



# **Subdivision and Development By-Law, 2003**

By-Law No. 1248, 2003

May 13, 2003

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The Council of the District of Kent, in open meeting assembled, ENACTS AS FOLLOWS:

## **1.0 CITATION**

By-law No. 1248 may be cited as "Subdivision and Development By-law, 2003".

## **2.0 PURPOSE**

This by-law establishes the standard of Works and Services to be provided for the Subdivision, Development and redevelopment of lands and shall apply to all property located within the District of Kent.

## **3.0 DEFINITIONS**

In this by-law and its schedules,

### **A**

**"Agricultural"** means a category of land use as designated by the Official Community Plan, (OCP), in which the predominant use of land is for agricultural purposes and includes other land uses where approved under the *Agricultural Land Commission Act*;

**"Applicant"** means a person applying for approval of a Subdivision or issuance of a building permit whether as the Developer or as a duly authorized agent;

**"Approving Officer"** means the person appointed under the *Land Title Act*;

**"Arterial Road"** means a Highway with the primary function to carry traffic from one area to another with limited direct access;

### **B**

**"Boulevard"** means the portion of a Highway not occupied by the Roadway or Sidewalk and includes Plantings, surface finishing or treatment;

**"Building Inspector"** means the Chief Building Inspector or his deputy or such other person appointed to the position of Building Inspector;

### **C**

**"Certificate of Substantial Completion"** means the written confirmation that the provision, design, construction and installation of the required works and services are substantially completed to the standards and specifications set out in this by-law. The Warranty Period shall commence with the date of the Certificate of Substantial Completion;

**"Collector Road"** means a Highway with the primary function to distribute traffic between Arterial Roads, other Collector Roads and Local Roads within an area;

**"Commercial"** means a category of land use as designated by the OCP in which the predominant use of the land is for commercial purposes;

**"Consulting Engineer"** means a Professional Engineer licensed under the provisions of the *Engineers and Geoscientists Act of BC acting on behalf of the Owner/Developer*;

**"Consulting Electrical Engineer"** means a Professional Engineer licensed under the provisions of the *Engineers and Geoscientists Act of BC acting on behalf of the Owner/Developer*;

**“Consulting Landscape Architect”** means a Landscape Architect registered as a member of the British Columbia Society of Landscape Architects under the provisions of the *Architects (Landscape) Act*;

**“Contractor”** means the person or firm that will construct the Works and Services to the requirements, standards and specifications of this by-law;

**“Crawl space”** means a space between the underside of any floor system and the underlying surface having a maximum height of 1.5 m to the underside of the joists;

## D

**“Developer”** means an Owner or Owners of land or the holder(s) of a bona fide interim agreement or option to purchase land, or an Applicant who has made application to the District for Subdivision, or building permit, or is engaged in undertaking the Development of such land, and shall include a duly authorized representative;

**“Development”** means the improvement of land that may require the installation of Works and Services as prescribed by this by-law, including, but not limited to the improvement of land requiring the issuance of a building permit;

**“District”** means the Corporation of the District of Kent;

**“Drainage System”** means any system designed, and constructed for the purpose of containing or conveying drainage to an outlet destination whether such system is located on public lands, protected by registered statutory rights-of-way, or in place historically, and includes, without limitation, storm sewer mains, ditches, swales, creeks, ravines conveying or capable of conveying drainage or runoff, watercourses, detention and infiltration systems;

## E

**“Easement”** means a right-of-way for works and services with a dominant and servient tenement;

**“Excess or Extended Works and Services”** means the excess or extended services and procedures defined in the Local Government Act;

**“Engineer”** means the Director of Engineering Services, as appointed from time to time by the Council of the District, or its designate;

## F

**“Final Acceptance”** means the acceptance of the construction and installation of the required Works and Services completed to the standards and specifications set out in this by-law, as evidenced by the issuance of a Final Acceptance Certificate signed by the Engineer, and the District assumes ownership of the works and services;

**“Final Acceptance Certificate”** means a certificate signed by the Engineer accepting responsibility for maintenance and ownership of the required Works and Services;

**“Final Approval”** means approval of a Subdivision plan granted by the Approving Officer when all applicable requirements of this by-law, the *Local Government Act*, the *Land Title Act*, the *Strata Property Act*, and other relevant by-laws, legislation and requirements have been fulfilled;

## G

**“Garage Pad Elevation (GPE)”** means the elevation of the garage floor of any building;

## H-I-J

- “**Heavy Industrial**” means a category of land use designation by the OCP in which the predominant use of the land is for heavy industrial purposes;
- “**Highway**” includes a public street, Roadway, Lane, bridge, Boulevard, Sidewalk, viaduct, and any other way open to public use, but does not include a private road over private lands;
- “**Hydrologist**” means a Professional Hydrologist licensed under the provision of the *Engineers and Geoscientists Act of BC*;
- “**Industrial**” means a category of land use designation by the OCP in which the predominant use of the land is for Light and Heavy Industrial purposes.
- “**Institutional**” means a category of land use designated by the OCP in which the predominant use of the land is for institutional purposes;
- “**Integrated Survey Area**” means a network of survey monuments which enables cadastral and other information to be referenced to a standard and universal coordinate system.

## K-L

- “**Landscaping**” means Plantings and landscape screening located on Highways, Boulevards, medians and private property;
- “**Lane**” means a Highway, typically within a 6.0 metre right of way, that provides primary or secondary vehicular access to any abutting Parcel;
- “**Light Industrial**” means a category of land use designated by the OCP in which the predominant use of the land is for light industrial purposes;
- “**Local Road**” means a Highway, including a cul-de-sac, which provides direct access to abutting Parcels and provides circulation of traffic within a Subdivision;

## M-N-O

- “**Medical Health Officer**” means the person appointed under the *Health Act*, or the duly authorized representative;
- “**Minimum Basement Elevation (MBE)**” means the lowest elevation of the lowest habitable floor, or the underside of the floor joists where the lowest habitable floor is constructed over a Crawlspace of any building, that can be serviced by a gravity connection to the storm and sanitary sewer main;
- “**Official Community Plan (OCP)**” means an Official Community Plan as approved by Council;
- “**Owner**”, in respect of real property, means the Owner, as defined in the *Local Government Act*;

## P

- “**Parcel**” means any lot, block or other area in which land is held or into which land is subdivided, but does not include a Highway;
- “**Plantings**” means any landscaping improvement including, but not limited to, topsoil, structural soil, seed, sod, shrubs and trees;
- “**Preliminary Layout Review**” means the written review by the Approving Officer of a proposed Subdivision plan;
- “**Professional Engineer**” means a Professional Engineer licensed under the provisions of the *Engineers and Geoscientists Act*;
- “**Provincial Highway**” means a highway controlled by the Province under the Highways Act;

## R

- “**Residential**” means a category of land use designated in the OCP where the predominant use of the land is residential;
- “**Roadway**” means the paved, constructed, or traveled portion of a Highway that is used for vehicular movement;
- “**Rural**” means any category of land use designated in the OCP where the predominant use of the land is agriculture, rural residential, resource management or lake-area residential;

## S

- “**Sanitary Sewer System**” means a system designed and constructed for the collection, treatment and disposal of sanitary sewage;
- “**Security Deposit**” means cash or an irrevocable automatically renewing Letter of Credit deposited with the District by the Developer in accordance with the requirements of this by-law, to secure the provision, design, construction and installation of the Works and Services and Landscaping to the requirements, standards and specifications of this by-law;
- “**Sidewalk**” means the improved area of a Highway adjacent to the Roadway or Boulevard which is intended for the use of pedestrian traffic;
- “**Structural Soil**” means a growing medium designed with physical characteristics to support structures, as well as facilitate the growth of trees and shrubs;
- “**Subdivision**” means
- (a) a subdivision as defined in the *Land Title Act*; and
  - (b) a subdivision under the *Strata Property Act*;
- “**Subdivision Application**” means a proposal submitted to the Approving Officer for approval;
- “**Surveyor**” means a land surveyor currently licensed and registered in the Province of British Columbia;

## T-U-V

- “**Urban**” means any category of land use designated in the OCP where the predominant use of the land is not Rural;
- “**Utility Right of Way**” means a statutory right-of-way granted by an owner to the District;

## W

- “**Walkway**” means a public right-of-way, with or without improvements for the predominant use of pedestrians, not including a Sidewalk on a Highway;
- “**Warranty Deposit**” means the reduced value of the Security Deposit or a separate irrevocable Letter of Credit to be deposited with the District for the duration of the warranty period, as required in Schedule “C”, attached to and forming part of this by-law, as a guarantee for the stability and sufficiency of the Works and Services completed by the Contractor on behalf of the Developer;
- “**Water Distribution System**” means a system of waterworks within the meaning of the *Health Act* to provide potable water for human consumption and fire protection;
- “**Works and Services**” means any public service, facility or utility which is required by this by-law, including: the supply and distribution of water for domestic use and fire fighting; collection and disposal of sanitary sewage; collection and disposal of surface drainage and other waters; grading and sediment control; street lighting; highways; roadways; curbs; gutters; sidewalks;

traffic control signs and devices; roadway markings; landscaping; supply and distribution of electrical power, and telephone.

Unless otherwise defined, all words or expressions shall have the same meaning assigned to them as like words or expressions contained in the *Land Title Act* and the *Local Government Act* as amended.

#### 4.0 BASIC PROVISIONS

- (a) This by-law shall apply to all lands within the legally defined boundaries of the District.
- (b) If any part, schedule, section, subsection, clause, sub-clause, or phrase of this by-law is, for any reason, held to be invalid by the decision of any Court of competent jurisdiction, the invalid portion shall be severed without affecting the remainder of the by-law.
- (c) All employees and officers of the District are authorized to enter, at all reasonable times, upon any property or premises to inspect the same in connection with their duties under this by-law and to ascertain whether the provisions of this by-law are being complied with.
- (d) The District recognizes that site conditions may necessitate minor variations to servicing requirements and the requirements, standards and specifications for Works and Services set out in this by-law, and authorizes the Engineer to approve such minor variations.
- (e) Nothing in this by-law shall relieve Applicants for Subdivision or Development from the responsibility to seek out and comply with any other applicable legislation associated with the Subdivision or Development of their property.
- (f) All measurements and standards referred to in this by-law are expressed in metric units.
- (g) The approval of an application for Subdivision or Development does not in any way constitute a representation or assurance that the District will expend public funds on Works and Services in support of such application.

#### 5.0 DEVELOPMENT APPROVALS

- (a) Every Applicant for approval of a Subdivision or Development shall apply in the manner and on the form(s) prescribed by the District for that purpose and, in respect of that application, shall comply with all applicable requirements of this by-law and all other District by-laws, Federal and Provincial statutes, regulations, rules and policies and obtain all necessary approvals of government ministries and agencies having jurisdiction.
- (b) The acceptance for review of any application for a proposed Subdivision shall not be construed as Preliminary Layout Review or Final Approval of a Subdivision for *Land Title Act* purposes.
- (c) The Approving Officer may revoke Preliminary Layout Review at any time in the event that new information becomes available subsequent to review by the Approving Officer or in the event that any change in legislation, regulations or by-laws that would render the proposed Subdivision unlawful takes effect before the granting of Final Approval.
- (d) No land shall be subdivided within the District unless and until the proposed Subdivision has first received the acceptance of the Approving Officer to an application for Subdivision;
- (e) Every application for Subdivision shall include the following:

- 
- (i) all applicable application fees;
- (ii) eight prints of the proposed subdivision plan prepared by a BC Land Surveyor at a scale of 1:1000 on a sheet(s) of paper 280mm x 430mm (11 x 17) clearly indicating:
- dimensions and orientation of the land(s) to be subdivided, including road width, rights of way and parcel dimensions;
  - relationships to the adjacent roads, lanes and pathways, and connections thereto;
  - intended use of the land(s) and remaining parcels being subdivided, with location of all existing buildings or structures on the existing parcel with siting distances from the proposed property lines;
  - location of all existing underground facilities such as a well, septic tank, sanitary sewer main, storm sewer main, water main, hydro, telephone, natural gas and cable systems; and
  - the area in hectares of each proposed lot to be created.
- (iii) a Utility Right of Way or Easement plan(s) acceptable to the Engineer for Works and Services not provided within a dedicated Highway, including upon or under private owned lands where required;
- (iv) one copy of the Certificate of Title to be obtained from the British Columbia Land Titles Office, dated no earlier than 15 days prior to date of subdivision application at the District;
- (v) certification from the Medical Health Officer for approval of a septic system, as required by the Health Act and its regulations; and
- (vi) additional requirements the Approving Officer may require.
- (f) The Approving Officer may at his discretion and without limitation require the Applicant to submit the following information with the application for Subdivision:
- sketch showing the ultimate subdivision of the lands where further subdivision is anticipated or possible;
  - site plan at a scale of 1:1000 clearly and accurately indicating existing buildings to be retained, existing watercourses and bodies of water, existing and proposed easements and rights of way, ravines and gullies, flood plain, engineering drawings and records in accordance with this by-law;
  - report(s) prepared by a qualified geotechnical engineer detailing recommendations and construction plans for hazardous and steep slope areas;
  - preliminary approval from the Province for access from a Provincial Highway;
  - environmental assessment for hazardous and sensitive areas; and
  - engineering reports as determined by the Engineer.

## 6.0 WORKS AND SERVICES - GENERAL REQUIREMENTS

- (a) Subject to 6(b), every Owner of lands applying for Subdivision or Development shall, at the Owner's cost:
  - (i) provide Works and Services for that Subdivision or Development in accordance with the provisions of this by-law and to the levels of Works and Services prescribed in *Tables No. 1 and 2*, attached to and forming part of this by-law and applicable to the proposed Subdivision or Development; and
  - (ii) provide, design, construct and install such Works and Services to the minimum requirements, standards and specifications for such Works and Services prescribed by Schedule "A" through Schedule "E" of this by-law.
- (b) The servicing requirements of this bylaw may be waived or modified by the Engineer where:
  - (i) Subdivision or Development creates parcels to support the installation of public facilities and utilities;
  - (ii) Subdivision proposes a lot line adjustment, and each parcel is serviced by an existing water and sewer system, has adequate access and where no future Subdivision potential exists; and
  - (iii) Development is for a single family building permit.
- (c) All Works and Services required under this by-law must be provided, designed, constructed and installed to the minimum requirements, standards and specifications of this by-law before the Approving Officer approves of the Subdivision or the Building Inspector issues a building permit, unless the Owner:
  - (i) deposits, with the District, security in the form of a cash deposit or an irrevocable, automatically renewing letter of credit from a financial institution acceptable to the District in the amount of 100% of the estimated cost to provide, design, construct and install the prescribed Works and Services, as estimated by the Consulting Engineer and Consulting Landscape Architect and accepted by the Engineer; and
  - (ii) enters into a Servicing Agreement with the District substantially in the form of agreement contained in *Schedule "C"* of this by-law.
- (d) Where the physical construction of part or all of the Works and Services required under this by-law is considered by the Engineer to be premature, he may require that the Owner provide such Works and Services or part by means of a cash payment in lieu of design, construction and installation. The cash payment shall be in an amount equal to the District's total cost of designing, constructing and installing the Works and Services, as estimated by the Consulting Engineer and Consulting Landscape Architect and accepted by the Engineer, plus the applicable administration and inspection fee prescribed by Schedule "A" of this by-law. The District shall use this cash payment at a future time when the design, construction and installation of the Works and Services becomes feasible. Every cash payment required under this subsection shall be paid before Final Approval of a Subdivision plan or issuance of a building permit.

- (e) The Engineer may require that an Owner provide Works and Services directly attributable to the proposed Subdivision or Development up to the centre line of that portion of Highway immediately adjacent to the land being subdivided or developed and the Owner shall provide such Works and Services at the Owner's own expense to the minimum requirements, standards and specifications contained in Schedules "A through E" of this by-law.
- (f) The Engineer may require the Owner to provide Works and Services to facilitate connection(s) of the Works and Services to lands beyond the proposed Subdivision, and where deemed necessary by the Engineer to provide Excess or Extended Works and Services which may be required to service land other than the land being subdivided or developed. Where Excess or Extended Works and Services are provided by the Owner, as determined by the Engineer, the Engineer will determine the proportion of the costs of providing the Works and Services he/she considers to be Excess or Extended Works and Services and which parcels of land benefit by the Excess or Extended Works and Services. The District will impose a latecomer charge for future connection to those Works and Services within the time limits provided in the Local Government Act, as amended or superceded.

## **7.0 WORKS AND SERVICES - SPECIFIC REQUIREMENTS**

- (a) Highways
  - (i) Every Owner of lands for Subdivision or Development shall provide each Parcel of land within the proposed Subdivision or Development with access to a Highway.
  - (ii) Every Highway, whether required in respect of Subdivision or Development, shall be dedicated and designed, constructed and installed in accordance with the minimum requirements, standards and specifications contained in Schedules "A through E" of this by-law. All encroaching structures or obstructions shall be removed prior to construction of every Highway.
  - (iii) Where the Engineer believes that due to terrain and soil conditions, the proposed Highway Works and Services cannot be adequately constructed in accordance with the minimum requirements, standards and specifications of this by-law, he may require that the Owner provide, without compensation, land of a width or dimension that, in the Engineer's opinion, would permit the Highway to be adequately and appropriately designed, constructed and installed.
  - (iv) Where a Development or Subdivision borders on a natural body of water, access to the water shall be given by a Highway in accordance with the requirements of the *Land Title Act*.
- (b) Drainage Collection and Disposal
  - (i) Every Owner of lands for Subdivision or Development shall provide each Parcel of land within the proposed Subdivision or Development with a Drainage System, including the standard service connection designed, constructed and installed in accordance with the minimum requirements, standards and specifications contained in Schedules "A through E" of this by-law, and shall provide for connection of the Drainage System to an existing adequate Drainage System.

(c) Water Distribution – Domestic and Fire Fighting

- (i) Every Owner of lands for Subdivision or Development shall provide each Parcel of land, within the proposed Subdivision or Development, with a Water Distribution System, including the standard service connection designed, constructed and installed in accordance with the minimum requirements, standards and specifications contained in Schedules “A through E” of this by-law, and shall provide for connection of the Water Distribution System to an existing adequate Water Distribution System.
- (ii) Despite clause (i), where acceptable to the Engineer and where an existing Water Distribution System is not available for extension or connection, each Parcel shall have a proven source of potable groundwater complete with a fire protection system designed, constructed and installed in accordance with the minimum requirements, standards and specifications contained in Schedules “A through E” of this by-law, and the Owner shall:
  - (1) subject to paragraph (2), provide the District with a certificate from a Consulting Engineer certifying that a pump test has been performed and that the yield from the well conforms to the applicable minimum requirements, standards and specifications contained in Schedule “A” of this by-law; and
  - (2) despite paragraph (1), where the Subdivision creates a Parcel greater in size than five (5) hectares and where the Parcel created is to be used for agricultural purposes and no residence is to be constructed on the new Parcel, the requirements of paragraph (1) shall not apply to that Parcel provided that the Owner registers a Restrictive Covenant against title to the Parcel prohibiting the construction of a dwelling unit until the requirements of paragraph (1) are fulfilled to the satisfaction of the Engineer.
- (iii) Where a proposed Subdivision or Development is adjacent to an existing Water Distribution System, and the minimum requirements, standards and specifications contained Schedules “A through E” of this by-law for either domestic flows or fire flows can not be achieved using the existing Water Distribution System, then the Owner or Applicant shall not connect to the existing Water Distribution System and shall instead provide a new Water Distribution System to service the proposed Subdivision or Development in accordance with the minimum requirements, standard and specification contained in Schedules “A through E” of this by-law.

(d) Sewage Collection and Disposal

- (i) Every Owner of lands for Subdivision or Development shall provide each Parcel of land, within the proposed Subdivision or Development, with a Sanitary Sewer System, including the standard service connection designed, constructed and installed in accordance with the minimum requirements, standards and specifications contained in Schedules “A through E” of this by-law, and shall provide for the connection of the Sanitary Sewer System by sewer mains to an existing adequate Sanitary Sewer System.
- (ii) Despite clause (i), where acceptable to the Engineer and where no Sanitary Sewer System exists, the proposed establishment of a septic system, including the suitability of the subsoil for absorption of septic waste emanating from a septic system, shall be subject to the approval of the Medical Health Officer as required by the *Health Act* and its regulations. Where a septic system is used to service a proposed Subdivision or Development, the system shall be contained entirely within the Parcel on which the Subdivision or Development it services is located.

(e) Power and Telecommunications Distribution

- (i) Every Owner of lands for Subdivision or Development within the Urban area of the District, except lands which are being subdivided or developed for Industrial uses shall provide each Parcel of land within the proposed Subdivision or Development with connection to an underground power and telecommunications distribution system.
- (ii) Every Owner of lands for Subdivision or Development outside the Urban area of the District, shall provide each Parcel of land within the proposed Subdivision or Development with an overhead power and telecommunications distribution system capable of providing a connection for the land use expected on the lands.
- (iii) Every Owner of lands for Subdivision or Development within the Urban area of the District shall provide for connection to the underground or overhead power and telecommunications distribution system via an underground dip service connection as defined in hydro and telephone manuals.
- (iv) Every Owner of lands for Subdivision or Development located on the following street(s) shall convert the existing overhead wires along the frontage to an underground distribution system. A cash in lieu of construction equivalent to the cost of converting the overhead wires may be accepted by the Engineer.

Street(s) Requiring Conversion of Overhead Wires

Pioneer Street from Agassiz Avenue to Evergreen Avenue and from Park Ave to Heath Road.

(f) Landscaping

- (i) Every Owner of lands to be subdivided or developed within the Urban area of the District shall provide Landscaping, designed, constructed and installed in accordance with the minimum requirements, standards and specifications contained in Schedules "A through E" of this by-law.

(g) Street Lighting

- (i) Every Owner of lands to be subdivided or developed shall provide street lighting within the proposed Subdivision or Development designed, constructed and installed in accordance with the minimum requirements, standards and specifications contained in Schedules "A through E" of this by-law.

## 8.0 SCHEDULES

Tables Nos. 1 and 2, Schedules "A through E" are attached to, and form part of, this by-law.

## 9.0 BY-LAWS REPEALED

By-law No. 926, cited as "The Subdivision Servicing By-law, 1989" No. 926, is repealed.

READ A FIRST TIME this                      23rd day of                      June, 2003

READ A SECOND TIME this                      23rd day of                      June, 2003

READ A THIRD TIME this                      28th day of                      July, 2003

RECONSIDERED and ADOPTED this                      25th day of                      August, 2003

  
\_\_\_\_\_  
Mayor

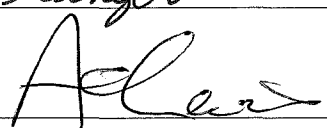
  
\_\_\_\_\_  
Chief Administrative Officer

TABLE NO. 1 LEVELS OF WORKS AND SERVICES WITHIN THE URBAN AREA

| OCP Land Use Designation | Highways | Water Distribution       |                              | Drainage Collection and Disposal |                              | Sewage Collection and Disposal |                   |       | Power/Telecommunications Distribution |     | Landscaping |
|--------------------------|----------|--------------------------|------------------------------|----------------------------------|------------------------------|--------------------------------|-------------------|-------|---------------------------------------|-----|-------------|
|                          |          | Domestic & Fire Fighting | Domestic & Fire Fighting (3) | Conveyance System                | Detention – Infiltration (2) | Gravity Mains                  | Conveyance System | PS/FM | O/H                                   | U/G |             |
| Residential              | Urban    | WDS                      | Private Well                 | Gravity Mains                    | Y                            | Y                              | Y                 | Y     | N                                     | Y   | Y           |
| Commercial               | Urban    | WDS                      | Private Well                 | Gravity Mains                    | Y                            | Y                              | Y                 | Y     | N                                     | Y   | Y           |
| Industrial - Light       | Urban    | WDS                      | Private Well                 | Gravity Mains                    | Y                            | Y                              | Y                 | Y     | N                                     | Y   | Y           |
| Industrial - Heavy       | Urban    | WDS                      | Private Well                 | Gravity Mains                    | Y                            | Y                              | Y                 | Y     | Y(1)                                  | N   | Y           |
| Institutional            | Urban    | WDS                      | Private Well                 | Gravity Mains                    | Y                            | Y                              | Y                 | Y     | N                                     | Y   | Y           |

(1) Service connection to each parcel shall be underground dip.

WDS means Water Distribution System

PS/FM means pump station and force main

Y = Yes

N = No

(2) Detention – Infiltration determined by Engineer.

(3) Water Distribution may include private wells where a WDS does not exist, provided a WDS dry system is installed.

TABLE NO. 2 LEVELS OF WORKS AND SERVICES WITHIN THE RURAL AREA

| OCP Land Use Designation | Highways | Water Distribution |              | Drainage Collection & Disposal |            |                          | Sanitary Collection & Disposal |                               | Power/ Telecommunications Distribution |            | Landscaping |
|--------------------------|----------|--------------------|--------------|--------------------------------|------------|--------------------------|--------------------------------|-------------------------------|----------------------------------------|------------|-------------|
|                          |          | Fire               | Domestic     | Conveyance System              |            | Detention – Infiltration | Gravity Main                   | MOH Approval of Septic System | O/H                                    | Connection |             |
|                          |          |                    |              | Gravity Main                   | Open Ditch |                          |                                |                               |                                        |            |             |
| Agricultural             | Rural    | N                  | Private Well |                                | Y          | Y(1)                     | N                              | Y                             | Y                                      | O/H        | N           |
| Rural Residential        | Rural    | N                  | Private Well | Y                              | Y          | N                        | N(2)                           | Y                             | Y                                      | O/H        | N           |
| Commercial               | Rural    | WDS(2)             | Private Well | Y(2)                           | Y          | N                        | N(2)                           | Y                             | Y                                      | O/H        | Y           |
| Industrial               | Rural    | WDS(2)             | Private Well | Y(2)                           | Y          | N                        | N(2)                           | Y                             | Y                                      | O/H        | Y           |
| Institutional            | Rural    | WDS(2)             | Private Well | Y(2)                           | Y          | N                        | N(2)                           | Y                             | Y                                      | O/H        | Y           |

(1) Detention only for greenhouse roof water runoff, when covering more than 20% of parcel.

(2) For water, drainage and sewage disposal, the higher urban level takes precedence when available.

MOH means Ministry of Health

WDS means Water Distribution System

Y = Yes

N = No

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**  
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**ENGINEERING STANDARDS AND SPECIFICATIONS**

## SECTION NO. 1- GENERAL INFORMATION

## 1.1 INTRODUCTION

This schedule forms Schedule "A" to By-law No. 1248 cited as "Subdivision and Development By-law, 2003". It identifies the Engineering Requirements, Standards and Specifications which apply to the provision, design, construction, installation and acceptance of Works and Services within the District of Kent.

For additional information, interpretation, clarification or suggestions for changes and alternatives, please consult with:

District of Kent  
7170 Cheam Avenue  
P.O. Box 70  
Agassiz, BC V0M 1A0

Telephone: 604-796-2235  
Fax: 604-796-9854

## 1.2 SCOPE AND USE OF THIS SCHEDULE

This schedule shall be applicable to Subdivisions, Developments and municipal rights-of-way within the District of Kent.

### 1.3 CONSTRUCTION SPECIFICATIONS

All construction within the scope of this schedule shall conform to the latest edition of the Master Municipal Construction Documents - Volume 2 and the requirements, standards and specifications prescribed by this by-law.

Should any conflict exist or arise between these documents, the Subdivision and Development By-law, 2003, shall take precedent over the Master Municipal Construction Documents.

#### 1.4 DEVELOPER PERFORMANCE RESPONSIBILITY

Where **Works and Services** are to be provided, designed, constructed and installed within the **District**, the **Developer** shall be aware of the areas and degrees of performance and responsibility required under this schedule.

The **Engineer**, or a duly authorized representative, shall be the **District's** representative during the provision, design, construction, installation, and maintenance of the **Works and Services**.

#### 1.4.1 Work Performance

The whole of the work, and the manner of performing the same, shall be done in accordance with the Requirements, Standards and Specifications set out in this by-law and the accepted plans to the satisfaction of the **Engineer**, whose decision shall be final and binding.

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**ENGINEERING STANDARDS AND SPECIFICATIONS**

1.4.2 Variation of Works and Services at Developer's Request

Any variation to the **Works and Services** previously accepted by the **District** shall be subject to review by the **Engineer**. All requests for variations to the **Works and Services**, designed and sealed by a **Professional Engineer** on behalf of a **Developer**, shall be made in writing to the **Engineer**.

Any requests for variations shall include a signed and sealed revision to the previously accepted drawing(s). The **Engineer's** decision as to the acceptability of any revision(s) shall be final and binding.

1.4.3 Unforeseen Conditions

If, at any time after the drawings have been accepted by the **District** for construction, unforeseen conditions or circumstances become known which make it necessary that changes in the design or extra **Works and Services** be done in order to complete the project to good engineering practice, the **Engineer** shall have the right to order such changes or extra **Works and Services** as deemed necessary to complete the **Works and Services** in an acceptable manner to the satisfaction of the **Engineer**.

All costs of such extra **Works and Services** shall be done by the **Developer**.

1.4.4 Verbal Agreements

No verbal instruction, objection, claim or notice by any party to the other shall change or modify any of the terms or obligations contained in any of the requirements, standards or specifications, and none of the requirements, standards or specifications shall be held to be waived or modified by reason of such verbal instruction, objection, claim or notice.

1.4.5 Service of Notices

Any notice, order, direction, request or other communication given by the **District**, shall be deemed to be well and sufficiently given if the same be left at any office used by the **Developer** or be delivered to the **Developer's Consulting Engineer** or **Contractor**.

1.5 CONDUCT OF WORK

1.5.1 Responsibility

The **Developer** shall be held fully responsible to the **District** for the acts and omissions of his agents and of all persons directly or indirectly employed by him. The **Developer** agrees to bind all agents or employees to the requirements, standards and specifications of this schedule.

The **Developer** shall not commence the construction of any **Works and Services** without written permission from the **Engineer**.

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1.5.2 Materials and Workmanship

The whole of the work shall be done in a substantial and workmanlike manner with materials, articles, and workmanship of the best quality and description as required by, and in strict conformity with, this schedule. Unless otherwise specified, all materials shall be new.

1.5.3 Survey Monuments and Legal Postings

All legal posts, stakes and integrated survey monuments within and outside the area of the work, and all construction stakes and marks on adjoining areas of work, shall be preserved, undisturbed and visible. In the event any of the above are disturbed, lost or destroyed, they shall be replaced by the **District**, at the cost of the **Developer**, to the satisfaction of the **Engineer**.

All surveys within integrated areas of the **District** shall be tied to the monument system based on the Surveyor General's instructions.

Additional survey monuments shall be installed, at the **Developer's** cost, to achieve a minimum density level as areas become developed. **Integrated Survey Area** locations will be established by the **Engineer** in accordance with Provincial standards. A cash payment equal to the estimated cost of monument densification for the proposed **Development** shall be paid by the **Developer** to the **District** at the time of **Subdivision** approval.

