plan, shall be prepared to show all aboveground information in relation to the proposed location of the various utilities, including hydro, telecommunications, and gas. The drawings must show all services, poles, pedestals, transformers, vaults, conduits, cables, and utility crossings. All offsets from other municipal infrastructure must be checked and any conflicts resolved.

#### **4.14 Detail Drawings**

The Township of Severn standard detail drawings shall be utilized whenever applicable. If a Township standard detail does not exist, the latest revision of the Ontario Provincial Standard Drawings may also be utilized. These drawings shall be included as part of the overall submission. Individual site-specific details shall be prepared, to scale, by the practitioner and included in the overall submission for any special features or situations not covered by the Township of Severn standard drawings and OPSD.

#### **4.15 Streetlighting and Electrical Plans**

Where streetlighting and/or traffic signals are a component of the project, detailed photometric plans, wiring diagrams, electrical layout, and details are to be prepared and included in the submission. The drawings are to be prepared at a maximum 1:500 scale.

Tables and charts are to be provided on the drawings to summarize:

- a) How the design meets minimum photometric requirements.
- b) All proposed materials and equipment, including details such as number, type, manufacturer, model, etc.

The Township or other road authorities (i.e. County of Simcoe, MTO) may also require the preparation of PHM-125 plans.

#### **4.16 Erosion and Sediment Control Plans**

Erosion and sediment control plans must be prepared to depict the location, type, and details for all erosion and sediment control measures to be implemented prior to commencement of construction. The drawings may also contain sequencing, staging, or phasing information as well as notes and specific instructions to be followed. Additional drawings and/or details may be required to depict temporary sediment control ponds and topsoil stockpiles to demonstrate, elevations, volumes, treatments, etc.

#### **4.17 Phasing Plans**

If a project is proposed to be constructed in phases, a phasing plan is to be provided to clearly depict the works to be constructed under each phase, including any temporary restoration works and subsequent removals. If practical, the Township may permit these details to be incorporated on other drawings, such as the general servicing plan or the plan-profile drawings, rather than submitting a separate phasing plan.

#### **4.18 Details**

These drawings shall include all municipal, provincial, and site-specific detail drawings that pertain to the project.

#### **4.19 Commissioning Plans**

As required by the Township, the practitioner shall prepare and submit commissioning plans as part of the overall submission. Sufficient details must be provided to demonstrate how the systems will be commissioned and will meet all required codes and standards.

In the case of watermain, this shall include details related to:

- a) Number and size of swabs as well as swab insertion and exit locations.
- b) Pressure testing sections and calculations.
- c) Chlorination/dechlorination details and sampling points.
- d) Hydrant flow testing locations and details.



## 4.20 Record Drawings

Record drawings shall be developed from the original engineering drawings and amended to incorporate any changes and variances during construction, in order to provide accurate information on the works, as installed.

Revisions for the purpose of record drawings shall be based upon a practitioner's final survey and/or field verification.

In general, record drawings shall include, but may not be limited to, the following:

- a) Road centreline elevations recalculated to two decimal places.
- b) Updated street names, lot numbering, and municipal addresses, as applicable.
- c) Type, size, length, and grade of all sewers as well as location and invert elevations of all sewer maintenance holes.
- d) Location of all roadway, ditch inlet, and rear lot catch basins, complete with final top of grate and invert elevations.
- e) Type, size, and obvert elevations, at a minimum of every 30 m, for all watermain.
- f) Location of all fire hydrants, valve boxes, valve chambers, tees, bends, and fittings.
- g) Location of all service connections to all lots and blocks and location of connection from nearest downstream maintenance hole as well as swing ties (minimum two) or GPS coordinates for all service connections at property line to allow for future ease of locating.
- h) Location of all utilities and streetlighting constructed as part of the project.
- i) Location of all other aboveground features, such as streetscaping, landscaping, fencing, street furniture, signage, etc. constructed as part of the project.

The title sheet shall be clearly marked as "Record Drawings" and a "Record Drawings" revision note shall be placed on all drawings in the revision block along with the date of issuance.

### 4.20.1 Tolerances

For all watermain and sewers, if the record information differs by more than 0.3 m horizontally or 0.15 m vertically, the watermain and sewers are to be redrawn in both plan and profile. Further, if the grade differs by more than 1%, or if requested by the Township, the practitioner shall submit revised hydraulic calculations.

