

THE CORPORATION OF THE TOWNSHIP OF LANGLEY
SUBDIVISION AND DEVELOPMENT SERVICING BYLAW 2019 NO. 5382

CONSOLIDATED FOR CONVENIENCE ONLY

EXPLANATORY NOTE

Bylaw 2019 No. 5382 repeals the Corporation of the Township of Langley Subdivision and Development Servicing Bylaw 2011 No. 4861 and all amendments.

Amending Bylaw No. 5839 – adopted February 27, 2023

Bylaw No. 5839 amends Development Application Procedures Bylaw No. 5760, Subdivision and Development Servicing Bylaw 2019 No. 5382, and Development Permit Delegation Bylaw 2016 No. 5246 to streamline the development application review and approval process

Amending Bylaw No. 5803 – adopted April 15, 2024

Bylaw No. 5803 amends Subdivision and Development Servicing Bylaw 2019 No. 5382 by changing the service level designation from Level 4 – Rural to Level 1 – Urban of the properties located at 23699 and 23737 Fraser Highway to coincide with rezoning from rural to industrial.

Amending Bylaw No. 6076 – adopted December 2, 2024

Bylaw No. 6076 amends the Subdivision and Development Servicing Bylaw 2019 No. 5382 by updating required service standards for water meters, bollards, and stormwater infrastructure design criteria.

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THE CORPORATION OF THE TOWNSHIP OF LANGLEY
SUBDIVISION AND DEVELOPMENT SERVICING BYLAW 2019 NO. 5382

The Municipal Council of the Corporation of the Township of Langley, in Open Meeting Assembled, ENACTS AS FOLLOWS:

1. This Bylaw may be cited for all purposes as “Subdivision and Development Servicing Bylaw 2019 No. 5382”.

THE CORPORATION OF THE TOWNSHIP OF LANGLEY
SUBDIVISION AND DEVELOPMENT SERVICING BYLAW 2019 NO. 5382

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1.0 TITLE

This Bylaw may be cited as the "Subdivision and Development Servicing Bylaw 2019 No. 5382".

2.0 DEFINITION

In this Bylaw, unless the context otherwise requires, the following words and terms shall have the meanings hereinafter assigned to them:

Accepted Drawings	means drawings accepted for construction by the Municipal Engineer in accordance with Schedule B, Section DR6.3.
Approving Officer	means the officer so appointed by Council resolution according to the provisions of the Land Title Act.
Chief Inspector	means that person appointed as head of the Permit, License and Inspection Services Department or their representative.
Development	means a Subdivision or any construction for which a building permit is required.
Essential Services	means Municipal services including water, sanitary and storm sewer systems, lot grading, asphalt base construction, curb and gutter, sidewalk /walkway/trail construction up to and including base gravels and fencing around sensitive environmental sensitive areas.
Excess or Extended Services	means a portion of a Highway system that shall provide access to land other than the land being subdivided or developed; and a portion of a water, sewage or drainage system that shall serve land other than the land being subdivided or developed.
Hardscape	means the treatment of boulevard between the back of curb to property line with asphalt, concrete, stamped concrete and/or pavers.
Highway	means a street, road, lane, bridge, viaduct, equestrian or other trail, bicycle route and any other way open to public use.
Landscape Architect	means the Landscape Architect referred to in Section 5.1
Municipal Engineer	means the General Manager, Engineering or their representative.
Municipality	means the Corporation of the Township of Langley.
Official Community Plan	means the official community plan of the Municipality as adopted by Bylaw.

Owner	means an Owner as defined in the Community Charter.
Owner's Engineer	means the Professional Engineer referred to in Section 5.1
Parcel	means any lot, block or other area in which land is held or into which land is subdivided.
Works and Services	means any work, service or utility which is required by this Bylaw and includes without limitation works and facilities for the supply and distribution of water, collection and disposal of sewage, collection and disposal of storm water, street lighting, Highways, curbs, gutters, sidewalks, and medians, boulevards, boulevard crossings, boulevard landscaping, on-site landscaping, and the underground supply and distribution of electricity, gas, and other forms of energy, telephone, telecommunications, and cablevision.
Zone	means a zone in accordance with the Township of Langley Zoning Bylaw 1987 No. 2500, as amended from time to time. Residential Zone does not include Suburban Residential Zone or Multiple Family Residential Zone.

3.0 ADMINISTRATION

3.1 Authority

Except for Schedule I (Tree Protection), this Bylaw shall be administered by the Municipal Engineer who shall have overall authority over the provision, location, design and construction of all Works and Services and the Municipal Engineer may exercise all powers, duties and functions of the Council of the Municipality in respect of the bylaw excluding Schedule I (Tree Protection). With respect to Schedule I (Tree Protection), the Manager, Green Infrastructure Services shall have overall authority over the matters described in Schedule I (Tree Protection) and the Manager, Green Infrastructure Services may exercise all the powers, duties and functions of the Council of the Municipality in respect of Schedule I (Tree Protection).

3.2 Inspection

Employees of the Municipality are authorized to enter at all reasonable times upon any property or premises for inspection purposes in connection with their duties under this Bylaw and to verify that the provisions of this Bylaw are being observed.

3.3 Severability

The provisions of this Bylaw are severable. If any provision is for any reason held to be invalid by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining provisions of this Bylaw.

3.4 Prohibitions

No person shall undertake a Development or construct Works and Services for a Development contrary to the provisions of this Bylaw.

3.5 Offences and Penalties

Any person who contravenes any of the provisions of this Bylaw may be subject to fines specified in the Township's Bylaw for municipal tickets as authorized under Part 8, Division 3 of the Community Charter, S.B.C. 2003, Chap.26.

Any person who violates a provision of this Bylaw commits an offence punishable on summary conviction and shall be liable to a fine of not less than Two Thousand (\$2,000) Dollars and not more than Ten Thousand (\$10,000) Dollars for each day on which an offence exists or is continuing, together with such costs as a court of competent jurisdiction may order. For the purposes of enforcing any judgment of a court or collecting any fine levied hereunder, the provisions of the Offence Act, R.S.B.C. 1996 c. 338, as amended, shall apply.

Any person who contravenes any of the provisions of this Bylaw may have proceedings brought against them in Supreme Court to enforce, or prevent or restrain the contravention of any provision of this Bylaw.

Any development application contravening any of the provisions of this Bylaw may be denied, deferred, given further review or required to be amended by Council.

3.6 Fees

Administration Fees are based on the accepted construction estimate including landscaping, street trees, replacement trees, retained trees and environmental works and shall be paid in accordance with the following table:

<u>ADMINISTRATION FEE BREAKDOWN</u>	<u>INCREMENTAL CONSTRUCTION COST</u>	<u>ADMINISTRATION FEES %</u>
FIRST	100,000	5.50
NEXT	150,000	5.00
NEXT	250,000	4.50
NEXT	500,000	4.00
REMAINDER	1,000,000 and over	3.75

When the Municipal Inspector is required to attend the site to complete additional inspections related to Substantial Completion or Final Inspection for Civil and/or Landscape Works a re-inspection fee of \$200 will be charged to the Owner and will be required to be paid prior to scheduling the inspection.

3.7 Approving Officer – Minimum Frontage

Pursuant to Section 512 of the Local Government Act, Council's powers to exempt a Parcel from the statutory or bylaw minimum frontage are delegated to the Approving Officer.

4.0 RESPONSIBILITY FOR WORKS AND SERVICES

Except as set out in this Section, the Owner shall be responsible for undertaking all design, inspection, testing, construction and installation of Works and Services required under this Bylaw.

Unless otherwise specifically approved by the Municipal Engineer, the Municipality may directly retain consultants for the design and construction supervision of new, or modifications to existing, pump stations, pressure reducing valve stations, meter stations and reservoirs and directly retain consultants for the design and construction supervision of arterial roads, trunk water and sewer utilities and for municipal stormwater detention and infiltration facilities.

The Municipal Engineer shall determine whether the Owner, or the Municipality, shall undertake the design, construction and installation of Works and Services on existing municipal Highways.

The Municipal Engineer shall determine whether connection of new Works and Services to municipal systems and manipulation of valves or control of pumps on existing municipal systems shall be undertaken by the Owner or by others, and the Owner or the Owner's contractor shall not do such work unless the Municipal Engineer provides written permission.

The Municipal Engineer shall determine if service connections between individual Parcels and existing municipal mains shall require application and payment of connection fees in accordance with the bylaws regulating waterworks and sewers in the Municipality.

The Municipal Engineer shall determine whether traffic signage, street name signs, and pavement markings shall be undertaken by the Owner or by others.

The Owner is responsible for all costs of all work undertaken in connection with the Development and shall pay, on demand, all costs and charges for any work undertaken by the Municipality or otherwise connected with construction of Works and Services for the Development and all applicable municipal fees and charges.

5.0 DUTIES OF OWNER, OWNER'S ENGINEER AND LANDSCAPE ARCHITECT

5.1 Duties of Owner

The Owner shall retain, as the Owner's Engineer, a Professional Engineer registered in the Province of British Columbia and experienced in municipal engineering and land development, to undertake all investigation, design, inspection, testing, and record keeping for the Works and Services, except for landscaping, until a Certificate of Acceptance is issued by the Municipal Engineer.

The Owner shall retain, as the Owner's Landscape Architect, a Landscape Architect, registered in the Province of British Columbia and experienced in landscape architecture and land development, to undertake the design, inspection, testing, and record keeping of landscaping requirements under this Bylaw until a Certificate of Landscape Acceptance is issued by the Municipality, and plans for landscaping and street trees shall be signed and sealed by the Landscape Architect and submitted to the Municipality for acceptance.

If sub-consultants or others with specialist responsibility are employed on components of the Works and Services, the Owner's Engineer or the Landscape Architect, as appropriate, shall act as prime consultant to the Owner for coordinating and reviewing overall investigation, design, layout and inspection and test reports and communicating with the Municipality. Prior to commencing design of the Works and Services, the Owner must sign and submit a Commitment by Owner and Engineer and a Commitment by Owner and Landscape Architect which set out the minimum duties that the Owner's Engineer and Landscape Architect are to be hired to perform.

If the Owner's Engineer ceases to be retained for, or is unable to carry out, the described duties, the Owner shall immediately make the lands being subdivided, developed or affected by the work safe and all construction must cease until a new Commitment by Owner and Engineer has been delivered to the Municipal Engineer and he has authorized work to recommence.

If the Landscape Architect ceases to be retained for, or is unable to carry out, the described duties, all landscape work must cease until a new Commitment by Owner and Landscape Architect has been delivered to the Manager, Green Infrastructure Services and he has authorized work to recommence.

The Owner shall continue maintenance of the site, including drainage and erosion and sediment control, throughout any period during which either the Owner's Engineer or the Landscape Architect ceases to be retained for, or is unable to carry out, the described duties.

The Owner shall engage qualified contractor(s) to undertake the construction and maintenance of the Works and Services and may be required to provide a summary of the projects that the contractor(s) has/have completed that are similar in scope, nature and value to the Works and Services.

The Owner shall ensure the Owner's Engineer, Landscape Architect and all sub-consultants and specialist firms and all individuals assigned responsibility for

components of the Works and Services perform all work in accordance with this Bylaw.

The Owner shall ensure its contractor(s) perform all Works and Services in accordance with this Bylaw and the Accepted Drawings.

The Owner shall, upon request of the Municipal Engineer, provide the names and addresses of the Owner's Engineer, the Landscape Architect and all sub-consultants and others with specialist responsibility that are to be retained together with their qualifications and summary of projects they have completed that are similar in scope, nature and value to the Works and Services.

5.2 Duties of Owner's Engineer and Landscape Architect

The Owner's Engineer and the Landscape Architect shall sign the respective Commitments by Owner and Engineer and Owner and Landscape Architect and carry out the duties described therein and in accordance with this Bylaw.

The Owner's Engineer shall immediately notify the Municipal Engineer if they ceases to be retained, or is unable to carry out, the described duties before a Certificate of Acceptance has been issued.

The Landscape Architect shall immediately notify the Municipality if they ceases to be retained, or is unable to carry out, the described duties before a Certificate of Landscape Acceptance has been issued.

The Owner's Engineer and any sub-consultants shall carry professional liability insurance of not less than \$1,000,000 per claim during the term of their engagement and shall provide proof of such insurance to the Municipal Engineer before designs are submitted for approval.

Municipal review or acceptance of design drawings does not confirm the accuracy of the design. The Municipality shall not accept responsibility for any costs or damages incurred by the Owner due to errors, omissions, or deficiencies in the design.

Monitoring and inspection of construction by the Municipality does not relieve the Owner's Engineer or the Landscape Architect of the obligation to provide inspection services and to certify Record Drawings.

6.0 WORKS AND SERVICES REQUIRED

6.1 Provision and Standards of Works and Services

Required Works and Services shall be provided and located in compliance with this Bylaw and the Accepted Drawings. If a Development requires the installation of underground utilities adjacent to currently unserviced Parcels, the Owner shall advise owners of those Parcels by registered mail that connections may be made at their expense at the time of development. The notification shall be coordinated through the Municipality with all related costs borne by the Owner.

6.2 Highways

Highways required in connection with the subdivision of land shall be dedicated, aligned and located and have dimensions and gradients in accordance with highway plans adopted by Council or, where such plans do not prescribe requirements, in accordance with this Bylaw.

Where, in the opinion of the Municipal Engineer, required Works and Services cannot be accommodated within the minimum width of Highway required by this Bylaw they may be constructed within:

- a) an additional width of dedicated Highway to the satisfaction of the Municipal Engineer; or
- b) a statutory right-of-way area to the satisfaction of the Municipal Engineer pursuant to a statutory right-of-way agreement in form and substance acceptable to the Municipal Engineer

6.3 Works and Services within Subdivisions

An Owner shall provide Works and Services to every Parcel within a Subdivision. Where underground wiring is required by the Municipal Engineer, separate ducts shall be provided for such services including electrical, gas and other forms of energy, telecommunications, telephone and cablevision services.

Except where, in the opinion of the Municipal Engineer, Works and Services may never need to be extended to serve land beyond the Subdivision, they shall be extended across the full width of each Parcel and to the boundaries of the subdivision. The Municipal Engineer may waive this requirement where it would require Works and Services to be extended across land designated on a subdivision plan as the remainder of a Parcel being subdivided provided the Owner grants a statutory right-of-way, to the acceptance of the Municipality's solicitor, and provides preliminary designs for the future provision of Works and Services all to the satisfaction of the Municipal Engineer. Section 6.3 does not apply to a Subdivision under the Strata Property Act

6.4 Water, Sewer and Drainage

Water distribution, sewage and drainage collection, conveyance and disposal systems installed in Subdivisions, including Subdivisions under the Strata Title Act, must be connected to the systems operated by the Municipality and designed, aligned, located, and constructed in accordance with plans adopted by Council or, where such plans do not prescribe requirements, in accordance with this Bylaw.

Water and sanitary and storm sewer service connections shall be installed to each Parcel. Installation of service connections for Developments other than in Residential Zones may be deferred until the issue of a building permit subject to the approval of the Municipal Engineer.

Where it is not practical to locate pump stations, reservoirs, pressure reducing valve stations, detention ponds or other municipal facilities within a Highway, the Owner shall provide and convey to the Municipality a Parcel of land in a location, and of sufficient size, that is, in the opinion of the Municipal Engineer, adequate for their construction, operation, and maintenance including any landscaping required.

Notwithstanding Section 6.3, each Parcel created in areas as specifically provided for in Schedule A (Minimum Service Level Standards) of this Bylaw, shall have a proven source of potable groundwater, the quantity, quality, inspection and certification of which shall conform to the requirement of Schedule B (Design Criteria) Section W20 - Private Wells. This requirement does not apply to a Parcel that is greater than 5 ha on which no residence is to be constructed providing the Owner registers a covenant in favour of the Municipality prohibiting construction of a building until the requirements of Schedule B (Design Criteria) Section W20 - Private Wells have been fulfilled to the satisfaction of the Chief Inspector.

Notwithstanding Section 6.3, where no municipal sanitary system exists, a subdivision may be approved if an Authorized Person pursuant to the Sewerage System Regulation of the Health Act certifies that separate sewerage systems in accordance with that Regulation and suitable for the land use permitted under the Zoning Bylaw, can be constructed for each Parcel in the proposed subdivision. A sewerage system must be contained entirely within the Parcel it serves, except with the approval of the Municipal Engineer.

6.5 Works and Services on Highways and on Building Sites

Owners may be required, as a condition of Development, to provide Works and Services on that portion of a Highway immediately adjacent to the site being developed, up to the centreline of the Highway.

Owners may be required, as a condition of building permit issuance, to provide Works and Services on the site being developed.

Council's powers, duties, and functions in respect to this Section are hereby delegated to the Municipal Engineer.

6.6 Rights-of-Way and Easements

Water distribution and sewage and drainage collection systems shall be installed within Highways unless that is not technically possible in which case they must be located within statutory rights-of-way in accordance with Schedule B (Design Criteria).

Every Parcel shall be accessed directly by a driveway from a public road to the Parcel frontage in accordance with Schedule B (Design Criteria). Every Parcel that is required to be provided with water and/or sewer services shall be connected at the Parcel frontage or at its boundary with a statutory right-of-way. Where it is not technically possible to access or serve a Parcel in this way and if it is acceptable to the Municipal Engineer, the Owner shall grant, or acquire, easements for such purposes in favour of the benefiting Parcel. The Owner shall covenant with the Municipality, in a form acceptable to the Municipality's solicitor, that the easement shall not be altered or discharged without the approval of the Municipality.

Rights-of-way and easement documents shall be deposited and registered in the Land Title Office before the Subdivision plan is signed or the building permit issued. Alternatively, the Owner may provide a solicitor's undertaking, satisfactory to the Municipality's solicitor, that the Subdivision plan and rights-of-way or easement documents shall all be deposited in the sequence required by the Municipality's solicitor and that, if that is not possible, the Subdivision plan shall be immediately returned directly to the Approving Officer.

The Owner shall pay all costs incurred in the preparation and registration of rights-of-way and easements and other legal documents associated with the Development whether prepared by the Owner or by the Municipality on the Owner's behalf.

If Works and Services required in accordance with this Bylaw shall cross an established easement or other right-of-way, the Owner shall, at his own expense before permission to proceed with construction is granted, obtain any amendments necessary to permit the construction, reconstruction, inspection, operation, repair, maintenance and use of the Works and Services under conditions acceptable to the Municipal Engineer.

6.7 Waiver of Servicing Requirements

The servicing requirements of this Bylaw may be waived by the Municipal Engineer:

- a) for Parcels created solely for the installation and operation of unattended equipment to be used for public works, utilities, communications, energy or similar purposes and on which no workshop, office or similar use or a dwelling shall be provided and where the Owner, unless it is the Municipality, shall enter into a covenant satisfactory to the Approving Officer prohibiting the Parcel being used for any other purpose without the approval of the Municipality;
- b) for applications consisting of lot line adjustments or consolidation and re-subdivision without an increase in either the total number of Parcels or the

number of Parcels that may be built on in accordance with the Zoning Bylaw.

7.0 COMMENCEMENT OF WORK

Except as necessary to construct ESC Facilities in accordance with Erosion and Sediment Control Bylaw 2006 No. 4381, as amended, and tree protection fencing in accordance with this Bylaw, no land clearing, stripping of top soil, excavation, placement of fill, construction or installation of any kind may be undertaken on a Subdivision site until Permission to Construct has been issued by the Municipal Engineer in accordance with the requirements of Schedule C (Construction Requirements and Specifications).

If Works and Services are installed without Municipal Approval, they shall not be connected to the Municipality's systems and the Municipality shall not accept them until:

- a) the Works and Services have been certified by the Owner's Engineer as designed and constructed in substantial compliance with this Bylaw;
- b) certified Record Drawings and Service Location Cards have been received and accepted;
- c) the Municipality has inspected the Works and Services and notified the Owner in writing that no apparent construction deficiencies have been discovered;
- d) the Owner has made application for tie-ins to Municipal systems; and
- e) the Owner has entered into an agreement with the Municipality, in which he covenants and agrees to:
 - i) maintain all of the said Works and Services in complete repair for a period of five years;
 - ii) remedy any defects which develop during the maintenance period and pay to the Municipality any costs resulting from damage to other works or property resulting from such defects;
 - iii) pay a maintenance deposit of 20% of the Municipal Engineer's estimated construction cost which security shall remain on deposit with the Municipality for five years;
 - iv) pay to the Municipality all fees related to a Development and legal costs incurred by the Municipality in accepting such Works and Services; and
 - v) provide all legal documentation to the acceptance of the Municipal Engineer.

8.0 COMPLETION OF THE WORKS AND SERVICES

8.1 Servicing Agreements and Security

All Works and Services required to be constructed and installed at the expense of the Owner shall be constructed and installed to the standards established in this Bylaw before the Approving Officer approves the subdivision plan or the Chief Inspector issues the building permit unless the Owner:

- a) enters into a Servicing Agreement with the Municipality to construct and install the required Works and Services by a specified date or forfeit to the Municipality the amount secured; and
- b) deposits with the Municipality a security deposit of cash, or a clean irrevocable letter of credit from a financial institution, acceptable to the Municipality for installing and paying for all Works and Services required under this Bylaw.

The amount of deposit required under Section 8.1(a) shall be 150% of the cost unless design drawings for all required Works and Services have been accepted for construction by the Municipal Engineer in which case the deposit shall be 100% of the cost. The cost for purposes of this Section shall be the construction cost including engineering, inspection, testing, and installation of the Works and Services and all taxes as estimated by the Owner's Engineer and accepted by the Municipal Engineer.

8.2 Cash in Lieu of Construction

If the construction of part or all of the Works and Services required under this Bylaw is considered by the Municipal Engineer to be premature, the requirement may be fulfilled by a non refundable cash payment equal to 120% of the amount estimated by the Owner's Engineer, and accepted by the Municipal Engineer, to cover the cost of the required Works and Services. This payment shall be used by the Municipality when construction of the Works and Services becomes feasible. In addition, the Owner shall pay an administration fee related to the Development based on the estimated cost in accordance with Section 3.6 of this Bylaw. Payment is required to be paid before the Approving Officer approves the subdivision plan or the Chief Inspector issues the building permit.

9.0 MINIMUM SERVICE LEVEL STANDARDS

Different minimum levels of service shall be provided in different areas of the Municipality in accordance with Schedule A (Minimum Service Level Standards).

Where, in the opinion of the Municipal Engineer, the application of Schedule A (Minimum Service Level Standards) is inappropriate within the context of existing municipal services in the area, they may modify the level of service.

10.0 UPSIZING AND EXTENDING WORKS AND SERVICES

The Municipal Engineer may require the Owner to provide Excess or Extended Services to provide access to, or service, land other than the Development. If the Municipal Engineer considers that the cost to the Municipality to provide all or any part of the Excess or Extended Services to be excessive then the Owner must pay those costs and the Municipality shall enter into an agreement with the Owner under Section 507 of the Local Government Act.

11.0 BYLAW SCHEDULES

The following Schedules are attached to and form part of this Bylaw:

- Schedule A: Minimum Service Level Standards
- Schedule B: Design Criteria
- Schedule C: Construction Requirements and Specifications
- Schedule D: Approved Materials and Products
- Schedule E: Accepted Street Trees and Plants Not Accepted for Use
- Schedule F: Servicing Agreement
- Schedule G: Standard Forms
- Schedule H: Supplementary Detail Drawings
- Schedule I: Tree Protection

12.0 REPEAL

Township of Langley Subdivision and Development Servicing Bylaw 2011 No. 4861 and all amendments is hereby repealed.

READ A FIRST TIME the	08	day of	July	, 2019
READ A SECOND TIME the	08	day of	July	, 2019
READ A THIRD TIME the	08	day of	July	, 2019
RECONSIDERED AND ADOPTED the	22	day of	July	, 2019

<u> 'JACK FROESE' </u>	Mayor	<u> 'WENDY BAUER' </u>	Township Clerk

TOWNSHIP OF LANGLEY

SUBDIVISION AND DEVELOPMENT SERVICING BYLAW

SCHEDULE A

MINIMUM SERVICE LEVEL STANDARDS

MINIMUM SERVICE LEVEL STANDARDS

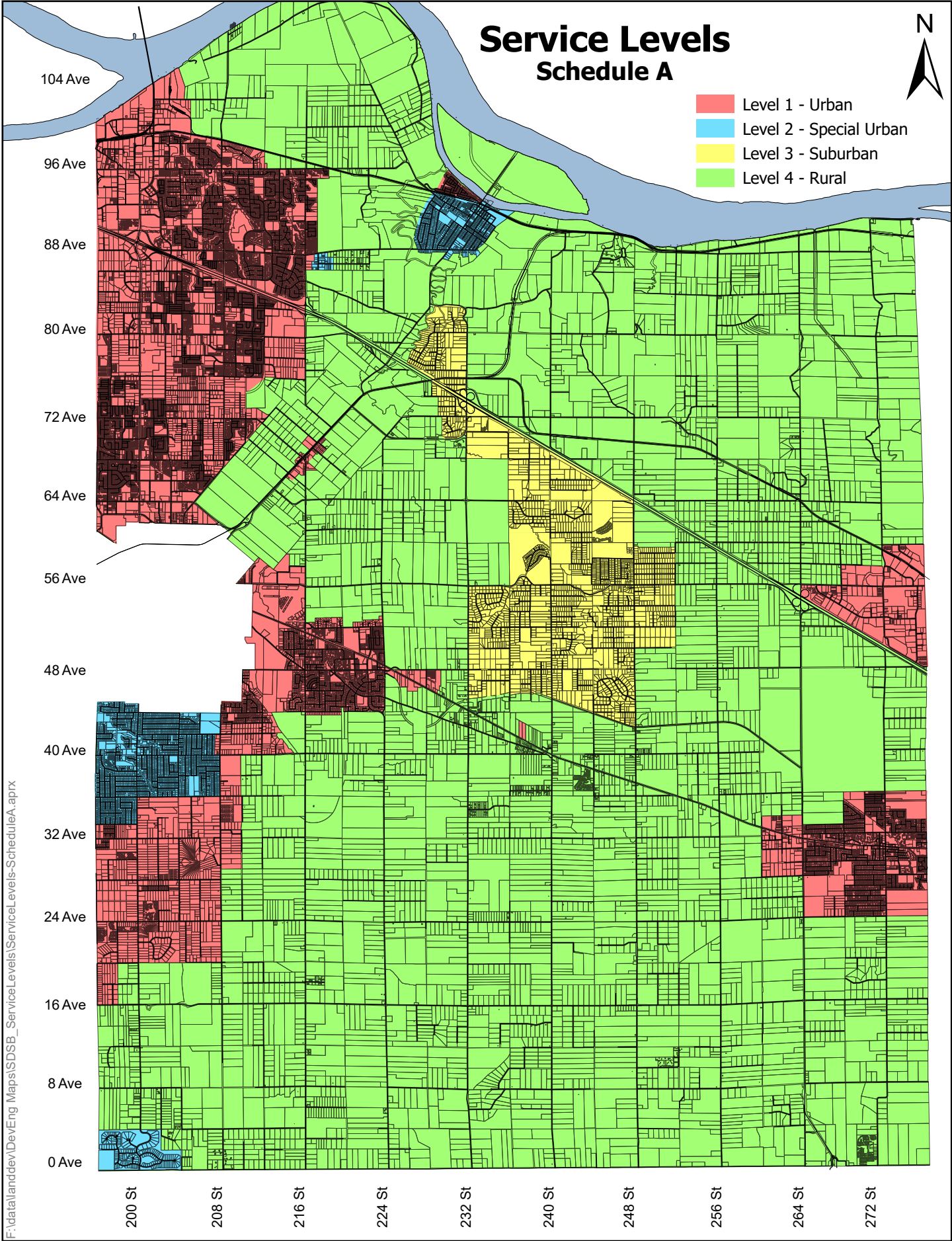
Schedule “A” of the Subdivision and Development Servicing Bylaw

Service	Standard	Service Level Area			
		1 Urban	2 Special Urban	3 Suburban	4 Rural
Highways Facilities	Urban Road Standards	.	.		
	Rural Road Standards		.	.	.
Water Systems	Private Well				.
	Municipal Water System	.	.	.	
Sanitary Sewerage	On-site Private Systems		• (3)	• (3)	• (3)
	Municipal Sewer System	.	• (2)		
Drainage Systems	Infiltration Systems	• (1)	• (1)	.	
	Open Channel System			.	.
	Storm Sewer System	.	.	.	
Hydro & Telecommunication (fiber optic)*	Overhead Systems	(4)	.	.	.
	Underground Systems	.	• (2)		
Street Lighting	Pole-Mounted		.	.	.
	Ornamental	.	• (2)		
Landscaping & Trees	Street Trees	.	.		
	Boulevard Landscaping	.	.		