1.5.4 Disposal or Removal of Excavated Materials

No person shall place or remove material from excavation on private property within the Agricultural Land Reserve unless that person has obtained a permit issued by the **District** as required under the Soil Conservation Act.

No person shall place material from excavation on properties outside the Agricultural Land Reserve unless that person has obtained a permit issued by the **District** as required under the **District's** Soil Removal By-law.

1.5.5 Work of Others

The **District**, its officers, employees, agents and contractors shall be at liberty to enter upon the site of the work with its workmen and materials to do other work, and the **Developer** shall afford any such workmen all reasonable access and facilities.

The **Developer** shall arrange his work and dispose of his materials in such a manner as will not interfere with the work or storage of materials of others upon the site of the work. The **Developer** shall join his work to that of others, and perform his work in proper sequence in relation to that of others to the acceptance of the **Engineer**.

1.5.6 Existing Structures and Utilities

Plans or descriptions, verbal or otherwise, of existing piping or structures that are given to the **Developer** are intended only as an aid in the location of these items. This information must be verified by the **Developer** prior to proceeding with construction.

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The **District** does not check, review or maintain the accuracy of any plans, maps or elevations that are in its possession. The **Developer**, or his **Consulting Engineer**, must review any information received from the **District**, and verify its accuracy by field investigation.

1.5.7 Drainage

The **District** utilizes natural watercourses as part of the **Drainage System**. Accordingly, the **Developer** shall be responsible for complying with all Federal, Provincial and Municipal legislation with respect to protection of fish, fish habitat, and watercourses.

The **Developer** shall keep all portions of the site properly and efficiently drained during construction and until acceptance by the **District**. The **Developer** shall be responsible for all damage which may be caused from water backing up, flowing over, through, from or along any part of the work, or elsewhere.

Existing culverts, drains, ditches and water courses affected by the work shall be kept clear of excavated material at all times. When it is necessary to relocate, remove or alter an existing drainage structure, the **Developer** shall provide suitable alternative measures for handling the drainage.

The **Developer** shall clean streets, catch basins, manhole sumps, and maintain siltation controls as often as the **Engineer** deems necessary, or as deemed necessary by other **District** permits or legislation enacted for such purposes, until the **Works and Services** are accepted by the **District**.

1.5.8 Work to Fit With Others

The **Developer** shall do all cutting, fitting or patching of his work that may be required to properly fit or receive existing structures and utilities.

The **Developer** shall not connect his **Works and Services** to existing **Works and Services** without the prior written consent of the **Engineer**.

1.5.9 Damage to Work

The **Developer** shall bear the risk and loss for damage which may occur on or to the **Works and Services** until accepted by the **Engineer** as evidenced the issuance of a **Final Acceptance Certificate**.

All repair, restoration or re-execution of the **Works and Services** shall be carried out to the satisfaction of the **Engineer** and at no cost to the **District**.

1.5.10 Use of Completed Portions

The **District** shall have the right to take possession of any completed, or partially completed, portion of the **Works and Services** when considered necessary by the **Engineer**. Such possession shall not be deemed an acceptance or ownership of **Works and Services**.

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**

1.5.11 District's Right to Repair, Restore or Re-Execute the Works and Services

Should the **Developer**, within 14 days of the **District's** written notice to do so, fail to perform the provision, design, construction and installation of **Works and Services**, or fail to begin, repair, restore, or re-execute the **Works and Services**, all to the satisfaction of the **Engineer**, or fail to comply with the Requirements, Standards and Specifications of this schedule, the **District** shall be hereby empowered to repair, restore or re-execute the **Works and Services** at the cost of the **Developer**.

Despite any other provisions of this by-law, the **District** reserves the right to repair, restore or re-execute the **Works and Services** on an emergency basis without written notice, as determined by the **Engineer**.

The work performed by the **District** shall not relieve the **Developer** from the performance and fulfilment of any of his obligations and duties under this by-law.

1.5.12 Payment of Accounts

The **Developer** shall pay all accounts for labour, services and materials, incurred by the **District** as a result of the **District** performing any repair, restoration or re-execution of the **Works and Services** whether during the design, construction and installation of the **Works and Services** or during any warranty period as established herein. Should payment not be made upon invoice, the **District** shall deduct the payment from the **Security Deposit** or **Warranty Deposit**, as the case may be.

If the amount is greater than the **Security Deposit** or **Warranty Deposit**, as the case may be, the **Developer** shall pay the difference when invoiced.

1.5.13 Arbitration

In the case of any dispute between the **District** and the **Developer** during the progress of the provision, design, construction or installation of the **Works and Services** or afterwards, as to any matter arising thereunder, either party may at his option give to the other, notice of such dispute and demand arbitration thereof; and the parties may, with respect to the particular matters then in dispute, agree to submit the same to arbitration in accordance with the laws of the Province of British Columbia; provided, however, that if arbitration has not been agreed upon, either party may elect to have such dispute determined by a Court of competent jurisdiction. Arbitration shall not be a cause for the stoppage of work.

1.5.14 Employee and Plant Safety, Adequacy

The **Developer** shall be responsible for the safety of his employees and for the safety, adequacy and sufficiency of his plant, equipment and method of executing the provision, design, construction and installation of **Works and Services**.

The **Developer** shall be responsible for notification of the proposed construction and installation of the **Works and Services** to the Workers' Compensation Board, and shall conduct the delivery of all **Works and Services** in compliance with the regulations of the Workers' Compensation Board. A copy of the notification letter shall be forwarded to the **Engineer** prior to commencement of construction.

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**ENGINEERING STANDARDS AND SPECIFICATIONS**

1.5.15 Public Convenience, Access and Clean-Up

In carrying out the work, the **Developer** shall always consider the convenience and safety of the public.

- (a) The **Developer** shall not obstruct any **Roadway** or **Sidewalk** longer than is necessary.
- (b) The **Developer** shall provide for safe access to **Sidewalks**, driveways, buildings and private property for vehicles and pedestrians at all times.
- (c) The **Developer** shall allow for passing along and crossing of all **Roadways** and **Sidewalks**, where practical, during the execution of the construction and installation of the **Works and Services**.
- (d) The **Developer** shall construct and maintain in good order suitable platforms, approaches, structures, bridges, crossings, signage or other **Works and Services** as required by the **Engineer**.
- (e) The **Developer** shall not deposit material upon a **Roadway** or other public or private property without the consent of the **Engineer** or private property **Owner**.
- (f) During all phases of the construction and installation of **Works and Services**, including the warranty period, the **Developer** shall take precautions to abate nuisance caused by mud, dust or erosion by clean-up, sweeping, sprinkling with water or other means, as necessary to accomplish results acceptable to the **Engineer**.
- (g) The **Developer** shall obtain written consent from the **Engineer** prior to any closure of a **Roadway**, sidewalk, access or right of way, water, sewer or drainage system.

1.5.16 Traffic Control Barriers, Lights

The **Developer** shall, at his own expense, provide, erect and maintain all required barriers, fences, warning flashers with amber globes, or other such proper protection including flag persons or watchmen if necessary, to ensure safety to the public as well as those engaged about the premises or with the construction and installation of the **Works and Services**.

The **Developer** shall also provide signs or notices in compliance with the Ministry of Transportation's Traffic Control Manual for Works on **Roadways** and Uniform Traffic Control Devices Manual.

1.5.17 Disposal of Debris by Open Burning

Debris from construction and site clearing works or material brought to the site shall not be disposed of by open burning without first obtaining a burning permit from the **District** pursuant to the **District's** Fire Prevention By-law.

1.5.18 Releases at Completion of Works and Services

The **Engineer** may require that, upon completion of construction and installation of any portion of the **Works and Services** on private property, the **Developer** obtain from each affected property **Owner**, a formal release, in writing, verifying that the property has been restored by the **Developer** to the same condition it was in as before such construction or installation.

In the case of a dispute, the **Engineer's** decision shall be final.

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**

1.5.19 Warranty Period (except for Landscaping)

The warranty period for **Works and Services** (except for **Landscaping**) provided, designed, constructed and installed under this by-law, shall be for a minimum of one (1) year following the date of issuance of the **Engineer's Certificate of Substantial Completion** and shall expire upon issuance of the **Final Acceptance Certificate**.

During the warranty period, the **Developer** shall guarantee the stability and sufficiency of the materials and workmanship of the **Works and Services** and shall make good, correct and repair all defects, imperfections, damage, settlements and acts of vandalism which may arise or occur in relation to the **Works and Services**.

The **Developer** shall ensure that the **Roadways**, including **Sidewalks** and **Walkways**, are kept clean and free of dirt and debris during the warranty period.

1.5.20 Universal Transverse Mercator (UTM) Monuments

The **Developer** shall install a sufficient number of UTM monuments, set in locations so that a BC Land Surveyor can coordinate the monuments to a level of accuracy suitable for an **Integrated Survey Area**. The **Surveyor** shall complete this field work in conjunction with his final posting of the **Subdivision**.

1.5.21 Warranty Period for Landscaping

Upon completion of **Landscaping** as required under this by-law, the **Developer** shall notify the **Engineer** who shall issue a **Landscape Certificate of Substantial Completion** upon satisfactory inspection of the work to determine conformance with the requirements, standards and specifications of this schedule.

The warranty period for **Landscaping** shall be for a minimum of one (1) year from the date of issuance of the **Landscape Certificate of Substantial Completion** by the **Engineer**.

During the warranty period for **Landscaping**, the **Developer** shall replace any plant material that dies, is damaged or that fails to grow satisfactorily as determined by the **Engineer**. All replacements shall be with plant material of the same kind and size as the original **Plantings** unless otherwise specified by the **Engineer**.

The **Developer** shall warrant all replacement plant material for a period equal to the original warranty period.

Should the **Developer** fail to make good and repair any defects, imperfections, vandalism acts, settlements or clean-up after being given at least seven (7) days written notice during the **Landscaping** warranty period, the **District** shall make or cause to be made all necessary repairs at the cost of the **Developer** and shall recover such costs in accordance with subsection 1.5.12.

The **Engineer** reserves the right to extend the **Developer's** warranty responsibilities for an additional time period, not to exceed one (1) year if at the end of the initial warranty period, leaf development, plant growth or overall vigour is not sufficient to ensure future survival as determined by the **Engineer**.

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1.6 AGREEMENTS, BONDING, INSURANCE, PERMITS

1.6.1 Servicing Agreements Contents and Provisions

Prior to commencement of provision, installation and construction of the **Works and Services** the **Developer** shall execute a Servicing Agreement with the **District** substantially in the form of agreement contained in Schedule "C" of this by-law. The Mayor and Chief Administrative Officer are hereby authorized to execute any Servicing Agreement substantially in the form as set out in Schedule "C".

The Servicing Agreement makes provision for, among other matters:

- (a) Security Deposit;
- (b) indemnity clause;
- (c) insurance requirements;
- (d) warranty period;
- (e) Warranty Deposit;
- (f) progress draws; and
- (g) administration fees.

1.6.2 Servicing Agreement Procedure

When entering into a Servicing Agreement the following procedure shall be followed:

Two copies of the Servicing Agreement shall be obtained from the **District**. Both copies of the Agreement shall be executed by the **Developer** and returned to the **District** along with the following:

- (a) **Security Deposits** in the amount and form specified;
- (b) Certificate of Insurance in accordance with the requirements of the Servicing Agreement;
- (c) a non-refundable administration and inspection fee in the amount calculated in accordance with subsection 1.6.3 and specified in the Servicing Agreement; and
- (d) any other connection fees, cash in lieu of **Works and Services**, latecomer fees, Development Cost Charges or similar charges levied by the **District** and required in the Servicing Agreement.

1.6.3 Administration and Inspection Fee

The administration and inspection fee shall be based upon the estimated cost of construction and calculated as follows:

| Estimated Cost   |   | Fee Value                                   |
|------------------|---|---------------------------------------------|
| up to \$ 300,000 | = | 4% (minimum \$500.00)                       |
| over \$ 300,000  | = | 4% on first \$300,000 then 2 % on remainder |

**SCHEDULE "A"**  
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1.6.4 Security Deposit

The **Security Deposit** deposited by the **Developer** is to ensure the provision, design, construction, installation and maintenance of the required **Works and Services** and **Landscaping** as determined by the **Engineer**. The **Security Deposit** shall be based on the estimated construction cost of the required **Works and Services** and **Landscaping**, including GST. Letters of Credit shall be automatically renewing, irrevocable, and refer to the **Developer's** name or company that is noted on the Servicing Agreement. The **District** shall not pay any interest on the **Security Deposit**.

1.6.5 Indemnity Clause

The **Developer** shall indemnify and hold the **District**, its officers, employees, elected officials, agents and **Contractors** harmless from and against all actions and proceedings, costs, damages, expenses, claims, and demands whatsoever and by whomsoever, brought by reason of or arising in any way from the provision, design, construction, installation or performance of the required **Works and Services**.

If as a result of any wilful or negligent act or omission of the **Developer** in fulfilling its obligations under this by-law, the **District** becomes obligated to pay any money to any person, the **Developer** shall reimburse the **District** for all such monies and reasonable expenses.

1.6.6 Public Liability and Property Damage

Prior to the commencement of any **Works and Services**, the **Developer** shall obtain and maintain a policy of insurance acceptable to the **Engineer** as follows. In all policies:

- (a) Each **Contractor** engaged in the work and the **District** shall be named as an additional insured;
- (b) Each policy shall contain a provision that the insurance shall apply as though a separate policy has been issued to each named insured;
- (c) Each policy shall provide that no expiry, cancellation or material change in the policy shall become effective until after 30 days notice of such cancellation or change. Notice of change shall be given to the **District** by registered mail; and
- (d) The **Developer** shall maintain the insurance policy until the **Works and Services** have been accepted by the **Engineer**, as evidenced by the **Final Acceptance Certificate**.

1.6.7 Insurance Policy Limits

The following are limits to be included:

- (a) Comprehensive Public Liability Insurance and Property Damage Insurance providing coverage of at least \$5,000,000 inclusive against liability for bodily injury or death and/or damage to property on an all risk occurrence basis;
- (b) Motor Vehicle Insurance for public liability and property damage providing coverage of at least \$5,000,000 inclusive on owned, non-owned or hired vehicles; and

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- (c) Completed operations coverage on an all-risk occurrence basis of at least \$5,000,000 inclusive against liability for bodily injury, death and/or damage to property of others arising out of the existence of any condition in the work when completed or any installation or repair operations during the period of 12 calendar months next ensuing after the issuance of a **Certificate of Substantial Completion** by the **District**.

1.6.8 Insurance Policy Submission

The **Developer** shall deliver to the **District**, a copy of the policy of insurance certificate signed by a licensed insurance agent, certifying as follows:

"I hereby certify that the attached insurance policy provides insurance coverage as required by Servicing Agreement between the District of Kent and (the **Developer**), and that the attached Insurance Policy No. \_\_\_\_\_ is valid for the period of the Servicing Agreement."

No construction may commence if this provision has not been satisfied.

1.6.9 Patents and Copyrights

The **Developer** shall pay all royalties, patent and licence fees, and hold and save the **District**, its officers, agents, servants and employees, harmless from liability of any nature or kind, including costs and expenses, for or on account of any copyrighted or un-copyrighted composition, secret process, patented or un-patented invention, articles, or appliances manufactured or used in the execution of the **Works and Services**, including their use by the **District**.

1.7 INSPECTION AND SECURITY DEPOSIT REDUCTIONS

1.7.1 Inspections - General

The **Engineer** may inspect any part of the **Works and Services** including workshops or other places where material is being prepared or stored. The **Developer** shall provide access and all information requested. The **Contractor** shall open for inspection any part of the **Works and Services** that have been covered up without inspection by the **Engineer**.

The **Consulting Engineer** shall supply representative samples of materials if requested by the **Engineer**. The **Consulting Engineer** shall provide on-site survey, measurements, inspection and testing of the **Works and Services**. The testing and geotechnical firm(s) shall immediately forward results, reports or recommendations to the **Consulting Engineer** and the **Engineer**.

Inspections by the **Engineer** shall not constitute supervision or co-ordination of the **Works and Services**, and neither are they intended to serve in place of proper engineering supervision of the **Works and Services** by the **Developer's Consulting Engineer**.

1.7.2 Inspections by the Engineer

Inspections by the **Engineer** are limited to ensuring that the **Works and Services** are:

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- (a) in compliance with the Requirements, Standards and Specifications of this by-law and all other by-laws of the **District**;
- (b) in general conformity with the intent of the accepted plans; and
- (c) in a condition acceptable to the **District**.

**1.7.3**     Inspections by the Consulting Engineer

The **Consulting Engineer** shall be responsible for:

- (a) carrying out on-site engineering inspection of the **Works and Services** to ensure that they comply with the Requirements, Standards and Specifications of this by-law and that the provision, design, construction and installation of the **Works and Services** are carried out according to sound engineering practices and standards and conform to the intent of the accepted plans and reports;
- (b) engaging the services of qualified testing and geotechnical engineering firms to provide quality assurance inspections, recommendations and testing of the **Works and Services**; and
- (c) ensuring that all other requirements of the **District** are performed and completed to a satisfactory conclusion.

**1.7.4**     Testing or Confirmation of Completed Works and Services

The **District** may conduct independent testing of any or all **Works and Services**. Typically, these tests will be conducted on a random basis and are for the purpose of ensuring that the **Works and Services** being accepted by the **District** meet the minimum requirements, standards and specifications of this by-law.

In addition to ensuring that the **District** has proper and accurate records of the **Works and Services** constructed by the **Developer**, survey spot checks may be conducted from time to time to verify authenticity of the as constructed information.

The costs for this random testing or surveying shall be borne by the **District**. If the **Works and Services** do not comply with this Schedule, the **Developer** shall bear such costs of testing or surveying plus all costs for repairs, replacement, reconstruction and re-certification of any **Works and Services** disturbed, exposed, removed or affected by the random checks.

**1.7.5**     Security Deposit Reductions

As the **Works and Services** progress, the **Consulting Engineer** may prepare and submit to the **Engineer** a Letter of Credit (LOC) reduction request setting forth an estimate of the quantity, value and percentage of the work completed.

Prior to approval by the **Engineer**, the **Consulting Engineer** shall provide confirmation acceptable to the **Engineer** that full and adequate payment has been made by the **Developer** to his **Contractors**, agents, consultants and any other person for the supply of all plant, material and labour or other services included in the design, construction and installation of the **Works and Services**.

Prior to issuance of the **Certificate of Substantial Completion**, the **Engineer** may reduce the **Security**

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**Deposit** held to a maximum of 90% of the original estimated value of the **Works and Services**.

The **Engineer** may deny reductions where, in his opinion, the **Security Deposit** is required to cover the remainder of the work. No request shall be for a period of less than one month. **Security Deposit** reductions are for the convenience of the **Developer** and, in no case, shall be taken as acceptance by the **Engineer** of the material or **Works and Services**.

1.7.6 Certificate of Substantial Completion

The **Consulting Engineer** shall notify the **Engineer** when construction of the **Works and Services** are substantially complete. The **Engineer** shall, if necessary, issue a list of deficiencies that must be corrected.

A **Certificate of Substantial Completion** will be issued by the **Engineer** when:

- (a) all deficiencies are rectified;
- (b) as built drawings of the **Works and Services** have been accepted by the **Engineer**;
- (c) Service Record Cards have been accepted by the **Engineer**;
- (d) proof that all legal encumbrances have been registered or released accordingly; and
- (e) a written declaration from the **Consulting Engineer** has been received stating that all **Works and Services** have been provided, supplied, designed, constructed and installed in substantial conformance with the accepted design drawings and the Requirements, Standards and Specifications of this by-law and all other applicable **District** by-laws.

1.7.7 Building Permit Issuance

For **Subdivisions**, no building permit will be issued until a **Certificate of Substantial Completion** for the required **Works and Services** has been issued by the **Engineer**.

1.7.8 Show Home Building Permits

Despite clause 1.7.7, a building permit for a show home may be issued as determined by the **Engineer**.

1.7.9 Service Record Cards

Services Record Cards for each **Parcel** shall show:

- (a) rights-of-way and easements as they pertain to the **Parcel**;
- (b) the location, inverts and depth of water, storm and sanitary connections, water meter boxes and service boxes;
- (c) MBE;
- (d) recommended **GPE**;
- (e) elevations at back of curb, **Parcel** corners, and finished ground at the rear building envelope line;
- (f) all dimensions of front, side and rear parcel lines of the **Parcel**; and

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- (g) shall be digital CAD format, AutoDesk and reference G.P.S. coordinates as determined by the **Engineer**.

1.7.10 Warranty Deposit

Upon issuance of the **Certificate of Substantial Completion**, the **Engineer** may release all **Security Deposit** less a **Warranty Deposit** of 10% of the estimated cost of the **Works and Services**, to a minimum of \$3,000 to secure the maintenance or repair to the **Works and Services** during the warranty period referred to in subsections 1.5.19 and 1.5.21.

The **Warranty Deposit** shall not be applied to the maintenance or repair of outside utility approved equipment installations but may be applied to the maintenance or repair of excavations and soil settlement areas on **District** property and rights of way arising from such installations.

1.7.11 Landscape Certificate of Substantial Completion

Upon completion of **Landscaping**, the **Consulting Landscape Architect** shall notify the **Engineer** who shall inspect the work and if necessary issue a list of deficiencies that shall be corrected. Upon correction of the deficiencies to the acceptance of the **Engineer**, a **Landscape Certificate of Substantial Completion** will be issued.

Upon issuance of the **Landscape Certificate of Substantial Completion** by the **Engineer**, the **District** may release that portion of the **Security Deposit** held for **Landscaping**, less a warranty holdback of 20%. The warranty holdback shall be held for a period of one (1) year from issuance of the **Landscape Certificate of Substantial Completion**.

1.7.12 Final Acceptance Certificate

A **Final Acceptance Certificate** will be issued by the **Engineer** upon expiration of the warranty period for required **Works and Services** provided all deficiencies have been corrected to the satisfaction of the **Engineer**. A **Landscape Final Acceptance Certificate** will be issued by the **Engineer** upon expiration of the **Landscape** warranty period provided all deficiencies have been corrected to the satisfaction of the **Engineer**.

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**SECTION NO. 2- ENGINEERING DRAWINGS AND RECORDS**

**2.1**      **INTRODUCTION**

The purpose of this section is to outline the minimum standards and requirements the **District** will accept for the submission of quality design and as-built drawings for **Works and Services**.

Incomplete or substandard submissions will be returned to the **Consulting Engineer** without comment on the drawings.

All submissions shall comply with the following:

- (a) all applicable requirements of this schedule;
- (b) all applicable requirements of the latest edition of Construction Specifications and Standard Detail Drawings;
- (c) all applicable requirements of **District** by-laws, as amended or replaced from time to time, including but not limited to:
  - (i) the Zoning By-law;
  - (ii) the **Official Community Plan**; and
  - (iii) the Building By-law.

**2.2**      **SURVEY INFORMATION**

All surveys shall be conducted safely with minimal nuisance to traffic or the public at large. The **Developer** must obtain permission from any **Owner** before entering private property.

All elevations shall be from geodetic datum. Information regarding the location and elevation of existing **Integrated Survey Area** may be obtained from the **Engineer**.

Originating benchmarks and **Integrated Survey Areas** shall be noted on all applicable plans.

Copies of legible field notes shall be made available to the **District** upon request.

Centrelines (or offset lines) are to be marked and referenced in the field, and all chainages shall be keyed to the legal posting.

All existing items such as survey monuments, manholes, catch basins, watermains, fittings, service connections, clean-outs, inspection chambers, ditches, watercourses, culverts, signals, underground cables, gas mains, curbs and gutters, **Sidewalks**, edges of pavement, junction boxes, kiosks, fire hydrants, poles, existing dwellings, fences, trees, hedges, and unusual ground shall be noted.

All surveyed features shall be tied to survey control and be referenced to UTM survey system.

All construction or alteration are to be shown on drawings distinguished from existing items by different, thicker line weights. The font for all notations will be "Romans" or the equivalent style.

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Cross-sections are required, where applicable. The sections shall include locations and elevations of:

- (a) centreline of pavement;
- (b) edge of pavement;
- (c) gutter line;
- (d) top of curb;
- (e) back of sidewalk;
- (f) edge of shoulder;
- (g) ditch invert;
- (h) top of ditch banks including high and low watermark(s);
- (i) property line;
- (j) an existing ground elevation 3 m inside property line and 5 m beyond cut or fill slopes; and
- (k) toe and top of bank of cut and fill slopes.

Typically, chainages on a drawing shall increase from left to right and from bottom to top. North should be at the top or right side of a drawing. All drawings should be oriented to view northward or westward.

**2.3** **DRAWING SUBMISSIONS**

All drawings shall be prepared in accordance with the following requirements and all other applicable requirements of this schedule. The **District** will supply to the **Consulting Engineer**, for a nominal charge, a digital version of the standard title block for A1 sized drawing sheets.

All drawings shall clearly identify the **Works and Services** in sufficient detail. Drawings shall be digital CAD format, AutoDesk and reference G.P.S. coordinates as determined by the **Engineer**. Drawings shall incorporate all digital information available through the **District**.

All new **Works and Services** are to be shown in bold lines.

Notes pertaining to the construction of **Works and Services** are to be shown on the specific service drawing or on a separate sheet.

Baselines and chainages are to be referenced to at least one legal posting on each sheet.

Offsets are to be shown to both sides of the **Highway** or right of way (R/W) or to one side with the **Highway** or R/W width noted.

All drawings, except for the street lighting plan and the Street Tree and Boulevard Planting plan(s), shall be signed and sealed by the **Consulting Engineer** responsible for the design and construction supervision of the **Works and Services**.

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All landscaping plans including Street Tree and Boulevard Planting plans shall be sealed and signed by the **Consulting Landscape Architect**.

The street lighting plans shall be signed and sealed by a **Consulting Electrical Engineer** responsible for the design of the street lighting **Works and Services**.

2.4 PLAN INFORMATION

Information on plans shall include:

- (a) the reference file number(s), noted in the lower right-hand corner of all drawings;
- (b) the legal layout of roads and properties;
- (c) the legal descriptions of all properties included in the **Subdivision or Development**;
- (d) dimensions to the nearest 0.01 m;
- (e) existing house numbers of parcels adjacent to the proposed **Works and Services**; and
- (f) all existing and proposed registered statutory rights of way and easements.

2.5 ENGINEERING DESIGN DRAWINGS

A complete set of Engineering Design drawings shall include, in the following sequence:

- (a) Cover Sheet - noting:
  - (i) the **Consulting Engineer's** name, address, phone and fax numbers;
  - (ii) **Developer's** name address, phone and fax numbers, including contact name;
  - (iii) **Surveyor's** name, address, phone and fax numbers;
  - (iv) the legal description of the lands involved;
  - (v) a site plan at 1:4000 scale showing all proposed roads and proposed **Subdivision** layouts; and
  - (vi) drawing index. (For smaller projects, general notes may be included on the cover sheet, otherwise general notes shall be on a separated sheet and/or on the appropriate utility sheet.
- (b) Key Plan - at a 1:1000 or 1:500 scale - noting:
  - (i) all proposed **Works and Services** including service connections, appurtenances such as hydrants, valves, manholes and catch basins, street lights, community post boxes complete with all offsets, locations and dimensions, and
  - (ii) the **Development** site shall be outlined with a bold line.

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- (c) Storm Water Management Plan (SWMP) at 1:1000 scale - noting:
- (i) the post-development contour lines at maximum 1 m intervals. These contour lines should match to the pre-development contour lines at the **Development** boundary, or as designed by the **Consulting Engineer**. Existing topographic information shall extend a minimum 10 m outside the **Subdivision** or **Development** boundary;
  - (ii) a directional arrow on each parcel indicating the prevailing post-development slope of the land;
  - (iii) the proposed minor (10-year return) **Drainage System** complete with inlet and outlet structures, and connection(s) to existing, adequate **Drainage Systems**;
  - (iv) the proposed major (100-year return) post-development flood route(s) and **Drainage System**, complete with connection to an existing, adequate **Drainage System**;
  - (v) the storm detention facility location, size (volume) and release rate if required;
  - (vi) a design table noting information for each segment of proposed main including the catchment area (in hectares), run-off coefficients, time of concentration, rainfall intensity, major and minor flow volume, pipe size slope and capacity both existing and proposed;
- (d) Road Works and Water Mains – may be on the same plan and profile and shall be at a scale of 1:500 horizontal and 1:50 vertical noting:
- (i) existing and/or proposed elevations and locations of:
    - the centre line of proposed and/or existing roadways,
    - proposed and existing curbs and gutters and sidewalks,
    - all curves at appropriate arc locations,
    - all existing and/or proposed catch basins including lid elevations;
  - (ii) BC, EC, arc length and "k" value design details of all vertical and horizontal curves;
  - (iii) all water main appurtenances including valves, hydrants, bends, tees, tie-in points, test points, blow offs, air valves, etc.;
  - (iv) the full pipe shall be shown on the profile;
  - (v) all water main crossover points with sewers and other utilities, including clearance and protection details;
  - (vi) the size, class, type, length and slope of each continuous water main pipe section;  
and
  - (vii) the service connection location and elevations at the property line.

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- (e) Storm and Sanitary Sewers – may be on the same plan/profile and shall be at a scale of 1:500 horizontal and 1:50 vertical noting:
- (i) all sewer main appurtenances including cleanouts, inspection chambers, manholes, catch basins, etc.;
  - (ii) the service connection location and elevations at the property line;
  - (iii) the minor and major **Drainage System** hydraulic grade lines (HGL) on the profile;
  - (iv) the full pipe shall be shown on the profile;
  - (v) rim elevations of all manholes, catch basins and cleanouts;
  - (vi) the size, class, type, length and slope of each continuous pipe section;
  - (vii) chainages and invert of each appurtenance shall be shown on profile;
  - (viii) all crossover points with other sewers, water mains and utilities including clearance and protection details; and
  - (ix) storm detention system, information calculations and construction details, if required.
- (f) Road Cross-Sections - The scale shall be at 1:100 horizontal and 1:50 vertical. Plans shall include:
- (i) cross-sections every 20 m and shall show proposed construction over existing conditions to 10 m beyond property line of the **Highway** right of way;
  - (ii) additional sections may be required or requested where excessive cuts or fills are involved.
- (g) Ornamental Street Lighting Plan - shall be to a scale of 1:500, noting:
- (i) sign and seal of a Professional Electrical **Engineer**;
  - (ii) general Notes;
  - (iii) mounting height and type of lamp standard;
  - (iv) make, model, wattage and type of luminaire;
  - (v) photometric calculations in table form;
  - (vi) location of proposed service base and hydro service box; and
  - (vii) off-set and chainages of each lamp standard;
- (h) Lot Grading Plan
- Refer to the guidelines set out in the Lot Grading Guidelines (Schedule "B"), which outlines procedures to be followed in setting grades and construction practices to be followed by the **Developer, Consulting Engineer, Contractor** and prospective homeowner.