All actual roadway centreline elevations, at a maximum 20 m intervals, shall be indicated on the record drawings. Gutter elevations shall be indicated for cul-de-sacs and intersections to show drainage into the storm system. If the horizontal road alignment changes more than 0.3 m or vertical alignment changes more than 0.15 m, the plan and/or profile shall be redrawn, as appropriate.

#### 4.20.2 Other

In addition to record drawings, the Township may also request copies of other construction records, including but not limited to, inspection records, photos, and testing results.

## 5 Supporting Reports

This section is intended to provide general guidance on the minimum requirements for various reports and studies that may be required to be completed in support of a project. Once again, it is noted that this is not considered to be an exhaustive listing and there may be additional requirements depending upon the nature of the project, site-specific conditions, and other factors. The reports and studies to be completed along with the scope of each must be confirmed with the Township prior to commencement of any design work.

### 5.1 Functional Servicing Report

Where a functional servicing report is required, it shall be prepared to demonstrate the ability of the existing area systems and networks, including but not necessarily limited to, the existing road network, utilities, water system, sanitary system, and stormwater management system to support a proposed development application. Any deficiencies or improvements to the existing systems must be clearly identified and solutions proposed.

### 5.2 Environmental Impact Study

Where an environmental impact study is required, it shall be prepared to characterize the existing natural environment, assess the potential impacts of the proposed project on the natural environment, and provide recommendations and mitigation measures to be implemented.

### 5.3 Archaeological and Cultural Heritage Reports

Where archaeological or cultural heritage reports are required, they shall be completed in accordance with the requirements of the following, as applicable:

- a) Ministry of Tourism, Culture, and Sport.
- b) Ontario Heritage Act and associated regulations.
- c) Funeral, Burial and Cremation Services Act and associated regulations.
- d) Standards and Guidelines for Consultant Archaeologists.

### 5.4 Geotechnical Report

A geotechnical investigation and report shall be prepared to confirm subsurface conditions relevant to the project. The following is a list of common requirements of a geotechnical report, although it is recognized that the content may vary depending on the project:

- a) A description of the project location and scope.

- b) Borehole location plan and borehole logs.
- c) A discussion regarding the management of soil, including any excess or unsuitable soils or import requirements and how they have/will be met.
- d) Identification, description and limits of the existing soil regimes.
- e) Extent of topsoil and its suitability for reuse.
- f) Suitability of native materials for trench backfill.
- g) Discussion on moisture content and water table levels, which may affect the proposed works and/or surrounding lands.
- h) Recommended pavement design.
- i) Any special recommendation for bedding or backfill materials.
- j) Results of soil sampling and chemical analysis, with any recommendations.
- k) Any special recommendations to be followed in the design and construction of foundations, including recommended foundation elevations above the seasonally high groundwater elevation.
- l) The engineering properties of the native material, including frost susceptibility, natural moisture content, corrosivity, compaction characteristics, relative density and structural integrity, complete with any recommendations.
- m) Recommendations for achieving proper compaction.
- n) Recommendations for dealing with deep excavation of trenches, requirements for method of dewatering, including rate of dewatering, requirements for treating contaminated dewatered water, and need for permits.
- o) Recommendations for dealing with septic or well systems that may be affected by the proposed works.

## 5.5 Hydrogeological Reports

A hydrogeological investigation and report may be required for a specific project. The following is a list of common requirements of a hydrogeological report, although it is recognized that the content may vary depending on the project:

- a) Discussion of investigations completed and data obtained. Test wells shall be drilled and pump testing performed, as necessary.
- b) Discussion of proposed works and identification of areas where dewatering may be required; the rate of dewatering; requirements for dewatering, including discharge requirements; and permits/approvals.
- c) Impacts to existing wells within the project area.
- d) Impacts to area aquifers from construction activities and/or discharge of wastewater.
- e) Impacts to nearby surface water bodies.

- f) Soil permeabilities and associated properties where the design of septic systems are concerned.
- g) Recommendations and mitigation measures to protect against any quantitative and qualitative impacts from the project.