* Fiber Optic duct to be installed at the discretion of the Municipal Engineer.

- (1) Infiltration systems shall be in accordance with an applicable master drainage plan, neighbourhood servicing plan or stormwater management plan. If there is no plan, infiltration facilities to be in accordance with Schedule B Section D10 “On-site Infiltration and Detention”.
- (2) Special Urban Area located in the southwest area, south of 4 Avenue and west of 204 Street, to be serviced with Municipal Sewer System, underground hydro, telephone and cablevision, ornamental street lighting and street trees. Special Urban Area located south of 88 Avenue and east of 216 Street shall be serviced with a Municipal Sewer System
- (3) On-site private sewerage system may be required to upgrade conventional septic systems to include nitrate removal in accordance with Schedule B – On-site System Requirements Figure S1, Schedule B or connect to a Municipal sewer system.
- (4) Overhead distribution permitted only in Heavy Industrial Area of Northwest Langley (see Supplementary Drawing TLG 05 for details)

Note: Municipal Water System is defined as a water system owned, operated and maintained by the Municipality.



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TOWNSHIP OF LANGLEY

SUBDIVISION AND DEVELOPMENT SERVICING BYLAW

SCHEDULE B

DESIGN CRITERIA

SCHEDULE B

DESIGN CRITERIA

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DESIGN CRITERIA

SECTION DR - Design and Record Document Submission

For Table of Contents, refer to beginning of Schedule B

SECTION DR - DESIGN AND RECORD DOCUMENT SUBMISSION

DR1 GENERAL

Design and record documents for Works and Services provided in connection with a Development shall be submitted in accordance with these requirements after favourable review of the proposal by the Community Development Division and all required application fees have been paid.

Incomplete or substandard submissions shall be returned to the Owner's Engineer or Landscape Architect without detailed review but with a short letter of explanation.

Municipal review of calculations and drawings is procedural only and does not confirm the accuracy or appropriateness of the design. The Owner's Engineer shall be fully responsible for the accuracy and suitability of the design and for its conformity to the Bylaw. Any design errors, omissions or deficiencies, whensoever discovered, shall be rectified to the satisfaction of the Municipal Engineer at the cost of the Owner, and the Municipality shall not be held liable for any such costs.

DR2 SURVEY INFORMATION

All coordinates and elevations shall reflect the latest coordinate refresh published by the Province of BC using the NAD83 (CSRS) 4.0.0.BC.1.GVRD horizontal datum and CVD28GVRD2018 vertical datum.

Plans are to show the following references: "Coordinates are UTM NAD83(CSRS) – 4.0.0.BC.1.GVRD converted to ground-level using a combined scale factor of 0.#####" and "Elevations are in metres and refer to CVD28GVRD2018 – Geodetic datum. Elevations are tied to GCM No. ##### (elev. ###.###)."

Permanent benchmarks and/or survey monuments used for elevation derivation must be noted on all plans. Temporary benchmarks are not acceptable.

Copies of legible field notes shall be made available to the Municipal Engineer upon request.

All existing items such as monuments, manholes, catchbasins, fire hydrants, poles, existing dwellings, BC Transit bus stops, fences, trees, hedges and unusual ground shall be noted.

Cross sections, as required, shall include centreline, edge of pavement or gutter line, edge of shoulder, ditch invert, top of ditch, property line, and existing ground elevation a minimum of 5.0m inside property line.

Generally, chainage shall increase from left to right and from bottom to top on a drawing.

DR3 PRELIMINARY REVIEW

Prior to the preparation of detailed construction drawings, the Owner's Engineer shall submit a conceptual Stormwater Control Plan, if required, in accordance with Schedule B, Section D2. The plan shall include a report by the Owner's Engineer describing in detail how the proposed Subdivision shall impact the fronting and downstream drainage system and how the proposed major and minor drainage systems meet the requirements of this Schedule. If a master drainage plan or neighbourhood servicing plan is not available, the report shall include an Engineer's analysis of the impact of the proposed Subdivision on existing flood-prone areas in the watershed.

The Owner's Engineer or Landscape Architect may be required to attend a pre-design meeting for a review of the preliminary design and to ensure compliance with current municipal standards, specifications and policies.

These requirements may be waived for subdivisions only requiring service connections for individual Parcels to existing municipal systems having adequate capacity, and may, at the discretion of the Municipal Engineer, be reduced in scope in other circumstances.

DR4 DESIGN SUBMISSIONS

First submission consists of design drawings, the Commitment by Owner and Engineer (Form F9) and the Commitment by Owner and Landscape Architect (Form F10) shall be submitted.

All design calculations and drawings, except for street lighting and landscaping plans, shall be signed and sealed by the Owner's Engineer. Street lighting calculations and plans shall be signed and sealed by a professional engineer experienced in street light calculations. All landscaping plans shall be signed and sealed by the Owner's Landscape Architect.

A Professional Engineer's or Landscape Architect's seal and signature on the design drawings shall certify that all works or landscaping shown on the drawings are appropriate for their intended use, comply with the requirements of the Subdivision and Development Servicing Bylaw, and are in accordance with good engineering or landscape architectural practice. Any exceptions shall be noted and explanatory documentation provided.

The Owner's Engineer shall obtain approvals from all other agencies as necessary and submit them to the Municipal Engineer before the design drawings can be accepted for approval. If an agency requires an application to be made by the Municipality, the Owner's Engineer shall supply the Municipality with the necessary drawings and any other supporting information for the application.

The Owner's Engineer shall:

- arrange for the coordination of the design, location and/or relocation of non-municipal utilities with the appropriate utility companies
- ensure non-municipal utility works are compatible with Municipal Requirements
- submit all drawings to the Municipal Engineer for review

The Municipal Engineer's acceptance of design submissions is only valid until the expiry date of the decision letter issued by the Approving Officer in connection with an application for a Subdivision or the expiry date of a Building Permit unless a Servicing Agreement has already been executed or Permission to Construct has already been issued. Re-submission shall be required for expired plans.

All requests for variations to the Accepted Drawings shall be made in writing by the Owner's Engineer or Landscape Architect and may be required to include a signed and sealed revision to the previously Accepted Drawings. All variations shall require the written approval of the Municipality.

DR5 STANDARDS AND CONTENT

All design drawings shall include the Municipality's standard title block, the Owner and Owner's Engineer, or Landscape Architect, company names, addresses, telephone numbers and e-mail address, the legal description of the lands being developed and, in the lower right hand corner, the Municipal Project Number.

Drawings shall be computer generated and shall clearly identify the works in sufficient detail.

All new works are to be drafted in bold lines. Font type and size and line thicknesses shall conform to the requirements of the Township of Langley's Geomatics Service Department. For further information, contact the Geomatics Service Department at geomatics@tol.ca.

Notes pertaining to construction and landscaping are to be shown on the relevant drawing.

A baseline referenced to legal lot lines shall be shown on each sheet. Chainages are to be shown on profile in even 20 m intervals. Offsets are to be shown to both sides of the road allowance or to one side with the road allowance width annotated.

All existing structures, including houses, sheds, fences, wells, septic tanks and fields, shall be shown on the appropriate drawings, with a notation indicating whether they are to be retained, removed, filled or otherwise modified.

Plans shall include a north arrow and show existing property lines, legal descriptions (lots and plan numbers) and dimensions (to the nearest 0.01 m), and show existing house numbers and all registered statutory rights-of-way, easements and covenant areas.

Alternatives to the scales required in the following sections may be accepted where the Municipality considers them to be appropriate.

A complete set of engineering design submissions shall include, in the following sequence:

DR5.1 Cover Sheet

In addition to DR5, the cover sheet shall include a site plan at 1:5000 scale showing the proposed subdivision layout and road names and a complete list of drawings. Erosion & Sediment Control Plans are a separate drawing submission.

DR5.2 Key Plan

The key plan shall be at a 1:500 scale and shall note all existing and proposed services, including street lighting, retained trees and all non-standard connection offsets. If more than one sheet is required, the westerly or southerly portion shall be noted first and identified as Key Plan "A" with additional plans noting "B" and "C", etc. The Development site is to be outlined with a bold line.

If a profile drawing is not required for a utility, then the service connection depths and inverts are to be noted on the Key Plan.

Each of the following that requires more than one sheet shall identify each sheet in accordance with the key plan system.

DR5.3 Stormwater Control Plan

The Stormwater Control Plan shall consist of a stormwater model report and calculations if the runoff hydrograph method is used, and drawings at a scale of 1:2500 or 1:5000 showing, but not be limited to:

- major and minor system catchment boundaries, number and area (ha)
- existing contours at 1 m intervals
- existing storm sewers and manholes
- proposed storm sewers and manholes
- future storm sewers
- detention pond(s) and, for each design event specified in this document, the pre and post-developments flows at the detention pond outlet, and the required pond volumes. If the proposed Subdivision flows into an existing detention pond, that shall be indicated in the report and on the plan
- accumulated major flows for each section with provision for upstream Development potential where applicable
- arrows identifying the positions of the major flow hydraulic grade lines within the Development as follows:
 - above ground (solid flow arrow)
 - surcharged (hatched flow arrow)
 - below ground (hollow flow arrow)
 - surface runoff arrows

DR5.4 Road and Water

Plan and profile drawings shall be at 1:500 horizontal and 1:50 vertical scales.

Plans shall show centreline of existing road and location of proposed or retained curbs and catchbasins, centreline and curb return radii, elevations at beginning, end and quarter points of curb returns, wheelchair letdowns, bus stops, trees, fences, retaining walls, etc. and the locations, offsets, curvatures, size and identification of watermains together with all bends, valves, hydrants and other appurtenances. Watermain fittings for each location are to be listed in a box on the plan and tied to chainage.

Profiles shall show existing and proposed road centreline profiles and profiles at property lines, full watermain diameter together with fittings and crossover points with sewers tied to chainage and note crossover clearances and all pipe and fittings materials.

Typical road cross sections are to be shown on each sheet.

In rural subdivisions with an open ditch drainage system, the size of future driveway culverts shall be sized to accommodate the 100 year flow.

DR5.5 Storm and Sanitary Sewers

Plan and profile drawings, at 1:500 horizontal and 1:50 vertical scales, shall show all pipelines, manholes, catchbasins and other appurtenances.

Plans shall show the locations, offsets, curvatures, size and identification of storm and sanitary sewers and note connection inverts and depth at property line and minimum building elevation (MBE) for each lot.

Profiles shall show ground profiles at centreline and at property lines, full pipe diameters, minor and major system hydraulic grade lines and symbols denoting service connection elevations at property line and shall note pipe diameters and materials, grades, inverts and all rim elevations. Crossover points with watermains tied to chainage and note crossover clearance.

DR5.6 Stormwater Management/Lot Grading Plan

The lot grading plan shall be scaled 1:500 and shall show, but not be limited to, the following:

- catchment boundaries with number and area (ha)
- existing storm sewers and manholes
- proposed storm sewers and manholes (bold)
- detention pond(s)
- pre-development contours at maximum 1 m intervals extending a minimum of 20 m beyond the Development site
- accumulated major and minor flows and pipe capacity for each section between manholes with provision for upstream Development potential where applicable

- arrows identifying the positions of the major flow hydraulic grade lines within the Development as follows:
 - above ground (solid flow arrow)
 - surcharged (hatched flow arrow)
 - below ground (hollow flow arrow)
- overland flow drainage arrows illustrating existing flows to and from site
- tabular calculations on Table D1
- existing elevations at all property line(s) (uncircled)
- proposed elevations at all property line(s) (circled)
- fill over 0.45 m (shaded)
- fill over 1 m (hatched)
- surface flow direction on each lot, noting minimum 2% grade
- overland flow arrow from neighbouring lots
- lawn basin, leads and rim elevations
- swales to be provided at time of subdivision development
- swales to be provided at time of building construction
- catchbasin and rim elevations
- on-site infiltration system
- storm sewer invert elevation at property line for all lots
- minimum building elevation (MBE) for each lot and include MBE definition
- retained trees.

DR5.7 Road Cross Sections

Road cross sections shall be at 1:100 horizontal and 1:50 vertical scales and show the elevations of existing ground and proposed road centreline, curb and gutter (or road edge) and property lines and show entire back slopes to meet final lot grading. Cross-sections are required at a maximum of 20 m intervals. Additional sections may be required where excessive cuts or fills are involved.

DR5.8 Street Lighting, Road Marking and Signage Plan

Separate street lighting and road marking and signage plans shall be at a scale of 1:500 and include:

- luminaire wattage, distribution type and voltage
- the calculated maintained average luminance level, average to minimum uniformity ratio and veiling luminance
- a table listing sign type and quantity in accordance with TAC MUTCD and length of each type of marking
- complete list of materials to be supplied by the Municipality.

If decorative lighting is to be used in accordance with SL6, plans shall be accompanied by:

- signed and sealed photometric calculations together with the make and model of luminaire proposed
- shop drawings (in digital format) of light poles with pole design criteria sealed by a Professional Engineer. Pole shall be designed to AASHTO 2000 with a wind pressure of 560 Pascals

- detailed product sheets, information and specifications of the luminaires and lamps proposed. All luminaire ballasts shall be CWA or CWI
- detailed product sheets and information on pole accessories (banner arms, receptacles, decorative castings etc.)

DR5.9 Landscape Lighting

Electrical outlets suitable for decorative tree lighting may be required at each tree planted in boulevards and medians in commercial areas. Such outlets shall be connected to the street lighting system. Street lighting poles should be designed to accommodate banner and hanging basket arms, as well as pedestrian scale luminaires as necessary along street side greenways.

DR5.10 Traffic Signals

Traffic signal plans shall consist of two sheets.

Sheet 1 shall be at a scale of 1:250 and show:

- lane markings
- signal phasing diagram
- wiring/cable color code
- Hydro service location
- controller location
- service panel location
- proposed and future works
- wiring details for each pole and conduit run
- legend
- general notes

Sheet 2 shall include:

- pole and base details
- signal and pedestrian head details
- materials required per pole and product list
- street light shown on traffic poles

DR5.11 Landscaping Plan

Street tree and greenway plans shall be at a scale of 1:500 and boulevard planting and trail and fence layout plans shall be at a scale of 1:250. The plans shall show:

- individual trees and shrubs with the correct botanical name, and proposed spacing
- ground cover, which may be shown en masse, with botanical names and spacing's
- a complete plant list indicating the plant quantities, botanical names, common names, size, spacing and include proposed area totals for the planted area and lawn sections
- existing and proposed ground elevations at property lines
- lawn basin and catchbasin rim elevations

- walkway pavement elevations and layout
- swales with flow direction noted
- vehicle restriction, greenway related signage, street furniture, retaining walls, special paving treatment
- special features within greenway
- retained trees
- standard notes

DR5.12 Construction Details

Construction details shall be in accordance with the Municipality or MMCD Standard Detail Drawings and the appropriate drawing number shall be referenced on the design drawings. If there is no appropriate standard drawing for a specific detail, a detail drawing shall be provided by the Owner's Engineer.

DR5.13 Standard Note Sheet

A copy of the Municipality's Standard Note Sheet is to be included, without any changes, as the last page of all submissions.

DR6 SUBMISSION SETS

DR6.1 First Submission

The first complete design submission shall consist of:

- four complete sets of civil and landscape drawings
- five additional key plans
- one additional lot grading plan
- one additional street lighting plan (complete with road marking and signage, if applicable) with accompanying photometrics
- two additional sets of traffic signal drawings if applicable
- three additional sets of landscaping plans, if required
- two additional sets of water system drawings including a key plan with each set (for Ministry of Health approval)
- one additional set of sanitary drawings including a key plan (for GVS&DD approval) together with a completed application to extend sewerage systems, to the appropriate governing agency
- soils report to verify road structure design and adequacy of existing pavement (soils reports are required on all new road construction design)
- all applicable utility calculations signed and sealed by Owner's Engineer (water, sanitary, storm sewer)
- latecomer submission if applicable and prepared by this stage

DR6.2 Submission Revisions

All items highlighted by the Municipality shall be addressed by the Owner's Engineer or Landscape Architect and failure to do so may result in rejection of the revised submission. Revised design submissions shall:

- include two complete sets of drawings (civil/landscaping)

- include previous drawing submission with comments from the Municipality
- include a complete construction estimate, signed and sealed by the Owner's Engineer or Landscape Architect
- have highlighted in yellow any changes made by the Owner's Engineer or Landscape Architect which are in addition to changes required by the Municipality
- include a revision to the latecomer's submission, if applicable

DR6.3 Final Submission

The final submission for the Municipality acceptance shall consist of:

- five complete sets of civil and landscape drawings, signed and sealed by the Owner's Engineer or Landscape Architect
- one .pdf version of complete sets of civil and landscape drawings
- three complete sets of civil/landscape drawings reduced to 11" by 17"
- six additional key plans
- one additional set of lot grading plans
- one additional set of street lighting plans (complete with road markings and signage, if applicable)
- one additional set of traffic signal drawings, if applicable
- four additional sets of landscaping plans to be submitted to the Green Infrastructure Services Department, if required
- final latecomer submission, if applicable

When satisfied with the final design submission, the Municipality shall stamp one set of drawings as accepted for construction (the Accepted Drawings) and return it to the Owner's Engineer or Landscape Architect.

DR7 CIVIL AND LANDSCAPING COST ESTIMATE

The Owner's Engineer and Landscape Architect shall submit a digital and hard copy of the cost estimates for provision of Works and Services detailed in accordance with the requirements of the Municipality. Cost estimates are subject to revision by, and acceptance of, the Municipality.

All hydro and telecommunication (including fiber optic ducts, as required) installation costs are to be bonded, and are to be included in the calculation of the Administration fee.

DR8 SERVICE RECORD CARDS

Service Record Cards are to indicate clearly and accurately the location, size, etc., of each municipal utility connection. The Municipal Project Number shall be required on all cards, but the roll number may be left blank. Service Record Cards are considered part of the Record Document submission.

DR9 RECORD DOCUMENTS

Record documents shall be prepared and submitted in accordance with MMCD 01 721.1.7 and this Section.

The Owner's Engineer shall submit two complete sets of paper prints, except for the road cross-section sheets, a complete set of connection cards and operations and maintenance manuals required in accordance with Schedule B, Section D9.6 for Municipal review.

The Owner's Engineer shall revise the record drawings and operations and maintenance manuals in accordance with the marked-up set of copies returned by the Municipality and may be required to resubmit operations and maintenance manuals and two paper prints of record drawings for review.

1. Record drawings shall be presented as follows:
 - a) Key Plan showing water, sanitary and storm mains, street lights, roadworks, bench marks and monuments. The plan shall show the as-constructed offsets for those works and the locations of all service connections relative to the lot lines.
 - b) Detailed plan/profile drawings for water, sanitary, storm and roadworks. Elevations, inverts and offsets to show the works as constructed. The profile drawings for the utilities shall state the pipe materials used and make and model of all water valves and make and model of all hydrants shall be noted on the water drawing.
 - c) Detention pond drawings complete with details of the control structure, and a table of water level, flow and volume information for the required design events.
 - d) Lot grading plans including the elevations at all lot corner pins, lawn basin and catchbasin rim elevations and swales. Grades between lot corners and control points shall be uniform unless indicated otherwise on the plan (to a tolerance of ± 100 mm).
 - e) Street light drawings showing make, model and type of luminaire unit and locations of service bases and photocells.
 - f) Plans of details for which there is no standard provided in this Bylaw.
 - g) Instructions to the contractor are to be removed or amended to indicate the results of construction. Previously existing works that have been removed or reconstructed shall be removed or amended to show works as constructed.
 - h) Record Drawings shall be submitted together with service connection cards as shown in Supplemental Standard Drawing TLG 02.

2. When the Municipal Engineer is satisfied with the record drawings and Operations and Maintenance Manuals, the Owner's Engineer shall submit the following:
 - a) A pdf version of civil and landscape drawings sign and sealed in accordance with
 - APEGBC requirements, or
 - a direct scan of drawings
 - b) Two sets of paper prints identified in bold letters with the words "CERTIFIED RECORD DRAWINGS" with the following certification:

"I certify this drawing reasonably represents the works and services as installed, and were installed with sufficient field reviews to ascertain that the work substantially complied in all material respects with the accepted design drawings and the Township of Langley Subdivision and Development Servicing Bylaw."

The signature and seal shall be those of the Engineer who personally performed or personally supervised the required inspections. One set shall be returned to the Owner's Engineer upon acceptance by the Municipal Engineer. The Municipal File Number must be added to each drawing.

- c) One set of drawings in AutoCAD or DXF format, identified in bold letters with the words "CERTIFIED RECORD DRAWINGS", to the acceptance of the Municipal Engineer. The Municipal File Number must be added to each drawing. Drawing files are required to:
 - i) be opened using an unaltered copy of AutoCAD (no third party entities, fonts etc.)
 - ii) be plotted by using extents and a fit scale (or noted scale on the appropriate paper size).
- d) One full size scaleable pdf version of full civil and landscape drawings.
- e) One copy of the "Certificate of Field Reviews" (Schedule G, Form F1) signed by the Owner's Engineer.
- f) Three paper copies of operations and maintenance manuals, plus one digital in pdf format.

For a building permit, the Owner's Engineer shall provide 2 sets of on-site servicing and lot grading as-built drawings upon completion of the works and services at the request of the Municipal Engineer. Pertinent information shall include service connection sizes and locations, driveway widths, light standard locations, and a lot grading plan including MBEs.

The same procedure shall be followed for landscape plans which shall include the make and model of street furniture, sign locations and vehicle restrictions, tree locations and surface treatments and a plant list of materials used, and for operations and maintenance manuals required in accordance with Schedule B, Section L3.9. The Landscape Architect shall be responsible for submitting, revising and certifying landscape plans.

When record documentation has been accepted by the Municipality, the Community Development Division shall authorize a reduction of the security deposit.

DESIGN CRITERIA

SECTION D - Drainage

For Table of Contents, refer to beginning of Schedule B

SECTION D - DRAINAGE

D1 INTRODUCTION

Stormwater collection and disposal systems shall be designed in accordance with any applicable neighbourhood servicing plan or master drainage plan that has been adopted by the Municipality and conform to applicable federal and provincial statutes including, but not limited to, the Fisheries Act and Water Act. In addition, subdivision and development sites shall provide on-site stormwater infiltration systems to replicate pre-development infiltration conditions.

Where the Municipality has not finalized a master drainage plan or where works recommended in such a Plan have not been completed, the Owner shall complete all works necessary to service the Development together with interim stormwater management measures as required by the Municipal Engineer to protect against downstream surcharge, flooding and erosion. Interim detention shall not be permitted unless the Municipality or Owner has secured the land necessary for a permanent detention facility.

No Development shall be allowed to change natural catchment boundaries.

D2 STORMWATER CONTROL PLANS

A stormwater control plan as detailed in Schedule B, Section DR5.3 shall be provided for all Subdivisions except those in Service Level 4.

The Owner's Engineer shall be responsible for obtaining true and accurate surface elevations for preparation of stormwater control plans and shall not rely on the accuracy of maps provided by the Municipality.

A conceptual stormwater control plan shall be submitted to, and accepted by, the Municipal Engineer prior to submission of detailed design drawings for a Subdivision where:

- significant changes are proposed to the location or capacity of drainage facilities or sub catchment boundaries shown in a neighbourhood servicing plan that has been accepted by the Municipality; or
- there is no neighbourhood servicing plan and the area of land proposed for Subdivision is more than 5 ha.

The conceptual stormwater control plan shall include a report by the Owner's Engineer describing in detail how the proposed Subdivision shall impact the fronting and downstream drainage system and how the proposed major and minor drainage systems meet the requirements of this Schedule. Existing facilities that are undersized or otherwise unacceptable to the Municipal Engineer shall be upgraded at the Owner's expense to accommodate the appropriate flows.

Where a Subdivision is phased, an overall stormwater control plan shall be submitted upon application for the first phase and shall govern the Development of subsequent phases.

D3 DESIGN FREQUENCIES AND STORAGE RELEASE RATES

Minor and major conveyance systems shall be designed using 2100 Climate Change (see Section D5 for information) post development flows for the following storm return frequencies:

- Minor Systems: 1 in 5 year (1 in 10 year for Bertrand Creek Watershed)
- Major Systems: 1 in 100 year

Stormwater storage facilities shall limit 1 in 2 year, 1 in 5 year (1 in 10 year for Bertrand Creek Watershed) and 1 in 100 year post development peak flows to equal the corresponding pre-development peak flows as follows:

- **Environmental Detention** – 2050 Climate Change flow from each post development storm duration must match or be lower than the highest Current Climate pre-development flow (highest of all durations calculated) for:
 - 1 in 2 year
 - 1 in 5 year
- **Peak Flow Control** – 2050 Climate Change flow from each post development storm duration must match or be lower than the highest Current Climate pre-development flow (highest durations calculated) for:
 - 1 in 10 year Bertrand Creek Watershed only
 - 1 in 100 year for all watersheds

The detention facility outlet structure shall be designed such that all of the above detention requirements can be met (or exceeded) with the same outlet design. The outlet design will likely require multiple orifices and/or discharge elevations in order to achieve this.

D4 RUNOFF ANALYSIS

The Runoff Hydrograph Method shall be used to calculate peak runoff and for the design of storage facilities except that the Rational Method may be used to calculate peak runoff from areas up to 10 ha. All calculations pertinent to the design of the drainage system shall be signed and sealed by the Owner's Engineer and submitted to the Municipal Engineer.

Analysis shall be based on calculation of post-development flows as if all land is developed in accordance with the Official Community Plan. Calculation of pre-development flows for sizing of storage facilities shall be based on "grassland" for the Rational Method and "meadow" for the Soil Conservation Service and other methods.

D5 RATIONAL METHOD

The Rational Method formula is:

$$Q = R \times A \times \text{RAIN}$$

Where

R	=	Runoff Coefficient x Soil Adjustment Factor (SAF)
A	=	drainage area in ha

I	=	rainfall intensity in mm/h
N	=	0.00278

The following runoff coefficients and soil adjustment factors are typical. The Owner's Engineer shall verify that they are appropriate for the catchment area subject to the approval of the Municipal Engineer.

The Owner's Engineer shall tabulate the rational method calculations on Table D1.



Q = RAIN

REF No. _____

Storm Frequency _____ Year

 $N = 0.00278$
$$Q_{cap} = \text{Capacity (m}^3/\text{s)}$$

L = Length (m)

Sheet: _____ of _____

[illegible]**Table D1**

D5.2 Runoff Coefficients

The following runoff coefficients shall be used for the Rational Formula:

Zone or Land Use	Percent Impervious	Runoff Coefficient	
		5/10 Year	100 Year
Suburban Residential	20	0.35	0.50
Residential, Multiple Family, Comprehensive Development	75	0.70	0.75
Commercial and Industrial	90	0.80	0.85
Institutional	80	0.75	0.80
Parks/Grasslands	20	0.20	0.30
Cultivated Fields	30	0.30	0.40
Woodlands	5	0.10	0.30

D5.3 Soil Adjustment Factor

A soil adjustment factor (SAF) shall be applied to the runoff coefficient to reflect local ground conditions.