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Plans shall be at a scale of 1:500 noting:

- (i) pre-development ground contours in dashed lines;
- (ii) post-development ground contours in solid lines;
- (iii) elevations at the corners of each proposed **Parcel**;
- (iv) elevations at the rear building line of each proposed **Parcel**;
- (v) drainage swales, typically on the uphill side of all downhill properties;
- (vi) CB's and lawn basins complete with rim elevations;
- (vii) proposed retaining walls, including materials and heights. The **Developer** shall construct all retaining walls that are integral to lot grading designs; and
- (viii) all areas of cut and fill in excess of 1.5 m deep shall be identified and located clearly and accurately.

(i) Construction Details

All construction details that are not covered or specifically detailed in the Construction Specifications and Standard Detail Drawings shall be provided on the drawings pertinent to the utility. Where there is a **District** standard or detailed drawing a reference to the standard is acceptable.

(j) Tree Survey Plan

Refer to the Development Permit, where applicable.

(k) Pavement Marking and Street and Traffic Advisory Plan – shall be at a scale of 1:500 or 1:1000 noting:

- (i) pavement markings including, arrows, edge of pavement lines, median and traffic movement islands, centre line and lane markings;
- (ii) street and traffic signs including, directional arrows, advance warning signs, checker boards, street name signs and traffic advisory signs.

Note: This plan may be combined with the Road Works plan, provided it is legible.

(l) Landscaping Plan – shall be at a scale of 1:1000 or 1:500 noting:

- (i) location, offset, spacing, and type of all street trees; over top of the key plan;
- (ii) potential conflicts with overhead wiring;
- (iii) an itemized list of the species to be planted; and
- (iv) seal and signature of a **Consulting Landscape Architect**.

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(m) Information

The following additional information shall be noted on pertinent drawings:

- (i) all existing underground utilities complete with size, type of material, inverts, off-sets and notes detailing connection and tie-ins, by whom, how, and at whose expense;
- (ii) all existing structures, including houses, sheds, fences, poles, pole anchors, overhead or underground encroachments, wells, septic tanks and septic fields, with notations indicating their fate (i.e., to be demolished, removed, filled, etc.); and
- (iii) The **Consulting Engineer** or **Consulting Landscape Architect** shall consult with outside utility agencies where applicable to ensure that the design, construction and installation of the proposed **Works and Services** is possible without interference. Alterations, additions, deletions, dedications, rights of way, easements etc. are the responsibility of the **Developer**.

2.6 DESIGN SUBMISSION SEQUENCE

(a) The first submission for review by the **District** shall consist of:

- two complete sets of plans of the proposed **Works and Services** sealed and signed by the **Consulting Engineer, Consulting Electrical Engineer** and **Consulting Landscape Architect**;
- all applicable calculations for the design of the proposed water mains, storm sewers including detention/retention and sanitary sewers;
- a detailed geotechnical report, if required.

(b) The final submission following **District** review shall consist of:

- eight complete sets of plans of the proposed **Works and Services**, signed and sealed by the **Consulting Engineer(s)** and **Consulting Landscape Architect** as required;
- one set of Water design plans for submission to Ministry of Health;
- one set of Lot Grading plans for distribution to Building Department;
- one set of Key plans for distribution to Building Department; and
- one set of **Landscaping** plans for distribution to Parks Department.

(c) Construction Estimate

The construction estimate shall be detailed in a format as directed by the **Engineer**. The **Engineer** shall supply a base progress draw form for use by the **Consulting Engineer** when submitting all progress draw releases for **Works and Services**.

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(d) Service Record Cards

The Engineering Department will provide, on request, a sufficient number of Service Record Cards for each **Development**. Service Record Cards are considered part of the "record drawing" submission, and are required prior to release of parcels for building permit. (Refer to Section 1.7.9)

2.7 RECORD DRAWING INFORMATION

(a) Record drawings shall be presented as follows:

- (i) The Key plan showing the as-constructed offsets and locations of all **Works and Services** including service connections. **GPE** and **MBE** may be shown but can be on either the Key plan or the Lot Grading plan;
- (ii) The Road works, Water main, Sanitary Sewer and Storm Sewer, plans showing elevations, inverts and off-sets as constructed. Profiles of the utilities shall state pipe materials, bedding and backfill used with chainages referenced to at least one legal posted **Parcel** line on each sheet;
- (iii) The Storm Water Management Plans as constructed;
- (iv) The Lot Grading plans showing as constructed ground elevations at all **Parcel** corners, rear building envelop line, back of curb or **Sidewalk**, and any changes in grade across the **Parcel**. The **MBE**, **GPE**, lawn basins, manholes and swales and any other feature that may affect the construction of a building on the **Parcel** shall be identified. Uniform grades between **Parcel** corners will be assumed to a tolerance of  $\pm 150$  mm;
- (v) The Street Light plans showing make, model, type of luminaire unit, illumination levels achieved with the as-constructed light spacing, locations of service bases, photocells and hydro service entrances as constructed;
- (vi) Any plans and details for which there were no Municipal Standards (pump stations etc.) complete with any operating manuals, Schedule "C's" for structural and geotechnical aspects of the construction, etc.; and
- (vii) A final geotechnical report, if required, addressing all recommendations and details of the preliminary report, confirming construction techniques, applications and details including placement and compaction of fill materials in excess of 1.5 m, stability of cut and fill slopes and embankments equal to or greater than 1V:2H.

In all cases, notes with instructions to the **Contractor** are to be removed or amended to indicate the result(s) of construction.

Previously existing **Works and Services** that have been deleted as a result of construction, or reconstructed in accordance with design, shall be removed or amended to show **Works and Services** as constructed.

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- (b) When the **District** is satisfied with the record drawing submission, the **Consulting Engineer** shall submit the following:
- (i) one set of Mylar drawings identified in bold letters with the words "CERTIFIED RECORD DRAWINGS" in the revision block. Mylars shall not be signed or sealed by the **Consulting Engineer**;
  - (ii) two sets of paper prints with the following certification noted on each drawing:

"I certify that these record drawings represent the **Works and Services** that have been supplied, constructed and installed in substantial conformance with the intent of the designs as accepted by the **Engineer** dated \_\_\_\_\_."

The seal and signature shall be that of the **Consulting Engineer** who was personally responsible for the design and inspections and shall be on each drawing. The **District** will return one set to the **Consulting Engineer** upon acceptance;
  - (iii) Completed Service Record Cards for each **Parcel** and Hydrant Cards. These may be produced electronically but shall be on card stock material; and
  - (iv) If the drawings were prepared using a CAD system one set of drawing files in DWG or DXF format on disk shall be supplied if requested by the **Engineer**.
- Note: All Mylar or paper plan(s), Service Record Card(s) and record drawing(s) will take precedence over digital information.

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**SECTION NO. 3 - WATER DISTRIBUTION – DOMESTIC AND FIRE FIGHTING**

**3.1**      **GENERAL**

The design of water systems in the **District** shall conform, with the requirements of the Provincial Ministry of Health and these Engineering Standards and Specifications.

**3.2**      **PRE-DESIGN REQUIREMENTS**

The adequacy of the existing available water supply, if applicable, shall be confirmed with the **Engineer** prior to designing any extension of, or connection to, existing **District Water Distribution Systems**. Where a **Water Distribution System** does not exist, the **Developer** shall provide a dry system as directed by the **Engineer**, and a proven potable water source (Section 3.14).

The proposed **Water Distribution System** shall be designed to provide domestic requirements and fire protection, as specified herein.

The required flow shall be the sum of the maximum daily flow plus the required fire flow.

Water mains shall be looped at the direction of the **Engineer**.

**3.3**      **DEMAND**

**RESIDENTIAL:**

|                    |                         |
|--------------------|-------------------------|
| Average daily flow | 500 litres/capita/day   |
| Maximum daily flow | 1,000 litres/capita/day |
| Peak hour flow     | 2,000 litres/capita/day |

Populations used in calculating water demand shall be computed in accordance with the **District's** population predictions or with the planned **Development** in the area to be served, whichever is greater.

**COMMERCIAL, INDUSTRIAL, INSTITUTIONAL:**

Water demand for non-residential uses shall be estimated using the following equivalent population factors:

|                      |                        |
|----------------------|------------------------|
| <b>Commercial</b>    | 60 persons per hectare |
| <b>Industrial</b>    | 90 persons per hectare |
| <b>Institutional</b> | 50 persons per hectare |

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Wherever possible a more accurate estimate of water demand shall be made using available information on similar projects elsewhere, acceptable to the **Engineer**. Large water consumers, such as car washes, greenhouses, laundromats and food-processing plants shall use a water demand from similar comparable projects.

The **Consulting Engineer** shall confirm projections with the **Engineer** prior to commencing water designs.

3.4 **FIRE FLOW REQUIREMENTS**

Fire flow requirements in the **District** follow published criteria by the Fire Underwriters' Survey (FUS) entitled, "Water Supply for Public Fire Protection - A Guide for Recommended Practice" (latest edition).

Minimum acceptable fire flows for specified zones are:

| Land Use                                                                              | Fire Flow              |
|---------------------------------------------------------------------------------------|------------------------|
| Low Density <b>Residential</b> ≤ 16 units/ha                                          | 3,600 l/min (60 l/s)   |
| Medium Density <b>Residential</b> >16 units/ha & ≤ 45 units/ha                        | 7,200 l/min (120 l/s)  |
| <b>Institutional, Commercial</b> and<br>High Density <b>Residential</b> > 45 units/ha | 10,000 l/min (167 l/s) |
| - wood frame                                                                          | 7,000 l/min (117 l/s)  |
| - non-combustible                                                                     | 12,000 l/min (200l/s)  |
| <b>Industrial</b>                                                                     |                        |

If available fire flows are less than the minimum requirements as stated herein, the **Developer** shall:

- improve, upgrade or extend the existing **Water Distribution System**; and/or
- make building design alterations to reduce the fire flow requirements (ie. sprinklers, fire walls, non-combustible building materials, etc.) acceptable to the **Engineer**.

At the discretion of the **Engineer**, interim fire flows, at a minimum of 75% of the required minimum rate, may be accepted if **Works and Services** scheduled in the **District's** current Five-Year Capital Works Program will provide the required coverage.

Where a **Water Distribution System** is extended, it must be sized to provide the appropriate minimum fire flows to each existing land use fronting the extended system in accordance with the above. Nonetheless, the minimum water main size shall be based on the type of **Development** and as noted in Section 3.8 (a).

Where necessary, the **Engineer** may require the extended **Water Distribution System** to be upsized. The **District** may pay for the cost of upsizing beyond that specified herein. The cost of upsizing to be paid by the **District** shall be restricted to material only.

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**

**3.5**      **SPRINKLER SYSTEMS**

Upon application for a building permit where each existing and future building on a **Parcel** is or will be constructed with an automatic fire sprinkler system protecting the entire building, the minimum fire flow required at that **Parcel** may be reduced to the greater of:

- (a) the minimum fire flow calculated in accordance with the FUS Survey Guide allowing for automatic fire sprinklers; or
- (b) the minimum flow required to support the automatic fire sprinkler systems plus all other water requirements for fire fighting purposes on the **Development**.

**3.6**      **WATER PRESSURE**

|                                                                                               |         |
|-----------------------------------------------------------------------------------------------|---------|
| Minimum Peak Demand Pressure at MBE                                                           | 250 kPa |
| Maximum Allowable Pressure                                                                    | 800 Kpa |
| Minimum Fire Hydrant Pressure (residual)<br>at maximum daily flow plus fire flow requirements | 138 Kpa |

**3.7**      **HYDRAULIC NETWORK CONSIDERATIONS**

The **Consulting Engineer** shall provide, at the discretion of the **Engineer**, a hydraulic analysis of the proposed water system showing minimum flows and pressures. It is the practice of the **District** that all water mains shall be looped at every opportunity.

Where there is an existing hydraulic network in place, the **District** may provide information for design calculations.

Design computations shall be based on Hazen-William's formula:

$$Q = 0.279 (CD^{2.63} S^{0.54})$$

Where:

- Q = rate of flow in m<sup>3</sup>/s
- D = Internal pipe diameter in m.
- S = Slope of hydraulic grade line
- C = Roughness coefficient: for mains less than or equal to 150 mm diameter use 110, for mains greater than or equal to 200 mm diameter use 120

The minimum pipe grade shall be 0.1%. Where the maximum grade is greater than 12%, the main shall be anchored in accordance with geotechnical engineer recommendations.

Design velocities within new water mains shall not exceed 4.5 m/sec.

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**

3.8 WATER MAINS AND APPURTENANCES

(a) Water Main Pipe Sizes

Minimum water main pipe size shall be 200mm, provided in all residential zones water mains may be reduced to 150 mm diameter where:

- they are at the terminus of a system that can not be extended in the future;
- no fire hydrants are connected to the 150 mm diameter section;
- minimum fire flow and water pressure requirements are met; and
- the water main services  $\leq$  18 single-family homes.

(b) Materials

Use PVC unless otherwise accepted by the **Engineer**..

(c) Valves

(i) Valves shall be located as follows:

- at intersections,
- in a cluster at the pipe intersections,
- at hydrant tees,
- every 200 m in **Residential** areas servicing densities  $\leq$  45 units/ha,
- every 150 m in **Residential** areas servicing  $>$  45 units/ha and **Industrial, Commercial & Institutional Developments**;

(ii) The minimum number of valves at intersections shall be:

- four (4) where mains "Cross",
- three (3) where mains "Tee";

(iii) Valves shall be the same diameter as the main up to 300 mm diameter. For mains larger than 300 mm in diameter, valves shall be no more than one diameter size smaller; and

(iv) All direct bury mainline valves shall be resilient seat gate valves. Butterfly valves shall not be used unless approved by the **Engineer**. Valves  $\geq$  400 mm diameter shall be provided with a bypass.

(d) Pressure Reducing Valves (PRV)

Pressure reducing valves are required where water systems cross pressure zones, or as directed by the **Engineer**.

(e) Air and Vacuum Release Valves

Air and vacuum release valves are generally not required on 300mm diameter and smaller water mains, unless directed by the **Engineer**.

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(f) Valve Chambers

Chambers or manholes containing valves, blow-offs, meters or other appurtenances shall be connected directly to the **Drainage System**, complete with appropriate back flow protection. Chambers or manholes may be drained to the surface or to absorption pits, subject to adequate soil conditions and the approval of the **Engineer**.

(g) Blow-offs

Blow-offs shall be provided on all dead-end mains. For mains  $\geq 200$  mm diameter, the blow-off shall be 100 mm diameter. For mains  $< 200$  mm diameter, the blow-off shall be 50 mm diameter.

(h) Thrust Blocks

Thrust blocks shall be provided at all crosses, tees, caps, and bends (vertical and horizontal). Where thrust blocks are not possible, adequate tie-rodging or joint restraint system is permitted at the discretion of the **Engineer**. All fittings shall rest on pre-cast concrete blocks.

3.9 HYDRANTS

Fire hydrants shall be located:

- (a) within 100 m of all possible residential building sites in urban areas, and within 45m of the front entrance of all industrial, commercial and institutional buildings;
- (b) on a registered statutory Utility Right of Way or public Highway;
- (c) in accordance with the appropriate Standard Drawing with the pumper nozzle a right angles to the curb;
- (d) where possible, at the EC/BC of curb returns at **Highway** intersections;
- (e) at least 1.5 m away from an ornamental lamp standard, utility pole or driveway;
- (f) opposite a property line between two **Parcels** or at the beginning of the radius of truncation for a corner **Parcel**; and
- (g) at a maximum spacing of 200 m in urban areas.

3.10 SERVICE CONNECTIONS AND WATER METERS

The **Consulting Engineer** shall determine the size of a proposed service connection. The standard single-family residential connection in the **District** is 20 mm and shall be located at the property line in the centre of the **Parcel** wherever possible.

Service connections in the **District** shall be metered at the property line and shall include a dual check valve. Dedicated fire lines and fire sprinkler services shall contain a bypass meter chamber with a tattletale meter.

All meters are supplied by the **District** at the **Developer's** cost. The **District** will install meters up to and including 50 mm diameter at the **Developer's** cost. All other meters will be supplied by the **District** and installed by the **Developer**.

Water meter boxes shall be set flush with the proposed finished elevation of the **Boulevard** or driveway.

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Service connections shall be located so they are not in driveways or under travelled areas wherever possible. Meter chambers shall be capable of supporting H-20 loading, if located in travelled areas.

Meters shall be installed as per standard detail drawings and may be sized per the following table:

| Size of Domestic Main<br>or Service Connection | Minimum Size of Meter     |
|------------------------------------------------|---------------------------|
| ≤ 50 mm (2")                                   | Actual size of connection |
| 100 mm (4")                                    | 75 mm (3")                |
| 150 mm (6")                                    | 100 mm (4")               |

Service connection material shall be Polyethylene/Aluminum Polyethylene composite pipe certified to CSA B137.9-M

**3.11** **WATER DISTRIBUTION SYSTEM LOCATION/CORRIDORS**

All proposed **Water Distribution Systems** within **Highway** rights of way shall be located as shown on the typical **Roadway** cross-sections wherever possible. Where a **Water Distribution System** crosses private property it shall be protected by a registered statutory **Utility Right of Way (R/W)**. The width of the R/W shall be dependent on the depth of the main as follows:

| Depth of Main | Width of R/W |
|---------------|--------------|
| ≤ 2 m         | 3 m          |
| > 2 m & ≤ 4 m | 4 m          |
| > 4 m         | 6 m          |

When a **Water Distribution System** is within a statutory **Utility Right of Way** on private property, a restrictive covenant may also be required at the discretion of the **Engineer** to restrict the depth and location of any proposed footings, buildings, overhangs etc. in the vicinity of the water main.

When a **Water Distribution System** is located within a statutory **Utility Right of Way**, the **Developer** may be required to provide access for maintenance vehicles. The maintenance access shall be constructed to support 9.1 tonne loading.

**3.12** **COVER**

Minimum cover over the crown of water mains shall be 1 m.

Minimum cover over the crown of water mains crossing under ditches shall be 0.6m.

Special crossings may require a steel carrier pipe, as determined by the **Engineer**.

**3.13** **SEPARATION FROM OTHER UTILITIES**

**Water Distribution Systems** constructed in proximity to other utilities shall conform to the criteria of the Ministry of Health.

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3.14 PRIVATE WATER SYSTEMS

Where no **District** water system exists, the **Developer** shall provide potable water from a proven ground water source acceptable to the **Engineer** as follows:

(a) Water Quality

The water quality shall meet or exceed the latest edition of "Guidelines for Canadian Drinking Water Quality", as published by Health and Welfare Canada. A certified laboratory that is under the direction of the Standards Council of Canada or the Canadian Association of Environmental and Analytical Laboratories shall complete testing and supply all testing results to the **Engineer** and **Consulting Engineer**.

(b) Water Quantity

For each single-family dwelling created or proposed there must be a dedicated well capable of providing 2500 litres per day and a peak flow of 9 litres per minute for a 4-hour period.

(c) Well Drilling

All water well drilling, construction and well abandonment shall conform to "Guidelines for Minimum Standards in Water Construction" as published by the Province of British Columbia and the BC Water Well Drilling Association. The well driller must be certified as a water well driller in British Columbia.

(d) Well Testing

A **Consulting Engineer** or certified **Hydrologist** shall submit well test information and certification that the well meets or exceeds the above standards. See Form F4 for certification requirements.

If there are two wells or less in the proposed **Development** a certification by a **Consulting Engineer** based on a Water Well **Contractor's** Report or Well Testing **Contractor's** Report will be sufficient. Where well yield is considered marginal, +/- 10% by the **Consulting Engineer** or where more than two wells are involved, a **Hydrologist** evaluation of the proposed water source may be required as determined by the **Engineer**.

(e) Well Testing Procedure

Completed wells shall be tested by pumping continuously at a constant rate for a minimum period of four hours. The tested rate must be at or greater than the required 9 lpm. See appropriate forms and appendices for recording of information and data. While the test is running, the following measurements shall be made:

- (i) water levels in the well at specific time intervals;
- (ii) pumping rate (must be constant);
- (iii) time that all readings were made;
- (iv) notes on colour, smell and taste of the water pumped; and
- (v) notes on weather conditions during and up to 48 hours prior to the time of testing.

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(f) Location(s)

Location(s) of all private wells shall be accepted by the **Engineer** prior to construction.

(g) Fire Protection System

A separate fire protection system shall be provided on municipal **Right of Way** supplied by an independent well and pump capable of providing the fire flow requirements provided in Section 3.4. Each pump shall provide an electrical connection, design and additional connection for a stand-by power generator. Design shall be acceptable to the **Engineer**.

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**SECTION NO. 4 - DRAINAGE COLLECTION AND DISPOSAL**

**4.1**      **GENERAL**

All **Drainage Systems** shall be designed with consideration for public safety, regulatory requirements, maintenance, economic benefits and the natural environment. All **Drainage Systems** must conform to Federal, Provincial and Municipal statutes, bylaws and guidelines. Some applicable statutes include The Local Government Act, Fisheries Act, Water Act, Wildlife Act, Dyking Act and guidelines include Land Development Guidelines for the Protection of Aquatic Habitat and Stream Stewardship – A Guide for Planners and Developers.

**Drainage Systems** shall consist of two components: the Minor System and the Major System. These shall be designed into an overall co-ordinated system using storm water management principles.

Proper erosion and sediment control is required for all **Developments** or **Works and Services** discharging runoff into **Drainage Systems**, adjacent lands, and/or natural watercourses.

**4.2**      **STORM WATER MANAGEMENT PRINCIPLES**

Storm Water Management is the planning, analysis and control of storm runoff in an entire catchment area. The design of the **Drainage System** shall incorporate techniques such as storm detention, lot grading, subsurface disposal, storage, erosion control and other acceptable methods to mitigate the runoff impacts due to change in land use.

A comprehensive Storm Water Management Plan (SWMP) is required for all **Developments** of greater than 0.5 ha, except rural or **Agricultural Subdivisions** or **Developments**, unless otherwise directed by the **Engineer**.

The SWMP shall include all major elements of the flow control facilities, lot grading, including pre- and post-development ground elevations, major flood path routing and all other appropriate information pertinent to the design.

Storm water runoff from **Subdivision** and **Development** may be required to be controlled or determined by the **Engineer**. Controls may include detention storage and/or infiltration systems for roof water. The **Consulting Engineer** shall confirm with the **Engineer** prior to commencing design, the standard(s) and method(s) to be utilized.

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**4.3**      **MINOR SYSTEM**

The Minor System shall be designed to prevent flooding and property damage and minimize public inconvenience caused by storm events up to a return period of 1 in 10 years. The runoff from a minor storm is referred to as the "Minor Flow".

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4.4 MAJOR SYSTEM

The Major System shall be designed to protect the public and prevent significant property damage due to flooding caused by the rare storm events with a return period of 1 in 100 years.

The runoff from these storms is referred to as the "Major Flow". The Major System shall have the capacity to carry post-development flows not carried by the Minor System or detained in a flow control facility. Flow control facilities include detention/retention ponds, underground detention tanks, linear detention ditches, exfiltration trenches for roof water, and other methods, which reduce the rate of runoff into the downstream **Drainage System**.

The Major System comprises surface flood paths, swales, channels, watercourses, **Roadways**, **Walkways**, pathways, flow control facilities or other **District** owned property at the discretion of the **Engineer**, designed to accommodate runoff from rare and intense storms.

Overland flow paths on **Roadways**, in swales and watercourses shall be designed to ensure that the maximum hydraulic grade line is below the lowest existing or proposed **MBE** of adjacent buildings. Additional protections measures may be required at the discretion of the **Engineer**.

Surcharging at an inlet under major flow is acceptable provided that the headwater profile does not rise above the **MBE** of adjacent properties. The maximum elevation of standing water above existing finished ground surfaces, parking lots, street surfaces etc. caused by any surcharging shall not be greater than 300 mm. Adequate erosion protection shall be required where surcharging is evident.

Where surface flood paths cannot be established, pipes and culverts of the existing or proposed Minor System may be enlarged to accommodate the major flow. Emergency overflow routes may be required by the **Engineer**.

4.5 DRAINAGE SYSTEM

All proposed **Drainage Systems** shall drain to existing, adequate **Drainage Systems**. The presence of existing **Drainage Systems** does not imply that there is adequate capacity to receive the design flow from proposed **Development**, nor does it imply that the existing system is adequate. The adequacy of existing **Drainage Systems** shall be confirmed with the **Engineer**, prior to commencing design of the proposed system. The **Engineer** may require a review of all downstream **Drainage Systems** to accommodate for the projected increase in runoff created by any proposed **Development**.

Existing **Drainage Systems**, which are undersized or inadequate to accept additional drainage flow, shall be upgraded to accommodate the proposed flows at the **Developer's** expense.

Typically, all **Drainage Systems** shall be located within **Highway** rights-of-way or registered statutory **Utility Rights of Way**. When a proposed **Drainage System** is proposed to be connected to an existing, adequate **Drainage System** that is not protected by R/W, efforts may be required to acquire necessary **Utility Rights of Way** at the discretion of the **Engineer**. The cost shall be borne by the **Developer**.

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4.6 SEDIMENT AND EROSION CONTROL

**Drainage Systems** shall not be used for receiving or conveying sediment or deleterious substances resulting from any **Subdivision** or **Development**. The **Developer** is responsible to ensure that sediment or deleterious substances do not enter a proposed or existing **Drainage System**, adjacent lands and/or a natural watercourse. Measures to prevent, restrict or eliminate the introduction of sediment or deleterious substance are outlined in Section 4.17.

4.7 DESIGN METHODS

(a) Hydrology

Storm **Drainage Systems** shall be designed to accommodate post-development flows using the Rational Method for smaller catchment areas (20 ha. or smaller) or a Runoff Hydrograph Method for larger catchment areas (above 20 ha).

The Rational Method:  $Q = RAIN$

Where:

|   |                                                                                                                                                                |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Q | =Flow in l/s                                                                                                                                                   |
| R | =Runoff Coefficient<br>Runoff Coefficient shall be:<br>- 0.6 for single family<br>- 0.7 for multi-family<br>- 0.8 for industrial, commercial and institutional |
| A | =Drainage area in hectares                                                                                                                                     |
| I | =Rainfall intensity in mm/h                                                                                                                                    |
| N | =0.00278                                                                                                                                                       |

The catchment areas shall be determined in accordance with the natural contours of the land. The **Consulting Engineer** shall confirm the extent of the catchment areas and the run off coefficient(s) with the **Engineer** prior to commencing design. Data on existing contour mapping and aerial photographs may not be accurate enough for design purposes and the **Consulting Engineer** shall confirm accurate surface elevations and contours for his design.

(b) Rainfall

Refer to (ES-D-1) for Intensity Duration Curves.

(c) Time of Concentration

The time of concentration is the time required for water to flow from the most remote part of the catchment area to the drainage element under design and shall be 10 minutes, unless directed otherwise by the **Engineer**.

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(d) Overland Sheet Flow in Undeveloped Basins

The maximum sheet flow path in any undeveloped basin shall be 300 m. The overland sheet flow time shall not exceed 15 minutes.

(e) Presentation of Rational Method Calculations

The designer shall tabulate all Rational Method calculations for submission along with appropriate plans and other relevant information as directed by the **Engineer**.

(f) Runoff Hydrograph Method

For basins larger than 20 hectares, hydrologic programs shall be used for runoff analyses. Standard runoff simulations shall be modelled using OTTHYMO89 or Visual OTTHYMO.

Other hydrologic programs may be considered if their uses are deemed necessary and are previously approved by the **Engineer**.

The model used shall be based on the post-development conditions using the most current planning information. Conservative parameters shall be selected if calibration data is not available. For assessment of existing systems, the drainage model may be based on the existing conditions if no future land use changes are anticipated. The total developed tributary area should not deviate from the total natural drainage area.

It is incumbent on the **Consulting Engineer** to obtain the appropriate rainfall data for the analysis and receive approval from the **Engineer** of the program, methodology and analysis prior to commencing the model.

(g) Presentation of Modelling Results

The **Consulting Engineer** shall submit a drainage report including the following:

- (i) name and version of modelling program;
- (ii) design storms and default parameters;
- (iii) schematic diagram of the model;
- (iv) drainage map showing the catchment and sub-catchment boundaries, slopes, land uses, soil conditions, etc.; and
- (v) input and output printouts and computer files.

4.8 PIPE DESIGN

(a) Hydraulics

Hydraulics shall be calculated using Manning's Formula:

$$Q = \frac{A R^{0.667} S^{0.5}}{N}$$

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Where:

- Q = flow capacity ( $\text{m}^3/\text{s}$ )  
A = cross-sectional area ( $\text{m}^2$ )  
R = hydraulic radius (m)  
S = slope of hydraulic grade line (m/m)  
N = coefficient of roughness  
0.010 for PVC  
0.013 for concrete pipe  
0.020 for paved invert CMP pipes.  
0.024 for unpaved CMP pipes

Note: Asbestos cement pipes, clay pipes and corrugated metal pipes are not acceptable for new storm sewer construction.

(b) Velocity

- minimum = 0.6 m/sec  
maximum = there is no maximum velocity, however if the design velocity exceeds 3.00 m/s and super-critical flow occurs, provisions for structural stability of the main and durability of the pipe shall be addressed by the **Consulting Engineer**.

Notwithstanding the above, where the slope of the proposed main exceeds 15%, scouring protection, anchor blocking and energy dissipation measures shall be incorporated. A geotechnical engineer may be required to provide design details, monitor construction and provide construction reports at the discretion of the **Engineer**.

All storm sewers shall be designed with a minimum slope of 0.4% whenever possible. No storm sewer shall have a slope less than 0.1% unless accepted by **Engineer**. All catch basin leads shall have a minimum slope of 1.0%

Special considerations may be required where large flows, high velocities or changes of direction in the order of 90 degrees are necessary at the discretion of the **Engineer**.

(c) Strength - "Class"

All concrete pipe shall be reinforced. Where cover on any sewer main exceeds 2.5 m the **Consulting Engineer** shall submit calculations indicating the class of pipe specified is adequate for the expected loading.

All pipe shall be structurally satisfactory for its intended use and acceptable to the **Engineer**.

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(d) Pipe Joints

All storm sewer systems shall be designed for closed joint construction unless otherwise directed by the **Engineer**.

4.9 STORM SEWERS AND APPURTENANCES

(a) Minimum Pipe Sizes

|       |                               |        |
|-------|-------------------------------|--------|
| (i)   | Mains                         | 250 mm |
| (ii)  | Mains (with C.B. connections) | 300 mm |
| (iii) | Catch Basin (C.B.) leads      | 200 mm |
| (iv)  | Double Catch Basin leads      | 250 mm |

(b) Depth

The depth at crown should be enough to drain service connections for all **Parcels** abutting the main. The elevation at the upstream terminus of any main shall be sufficient to service all upstream tributary lands beyond the **Subdivision** or **Development** and within the approved design catchment area.