## 5.6 Traffic & Transportation Impact Study

A traffic or transportation impact study may be required in support a project. In general, for a traffic impact study, the following may be required:

- a) Description of proposed project, location, and study area.
- b) Traffic counts, data, and any assumptions.
- c) Transportation capacity assessment and intersection capacity analysis for existing conditions.
- d) Site trip generation, distribution, travel mode selection and assignment to the transportation network.
- e) Reassessment of road network and intersection analysis under proposed conditions for predetermined post-development time horizons.
- f) Identification of required network improvements to accommodate the proposed project.
- g) Recommendations for traffic circulation within a project site.
- h) Site access evaluation and optimization, including traffic operations and safety assessments.
- i) Pedestrian and cyclist management.
- j) Traffic control devices, including signal warrants and vehicular/pedestrian signage.
- k) Speed management/traffic calming.
- l) Parking demand and layout.
- m) Roadway and intersection illumination.
- n) Commercial vehicle movement.
- o) Consideration of transit.
- p) Figures, diagrams, and copies of all traffic and transportation modelling output files.

## 5.7 Noise and Vibration Studies

Where a noise and/or vibration study is required, it shall be prepared to identify sensitive receptors in proximity to the proposed project; identify sources of noise and vibration under existing and ultimate conditions; assess the impacts; and determine the need for mitigation measures and/or any adjustments to the proposed work, as necessary, to comply with NPC-300 and all other relevant regulations and standards.

## 5.8 Stormwater Management Reports

A stormwater management report shall be prepared to demonstrate how stormwater will be collected, conveyed, controlled, and treated as part of a project. The following is an overall list of common requirements of a stormwater management report, although it is recognized that the content may vary depending upon the project:

- a) Project location and description of proposed scope of work.
- b) Background studies and information.
- c) Existing and proposed drainage area plans.
- d) Design criteria and targets being applied.
- e) Pre and post development catchment parameters.
- f) Stage, storage, discharge, characteristics and draw down time for any facilities.
- g) Pre and post development peak flows and storage volumes.
- h) Permanent pool and extended detention storage requirements, infiltration and subsurface storage volumes and/or surface ponding levels.
- i) Hydraulic grade line calculations.
- j) Major system overland flows and velocities to confirm conveyance within R.O.W. and/or defined flow routes.
- k) Erosion control calculations and requirements.
- l) Input/output modelling files.
- m) Engineering plans and details.
- n) Landscaping/restoration plans and details.
- o) Erosion and sediment control plans and details.
- p) Monitoring requirements and details, where required, including type and location of equipment, baseline conditions, parameters to be monitored, overall duration of monitoring, frequency of sampling or measurements, and reporting requirements.
- q) Where Low Impact Development (LID) features are proposed, additional information and discussion must be provided for the rationale behind the LID selection, including but not limited to, the suitability of the LID with respect to area soils and groundwater elevation as well as any other site restrictions or constraints.

### 5.8.1 Operation and Maintenance Manuals

A separate Stormwater Management Operations and Maintenance Manual may be required to be prepared where there are facilities to be operated and/or assumed by the Township. The manual is to describe how each facility operates and provide the short and long-term inspection and maintenance requirements.

The following items shall be included in the Manual, as applicable:

- a) Project location and description.
- b) Design drawings.
- c) Type(s) of SWM facilities.
- d) General description of function and operation, including design criteria, targets, and objectives, particularly those related to life expectancy.
- e) Recommended monitoring and inspection frequency, methods, and procedures.
- f) Procedures for removal and disposal of sediment as well as any other media (i.e. phosphorous removal media, etc.).
- g) Other maintenance requirements (grass cutting, weed control, plantings, trash removal, etc.).
- h) Estimated annual operations and maintenance costs.

## 6 Bridge and Culvert Structure Submissions

Where the proposed work involves a municipal roadway structure (i.e. bridges, culverts, water crossings), a specific submission related to the structure is required and shall include, but may not be limited to, the following:

- a) General Arrangement drawing(s), prepared in general accordance with the MTO Structural Manual. It includes the roadway structure plan, profile, elevation and cross sections.
- b) Drawings for additional components, staging, details, waterproofing, paving, grading, guiderail, environmental protection, etc.
- c) All design calculations.
- d) Design Report, which includes but is not limited to, the description of the works, design criteria (type and class of road, volume of traffic, speed limit, geometric information), how the design and details were arrived at, different options considered, and lifecycle cost analysis.
- e) Geotechnical/Hydrogeological Report.
- f) A letter from the practitioner responsible for the design which certifies that:
  - The bridge type, length and width are appropriate.
  - Canadian Highway Bridge Design Code (CHBDC) requirements are met.
  - Ministry standards have been followed.
  - The most economical life cycle cost solution has been selected for the site.