Surface Type	SAF
Permeable soil with flat slope (up to 5%)	0.9
Permeable soil with steep slope (over 5%)	1.0
Impermeable soil with flat slope (up to 5%)	1.0
Impermeable soil with steep slope (over 5%)	1.1

D5.4 Time of Concentration

The time of concentration is the time for water to flow from the most remote part of the catchment area under consideration to the design node. For both urban and rural areas, the time of concentration is:

$$T_c = T_i + T_t$$

Where	T_c	=	time of concentration (minutes)
	T_i	=	inlet or overland flow time (minutes)
	T_t	=	travel time in sewers, ditches, channels or watercourses (minutes)

Inlet times to be used for urban Zones are:

Suburban Residential	10 minutes
Residential, Multiple Family, Comprehensive Development	8 minutes
Commercial, Industrial, Institutional	5 minutes

Inlet time in rural areas shall be calculated by the Airport Method:

$$T_i = \frac{3.26 (1.1 - C) L^{0.5}}{S^{0.33}}$$

Where T_i = inlet time (minutes)
 C = runoff coefficient (Section D5.1)
 L = travel distance (m), maximum length = 300 m
 S = slope of travel path (%)

Travel time in sewers, ditches, channels or watercourses shall be estimated using the formula:

$$T_t = \frac{C_t L n}{12 s^{0.5}}$$

Where T_t = travel time (minutes)
 C_t = flow travel coefficient (0.5)
 L = length of flow (m)
 n = roughness coefficient
0.050 natural channels
0.030 excavated ditches
0.013 concrete lined channels
0.013 concrete or PVC pipe
 s = slope in m/m

This equation provides an approximate travel time which shall be corrected with the actual time of flow calculated from the hydraulic properties of the selected pipe or channel. A composite value for T_t shall be calculated where the type of flow along the longest path varies or the slope changes.

D5.5 Rainfall Intensity

The rainfall intensity for the Rational Formula shall be determined for the calculated time of concentration using the appropriate Intensity- Duration-Frequency curve (Figure D2-D5) selected in accordance with the Rainfall Boundaries Map (Figure D1) and sections D5.6 and D5.7.

D5.6 Climate Change Rainfall Data

The 2100 CLIMATE CHANGE data shall be used to determine rainfall intensity for the post-development condition and for general stormwater design for all conveyance infrastructure and storage volume of on-site detention structures. The 2050 CLIMATE CHANGE data shall be used to determine rainfall intensity for the post-development conditions for design of detention storage volume of community detention ponds.

Critical infrastructure, including bridge and culvert crossings of major arterial roads, may be required to design to the 2100 CLIMATE CHANGE rainfall and include an additional factor of safety at a multiplier of 1.2 at the discretion of the Municipal Engineer.

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D5.7 Current Rainfall Data

The CURRENT data shall be used to determine rainfall intensity for the pre-development condition. Temporary stormwater infrastructure, with a useful life estimate less than 5 years, may also use the Current IDF curves for the appropriate zone for design.

Rainfall Regional Map

Figure D1



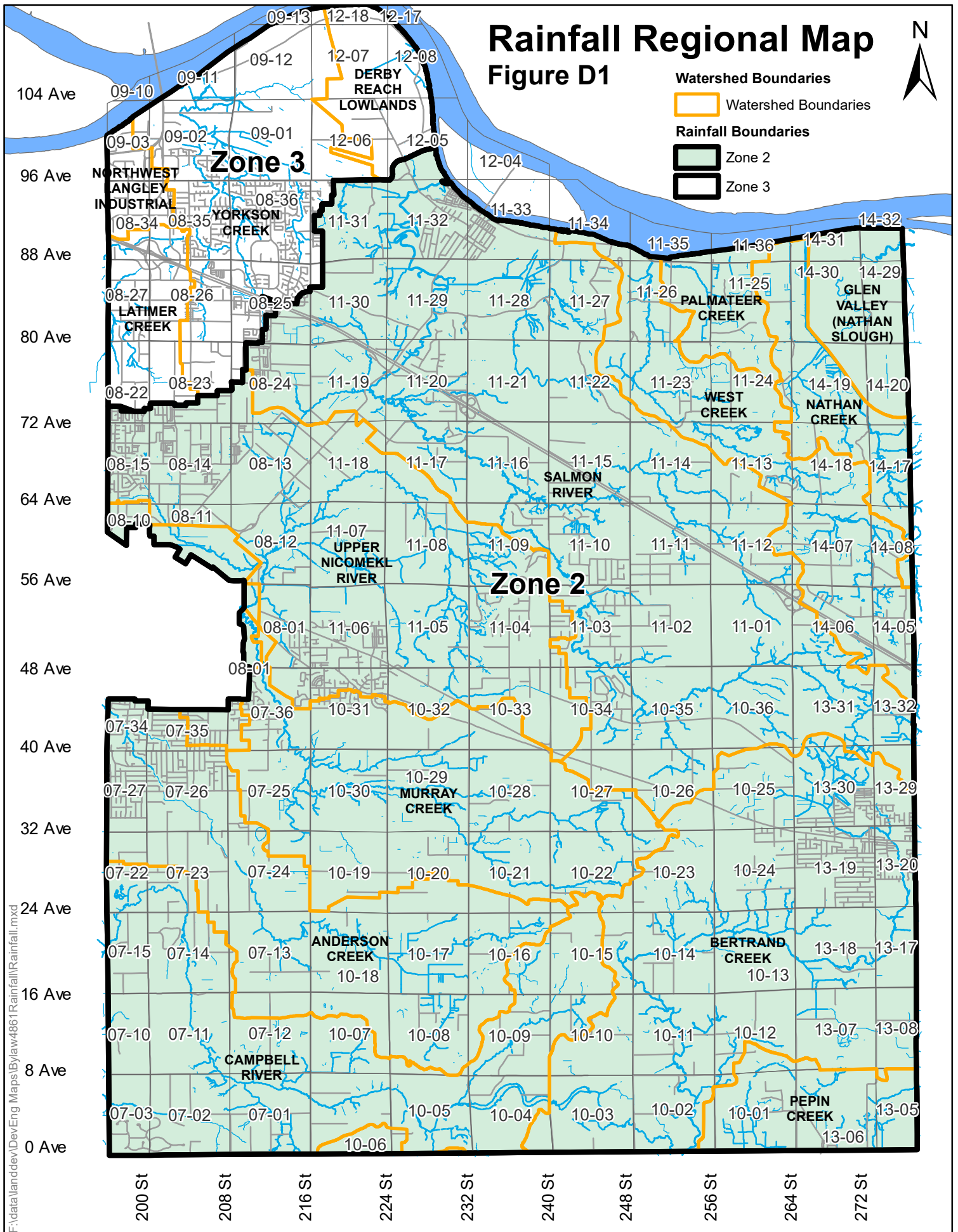
Watershed Boundaries

Watershed Boundaries

Rainfall Boundaries

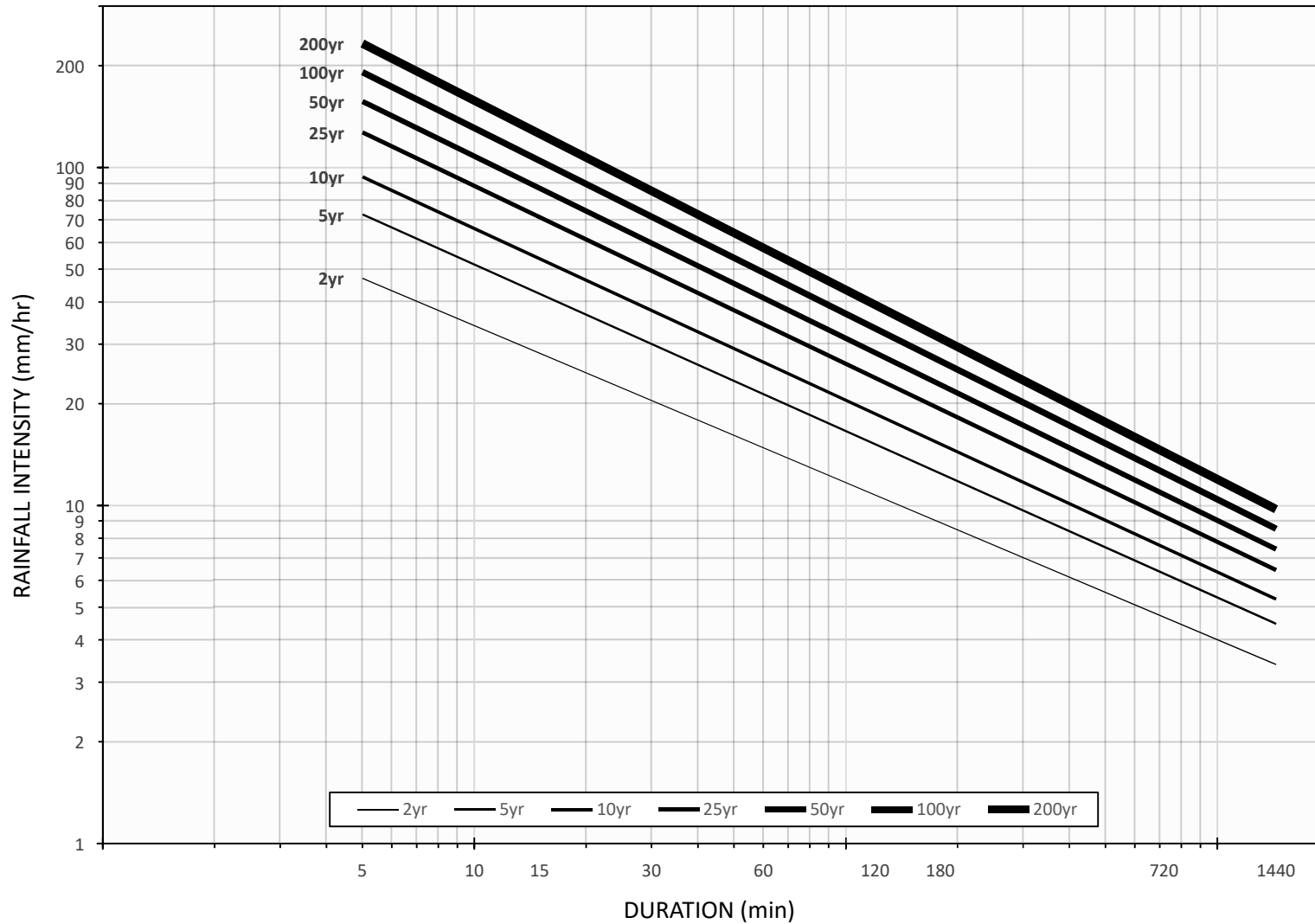
Zone 2

Zone 3



Zone 2 - 2100 Moderate IDF Curve

Intensity Duration Frequency Data



$$I = A (T/60)^B$$

Where:

I = Intensity (mm/hr)

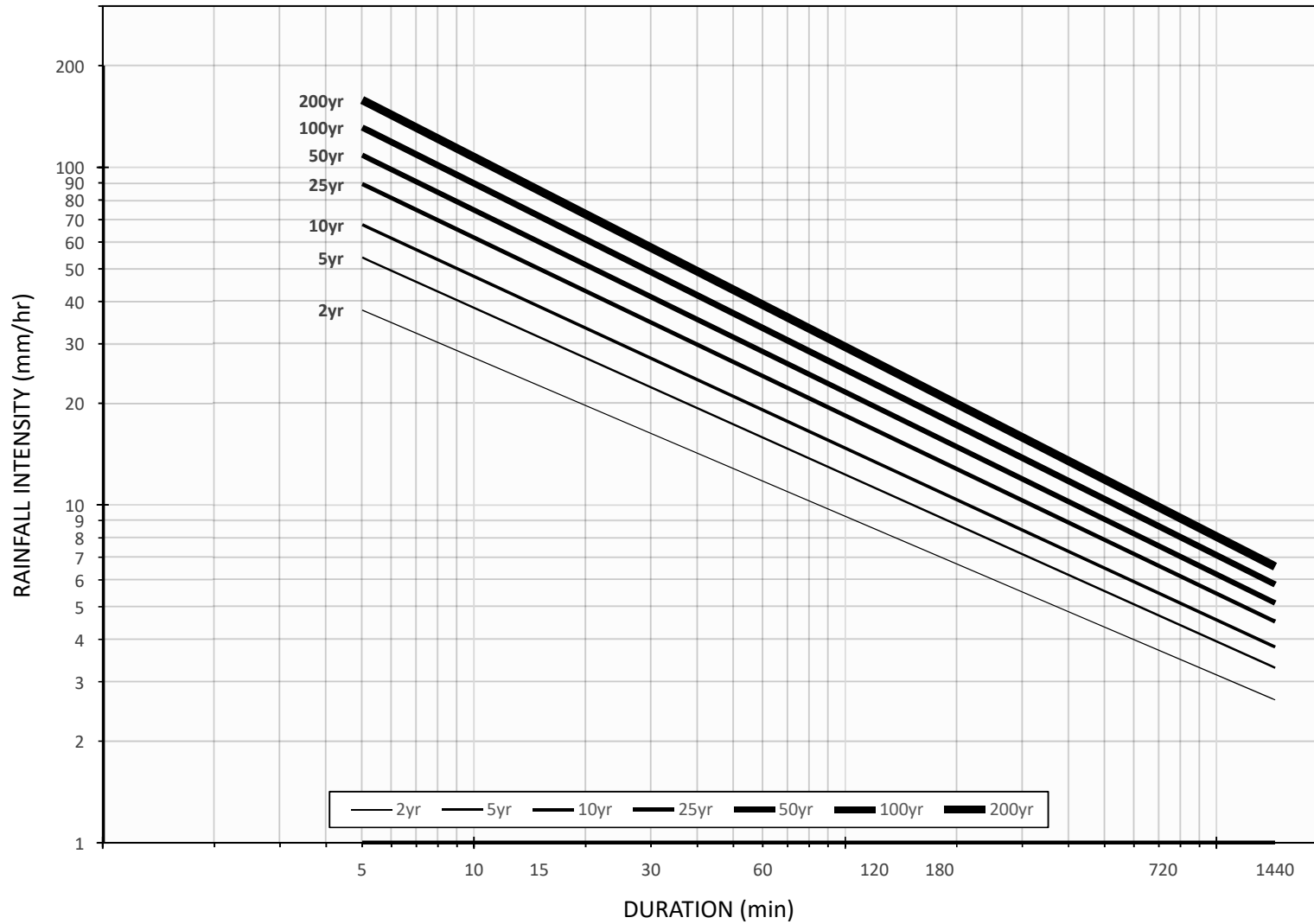
T = Time (min)

	A	B
2yr	14.816	-0.465
5yr	21.359	-0.492
10yr	26.546	-0.508
25yr	34.344	-0.526
50yr	41.125	-0.539
100yr	48.879	-0.549
200yr	57.814	-0.560

Figure D2

Zone 2 - Current IDF

Intensity Duration Frequency Data



$$I = A (T/60)^B$$

Where:

I = Intensity (mm/hr)

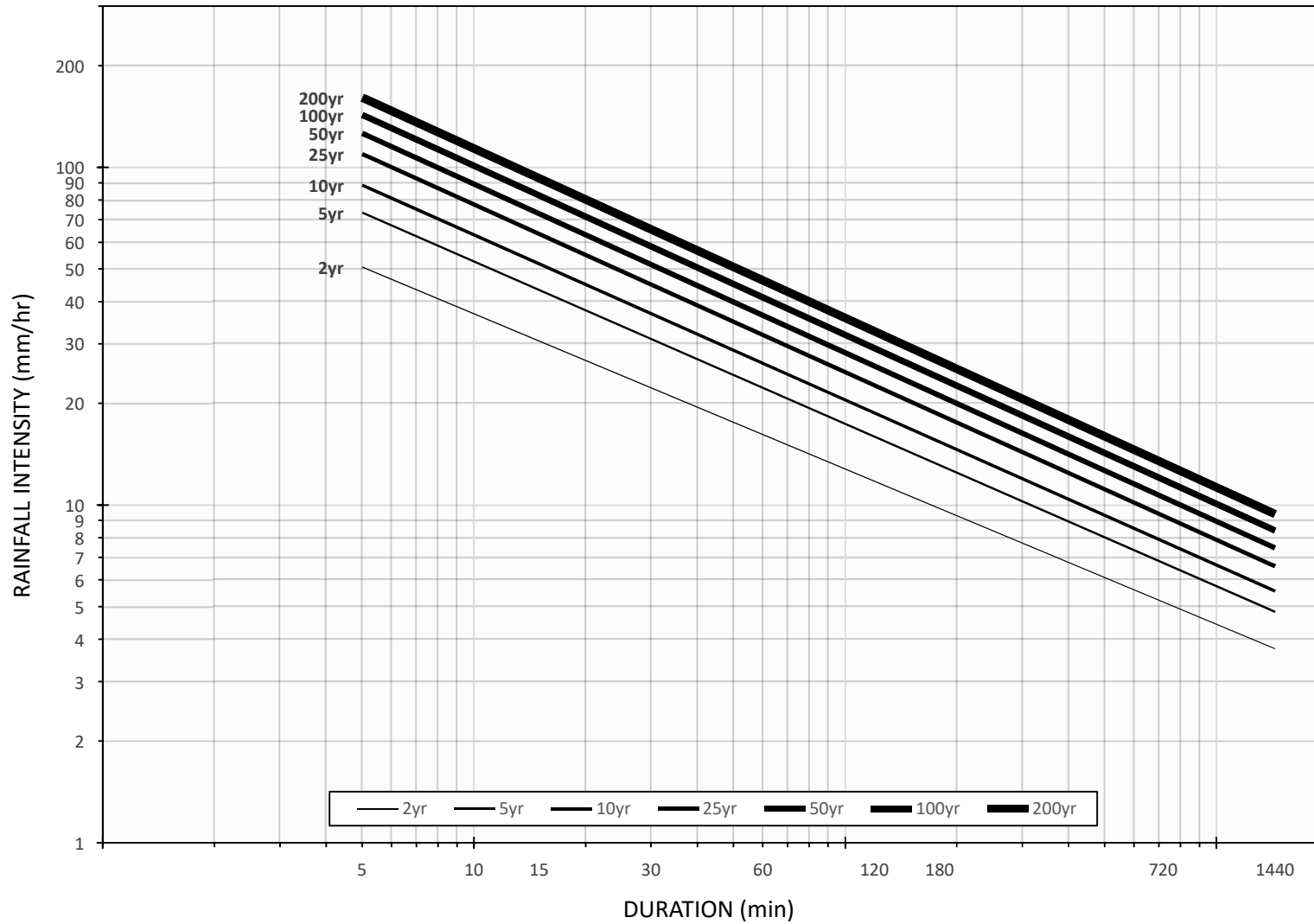
T = Time (min)

	A	B
2yr	11.767	-0.469
5yr	15.842	-0.494
10yr	19.114	-0.508
25yr	24.098	-0.527
50yr	28.454	-0.539
100yr	33.425	-0.550
200yr	39.167	-0.562

Figure D3

Zone 3 - 2100 Moderate IDF Curve

Intensity Duration Frequency Data



$$I = A (T/60)^B$$

Where:

I = Intensity (mm/hr)

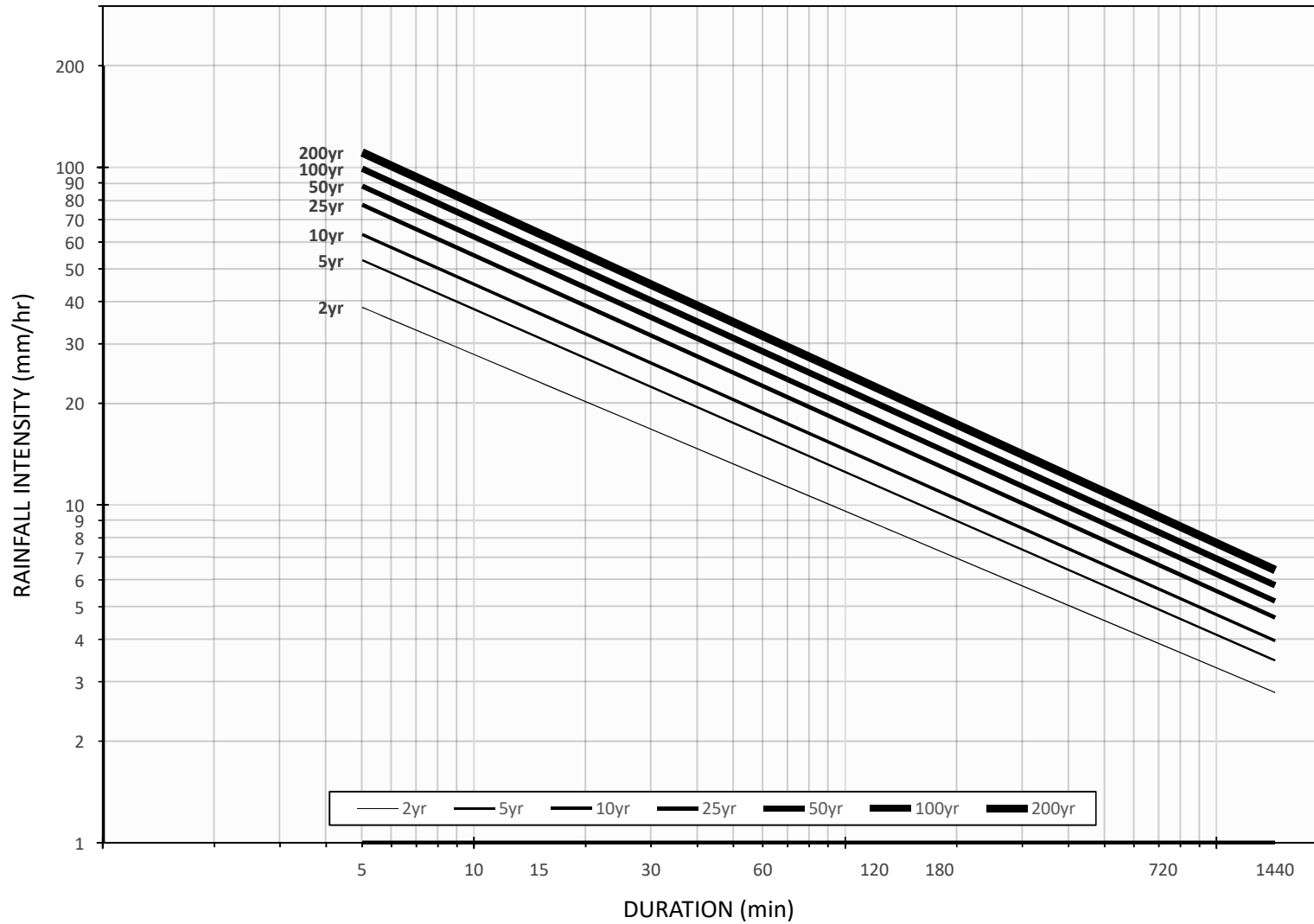
T = Time (min)

	A	B
2yr	16.168	-0.460
5yr	22.237	-0.481
10yr	26.281	-0.489
25yr	31.889	-0.496
50yr	36.458	-0.499
100yr	41.216	-0.500
200yr	46.265	-0.501

Figure D4

Zone 3 - Current IDF

Intensity Duration Frequency Data



$$I = A (T/60)^B$$

Where:

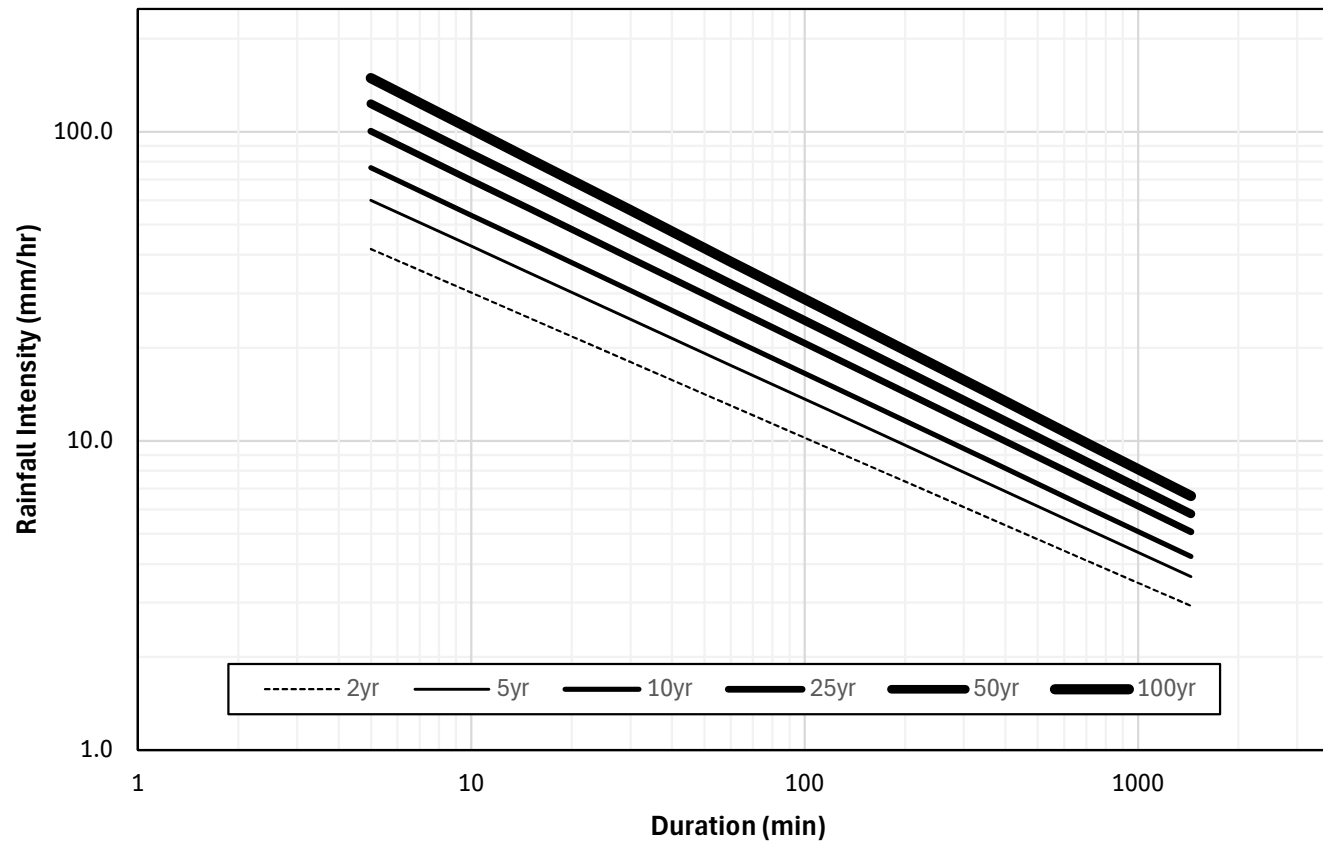
I = Intensity (mm/hr)

T = Time (min)

	A	B
2yr	12.158	-0.464
5yr	16.026	-0.482
10yr	18.757	-0.489
25yr	22.516	-0.497
50yr	25.416	-0.500
100yr	28.484	-0.501
200yr	31.712	-0.503

Figure D5

Zone 2 - 2050 Median IDF Curve Intensity Duration Frequency Data



$$I = A (T/60)^B$$

Where:

I = Intensity (mm/hr)

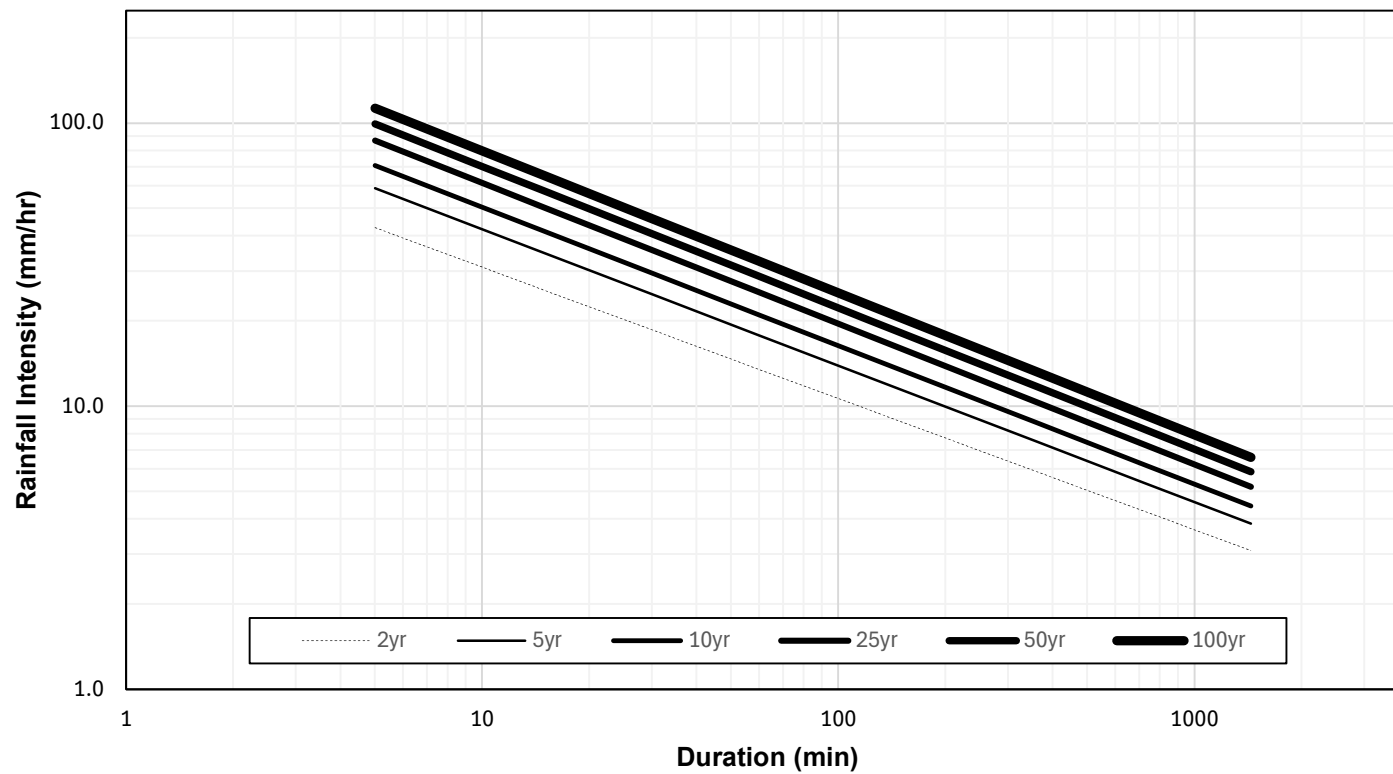
T = Time (min)

	A	B
2 yr	13.006	-0.469
5 yr	17.554	-0.495
10 yr	21.476	-0.512
25 yr	27.094	-0.527
50 yr	32.257	-0.540
100 yr	38.039	-0.550

Figure D6

Zone 3 - 2050 Median IDF Curve

Intensity Duration Frequency Data



$$I = A (T/60)^B$$

Where:

I = Intensity (mm/hr)

T = Time (min)

	A	B
2 yr	13.495	-0.464
5 yr	17.789	-0.482
10 yr	21.008	-0.489
25 yr	25.218	-0.497
50 yr	28.720	-0.500
100 yr	32.471	-0.501

Figure D7

D6 RUNOFF HYDROGRAPH METHOD

D6.1 Selection of Modelling Program

For basins larger than 10 hectares, hydrograph programs shall be used for runoff analyses. Standard runoff simulations shall be modeled with SWMM or HYMO based programs. Other hydrograph programs may be considered if their uses are deemed necessary and approved by the Municipal Engineer.