All pipes shall have at least 1.0 m cover unless accepted by the **Engineer**. The **Engineer** may accept construction at less than 1.0m cover, provided that specific details of pipe material, backfill, and bedding design are submitted for review and acceptance prior to construction.

(c) Manholes

Manholes are required:

- (i) every 120 m for pipes less than or equal to 900 mm diameter;
- (ii) every 300 m for pipes greater than 900 mm diameter;
- (iii) at all changes in grade or alignment;
- (iv) the upstream terminus of all mains;
- (v) manholes shall include a minimum 600 mm sump where ditches discharge to storm sewers;
- (vi) at all intersecting sewers; and
- (vii) shall be located so that the lid is not in the wheel path of a travel lane.

The crown of the inlet pipe shall be at or above the crown of the outlet pipe.

The drop through all manholes shall be 30 mm unless otherwise approved by the **Engineer**.

All manholes shall be accessible for maintenance.

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Manhole sizes shall be:

- (i) On mains  $\leq$  450mm diameter, use 1050 mm diameter; and
- (ii) On mains  $\geq$  450mm diameter, use minimum 1200 mm diameter.

(d) Cleanouts

Cleanouts shall be minimum 200 mm diameter and may be provided on terminal sections of mains when:

- (i) extension of the main is proposed in the future; and
- (ii) the distance to the nearest downstream manhole is less than 50 m; and the depth of the sewer at the terminal point is less than 2.0 m.

(e) Catchbasins

- (i) Location:

At regular intervals along **Roadways**; and

At intersections and curb returns wherever practical. Storm water should be collected on the upstream side of curb returns and wheel chair letdowns and located such that surface water will not flow across the **Roadway**.

- (ii) Design:

Catchbasins shall be designed to collect up to a maximum of 800 m<sup>2</sup> of pavement runoff per C.B. where gutter grades are less than or equal to 3% and up to a maximum of 500 m<sup>2</sup> of pavement runoff where gutter grades exceed 3%. If the major flow is conveyed in the pipe system, additional or special catch basins are required.

The **Consulting Engineer** shall specify the appropriate type of catch basin to be used in swales and shallow ditches.

The maximum length for a catch basin lead is 30 m.

(f) Service Connections

The use of rock pits or dry well drainage on low density **Residential** is encouraged unless directed otherwise by the **Engineer**.

- (i) Minimum diameter

- 100 mm for single family residential;
- 150 mm for all other applications.

- (ii) Minimum slope from main to property line = 2%

- (iii) All **Parcels** abutting a proposed **Drainage System** shall be provided a service connection and capped until used except where existing service from another **Drainage System** is adequate and acceptable to the **Engineer**;

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- (iv) All service connections shall be at a depth to permit gravity flow from existing or proposed building(s) to the main, unless approved by the **Engineer**;
  - (v) A connection to any **Drainage System** may be made only where the habitable portion of a dwelling (**MBE**) is a minimum 0.6 m above the major system hydraulic grade line or centreline of abutting **Roadway** used for conveyance of the major system flow on the surface;
  - (vi) Typically, connections shall be located on the low side of the **Parcel** or property;
  - (vii) The invert of connections at property line shall be above the minor flow hydraulic grade line and enter the main at or above the spring-line;
  - (viii) Typically, only one service connection per **Parcel** is permitted;
  - (ix) When infilling an existing ditch all existing service connections to existing properties shall be connected to the new main; and
  - (x) Roof water leaders and down spouts shall be directed to a rock pit to allow roof water to infiltrate into the ground unless directed otherwise by a geotechnical engineer or the **Engineer**.
- (g) Inlet/Outlet Structures
- (i) All storm mains  $\geq 300$  mm diameter, require properly designed reinforced concrete inlet and outlet structures per Standard Drawings;
  - (ii) All mains discharging to open ditches, creeks or watercourses require riprap protection for a minimum of 3 m downstream of the apron of outlet structure or headwall subject to fisheries requirements. Additional riprap may be required at the discretion of the **Engineer**;
  - (iii) Where the velocity of flow in the main is  $\geq 1$  m/sec, an outlet structure is required, complete with energy dissipating baffles;
  - (iv) Structures exceeding 1 m in height shall include railing as specified by the **Engineer**;
  - (v) Trash screens and safety grills may be required as determined by the **Engineer**; and
  - (vi) Contain aesthetic considerations, where appropriate.
- (h) Culverts
- (i) Minimum diameter = 450 mm.
  - (ii) The minimum diameter shall be greater than or equal to the depth of headwater at the inlet, unless otherwise approved the **Engineer**.
  - (iii) Culverts located in natural watercourses or all culverts crossing **Roadways** shall be designed to convey the major flow. The **Consulting Engineer** shall determine whether the culvert will operate under inlet or outlet control conditions.
  - (iv) Reinforced concrete culverts are preferred for general uses. Other materials may be considered at the discretion of the **Engineer**.

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- (v) The minimum depth of cover is 0.3 m subject to adequate pipe loading design parameters.
- (vi) Inlet and outlet structures are required on all culverts designed to convey the major flow. Energy dissipation and scouring protection or erosion control shall be included in the design of any culvert installation.
- (vii) Driveway culverts form part of the minor system and shall have the capacity for the 1 in 10 year storm with the design headwater not to exceed the top of the culvert.

(i) Ditches

Open ditches for drainage are not acceptable for permanent servicing of land within the urban areas of the **District**. Ditches may be used for drainage in rural areas.

Ditches adjacent to **Roadways** shall conform to the following:

- (i) maximum depth 1.5 m
- (ii) minimum bottom width 0.5 m
- (iii) maximum side slopes 1.5H:1V
- (iv) minimum grade 0.5%
- (v) maximum velocity 1.0 m/s
- (vi) minimum freeboard 600mm

Where soil conditions permit or where erosion protection is provided, higher velocities may be permitted at the discretion of the **Engineer**. If grades are excessive, scour control structures or ditch enclosure may be required.

The minimum right of way (R/W) width, for an existing or proposed ditch crossing private property, shall be 5 m. The ditch shall be offset in the right of way to permit access for maintenance vehicles. Additional R/W may be required to facilitate access for ditch construction and maintenance. The top of a ditch adjacent to a property line shall be a minimum 0.5 m away from that property line.

Where a **Subdivision or Development** is traversed by a stream, channel, watercourse, drainage ditch and maintained by the **District**, a right of way shall be provided in favour of the **District**.

**4.10 FRENCH DRAINS**

French drains shall be used where the presence of ground water may affect the stability of the existing or proposed **Highway**. French drains are required where indicated by investigation and soils report(s) prepared by a qualified geotechnical engineer and at the discretion of the **Engineer**. French Drains shall consist of 100mm diameter perforated PVC pipe SDR 35, surrounded with 300mm of drain rock and a protective filter fabric Layfield Plastics LP401 or equivalent.

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4.11 SWALES

Swales may be used:

- in conjunction with lot grading to protect adjacent downstream properties from overland sheet flow from uphill properties, as required or directed by the **Engineer**;
- to convey overland Major Flows at the discretion of the **Engineer**; and
- on a rural **Highway** for road drainage at the discretion of the **Engineer**.

Once a lot grading swale crosses a property line, it shall be protected and secured by a registered easement to the point of discharge to the **Drainage System** or dedicated road right of way.

The maximum length of a lot grading swale from the upstream end to a **Drainage System** discharge point shall be 45 m or across 3 **Parcels** unless otherwise approved the **Engineer**.

(a) Lot Grading Swales

Lot grading swales shall be:

- minimum depth = 150 mm;
- minimum width 1.5 m;
- minimum slope = 1.0%;
- maximum velocity = 1 m/s;
- lined with turf on minimum 150 mm topsoil or erosion blanket.

(b) Major Flow Path Swales

Major flow path swales shall be

- designed for the capacity of the expected flows;
- designed with scour protection and energy dissipation;
- secured and protected by a registered statutory **Utility Right of Way**; and
- designed with suitable access for continuous maintenance, inspection, and safety considerations.

(c) Roadside Drainage Swales

Roadside drainage swales shall be connected to an adequate **Drainage System** with an appropriate connection and shall be:

- used where the road drainage is minimal and can be contained safely and practically in a swale rather than a ditch;
- maximum 2.0 m wide;
- maximum 0.3 m deep;
- designed with the roadside edge of the swale at least 2 m from the edge of pavement;
- designed with a maximum velocity of 1 m/s; and
- lined with sod on minimum 150 mm topsoil or erosion blanket/mat.

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4.12 MINIMUM BASEMENT ELEVATION (MBE)

The **MBE** of all **Parcels** shall be 150 mm above the 100-year storm hydraulic grade line or centreline of abutting **Roadway** if designed to convey the 100-year flow on the surface.

4.13 CURVILINEAR SEWERS

At the discretion of the **Engineer**, curvilinear sewers may be permitted where:

- (a) the main is on a constant simple curve;
- the minimum radius is 750 times the diameter of the pipe;
  - there is no deflection at joints or fittings;
  - all joints are located by survey for record drawing information; and
  - minimum velocities and minimum grades are maintained.

4.14 LOCATION/CORRIDORS

Mains located within the **Highway** right of way shall substantially conform to the standard typical cross-sections.

Where an enclosed **Drainage System** crosses private property, it shall be secured within a registered statutory **Utility Right of Way** as per clause 4.5. The depth of the main shall determine the width of the right of way as follows:

| Depth of Main<br>(ground to invert) | Width of R/W<br>(1 pipe) | Width of R/W<br>(2 pipes) |
|-------------------------------------|--------------------------|---------------------------|
| ≤ 3 m                               | 3 m                      | 4.5 m                     |
| > 3 m & ≤ 4 m                       | 4 m                      | 5.5 m                     |
| > 4 m                               | 6 m                      | 8.0 m                     |

Storm mains in **Utility Rights of Way** may require access for maintenance at the discretion of the **Engineer**. The access shall be a minimum 3.0 m wide and designed for 9.1 tonne loading.

4.15 ROCK PITS/DRY WELLS

The use of rock pits or dry well drainage on low density **Residential** is encouraged unless otherwise directed by the **Engineer**.

4.16 MAJOR FLOW ROUTING AND FLOOD CONTROL

(a) Major Flow Routing

Major flow routing is typically accommodated on **Roadways**, in swales, ditches or watercourses. Major flows can also be accommodated in the proposed **Drainage System**, provided the existing downstream system has adequate capacity to accept this flow.

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The ultimate designated flow path(s) shall be protected by restrictive covenants, and registered statutory **Utility Rights of Way** and shall be clearly identified on the Storm Water Management Plan.

The flow permitted to be conveyed on the surface is the total major flow less the minor flow. The design of the flow path shall ensure, to the satisfaction of the **Engineer** that no endangering of public safety or substantial property damages will occur under major flow conditions.

(b) Roadway Surface Drainage

**Urban Roadways** with curbs and gutters can be used as wide shallow channels to convey major flows on the surface. The maximum depth of major flow within **Roadways** shall not exceed 150 mm above the top of curbs. The lowest **MBE** of adjacent existing properties shall be at least 150 mm above the maximum hydraulic grade line elevation of the major flow. In new developments, all **MBE's** shall be designed at a minimum 150 mm above the hydraulic grade line elevation of the major flow.

Design at intersections shall ensure that surface flow can continue along the designated path crossing over lateral streets. Similar consideration is required if a change of surface flow direction is required at an intersection.

(c) Natural Watercourses

Natural watercourses may be integral components of the **Drainage System**. They are also important to the existing ecological system. The **Consulting Engineer** shall refer to the "Land Development Guidelines for the Protection of Aquatic Habitat" issued by the Ministry of Water, Lands and Air Protection and Department of Fisheries and Oceans.

The **Consulting Engineer** must forward all proposals and designs for **Works and Services** directly impacting natural watercourses, to the appropriate Federal and Provincial Government Agencies for their acceptance.

4.17 SILTATION, EROSION CONTROL AND PROTECTION

The **Consulting Engineer** shall demonstrate how proposed **Works and Services** and any **Subdivision or Development** of the lands can be undertaken and completed in such a way that prevents erosion, sediment or other deleterious substances from entering the aquifer, natural watercourse(s), or **Drainage Systems**.

Expertise from other sources or specialists may be necessary, at the discretion of the **Engineer**, to ensure adequate review and proposals are presented, in environmentally sensitive areas.

At the minimum, any water discharged or infiltrated from lands zoned as **Commercial, Industrial, or Institutional**, shall be collected in such a way that oil and grease particulate as well as any other potential contaminate known to the **Developer** or his **Consulting Engineer** can be removed or settled out of the runoff water prior to entering a **Drainage System**. The **Consulting Engineer** shall demonstrate the method of collection, settling and removal with recommendations for maintenance and security of the proposed system.

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Detail of the proposed controls shall be included in the design drawings and shall be installed as part of the **Works and Services** undertaken for any **Subdivision or Development**.

Environmentally sensitive or steep sloped areas must be stabilized using appropriate measures before September 30<sup>th</sup> in any given year as determined by the **Engineer**. Grading and site servicing works conducted after September 30<sup>th</sup> shall be designed and supervised by an Environmental or Erosion Control specialist consultant. The **Engineer** prior to any works taking place shall accept an erosion and sediment control plan.

Examples of stabilization measures includes:

- temporary planting or hydro-seeding grasses and legumes;
- organic mulches, such as straw, corn stalks, wood chips or wood fibre;
- erosion control blankets, matting;
- permanent planting of trees, shrubs, grasses or sod;
- sediment trap barriers, check dams, or filter berms;
- sediment storage ponds; and
- serrated sloping and re-vegetation.

Erosion and sediment control plans typically include:

- location of all streams, lakes, wetlands, swales or drainage channels that may involve the site;
- protection of natural vegetation areas, where appropriate;
- identification of drainage catchment areas;
- regrading details, including cut and fill slopes, stockpiles, grades;
- direction and location of surface water runoff, including topographic contours;
- type, location and design of stabilization measures to be utilized;
- limits, phasing and timing of construction works;
- construction access/egress;
- inspection and maintenance requirements; and
- geotechnical considerations, where appropriate.

All sediment and erosion control **Works and Services** shall be constructed to provide ready access for cleaning and maintenance. Proposed sediment and erosion control **Works and Services** shall be maintained throughout the course of construction and until 90% of the building construction in the **Subdivision or Development** is complete. Changes in the design and construction of the **Works and Services** or procedures shall be made if the **Engineer** deems them to be inadequate.

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**SECTION NO. 5- SEWAGE COLLECTION AND DISPOSAL**

**5.1**      **GENERAL**

The design of **Sanitary Sewer Systems** in the **District** conform with Ministry of Water, Land and Air Protection, Guidelines for Assessing Sewage Collection Facilities, latest edition; and these Engineering Standards and Specifications.

**5.2**      **PRE-DESIGN REQUIREMENTS**

The adequacy of the existing downstream **Sanitary Sewer System** shall be confirmed with the **Engineer**, prior to completing the design of the proposed system.

The **Consulting Engineer** shall confirm with the **Engineer** the peaking factor and ultimate density of the population expected in the catchment area. The **Engineer** may also require design of future extensions within the catchment area.

**5.3**      **DESIGN FLOW**

Design Flow = Average daily flow x peaking factor + Infiltration

Variables are derived from the following:

|                        |   |                               |
|------------------------|---|-------------------------------|
| Average daily flow     | = | 350 litres/day/capita (l/d/c) |
| Peaking factor         | = | Babbitt Curve shown           |
| Infiltration allowance | = | 5,600 litres/day/hectare      |

The peaking factor is applied to the sanitary sewage contribution only.

The following table is a guideline for applying minimum density by land use to determine flow:

| <b>For Residential</b>                                      | <b>Persons/Unit</b>    |
|-------------------------------------------------------------|------------------------|
| Low Density ( $\leq 16$ units per hectare)                  | 3.3                    |
| Medium Density ( $\geq 17$ and $\leq 45$ units per hectare) | 2.5                    |
| High Density ( $> 45$ units per hectare)                    | 1.8                    |
| <b>For Non-Residential</b>                                  | <b>Persons/Hectare</b> |
| <b>Commercial</b>                                           | 60                     |
| <b>Industrial</b>                                           | 90                     |
| <b>Institutional</b>                                        | 50*                    |

\*For hospitals, use 900 litres/bed/day and for nursing homes use 450 litres/bed/day, with no peaking factor.

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5.4 PIPE DESIGN

(a) Hydraulics

Refer to Hydraulic Element chart (ES-S-1).

(i) Gravity Sewers

Use Manning's formula:

$$Q = \frac{AR^{0.667} S^{0.5}}{N}$$

Where

|   |   |                                                |
|---|---|------------------------------------------------|
| Q | = | design flow in m <sup>3</sup> /s               |
| A | = | cross-sectional area in m <sup>2</sup>         |
| R | = | hydraulic radius (area/wetted perimeter) in m; |
| S | = | slope of hydraulic grade line in m/m           |
| N | = | roughness coefficient = 0.013                  |
| D | = | diameter of pipe in m                          |

(ii) Force Main Sewers

Use Hazen-William's formula:

$$Q = 0.279 (CD^{2.63} S^{0.54})$$

Where

|   |   |                                   |
|---|---|-----------------------------------|
| Q | = | rate of flow in m <sup>3</sup> /s |
| D | = | internal pipe diameter in m       |
| S | = | slope of hydraulic grade line     |
| C | = | roughness coefficient = (See 3.7) |

(b) Velocities

|               |   |                     |
|---------------|---|---------------------|
| Gravity Sewer | = | 0.6 m/sec (minimum) |
| Force Main    | = | 0.9 m/sec (minimum) |
|               | = | 3.5 m/sec (maximum) |

Gravity sewers with velocities > than 4.5 m/sec shall be anchored, and incorporate measures to mitigate scour, erosion and pipe protection systems.

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5.5 SANITARY SEWER MAINS AND APPURTENANCES

(a) General

Terminal sections of mains serving 10 homes or less shall have a minimum grade of 1.0%.

Sanitary sewers shall be designed as open channels with the depth of flow, under maximum design flow conditions, shall not exceed 50% of the internal diameter of the sewer main.

(b) Pipe

Minimum pipe sizes shall be:

Mains: 200 mm

Terminal Mains: 150 mm (serving 10 homes or less or equivalent flow)

(c) Depth of Mains

The depth at crown shall be designed to allow service connections for all existing or proposed **Parcels** abutting the main. All mains shall have a minimum 1.2 m cover.

The **Engineer** may accept construction of mains with less than 1.2 m cover, provided that specific details of pipe material, backfill, and bedding design are submitted for review and acceptance prior to construction.

Mains shall be designed to service all upstream lands in the appropriate sewer catchment area as directed by the **Engineer**.

(d) Manholes

(i) Locations

Manholes are required:

- at all changes in grade, direction and pipe size;
- at all intersecting sewers;
- at all terminal sections;
- at downstream end of curvilinear sewers;
- every 120 m; and
- shall be located so that the lid is not in the wheel path of travel lane.

(ii) Rim Elevations

(iii) Manhole rim elevations in off-road areas shall be set:

- above adjacent storm manhole rim elevation; and
- above surrounding ground to prevent infiltration from surface ponding.

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- (iv) Manhole rim elevations within the **Roadway** or asphalt shall be set:
- at the elevation of the first lift of asphalt and then flush with final lift of asphalt;
  - to conform with the slope and contour of the **Roadway**.
- (v) Types
- (1) Outside drop structures shall be used wherever possible to minimize the depth of the main.
  - (2) For all drop structures, the minimum difference in elevation between the inlet and outlet shall be 0.6 m.
  - (3) Inside drop structures shall not be used for new construction and may only be used at the discretion of the **Engineer**.
  - (4) Where the invert-to-invert change in elevation through a manhole is  $\leq 450$  mm, a ramp shall be constructed in the manhole.
  - (5) Ramps in manholes for mains  $> 200$  mm will be considered only when the manholes are  $\geq 1200$  mm diameter.
- (vi) Size
- (1) Manholes on mains  $\leq 450$  mm diameter shall be 1050 mm diameter.
  - (2) Manholes on mains  $> 450$  mm diameter shall be sized to fit the main and be a minimum 1200 mm diameter.
- (vii) Hydraulic Considerations
- (1) The crown of the inlet pipe shall be at or above the crown of the outlet pipe.
  - (2) Minimum drop in elevation through manholes:

| At:                                       | Drop:                     |
|-------------------------------------------|---------------------------|
| Deflections up to $22\frac{1}{2}^{\circ}$ | use upstream design grade |
| Deflections up to $45^{\circ}$            | 15 mm                     |
| Deflections up to $90^{\circ}$            | 30 mm                     |

Note: There shall be no horizontal change of direction  $> 90^{\circ}$  (degrees) through any manhole.

(e) Clean-outs

Clean-outs shall be 200 mm diameter and may be provided on terminal sections when:

- (i) extension of the main is proposed or anticipated; and
- (ii) the distance to the nearest downstream manhole is less than 50 m, and the depth of the sewer at the terminal point is less than 2.0 m.

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(f) Service Connections

All properties abutting a sanitary sewer main shall be provided with and are required to connect to the sewer main. Each lot or building shall have a separate service connection. Duplex units shall have a separate service connection for each unit.

- (i) Minimum diameter = 100 mm;
- (ii) Minimum slope from spring line of main to property line or R/W line shall be 2%;
- (iii) An inspection chamber (IC) is required for all connections to **District** mains. IC's shall be installed at the property line or R/W line. Each connection shall be capped until joined to the onsite system.
- (iv) the typical location of service connections shall be at the downstream side of the **Parcel**;
- (v) the minimum cover from finished surface at property line or R/W line to top of connection shall be 1 m. The maximum cover from finished surface design grade at property line or R/W line to top of connection shall be 2.5 m;
- (vi) the invert elevation at the property line shall be above any design surcharge level in the main;
- (vii) all service connections shall enter the main at or above the spring-line;
- (viii) only one connection per property is permitted unless otherwise approved by the **Engineer**;
- (ix) connections to new mains shall be made using wye fittings only. Connections to existing mains may be made using pre-manufactured tees or saddles at the discretion of the **Engineer**; and
- (x) where connections to the main are for the discharge of industrial waste, these connections shall require a manhole for sampling waste discharge.
- (xi) all service connections shall be equipped with an approved backflow prevention device or determined by the **Engineer**. This requirement applies to all **Development** applications, including connections to existing services.

5.6 CURVILINEAR SEWERS

At the discretion of the **Engineer**, curvilinear sewers may be permitted where:

- (a) the main is on a constant simple curve;
- (b) the minimum radius is 750 times the diameter of the pipe;
- (c) there is no deflection at joints or fittings;
- (d) all joints are located by survey for as-built purposes; and
- (e) minimum velocities and minimum grades are maintained.

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5.7 SEWER LOCATION/CORRIDORS

Mains shall be located within the **Highway** right of way as per the standard typical cross-sections, wherever possible.

Where sanitary sewer mains cross private property, they shall be within a minimum 3.0 m wide registered statutory **Utility Right of Way**. The depth of the main shall determine the width of the right of way as follows:

| Depth of Main<br>(ground to invert) | Width of R/W<br>(with 1 pipe) | Width of R/W<br>(with 2 pipes) |
|-------------------------------------|-------------------------------|--------------------------------|
| ≤ 3 m                               | 3 m                           | 4.5 m                          |
| > 3 m & ≤ 4 m                       | 4 m                           | 5.5 m                          |
| > 4 m                               | 6 m                           | 8.0 m                          |

Sanitary sewer mains in statutory **Utility Rights of Way** may require access for maintenance. The access shall be a minimum 3.0 m wide and designed for 9.1 tonne loading.

5.8 SANITARY PUMP STATIONS

The use of sanitary pump stations is discouraged. Where the only alternative is the use of pump stations, the **Consulting Engineer** shall receive prior approval from the **Engineer**. Sanitary pump stations shall be designed in accordance with Schedule "E".

5.9 SEPTIC SYSTEMS

Where no community sewer system exists or can be extended, the **Developer** shall provide an approved alternate system for each **Parcel**. The approved alternate system shall be subject to the approval of the **Medical Health Officer** as required by the *Health Act* as well as be acceptable to the **Engineer**.

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**SECTION NO. 6 - HIGHWAYS**

**6.1**      **GENERAL REQUIREMENTS**

**Roadway** design shall conform to these engineering standards or as otherwise accepted by the **Engineer**. Principles of design shall also conform to standards and practices developed by the Transportation Association of Canada (TAC) and described in their manual "Geometric Design Standards for Canadian Roads" as amended from time to time.

The requirement to provide **Highway** improvements, not including dedications, shall not be required for **Rural Subdivisions** or **Developments** where less than 3 additional **Residential** properties are included in the application for subdivision or building permit; providing all **Parcels** have access to the existing road system acceptable to the **Engineer**.

**6.2**      **HIGHWAY CLASSIFICATIONS**

The appropriate **Highway** classification shall be consistent with the **Official Community Plan (OCP)**.

The **Consulting Engineer** shall confirm with the **Engineer**, the appropriate **Highway** classification within and adjacent to the proposed **Subdivision** or **Development** in order to establish appropriate right of way widths and design.

Dedications by the **Developer** shall be dependent on the ultimate design of the **Roadway** within each **Highway** classification and the ability to provide **Works and Services** required by the **Engineer**, and this by-law.

Standard off-sets for utilities and other services are shown on the typical standard cross-sections. When existing utilities do not match the typical cross-section off-sets, or will not permit the use of a typical cross-section, an alternate design may be required. The **Consulting Engineer** shall confirm the alternate design with the **Engineer** prior to commencing detailed design. The **Developer** may be required to provide further dedication and/or provide statutory rights-of-way in order to accommodate special designs, postal kiosks, bus shelters, landscaping ditches and/or outside utilities. The **Engineer** shall approve all cross-section designs, either standard or special.

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6.3 DESIGN

(a) Classification

| Highway Classification | Right of Way<br>Minimum R/W Width (m) | Roadway Design Width (m)<br>(curb face to curb face) |
|------------------------|---------------------------------------|------------------------------------------------------|
| Urban Arterial         | 22                                    | 13.4                                                 |
| Urban Collector        | 20                                    | 11.6                                                 |
| Urban Local            | 18                                    | 9.0                                                  |
| Cul de sac             | 15                                    | 9                                                    |
| Urban Lane             | 6                                     | 5.7                                                  |
| Rural Collector        | 20                                    | 7.0 m pavement & 1.5 m shoulders                     |
| Rural Local            | 18                                    | 7.0 m pavement & 0.5 m shoulders                     |

(b) Boulevards

**Boulevards** shall be designed to accommodate **Sidewalks**, fire hydrants, ornamental street lights, hydro and telephone poles, hydro kiosks, hydro service/junction boxes, telephone and cablevision service/junction boxes, gas mains, water meter boxes, street tree planting and street/traffic signs.

(c) Design Speeds

Unless otherwise directed by the **Engineer**, the standard design speed to be used for the design of **Roadways** in the **District** shall be in accordance with the 85th percentile speed of the traffic, which typically is:

| Highway Classification | Design Speed                    |
|------------------------|---------------------------------|
| Urban Arterials        | proposed posted speed + 10 km/h |
| Urban Collectors       | 60 km/h                         |
| All others             | 50 km/h                         |

Prior to planning and design, the **Consulting Engineer** shall verify the design speed to be used, with the **Engineer**.

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(d) Design Gradients

Maximum and minimum gradients for **Roadways** shall be:

| Highway Classification | Maximum | Minimum (gutter) |
|------------------------|---------|------------------|
| <b>Arterials</b>       | 10%     | 0.50%            |
| <b>Collectors</b>      | 12%     | 0.50%            |
| <b>Locals</b>          | 14%     | 0.35%            |
| Cul-de-sac             | 14%     | 0.50%            |
| <b>Lanes</b>           | 14%     | 0.35%            |

The **Consulting Engineer** may be required to supply to the **Engineer** additional information including traffic studies, sight line and stopping distance calculations, proposed design restrictions, where gradients higher than 10% are proposed.

(e) Cross Slopes and Super-elevation

Cross slopes for all **Roadways** shall not be less than 2% nor more than 4%. The crown of the road shall be at the centreline of the right of way unless as shown on the typical standard cross-sections, or otherwise directed by the **Engineer**.

Super elevation for any **Roadway** shall be accepted by the **Engineer** prior to design.

(f) Horizontal Curves

Horizontal curves shall be governed by the design speed of the road. Radii shall be derived from the expression:

$$R = \frac{V^2}{127 (e+f)}$$

Where:

|   |   |                                            |
|---|---|--------------------------------------------|
| R | = | radius of curve in metres                  |
| V | = | vehicle speed in kilometres per hour       |
| e | = | roadway superelevation in metres per metre |
| f | = | side friction factor                       |

|               |         |   |      |
|---------------|---------|---|------|
| Values for f: | 70 km/h | = | 0.17 |
|               | 60 km/h | = | 0.18 |
|               | 50 km/h | = | 0.21 |
|               | 40 km/h | = | 0.25 |
|               | 30 km/h | = | 0.31 |

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The following examples are derived from this equation, and shall be typical unless otherwise directed by the **Engineer**:

| Classification         | Design Speed (km/h)             | Min. Radius (m) |
|------------------------|---------------------------------|-----------------|
| <b>Local Roads</b>     | 50 km/h with 2% Cross-fall      | 103             |
|                        | 50 km/h with 2% Super elevation | 85              |
| <b>Collector Roads</b> | 60 km/h with 2% Cross-fall      | 177             |
|                        | 60 km/h with 2% Super elevation | 142             |
|                        | 60 km/h with 4% Super elevation | 129             |

(g) Vertical Curves

Vertical curves shall be governed by the design speed of the road. Typically, the numerical value for the length of a vertical curve should not be less than the numerical value of the design speed in km/h.

Vertical curves are required for all changes in grade greater than 1.5%.

(i) Crest Curves

| Design Speed<br>km/h | Minimum Stopping Sight<br>Distance (m) | Minimum Crest, "k" |
|----------------------|----------------------------------------|--------------------|
| 40                   | 45                                     | 4                  |
| 50                   | 65                                     | 7                  |
| 60                   | 85                                     | 15                 |
| 70                   | 110                                    | 22                 |

Note: When a **Local Road** meets another **Local Road** at a stop condition and no through road condition is contemplated, then a 30 km/h design speed is permitted. The **Engineer**, prior to acceptance of the drawings, shall review stopping distances and "k" values.

(ii) Sag Curves

| Design Speed<br>km/h | Minimum Stopping Sight<br>Distance (m) | Minimum Sag, "k"      |                    |
|----------------------|----------------------------------------|-----------------------|--------------------|
|                      |                                        | No Street<br>Lighting | Street<br>Lighting |
| 40                   | 45                                     | 7                     | 4                  |
| 50                   | 65                                     | 11                    | 6                  |
| 60                   | 85                                     | 20                    | 10                 |
| 70                   | 110                                    | 25                    | 15                 |

Note: When a **Local Road** meets another **Local Road** at a stop condition and no through road is contemplated, 20 km/h design speed is permitted. The **Engineer**, prior to acceptance of the drawings, shall review stopping distances and "k" values.

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(h) Pavement Tapers

Pavement tapers are used to connect the end of new road construction to the existing **Roadway**.

Unless otherwise specified by the **Engineer**, tapers shall be:

| Highway Classification | Direction of Taper               | Taper (length to width) |
|------------------------|----------------------------------|-------------------------|
| <b>Local Roads</b>     | Widening in direction of Travel  | 10:1                    |
|                        | Narrowing in direction of Travel | 20:1                    |
| <b>Collector Roads</b> | Widening in direction of Travel  | 10:1                    |
|                        | Narrowing in direction of Travel | 30:1                    |
| <b>Arterial Roads</b>  | Widening in direction of Travel  | 30:1                    |
|                        | Narrowing in direction of Travel | 30:1                    |

6.4 INTERSECTIONS

(a) Dedications

Intersection design where traffic channelization is required shall be as directed by the **Engineer**. Additional right of way dedications may be required to suit intersection designs.

(b) Curb Returns

Radii of curb returns shall be governed by the narrower pavement width of the intersecting streets or as specified by the **Engineer** and shall typically conform to the following:

| Pavement Width                     | Radius |
|------------------------------------|--------|
| 9 m                                | 8 m    |
| 11.6 m                             | 10 m   |
| 13.4 m                             | 11 m   |
| At <b>Rural</b> road intersections | 12 m   |

For intersections at angles other than 90°, traffic movement shall suit the appropriate design vehicle turning radius, as determined by the **Consulting Engineer** and confirmed by the **Engineer**.

(c) Spacing and Location

- (i) Intersecting roads shall meet as close to 90° as possible.
- (ii) Crossing sight distances shall be as outlined by TAC.
- (iii) The location of intersections near curves and hills shall be governed by guidelines established by TAC, including sight and stopping distance references.
- (iv) Where T-intersections occur on **Collector Roads**, the minimum spacing between them shall be 80 m as measured between the centrelines of the intersecting streets.

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- (v) Where T-intersections occur on **Local Roads**, the minimum spacing between them shall be 64 m as measured from the nearest property lines of the intersecting streets.

6.5 HIGHWAY LENGTHS

Where the maximum centreline length of a cul-de-sac in a residential **Subdivision** or **Development** is greater than 400 m, alternate access for emergency vehicle use shall be dedicated and constructed.

Temporary dead-end roads shall use radial or hammerhead type turnarounds. The turnaround shall be within the dedicated road right of way or on a registered statutory right of way as required.

6.6 ALTERNATE ACCESS

Alternate access is constructed for the use of emergency vehicles or for other vehicles under emergency conditions only. It shall not be open to traffic other than pedestrians unless conditions warrant its use under emergency situations. Where alternate access is required it shall:

- (i) be a minimum 6 m wide;
- (ii) be designed for 9.1 tonne axle loading (36,300 lbs);
- (iii) be within a registered statutory right of way or dedicated road right of way; and
- (iv) contain appropriate barricades as accepted by the **Engineer**.

6.7 STRUCTURAL CONSIDERATIONS

(a) Cuts and Fills

- (i) Cut and fill slopes shall be a minimum of 2% and a maximum of 12% within 2 m of the proposed curbs and back of **Sidewalk** unless otherwise accepted by the **Engineer**;
- (ii) Cut and fill slopes outside the dedicated road right of way may be protected by a registered statutory rights-of-way or as determined by the **Engineer**;
- (iii) Rock cuts are anticipated the slope of the rock face shall be as designated by a geotechnical engineer. The surface shall be treated as required by the geotechnical engineer. At the base of all rock cuts or slopes stabilized with rock, a suitable 'rock fall' zone shall be provided to protect pedestrian and vehicle traffic from incidental rock or debris falls. The width of the 'rock fall' zone shall be as indicated by a geotechnical engineer.

(b) Retaining Walls

The use of retaining walls to contain road cuts and fills is permitted subject to:

- (i) The acceptance of the **Engineer**;
- (ii) Use materials and construction techniques acceptable to the **Engineer**;
- (iii) Any wall(s) on private property being within a registered statutory right of way;

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- (iv) Geotechnical reports being submitted detailing type of construction, base, backfill, and drainage.
- (v) A building permit being issued prior to construction. Requirements of the Building Department and *BC Building Code* shall be met, including railings and fencing as necessary.
- (c) Road Base and Pavement Design

**Roadway** structural design shall be designed for an expected life of 25 years under the anticipated traffic conditions for the specified **Highway** classification. The **Consulting Engineer** shall specify road base and depth of asphalt to be used for all **Roadway** designs in the **District**.

A geotechnical report may be required with any **Roadway** design, confirming the structural adequacy of any existing **Roadway** and/or new **Roadway** being constructed by the **Developer**.

- (i) Existing **Roadway** Upgrading:  
Existing **Roadway** re-construction designs, including asphalt overlays, shall be based on recommendations of a geotechnical engineer. A report shall be submitted including the results of Benkelman Beam tests and evaluation of test holes to establish design parameters.
- (ii) New **Roadway** Construction:
  - (1) The design of new **Roadways** shall be based on a geotechnical analysis including recommendation of widths and depths of materials to be used.
  - (2) Test holes and samples shall be undertaken by a qualified soils testing company. All reports shall be signed and sealed by the geotechnical engineer.
- (iii) When using results of a Benkelman Beam test, the maximum seasonally adjusted design deflections (mean plus two standard deviations) per the following table shall be used:

| Classification         | Road Base | Asphalt |
|------------------------|-----------|---------|
| <b>Arterial Roads</b>  | 1.5 mm    | 1.0 mm  |
| <b>Collector Roads</b> | 2.0 mm    | 1.3 mm  |
| <b>Local Roads</b>     | 2.6 mm    | 1.5 mm  |
| <b>Lane</b>            | 3.1 mm    | 1.5 mm  |

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Regardless of the method used for design, the:

- minimum granular base course thickness = 75 mm;
- minimum asphaltic concrete thickness = 75 mm (laid in two separate lifts); and
- minimum sub-base course thickness = 450 mm (350 mm for residential **Local Roads** and 200 mm for **Lanes**).

**6.8**      **PAVING**

(a)      **Materials**

The standard paving material in the **District** shall be hot-mixed, machine laid, asphaltic concrete, and shall conform to the appropriate MMCD Standards and Specifications.

Gravel, surface-treated, or flush-coat treatments are not acceptable for new **Roadway** construction.

(b)      **Paving Procedure**

- (i) All paving shall be done in 2 lifts. Thickness shall be as designated by the accepted design;
- (ii) The first lift shall be laid on an approved base;
- (iii) The second and final lift may be laid at the end of the warranty period, typically one year from Substantial Completion, but may be laid prior to the end of the warranty period or when 90% of house construction in the **Development** is complete, at the discretion of the **Engineer**.

**6.9**      **SIDEWALKS AND CURBS, GUTTERS**

(a)      **Curbs and Gutters**

- (i) All **Urban Roadways** shall be constructed with concrete curb and gutter on both sides unless otherwise specified by the **Engineer**;
- (ii) All **Urban Collector** and **Arterial Roadways** be constructed with barrier curb and gutter;
- (iii) Major flood routes and steep grades may indicate the need for barrier curb and gutter at the discretion of the **Engineer**;
- (iv) The transition between barrier curb and rollover curb shall take place over a minimum distance of 2 m; and
- (v) Road support structure shall be constructed to support the curb and gutter and **Sidewalk** and in no case shall it be less than 0.6 m wider than the curb and gutter and **Sidewalk** dimension.

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(b) Wheelchair Ramps

Wheelchair ramps are required at all intersections or as directed by the **Engineer**.

A catch basin shall be located to intercept road drainage at the upstream side of wheelchair ramps.

(c) Sidewalks

- (i) **Sidewalks** are typically constructed on the north and/or east side of the **Roadway**;
- (ii) On **Urban Roadways** with **Sidewalk** and street lighting designed for one side only, the street lighting shall be on the same side as the **Sidewalk**;
- (iii) Cul-de-sacs and dead ended **Roadways** serving twelve or more homes shall have a **Sidewalk** constructed up to the throat of the cul-de-sac or the beginning of the turnaround;
- (iv) Where a **Walkway** or alternate access is proposed from a cul-de-sac, the **Sidewalk** shall be extended to connect with them and a street light is required at the connection point;
- (v) The grade of the **Sidewalk** adjacent to **Roadways** shall be consistent with the grade of the **Roadway**; and
- (vi) **Sidewalks** adjacent to rollover curb and gutter shall be a minimum 140 mm thick. **Sidewalks** adjacent to barrier curb and gutter shall be 115 mm thick except at driveway crossings where the thickness shall be increased to 150 mm.

6.10 BOULEVARDS (BOTH SIDES OF SIDEWALK)

- (a) All **Boulevards** shall be finished at the direction of the **Engineer**. The minimum finish shall be 150 mm topsoil and seeding or sod at the discretion of the **Engineer**.
- (b) The **Developer** shall be responsible for maintaining the **Boulevard** until the end of the warranty period. At the discretion of the **Engineer**, final finishing of the **Boulevard** with topsoil and seed/sod may be extended to the end of the warranty period, provided the **Boulevard** is adequately drained to catch basins, lawn basins or ditches as necessary.

6.11 SIGNAGE

Pavement markings, street signage, traffic advisory signs etc. shall be supplied and installed by the **District** at cost to the **Developer**.

6.12 WALKWAYS

- (a) **Walkways** with an overall grade of 8% or less shall have a uniform gradient. With a gradient between 8% and 12%, the **Walkway** shall be constructed with stepped ramps and where the gradient exceeds 12%, a stairway shall be constructed with stairs.
- (b) The **Consulting Engineer** shall review all walkway designs with gradients greater than 8% with the **Engineer** prior to commencing design.

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- (c) **Walkways** shall have ornamental street lighting at:
  - (i) the entrance and exit;
  - (ii) all changes in direction greater than 30° along its length; and
  - (iii) every 50 m.
- (d) **Walkways** shall be adequately drained, (not drain onto private property) and in **Urban** areas shall be concrete 2.4 m in width with chain link fencing on both sides and bicycle baffles at both ends.

6.13 HANDRAILS

- (a) Handrails shall be constructed in accordance where grades are in excess of 14%, where steps are provided, or where grade separation exceeds 0.6 m.
- (b) Handrails may be required on storm sewer inlet/outlet structures, along **Walkways** and **Sidewalks** where steep or excessive side slopes are encountered, or in any location as deemed necessary by the **Engineer** where, in his opinion the safety of the public or maintenance worker is a concern.

6.14 COMMUNITY MAILBOXES

The **Engineer** shall approve the location of all community mailboxes. Typically, preference shall be given to a specific location that is convenient for the "homeward-bound" residents of an area or **Subdivision**. The location and design of community mailboxes shall be in consultation with Canada Post.

6.15 BUS STOPS

Where a **Subdivision** or **Development** occurs adjacent to a bus route, provisions shall be made for bus stops, as either extra **Highway** right of way dedication or registered statutory right of way. The minimum dimension for a bus stop area shall be 1.5 m wide and 4.0 m long. Typical improvements of designated bus stop locations shall include:

- (a) Concrete sidewalk to the curb to provide an all weather access to each door of the bus;
- (b) Sufficient right of way to provide enough space for a bus shelter (1.5 m x 4.0 m), and garbage can (1.0 m diameter). Base preparation for any bus stop furniture shall be treated as an extension of the sidewalk;
- (c) Any bus stop furniture or structure(s) shall be clear of the designated sidewalk to provide handicapped access;
- (d) Street lighting to be located to illuminate the bus stop; and
- (e) Sign post inserts shall be installed in the sidewalk, for bus stop signs as determined by the **Engineer**.

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**6.16**      **TRAFFIC ACCESS AND IMPACT STUDIES**

In order to review a **Subdivision** or **Development** application, the **Engineer** may require a Traffic Access and Impact Study. The terms of reference shall be determined by the **Engineer**.

**6.17**      **HILLSIDE DEVELOPMENT**

Where the average slope of the land in an area exceeds 15%, the design of **Roadways** in the **Subdivision** may employ the following criteria at the discretion of the **Engineer**.

The **Consulting Engineer** shall verify with the **Engineer** the use of these criteria prior to commencement of planning and design of a **Subdivision**.

(a)      **Design Speeds**

| <b>Highway Classification</b> | <b>Design Speed<br/>(kph)</b> | <b>Posted Speed<br/>(kph)</b> |
|-------------------------------|-------------------------------|-------------------------------|
| <b>Collector Roads</b>        | 50                            | 40                            |
| <b>Local Roads</b>            | 40                            | 30                            |

(b)      **Intersections**

At intersections a flat continuous grade through the intersection is required. The through grade of the major **Roadway** shall be predominant.

(c)      **Curb Returns**

The **Consulting Engineer** shall take special care in the design of curb returns on hillside development. The maximum gradient around curb returns shall not exceed the maximum gradient of the major adjacent street.

**6.18**      **TRAFFIC CONTROL**

Traffic control devices shall be required to support public safety, protect property, provide convenience and manage traffic flow. All traffic control devices shall be accepted by the **Engineer** prior to commencement of construction.

**6.19**      **PRIVATE ROADS**

All private roads within or required in connection with a proposed **Subdivision**, Bare Land Strata Plan or Phased Strata Plan shall:

- (a)      provide adequate drainage by means of storm sewers;
- (b)      be constructed to a loading standard of at least 9.1 tonne axle loading (36,300 lbs.);
- (c)      be cleared to a width of at least 6 metres except where they provide frontage to building units, in which case a cleared width of at least 9 metres;
- (d)      have a paved surface of at least 6 clear and continuous metres in width, for two way traffic;
- (e)      have a centreline radius of not less than 12 metres;

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- (f) have an overhead clearance of not less than 5 metres;
- (g) have a maximum centreline grade of 16% and a maximum change of grade of 8% over a minimum distance of 15 metres;
- (h) have paved turnaround facilities with a minimum diameter of 22 metres for any dead-end portion of the road which exceeds 90 metres in length; and
- (i) connect to a public **Highway**.

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**SECTION NO. 7- STREET LIGHTING**

**7.1**      **GENERAL**

Street lighting design shall comply with ANSI/IES RP-8, 1983 ROADWAY LIGHTING, and these standards.

Detail drawings and specifications for ornamental street lighting systems shall be prepared by a qualified **Consulting Engineer** experienced in **Roadway** lighting design.

**7.2**      **MINIMUM STANDARD REQUIREMENTS**

| Highway Classification | Minimum Avg. Lux | Minimum Wattage | Pole Height (m)             | Pattern             | Maximum Uniformity Ratio | Intersection Minimum Lux |
|------------------------|------------------|-----------------|-----------------------------|---------------------|--------------------------|--------------------------|
| <b>Arterial</b>        | 15               | 150             | 9.1 or 11                   | Staggered/ opposing | 3:1                      | 22                       |
| <b>Collector</b>       | 8                | 150             | 9.1                         | staggered           | 3:1                      | 12                       |
| <b>Local</b>           | 4                | 100             | 7.62                        | one side            | 6:1                      | 11                       |
| <b>Rural</b>           |                  | 150             | lease lights on power poles |                     |                          | 8                        |

The illumination levels at all intersections shall be determined by the higher **Highway** classification and application. Lighting in **Rural** areas shall be at intersections only.

**7.3**      **STREET LIGHT POLE LOCATIONS**

Poles shall be located within 0.6 m of property corners, and shall not conflict with proposed driveway and/or underground services.

**7.4**      **UNDERGROUND DUCTS**

- (a) Underground wiring for street lighting shall be designed in accordance with B.C. Hydro Specifications and shall conform to the rules and regulations of the Canadian Electrical Code (Part 1), the Provincial Electrical Inspection amendments and any **District** codes or by-laws and other authorities having jurisdiction;
- (b) The standard offset for the location of the underground street lighting ducts within **Highway** rights-of-way shall conform to the typical cross-sections or as directed by the **Engineer**;
- (c) The minimum depth for the underground ducts shall be 0.6 m in **Boulevards** and 0.9 m in **Roadways**;
- (d) It is the **Consulting Electrical Engineer's** responsibility to ensure that the service entrance for street lighting systems is approved by B.C. Hydro prior to construction.

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7.5 CLEARANCES TO HYDRO LINES

The requirements of B.C. Hydro, Canadian Electrical Code, B.C. Electrical Inspectors Branch, and the Workers' Compensation Board shall be followed with respect to clearances between street light poles, luminaires, high voltage and other conductors.

7.6 NUMBER OF LUMINAIRES PER SERVICE

The **Consulting Electrical Engineer** shall set the number of luminaires on any hydro service. Where a new system can be extended in the future, the design shall account for this in sizing wire and circuits accordingly.

Where an existing system is to be extended, the **Consulting Electrical Engineer** shall ensure that existing service entrance, circuits and power draw on the existing service meets minimum standards and regulations of the Canadian Electrical Code.

7.7 LIGHT SOURCE

The light source for luminaires shall be high pressure sodium (HPS). Any deviation from HPS shall be accepted by the **Engineer**.

Luminaire ballasts shall be CSA approved factory wired and tested featuring a -34°C lamp starting capacity or accepted equivalent.

7.8 TRANSITION LIGHTING

In the case where luminaire output or type changes, the spacing of luminaires shall change gradually to suit the change in levels of illumination. The spacing changes in the transition area shall not be abrupt or irregular.

7.9 OTHER DESIGN FEATURES

The design drawings shall show:

- (a) distribution type;
- (b) maximum spacing of luminaires;
- (c) minimum average lux achieved for the luminaire selected, ie, design requirement and level achieved by design;
- (d) luminaire manufacturer, type and model number;
- (e) the uniformity ratio, ie, design requirement and uniformity achieved by design;
- (f) type of pole (davit/post-top/decorative) make/model, pole height and offset from property lines; and
- (g) all poles should be unpainted and galvanized.

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**SECTION NO. 8- LANDSCAPING**

**8.1**      **GENERAL**

Landscape design shall comply with the British Columbia Landscape Standard, latest edition and these standards. In the event of conflict between the BCLS and these standards, these standards shall prevail. A **Consulting Landscape Architect**, or pre-approved equivalent, shall prepare drawings and planting specifications for street trees, yard trees, **Boulevards**, medians and any other landscape screening at the discretion of the **Engineer**.

**8.2**      **PLANTING REQUIREMENTS**

(a)      Highways

A minimum 6.0 cm caliper street tree shall be required on any **Highway** adjacent to the **Subdivision** or **Development** at the discretion of the **Engineer**. The species, spacing and location, shall be at the discretion of the **Engineer**. Refer to the typical **Highway** cross-sections showing locations for street trees within the right of way.

(b)      Boulevards

**Boulevards** shall be landscaped where the **Boulevard** is physically separated from the adjacent **Development** by a solid landscape screen, topographic feature, watercourse or fence.

(c)      Medians

Medians shall be landscaped at the discretion of the **Engineer**.

(d)      Single Family Residential Parcels

A minimum 6.0 cm caliper yard tree shall be provided for each new single family residential **Parcel** in a **Subdivision** or **Development** and shall be secured by either:

- a registered design covenant; or
- a **Security Deposit**.

**8.3**      **PLANT SPACING AND LOCATION**

One street tree is required for every 9.0 m or portion of the abutting property line. Typically, street trees shall be spaced from 6 m to 15 m apart depending upon the species used in the design as follows:

| <b>Tree Type</b> | <b>Spacing on Centre (o/c)</b> |
|------------------|--------------------------------|
| Large            | 12.0 m - 15.0 m                |
| Medium           | 9.0 m - 12.0 m                 |
| Small            | 6.0 m - 9.0 m                  |

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**Boulevard**, median and landscape **Plantings** shall be designed to fill in within 3 years of installation. A maximum spacing at installation shall be 900 mm o/c for #2 pot shrubs and 450 mm o/c for 10 cm pot evergreen ground covers.

Locations shall be staked out by the **Developer** according to accepted plans and verified on site by the **Engineer** prior to planting. If underground obstructions are uncovered, they shall be reported to the **Engineer** for resolution.

Refer to Section 2.5 (l) for details pertaining to the **Landscaping** Plan.

8.4 MINIMUM TREE PLANTING CLEARANCES

Listed below are the minimum distance trees should be planted from street feature or furniture:

| Street Feature/Furniture                    | Minimum Separation to Tree               |
|---------------------------------------------|------------------------------------------|
| Lamp Standards                              | 6.0 m                                    |
| Steel/wooden poles, posts & bollards        | 3.0 m                                    |
| Hydrants                                    | 3.0 m                                    |
| Catch Basins                                | 3.0 m                                    |
| Manholes, Valve Boxes, Service Boxes        | 3.0 m                                    |
| Water, Drainage & Sewer Service Connections | 2.0 m                                    |
| Intersection Corners                        | in line with 8 m sight triangle distance |

8.5 SPECIES SELECTION

**Landscaping** design shall blend with existing **Plantings**. Tree species shall differ from one street to the next. Changes should typically occur at intersections. Trees planted in proximity to overhead wires shall be limited to shorter species.

The selection of tree species to be used in a **Subdivision** or **Development** shall be determined by the **Engineer** prior to commencing design. The **Developer** shall not make substitutions without the expressed written approval of the **Engineer**.

8.6 PLANTING STOCK ORIGIN

All plant material shall be nursery-grown stock. Collected material is not acceptable.

8.7 TREE DIMENSIONS

Each tree shall be minimum 6 cm as specified, measured 15 cm from the ground and have a minimum 1.8 m standard height. Each tree shall have a sturdy, reasonably straight trunk and a well-developed leader. Each tree shall have a well-balanced branching head with the branches growing out from the stem with reasonable symmetry.

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8.8 ROOT SYSTEM

Plants shall be ball and burlap (B&B), Machine Dug into Wire Basket (MDWB) or container grown stock. Bare Root (BR) trees are not acceptable. B&B and MDWB stock shall be dug and sacked at least one year prior to planting. Container grown stock shall have a sufficiently well established root system to hold the soil together when removed from the container. In all cases, the root system shall be strong, fibrous, and free of disease, insects, defects or injuries and shall be sufficiently developed to ensure successful transplantation.

8.9 CONDITION

All plant material shall be of good health and vigour with no visible signs of disease, insect pests, damage or other disfigurements.

8.10 SUB-GRADE

Prior to placing growing medium in **Boulevard** and median planting areas, the sub-grade shall be established at a minimum:

- (a) 150 mm below finished grade for all designated seeded or sod areas and 300 mm for all designated ground cover planting areas;
- (b) 450 mm below finished grade for all designated shrub-planting areas;
- (c) 600 mm below finished grade for all designated non-hard surfaced street tree areas between the back of curb and **Sidewalk**; and
- (d) 750 mm below finished grade for all designated hard surfaced street tree areas between the back of curb and **Sidewalk**.

Refer to the typical cross-sections for other details. Grade transitions shall be smooth and even, and shall be such that ponding cannot occur on the sub-grade surface. Debris, roots, branches, stones, building material, contaminated subsoil, visible weeds and anything else that may interfere with the proper growth and development of the planted **Boulevard**, shall be removed from the sub-grade prior to installing the growing medium.

8.11 DRAINAGE

The **Consulting Landscape Architect** shall consider drainage requirements for all **Plantings**, and specifically street trees planted under hard surfaced areas

8.12 IRRIGATION

Drip irrigation and controllers meeting **District** standards shall be provided where street trees are planted in hard surfaced street tree planting areas.

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8.13 LANDSCAPE LIGHTING

At the discretion of the **Engineer**, conduit from the nearest **District** electrical outlet to each tree pit shall be provided for all trees planted in hard surfaced street tree planting or **Boulevard** areas. Lighting systems shall be reviewed by the **Engineer** prior to commencing design.

8.14 GROWING MEDIUM AND STRUCTURAL SOIL

- (a) Growing medium properties shall meet the needs of the **Plantings**. Growing medium shall be installed at the following minimum depths prior to shrub/tree planting in non-hard surfaced areas (measured from top of sod thatch):
- (i) sod only areas 150 mm;
  - (ii) ground cover areas 300 mm;
  - (iii) shrub areas 450 mm;
  - (iv) street tree areas 600 mm.
- (b) Structural soil shall be installed at the following minimum volumes and depths prior to installation of hard surfaces:
- (i) where street trees are required in hard surfaced areas, shall be 600 mm deep over a minimum 14 m<sup>2</sup> area per tree (not including growing medium and root ball in the planting pit);
  - (ii) where street trees are required in non-hard surfaced areas, structural soil is required under the **Sidewalks** immediately adjacent to the trees and shall be 600 mm deep over a minimum 2.5 m<sup>2</sup> area.
- (c) **Structural Soil** is a consistent, even distribution of its components. The ratio of components may vary and may require adjustment to ensure soil volume is adequate to fill all voids in the stone.

The following is a recommended base ratio of materials for **Structural Soil**:

4 cubic metre of aggregate stone

1.5 cubic metre of Growing Medium

2 kg Stabiliser

Water as required\*

\*The amount of water required will vary according to moisture present in growing medium.

The stone, growing medium and stabilizer product are to be combined into a homogeneous mixture.

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(d) Growing Medium

The growing medium within the **Structural Soil** mix shall meet the following requirements:

**Growing Medium for Structural Soil**

**Texture: Particle size Classes by the Canadian System of Soil Classification**

|                                                            |                           |
|------------------------------------------------------------|---------------------------|
| Gravel: greater than 2 mm - less than 75 mm                | 0                         |
| Sand: greater than 0.05 mm - less than 2 mm                | maximum 60%               |
| Silt: greater than 0.002 mm - less than 0.05 mm            | maximum 35%               |
| Clay: less than 0.002 mm                                   | maximum 15%               |
| Clay & Silt Combined                                       | maximum 40%               |
| ACIDITY (Ph):                                              | 6.0 -7.0                  |
| SALINITY: Saturated extract conductivity shall not exceed; | 3.0 millimhos/cm at 25°C. |
| ORGANIC CONTENT: Percent of Dry Weight (%)                 | 8 - 12%                   |

The aggregate within the **Structural Soil** mix shall be:

- (i) Clean stone of high angularity,
- (ii) Stone dimension aspect ratio should approach 1:1:1 with a maximum of 2:1:1 length: width: depth,
- (iii) Single size stone, 60mm to 75mm clear sieve designation: Blasted Quarry Rock,
- (iv) Aggregates to be free of any foreign elements or material,
- (v) Aggregate quality: Material shall be sound, hard, durable, free from soft, thin, elongated or laminated particles, organic material, clay lumps or material, or other substances that would act in a deleterious manner for use intended.

8.15 FILTER FABRIC

- (a) After adequate compaction of the **Structural Soil** is confirmed, non-woven filter fabric is to be installed as a separation layer directly above the compacted **Structural Soil** mixture.

- (b) Filter fabric to conform to the following ASTM designations:

|                       |             |                           |
|-----------------------|-------------|---------------------------|
| Grab Tensile Strength | ASTM-D-4632 | .400 kN                   |
| Tensile Élongation    | ASTM-D-4632 | 50%                       |
| Mullen Burst          | ASTM-D-3786 | 1270 kPa                  |
| Flow Rate             | ASTM-D-4491 | 6300 l/min/m <sup>2</sup> |

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**

8.16 TIME OF PLANTING

- (a) Planting is to be completed during normal planting seasons as dictated by prevailing weather conditions. Planting in frozen ground or with frozen root balls is not acceptable. All necessary precautions are to be taken to protect the plant material from prevailing adverse weather conditions during transportation and planting.
- (b) Planting of street and yard trees within residential **Subdivisions** shall not be accepted until all building construction is at least 90% complete, or at the discretion of the **Engineer**. Typically, this will coincide with the second lift of asphalt in residential areas.

8.17 PLANTING PROCEDURES –TREES IN NON-HARD SURFACED BOULEVARDS

- (a) All trees shall be planted in holes large enough to accommodate the entire root ball plus topsoil. Therefore, holes shall be excavated to the diameter of the root ball plus 600 mm. The holes shall then be backfilled with topsoil to bring the plant material to the depth at which they were originally growing in the nursery. All trees shall be planted so that after settlement, they will be at the original growing medium depth.
- (b) B&B stock shall have the top 1/3 of the burlap folded back without disturbing the root ball and any string removed. MDWB stock shall have string removed and any handles of the basket bent back into the planting hole or cut so that no wires shall protrude into the top 100 mm of soil. Container grown stock shall have the container and any string removed before planting.
- (c) Once the trees are in place, the holes are to be backfilled with topsoil mixed with a high phosphate fertilizer applied at a rate according to the manufacturer's recommendations. The holes shall be backfilled, tamped and watered in layers to help secure the tree and eliminate large air pockets.
- (d) Once planted, the trees are to be securely staked by using a two 2 m long, 50-75 mm diameter pressure treated stake. Use a 50 mm wide green vinyl band attached to the stake with a shingle nail to tie the tree to the stake. Refer to typical tree planting details.

8.18 PLANTING PROCEDURES –TREES IN HARD SURFACED BOULEVARDS

- (a) Remove enough granular material from the tree pit to accommodate the root ball and growing medium. Re-compact all material below the root ball to the specified density to prevent settlement of the tree. Ensure that the tree is planted so that the trunk is in the exact centre of the planting station, straight and true. Ensure that the top of the root ball is at the same elevation as the top of the surrounding material.
- (b) B&B stock shall have the top 1/3 of the burlap folded back without disturbing the root ball and any string removed. MDWB stock shall have string removed and any handles of the basket bent back into the planting hole or cut so that no wires shall protrude into the top 100 mm of soil. Container grown stock shall have the container and any string removed before planting.

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**

- (c) Once the trees are in place, the holes are to be backfilled with growing medium mixed with a high phosphate fertilizer applied at a rate according to the manufacturer's recommendations. The holes shall be backfilled, tamped and watered in layers to help secure the tree and eliminate large air pockets.
- (d) Once planted, the trees are to be securely staked by using a two 2 m long, 50-75 mm diameter pressure treated stake. Use a 50 mm wide green vinyl band attached to the stake with a shingle nail to tie the tree to the stake. Refer to typical tree planting details.

8.19 PLANTING PROCEDURES - BOULEVARDS AND MEDIANS

- (a) All **Plantings** for **Boulevard** and median areas shall be delivered to the site and protected from sun and drying winds. Plants that cannot be planted immediately upon delivery shall be kept well watered. New plants shall not remain unplanted for longer than three (3) days after delivery.
- (b) Plants shall be planted so that after settlement they will be at the original growing medium depth. Allow for settling of the growing medium after planting so that the total depth of the root ball remains in the topsoil.
- (c) Plants shall be set plumb in the planting beds or planting pits, except where the plant's character requires variation from this.
- (d) Growing medium shall be placed in layers around the roots or ball, preferably by hand. Each layer shall be carefully tamped to avoid injuring the roots or ball, or disturbing the position of the plant.
- (e) Upon completion of **Boulevard** planting the soil shall be raked to remove any debris brought to the surface by planting operations. After raking the planting area shall be covered with a minimum 50 mm depth of bark mulch placed in an even layer over the entire soil surface.
- (f) Once planting and mulching is completed, the site shall be cleaned of all excess soil, rock and debris.