Conservative parameters shall be selected if calibration data is not available.

D6.2 Design Storms

Single event design storms with durations 1 hour to 24 hours and various return frequencies are listed in Tables D2 to D13 and Tables D15 to D26 for Zones 2 and 3 respectively. The average rainfall intensities for various duration storms are listed in Tables D14 and D27.

The selection of the tabulated hydrograph shall be based on the Rainfall Boundaries Map (Figure D1). If the study area overlaps both regions, the Owner's Engineer shall make necessary adjustments or interpolations in the analysis.

Chicago distribution or SCS distribution design storms shall be used only for storm pipe sizing. For sizing detention facilities, the AES distribution design storms shall be used.

2100 CLIMATE CHANGE design storms shall be used for the post-development condition and for general stormwater design. Critical infrastructure, including bridge and culverts crossing of major arterial roads, may be required to design to the 2100 Extreme Climate Change rainfall with an additional factor of safety of 1.2 applied to the rainfall, in approximation of the 95th percentile climate change prediction, at the discretion of the Municipal Engineer.

CURRENT design storms shall be used for the pre-development condition. Temporary stormwater infrastructure, with a useful life of less than 5 years, may also use the Current rainfall data.

2050 CLIMATE CHANGE design storms shall be used for the post-development conditions for design of community pond detention storage to detain post-development peak flows to pre-development peak flow levels.

When the 2050 CLIMATE CHANGE design storms are used for post-development conditions for design of detention, other means and methods must be designed to convey and manage 1 in 100 year 2100 CLIMATE CHANGE peak flow, such as spillway capacity, downstream conveyance, and energy dissipation.

For the simulation of large watersheds or complex drainage systems, including those involving multiple detention facilities or infiltration systems, the Municipal Engineer may require the use of extended duration and sequential storms or continuous rainfall data. The Owner's Engineer shall obtain the appropriate rainfall data for the analysis.

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1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	8.27	1.74	0:00	5.87	1.24	0:00	4.83	1.07	0:00	2.79	3.90	0:00	3.55	2.79	0:00	2.31	1.73
0:05	9.08	5.22	0:05	6.12		0:05	4.96		0:10		4.06	0:10		2.93	0:20		1.44
0:10	10.21	10.44	0:10	6.41	3.71	0:10	5.11		0:20		4.19	0:20		3.07	0:40		1.49
0:15	11.97	17.40	0:15	6.75		0:15	5.27	3.20	0:30	3.98	4.20	0:30		3.16	1:00		2.13
0:20	15.31	26.10	0:20	7.16	7.42	0:20	5.44		0:40		4.37	0:40		3.18	1:20		2.42
0:25	34.06	36.54	0:25	7.65		0:25	5.64		0:50		4.58	0:50		3.22	1:40		2.30
0:30	34.06	27.84	0:30	8.27	12.36	0:30	5.87	6.40	1:00	5.97	5.07	1:00	4.14	3.32	2:00	2.70	2.43
0:35	15.31	20.88	0:35	9.08		0:35	6.12		1:10		5.27	1:10		3.42	2:20		2.49
0:40	11.97	13.92	0:40	10.21	18.54	0:40	6.41		1:20		5.39	1:20		3.55	2:40		2.47
0:45	10.21	8.70	0:45	11.97		0:45	6.75	10.67	1:30	7.16	4.98	1:30		3.70	3:00		2.42
0:50	9.08	3.48	0:50	15.31	25.96	0:50	7.16		1:40		5.15	1:40		3.90	3:20		2.51
0:55	8.27	1.74	0:55	34.06		0:55	7.65		1:50		5.52	1:50		4.08	3:40		2.76
1:00	0.00	0.00	1:00	34.06	19.78	1:00	8.27	16.01	2:00	9.15	6.10	2:00	5.32	4.21	4:00	3.47	2.85
			1:05	15.31		1:05	9.08		2:10		6.89	2:10		4.26	4:20		2.99
			1:10	11.97	14.83	1:10	10.21		2:20		7.89	2:20		4.38	4:40		3.21
			1:15	10.21		1:15	11.97	22.41	2:30	13.13	18.22	2:30		4.57	5:00		3.54
			1:20	9.08	9.89	1:20	15.31		2:40		20.24	2:40		5.00	5:20		3.80
			1:25	8.27		1:25	34.06		2:50		19.85	2:50		5.30	5:40		3.96
			1:30	7.65	6.18	1:30	34.06	17.08	3:00	9.95	12.21	3:00	4.73	5.43	6:00	3.08	4.60
			1:35	7.16		1:35	15.31		3:10		9.53	3:10		5.18	6:20		4.88
			1:40	6.75	2.47	1:40	11.97		3:20		7.65	3:20		5.15	6:40		4.67
			1:45	6.41		1:45	10.21	12.81	3:30	8.36	7.69	3:30		5.48	7:00		5.53
			1:50	6.12	1.24	1:50	9.08		3:40		6.92	3:40		6.04	7:20		7.15
			1:55	5.87		1:55	8.27		3:50		6.24	3:50		6.80	7:40		18.35
			2:00	0.00	0.00	2:00	7.65	8.54	4:00	6.77	5.65	4:00	4.73	7.75	8:00	3.08	11.07
						2:05	7.16		4:10		5.16	4:10		15.09	8:20		6.94
						2:10	6.75		4:20		4.76	4:20		20.23	8:40		6.27
						2:15	6.41	5.34	4:30	5.17	4.80	4:30		20.45	9:00		5.12
						2:20	6.12		4:40		4.63	4:40		14.66	9:20		4.32
						2:25	5.87		4:50		4.46	4:50		10.11	9:40		4.19
						2:30	5.64	2.13	5:00	3.98	4.24	5:00	7.09	8.01	10:00	4.63	3.84
						2:35	5.44		5:10		4.09	5:10		7.58	10:20		3.62
						2:40	5.27		5:20		3.99	5:20		7.14	10:40		3.57
						2:45	5.11	1.07	5:30	3.18	4.05	5:30		6.43	11:00		3.36
						2:50	4.96		5:40		3.94	5:40		5.82	11:20		3.16
						2:55	4.83		5:50		3.82	5:50		5.31	11:40		2.93
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	5.32	4.88	12:00	3.47	2.88
												6:10		4.79	12:20		2.97
												6:20		4.71	12:40		2.78
												6:30		4.54	13:00		2.88
												6:40		4.33	13:20		2.71
												6:50		4.16	13:40		2.62
												7:00	5.32	4.06	14:00	3.47	2.61
												7:10		4.06	14:20		2.58
												7:20		4.00	14:40		2.53
												7:30		3.89	15:00		2.50
												7:40		3.77	15:20		2.46
												7:50		3.66	15:40		2.42
												8:00	5.32	3.54	16:00	3.47	2.38
												8:10		3.39	16:20		2.34
												8:20		3.28	16:40		2.30
												8:30		3.22	17:00		2.27
												8:40		3.21	17:20		2.23
												8:50		3.24	17:40		2.19
												9:00	4.73	3.29	18:00	3.08	2.14
												9:10		3.21	18:20		2.11
												9:20		3.10	18:40		2.07
												9:30		3.08	19:00		2.03
												9:40		3.16	19:20		1.99
												9:50		3.12	19:40		1.95
												10:00	4.73	3.04	20:00	3.08	1.91
												10:10		2.98	20:20		1.87
												10:20		2.93	20:40		1.84
												10:30		2.90	21:00		1.80
												10:40		2.91	21:20		1.76
												10:50		2.90	21:40		1.72
												11:00	4.14	2.88	22:00	2.70	1.68
												11:10		2.86	22:20		1.64
												11:20		2.83	22:40		1.60
												11:30		2.81	23:00		1.56
												11:40		2.79	23:20		1.52
												11:50		2.77	23:40		1.48
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	14.8	14.5		21.5	20.6		26.7	26.7		39.80	39.8		59.10	59.1		77.10	77.1

1:2 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2100 CLIMATE CHANGE
Table D2

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	11.33	2.50	0:00	7.87	1.70	0:00	6.40	1.49	0:00	3.74	5.24	0:00	4.81	3.78	0:00	3.13	2.34
0:05	12.51	7.49	0:05	8.23		0:05	6.59		0:10		5.45	0:10		3.98	0:20		1.95
0:10	14.17	14.98	0:10	8.65	5.11	0:10	6.80		0:20		5.63	0:20		4.16	0:40		2.02
0:15	16.77	24.96	0:15	9.14		0:15	7.02	4.48	0:30	5.34	5.64	0:30		4.28	1:00		2.88
0:20	21.76	37.44	0:20	9.72	10.22	0:20	7.27		0:40		5.86	0:40		4.31	1:20		3.27
0:25	51.61	52.42	0:25	10.43		0:25	7.56		0:50		6.14	0:50		4.38	1:40		3.12
0:30	51.61	39.94	0:30	11.33	17.04	0:30	7.87	8.95	1:00	8.01	6.80	1:00	5.61	4.50	2:00	3.65	3.29
0:35	21.76	29.95	0:35	12.51		0:35	8.23		1:10		7.07	1:10		4.65	2:20		3.37
0:40	16.77	19.97	0:40	14.17	25.56	0:40	8.65		1:20		7.23	1:20		4.81	2:40		3.34
0:45	14.17	12.48	0:45	16.77		0:45	9.14	14.92	1:30	9.61	6.68	1:30		5.02	3:00		3.28
0:50	12.51	4.99	0:50	21.76	35.78	0:50	9.72		1:40		6.91	1:40		5.29	3:20		3.40
0:55	11.33	2.50	0:55	51.61		0:55	10.43		1:50		7.41	1:50		5.53	3:40		3.74
1:00	0.00	0.00	1:00	51.61	27.26	1:00	11.33	22.38	2:00	12.28	8.18	2:00	7.22	5.72	4:00	4.69	3.85
			1:05	21.76		1:05	12.51		2:10		9.25	2:10		5.78	4:20		4.05
			1:10	16.77	20.45	1:10	14.17		2:20		10.59	2:20		5.94	4:40		4.34
			1:15	14.17		1:15	16.77	31.34	2:30	17.62	24.44	2:30		6.21	5:00		4.79
			1:20	12.51	13.63	1:20	21.76		2:40		27.16	2:40		6.78	5:20		5.14
			1:25	11.33		1:25	51.61		2:50		26.64	2:50		7.19	5:40		5.36
			1:30	10.43	8.52	1:30	51.61	23.88	3:00	13.35	16.39	3:00	6.42	7.37	6:00	4.17	6.22
			1:35	9.72		1:35	21.76		3:10		12.78	3:10		7.02	6:20		6.61
			1:40	9.14	3.41	1:40	16.77		3:20		10.27	3:20		6.99	6:40		6.32
			1:45	8.65		1:45	14.17	17.91	3:30	11.21	10.32	3:30		7.43	7:00		7.48
			1:50	8.23	1.70	1:50	12.51		3:40		9.28	3:40		8.19	7:20		9.68
			1:55	7.87		1:55	11.33		3:50		8.37	3:50		9.22	7:40		24.83
			2:00	0.00	0.00	2:00	10.43	11.94	4:00	9.08	7.58	4:00	6.42	10.51	8:00	4.17	14.98
						2:05	9.72		4:10		6.92	4:10		20.47	8:20		9.39
						2:10	9.14		4:20		6.39	4:20		27.46	8:40		8.48
						2:15	8.65	7.46	4:30	6.94	6.44	4:30		27.75	9:00		6.93
						2:20	8.23		4:40		6.21	4:40		19.90	9:20		5.84
						2:25	7.87		4:50		5.98	4:50		13.72	9:40		5.67
						2:30	7.56	2.98	5:00	5.34	5.68	5:00	9.62	10.87	10:00	6.26	5.19
						2:35	7.27		5:10		5.49	5:10		10.28	10:20		4.90
						2:40	7.02		5:20		5.36	5:20		9.69	10:40		4.83
						2:45	6.80	1.49	5:30	4.27	5.43	5:30		8.73	11:00		4.55
						2:50	6.59		5:40		5.28	5:40		7.90	11:20		4.27
						2:55	6.40		5:50		5.13	5:50		7.20	11:40		3.97
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	7.22	6.63	12:00	4.69	3.89
												6:10		6.50	12:20		4.02
												6:20		6.39	12:40		3.76
												6:30		6.16	13:00		3.89
												6:40		5.88	13:20		3.67
												6:50		5.65	13:40		3.55
												7:00	7.22	5.51	14:00	4.69	3.54
												7:10		5.51	14:20		3.49
												7:20		5.43	14:40		3.43
												7:30		5.27	15:00		3.38
												7:40		5.12	15:20		3.32
												7:50		4.96	15:40		3.28
												8:00	7.22	4.81	16:00	4.69	3.22
												8:10		4.60	16:20		3.17
												8:20		4.45	16:40		3.12
												8:30		4.38	17:00		3.07
												8:40		4.36	17:20		3.01
												8:50		4.39	17:40		2.96
												9:00	6.42	4.47	18:00	4.17	2.90
												9:10		4.36	18:20		2.85
												9:20		4.21	18:40		2.80
												9:30		4.18	19:00		2.74
												9:40		4.29	19:20		2.69
												9:50		4.24	19:40		2.64
												10:00	6.42	4.12	20:00	4.17	2.59
												10:10		4.04	20:20		2.53
												10:20		3.97	20:40		2.49
												10:30		3.93	21:00		2.43
												10:40		3.95	21:20		2.38
												10:50		3.94	21:40		2.32
												11:00	5.61	3.91	22:00	3.65	2.27
												11:10		3.88	22:20		2.22
												11:20		3.84	22:40		2.17
												11:30		3.82	23:00		2.11
												11:40		3.79	23:20		2.06
												11:50		3.76	23:40		2.01
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	21.4	20.8		30.4	28.4		37.3	37.3		53.40	53.4		80.20	80.2		104.30	104.3

1:5 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2100 CLIMATE CHANGE
Table D3

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	13.67	3.13	0:00	9.39	2.06	0:00	7.58	1.82	0:00	4.46	6.25	0:00	5.75	4.52	0:00	3.74	2.80
0:05	15.14	9.40	0:05	9.83		0:05	7.81		0:10		6.50	0:10		4.76	0:20		2.33
0:10	17.22	18.79	0:10	10.35	6.19	0:10	8.07		0:20		6.71	0:20		4.98	0:40		2.41
0:15	20.48	31.32	0:15	10.95		0:15	8.34	5.47	0:30	6.37	6.72	0:30		5.12	1:00		3.44
0:20	26.81	46.98	0:20	11.67	12.38	0:20	8.65		0:40		6.99	0:40		5.16	1:20		3.91
0:25	65.96	65.77	0:25	12.55		0:25	9.00		0:50		7.33	0:50		5.23	1:40		3.73
0:30	65.96	50.11	0:30	13.67	20.64	0:30	9.39	10.94	1:00	9.56	8.11	1:00	6.71	5.39	2:00	4.37	3.93
0:35	26.81	37.58	0:35	15.14		0:35	9.83		1:10		8.44	1:10		5.56	2:20		4.03
0:40	20.48	25.06	0:40	17.22	30.96	0:40	10.35		1:20		8.62	1:20		5.75	2:40		3.99
0:45	17.22	15.66	0:45	20.48		0:45	10.95	18.23	1:30	11.47	7.96	1:30		6.00	3:00		3.92
0:50	15.14	6.26	0:50	26.81	43.34	0:50	11.67		1:40		8.24	1:40		6.32	3:20		4.06
0:55	13.67	3.13	0:55	65.96		0:55	12.55		1:50		8.83	1:50		6.62	3:40		4.47
1:00	0.00	0.00	1:00	65.96	33.02	1:00	13.67	27.35	2:00	14.65	9.76	2:00	8.63	6.84	4:00	5.62	4.61
			1:05	26.81		1:05	15.14		2:10		11.03	2:10		6.92	4:20		4.85
			1:10	20.48	24.77	1:10	17.22		2:20		12.63	2:20		7.11	4:40		5.19
			1:15	17.22		1:15	20.48	38.28	2:30	21.02	29.16	2:30		7.42	5:00		5.73
			1:20	15.14	16.51	1:20	26.81		2:40		32.40	2:40		8.11	5:20		6.15
			1:25	13.67		1:25	65.96		2:50		31.77	2:50		8.59	5:40		6.41
			1:30	12.55	10.32	1:30	65.96	29.17	3:00	15.93	19.55	3:00	7.67	8.82	6:00	4.99	7.44
			1:35	11.67		1:35	26.81		3:10		15.25	3:10		8.40	6:20		7.90
			1:40	10.95	4.13	1:40	20.48		3:20		12.25	3:20		8.36	6:40		7.56
			1:45	10.35		1:45	17.22	21.88	3:30	13.38	12.30	3:30		8.89	7:00		8.95
			1:50	9.83	2.06	1:50	15.14		3:40		11.07	3:40		9.80	7:20		11.58
			1:55	9.39		1:55	13.67		3:50		9.98	3:50		11.03	7:40		29.71
			2:00	0.00	0.00	2:00	12.55	14.59	4:00	10.83	9.04	4:00	7.67	12.57	8:00	4.99	17.92
						2:05	11.67		4:10		8.26	4:10		24.48	8:20		11.23
						2:10	10.95		4:20		7.62	4:20		32.83	8:40		10.15
						2:15	10.35	9.12	4:30	8.28	7.68	4:30		33.19	9:00		8.29
						2:20	9.83		4:40		7.40	4:40		23.79	9:20		6.99
						2:25	9.39		4:50		7.13	4:50		16.41	9:40		6.79
						2:30	9.00	3.65	5:00	6.37	6.78	5:00	11.51	13.00	10:00	7.49	6.22
						2:35	8.65		5:10		6.55	5:10		12.30	10:20		5.86
						2:40	8.34		5:20		6.39	5:20		11.59	10:40		5.77
						2:45	8.07	1.82	5:30	5.10	6.48	5:30		10.44	11:00		5.44
						2:50	7.81		5:40		6.30	5:40		9.45	11:20		5.11
						2:55	7.58		5:50		6.12	5:50		8.61	11:40		4.75
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	8.63	7.92	12:00	5.62	4.66
												6:10		7.78	12:20		4.81
												6:20		7.65	12:40		4.49
												6:30		7.37	13:00		4.66
												6:40		7.03	13:20		4.39
												6:50		6.75	13:40		4.25
												7:00	8.63	6.59	14:00	5.62	4.23
												7:10		6.59	14:20		4.17
												7:20		6.49	14:40		4.10
												7:30		6.31	15:00		4.04
												7:40		6.12	15:20		3.98
												7:50		5.93	15:40		3.92
												8:00	8.63	5.75	16:00	5.62	3.86
												8:10		5.50	16:20		3.79
												8:20		5.32	16:40		3.73
												8:30		5.23	17:00		3.67
												8:40		5.21	17:20		3.60
												8:50		5.25	17:40		3.54
												9:00	7.67	5.34	18:00	4.99	3.47
												9:10		5.21	18:20		3.41
												9:20		5.04	18:40		3.35
												9:30		4.99	19:00		3.28
												9:40		5.13	19:20		3.22
												9:50		5.07	19:40		3.15
												10:00	7.67	4.93	20:00	4.99	3.10
												10:10		4.83	20:20		3.03
												10:20		4.75	20:40		2.97
												10:30		4.70	21:00		2.91
												10:40		4.72	21:20		2.84
												10:50		4.71	21:40		2.78
												11:00	6.71	4.67	22:00	4.37	2.72
												11:10		4.64	22:20		2.65
												11:20		4.59	22:40		2.59
												11:30		4.56	23:00		2.52
												11:40		4.53	23:20		2.46
												11:50		4.50	23:40		2.40
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	26.5	26.1		37.3	34.4		45.6	45.6		63.70	63.7		95.90	95.9		124.80	124.8

1:10 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2100 CLIMATE CHANGE
Table D4

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	23.14	6.24	0:00	15.41	3.51	0:00	12.24	3.21	0:00	7.42	10.40	0:00	9.41	7.39	0:00	6.18	4.62
0:05	25.85	18.72	0:05	16.21		0:05	12.64		0:10		10.82	0:10		7.78	0:20		3.85
0:10	29.71	37.44	0:10	17.12	10.53	0:10	13.08		0:20		11.17	0:20		8.14	0:40		3.99
0:15	35.84	62.40	0:15	18.20		0:15	13.57	9.62	0:30	10.60	11.19	0:30		8.37	1:00		5.69
0:20	47.96	93.60	0:20	19.50	21.06	0:20	14.11		0:40		11.63	0:40		8.43	1:20		6.46
0:25	130.78	131.04	0:25	21.10		0:25	14.72		0:50		12.19	0:50		8.55	1:40		6.16
0:30	130.78	99.84	0:30	23.14	35.10	0:30	15.41	19.25	1:00	15.90	13.50	1:00	10.98	8.80	2:00	7.21	6.49
0:35	47.96	74.88	0:35	25.85		0:35	16.21		1:10		14.04	1:10		9.09	2:20		6.65
0:40	35.84	49.92	0:40	29.71	52.65	0:40	17.12		1:20		14.35	1:20		9.41	2:40		6.60
0:45	29.71	31.20	0:45	35.84		0:45	18.20	32.08	1:30	19.08	13.25	1:30		9.81	3:00		6.47
0:50	25.85	12.48	0:50	47.96	73.71	0:50	19.50		1:40		13.72	1:40		10.33	3:20		6.71
0:55	23.14	6.24	0:55	130.78		0:55	21.10		1:50		14.70	1:50		10.82	3:40		7.39
1:00	0.00	0.00	1:00	130.78	56.16	1:00	23.14	48.12	2:00	24.38	16.24	2:00	14.11	11.18	4:00	9.27	7.61
			1:05	47.96		1:05	25.85		2:10		18.36	2:10		11.31	4:20		8.00
			1:10	35.84	42.12	1:10	29.71		2:20		21.01	2:20		11.62	4:40		8.57
			1:15	29.71		1:15	35.84	67.37	2:30	34.98	48.52	2:30		12.14	5:00		9.46
			1:20	25.85	28.08	1:20	47.96		2:40		53.91	2:40		13.25	5:20		10.16
			1:25	23.14		1:25	130.78		2:50		52.87	2:50		14.05	5:40		10.59
			1:30	21.10	17.55	1:30	130.78	51.33	3:00	26.50	32.53	3:00	12.54	14.42	6:00	8.24	12.28
			1:35	19.50		1:35	47.96		3:10		25.37	3:10		13.73	6:20		13.05
			1:40	18.20	7.02	1:40	35.84		3:20		20.39	3:20		13.67	6:40		12.48
			1:45	17.12		1:45	29.71	38.50	3:30	22.26	20.48	3:30		14.53	7:00		14.78
			1:50	16.21	3.51	1:50	25.85		3:40		18.42	3:40		16.02	7:20		19.12
			1:55	15.41		1:55	23.14		3:50		16.61	3:50		18.03	7:40		49.06
			2:00	0.00	0.00	2:00	21.10	25.66	4:00	18.02	15.04	4:00	12.54	20.55	8:00	8.24	29.60
						2:05	19.50		4:10		13.74	4:10		40.03	8:20		18.55
						2:10	18.20		4:20		12.68	4:20		53.69	8:40		16.76
						2:15	17.12	16.04	4:30	13.78	12.77	4:30		54.26	9:00		13.69
						2:20	16.21		4:40		12.32	4:40		38.91	9:20		11.54
						2:25	15.41		4:50		11.87	4:50		26.82	9:40		11.21
						2:30	14.72	6.42	5:00	10.60	11.28	5:00	18.82	21.26	10:00	12.37	10.26
						2:35	14.11		5:10		10.90	5:10		20.10	10:20		9.68
						2:40	13.57		5:20		10.64	5:20		18.95	10:40		9.54
						2:45	13.08	3.21	5:30	8.48	10.78	5:30		17.06	11:00		8.99
						2:50	12.64		5:40		10.48	5:40		15.45	11:20		8.44
						2:55	12.24		5:50		10.18	5:50		14.08	11:40		7.84
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	14.11	12.96	12:00	9.27	7.69
												6:10		12.71	12:20		7.94
												6:20		12.50	12:40		7.42
												6:30		12.04	13:00		7.69
												6:40		11.50	13:20		7.25
												6:50		11.04	13:40		7.01
												7:00	14.11	10.77	14:00	9.27	6.99
												7:10		10.77	14:20		6.89
												7:20		10.61	14:40		6.77
												7:30		10.31	15:00		6.68
												7:40		10.01	15:20		6.57
												7:50		9.70	15:40		6.48
												8:00	14.11	9.40	16:00	9.27	6.37
												8:10		8.99	16:20		6.26
												8:20		8.80	16:40		6.16
												8:30		8.55	17:00		6.06
												8:40		8.52	17:20		5.95
												8:50		8.58	17:40		5.85
												9:00	12.54	8.74	18:00	8.24	5.73
												9:10		8.52	18:20		5.63
												9:20		8.23	18:40		5.53
												9:30		8.17	19:00		5.42
												9:40		8.38	19:20		5.32
												9:50		8.29	19:40		5.21
												10:00	12.54	8.05	20:00	8.24	5.11
												10:10		7.90	20:20		5.00
												10:20		7.77	20:40		4.91
												10:30		7.69	21:00		4.80
												10:40		7.72	21:20		4.69
												10:50		7.70	21:40		4.59
												11:00	10.98	7.64	22:00	7.21	4.49
												11:10		7.58	22:20		4.38
												11:20		7.51	22:40		4.28
												11:30		7.46	23:00		4.16
												11:40		7.41	23:20		4.07
												11:50		7.35	23:40		3.96
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	48.9	52.0		66.8	58.5		80.2	80.2		106.00	106.0		156.80	156.8		206.10	206.1