8.20 PLANT MAINTENANCE

The **Contractor** is responsible for all necessary maintenance of the planted material during the warranty period. This shall include any procedure necessary to maintain all plants in a healthy growing condition such as watering, weeding, staking, pruning, treatment for disease and pests and replacement, if required.

All planting beds shall have weeds removed at least once per month during the growing season by hand pulling or hoeing.

**Plantings** are to be watered as often as required to ensure that no stress occurs to the plants during hot weather.

**SCHEDULE "A"**  
**ENGINEERING STANDARDS AND SPECIFICATIONS**

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**SCHEDULE "B"**  
**LOT GRADING GUIDELINES**

**1.0 INTENT**

- 1.1 Due to the inherent uncertainty of lot grading, guidelines have been developed to assist the **Consulting Engineer** and **District** to prepare lot grading plans where appropriate.
- 1.2 Matching existing terrain, slope stability, structural integrity and reducing impact on the environment and neighbouring lands are important aspects to consider for **Subdivision** and **Development** on hillsides and steep slopes.
- 1.3 Close attention must be focused on how **Subdivision** and **Development** takes place on complex slopes. Developing consistent guidelines, that are easy to read, understand and implement, will help provide a responsible, consistent approach to the scope and form of **Development** on sloping terrain.
- 1.4 Multiple changes in grade have an impact on building and land development. **Developers**, engineers, designers and builders need to recognize this and develop ways to mitigate this impact.
- 1.5 Lot grading guidelines are necessary to ensure that inherent problems of steep slope **Subdivision** and **Development** are considered and addressed.

**2.0 LOT GRADING OBJECTIVES**

- ensure that Developers, engineers, designers and builders consider existing topography to mitigate negative impacts to surrounding lands;
- reduce the use of retaining walls where long term maintenance is a potential hazard or difficult and where the visual and physical impact on neighbouring lands is a concern;
- retain and maintain the natural vegetation on the slopes to the extent possible;
- reduce the impact of grade differences between adjacent properties;
- enhance environmental protection by reducing erosion and siltation;
- maintain the integrity of ecologically sensitive areas; and
- create visually attractive **Subdivisions** and **Developments**.

**3.0 IMPLEMENTATION**

Lot grading plans may be required at the discretion of the **Engineer** as follows:

**3.1 Development Permit Applications**

- Development permits are required in certain areas of the **District** prior to clearing, preliminary site grading (bulk grading), re-contouring and **Subdivision**. It is the intention that any grading at this stage shall be compatible with the proposed final lot grading of the **Development**. The **Developer** and his **Consulting Engineer** shall review aspects of lot grading and submit plans accordingly.

**3.2 Subdivisions**

- The **Preliminary Layout Review** may require lot grading as a condition of Subdivision approval.

**SCHEDULE "B"**  
**LOT GRADING GUIDELINES**

- The first design submission package from the consultant shall include lot grading designs, if required.
- A **Subdivision** shall not attain a **Certificate of Substantial Completion** until lot grading as accepted is substantially complete.

**3.3 Building Permit Applications**

- Building permit applications may be reviewed in conjunction with these lot grading guidelines. Final lot grading plan by the builder, shall be submitted and accepted prior to issuance of a building permit.
- Final inspection shall not be approved until lot grading as accepted is complete.

**4.0 DESIGN GUIDELINES**

**4.1 Lot grading designs shall:**

- show that proposed grading meets and utilizes existing or proposed slopes within **Subdivision** or **Development** boundaries with minimal impacts on neighbouring lands;
- retain existing vegetation where ever possible or use planted vegetation to enhance grading and slopes within **Subdivision** or **Development** boundaries;
- demonstrate effective protection of environmentally and ecologically sensitive areas while practising guidelines/regulations of governing agencies, Provincial and Federal Legislation;
- consider all aspects of construction techniques, ideas, suggestions, applications that will control or prevent erosion and sedimentation;
- minimize grade changes or differences between existing neighbouring lands and the proposed Development;
- minimize the use of retaining walls where other more innovative forms of grading will work. When the use of retaining walls is necessary, aspects of design shall include:
  - maximum height,
  - maximum length,
  - drainage,
  - maintenance, both short and long term; and
  - access for maintenance and replacement.
- minimize cuts and fills; and
- conform to standards and specification of this By-law.

**4.2 Retaining walls shall:**

- be a maximum height of 1.5m or stepped back a minimum 0.9m for each 1.5m vertical rise;
- contain horizontal areas between retaining walls which shall be vegetated with maintenance free materials to mitigate the visual impact on neighbouring lands. Convenient access is required to each step;

**SCHEDULE "B"**  
**LOT GRADING GUIDELINES**

- utilize materials with a life-expectancy of the buildings onsite;
- require review and acceptance by a professional structural and geotechnical engineer(s) at the discretion of the **Engineer**;
- be accepted by the **Engineer** prior to commencement of construction;
- contain tie-backs, if required which are placed within the **Subdivision** or **Development**; and
- be environmentally acceptable in sensitive areas.

**5.0 CONSIDERATIONS**

- 5.1 The **District** reserves the right to request further information or review if it feels that the submission is not specific enough. If a **Developer** or his **Consulting Engineer** feels that they have practical alternatives the **Engineer** will review and consider all alternatives.
- 5.2 Grading designs shall meet the natural or pre-development grade at the boundaries of the lands being developed wherever possible. The width, depth and number of lots may be adjusted in order to meet this requirement.
- 5.3 All slopes, existing or proposed, shall be accessible for maintenance. Access and maintenance shall include gardening, lawn care, tree planting, fence construction, etc.
- 5.4 Drainage, both surface and behind the retaining wall, shall be a prime consideration by the **Consulting Engineer**.

**6.0 DESIGN/DRAWING SUBMISSION**

**6.1 Subdivisions**

Plans and details shall conform to specifications and standards of the District's Subdivision and Development By-law.

**6.2 Building Permit Applications**

Plans shall be in a recognized metric scale and include:

- the existing grade at the rear building envelope line or the rear of the proposed building;
- the proposed finished grade at the foundation wall on four sides of the proposed building(s);
- the existing and proposed finished grade at all lot corners;
- the proposed slope of the driveway;
- existing retaining walls;
- proposed retaining walls with the elevation of the top and proposed ground at the bottom face of the wall;
- **MBE and GPE**;
- **Proposed swales**;
- legal notations, security, declarations, etc; and

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**SCHEDULE "B"**  
**LOT GRADING GUIDELINES**

- geotechnical reports for cuts and fills greater than 1.2 metres in depth and slopes greater than 30%.

6.3 Subdivisions and Building Permit Applications – Flatland

Plan shall be in a metric scale and include:

- The existing and proposed finished grade at all lot corners;
- MBE;
- Proposed swales; and
- Legal notations, security, declarations, etc.

**7.0 CERTIFICATIONS AND DECLARATIONS**

- 7.1 The **District** encourages the submission of pre-approved building permit site plans from the **Developer** of the lands. **Developers** shall declare their intent to use pre-approved plans when their **Consulting Engineer** submits **Subdivision** design drawings.
- 7.2 A pre-approved building permit site plan shall be from a recognized professional with expertise in the building and engineering industry who has been appointed, hired or commissioned by the **Developer**. Site plans on or with building permit applications shall have been reviewed or prepared in conformance with the accepted lot grading plans and shall be approved by the recognized professional before they are submitted for building permits.
- 7.3 Final lot grading by the builder, shall be performed in substantial conformance with the accepted lot grading plans prior to final inspection of the building.
- 7.4 Following final inspection, the property owner may want to adjust the grades or construct retaining walls. Acceptance from the original **Developer** and **Consulting Engineer** who designed the lot grading on the lot shall be obtained and submitted by the property owner. Acceptance from the **Engineer** is required prior to construction. An "impact statement" that addresses all possible constraints and concerns of adjacent properties shall accompany the request.

**8.0 LEGAL DOCUMENTATION**

- 8.1 Covenants may be required at the discretion of the **Engineer** which can be registered against the title(s) of the lands where:
- the final slopes are greater than 30%; or
  - retaining walls are shown on the lot grading plan.

The covenant shall prevent further re-grading, re-contouring, retaining wall construction, installation or alteration without the acceptance of the **Engineer**.

**SCHEDULE "C"**  
**SERVICING AGREEMENT**

FILE NO. \_\_\_\_\_

THIS AGREEMENT made the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

BETWEEN:

\_\_\_\_\_  
(hereinafter called the "Developer")

OF THE FIRST PART

AND:

THE CORPORATION OF THE DISTRICT OF KENT (a Municipal Corporation under the *Local Government Act* of the Province of British Columbia) having its municipal offices at 7170 Cheam Avenue, P.O. Box 70, Agassiz, British Columbia, V0M 1A0

(hereinafter called the "District")

OF THE SECOND PART

WHEREAS:

- A. The Developer is the Owner of, and proposes to develop certain lands and premises located within the District of Kent, in the Province of British Columbia, and more particularly known and described as:

\_\_\_\_\_  
(hereinafter called the "said lands");

- B. The Developer has requested approval of the Subdivision or Development of the said lands by the Approving Officer of the District prior to the completion of all Works and Services required to be constructed and installed by the Developer in connection with the said Subdivision or Development;
- C. The District has determined that the cost to the District of providing necessary services to the proposed Development would be excessive, as a portion of the municipal Works and Services required to be installed by the Developer to serve the proposed Subdivision or Development may provide access to or serve land other than the said lands, and thus may be eligible for a contribution toward the cost of such Works and Services from the District or from the Owners of other lands who may connect to or use the said Works and Services; however, the District does not have sufficient funds to pay for the cost of said Works and Services; and
- D. The Developer has voluntarily agreed to install such Works and Services which are necessary to serve the proposed Development of the said lands and to waive any right the Developer may have to a contribution toward the cost of said Works and Services, and has requested that the District enter into this agreement with the Developer.

**SCHEDULE "C"**  
**SERVICING AGREEMENT**

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the premises and the mutual covenants and agreement contained herein and the sum of Ten Dollars (\$10.00) now paid by the parties hereto each to the other (the receipt and sufficiency whereof is hereby acknowledged), the parties hereto covenant and agree each with the other as follows:

1. THE DEVELOPER COVENANTS AND AGREES with the District:

- (a) to provide, design, construct and install all Works and Services shown on the engineering drawings numbered \_\_\_\_\_, prepared by \_\_\_\_\_, dated \_\_\_\_\_, and reviewed by the Engineer on \_\_\_\_\_, which drawings are hereby incorporated in and shall form part of this agreement (hereinafter called the "said works"), within one year from the date of this agreement;
- (b) that the said works shall be provided, designed, constructed and installed in accordance with the aforesaid drawings and the specifications and standards for the design and construction of works contained in the District's Subdivision and Development By-law, and amendments thereto;
- (c) to grant to the District all necessary road dedications, statutory rights-of-way and easements over the said lands to accommodate the said works, and where the said works are located upon or under privately owned lands other than the said lands, to obtain at the Developer's expense, all necessary road dedications, statutory rights-of-way and easements over such lands, in favour of the District, to accommodate the said works;
- (d) to construct and install fully completed works to the District's standards and to the satisfaction of the District's Engineer and which, in the discretion of the Engineer, may be varied because of conditions at the site, so that the said works function and operate to the satisfaction of the Engineer and, should the said works as constructed prove to be in any way defective or should they not operate to the satisfaction of the Engineer, then the Developer shall, at the Developer's expense, modify or reconstruct the said works so that the said works shall be fully operative and function to the satisfaction of the Engineer, such satisfaction to be indicated by a Certificate of Substantial Completion signed by the Engineer;
- (e) to pay to the District, upon execution of this agreement, the sum of \_\_\_\_\_ (\$\_\_\_\_\_) plus G.S.T. in the sum of \_\_\_\_\_ (\$\_\_\_\_\_) in payment of all engineering and administration costs, associated with the construction of the said works incurred by the District in connection with the said lands;
- (f) to pay to the District, upon execution of this agreement, the sum of \_\_\_\_\_ (\$\_\_\_\_\_) in payment of street name signs, energization of street light circuits, water meters and other District services in connection with the said lands;
- (g) to pay to the District, upon receipt of an invoice for same, the cost of all tie-ins of the said works to existing water mains, storm and sanitary sewers and street name signs, energizing of street lighting circuits and other District services in connection with the said lands;
- (h) to assign, transfer and convey to the District upon issuance of the Final Acceptance Certificate all of the Developer's right, title and interest in the said works, and the Developer shall, from time to time and at all times so long as the Developer exercises any rights of ownership in the said lands, upon the request of the District, make, do and execute or cause or procure to be made, done and

**SCHEDULE "C"**  
**SERVICING AGREEMENT**

executed, all such further acts, deeds, rights-of-way, easements and assurances required by the District for the effectual carrying out of this agreement;

- (i) that as security for the due and proper completion of providing, designing, constructing and installing the said works, the Developer has deposited with the District, upon execution of this agreement, an automatically renewing, irrevocable letter of credit or cash in the sum of \_\_\_\_\_ (\$ \_\_\_\_\_) (hereinafter called the "security deposit");
- (j) that if the said works are not duly and properly completed within the time specified in paragraph 1(a) hereof, the District may draw upon the security deposit and may complete the said works at the cost of the Developer and deduct from the security deposit the cost of such completion, and the balance of the security deposit shall be returned to the Developer, less any administration costs incurred by the District. If the security deposit is insufficient to cover the actual cost of completing the said works, then the Developer shall pay such deficiency to the District immediately upon receipt of the District's bill for same. It is understood that the District may do such work either by itself or by Contractors employed by the District. If the said works are completed by the Developer as herein provided, then the security deposit shall be returned to the Developer on receipt of the Engineer's Certificate of Substantial Completion;
- (k) to provide and transfer ownership or interest of all drawings referenced in paragraph 1(a) hereof, and any materials placed on the Lands during the construction and installation of all Works and Services shown on the drawings references in paragraph 1(a) hereof;
- (l) to submit to the District the final as-built drawings of the said works as constructed and as accepted by the Engineer prior to the release of any building permits on the said lands, or within 30 days of the date of completion of the said works;
- (m) to pay to the District, prior to the approval of the proposed Subdivision or Development of the said lands:
  - (i) all arrears of taxes outstanding against the said lands; and
  - (ii) all current taxes levied or to be levied upon the said lands on the basis and in accordance with the assessment and collector's roll entries;
- (n) to maintain the said works in complete repair for a period of one year from the date of issuance of a Certificate of Substantial Completion;
- (o) to remedy any defects or damage during the warranty period of one year from issuance of the Certificate of Substantial Completion, and to pay for any damage to other works or property resulting therefrom, save and except for defects caused by reasonable wear and tear, negligence of the District, its servants or agents, or acts of God;
- (p) to deposit as security with the District, prior to the return of the security deposit, an automatically renewing, irrevocable letter of credit or cash in the sum of \_\_\_\_\_ (\$ \_\_\_\_\_) (hereinafter called the "warranty deposit"). Should the Developer fail to maintain the said works or remedy any defect or pay for any damages resulting therefrom, the District may draw upon the warranty deposit and may maintain the said works, remedy the defect or pay the damages at the cost of the Developer, and may deduct the cost of maintaining the said works;

**SCHEDULE "C"**  
**SERVICING AGREEMENT**

remedying the defect or paying the damages from the warranty deposit, and the balance of the warranty deposit, less any administration costs incurred by the District, shall be returned to the Developer on receipt of the Engineer's Final Acceptance Certificate. If the warranty deposit is insufficient to cover the actual costs incurred by the District, then the Developer shall pay such deficiency to the District immediately upon receipt of the District's invoice for same. If the said works are maintained by the Developer as herein provided, then the warranty deposit shall be returned to the Developer upon written request and upon receipt of the Engineer's Final Acceptance Certificate;

- (q) that except as hereinafter specifically provided, the work done and payments made pursuant to this agreement are not payments or work to be applied in lieu of Development Cost Charges, and the Developer further covenants and agrees to pay to the District all applicable Development Cost Charges imposed upon the Subdivision or Development of the said lands by the Development Cost Charges By-law(s), as amended or superseded from time to time;
- (r) to protect all survey markers, pins, posts and similar things during the construction, installation, maintenance and repair of the said works, and to employ, at the Developer's expense, a British Columbia Land Surveyor to replace any such markers, pins, posts or similar things which may be moved, damaged or destroyed during such construction, installation, maintenance or repair;
- (s) to save harmless and indemnify the District against:
  - (i) all actions and proceedings, costs, damages, expenses, claims and demands whatsoever and by whomsoever brought by reason of the construction, installation, maintenance or repair of the said works;
  - (ii) all expenses and costs which may be incurred by reason of the construction, installation, maintenance or repair of the said works resulting in damage to any property owned in whole or in part by the District or which the District by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, install, maintain or repair; and
  - (iii) all expenses and costs which may be incurred by reason of liens for non-payment of labour or materials, Workers' Compensation, Employment Insurance, G.S.T. and Provincial taxes, check-off or encroachments owing to mistakes in survey;
- (t) to obtain and maintain until the date of issuance of the Final Acceptance Certificate of the said works, at the Developer's expense, with such company or companies and on such forms as are acceptable to the District, in the name of the Developer, Comprehensive General Liability Insurance coverage covering premises and operations liability, contingency liability with respect to the operations of Contractors and sub-contractors, completed operations liability, contractual liability and automobile liability for owned, non-owned and hired units. The limits of liability shall be not less than \$5,000,000 for each occurrence for bodily injury and property damage. Each policy shall provide that it cannot be cancelled, lapsed, or materially altered without at least 30 days' notice in writing to the District by registered mail, shall name the District as an additional insured, and shall contain a cross-liability clause;
- (u) to deliver a copy of each such insurance policy to the District prior to the commencement of any construction, installation, maintenance or repair of the said works; and

**SCHEDULE "C"**  
**SERVICING AGREEMENT**

- (v) that if the Developer fails to obtain and/or maintain the said insurance or deliver the said policy or policies to the District, then the District may obtain and/or maintain such insurance at the expense of the Developer, and the Developer hereby appoints the District as the Developer's lawful attorney to do all things necessary for that purpose.
- 2. The Developer hereby waives, relinquishes and abandons any right which the Developer now has or may at any time hereafter have for any contribution from the District or any other person toward the Developer's cost of installing the said works, and agrees that none of the said works shall be construed to be "excess or extended services" as defined by the *Local Government Act*.
- 3. The Developer hereby releases and forever discharges the District and its servants, agents, successors and assigns from all manner of actions, causes of action, suits, debts, dues, accounts, bonds, covenants, contracts, claims and demands whatsoever against the District which the Developer ever had, now has or hereafter may have by reason of the installation of the said works by the Developer with no contribution toward the cost of the said works by the District or any other person and, without limiting the generality of the foregoing, by reason of the failure by the District to impose or collect any latecomer charges from the Owners of the lands which may connect to or use the said works.
- 4. THE DISTRICT COVENANTS AND AGREES with the Developer:
  - (a) to permit the Developer to perform all of the said works upon the terms and conditions herein contained; and
  - (b) that upon satisfactory completion by the Developer of all of the covenants and conditions in this agreement, including the maintenance of the said works in complete repair for a period of one year, the District shall provide the Developer with a Final Acceptance Certificate of the said works signed by the Engineer.
- 5. IT IS MUTUALLY UNDERSTOOD, agreed and declared by and between the parties hereto that:
  - (a) the District has made no representations, covenants, warranties, guarantees, promises or agreements (oral or otherwise) with the Developer other than those contained in this agreement;
  - (b) nothing contained or implied herein shall prejudice or affect the rights and powers of the District in the exercise of its functions under any public and private statutes, by-laws, orders and regulations, all of which may be fully and effectively exercised in relation to the said lands as if this agreement had not been executed and delivered by the Developer;
  - (c) the said works shall be and remain at the sole risk of the Developer until such time as they are accepted by the District as evidenced by the Engineer's Final Acceptance Certificate;
  - (d) wherever the singular or masculine is used herein, the same shall be construed as meaning the plural, feminine or the body corporate or politic where the context or the parties so require and, where the Developer consists of more than one person, the term "Developer" shall mean all such persons jointly or severally;
  - (e) this agreement shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns;
  - (f) the parties hereto shall do and cause to be done all things and execute and cause to be executed

**SCHEDULE "C"**  
**SERVICING AGREEMENT**

all documents which may be necessary to give proper effect to the intention of this agreement;  
and

- (g) the definitions of terms contained in the District's Subdivision and Development By-law No. 1248, 2003, as amended from time to time, shall apply in the interpretation of this agreement.

IN WITNESS WHEREOF the parties hereto have hereunto affixed their respective Corporate Seals, attested by the hands of their respective officers duly authorized in that behalf, the day and year first above written.

The Corporate Seal of \_\_\_\_\_

\_\_\_\_\_ was hereunto affixed in the presence of:

\_\_\_\_\_ Authorized Signatory

\_\_\_\_\_ Authorized Signatory

SIGNED, SEALED AND DELIVERED by the  
above-named in the presence of:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Occupation: \_\_\_\_\_

THE CORPORATE SEAL OF THE CORPORATION OF  
THE DISTRICT OF KENT was hereunto  
affixed in the presence of:

\_\_\_\_\_ Mayor - Authorized Signatory

\_\_\_\_\_ Chief Administrative Officer - Authorized Signatory



**SCHEDULE "D"**  
**DETAIL DRAWINGS**

The following Detail Drawings are attached to, and form part of, the Engineering Standards. They shall typically be included or referenced on design drawings submitted for construction.

All references to these Detail Drawings shall, in each instance, be understood to refer to the latest dated revision as issued by the District of Kent.

General Standards

Typical Service Connection Locations ..... ES-G-1

Drainage Standards

Rainfall Intensity Curves ..... ES-D-1

Typical Rock Pit and French Drain ..... ES-D-2

Sewer Standards

Hydraulic Element Chart ..... ES-S-1

Peaking Factors for Sanitary Sewer Flow (Babbitt Curve) ..... ES-S-2

Roadway Standards

Typical Cul-de-sac ..... ES-R-1

Urban Local Road – 18m R.O.W. – 9m pavement ..... ES-R-2

Urban Collector Road – 20m R.O.W. – 11.6m pavement ..... ES-R-3

Urban Arterial Road – 22m R.O.W. – 13.4m pavement ..... ES-R-4

Rural Local Road – 18m R.O.W. – 7m pavement ..... ES-R-5

Rural Collector Road – 20m R.O.W. – 7m pavement ..... ES-R-6

Landscaping Standards

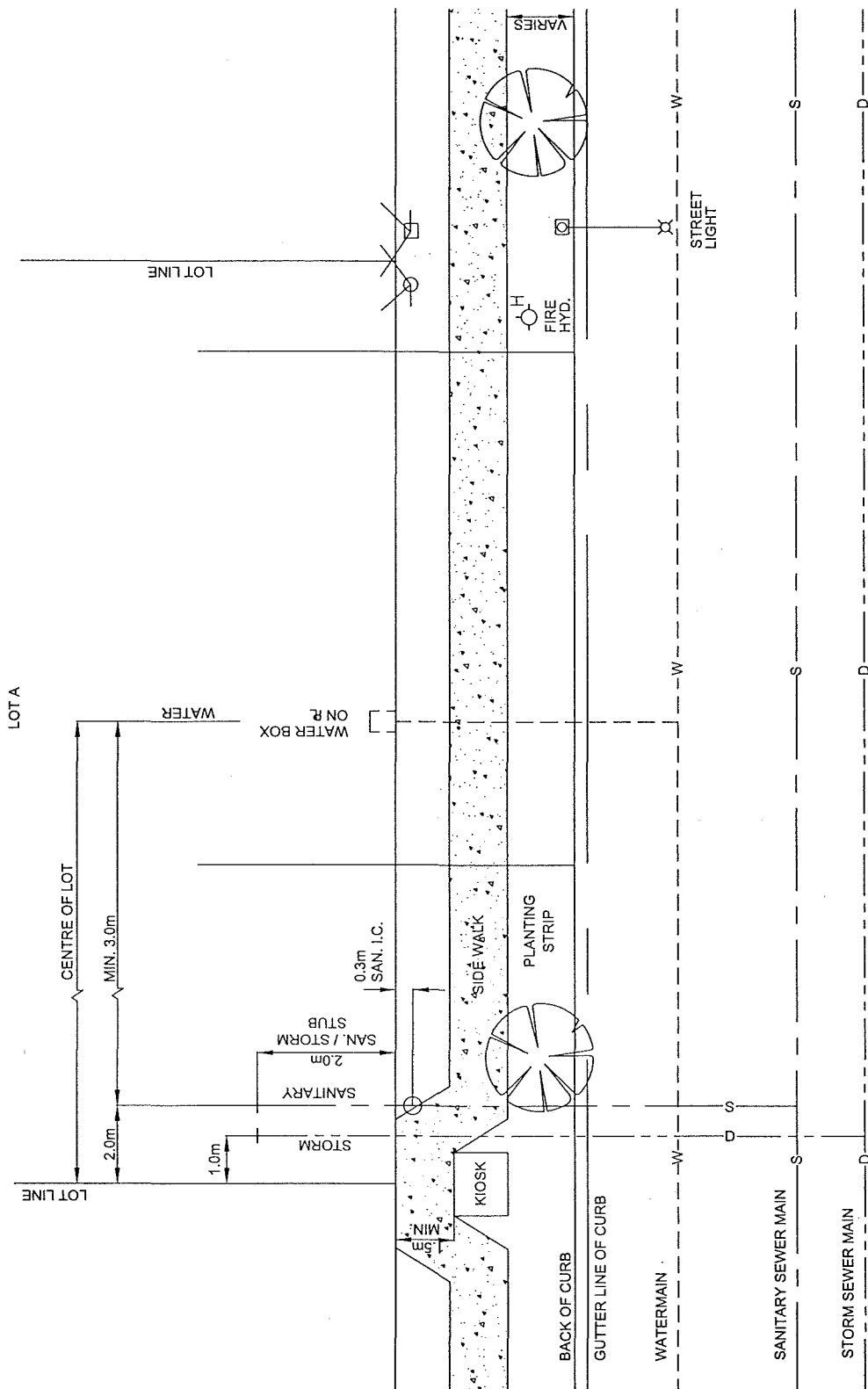
Tree Planting Detail Linear Planting Channel ..... ES-L-1

Tree Planting Detail Structural Soil Planting Under Paved Area ..... ES-L-2

Tree Planting Detail ..... ES-L-3

Protection Detail for Tree(s) ..... ES-L-4

Street Tree Locations at Intersections ..... ES-L-5



NOTE:  
SANITARY AND STORM SEWER SERVICES & CONNECTIONS  
ARE TYPICALLY INSTALLED ON THE DOWNSTREAM SIDE OF  
THE LOT.

## TYPICAL SERVICE CONNECTION LOCATIONS

N.T.S.

TITLE:

# TYPICAL SERVICE CONNECTION LOCATIONS



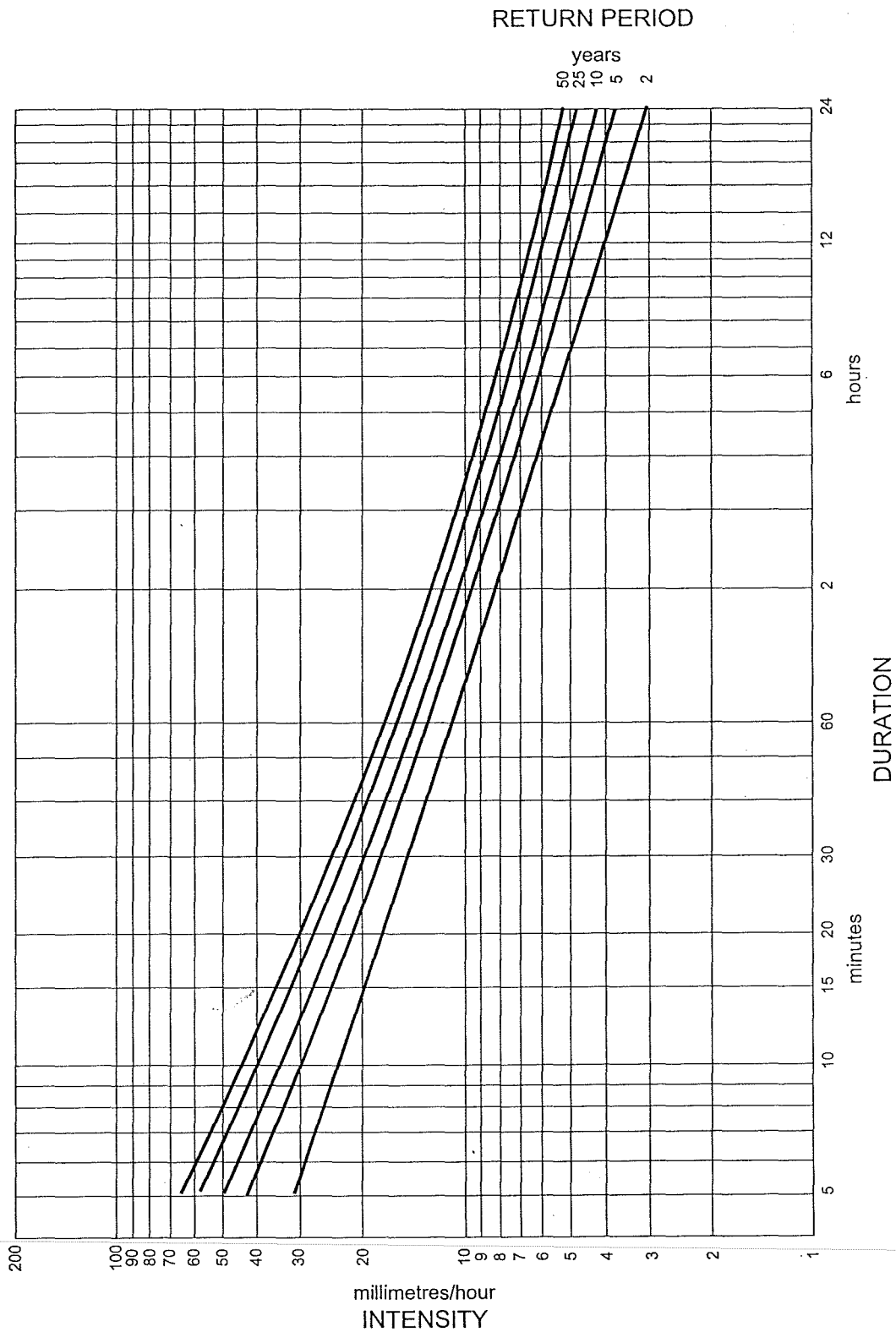
**DISTRICT  
OF KENT**

Date: 26 Feb. 2003

Revised:

Drawing Nbr:

**ES-G-1**



# RAINFALL INTENSITY CURVES

NIS

TITLEB:

## RAINFALL INTENSITY CURVES

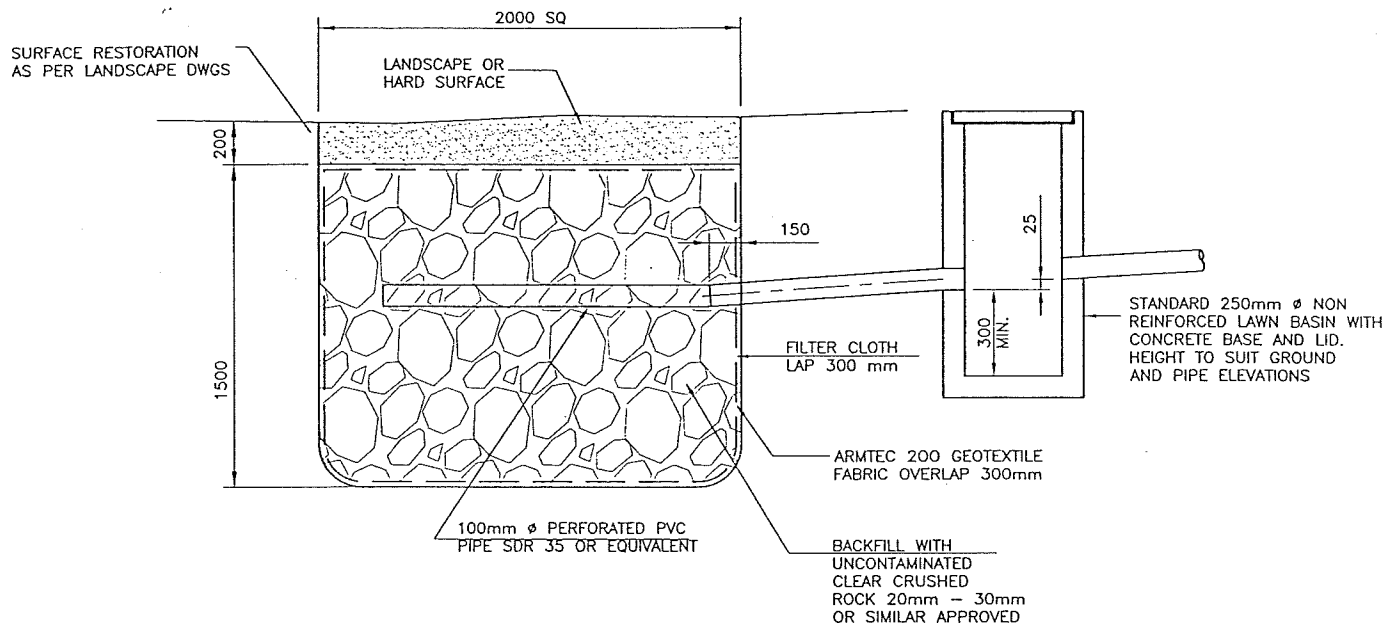


**DISTRICT  
OF KENT**

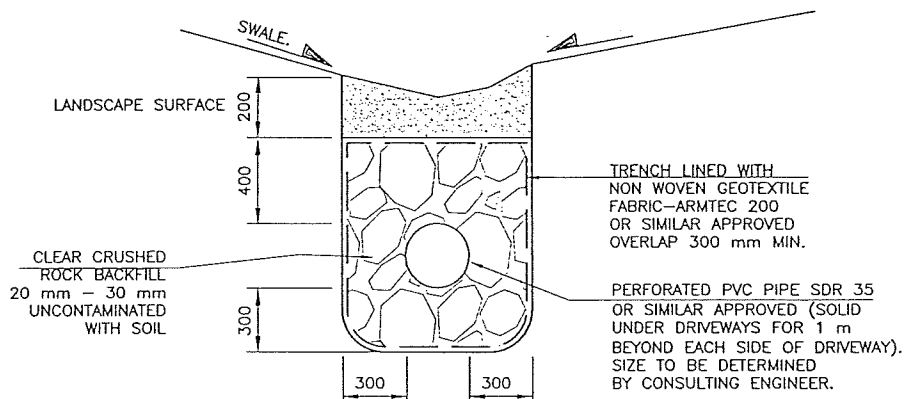
Date 26 Feb. 2003  
Revised

Drawing No

**ES-D-1**



TYPICAL ROCK PIT  
NTS



FRENCH DRAIN  
NTS

NOTE: DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

TITLE:

# ROCK PIT AND FRENCH DRAIN

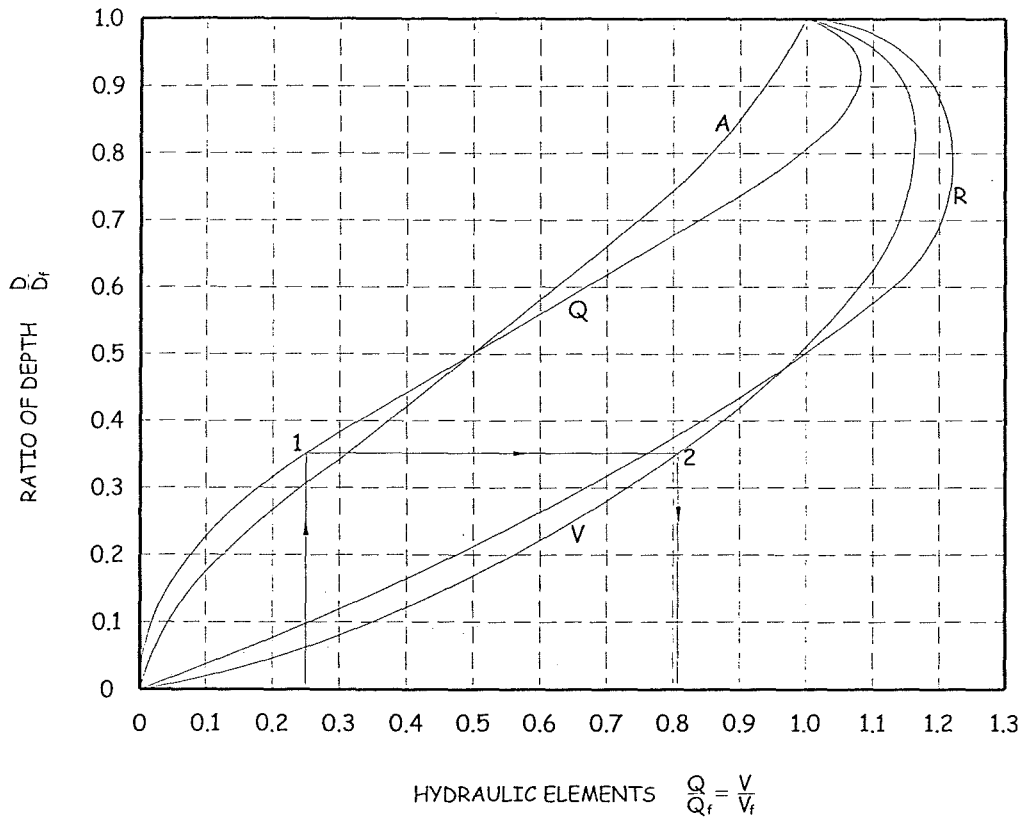


**DISTRICT  
OF KENT**

Date: 26 Feb. 2003  
Revised: 20 May 2003

Drawing Nbr:  
**ES-D-2**

# HYDRAULIC ELEMENT CHART



## NOTES FOR USE:

- FOR EXAMPLE, CALCULATE  $\frac{Q}{Q_f}$  AND ENTER CHART ON BOTTOM AXIS.
- INTERSECT Q LINE AT POINT 1, THEN PROJECT TO V LINE AT POINT 2.
- READ OFF FRACTIONAL VALUE OF  $V/V_f = 0.82$ , THEREFORE,  $V = .82 V_f$ .

TITLE:

## HYDRAULIC ELEMENT CHART

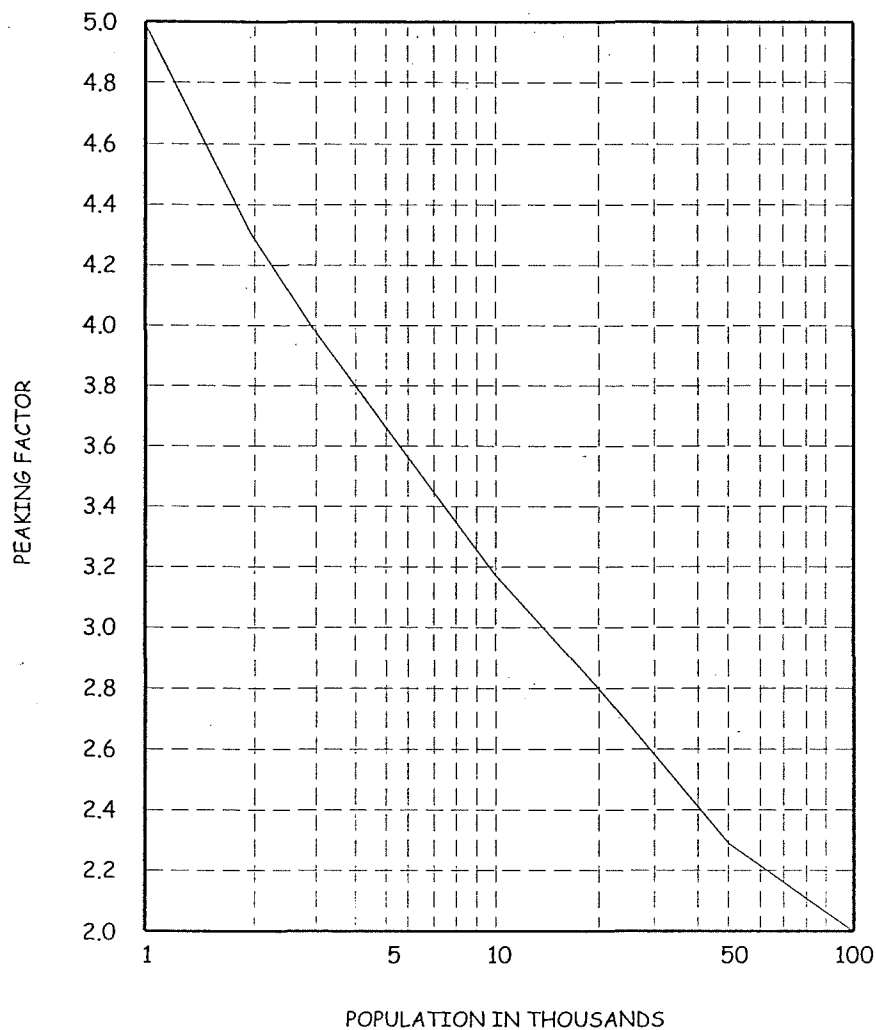


**DISTRICT  
OF KENT**

Date  
26 Feb 2003  
Rev sed

Drawing Nbr

**ES-S-1**



TITLEB

# **PEAKING FACTORS for SANITARY SEWER FLOW** (Bobbitt Curve)

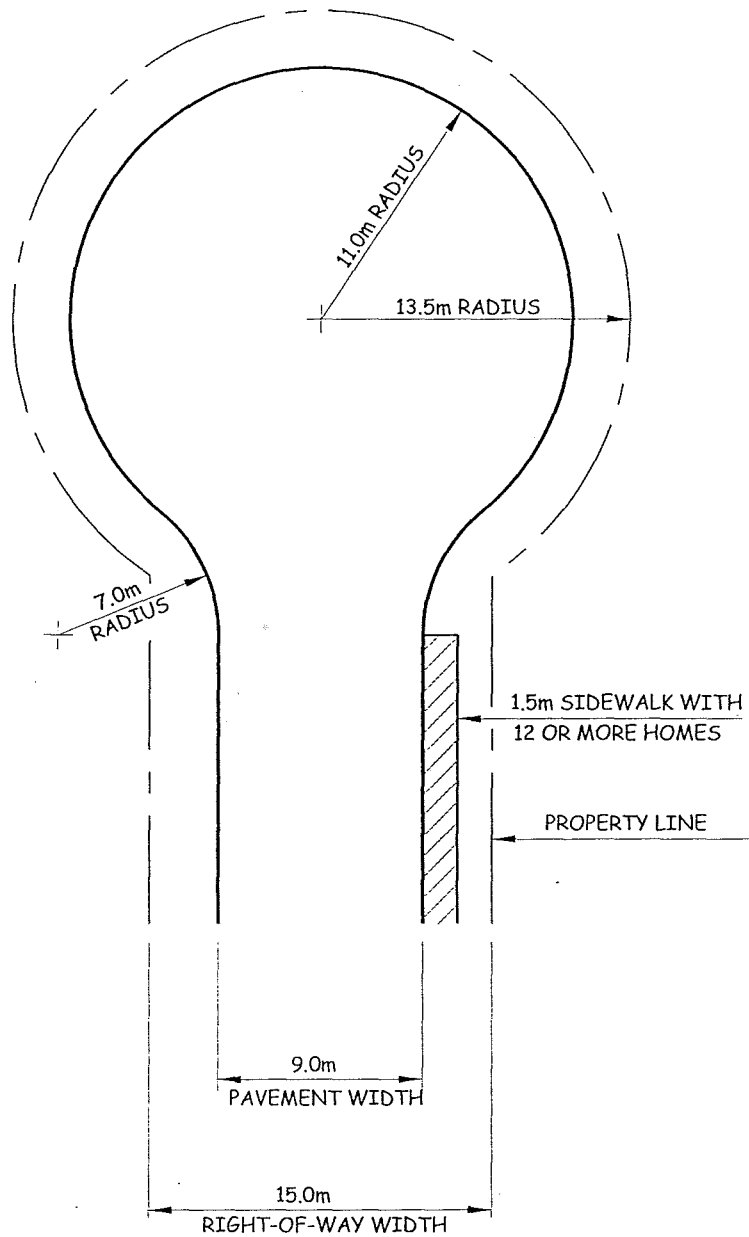


**DISTRICT  
OF KENT**

Date 26 Feb. 2003  
Revised

Drawing Nbr:

**ES-S-2**



TITLE

# TYPICAL CUL-DE-SAC



DISTRICT  
OF KENT

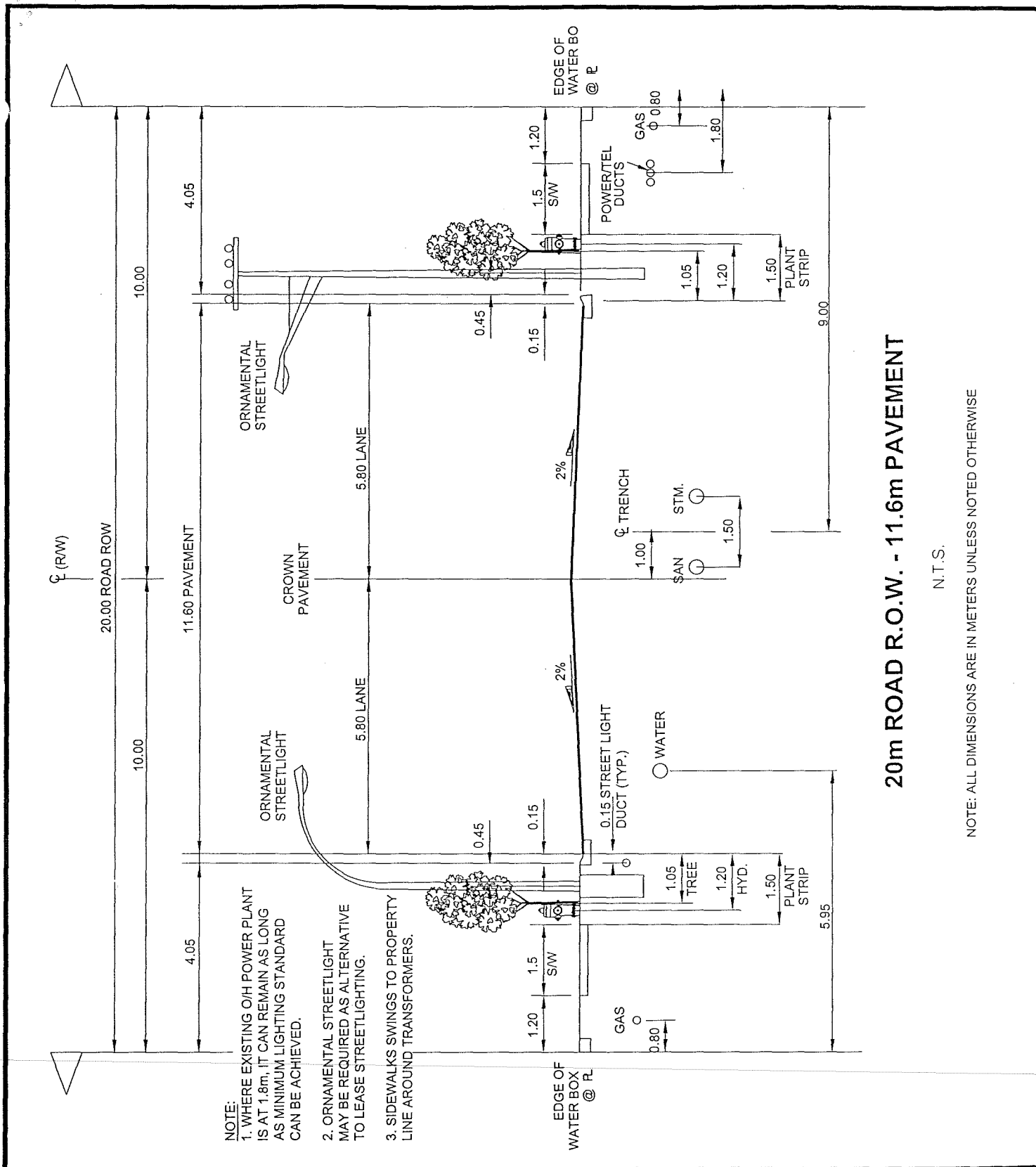
Date 3 Mar 2003

Drawing No

Revised

ES-R-1





TITLE:

# **URBAN COLLECTOR ROAD** **20m R.O.W.** **11.6m PAVEMENT**

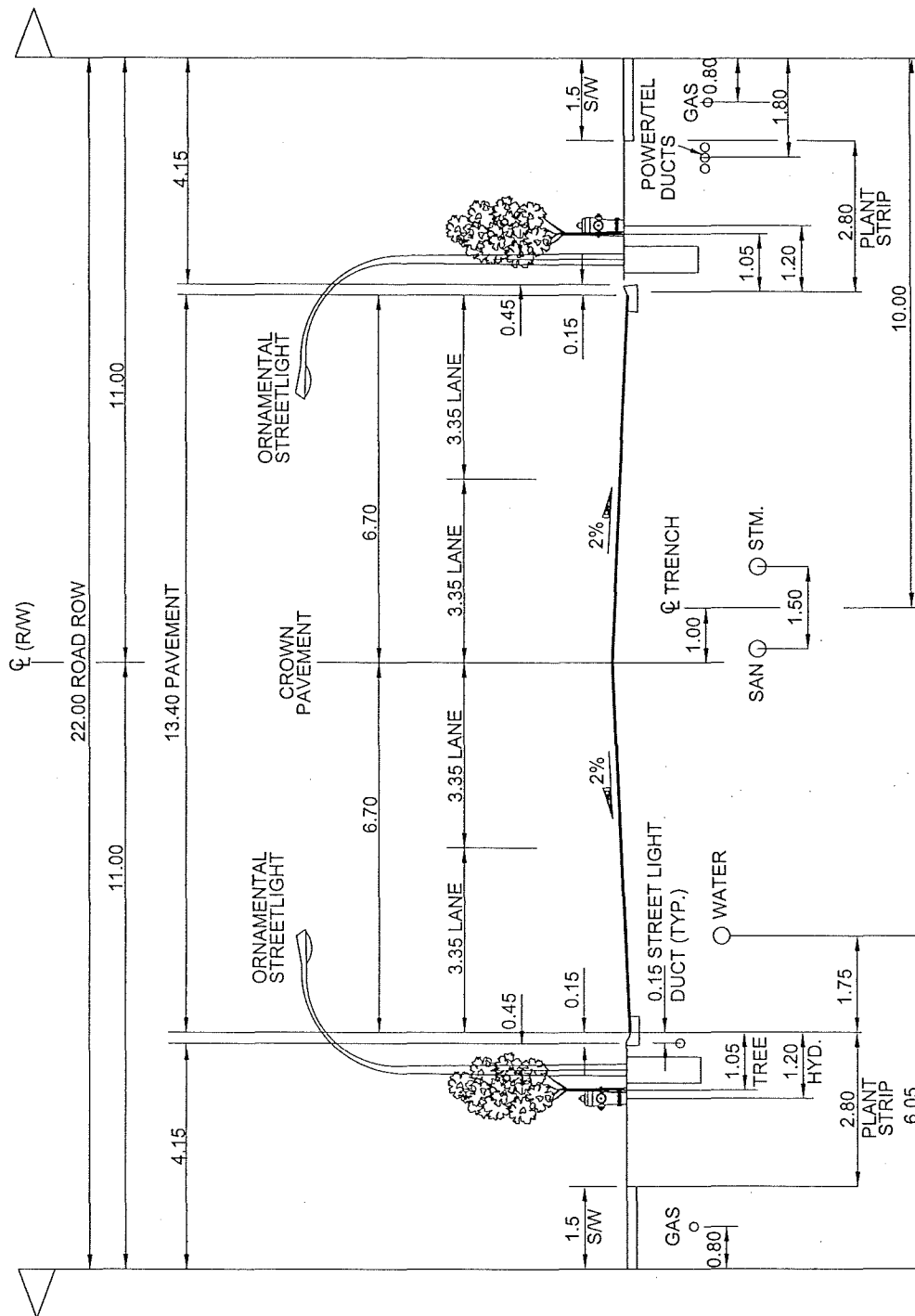


**DISTRICT  
OF KENT**

Date: 26 Feb. 2003  
Revised:

Drawing Nbr:

**ES-R-3**



## 22m ROAD R.O.W. - 13.4m PAVEMENT

N.T.S.

NOTE: ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE

TITLE:

## URBAN ARTERIAL ROAD 22m R.O.W. 13.4m PAVEMENT



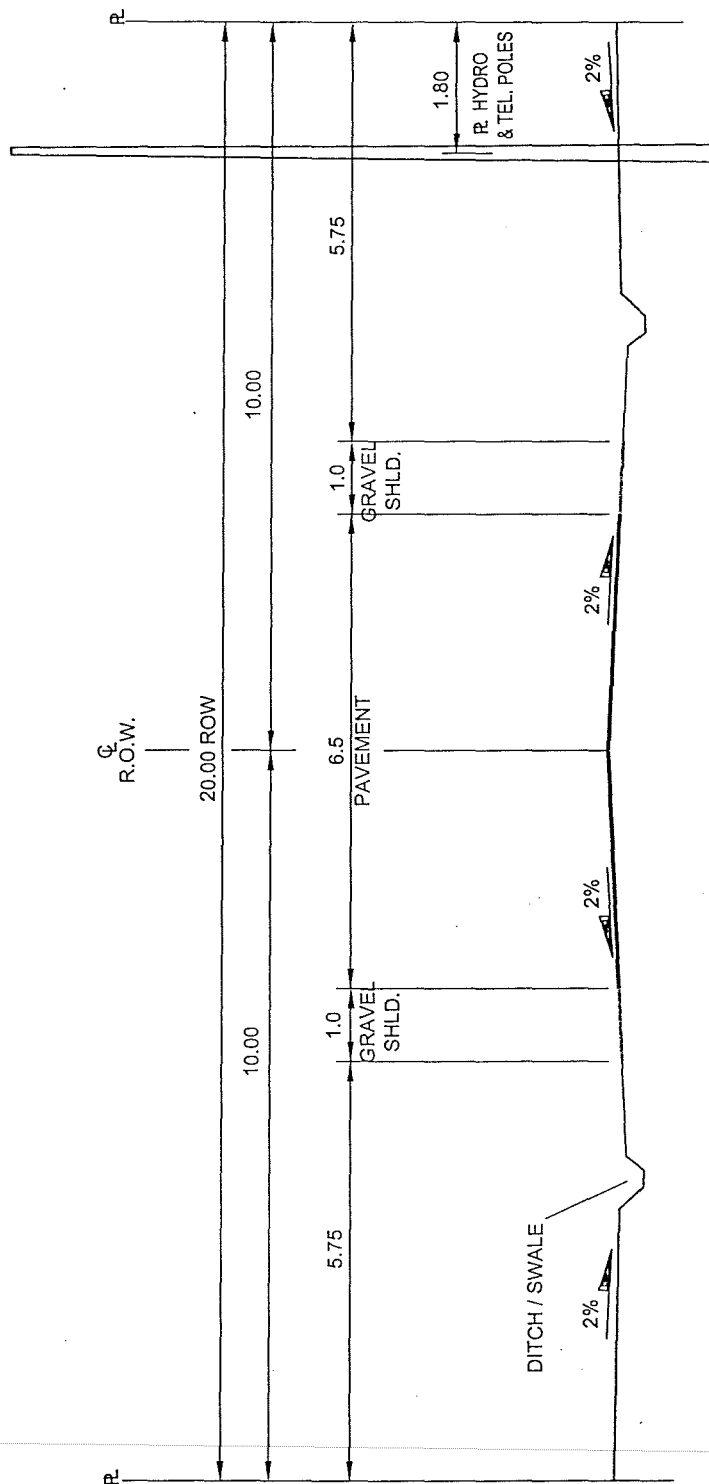
DISTRICT  
OF KENT

Date: 26 Feb. 2003

Revised:

Drawing Nbr:

ES-R-4



# **RURAL LOCAL ROAD** **20m R.O.W. - 6.5m PAVEMENT**

N.T.S.

NOTE: ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE

TITLE:

## **RURAL LOCAL ROAD** **20m R.O.W.** **6.5m PAVEMENT**

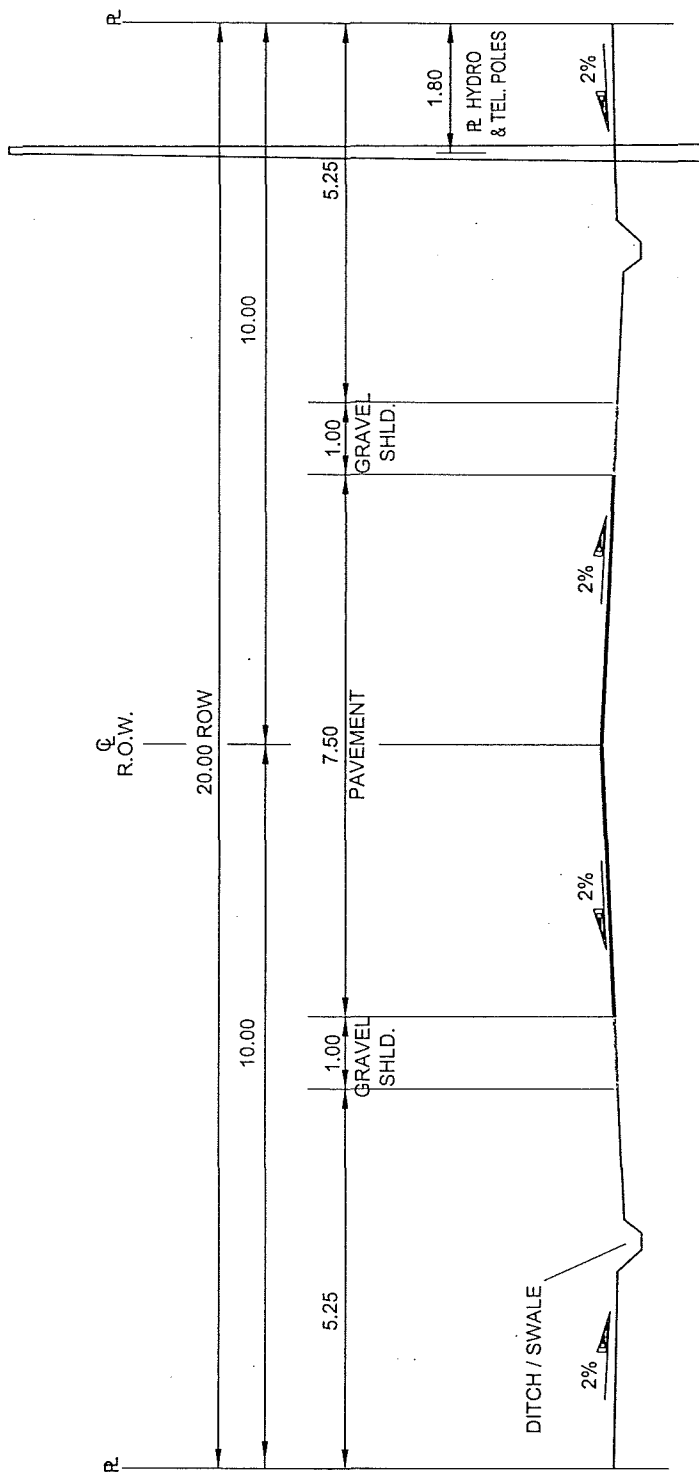


**DISTRICT  
OF KENT**

Date: 26 Feb. 2003  
 Revised: 20 May 2003

Drawing Nbr:

**ES-R-5**



# **RURAL COLLECTOR ROAD** **20m R.O.W. - 7.5m PAVEMENT**

N.T.S.