1:100 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2100 CLIMATE CHANGE
Table D5

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	1.52	0:00	1.09	0:00	0.92	0:00	2.54	0:00	3.07	0:00	2.00
0:05	4.57	0:05	1.09	0:05	0.92	0:10	2.54	0:10	3.07	0:20	2.00
0:10	9.15	0:10	3.23	0:10	0.92	0:20	2.54	0:20	3.07	0:40	2.00
0:15	15.26	0:15	3.23	0:15	2.80	0:30	3.48	0:30	3.07	1:00	2.00
0:20	22.87	0:20	6.49	0:20	2.80	0:40	3.48	0:40	3.07	1:20	2.00
0:25	32.03	0:25	6.49	0:25	2.80	0:50	3.48	0:50	3.07	1:40	2.00
0:30	24.41	0:30	10.81	0:30	5.59	1:00	5.23	1:00	3.60	2:00	2.33
0:35	18.30	0:35	10.81	0:35	5.59	1:10	5.23	1:10	3.60	2:20	2.33
0:40	12.20	0:40	16.22	0:40	5.59	1:20	5.23	1:20	3.60	2:40	2.33
0:45	7.63	0:45	16.22	0:45	9.31	1:30	6.27	1:30	3.60	3:00	2.33
0:50	3.05	0:50	22.70	0:50	9.31	1:40	6.27	1:40	3.60	3:20	2.33
0:55	1.52	0:55	22.70	0:55	9.31	1:50	6.27	1:50	3.60	3:40	2.33
1:00	0.00	1:00	17.29	1:00	13.98	2:00	8.02	2:00	4.62	4:00	3.00
		1:05	17.29	1:05	13.98	2:10	8.02	2:10	4.62	4:20	3.00
		1:10	12.97	1:10	13.98	2:20	8.02	2:20	4.62	4:40	3.00
		1:15	12.97	1:15	19.58	2:30	11.50	2:30	4.62	5:00	3.00
		1:20	8.64	1:20	19.58	2:40	11.50	2:40	4.62	5:20	3.00
		1:25	8.64	1:25	19.58	2:50	11.50	2:50	4.62	5:40	3.00
		1:30	5.41	1:30	14.91	3:00	8.71	3:00	4.10	6:00	2.66
		1:35	5.41	1:35	14.91	3:10	8.71	3:10	4.10	6:20	2.66
		1:40	2.17	1:40	14.91	3:20	8.71	3:20	4.10	6:40	2.66
		1:45	2.17	1:45	11.19	3:30	7.32	3:30	4.10	7:00	2.66
		1:50	1.09	1:50	11.19	3:40	7.32	3:40	4.10	7:20	2.66
		1:55	1.09	1:55	11.19	3:50	7.32	3:50	4.10	7:40	2.66
		2:00	0.00	2:00	7.46	4:00	5.92	4:00	4.10	8:00	2.66
				2:05	7.46	4:10	5.92	4:10	4.10	8:20	2.66
				2:10	7.46	4:20	5.92	4:20	4.10	8:40	2.66
				2:15	4.67	4:30	4.53	4:30	4.10	9:00	2.66
				2:20	4.67	4:40	4.53	4:40	4.10	9:20	2.66
				2:25	4.67	4:50	4.53	4:50	4.10	9:40	2.66
				2:30	1.87	5:00	3.48	5:00	6.16	10:00	3.99
				2:35	1.87	5:10	3.48	5:10	6.16	10:20	3.99
				2:40	1.87	5:20	3.48	5:20	6.16	10:40	3.99
				2:45	0.92	5:30	2.78	5:30	6.16	11:00	3.99
				2:50	0.92	5:40	2.78	5:40	6.16	11:20	3.99
				2:55	0.92	5:50	2.78	5:50	6.16	11:40	3.99
				3:00	0.00	6:00	0.00	6:00	4.62	12:00	3.00
								6:10	4.62	12:20	3.00
								6:20	4.62	12:40	3.00
								6:30	4.62	13:00	3.00
								6:40	4.62	13:20	3.00
								6:50	4.62	13:40	3.00
								7:00	4.62	14:00	3.00
								7:10	4.62	14:20	3.00
								7:20	4.62	14:40	3.00
								7:30	4.62	15:00	3.00
								7:40	4.62	15:20	3.00
								7:50	4.62	15:40	3.00
								8:00	4.62	16:00	3.00
								8:10	4.62	16:20	3.00
								8:20	4.62	16:40	3.00
								8:30	4.62	17:00	3.00
								8:40	4.62	17:20	3.00
								8:50	4.62	17:40	3.00
								9:00	4.10	18:00	2.66
								9:10	4.10	18:20	2.66
								9:20	4.10	18:40	2.66
								9:30	4.10	19:00	2.66
								9:40	4.10	19:20	2.66
								9:50	4.10	19:40	2.66
								10:00	4.10	20:00	2.66
								10:10	4.10	20:20	2.66
								10:20	4.10	20:40	2.66
								10:30	4.10	21:00	2.66
								10:40	4.10	21:20	2.66
								10:50	4.10	21:40	2.66
								11:00	3.60	22:00	2.33
								11:10	3.60	22:20	2.33
								11:20	3.60	22:40	2.33
								11:30	3.60	23:00	2.33
								11:40	3.60	23:20	2.33
								11:50	3.60	23:40	2.33
Rain (mm)								12:00	0.00	0:00	0.00
	12.7		18.0		23.3		34.9		51.3		66.6

1:2 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE

Table D6

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	2.05	0:00	1.41	0:00	1.23	0:00	3.08	0:00	3.94	0:00	2.55
0:05	6.13	0:05	1.41	0:05	1.23	0:10	3.08	0:10	3.94	0:20	2.55
0:10	12.29	0:10	4.21	0:10	1.23	0:20	3.08	0:20	3.94	0:40	2.55
0:15	20.47	0:15	4.21	0:15	3.67	0:30	4.40	0:30	3.94	1:00	2.55
0:20	30.71	0:20	8.42	0:20	3.67	0:40	4.40	0:40	3.94	1:20	2.55
0:25	43.00	0:25	8.42	0:25	3.67	0:50	4.40	0:50	3.94	1:40	2.55
0:30	32.76	0:30	14.02	0:30	7.34	1:00	6.60	1:00	4.58	2:00	2.97
0:35	24.57	0:35	14.02	0:35	7.34	1:10	6.60	1:10	4.58	2:20	2.97
0:40	16.37	0:40	21.04	0:40	7.34	1:20	6.60	1:20	4.58	2:40	2.97
0:45	10.24	0:45	21.04	0:45	12.24	1:30	7.92	1:30	4.58	3:00	2.97
0:50	4.10	0:50	29.46	0:50	12.24	1:40	7.92	1:40	4.58	3:20	2.97
0:55	2.05	0:55	29.46	0:55	12.24	1:50	7.92	1:50	4.58	3:40	2.97
1:00	0.00	1:00	22.44	1:00	18.36	2:00	10.11	2:00	5.91	4:00	3.82
		1:05	22.44	1:05	18.36	2:10	10.11	2:10	5.91	4:20	3.82
		1:10	16.82	1:10	18.36	2:20	10.11	2:20	5.91	4:40	3.82
		1:15	16.82	1:15	25.71	2:30	14.51	2:30	5.91	5:00	3.82
		1:20	11.22	1:20	25.71	2:40	14.51	2:40	5.91	5:20	3.82
		1:25	11.22	1:25	25.71	2:50	14.51	2:50	5.91	5:40	3.82
		1:30	7.02	1:30	19.59	3:00	11.00	3:00	5.25	6:00	3.39
		1:35	7.02	1:35	19.59	3:10	11.00	3:10	5.25	6:20	3.39
		1:40	2.80	1:40	19.59	3:20	11.00	3:20	5.25	6:40	3.39
		1:45	2.80	1:45	14.69	3:30	9.24	3:30	5.25	7:00	3.39
		1:50	1.41	1:50	14.69	3:40	9.24	3:40	5.25	7:20	3.39
		1:55	1.41	1:55	14.69	3:50	9.24	3:50	5.25	7:40	3.39
		2:00	0.00	2:00	9.79	4:00	7.48	4:00	5.25	8:00	3.39
				2:05	9.79	4:10	7.48	4:10	5.25	8:20	3.39
				2:10	9.79	4:20	7.48	4:20	5.25	8:40	3.39
				2:15	6.12	4:30	5.72	4:30	5.25	9:00	3.39
				2:20	6.12	4:40	5.72	4:40	5.25	9:20	3.39
				2:25	6.12	4:50	5.72	4:50	5.25	9:40	3.39
				2:30	2.45	5:00	4.40	5:00	7.86	10:00	5.10
				2:35	2.45	5:10	4.40	5:10	7.86	10:20	5.10
				2:40	2.45	5:20	4.40	5:20	7.86	10:40	5.10
				2:45	1.23	5:30	3.52	5:30	7.86	11:00	5.10
				2:50	1.23	5:40	3.52	5:40	7.86	11:20	5.10
				2:55	1.23	5:50	3.52	5:50	7.86	11:40	5.10
				3:00	0.00	6:00	0.00	6:00	5.91	12:00	3.82
								6:10	5.91	12:20	3.82
								6:20	5.91	12:40	3.82
								6:30	5.91	13:00	3.82
								6:40	5.91	13:20	3.82
								6:50	5.91	13:40	3.82
								7:00	5.91	14:00	3.82
								7:10	5.91	14:20	3.82
								7:20	5.91	14:40	3.82
								7:30	5.91	15:00	3.82
								7:40	5.91	15:20	3.82
								7:50	5.91	15:40	3.82
								8:00	5.91	16:00	3.82
								8:10	5.91	16:20	3.82
								8:20	5.91	16:40	3.82
								8:30	5.91	17:00	3.82
								8:40	5.91	17:20	3.82
								8:50	5.91	17:40	3.82
								9:00	5.25	18:00	3.39
								9:10	5.25	18:20	3.39
								9:20	5.25	18:40	3.39
								9:30	5.25	19:00	3.39
								9:40	5.25	19:20	3.39
								9:50	5.25	19:40	3.39
								10:00	5.25	20:00	3.39
								10:10	5.25	20:20	3.39
								10:20	5.25	20:40	3.39
								10:30	5.25	21:00	3.39
								10:40	5.25	21:20	3.39
								10:50	5.25	21:40	3.39
								11:00	4.58	22:00	2.97
								11:10	4.58	22:20	2.97
								11:20	4.58	22:40	2.97
								11:30	4.58	23:00	2.97
								11:40	4.58	23:20	2.97
								11:50	4.58	23:40	2.97
Rain (mm)								12:00	0.00	0:00	0.00
	17.1		23.4		30.6		44.0		65.6		84.9

1:5 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE
Table D7

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	2.53	0:00	1.66	0:00	1.47	0:00	3.60	0:00	4.64	0:00	3.00
0:05	7.59	0:05	1.66	0:05	1.47	0:10	3.60	0:10	4.64	0:20	3.00
0:10	15.18	0:10	5.00	0:10	1.47	0:20	3.60	0:20	4.64	0:40	3.00
0:15	25.30	0:15	5.00	0:15	4.42	0:30	5.15	0:30	4.64	1:00	3.00
0:20	37.95	0:20	10.00	0:20	4.42	0:40	5.15	0:40	4.64	1:20	3.00
0:25	53.13	0:25	10.00	0:25	4.42	0:50	5.15	0:50	4.64	1:40	3.00
0:30	40.48	0:30	16.67	0:30	8.84	1:00	7.72	1:00	5.42	2:00	3.50
0:35	30.36	0:35	16.67	0:35	8.84	1:10	7.72	1:10	5.42	2:20	3.50
0:40	20.24	0:40	25.01	0:40	8.84	1:20	7.72	1:20	5.42	2:40	3.50
0:45	12.65	0:45	25.01	0:45	14.73	1:30	9.27	1:30	5.42	3:00	3.50
0:50	5.06	0:50	35.01	0:50	14.73	1:40	9.27	1:40	5.42	3:20	3.50
0:55	2.53	0:55	35.01	0:55	14.73	1:50	9.27	1:50	5.42	3:40	3.50
1:00	0.00	1:00	26.67	1:00	22.09	2:00	11.83	2:00	6.97	4:00	4.51
		1:05	26.67	1:05	22.09	2:10	11.83	2:10	6.97	4:20	4.51
		1:10	20.01	1:10	22.09	2:20	11.83	2:20	6.97	4:40	4.51
		1:15	20.01	1:15	30.92	2:30	16.98	2:30	6.97	5:00	4.51
		1:20	13.34	1:20	30.92	2:40	16.98	2:40	6.97	5:20	4.51
		1:25	13.34	1:25	30.92	2:50	16.98	2:50	6.97	5:40	4.51
		1:30	8.34	1:30	23.56	3:00	12.87	3:00	6.20	6:00	4.00
		1:35	8.34	1:35	23.56	3:10	12.87	3:10	6.20	6:20	4.00
		1:40	3.34	1:40	23.56	3:20	12.87	3:20	6.20	6:40	4.00
		1:45	3.34	1:45	17.67	3:30	10.81	3:30	6.20	7:00	4.00
		1:50	1.66	1:50	17.67	3:40	10.81	3:40	6.20	7:20	4.00
		1:55	1.66	1:55	17.67	3:50	10.81	3:50	6.20	7:40	4.00
		2:00	0.00	2:00	11.79	4:00	8.75	4:00	6.20	8:00	4.00
				2:05	11.79	4:10	8.75	4:10	6.20	8:20	4.00
				2:10	11.79	4:20	8.75	4:20	6.20	8:40	4.00
				2:15	7.37	4:30	6.69	4:30	6.20	9:00	4.00
				2:20	7.37	4:40	6.69	4:40	6.20	9:20	4.00
				2:25	7.37	4:50	6.69	4:50	6.20	9:40	4.00
				2:30	2.95	5:00	5.15	5:00	9.30	10:00	6.01
				2:35	2.95	5:10	5.15	5:10	9.30	10:20	6.01
				2:40	2.95	5:20	5.15	5:20	9.30	10:40	6.01
				2:45	1.47	5:30	4.12	5:30	9.30	11:00	6.01
				2:50	1.47	5:40	4.12	5:40	9.30	11:20	6.01
				2:55	1.47	5:50	4.12	5:50	9.30	11:40	6.01
				3:00	0.00	6:00	0.00	6:00	6.97	12:00	4.51
								6:10	6.97	12:20	4.51
								6:20	6.97	12:40	4.51
								6:30	6.97	13:00	4.51
								6:40	6.97	13:20	4.51
								6:50	6.97	13:40	4.51
								7:00	6.97	14:00	4.51
								7:10	6.97	14:20	4.51
								7:20	6.97	14:40	4.51
								7:30	6.97	15:00	4.51
								7:40	6.97	15:20	4.51
								7:50	6.97	15:40	4.51
								8:00	6.97	16:00	4.51
								8:10	6.97	16:20	4.51
								8:20	6.97	16:40	4.51
								8:30	6.97	17:00	4.51
								8:40	6.97	17:20	4.51
								8:50	6.97	17:40	4.51
								9:00	6.20	18:00	4.00
								9:10	6.20	18:20	4.00
								9:20	6.20	18:40	4.00
								9:30	6.20	19:00	4.00
								9:40	6.20	19:20	4.00
								9:50	6.20	19:40	4.00
								10:00	6.20	20:00	4.00
								10:10	6.20	20:20	4.00
								10:20	6.20	20:40	4.00
								10:30	6.20	21:00	4.00
								10:40	6.20	21:20	4.00
								10:50	6.20	21:40	4.00
								11:00	5.42	22:00	3.50
								11:10	5.42	22:20	3.50
								11:20	5.42	22:40	3.50
								11:30	5.42	23:00	3.50
								11:40	5.42	23:20	3.50
								11:50	5.42	23:40	3.50
Rain (mm)								12:00	0.00	0:00	0.00
	21.1		27.8		36.8		51.5		77.5		100.1

1:10 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE
Table D8

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	4.86	0:00	2.73	0:00	2.49	0:00	5.79	0:00	7.29	0:00	4.82
0:05	14.59	0:05	2.73	0:05	2.49	0:10	5.79	0:10	7.29	0:20	4.82
0:10	29.17	0:10	8.20	0:10	2.49	0:20	5.79	0:20	7.29	0:40	4.82
0:15	48.63	0:15	8.20	0:15	7.48	0:30	8.27	0:30	7.29	1:00	4.82
0:20	72.93	0:20	16.39	0:20	7.48	0:40	8.27	0:40	7.29	1:20	4.82
0:25	102.10	0:25	16.39	0:25	7.48	0:50	8.27	0:50	7.29	1:40	4.82
0:30	77.79	0:30	27.32	0:30	14.96	1:00	12.42	1:00	8.51	2:00	5.63
0:35	58.34	0:35	27.32	0:35	14.96	1:10	12.42	1:10	8.51	2:20	5.63
0:40	38.90	0:40	40.97	0:40	14.96	1:20	12.42	1:20	8.51	2:40	5.63
0:45	24.31	0:45	40.97	0:45	24.95	1:30	14.90	1:30	8.51	3:00	5.63
0:50	9.72	0:50	57.36	0:50	24.95	1:40	14.90	1:40	8.51	3:20	5.63
0:55	4.86	0:55	57.36	0:55	24.95	1:50	14.90	1:50	8.51	3:40	5.63
1:00	0.00	1:00	43.70	1:00	37.41	2:00	19.03	2:00	10.95	4:00	7.23
		1:05	43.70	1:05	37.41	2:10	19.03	2:10	10.95	4:20	7.23
		1:10	32.78	1:10	37.41	2:20	19.03	2:20	10.95	4:40	7.23
		1:15	32.78	1:15	52.37	2:30	27.31	2:30	10.95	5:00	7.23
		1:20	21.86	1:20	52.37	2:40	27.31	2:40	10.95	5:20	7.23
		1:25	21.86	1:25	52.37	2:50	27.31	2:50	10.95	5:40	7.23
		1:30	13.66	1:30	39.90	3:00	20.69	3:00	9.73	6:00	6.43
		1:35	13.66	1:35	39.90	3:10	20.69	3:10	9.73	6:20	6.43
		1:40	5.46	1:40	39.90	3:20	20.69	3:20	9.73	6:40	6.43
		1:45	5.46	1:45	29.93	3:30	17.38	3:30	9.73	7:00	6.43
		1:50	2.73	1:50	29.93	3:40	17.38	3:40	9.73	7:20	6.43
		1:55	2.73	1:55	29.93	3:50	17.38	3:50	9.73	7:40	6.43
		2:00	0.00	2:00	19.95	4:00	14.07	4:00	9.73	8:00	6.43
				2:05	19.95	4:10	14.07	4:10	9.73	8:20	6.43
				2:10	19.95	4:20	14.07	4:20	9.73	8:40	6.43
				2:15	12.47	4:30	10.75	4:30	9.73	9:00	6.43
				2:20	12.47	4:40	10.75	4:40	9.73	9:20	6.43
				2:25	12.47	4:50	10.75	4:50	9.73	9:40	6.43
				2:30	4.99	5:00	8.27	5:00	14.60	10:00	9.64
				2:35	4.99	5:10	8.27	5:10	14.60	10:20	9.64
				2:40	4.99	5:20	8.27	5:20	14.60	10:40	9.64
				2:45	2.49	5:30	6.63	5:30	14.60	11:00	9.64
				2:50	2.49	5:40	6.63	5:40	14.60	11:20	9.64
				2:55	2.49	5:50	6.63	5:50	14.60	11:40	9.64
				3:00	0.00	6:00	0.00	6:00	10.95	12:00	7.23
								6:10	10.95	12:20	7.23
								6:20	10.95	12:40	7.23
								6:30	10.95	13:00	7.23
								6:40	10.95	13:20	7.23
								6:50	10.95	13:40	7.23
								7:00	10.95	14:00	7.23
								7:10	10.95	14:20	7.23
								7:20	10.95	14:40	7.23
								7:30	10.95	15:00	7.23
								7:40	10.95	15:20	7.23
								7:50	10.95	15:40	7.23
								8:00	10.95	16:00	7.23
								8:10	10.95	16:20	7.23
								8:20	10.95	16:40	7.23
								8:30	10.95	17:00	7.23
								8:40	10.95	17:20	7.23
								8:50	10.95	17:40	7.23
								9:00	9.73	18:00	6.43
								9:10	9.73	18:20	6.43
								9:20	9.73	18:40	6.43
								9:30	9.73	19:00	6.43
								9:40	9.73	19:20	6.43
								9:50	9.73	19:40	6.43
								10:00	9.73	20:00	6.43
								10:10	9.73	20:20	6.43
								10:20	9.73	20:40	6.43
								10:30	9.73	21:00	6.43
								10:40	9.73	21:20	6.43
								10:50	9.73	21:40	6.43
								11:00	8.51	22:00	5.63
								11:10	8.51	22:20	5.63
								11:20	8.51	22:40	5.63
								11:30	8.51	23:00	5.63
								11:40	8.51	23:20	5.63
								11:50	8.51	23:40	5.63
Rain (mm)								12:00	0.00	0:00	0.00
	40.5		45.5		62.3		82.8		121.6		160.7

1:100 YR - ZONE 2 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE
Table D9

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	6.51	1.38	0:00	4.60	0.98	0:00	3.78	0.84	0:00	2.21	3.09	0:00	2.78	2.19	0:00	1.81	1.35
0:05	7.16	4.14	0:05	4.80		0:05	3.89		0:10		3.22	0:10		2.30	0:20		1.12
0:10	8.06	8.28	0:10	5.04	2.93	0:10	4.00		0:20		3.32	0:20		2.41	0:40		1.16
0:15	9.46	13.80	0:15	5.31		0:15	4.13	2.53	0:30	3.15	3.33	0:30		2.48	1:00		1.66
0:20	12.13	20.70	0:20	5.63	5.87	0:20	4.27		0:40		3.46	0:40		2.50	1:20		1.89
0:25	27.28	28.98	0:25	6.02		0:25	4.43		0:50		3.62	0:50		2.53	1:40		1.80
0:30	27.28	22.08	0:30	6.51	9.78	0:30	4.60	5.06	1:00	4.73	4.01	1:00	3.25	2.61	2:00	2.11	1.90
0:35	12.13	16.56	0:35	7.16		0:35	4.80		1:10		4.17	1:10		2.69	2:20		1.94
0:40	9.46	11.04	0:40	8.06	14.67	0:40	5.04		1:20		4.26	1:20		2.78	2:40		1.93
0:45	8.06	6.90	0:45	9.46		0:45	5.31	8.43	1:30	5.67	3.94	1:30		2.90	3:00		1.89
0:50	7.16	2.76	0:50	12.13	20.54	0:50	5.63		1:40		4.08	1:40		3.06	3:20		1.96
0:55	6.51	1.38	0:55	27.28		0:55	6.02		1:50		4.37	1:50		3.20	3:40		2.16
1:00	0.00	0.00	1:00	27.28	15.65	1:00	6.51	12.65	2:00	7.25	4.83	2:00	4.18	3.31	4:00	2.71	2.22
			1:05	12.13		1:05	7.16		2:10		5.46	2:10		3.35	4:20		2.34
			1:10	9.46	11.74	1:10	8.06		2:20		6.24	2:20		3.44	4:40		2.50
			1:15	8.06		1:15	9.46	17.71	2:30	10.40	14.42	2:30		3.59	5:00		2.76
			1:20	7.16	7.82	1:20	12.13		2:40		16.02	2:40		3.92	5:20		2.97
			1:25	6.51		1:25	27.28		2:50		15.71	2:50		4.16	5:40		3.09
			1:30	6.02	4.89	1:30	27.28	13.49	3:00	7.88	9.67	3:00	3.71	4.27	6:00	2.41	3.59
			1:35	5.63		1:35	12.13		3:10		7.54	3:10		4.06	6:20		3.81
			1:40	5.31	1.96	1:40	9.46		3:20		6.06	3:20		4.05	6:40		3.65
			1:45	5.04		1:45	8.06	10.12	3:30	6.62	6.09	3:30		4.30	7:00		4.32
			1:50	4.80	0.98	1:50	7.16		3:40		5.47	3:40		4.74	7:20		5.59
			1:55	4.60		1:55	6.51		3:50		4.94	3:50		5.33	7:40		14.33
			2:00	0.00	0.00	2:00	6.02	6.75	4:00	5.36	4.47	4:00	3.71	6.08	8:00	2.41	8.65
						2:05	5.63		4:10		4.08	4:10		11.85	8:20		5.42
						2:10	5.31		4:20		3.77	4:20		15.89	8:40		4.90
						2:15	5.04	4.22	4:30	4.10	3.80	4:30		16.06	9:00		4.00
						2:20	4.80		4:40		3.66	4:40		11.51	9:20		3.37
						2:25	4.60		4:50		3.53	4:50		7.94	9:40		3.28
						2:30	4.43	1.69	5:00	3.15	3.35	5:00	5.57	6.29	10:00	3.61	3.00
						2:35	4.27		5:10		3.24	5:10		5.95	10:20		2.83
						2:40	4.13		5:20		3.16	5:20		5.61	10:40		2.79
						2:45	4.00	0.84	5:30	2.52	3.20	5:30		5.05	11:00		2.63
						2:50	3.89		5:40		3.11	5:40		4.57	11:20		2.46
						2:55	3.78		5:50		3.02	5:50		4.17	11:40		2.29
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	4.18	3.83	12:00	2.71	2.25
												6:10		3.76	12:20		2.32
												6:20		3.70	12:40		2.17
												6:30		3.56	13:00		2.25
												6:40		3.40	13:20		2.12
												6:50		3.27	13:40		2.05
												7:00	4.18	3.19	14:00	2.71	2.04
												7:10		3.19	14:20		2.01
												7:20		3.14	14:40		1.98
												7:30		3.05	15:00		1.95
												7:40		2.96	15:20		1.92
												7:50		2.87	15:40		1.89
												8:00	4.18	2.78	16:00	2.71	1.86
												8:10		2.66	16:20		1.83
												8:20		2.58	16:40		1.80
												8:30		2.53	17:00		1.77
												8:40		2.52	17:20		1.74
												8:50		2.54	17:40		1.71
												9:00	3.71	2.59	18:00	2.41	1.67
												9:10		2.52	18:20		1.65
												9:20		2.44	18:40		1.62
												9:30		2.42	19:00		1.58
												9:40		2.48	19:20		1.56
												9:50		2.45	19:40		1.52
												10:00	3.71	2.38	20:00	2.41	1.49
												10:10		2.34	20:20		1.46
												10:20		2.30	20:40		1.44
												10:30		2.28	21:00		1.40
												10:40		2.28	21:20		1.37
												10:50		2.28	21:40		1.34
												11:00	3.25	2.26	22:00	2.11	1.31
												11:10		2.24	22:20		1.28
												11:20		2.22	22:40		1.25
												11:30		2.21	23:00		1.22
												11:40		2.19	23:20		1.19
												11:50		2.18	23:40		1.16
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	11.8	11.5		17.0	16.3		21.1	21.1		31.50	31.5		46.40	46.4		60.20	60.2