NOTE: ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE

TITLE:

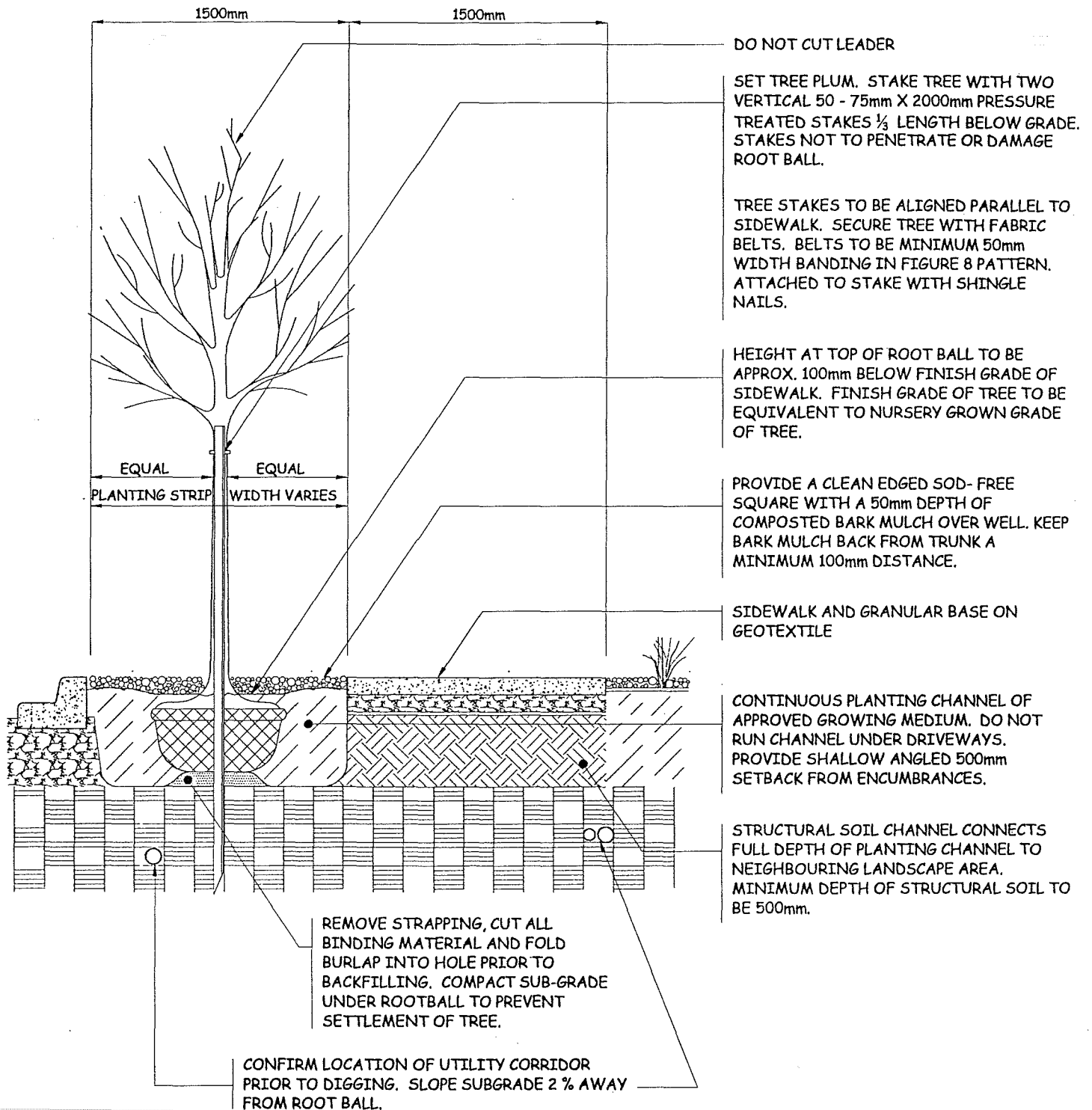
## **RURAL COLLECTOR ROAD** **20m R.O.W.** **7.5m PAVEMENT**



**DISTRICT  
OF KENT**

Date: 26 Feb. 2003  
 Revised: 20 May 2003

Drawing Nbr:  
**ES-R-6**



**NOTE:**

THIS DETAIL IS FOR USE IN BOULEVARD AREAS WHERE SIDEWALKS ARE SEPARATED FROM CURB.

TITLE:

# **TREE PLANTING DETAIL LINEAR PLANTING CHANNEL**



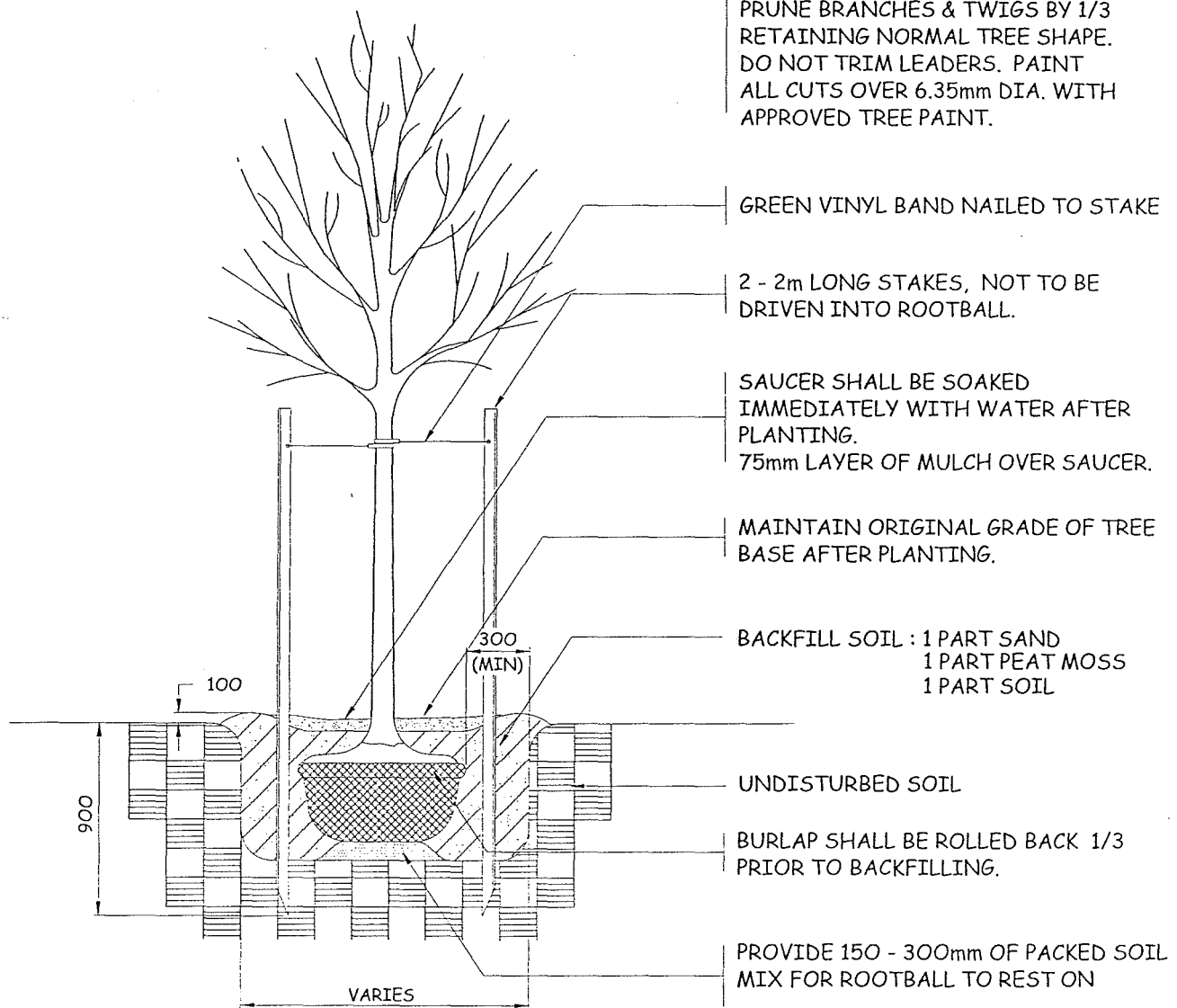
**DISTRICT  
OF KENT**

Date: 3 Mar. 2003  
Revised:

Drawing Nbr:

**ES-L-1**





TITLE

# TREE PLANTING DETAIL



**DISTRICT  
OF KENT**

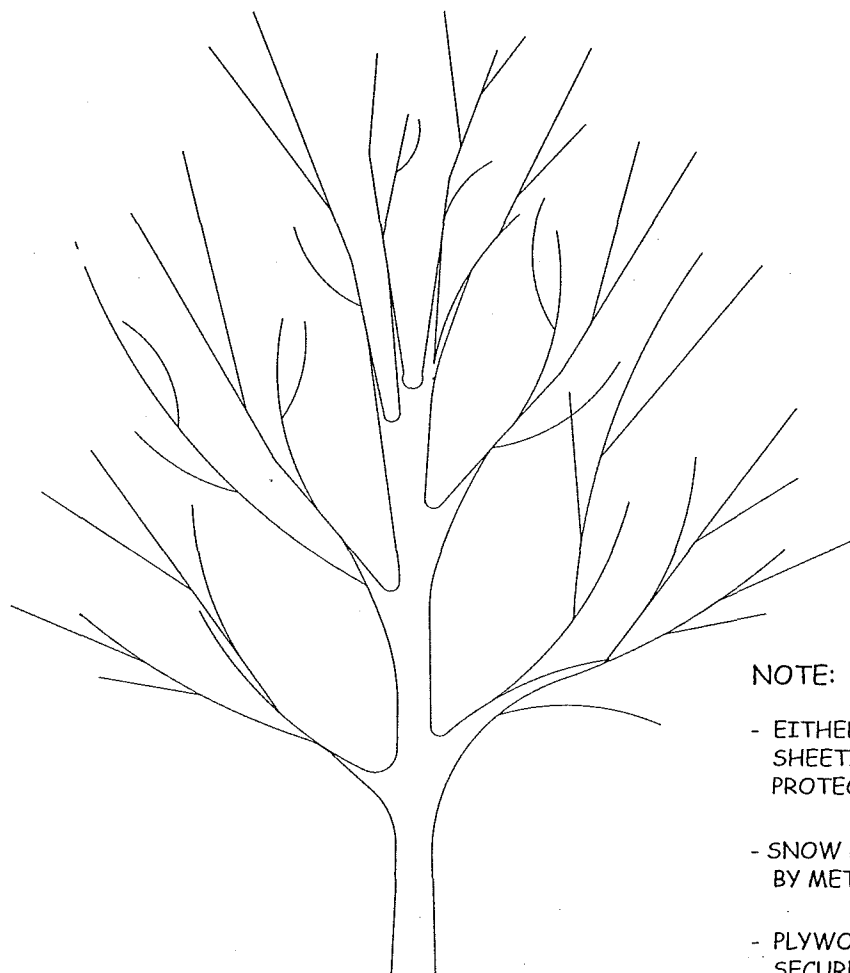
Date

26 Feb 2003

Revised

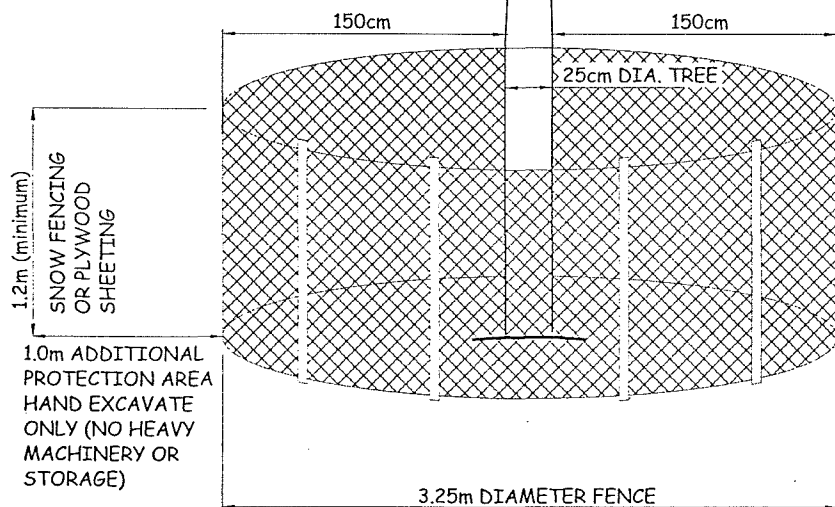
Drawing No

**ES-L-3**



**NOTE:**

- EITHER SNOW FENCING OR PLYWOOD SHEETING SHOULD BE USED FOR PROTECTION FENCE
- SNOW FENCING SHOULD BE SECURED BY METAL STAKES
- PLYWOOD SHEETING SHOULD BE SECURED BY 5.0cm x 10.0cm WOODEN STAKES
- FLAGGING TAPE MUST BE ATTACHED TO FENCE TO HIGHLIGHT PROTECTION ZONE



(FOR EVERY 2.5cm OF TREE DIAMETER, A PROTECTION ZONE OF 30cm PLUS THE DIAMETER IS REQUIRED)

TITLE

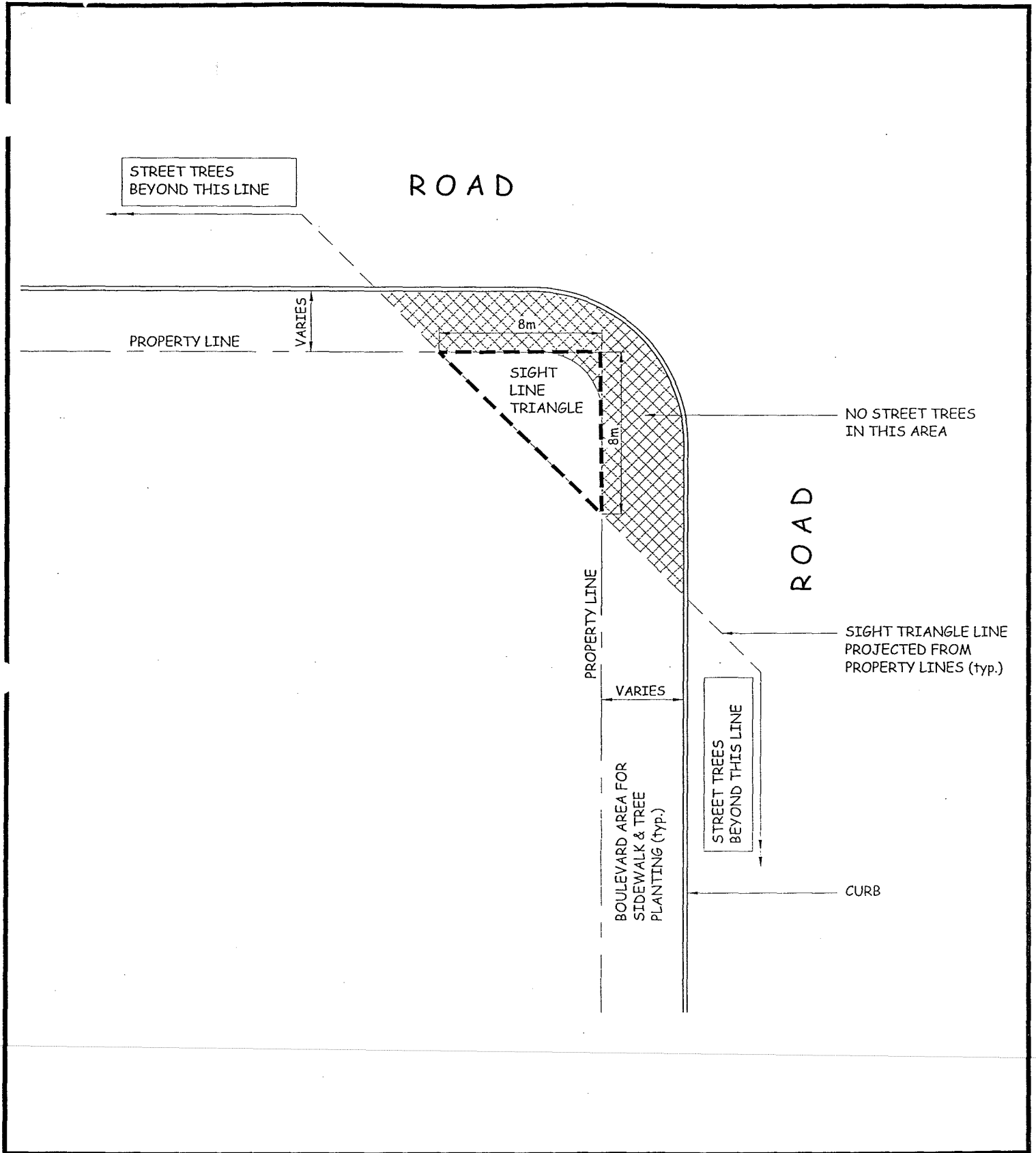
# **PROTECTION DETAIL for TREE(S)**



**DISTRICT  
OF KENT**

Date  
26 Feb 2003  
Revised

Drawing No.  
**ES-L-4**



TITLE:

# STREET TREE LOCATIONS at INTERSECTIONS



**DISTRICT  
OF KENT**

Date 3 Mar 2003

Drawing Nbr

Revised

**ES-L-5**

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

The use of sanitary lift stations is discouraged. Where the only alternative is the use of lift stations, the Consulting Engineer must receive prior approval from the Engineer.

**1.0 PRE-DESIGN REPORT**

- 1.1 Prior to beginning the detailed design of the lift station, the Consulting Engineer shall submit 2 signed and sealed copies of a pre-design report for the City's review and comment.
- 1.2 The report should include and/or address the following design considerations:
  - A drawing showing the proposed Development complete with the catchment area and the location of the proposed lift station and forcemain;
  - Calculations based on the proposed zoning, including number of equivalent dwelling units (EDU), average day and peak day flows. Assume 3.3 persons per EDU, average day flow of 350 litres per person per day and a peaking factor based upon the Babbitt formula (Drawing ES-S-2). Calculations are to be in litres per second;
  - Size, type, length and location of the proposed forcemain;
  - Calculation of static or geodetic head;
  - Calculation of hydraulic system headloss using Hazen William's formula ( $C=120$ );
  - Calculation of total dynamic head loss (i.e. geodetic head plus hydraulic system head loss);
  - A copy of pump manufacturer's pump curve, motor size, and impeller number. Include power requirements, rated speed, and pump efficiency. Plot the hydraulic system curve on to the pump curve;
  - Calculation of velocity in the forcemain. The entire length of forcemain should be flushed a minimum of once per day during projected average day flows;
  - Calculation of sump volume between pump cycles. The sump should be capable of accommodating peak day flow for a minimum of 15 minutes. Where flooding could adversely effect the environment, an overflow tank shall be provided to accommodate 2 hour detention capacity during peak day flows;
  - Calculation of the number of pump starts per hour during average and peak day flows. Indicate the maximum number of pump starts per hour per the manufacturer's specifications. The minimum pump run time should not be less than 2.5 minutes;
  - Vessel buoyancy calculations (based upon maximum flood elevations);
  - The impact on neighbouring properties with respect to aesthetics, noise, odour, landscaping requirements;
  - Access for construction and maintenance. Assume minimum H-20 loading requirements and parking and turning of maintenance vehicles;
  - A geotechnical report indicating existing ground conditions, de-watering requirements, blasting, or any other anomalies that may affect the design and construction of the proposed pump station and forcemain;

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

- Access to a proposed or existing power supply. A review and recommendation of standby power requirements shall be included;
- A preliminary cost estimate of all associated Works and Services;
- All sanitary lift stations that will be turned over to, serviced and/or maintained by the City must be located within a right-of-way and not within the road allowance; and
- Alternate pumps may be approved which are equal to or better in quality than those specified in the pre-design report. Alternate pumps shall match the pre-design pump curve and shall not increase pump flows more than 10% over those stated in the pre-design report.

**2.0 GENERAL REQUIREMENTS**

- 2.1 Upon approval of the pre-design report the Consulting Engineer may proceed with detailed plan/profile construction drawings in accordance with the City's Engineering Standards and Specifications.
- 2.2 Drawings shall include:
- site plan
  - plan of the station
  - side view section of the station
  - front view section of the station
  - pump/system curve
  - pre-set pump levels
  - relevant technical elevations
  - electrical schematic drawings
  - plan and profile of the forcemain
- 2.3 Every station shall be a wet well type with duplicate submersible sewage pumps (or approved alternate). The pump system shall be as manufactured by Flygt Canada (or approved alternate). Pumps must be set up to operate automatically in alternating sequence. Pumps should be capable of handling raw, unscreened sewage.

**3.0 PUMPS AND MOTORS**

- 3.1 All pumps and motors must meet the following requirements:
- Pumps shall be a submersible, constant speed, explosion proof, non-clog, solids-handling type, capable of passing spherical solids up to 75 mm in size;
  - Pump suction and discharge openings shall be a minimum of 100 mm diameter;
  - Pump impeller, volute, motor, discharge elbow and seal housing to be high quality cast iron;

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

- Pumps shall have double mechanical seals, replaceable bronze wear rings, and removable inspection ports;
- Pumps must be capable of operating dry without damage;
- The motors must be capable of operating 10 spaced starts per hour and shall conform to CSA and EEMAC standards;
- Motors shall have an automatically resetting, embedded temperature sensing device to protect against overheating;
- Motors shall have a loss of seal sensor to protect the motor from damage due to loss of seal;
- Pump motor shaft, all exposed bolts, and motor information plate to be stainless steel;
- All relevant pump, motor, and impeller information shall be stamped on the plate and permanently attached to the pump;
- Bearings shall be factory lubricated with an operating life of not less than 70,000 hours;
- All rotating parts shall be balanced to provide minimum vibration under service conditions;
- Power cables shall be fully weather proofed and sized to match the pumps supplied. Cables to be continuous from the vessel to the kiosk. In no instance shall a cable be spliced; and
- Pumps shall be shop primed and painted with a minimum of 2 coats of coal tar epoxy.

#### **4.0 VESSEL**

**4.1** All vessels shall meet the following requirements:

- Filament wound reinforced fibreglass or steel reinforced concrete and completely watertight;
- Walls and floor shall be painted with 2 coats of epoxy enamel (2 component), white in colour, and should have a smooth glass like finish;
- Intermediate platforms are required when the depth of the vessel exceeds 4 metres. Platforms shall consist of fibreglass or aluminium grating with removable sections above the pump units to facilitate pump removal;
- Bottoms shall be sloped towards the pumps to prevent solid deposition;
- An access ladder is required complete with "ladder-up" support, (per Bilco style) shall extend to the bottom of chamber is required. The "ladder-up" support must be provided if the ladder does not extend above entrance when the hatch doors are open;
- There shall be individual aluminium watertight hatches for each pump. Hatches shall be fitted with stainless steel hinges and capable of supporting the weight of each pump. Each hatch must be secured with a standard 50 mm laminated Master padlock. A mechanism must be provided for securing hatch lids in the open position to prevent accidental closing;
- The top shall be set flush with final ground elevation; and
- The vessel shall be tested for water tightness using infiltration/exfiltration methods (depending on water table level) prior to the installation of the pumps, pipe work and/or electrical works.

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

**5.0 PIPING AND ACCESSORIES**

5.1 The following piping and accessories are required:

- Piping shall be schedule 40 steel to ASTM A-53;
- All fittings shall be either steel or cast iron Class 125;
- Piping shall be coated inside and out with 2 coats of coal tar epoxy;
- All mechanical fittings and couplings (excluding flanged joints) shall be located above the intermediate platform (where applicable);
- Two guide bars shall be installed for each pump to facilitate removal and installation without disturbing the discharge piping. Each pump shall be supplied with galvanized lifting chains;
- Check valves and eccentric isolation gate valves shall be supplied for each pump;
- Check valves shall be outside lever and weight, non-clog type, with cast iron body (Class 125), and shall be mounted in the vertical position;
- Check valves shall be located above the intermediate platform (where applicable);
- Explosion proof ventilation fan and ducting capable of providing a minimum of 30 air changes per hour is required. Air shall be forced into the wet well with adequate exhaust vents to allow displaced air to escape;
- Vents shall be a minimum 150 mm diameter goose neck stack extending a minimum 1 m above finished ground elevation complete with screen, adequately supports and bollard protection if necessary;
- Fans shall be located in a separate, isolated compartment in the kiosk and ducted to the wet well. There shall be no exchange of air between the fan compartment and the remaining portion of the kiosk. A fan on-off switch shall be provided on the control panel;
- There shall be a minimum 19 mm diameter water service located inside the vessel complete with line valve, hanger, hose and nozzle for wash down;
- a standard concrete meter box shall be located outside the vessel complete with a meter setter, valve, double check valve backflow preventer (Clayton Model D2 or equivalent) and water meter equivalent in size to the service connection;
- A portable, heavy duty, explosion proof trouble light shall be provided and stored inside the kiosk;
- Provision(s) shall be made for standby pumping from an external source. Connection shall be an adaptor flange with 100 mm diameter female Kamlock quick coupling and lockable lid;
- A receptacle compatible with the City's portable lifting arm shall be incorporated in the design of the lift station lid to facilitate the removal and installation of the pumps. The receptacle shall be flush with the top of the vessel;
- For proposed City-owned and operated lift stations, a 1.8 metre high chain link fence complete with 2 strands of barbed wire shall be installed around the lift station site;

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

- City-owned lift stations shall include an asphalt driveway constructed up to and beside the lift station to allow service vehicles to park off the street while conducting maintenance, repairs, alterations etc. Also, sufficient space shall be provided for turning and manoeuvring of standby generator and tow vehicle;
- The area adjacent to and to a minimum of 1.5 m surrounding the kiosk and vessel shall be free draining and covered with a 300 mm layer of 19 mm clear crush gravel;
- Steel bollards or concrete no-post barriers shall be installed around the lift station to prevent vehicles from driving over top of the vessel; and
- inlet to the vessel shall be by gravity to avoid creating turbulence within vessel and shall also be located to direct flows away from level controls.

## **6.0 ELECTRICAL SUPPLY AND CONTROLS**

6.1 All electrical components shall meet the following requirements:

- The power supply to the kiosk shall be by underground dip from the nearest convenient source. Pumps larger than 5 hp shall be 600 volt, 3 phase power;
- The control kiosk shall be a factory built enclosure manufactured to CEMA 3 weather proof standards and shall be pre-wired, inspected and approved by the BC Electrical Safety Inspection Branch;
- The kiosk shall be constructed of 10 gauge steel and have hinged doors for the control and service entry sections. Rain gutters are to be provided on all sides;
- The kiosk shall be factory primed and painted with 2 coats of enamel (green). For City-maintained lift stations, the doors shall be secured by means of a standard City 50 mm laminated padlock supplied by the City at cost to the Developer;
- The kiosk shall be bolted onto a concrete pad. The concrete pad shall not be placed over top of the water service, forcemain, or gravity sewer main;
- The level controls shall be ultrasonic type (Millitronics, Multiranger or approved alternate). Ultrasonic level control sensors shall be mounted near the top of the vessel inside a stilling well, which extends below the low water level;
- The level controls shall be set to **START** the **LEAD PUMP** upon rise in liquid level to a pre-set elevation as approved by the manufacturer;
- The level controls shall be set to **STOP** the **LEAD PUMP** at a pre-determined low level elevation as approved by the manufacturer or the City;
- The **LAG PUMP** shall set to **START** when the liquid level rises to the second pre-set elevation, as approved by the manufacturer and both pumps shall operate until the pre-determined low level elevation as approved by the manufacturer is reached, where both pumps would stop simultaneously;

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

- An alarm level shall be set at a pre-determined level above the start level of the lag pump. There shall be a minimum of 150 mm between pre-set elevations and the alarm level should be below the invert of the inflow pipe. The pre-determined alarm level shall be approved by the City if this is a City operated lift station;
- The pumps shall alternate starting sequence following each full pump cycle. Alarms shall be telemetered to the City SCADA monitoring system;
- A ball float (Flygt or approved alternate) shall be installed as a back up for high level alarm;
- An audible alarm and light shall be mounted on the roof of the kiosk;
- The operator should be able to start either pump manually if necessary;
- Electrical equipment inside the kiosk shall include a main breaker panel, hydro meter, manual transfer switch, emergency power receptacle, overload switch between the receptacle transfer switch (depending upon amperage), pump control panel, smart remote telemetry unit, radio modem, across-the-line magnetic starters, control transformers, 120 volt receptacle, on-off switch for ventilation fan, elapsed time totalizer for each pump, current-limiting motor protection, lightning protection, ammeter for each pump, HOA selector switches and run lights for each pump, heater for cold weather, and a cooling fan for hot weather;
- RTU shall be a programmable Unitec (or approved alternate) complete with intelligent protocol mounted within a cabinet located adjacent to the control panel. Alarm contacts for power failure (as detected by a phase monitor and auxiliary relay), high-level and low-level overload for each pump, seal leak alarm or indicator for each pump, motor high-temperature for each pump and starter auxiliary contact for each pump;
- Generator receptacle shall be Crouse-Hind (or approved alternate) and shall be compatible with those connectors now used on the City's portable generator;
- The radio modem shall be compatible with the City's SCADA system. A radio antenna shall be mounted on a street light pole adjacent to the kiosk. The size of the street light pole and antenna will be dependant upon each individual location;
- All work shall conform to the latest edition of the *BC Electrical Code*.

**Note:** Private lift stations which will never be maintained by the City may delete the requirement for the ultrasonic level control, RTU, radio modem, and antenna. The level control shall then be by four Flygt (or approved alternate) ball floats. All pump operation shall be controlled by a standard relay system.

## **7.0 FORCE MAINS**

- 7.1 In conjunction with sanitary pump stations, the following criteria shall be used in the design of force mains:
- The lowest pump delivery rate anticipated shall occur at least once per day, a scouring velocity of at least 0.9 metres per second shall be maintained and maximum velocity of flow in the main shall not exceed 3.5 metres per second;

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

- An automatic air-relief valve shall be placed at regular intervals in the forcemain to prevent air locks;
- Discharge into the gravity sewer system shall be ramped to avoid turbulence;
- The minimum size of force mains shall be 100 mm diameter unless otherwise approved by the Engineer;
- Cleanouts and valves shall be at maximum intervals of 1,000 metres or at points where the force main makes abrupt change in profile (i.e. creek crossings);
- Line valves shall be located as directed by the Engineer and on both sides of railway crossings and creek crossings.

**8.0 COMMISSIONING OF EQUIPMENT**

- 8.1 When all mechanical and electrical equipment has been completed, adjusted, and tested, the Consulting Engineer shall verify the proper operation of the pumping station over a minimum of three pumping cycles (for each pump). The test shall include a normal pumping cycle, combination lead and lag pump cycle, and high level alarm situation. The pump capacities for each situation shall be measured and recorded. The Consulting Engineer shall co-ordinate an inspection and supervision of start-up by the equipment supplier. The measured pump capacities shall be noted on the as-built mechanical drawing. A separate test shall be performed with the BC Hydro power switched off and the controls connected to a standby generator unit.

**9.0 DOCUMENTATION**

- 9.1 Prior to construction, the Consulting Engineer shall submit 2 sets of signed and sealed mechanical drawings to the City for review and comment.
- 9.2 Prior to requesting Final Acceptance, the Consulting Engineer shall submit 3 copies of an Operations and Maintenance manual in a hard covered binder which contains the following:
- Title page with project name, date, Contractor, Consulting Engineer;
  - Table of Contents;
  - Descriptive and technical data;
  - Maintenance and operating instructions for all mechanical and electrical equipment;
  - Manufacturer's catalogues for all mechanical and electrical equipment;
  - Electrical wiring schematics and coding;
  - List of parts for all equipment including part numbers, addresses of sales, service representatives and suppliers;
  - Motor list detailing motor number, name, horsepower, pump name plate, current rating, current being drawn;

**SCHEDULE "E"**  
**STANDARD FOR DESIGN OF SANITARY PUMP STATIONS**

- Heater size and type;
- Copy of written certification by the supplier that the equipment is installed and operating in accordance with the manufacturer's standards;
- Signed and sealed as-built of the mechanical and electrical drawings;
- Emergency operating procedures; and
- Measured pump capacities during the commissioning of the equipment.