1:2 YR ZONE 2 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)
Table D10

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	8.38	1.85	0:00	5.82	1.27	0:00	4.73	1.11	0:00	2.78	3.89	0:00	3.55	2.79	0:00	2.30	1.72
0:05	9.26	5.54	0:05	6.08		0:05	4.87		0:10		4.05	0:10		2.94	0:20		1.43
0:10	10.49	11.09	0:10	6.39	3.80	0:10	5.02		0:20		4.18	0:20		3.07	0:40		1.48
0:15	12.42	18.48	0:15	6.75		0:15	5.19	3.32	0:30	3.97	4.19	0:30		3.16	1:00		2.11
0:20	16.13	27.72	0:20	7.18	7.60	0:20	5.37		0:40		4.36	0:40		3.18	1:20		2.40
0:25	38.39	38.81	0:25	7.71		0:25	5.58		0:50		4.57	0:50		3.23	1:40		2.29
0:30	38.39	29.57	0:30	8.38	12.66	0:30	5.82	6.63	1:00	5.96	5.06	1:00	4.14	3.32	2:00	2.68	2.41
0:35	16.13	22.18	0:35	9.26		0:35	6.08		1:10		5.26	1:10		3.43	2:20		2.47
0:40	12.42	14.78	0:40	10.49	18.99	0:40	6.39		1:20		5.37	1:20		3.55	2:40		2.45
0:45	10.49	9.24	0:45	12.42		0:45	6.75	11.05	1:30	7.15	4.96	1:30		3.70	3:00		2.41
0:50	9.26	3.70	0:50	16.13	26.59	0:50	7.18		1:40		5.14	1:40		3.90	3:20		2.50
0:55	8.38	1.85	0:55	38.39		0:55	7.71		1:50		5.51	1:50		4.09	3:40		2.75
1:00	0.00	0.00	1:00	38.39	20.26	1:00	8.38	16.57	2:00	9.13	6.08	2:00	5.33	4.22	4:00	3.45	2.83
			1:05	16.13		1:05	9.26		2:10		6.88	2:10		4.27	4:20		2.98
			1:10	12.42	15.19	1:10	10.49		2:20		7.87	2:20		4.39	4:40		3.18
			1:15	10.49		1:15	12.42	23.20	2:30	13.10	18.17	2:30		4.58	5:00		3.52
			1:20	9.26	10.13	1:20	16.13		2:40		20.19	2:40		5.00	5:20		3.78
			1:25	8.38		1:25	38.39		2:50		19.80	2:50		5.30	5:40		3.94
			1:30	7.71	6.33	1:30	38.39	17.68	3:00	9.93	12.18	3:00	4.74	5.44	6:00	3.06	4.57
			1:35	7.18		1:35	16.13		3:10		9.50	3:10		5.18	6:20		4.85
			1:40	6.75	2.53	1:40	12.42		3:20		7.64	3:20		5.16	6:40		4.64
			1:45	6.39		1:45	10.49	13.26	3:30	8.34	7.67	3:30		5.49	7:00		5.49
			1:50	6.08	1.27	1:50	9.26		3:40		6.90	3:40		6.05	7:20		7.11
			1:55	5.82		1:55	8.38		3:50		6.22	3:50		6.81	7:40		18.23
			2:00	0.00	0.00	2:00	7.71	8.84	4:00	6.75	5.63	4:00	4.74	7.76	8:00	3.06	11.00
						2:05	7.18		4:10		5.15	4:10		15.11	8:20		6.89
						2:10	6.75		4:20		4.75	4:20		20.27	8:40		6.23
						2:15	6.39	5.53	4:30	5.16	4.78	4:30		20.49	9:00		5.09
						2:20	6.08		4:40		4.62	4:40		14.69	9:20		4.29
						2:25	5.82		4:50		4.45	4:50		10.13	9:40		4.17
						2:30	5.58	2.21	5:00	3.97	4.22	5:00	7.10	8.03	10:00	4.60	3.82
						2:35	5.37		5:10		4.08	5:10		7.59	10:20		3.60
						2:40	5.19		5:20		3.98	5:20		7.15	10:40		3.54
						2:45	5.02	1.11	5:30	3.18	4.04	5:30		6.44	11:00		3.34
						2:50	4.87		5:40		3.93	5:40		5.83	11:20		3.14
						2:55	4.73		5:50		3.81	5:50		5.32	11:40		2.91
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	5.33	4.89	12:00	3.45	2.86
												6:10		4.80	12:20		2.95
												6:20		4.72	12:40		2.76
												6:30		4.55	13:00		2.86
												6:40		4.34	13:20		2.69
												6:50		4.17	13:40		2.61
												7:00	5.33	4.07	14:00	3.45	2.60
												7:10		4.07	14:20		2.56
												7:20		4.01	14:40		2.52
												7:30		3.89	15:00		2.48
												7:40		3.78	15:20		2.44
												7:50		3.66	15:40		2.41
												8:00	5.33	3.55	16:00	3.45	2.37
												8:10		3.39	16:20		2.33
												8:20		3.29	16:40		2.29
												8:30		3.23	17:00		2.25
												8:40		3.22	17:20		2.21
												8:50		3.24	17:40		2.17
												9:00	4.74	3.30	18:00	3.06	2.13
												9:10		3.22	18:20		2.09
												9:20		3.11	18:40		2.06
												9:30		3.08	19:00		2.02
												9:40		3.16	19:20		1.98
												9:50		3.13	19:40		1.94
												10:00	4.74	3.04	20:00	3.06	1.90
												10:10		2.98	20:20		1.86
												10:20		2.93	20:40		1.83
												10:30		2.90	21:00		1.79
												10:40		2.91	21:20		1.74
												10:50		2.91	21:40		1.71
												11:00	4.14	2.89	22:00	2.68	1.67
												11:10		2.86	22:20		1.63
												11:20		2.84	22:40		1.59
												11:30		2.82	23:00		1.55
												11:40		2.80	23:20		1.51
												11:50		2.78	23:40		1.47
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	15.8	15.4		22.5	21.1		27.6	27.6		39.70	39.7		59.20	59.2		76.60	76.6

1:5 YR ZONE 2 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)
Table D11

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	9.83	2.26	0:00	6.75	1.49	0:00	5.45	1.31	0:00	3.23	4.52	0:00	4.13	3.25	0:00	2.68	2.00
0:05	10.89	6.77	0:05	7.07		0:05	5.62		0:10		4.71	0:10		3.42	0:20		1.67
0:10	12.39	13.54	0:10	7.44	4.46	0:10	5.80		0:20		4.86	0:20		3.58	0:40		1.73
0:15	14.74	22.56	0:15	7.87		0:15	6.00	9.94	0:30	4.61	4.87	0:30		3.68	1:00		2.47
0:20	19.30	33.84	0:20	8.39	8.93	0:20	6.22		0:40		5.06	0:40		3.71	1:20		2.80
0:25	47.54	47.38	0:25	9.03		0:25	6.47		0:50		5.30	0:50		3.76	1:40		2.67
0:30	47.54	36.10	0:30	9.83	14.88	0:30	6.75	7.87	1:00	6.92	5.87	1:00	4.82	3.87	2:00	3.13	2.81
0:35	19.30	27.07	0:35	10.89		0:35	7.07		1:10		6.11	1:10		3.99	2:20		2.88
0:40	14.74	18.05	0:40	12.39	22.32	0:40	7.44		1:20		6.24	1:20		4.13	2:40		2.86
0:45	12.39	11.28	0:45	14.74		0:45	7.87	13.12	1:30	8.30	5.76	1:30		4.31	3:00		2.80
0:50	10.89	4.51	0:50	19.30	31.25	0:50	8.39		1:40		5.97	1:40		4.54	3:20		2.91
0:55	9.83	2.26	0:55	47.54		0:55	9.03		1:50		6.39	1:50		4.75	3:40		3.20
1:00	0.00	0.00	1:00	47.54	23.81	1:00	9.83	19.68	2:00	10.60	7.06	2:00	6.20	4.91	4:00	4.02	3.30
			1:05	19.30		1:05	10.89		2:10		7.99	2:10		4.97	4:20		3.47
			1:10	14.74	17.86	1:10	12.39		2:20		9.14	2:20		5.11	4:40		3.71
			1:15	12.39		1:15	14.74	27.55	2:30	15.21	21.10	2:30		5.33	5:00		4.10
			1:20	10.89	11.90	1:20	19.30		2:40		23.45	2:40		5.82	5:20		4.40
			1:25	9.83		1:25	47.54		2:50		22.99	2:50		6.17	5:40		4.59
			1:30	9.03	7.44	1:30	47.54	20.99	3:00	11.53	14.15	3:00	5.51	6.33	6:00	3.57	5.32
			1:35	8.39		1:35	19.30		3:10		11.03	3:10		6.03	6:20		5.66
			1:40	7.87	2.98	1:40	14.74		3:20		8.87	3:20		6.01	6:40		5.41
			1:45	7.44		1:45	12.39	15.74	3:30	9.68	8.91	3:30		6.38	7:00		6.40
			1:50	7.07	1.49	1:50	10.89		3:40		8.01	3:40		7.04	7:20		8.28
			1:55	6.75		1:55	9.83		3:50		7.22	3:50		7.92	7:40		21.26
			2:00	0.00	0.00	2:00	9.03	10.50	4:00	7.84	6.54	4:00	5.51	9.03	8:00	3.57	12.82
						2:05	8.39		4:10		5.98	4:10		17.59	8:20		8.04
						2:10	7.87		4:20		5.52	4:20		23.59	8:40		7.26
						2:15	7.44	6.56	4:30	5.99	5.56	4:30		23.84	9:00		5.93
						2:20	7.07		4:40		5.36	4:40		17.10	9:20		5.00
						2:25	6.75		4:50		5.16	4:50		11.79	9:40		4.86
						2:30	6.47	2.62	5:00	4.61	4.91	5:00	8.27	9.34	10:00	5.36	4.45
						2:35	6.22		5:10		4.74	5:10		8.83	10:20		4.19
						2:40	6.00		5:20		4.63	5:20		8.33	10:40		4.13
						2:45	5.80	1.31	5:30	3.69	4.69	5:30		7.50	11:00		3.89
						2:50	5.62		5:40		4.56	5:40		6.79	11:20		3.66
						2:55	5.45		5:50		4.43	5:50		6.19	11:40		3.40
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	6.20	5.69	12:00	4.02	3.33
												6:10		5.59	12:20		3.44
												6:20		5.49	12:40		3.22
												6:30		5.29	13:00		3.33
												6:40		5.05	13:20		3.14
												6:50		4.85	13:40		3.04
												7:00	6.20	4.73	14:00	4.02	3.03
												7:10		4.73	14:20		2.99
												7:20		4.66	14:40		2.94
												7:30		4.53	15:00		2.89
												7:40		4.40	15:20		2.85
												7:50		4.26	15:40		2.81
												8:00	6.20	4.13	16:00	4.02	2.76
												8:10		3.95	16:20		2.71
												8:20		3.83	16:40		2.67
												8:30		3.76	17:00		2.63
												8:40		3.74	17:20		2.58
												8:50		3.77	17:40		2.53
												9:00	5.51	3.84	18:00	3.57	2.48
												9:10		3.74	18:20		2.44
												9:20		3.62	18:40		2.40
												9:30		3.59	19:00		2.35
												9:40		3.68	19:20		2.31
												9:50		3.64	19:40		2.26
												10:00	5.51	3.54	20:00	3.57	2.22
												10:10		3.47	20:20		2.17
												10:20		3.41	20:40		2.13
												10:30		3.38	21:00		2.08
												10:40		3.39	21:20		2.03
												10:50		3.38	21:40		1.99
												11:00	4.82	3.36	22:00	3.13	1.95
												11:10		3.33	22:20		1.90
												11:20		3.30	22:40		1.86
												11:30		3.28	23:00		1.80
												11:40		3.25	23:20		1.76
												11:50		3.23	23:40		1.72
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	19.1	18.8		26.9	24.8		32.8	32.8		46.10	46.1		68.90	68.9		89.30	89.3

1:10 YR ZONE 2 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)
Table D12

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	15.79	4.27	0:00	10.51	2.40	0:00	8.34	2.19	0:00	5.09	7.13	0:00	6.41	5.04	0:00	4.20	3.14
0:05	17.64	12.82	0:05	11.05		0:05	8.62		0:10		7.42	0:10		5.30	0:20		2.61
0:10	20.28	25.63	0:10	11.68	7.20	0:10	8.92		0:20		7.66	0:20		5.55	0:40		2.71
0:15	24.48	42.72	0:15	12.42		0:15	9.25	6.57	0:30	7.27	7.67	0:30		5.71	1:00		3.86
0:20	32.77	64.08	0:20	13.31	14.40	0:20	9.63		0:40		7.98	0:40		5.75	1:20		4.39
0:25	89.58	89.71	0:25	14.40		0:25	10.04		0:50		8.36	0:50		5.83	1:40		4.18
0:30	89.58	68.35	0:30	15.79	24.00	0:30	10.51	13.15	1:00	10.91	9.26	1:00	7.48	6.00	2:00	4.90	4.41
0:35	32.77	51.26	0:35	17.64		0:35	11.05		1:10		9.63	1:10		6.19	2:20		4.52
0:40	24.48	34.18	0:40	20.28	36.00	0:40	11.68		1:20		9.84	1:20		6.41	2:40		4.48
0:45	20.28	21.36	0:45	24.48		0:45	12.42	21.92	1:30	13.09	9.09	1:30		6.69	3:00		4.40
0:50	17.64	8.54	0:50	32.77	50.40	0:50	13.31		1:40		9.41	1:40		7.04	3:20		4.56
0:55	15.79	4.27	0:55	89.58		0:55	14.40		1:50		10.08	1:50		7.38	3:40		5.02
1:00	0.00	0.00	1:00	89.58	38.40	1:00	15.79	32.87	2:00	16.72	11.14	2:00	9.62	7.62	4:00	6.30	5.17
			1:05	32.77		1:05	17.64		2:10		12.59	2:10		7.71	4:20		5.44
			1:10	24.48	28.80	1:10	20.28		2:20		14.41	2:20		7.92	4:40		5.82
			1:15	20.28		1:15	24.48	46.02	2:30	23.99	33.27	2:30		8.27	5:00		6.43
			1:20	17.64	19.20	1:20	32.77		2:40		36.98	2:40		9.04	5:20		6.90
			1:25	15.79		1:25	89.58		2:50		36.26	2:50		9.58	5:40		7.19
			1:30	14.40	12.00	1:30	89.58	35.06	3:00	18.18	22.31	3:00	8.55	9.83	6:00	5.60	8.34
			1:35	13.31		1:35	32.77		3:10		17.40	3:10		9.36	6:20		8.87
			1:40	12.42	4.80	1:40	24.48		3:20		13.98	3:20		9.32	6:40		8.48
			1:45	11.68		1:45	20.28	26.30	3:30	15.27	14.04	3:30		9.91	7:00		10.04
			1:50	11.05	2.40	1:50	17.64		3:40		12.64	3:40		10.92	7:20		12.99
			1:55	10.51		1:55	15.79		3:50		11.39	3:50		12.29	7:40		33.33
			2:00	0.00	0.00	2:00	14.40	17.53	4:00	12.36	10.32	4:00	8.55	14.01	8:00	5.60	20.10
						2:05	13.31		4:10		9.42	4:10		27.29	8:20		12.60
						2:10	12.42		4:20		8.70	4:20		36.60	8:40		11.39
						2:15	11.68	10.96	4:30	9.45	8.76	4:30		36.99	9:00		9.30
						2:20	11.05		4:40		8.45	4:40		26.52	9:20		7.84
						2:25	10.51		4:50		8.14	4:50		18.29	9:40		7.62
						2:30	10.04	4.38	5:00	7.27	7.74	5:00	12.83	14.49	10:00	8.40	6.97
						2:35	9.63		5:10		7.47	5:10		13.71	10:20		6.58
						2:40	9.25		5:20		7.30	5:20		12.92	10:40		6.48
						2:45	8.92	2.19	5:30	5.82	7.39	5:30		11.63	11:00		6.10
						2:50	8.62		5:40		7.19	5:40		10.53	11:20		5.73
						2:55	8.34		5:50		6.98	5:50		9.60	11:40		5.33
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	9.62	8.83	12:00	6.30	5.22
												6:10		8.67	12:20		5.40
												6:20		8.52	12:40		5.04
												6:30		8.21	13:00		5.22
												6:40		7.84	13:20		4.92
												6:50		7.53	13:40		4.77
												7:00	9.62	7.34	14:00	6.30	4.75
												7:10		7.35	14:20		4.68
												7:20		7.24	14:40		4.60
												7:30		7.03	15:00		4.54
												7:40		6.82	15:20		4.46
												7:50		6.61	15:40		4.40
												8:00	9.62	6.41	16:00	6.30	4.33
												8:10		6.13	16:20		4.25
												8:20		5.94	16:40		4.18
												8:30		5.83	17:00		4.12
												8:40		5.81	17:20		4.04
												8:50		5.85	17:40		3.97
												9:00	8.55	5.96	18:00	5.60	3.89
												9:10		5.81	18:20		3.83
												9:20		5.61	18:40		3.76
												9:30		5.57	19:00		3.68
												9:40		5.71	19:20		3.62
												9:50		5.65	19:40		3.54
												10:00	8.55	5.49	20:00	5.60	3.47
												10:10		5.39	20:20		3.40
												10:20		5.30	20:40		3.34
												10:30		5.24	21:00		3.26
												10:40		5.26	21:20		3.19
												10:50		5.25	21:40		3.12
												11:00	7.48	5.21	22:00	4.90	3.05
												11:10		5.17	22:20		2.98
												11:20		5.12	22:40		2.91
												11:30		5.09	23:00		2.83
												11:40		5.05	23:20		2.76
												11:50		5.01	23:40		2.69
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	33.4	36.6		45.7	40.0		54.8	54.8		72.70	72.7		106.90	106.9		140.00	140.0

1:100 YR ZONE 2 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)

Table D13

Total Rainfall (mm)

Return Period Storm Duration	2100 Moderate IDF Curve							Current						
	2yr	5yr	10yr	25yr	50yr	100yr	200yr	2yr	5yr	10yr	25yr	50yr	100yr	200yr
5-min	3.7	5.8	7.5	10.1	12.4	14.9	17.9	3.0	4.3	5.4	7.1	8.6	10.2	12.2
10-min	5.9	9.0	11.5	15.4	18.8	22.8	27.4	4.7	6.7	8.3	10.8	13.0	15.6	18.6
15-min	7.3	10.9	13.8	18.3	22.3	26.9	32.2	5.8	8.1	9.9	12.8	15.4	18.4	21.8
30-min	10.4	15.3	19.4	25.6	31.0	37.5	45.3	8.3	11.4	14.0	18.0	21.5	25.7	30.7
1-hr	14.5	20.8	26.1	34.6	42.5	52.0	63.5	11.5	15.4	18.8	24.3	29.4	35.6	43.0
2-hr	20.6	28.4	34.4	43.0	50.2	58.5	67.5	16.3	21.1	24.8	30.2	34.8	40.0	45.7
6-hr	39.8	53.4	63.7	78.7	91.6	106.0	122.3	31.5	39.7	46.1	55.5	63.6	72.7	83.0
12-hr	59.1	80.2	95.9	118.1	136.6	156.8	179.0	46.4	59.2	68.9	82.7	94.3	106.9	120.8
24-hr	77.1	104.3	124.8	154.1	178.8	206.1	236.4	60.2	76.6	89.3	107.5	122.9	140.0	159.0
Annual Exceedance Probability	50%	20%	10%	4%	2%	1%	0.50%	50%	20%	10%	4%	2%	1%	0.50%

Rainfall Intensity (mm/hr)

Return Period Storm Duration	2100 Moderate IDF Curve							Current						
	2yr	5yr	10yr	25yr	50yr	100yr	200yr	2yr	5yr	10yr	25yr	50yr	100yr	200yr
5-min	47.0	72.6	93.8	127.1	156.8	191.4	232.6	37.8	54.1	67.6	89.3	108.7	131.2	158.2
10-min	34.1	51.6	66.0	88.2	107.9	130.8	157.7	27.3	38.4	47.5	61.9	74.8	89.6	107.2
15-min	28.2	42.3	53.7	71.3	86.8	104.7	125.7	22.6	31.4	38.7	50.0	60.1	71.7	85.3
30-min	20.4	30.0	37.7	49.5	59.7	71.5	85.2	16.3	22.3	27.2	34.7	41.4	48.9	57.8
1-hr	14.8	21.4	26.5	34.3	41.1	48.9	57.8	11.8	15.8	19.1	24.1	28.5	33.4	39.2
2-hr	10.7	15.2	18.7	23.8	28.3	33.4	39.2	8.5	11.2	13.4	16.7	19.6	22.8	26.5
6-hr	8.9	12.4	15.2	19.3	22.8	26.7	31.2	7.0	9.2	10.9	13.5	15.7	18.3	21.1
12-hr	4.7	6.3	7.5	9.3	10.8	12.5	14.4	3.7	4.6	5.4	6.5	7.5	8.5	9.7
24-hr	3.4	4.5	5.3	6.4	7.4	8.5	9.7	2.6	3.3	3.8	4.5	5.1	5.8	6.6
Annual Exceedance Probability	50%	20%	10%	4%	2%	1%	0.50%	50%	20%	10%	4%	2%	1%	0.50%

Zone 2 - AVERAGE RAINFALL

Table D14

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	9.10	1.85	0:00	6.48	1.36	0:00	5.34	1.17	0:00	3.24	4.54	0:00	3.79	2.97	0:00	2.62	1.94
0:05	9.98	5.54	0:05	6.76		0:05	5.49		0:10		4.73	0:10		3.13	0:20		1.62
0:10	11.22	11.09	0:10	7.07	4.09	0:10	5.65		0:20		4.88	0:20		3.27	0:40		1.67
0:15	13.12	18.48	0:15	7.45		0:15	5.82	3.51	0:30	4.36	4.89	0:30		3.37	1:00		2.39
0:20	16.74	27.72	0:20	7.89	8.17	0:20	6.02		0:40		5.08	0:40		3.39	1:20		2.71
0:25	36.84	38.81	0:25	8.43		0:25	6.24		0:50		5.33	0:50		3.44	1:40		2.58
0:30	36.84	29.57	0:30	9.10	13.62	0:30	6.48	7.03	1:00	6.95	5.90	1:00	4.42	3.54	2:00	3.03	2.73
0:35	16.74	22.18	0:35	9.98		0:35	6.76		1:10		6.13	1:10		3.66	2:20		2.79
0:40	13.12	14.78	0:40	11.22	20.43	0:40	7.07		1:20		6.27	1:20		3.79	2:40		2.77
0:45	11.22	9.24	0:45	13.12		0:45	7.45	11.71	1:30	8.33	5.79	1:30		3.95	3:00		2.72
0:50	9.98	3.70	0:50	16.74	28.60	0:50	7.89		1:40		5.99	1:40		4.16	3:20		2.82
0:55	9.10	1.85	0:55	36.84		0:55	8.43		1:50		6.42	1:50		4.35	3:40		3.10
1:00	0.00	0.00	1:00	36.84	21.79	1:00	9.10	17.56	2:00	10.65	7.09	2:00	5.68	4.50	4:00	3.89	3.19
			1:05	16.74		1:05	9.98		2:10		8.02	2:10		4.55	4:20		3.36
			1:10	13.12	16.34	1:10	11.22		2:20		9.18	2:20		4.68	4:40		3.60
			1:15	11.22		1:15	13.12	24.59	2:30	15.28	21.19	2:30		4.88	5:00		3.97
			1:20	9.98	10.90	1:20	16.74		2:40		23.55	2:40		5.33	5:20		4.26
			1:25	9.10		1:25	36.84		2:50		23.09	2:50		5.65	5:40		4.44
			1:30	8.43	6.81	1:30	36.84	18.73	3:00	11.58	14.21	3:00	5.05	5.80	6:00	3.46	5.16
			1:35	7.89		1:35	16.74		3:10		11.08	3:10		5.53	6:20		5.48
			1:40	7.45	2.72	1:40	13.12		3:20		8.90	3:20		5.50	6:40		5.24
			1:45	7.07		1:45	11.22	14.05	3:30	9.72	8.94	3:30		5.85	7:00		6.20
			1:50	6.76	1.36	1:50	9.98		3:40		8.05	3:40		6.45	7:20		8.02
			1:55	6.48		1:55	9.10		3:50		7.26	3:50		7.25	7:40		20.59
			2:00	0.00	0.00	2:00	8.43	9.37	4:00	7.87	6.57	4:00	5.05	8.27	8:00	3.46	12.42
						2:05	7.89		4:10		6.00	4:10		16.11	8:20		7.79
						2:10	7.45		4:20		5.54	4:20		21.60	8:40		7.04
						2:15	7.07	5.85	4:30	6.02	5.58	4:30		21.84	9:00		5.74
						2:20	6.76		4:40		5.38	4:40		15.66	9:20		4.84
						2:25	6.48		4:50		5.18	4:50		10.79	9:40		4.71
						2:30	6.24	2.34	5:00	4.63	4.93	5:00	7.57	8.55	10:00	5.19	4.31
						2:35	6.02		5:10		4.76	5:10		8.09	10:20		4.06
						2:40	5.82		5:20		4.65	5:20		7.62	10:40		4.00
						2:45	5.65	1.17	5:30	3.70	4.71	5:30		6.87	11:00		3.77
						2:50	5.49		5:40		4.58	5:40		6.22	11:20		3.54
						2:55	5.34		5:50		4.45	5:50		5.67	11:40		3.29
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	5.68	5.21	12:00	3.89	3.23
												6:10		5.12	12:20		3.33
												6:20		5.03	12:40		3.11
												6:30		4.85	13:00		3.23
												6:40		4.63	13:20		3.04
												6:50		4.44	13:40		2.94
												7:00	5.68	4.33	14:00	3.89	2.93
												7:10		4.34	14:20		2.89
												7:20		4.27	14:40		2.84
												7:30		4.15	15:00		2.80
												7:40		4.03	15:20		2.76
												7:50		3.90	15:40		2.72
												8:00	5.68	3.78	16:00	3.89	2.67
												8:10		3.62	16:20		2.63
												8:20		3.50	16:40		2.58
												8:30		3.44	17:00		2.54
												8:40		3.43	17:20		2.50
												8:50		3.45	17:40		2.45
												9:00	5.05	3.52	18:00	3.46	2.41
												9:10		3.43	18:20		2.36
												9:20		3.31	18:40		2.32
												9:30		3.29	19:00		2.28
												9:40		3.37	19:20		2.24
												9:50		3.34	19:40		2.19
												10:00	5.05	3.24	20:00	3.46	2.15
												10:10		3.18	20:20		2.10
												10:20		3.13	20:40		2.06
												10:30		3.09	21:00		2.02
												10:40		3.11	21:20		1.97
												10:50		3.10	21:40		1.93
												11:00	4.42	3.08	22:00	3.03	1.89
												11:10		3.05	22:20		1.84
												11:20		3.02	22:40		1.80
												11:30		3.00	23:00		1.75
												11:40		2.98	23:20		1.71
												11:50		2.96	23:40		1.66
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	16.2	15.4		23.5	22.7		29.3	29.3		46.30	46.3		63.10	63.1		86.50	86.5

1:2 YR ZONE 3 DESIGN INTENSITY 2100 CLIMATE CHANGE (mm/hr)
Table D15

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	12.05	2.54	0:00	8.45	1.76	0:00	6.90	1.57	0:00	4.14	5.81	0:00	4.97	3.91	0:00	3.47	2.59
0:05	13.28	7.63	0:05	8.83		0:05	7.10		0:10		6.04	0:10		4.11	0:20		2.16
0:10	15.00	15.26	0:10	9.26	5.27	0:10	7.32		0:20		6.24	0:20		4.30	0:40		2.24
0:15	17.67	25.44	0:15	9.77		0:15	7.56	4.72	0:30	5.92	6.25	0:30		4.43	1:00		3.20
0:20	22.80	38.16	0:20	10.38	10.55	0:20	7.82		0:40		6.50	0:40		4.46	1:20		3.63
0:25	52.62	53.42	0:25	11.12		0:25	8.12		0:50		6.81	0:50		4.52	1:40		3.46
0:30	52.62	40.70	0:30	12.05	17.58	0:30	8.45	9.44	1:00	8.88	7.54	1:00	5.80	4.66	2:00	4.05	3.65
0:35	22.80	30.53	0:35	13.28		0:35	8.83		1:10		7.84	1:10		4.80	2:20		3.74
0:40	17.67	20.35	0:40	15.00	26.37	0:40	9.26		1:20		8.01	1:20		4.97	2:40		3.71
0:45	15.00	12.72	0:45	17.67		0:45	9.77	15.74	1:30	10.66	7.40	1:30		5.19	3:00		3.64
0:50	13.28	5.09	0:50	22.80	36.92	0:50	10.38		1:40		7.66	1:40		5.46	3:20		3.77
0:55	12.05	2.54	0:55	52.62		0:55	11.12		1:50		8.21	1:50		5.72	3:40		4.15
1:00	0.00	0.00	1:00	52.62	28.13	1:00	12.05	23.60	2:00	13.62	9.07	2:00	7.46	5.91	4:00	5.21	4.27
			1:05	22.80		1:05	13.28		2:10		10.25	2:10		5.98	4:20		4.50
			1:10	17.67	21.10	1:10	15.00		2:20		11.74	2:20		6.14	4:40		4.81
			1:15	15.00		1:15	17.67	33.05	2:30	19.54	27.10	2:30		6.42	5:00		5.32
			1:20	13.28	14.06	1:20	22.80		2:40		30.11	2:40		7.01	5:20		5.71
			1:25	12.05		1:25	52.62		2:50		29.53	2:50		7.43	5:40		5.95
			1:30	11.12	8.79	1:30	52.62	25.18	3:00	14.80	18.17	3:00	6.63	7.62	6:00	4.63	6.90
			1:35	10.38		1:35	22.80		3:10		14.17	3:10		7.26	6:20		7.33
			1:40	9.77	3.52	1:40	17.67		3:20		11.39	3:20		7.23	6:40		7.01
			1:45	9.26		1:45	15.00	18.88	3:30	12.43	11.44	3:30		7.68	7:00		8.30
			1:50	8.83	1.76	1:50	13.28		3:40		10.29	3:40		8.47	7:20		10.74
			1:55	8.45		1:55	12.05		3:50		9.28	3:50		9.53	7:40		27.56
			2:00	0.00	0.00	2:00	11.12	12.59	4:00	10.06	8.40	4:00	6.63	10.87	8:00	4.63	16.63
						2:05	10.38		4:10		7.67	4:10		21.16	8:20		10.42
						2:10	9.77		4:20		7.08	4:20		28.38	8:40		9.42
						2:15	9.26	7.87	4:30	7.70	7.13	4:30		28.69	9:00		7.69
						2:20	8.83		4:40		6.88	4:40		20.57	9:20		6.49
						2:25	8.45		4:50		6.63	4:50		14.18	9:40		6.30
						2:30	8.12	3.15	5:00	5.92	6.30	5:00	9.95	11.24	10:00	6.95	5.77
						2:35	7.82		5:10		6.09	5:10		10.63	10:20		5.44
						2:40	7.56		5:20		5.94	5:20		10.02	10:40		5.36
						2:45	7.32	1.57	5:30	4.74	6.02	5:30		9.02	11:00		5.05
						2:50	7.10		5:40		5.85	5:40		8.17	11:20		4.74
						2:55	6.90		5:50		5.68	5:50		7.44	11:40		4.40
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	7.46	6.85	12:00	5.21	4.32
												6:10		6.72	12:20		4.46
												6:20		6.61	12:40		4.17
												6:30		6.37	13:00		4.32
												6:40		6.08	13:20		4.07
												6:50		5.84	13:40		3.94
												7:00	7.46	5.69	14:00	5.21	3.93
												7:10		5.70	14:20		3.87
												7:20		5.61	14:40		3.81
												7:30		5.45	15:00		3.75
												7:40		5.29	15:20		3.69
												7:50		5.13	15:40		3.64
												8:00	7.46	4.97	16:00	5.21	3.58
												8:10		4.75	16:20		3.52
												8:20		4.60	16:40		3.46
												8:30		4.52	17:00		3.41
												8:40		4.50	17:20		3.34
												8:50		4.54	17:40		3.29
												9:00	6.63	4.62	18:00	4.63	3.22
												9:10		4.50	18:20		3.17
												9:20		4.35	18:40		3.11
												9:30		4.32	19:00		3.05
												9:40		4.43	19:20		2.99
												9:50		4.38	19:40		2.93
												10:00	6.63	4.26	20:00	4.63	2.87
												10:10		4.18	20:20		2.81
												10:20		4.11	20:40		2.76
												10:30		4.06	21:00		2.70
												10:40		4.08	21:20		2.64
												10:50		4.07	21:40		2.58
												11:00	5.80	4.04	22:00	4.05	2.52
												11:10		4.01	22:20		2.46
												11:20		3.97	22:40		2.41
												11:30		3.94	23:00		2.34
												11:40		3.92	23:20		2.29
												11:50		3.89	23:40		2.23
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	22.2	21.2		31.9	29.3		39.3	39.3		59.20	59.2		82.90	82.9		115.80	115.8

1:5 YR ZONE 3 DESIGN INTENSITY 2100 CLIMATE CHANGE (mm/hr)
Table D16

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	14.03	3.00	0:00	9.78	2.02	0:00	7.96	1.84	0:00	4.70	6.58	0:00	5.77	4.53	0:00	4.09	3.06
0:05	15.49	9.00	0:05	10.22		0:05	8.20		0:10		6.85	0:10		4.77	0:20		2.55
0:10	17.53	18.00	0:10	10.74	6.07	0:10	8.45		0:20		7.07	0:20		4.99	0:40		2.64
0:15	20.71	30.00	0:15	11.34		0:15	8.73	5.53	0:30	6.71	7.08	0:30		5.14	1:00		3.77
0:20	26.83	45.00	0:20	12.05	12.13	0:20	9.04		0:40		7.37	0:40		5.17	1:20		4.27
0:25	63.10	63.00	0:25	12.93		0:25	9.39		0:50		7.72	0:50		5.25	1:40		4.07
0:30	63.10	48.00	0:30	14.03	20.22	0:30	9.78	11.06	1:00	10.07	8.55	1:00	6.73	5.40	2:00	4.77	4.30
0:35	26.83	36.00	0:35	15.49		0:35	10.22		1:10		8.89	1:10		5.57	2:20		4.40
0:40	20.71	24.00	0:40	17.53	30.33	0:40	10.74		1:20		9.08	1:20		5.77	2:40		4.37
0:45	17.53	15.00	0:45	20.71		0:45	11.34	18.43	1:30	12.08	8.39	1:30		6.02	3:00		4.28
0:50	15.49	6.00	0:50	26.83	42.46	0:50	12.05		1:40		8.68	1:40		6.34	3:20		4.44
0:55	14.03	3.00	0:55	63.10		0:55	12.93		1:50		9.31	1:50		6.64	3:40		4.89
1:00	0.00	0.00	1:00	63.10	32.35	1:00	14.03	27.65	2:00	15.43	10.28	2:00	8.66	6.86	4:00	6.14	5.03
			1:05	26.83		1:05	15.49		2:10		11.62	2:10		6.94	4:20		5.30
			1:10	20.71	24.26	1:10	17.53		2:20		13.30	2:20		7.13	4:40		5.67
			1:15	17.53		1:15	20.71	38.71	2:30	22.14	30.71	2:30		7.45	5:00		6.26
			1:20	15.49	16.18	1:20	26.83		2:40		34.13	2:40		8.13	5:20		6.72
			1:25	14.03		1:25	63.10		2:50		33.47	2:50		8.62	5:40		7.01
			1:30	12.93	10.11	1:30	63.10	29.49	3:00	16.78	20.59	3:00	7.70	8.84	6:00	5.46	8.13
			1:35	12.05		1:35	26.83		3:10		16.06	3:10		8.43	6:20		8.64
			1:40	11.34	4.04	1:40	20.71		3:20		12.90	3:20		8.39	6:40		8.26
			1:45	10.74		1:45	17.53	22.12	3:30	14.09	12.96	3:30		8.91	7:00		9.78
			1:50	10.22	2.02	1:50	15.49		3:40		11.66	3:40		9.83	7:20		12.65
			1:55	9.78		1:55	14.03		3:50		10.51	3:50		11.06	7:40		32.47
			2:00	0.00	0.00	2:00	12.93	14.75	4:00	11.41	9.52	4:00	7.70	12.61	8:00	5.46	19.59
						2:05	12.05		4:10		8.70	4:10		24.56	8:20		12.28
						2:10	11.34		4:20		8.03	4:20		32.94	8:40		11.09
						2:15	10.74	9.22	4:30	8.72	8.09	4:30		33.29	9:00		9.06
						2:20	10.22		4:40		7.80	4:40		23.87	9:20		7.64
						2:25	9.78		4:50		7.51	4:50		16.46	9:40		7.42
						2:30	9.39	3.69	5:00	6.71	7.14	5:00	11.54	13.04	10:00	8.18	6.79
						2:35	9.04		5:10		6.90	5:10		12.33	10:20		6.41
						2:40	8.73		5:20		6.73	5:20		11.62	10:40		6.31
						2:45	8.45	1.84	5:30	5.37	6.83	5:30		10.47	11:00		5.95
						2:50	8.20		5:40		6.63	5:40		9.48	11:20		5.58
						2:55	7.96		5:50		6.44	5:50		8.64	11:40		5.19
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	8.66	7.95	12:00	6.14	5.09
												6:10		7.80	12:20		5.26
												6:20		7.67	12:40		4.91
												6:30		7.39	13:00		5.09
												6:40		7.05	13:20		4.80
												6:50		6.77	13:40		4.64
												7:00	8.66	6.61	14:00	6.14	4.62
												7:10		6.61	14:20		4.56
												7:20		6.51	14:40		4.48
												7:30		6.33	15:00		4.42
												7:40		6.14	15:20		4.35
												7:50		5.95	15:40		4.29
												8:00	8.66	5.77	16:00	6.14	4.22
												8:10		5.51	16:20		4.14
												8:20		5.34	16:40		4.07
												8:30		5.25	17:00		4.01
												8:40		5.22	17:20		3.94
												8:50		5.27	17:40		3.87
												9:00	7.70	5.36	18:00	5.46	3.79
												9:10		5.22	18:20		3.73
												9:20		5.05	18:40		3.66
												9:30		5.01	19:00		3.59
												9:40		5.14	19:20		3.52
												9:50		5.08	19:40		3.45
												10:00	7.70	4.94	20:00	5.46	3.38
												10:10		4.85	20:20		3.31
												10:20		4.77	20:40		3.25
												10:30		4.72	21:00		3.18
												10:40		4.73	21:20		3.11
												10:50		4.72	21:40		3.04
												11:00	6.73	4.69	22:00	4.77	2.97
												11:10		4.65	22:20		2.90
												11:20		4.61	22:40		2.83
												11:30		4.58	23:00		2.76
												11:40		4.54	23:20		2.69
												11:50		4.51	23:40		2.62
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	26.3	25.0		37.5	33.7		46.1	46.1		67.10	67.1		96.20	96.2		136.40	136.4

1:10 YR ZONE 3 DESIGN INTENSITY 2100 CLIMATE CHANGE (mm/hr)
Table D17

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	21.53	4.79	0:00	14.87	2.98	0:00	12.05	2.85	0:00	6.61	9.26	0:00	8.81	6.92	0:00	6.56	4.90
0:05	23.82	14.36	0:05	15.57		0:05	12.41		0:10		9.64	0:10		7.29	0:20		4.08
0:10	27.04	28.73	0:10	16.37	8.93	0:10	12.81		0:20		9.94	0:20		7.62	0:40		4.23
0:15	32.07	47.88	0:15	17.30		0:15	13.24	8.56	0:30	9.44	9.97	0:30		7.84	1:00		6.04
0:20	41.81	71.82	0:20	18.43	17.86	0:20	13.73		0:40		10.36	0:40		7.90	1:20		6.86
0:25	101.04	100.55	0:25	19.80		0:25	14.26		0:50		10.86	0:50		8.01	1:40		6.54
0:30	101.04	76.61	0:30	21.53	29.76	0:30	14.87	17.13	1:00	14.16	12.02	1:00	10.28	8.25	2:00	7.66	6.89
0:35	41.81	57.46	0:35	23.82		0:35	15.57		1:10		12.51	1:10		8.51	2:20		7.06
0:40	32.07	38.30	0:40	27.04	44.64	0:40	16.37		1:20		12.78	1:20		8.81	2:40		7.00
0:45	27.04	23.94	0:45	32.07		0:45	17.30	28.54	1:30	16.99	11.80	1:30		9.19	3:00		6.87
0:50	23.82	9.58	0:50	41.81	62.50	0:50	18.43		1:40		12.22	1:40		9.68	3:20		7.13
0:55	21.53	4.79	0:55	101.04		0:55	19.80		1:50		13.09	1:50		10.14	3:40		7.84
1:00	0.00	0.00	1:00	101.04	47.62	1:00	21.53	42.81	2:00	21.71	14.46	2:00	13.22	10.47	4:00	9.85	8.07
			1:05	41.81		1:05	23.82		2:10		16.35	2:10		10.59	4:20		8.50
			1:10	32.07	35.71	1:10	27.04		2:20		18.71	2:20		10.88	4:40		9.10
			1:15	27.04		1:15	32.07	59.94	2:30	31.15	43.21	2:30		11.37	5:00		10.04
			1:20	23.82	23.81	1:20	41.81		2:40		48.01	2:40		12.42	5:20		10.79
			1:25	21.53		1:25	101.04		2:50		47.09	2:50		13.16	5:40		11.24
			1:30	19.80	14.88	1:30	101.04	45.67	3:00	23.60	28.97	3:00	11.75	13.50	6:00	8.75	13.04
			1:35	18.43		1:35	41.81		3:10		22.59	3:10		12.87	6:20		13.86
			1:40	17.30	5.95	1:40	32.07		3:20		18.15	3:20		12.81	6:40		13.25
			1:45	16.37		1:45	27.04	34.25	3:30	19.82	18.23	3:30		13.61	7:00		15.69
			1:50	15.57	2.98	1:50	23.82		3:40		16.41	3:40		15.01	7:20		20.30
			1:55	14.87		1:55	21.53		3:50		14.79	3:50		16.89	7:40		52.08
			2:00	0.00	0.00	2:00	19.80	22.83	4:00	16.05	13.39	4:00	11.75	19.25	8:00	8.75	31.42
						2:05	18.43		4:10		12.24	4:10		37.50	8:20		19.69
						2:10	17.30		4:20		11.30	4:20		50.30	8:40		17.80
						2:15	16.37	14.27	4:30	12.27	11.38	4:30		50.84	9:00		14.53
						2:20	15.57		4:40		10.97	4:40		36.45	9:20		12.25
						2:25	14.87		4:50		10.57	4:50		25.13	9:40		11.90
						2:30	14.26	5.71	5:00	9.44	10.05	5:00	17.63	19.92	10:00	13.13	10.90
						2:35	13.73		5:10		9.70	5:10		18.83	10:20		10.28
						2:40	13.24		5:20		9.47	5:20		17.75	10:40		10.12
						2:45	12.81	2.85	5:30	7.55	9.60	5:30		15.98	11:00		9.54
						2:50	12.41		5:40		9.33	5:40		14.47	11:20		8.96
						2:55	12.05		5:50		9.06	5:50		13.19	11:40		8.32
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	13.22	12.14	12:00	9.85	8.16
												6:10		11.91	12:20		8.43
												6:20		11.71	12:40		7.88
												6:30		11.28	13:00		8.16
												6:40		10.77	13:20		7.70
												6:50		10.34	13:40		7.45
												7:00	13.22	10.09	14:00	9.85	7.42
												7:10		10.09	14:20		7.32
												7:20		9.94	14:40		7.19
												7:30		9.66	15:00		7.09
												7:40		9.37	15:20		6.97
												7:50		9.09	15:40		6.88
												8:00	13.22	8.80	16:00	9.85	6.76
												8:10		8.42	16:20		6.64
												8:20		8.16	16:40		6.54
												8:30		8.01	17:00		6.43
												8:40		7.98	17:20		6.32
												8:50		8.04	17:40		6.21
												9:00	11.75	8.18	18:00	8.75	6.08
												9:10		7.98	18:20		5.98
												9:20		7.71	18:40		5.87
												9:30		7.65	19:00		5.76
												9:40		7.85	19:20		5.65
												9:50		7.76	19:40		5.53
												10:00	11.75	7.54	20:00	8.75	5.43
												10:10		7.40	20:20		5.31
												10:20		7.28	20:40		5.22
												10:30		7.20	21:00		5.10
												10:40		7.23	21:20		4.98
												10:50		7.21	21:40		4.87
												11:00	10.28	7.16	22:00	7.66	4.77
												11:10		7.10	22:20		4.65
												11:20		7.04	22:40		4.54
												11:30		6.99	23:00		4.42
												11:40		6.94	23:20		4.32
												11:50		6.89	23:40		4.21
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	41.2	39.9		58.3	49.6		71.4	71.4		94.40	94.4		146.90	146.9		218.80	218.8

1:100 YR ZONE 3 DESIGN INTENSITY 2100 CLIMATE CHANGE (mm/hr)
Table D18

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	1.54	0:00	1.12	0:00	0.97	0:00	2.66	0:00	3.11	0:00	2.16
0:05	4.62	0:05	1.12	0:05	0.97	0:10	2.66	0:10	3.11	0:20	2.16
0:10	9.23	0:10	3.34	0:10	0.97	0:20	2.66	0:20	3.11	0:40	2.16
0:15	15.38	0:15	3.34	0:15	2.91	0:30	3.80	0:30	3.11	1:00	2.16
0:20	23.08	0:20	6.69	0:20	2.91	0:40	3.80	0:40	3.11	1:20	2.16
0:25	32.31	0:25	6.69	0:25	2.91	0:50	3.80	0:50	3.11	1:40	2.16
0:30	24.61	0:30	11.14	0:30	5.81	1:00	5.70	1:00	3.63	2:00	2.51
0:35	18.46	0:35	11.14	0:35	5.81	1:10	5.70	1:10	3.63	2:20	2.51
0:40	12.31	0:40	16.71	0:40	5.81	1:20	5.70	1:20	3.63	2:40	2.51
0:45	7.69	0:45	16.71	0:45	9.68	1:30	6.84	1:30	3.63	3:00	2.51
0:50	3.07	0:50	23.40	0:50	9.68	1:40	6.84	1:40	3.63	3:20	2.51
0:55	1.54	0:55	23.40	0:55	9.68	1:50	6.84	1:50	3.63	3:40	2.51
1:00	0.00	1:00	17.83	1:00	14.53	2:00	8.74	2:00	4.66	4:00	3.23
		1:05	17.83	1:05	14.53	2:10	8.74	2:10	4.66	4:20	3.23
		1:10	13.37	1:10	14.53	2:20	8.74	2:20	4.66	4:40	3.23
		1:15	13.37	1:15	20.34	2:30	12.54	2:30	4.66	5:00	3.23
		1:20	8.91	1:20	20.34	2:40	12.54	2:40	4.66	5:20	3.23
		1:25	8.91	1:25	20.34	2:50	12.54	2:50	4.66	5:40	3.23
		1:30	5.57	1:30	15.50	3:00	9.51	3:00	4.14	6:00	2.87
		1:35	5.57	1:35	15.50	3:10	9.51	3:10	4.14	6:20	2.87
		1:40	2.23	1:40	15.50	3:20	9.51	3:20	4.14	6:40	2.87
		1:45	2.23	1:45	11.63	3:30	7.98	3:30	4.14	7:00	2.87
		1:50	1.12	1:50	11.63	3:40	7.98	3:40	4.14	7:20	2.87
		1:55	1.12	1:55	11.63	3:50	7.98	3:50	4.14	7:40	2.87
		2:00	0.00	2:00	7.75	4:00	6.47	4:00	4.14	8:00	2.87
				2:05	7.75	4:10	6.47	4:10	4.14	8:20	2.87
				2:10	7.75	4:20	6.47	4:20	4.14	8:40	2.87
				2:15	4.84	4:30	4.94	4:30	4.14	9:00	2.87
				2:20	4.84	4:40	4.94	4:40	4.14	9:20	2.87
				2:25	4.84	4:50	4.94	4:50	4.14	9:40	2.87
				2:30	1.93	5:00	3.80	5:00	6.22	10:00	4.30
				2:35	1.93	5:10	3.80	5:10	6.22	10:20	4.30
				2:40	1.93	5:20	3.80	5:20	6.22	10:40	4.30
				2:45	0.97	5:30	3.04	5:30	6.22	11:00	4.30
				2:50	0.97	5:40	3.04	5:40	6.22	11:20	4.30
				2:55	0.97	5:50	3.04	5:50	6.22	11:40	4.30
				3:00	0.00	6:00	0.00	6:00	4.66	12:00	3.23
								6:10	4.66	12:20	3.23
								6:20	4.66	12:40	3.23
								6:30	4.66	13:00	3.23
								6:40	4.66	13:20	3.23
								6:50	4.66	13:40	3.23
								7:00	4.66	14:00	3.23
								7:10	4.66	14:20	3.23
								7:20	4.66	14:40	3.23
								7:30	4.66	15:00	3.23
								7:40	4.66	15:20	3.23
								7:50	4.66	15:40	3.23
								8:00	4.66	16:00	3.23
								8:10	4.66	16:20	3.23
								8:20	4.66	16:40	3.23
								8:30	4.66	17:00	3.23
								8:40	4.66	17:20	3.23
								8:50	4.66	17:40	3.23
								9:00	4.14	18:00	2.87
								9:10	4.14	18:20	2.87
								9:20	4.14	18:40	2.87
								9:30	4.14	19:00	2.87
								9:40	4.14	19:20	2.87
								9:50	4.14	19:40	2.87
								10:00	4.14	20:00	2.87
								10:10	4.14	20:20	2.87
								10:20	4.14	20:40	2.87
								10:30	4.14	21:00	2.87
								10:40	4.14	21:20	2.87
								10:50	4.14	21:40	2.87
								11:00	3.63	22:00	2.51
								11:10	3.63	22:20	2.51
								11:20	3.63	22:40	2.51
								11:30	3.63	23:00	2.51
								11:40	3.63	23:20	2.51
								11:50	3.63	23:40	2.51
Rain (mm)								12:00	0.00	0:00	0.00
	12.8		18.6		24.2		38.0		51.8		71.8

1:2 YR - ZONE 3 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE

Table D19

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	2.04	0:00	1.40	0:00	1.25	0:00	3.30	0:00	3.94	0:00	2.78
0:05	6.10	0:05	1.40	0:05	1.25	0:10	3.30	0:10	3.94	0:20	2.78
0:10	12.21	0:10	4.19	0:10	1.25	0:20	3.30	0:20	3.94	0:40	2.78
0:15	20.34	0:15	4.19	0:15	3.77	0:30	4.71	0:30	3.94	1:00	2.78
0:20	30.51	0:20	8.38	0:20	3.77	0:40	4.71	0:40	3.94	1:20	2.78
0:25	42.72	0:25	8.38	0:25	3.77	0:50	4.71	0:50	3.94	1:40	2.78
0:30	32.55	0:30	13.96	0:30	7.53	1:00	7.07	1:00	4.61	2:00	3.25
0:35	24.41	0:35	13.96	0:35	7.53	1:10	7.07	1:10	4.61	2:20	3.25
0:40	16.27	0:40	20.94	0:40	7.53	1:20	7.07	1:20	4.61	2:40	3.25
0:45	10.17	0:45	20.94	0:45	12.55	1:30	8.38	1:30	4.61	3:00	3.25
0:50	4.07	0:50	29.31	0:50	12.55	1:40	8.38	1:40	4.61	3:20	3.25
0:55	2.04	0:55	29.31	0:55	12.55	1:50	8.38	1:50	4.61	3:40	3.25
1:00	0.00	1:00	22.33	1:00	18.82	2:00	10.83	2:00	5.93	4:00	4.17
		1:05	22.33	1:05	18.82	2:10	10.83	2:10	5.93	4:20	4.17
		1:10	16.75	1:10	18.82	2:20	10.83	2:20	5.93	4:40	4.17
		1:15	16.75	1:15	26.36	2:30	15.54	2:30	5.93	5:00	4.17
		1:20	11.17	1:20	26.36	2:40	15.54	2:40	5.93	5:20	4.17
		1:25	11.17	1:25	26.36	2:50	15.54	2:50	5.93	5:40	4.17
		1:30	6.98	1:30	20.07	3:00	11.78	3:00	5.26	6:00	3.70
		1:35	6.98	1:35	20.07	3:10	11.78	3:10	5.26	6:20	3.70
		1:40	2.79	1:40	20.07	3:20	11.78	3:20	5.26	6:40	3.70
		1:45	2.79	1:45	15.06	3:30	9.89	3:30	5.26	7:00	3.70
		1:50	1.40	1:50	15.06	3:40	9.89	3:40	5.26	7:20	3.70
		1:55	1.40	1:55	15.06	3:50	9.89	3:50	5.26	7:40	3.70
		2:00	0.00	2:00	10.04	4:00	8.01	4:00	5.26	8:00	3.70
				2:05	10.04	4:10	8.01	4:10	5.26	8:20	3.70
				2:10	10.04	4:20	8.01	4:20	5.26	8:40	3.70
				2:15	6.27	4:30	6.13	4:30	5.26	9:00	3.70
				2:20	6.27	4:40	6.13	4:40	5.26	9:20	3.70
				2:25	6.27	4:50	6.13	4:50	5.26	9:40	3.70
				2:30	2.51	5:00	4.71	5:00	7.90	10:00	5.56
				2:35	2.51	5:10	4.71	5:10	7.90	10:20	5.56
				2:40	2.51	5:20	4.71	5:20	7.90	10:40	5.56
				2:45	1.25	5:30	3.77	5:30	7.90	11:00	5.56
				2:50	1.25	5:40	3.77	5:40	7.90	11:20	5.56
				2:55	1.25	5:50	3.77	5:50	7.90	11:40	5.56
				3:00	0.00	6:00	0.00	6:00	5.93	12:00	4.17
								6:10	5.93	12:20	4.17
								6:20	5.93	12:40	4.17
								6:30	5.93	13:00	4.17
								6:40	5.93	13:20	4.17
								6:50	5.93	13:40	4.17
								7:00	5.93	14:00	4.17
								7:10	5.93	14:20	4.17
								7:20	5.93	14:40	4.17
								7:30	5.93	15:00	4.17
								7:40	5.93	15:20	4.17
								7:50	5.93	15:40	4.17
								8:00	5.93	16:00	4.17
								8:10	5.93	16:20	4.17
								8:20	5.93	16:40	4.17
								8:30	5.93	17:00	4.17
								8:40	5.93	17:20	4.17
								8:50	5.93	17:40	4.17
								9:00	5.26	18:00	3.70
								9:10	5.26	18:20	3.70
								9:20	5.26	18:40	3.70
								9:30	5.26	19:00	3.70
								9:40	5.26	19:20	3.70
								9:50	5.26	19:40	3.70
								10:00	5.26	20:00	3.70
								10:10	5.26	20:20	3.70
								10:20	5.26	20:40	3.70
								10:30	5.26	21:00	3.70
								10:40	5.26	21:20	3.70
								10:50	5.26	21:40	3.70
								11:00	4.61	22:00	3.25
								11:10	4.61	22:20	3.25
								11:20	4.61	22:40	3.25
								11:30	4.61	23:00	3.25
								11:40	4.61	23:20	3.25
								11:50	4.61	23:40	3.25
Rain (mm)								12:00	0.00	0:00	0.00
	17.0		23.3		31.4		47.1		65.8		92.6

1:5 YR - ZONE 3 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE
Table D20

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	2.41	0:00	1.61	0:00	1.48	0:00	3.76	0:00	4.60	0:00	3.29
0:05	7.23	0:05	1.61	0:05	1.48	0:10	3.76	0:10	4.60	0:20	3.29
0:10	14.47	0:10	4.83	0:10	1.48	0:20	3.76	0:20	4.60	0:40	3.29
0:15	24.12	0:15	4.83	0:15	4.44	0:30	5.37	0:30	4.60	1:00	3.29
0:20	36.18	0:20	9.66	0:20	4.44	0:40	5.37	0:40	4.60	1:20	3.29
0:25	50.65	0:25	9.66	0:25	4.44	0:50	5.37	0:50	4.60	1:40	3.29
0:30	38.59	0:30	16.10	0:30	8.86	1:00	8.05	1:00	5.38	2:00	3.84
0:35	28.95	0:35	16.10	0:35	8.86	1:10	8.05	1:10	5.38	2:20	3.84
0:40	19.29	0:40	24.15	0:40	8.86	1:20	8.05	1:20	5.38	2:40	3.84
0:45	12.06	0:45	24.15	0:45	14.77	1:30	9.66	1:30	5.38	3:00	3.84
0:50	4.83	0:50	33.81	0:50	14.77	1:40	9.66	1:40	5.38	3:20	3.84
0:55	2.41	0:55	33.81	0:55	14.77	1:50	9.66	1:50	5.38	3:40	3.84
1:00	0.00	1:00	25.76	1:00	22.14	2:00	12.34	2:00	6.92	4:00	4.93
		1:05	25.76	1:05	22.14	2:10	12.34	2:10	6.92	4:20	4.93
		1:10	19.32	1:10	22.14	2:20	12.34	2:20	6.92	4:40	4.93
		1:15	19.32	1:15	31.00	2:30	17.71	2:30	6.92	5:00	4.93
		1:20	12.88	1:20	31.00	2:40	17.71	2:40	6.92	5:20	4.93
		1:25	12.88	1:25	31.00	2:50	17.71	2:50	6.92	5:40	4.93
		1:30	8.05	1:30	23.62	3:00	13.42	3:00	6.14	6:00	4.38
		1:35	8.05	1:35	23.62	3:10	13.42	3:10	6.14	6:20	4.38
		1:40	3.22	1:40	23.62	3:20	13.42	3:20	6.14	6:40	4.38
		1:45	3.22	1:45	17.72	3:30	11.27	3:30	6.14	7:00	4.38
		1:50	1.61	1:50	17.72	3:40	11.27	3:40	6.14	7:20	4.38
		1:55	1.61	1:55	17.72	3:50	11.27	3:50	6.14	7:40	4.38
		2:00	0.00	2:00	11.81	4:00	9.13	4:00	6.14	8:00	4.38
				2:05	11.81	4:10	9.13	4:10	6.14	8:20	4.38
				2:10	11.81	4:20	9.13	4:20	6.14	8:40	4.38
				2:15	7.39	4:30	6.97	4:30	6.14	9:00	4.38
				2:20	7.39	4:40	6.97	4:40	6.14	9:20	4.38
				2:25	7.39	4:50	6.97	4:50	6.14	9:40	4.38
				2:30	2.95	5:00	5.37	5:00	9.22	10:00	6.58
				2:35	2.95	5:10	5.37	5:10	9.22	10:20	6.58
				2:40	2.95	5:20	5.37	5:20	9.22	10:40	6.58
				2:45	1.48	5:30	4.29	5:30	9.22	11:00	6.58
				2:50	1.48	5:40	4.29	5:40	9.22	11:20	6.58
				2:55	1.48	5:50	4.29	5:50	9.22	11:40	6.58
				3:00	0.00	6:00	0.00	6:00	6.92	12:00	4.93
								6:10	6.92	12:20	4.93
								6:20	6.92	12:40	4.93
								6:30	6.92	13:00	4.93
								6:40	6.92	13:20	4.93
								6:50	6.92	13:40	4.93
								7:00	6.92	14:00	4.93
								7:10	6.92	14:20	4.93
								7:20	6.92	14:40	4.93
								7:30	6.92	15:00	4.93
								7:40	6.92	15:20	4.93
								7:50	6.92	15:40	4.93
								8:00	6.92	16:00	4.93
								8:10	6.92	16:20	4.93
								8:20	6.92	16:40	4.93
								8:30	6.92	17:00	4.93
								8:40	6.92	17:20	4.93
								8:50	6.92	17:40	4.93
								9:00	6.14	18:00	4.38
								9:10	6.14	18:20	4.38
								9:20	6.14	18:40	4.38
								9:30	6.14	19:00	4.38
								9:40	6.14	19:20	4.38
								9:50	6.14	19:40	4.38
								10:00	6.14	20:00	4.38
								10:10	6.14	20:20	4.38
								10:20	6.14	20:40	4.38
								10:30	6.14	21:00	4.38
								10:40	6.14	21:20	4.38
								10:50	6.14	21:40	4.38
								11:00	5.38	22:00	3.84
								11:10	5.38	22:20	3.84
								11:20	5.38	22:40	3.84
								11:30	5.38	23:00	3.84
								11:40	5.38	23:20	3.84
								11:50	5.38	23:40	3.84
Rain (mm)								12:00	0.00	0:00	0.00
	20.1		26.8		36.9		53.7		76.8		109.6

1:10 YR - ZONE 3 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE
Table D21

#6076
02/12/24

1 HR		2 HR		3 HR		6 HR		12 HR		24 HR	
Time	AES	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain	Time	AES Rain
0:00	3.77	0:00	2.33	0:00	2.24	0:00	5.18	0:00	6.91	0:00	5.17
0:05	11.31	0:05	2.33	0:05	2.24	0:10	5.18	0:10	6.91	0:20	5.17
0:10	22.62	0:10	6.99	0:10	2.24	0:20	5.18	0:20	6.91	0:40	5.17
0:15	37.70	0:15	6.99	0:15	6.73	0:30	7.40	0:30	6.91	1:00	5.17
0:20	56.54	0:20	13.98	0:20	6.73	0:40	7.40	0:40	6.91	1:20	5.17
0:25	79.16	0:25	13.98	0:25	6.73	0:50	7.40	0:50	6.91	1:40	5.17
0:30	60.31	0:30	23.29	0:30	13.45	1:00	11.10	1:00	8.06	2:00	6.03
0:35	45.23	0:35	23.29	0:35	13.45	1:10	11.10	1:10	8.06	2:20	6.03
0:40	30.16	0:40	34.93	0:40	13.45	1:20	11.10	1:20	8.06	2:40	6.03
0:45	18.85	0:45	34.93	0:45	22.42	1:30	13.32	1:30	8.06	3:00	6.03
0:50	7.53	0:50	48.91	0:50	22.42	1:40	13.32	1:40	8.06	3:20	6.03
0:55	3.77	0:55	48.91	0:55	22.42	1:50	13.32	1:50	8.06	3:40	6.03
1:00	0.00	1:00	37.26	1:00	33.63	2:00	17.02	2:00	10.36	4:00	7.75
		1:05	37.26	1:05	33.63	2:10	17.02	2:10	10.36	4:20	7.75
		1:10	27.94	1:10	33.63	2:20	17.02	2:20	10.36	4:40	7.75
		1:15	27.94	1:15	47.10	2:30	24.41	2:30	10.36	5:00	7.75
		1:20	18.63	1:20	47.10	2:40	24.41	2:40	10.36	5:20	7.75
		1:25	18.63	1:25	47.10	2:50	24.41	2:50	10.36	5:40	7.75
		1:30	11.64	1:30	35.87	3:00	18.50	3:00	9.21	6:00	6.90
		1:35	11.64	1:35	35.87	3:10	18.50	3:10	9.21	6:20	6.90
		1:40	4.66	1:40	35.87	3:20	18.50	3:20	9.21	6:40	6.90
		1:45	4.66	1:45	26.91	3:30	15.54	3:30	9.21	7:00	6.90
		1:50	2.33	1:50	26.91	3:40	15.54	3:40	9.21	7:20	6.90
		1:55	2.33	1:55	26.91	3:50	15.54	3:50	9.21	7:40	6.90
		2:00	0.00	2:00	17.94	4:00	12.58	4:00	9.21	8:00	6.90
				2:05	17.94	4:10	12.58	4:10	9.21	8:20	6.90
				2:10	17.94	4:20	12.58	4:20	9.21	8:40	6.90
				2:15	11.21	4:30	9.62	4:30	9.21	9:00	6.90
				2:20	11.21	4:40	9.62	4:40	9.21	9:20	6.90
				2:25	11.21	4:50	9.62	4:50	9.21	9:40	6.90
				2:30	4.48	5:00	7.40	5:00	13.81	10:00	10.33
				2:35	4.48	5:10	7.40	5:10	13.81	10:20	10.33
				2:40	4.48	5:20	7.40	5:20	13.81	10:40	10.33
				2:45	2.24	5:30	5.92	5:30	13.81	11:00	10.33
				2:50	2.24	5:40	5.92	5:40	13.81	11:20	10.33
				2:55	2.24	5:50	5.92	5:50	13.81	11:40	10.33
				3:00	0.00	6:00	0.00	6:00	10.36	12:00	7.75
								6:10	10.36	12:20	7.75
								6:20	10.36	12:40	7.75
								6:30	10.36	13:00	7.75
								6:40	10.36	13:20	7.75
								6:50	10.36	13:40	7.75
								7:00	10.36	14:00	7.75
								7:10	10.36	14:20	7.75
								7:20	10.36	14:40	7.75
								7:30	10.36	15:00	7.75
								7:40	10.36	15:20	7.75
								7:50	10.36	15:40	7.75
								8:00	10.36	16:00	7.75
								8:10	10.36	16:20	7.75
								8:20	10.36	16:40	7.75
								8:30	10.36	17:00	7.75
								8:40	10.36	17:20	7.75
								8:50	10.36	17:40	7.75
								9:00	9.21	18:00	6.90
								9:10	9.21	18:20	6.90
								9:20	9.21	18:40	6.90
								9:30	9.21	19:00	6.90
								9:40	9.21	19:20	6.90
								9:50	9.21	19:40	6.90
								10:00	9.21	20:00	6.90
								10:10	9.21	20:20	6.90
								10:20	9.21	20:40	6.90
								10:30	9.21	21:00	6.90
								10:40	9.21	21:20	6.90
								10:50	9.21	21:40	6.90
								11:00	8.06	22:00	6.03
								11:10	8.06	22:20	6.03
								11:20	8.06	22:40	6.03
								11:30	8.06	23:00	6.03
								11:40	8.06	23:20	6.03
								11:50	8.06	23:40	6.03
Rain (mm)								12:00	0.00	0:00	0.00
	31.4		38.8		56.1		74.0		115.1		172.3

1:100 YR - ZONE 3 - DESIGN STORM INTENSITY (mm/hr) - 2050 CLIMATE CHANGE
Table D22

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	6.79	1.39	0:00	4.82	1.01	0:00	3.97	0.88	0:00	2.41	3.37	0:00	2.81	2.21	0:00	1.95	1.45
0:05	7.46	4.18	0:05	5.03		0:05	4.08		0:10		3.51	0:10		2.33	0:20		1.21
0:10	8.39	8.35	0:10	5.27	3.02	0:10	4.20		0:20		3.62	0:20		2.43	0:40		1.26
0:15	9.83	13.92	0:15	5.55		0:15	4.33	2.63	0:30	3.44	3.63	0:30		2.50	1:00		1.79
0:20	12.56	20.88	0:20	5.88	6.05	0:20	4.48		0:40		3.78	0:40		2.52	1:20		2.03
0:25	27.92	29.23	0:25	6.28		0:25	4.64		0:50		3.96	0:50		2.56	1:40		1.94
0:30	27.92	22.27	0:30	6.79	10.08	0:30	4.82	5.26	1:00	5.16	4.38	1:00	3.28	2.63	2:00	2.27	2.04
0:35	12.56	16.70	0:35	7.46		0:35	5.03		1:10		4.56	1:10		2.72	2:20		2.09
0:40	9.83	11.14	0:40	8.39	15.12	0:40	5.27		1:20		4.66	1:20		2.81	2:40		2.08
0:45	8.39	6.96	0:45	9.83		0:45	5.55	8.76	1:30	6.19	4.30	1:30		2.93	3:00		2.04
0:50	7.46	2.78	0:50	12.56	21.17	0:50	5.88		1:40		4.45	1:40		3.09	3:20		2.11
0:55	6.79	1.39	0:55	27.92		0:55	6.28		1:50		4.77	1:50		3.24	3:40		2.33
1:00	0.00	0.00	1:00	27.92	16.13	1:00	6.79	13.15	2:00	7.91	5.27	2:00	4.22	3.34	4:00	2.92	2.40
			1:05	12.56		1:05	7.46		2:10		5.96	2:10		3.38	4:20		2.52
			1:10	9.83	12.10	1:10	8.39		2:20		6.82	2:20		3.48	4:40		2.70
			1:15	8.39		1:15	9.83	18.40	2:30	11.35	15.75	2:30		3.63	5:00		2.98
			1:20	7.46	8.06	1:20	12.56		2:40		17.50	2:40		3.96	5:20		3.20
			1:25	6.79		1:25	27.92		2:50		17.16	2:50		4.20	5:40		3.33
			1:30	6.28	5.04	1:30	27.92	14.02	3:00	8.60	10.56	3:00	3.75	4.31	6:00	2.60	3.87
			1:35	5.88		1:35	12.56		3:10		8.23	3:10		4.11	6:20		4.11
			1:40	5.55	2.02	1:40	9.83		3:20		6.62	3:20		4.09	6:40		3.93
			1:45	5.27		1:45	8.39	10.52	3:30	7.22	6.65	3:30		4.35	7:00		4.65
			1:50	5.03	1.01	1:50	7.46		3:40		5.98	3:40		4.79	7:20		6.02
			1:55	4.82		1:55	6.79		3:50		5.39	3:50		5.39	7:40		15.45
			2:00	0.00	0.00	2:00	6.28	7.01	4:00	5.85	4.88	4:00	3.75	6.15	8:00	2.60	9.32
						2:05	5.88		4:10		4.46	4:10		11.97	8:20		5.84
						2:10	5.55		4:20		4.12	4:20		16.06	8:40		5.28
						2:15	5.27	4.38	4:30	4.47	4.15	4:30		16.23	9:00		4.31
						2:20	5.03		4:40		4.00	4:40		11.64	9:20		3.63
						2:25	4.82		4:50		3.85	4:50		8.02	9:40		3.53
						2:30	4.64	1.75	5:00	3.44	3.66	5:00	5.63	6.36	10:00	3.89	3.23
						2:35	4.48		5:10		3.54	5:10		6.01	10:20		3.05
						2:40	4.33		5:20		3.45	5:20		5.67	10:40		3.00
						2:45	4.20	0.88	5:30	2.75	3.50	5:30		5.10	11:00		2.83
						2:50	4.08		5:40		3.40	5:40		4.62	11:20		2.66
						2:55	3.97		5:50		3.30	5:50		4.21	11:40		2.47
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	4.22	3.88	12:00	2.92	2.42
												6:10		3.80	12:20		2.50
												6:20		3.74	12:40		2.34
												6:30		3.60	13:00		2.42
												6:40		3.44	13:20		2.28
												6:50		3.30	13:40		2.21
												7:00	4.22	3.22	14:00	2.92	2.20
												7:10		3.22	14:20		2.17
												7:20		3.18	14:40		2.13
												7:30		3.08	15:00		2.10
												7:40		2.99	15:20		2.07
												7:50		2.90	15:40		2.04
												8:00	4.22	2.81	16:00	2.92	2.01
												8:10		2.69	16:20		1.97
												8:20		2.60	16:40		1.94
												8:30		2.56	17:00		1.91
												8:40		2.55	17:20		1.87
												8:50		2.57	17:40		1.84
												9:00	3.75	2.61	18:00	2.60	1.80
												9:10		2.55	18:20		1.77
												9:20		2.46	18:40		1.74
												9:30		2.44	19:00		1.71
												9:40		2.51	19:20		1.68
												9:50		2.48	19:40		1.64
												10:00	3.75	2.41	20:00	2.60	1.61
												10:10		2.36	20:20		1.58
												10:20		2.32	20:40		1.55
												10:30		2.30	21:00		1.51
												10:40		2.31	21:20		1.48
												10:50		2.30	21:40		1.45
												11:00	3.28	2.29	22:00	2.27	1.42
												11:10		2.27	22:20		1.38
												11:20		2.25	22:40		1.35
												11:30		2.23	23:00		1.31
												11:40		2.22	23:20		1.28
												11:50		2.20	23:40		1.25
												12:00	0.00	0.00	24:00	0.00	0.00
Rain (mm)																	
	12.2	11.6		17.6	16.8		21.9	21.9		34.40	34.4		46.90	46.9		64.90	64.9

1:2 YR ZONE 3 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)

Table D23

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	8.67	1.84	0:00	6.07	1.26	0:00	4.96	1.13	0:00	2.98	4.17	0:00	3.56	2.80	0:00	2.51	1.87
0:05	9.55	5.51	0:05	6.34		0:05	5.10		0:10		4.34	0:10		2.95	0:20		1.56
0:10	10.79	11.02	0:10	6.66	3.78	0:10	5.26		0:20		4.48	0:20		3.08	0:40		1.62
0:15	12.72	18.36	0:15	7.02		0:15	5.43	3.40	0:30	4.25	4.49	0:30		3.17	1:00		2.31
0:20	16.42	27.54	0:20	7.46	7.56	0:20	5.62		0:40		4.67	0:40		3.19	1:20		2.62
0:25	38.00	38.56	0:25	8.00		0:25	5.83		0:50		4.89	0:50		3.24	1:40		2.50
0:30	38.00	29.38	0:30	8.67	12.60	0:30	6.07	6.80	1:00	6.38	5.41	1:00	4.16	3.34	2:00	2.93	2.63
0:35	16.42	22.03	0:35	9.55		0:35	6.34		1:10		5.63	1:10		3.44	2:20		2.70
0:40	12.72	14.69	0:40	10.79	18.90	0:40	6.66		1:20		5.75	1:20		3.56	2:40		2.68
0:45	10.79	9.18	0:45	12.72		0:45	7.02	11.33	1:30	7.65	5.31	1:30		3.72	3:00		2.63
0:50	9.55	3.67	0:50	16.42	26.46	0:50	7.46		1:40		5.50	1:40		3.91	3:20		2.72
0:55	8.67	1.84	0:55	38.00		0:55	8.00		1:50		5.89	1:50		4.10	3:40		3.00
1:00	0.00	0.00	1:00	38.00	20.16	1:00	8.67	16.99	2:00	9.78	6.51	2:00	5.35	4.23	4:00	3.76	3.09
			1:05	16.42		1:05	9.55		2:10		7.36	2:10		4.28	4:20		3.25
			1:10	12.72	15.12	1:10	10.79		2:20		8.42	2:20		4.40	4:40		3.48
			1:15	10.79		1:15	12.72	23.79	2:30	14.03	19.45	2:30		4.60	5:00		3.84
			1:20	9.55	10.08	1:20	16.42		2:40		21.62	2:40		5.02	5:20		4.12
			1:25	8.67		1:25	38.00		2:50		21.20	2:50		5.32	5:40		4.29
			1:30	8.00	6.30	1:30	38.00	18.12	3:00	10.63	13.04	3:00	4.75	5.46	6:00	3.34	4.98
			1:35	7.46		1:35	16.42		3:10		10.17	3:10		5.20	6:20		5.30
			1:40	7.02	2.52	1:40	12.72		3:20		8.17	3:20		5.18	6:40		5.06
			1:45	6.66		1:45	10.79	13.59	3:30	8.93	8.21	3:30		5.50	7:00		5.99
			1:50	6.34	1.26	1:50	9.55		3:40		7.39	3:40		6.07	7:20		7.76
			1:55	6.07		1:55	8.67		3:50		6.66	3:50		6.83	7:40		19.90
			2:00	0.00	0.00	2:00	8.00	9.06	4:00	7.23	6.03	4:00	4.75	7.79	8:00	3.34	12.01
						2:05	7.46		4:10		5.51	4:10		15.16	8:20		7.52
						2:10	7.02		4:20		5.09	4:20		20.34	8:40		6.80
						2:15	6.66	5.66	4:30	5.53	5.12	4:30		20.56	9:00		5.55
						2:20	6.34		4:40		4.94	4:40		14.74	9:20		4.68
						2:25	6.07		4:50		4.76	4:50		10.16	9:40		4.55
						2:30	5.83	2.27	5:00	4.25	4.52	5:00	7.13	8.05	10:00	5.02	4.16
						2:35	5.62		5:10		4.37	5:10		7.62	10:20		3.93
						2:40	5.43		5:20		4.27	5:20		7.18	10:40		3.87
						2:45	5.26	1.13	5:30	3.40	4.32	5:30		6.46	11:00		3.65
						2:50	5.10		5:40		4.20	5:40		5.85	11:20		3.42
						2:55	4.96		5:50		4.08	5:50		5.33	11:40		3.18
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	5.35	4.91	12:00	3.76	3.12
												6:10		4.82	12:20		3.22
												6:20		4.74	12:40		3.01
												6:30		4.56	13:00		3.12
												6:40		4.36	13:20		2.94
												6:50		4.18	13:40		2.85
												7:00	5.35	4.08	14:00	3.76	2.83
												7:10		4.08	14:20		2.80
												7:20		4.02	14:40		2.75
												7:30		3.91	15:00		2.71
												7:40		3.79	15:20		2.66
												7:50		3.68	15:40		2.63
												8:00	5.35	3.56	16:00	3.76	2.58
												8:10		3.41	16:20		2.54
												8:20		3.30	16:40		2.50
												8:30		3.24	17:00		2.46
												8:40		3.23	17:20		2.41
												8:50		3.25	17:40		2.37
												9:00	4.75	3.31	18:00	3.34	2.32
												9:10		3.23	18:20		2.29
												9:20		3.12	18:40		2.24
												9:30		3.09	19:00		2.20
												9:40		3.17	19:20		2.16
												9:50		3.14	19:40		2.11
												10:00	4.75	3.05	20:00	3.34	2.07
												10:10		2.99	20:20		2.03
												10:20		2.94	20:40		1.99
												10:30		2.91	21:00		1.95
												10:40		2.92	21:20		1.90
												10:50		2.92	21:40		1.86
												11:00	4.16	2.90	22:00	2.93	1.82
												11:10		2.87	22:20		1.78
												11:20		2.85	22:40		1.74
												11:30		2.83	23:00		1.69
												11:40		2.81	23:20		1.65
												11:50		2.79	23:40		1.61
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	16.0	15.3		23.0	21.0		28.3	28.3		42.50	42.5		59.40	59.4		83.60	83.6

1:5 YR ZONE 3 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)
Table D24

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	10.01	2.15	0:00	6.97	1.43	0:00	5.68	1.32	0:00	3.35	4.69	0:00	4.10	3.22	0:00	2.93	2.19
0:05	11.04	6.44	0:05	7.29		0:05	5.84		0:10		4.88	0:10		3.39	0:20		1.82
0:10	12.50	12.89	0:10	7.65	4.30	0:10	6.02		0:20		5.04	0:20		3.55	0:40		1.89
0:15	14.78	21.48	0:15	8.08		0:15	6.22	3.95	0:30	4.78	5.05	0:30		3.65	1:00		2.69
0:20	19.14	32.22	0:20	8.59	8.60	0:20	6.44		0:40		5.25	0:40		3.68	1:20		3.06
0:25	45.07	45.11	0:25	9.22		0:25	6.69		0:50		5.50	0:50		3.73	1:40		2.92
0:30	45.07	34.37	0:30	10.01	14.34	0:30	6.97	7.89	1:00	7.17	6.09	1:00	4.79	3.84	2:00	3.42	3.07
0:35	19.14	25.78	0:35	11.04		0:35	7.29		1:10		6.33	1:10		3.96	2:20		3.15
0:40	14.78	17.18	0:40	12.50	21.51	0:40	7.65		1:20		6.47	1:20		4.10	2:40		3.12
0:45	12.50	10.74	0:45	14.78		0:45	8.08	13.15	1:30	8.60	5.98	1:30		4.28	3:00		3.07
0:50	11.04	4.30	0:50	19.14	30.11	0:50	8.59		1:40		6.19	1:40		4.51	3:20		3.18
0:55	10.01	2.15	0:55	45.07		0:55	9.22		1:50		6.63	1:50		4.72	3:40		3.50
1:00	0.00	0.00	1:00	45.07	22.94	1:00	10.01	19.72	2:00	10.99	7.32	2:00	6.16	4.88	4:00	4.39	3.60
			1:05	19.14		1:05	11.04		2:10		8.28	2:10		4.93	4:20		3.79
			1:10	14.78	17.21	1:10	12.50		2:20		9.48	2:20		5.07	4:40		4.06
			1:15	12.50		1:15	14.78	27.61	2:30	15.77	21.88	2:30		5.29	5:00		4.48
			1:20	11.04	11.47	1:20	19.14		2:40		24.31	2:40		5.78	5:20		4.81
			1:25	10.01		1:25	45.07		2:50		23.84	2:50		6.13	5:40		5.01
			1:30	9.22	7.17	1:30	45.07	21.04	3:00	11.95	14.67	3:00	5.47	6.29	6:00	3.90	5.82
			1:35	8.59		1:35	19.14		3:10		11.44	3:10		5.99	6:20		6.18
			1:40	8.08	2.87	1:40	14.78		3:20		9.19	3:20		5.96	6:40		5.91
			1:45	7.65		1:45	12.50	15.78	3:30	10.04	9.23	3:30		6.34	7:00		7.00
			1:50	7.29	1.43	1:50	11.04		3:40		8.31	3:40		6.99	7:20		9.05
			1:55	6.97		1:55	10.01		3:50		7.49	3:50		7.86	7:40		23.23
			2:00	0.00	0.00	2:00	9.22	10.52	4:00	8.13	6.78	4:00	5.47	8.97	8:00	3.90	14.02
						2:05	8.59		4:10		6.20	4:10		17.46	8:20		8.78
						2:10	8.08		4:20		5.72	4:20		23.42	8:40		7.94
						2:15	7.65	6.58	4:30	6.21	5.76	4:30		23.67	9:00		6.48
						2:20	7.29		4:40		5.56	4:40		16.97	9:20		5.47
						2:25	6.97		4:50		5.35	4:50		11.70	9:40		5.31
						2:30	6.69	2.63	5:00	4.78	5.09	5:00	8.21	9.27	10:00	5.86	4.86
						2:35	6.44		5:10		4.91	5:10		8.77	10:20		4.58
						2:40	6.22		5:20		4.80	5:20		8.27	10:40		4.52
						2:45	6.02	1.32	5:30	3.82	4.86	5:30		7.44	11:00		4.26
						2:50	5.84		5:40		4.73	5:40		6.74	11:20		4.00
						2:55	5.68		5:50		4.59	5:50		6.14	11:40		3.71
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	6.16	5.65	12:00	4.39	3.64
												6:10		5.55	12:20		3.76
												6:20		5.45	12:40		3.51
												6:30		5.25	13:00		3.64
												6:40		5.02	13:20		3.43
												6:50		4.82	13:40		3.32
												7:00	6.16	4.70	14:00	4.39	3.31
												7:10		4.70	14:20		3.26
												7:20		4.63	14:40		3.21
												7:30		4.50	15:00		3.16
												7:40		4.37	15:20		3.11
												7:50		4.23	15:40		3.07
												8:00	6.16	4.10	16:00	4.39	3.02
												8:10		3.92	16:20		2.96
												8:20		3.80	16:40		2.92
												8:30		3.73	17:00		2.87
												8:40		3.72	17:20		2.82
												8:50		3.74	17:40		2.77
												9:00	5.47	3.81	18:00	3.90	2.71
												9:10		3.71	18:20		2.67
												9:20		3.59	18:40		2.62
												9:30		3.56	19:00		2.57
												9:40		3.66	19:20		2.52
												9:50		3.62	19:40		2.47
												10:00	5.47	3.51	20:00	3.90	2.42
												10:10		3.45	20:20		2.37
												10:20		3.39	20:40		2.33
												10:30		3.35	21:00		2.27
												10:40		3.37	21:20		2.22
												10:50		3.36	21:40		2.17
												11:00	4.79	3.33	22:00	3.42	2.13
												11:10		3.31	22:20		2.08
												11:20		3.28	22:40		2.03
												11:30		3.25	23:00		1.97
												11:40		3.23	23:20		1.93
												11:50		3.21	23:40		1.88
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	18.8	17.9		26.7	23.9		32.9	32.9		47.80	47.8		68.40	68.4		97.60	97.6

1:10 YR ZONE 3 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)
Table D25

#6076
02/12/24

1 HR			2 HR			3 HR			6 HR			12 HR			24 HR		
Time	Chicago	AES	Time	Chicago	AES	Time	Chicago	AES	Time	AES	SCS	Time	AES	SCS	Time	AES	SCS
0:00	14.85	3.31	0:00	10.25	2.05	0:00	8.30	1.97	0:00	4.55	6.38	0:00	6.07	4.77	0:00	4.54	3.39
0:05	16.43	9.94	0:05	10.73		0:05	8.55		0:10		6.63	0:10		5.02	0:20		2.83
0:10	18.66	19.87	0:10	11.28	6.14	0:10	8.82		0:20		6.85	0:20		5.25	0:40		2.93
0:15	22.14	33.12	0:15	11.93		0:15	9.12	5.91	0:30	6.50	6.86	0:30		5.40	1:00		4.18
0:20	28.88	49.68	0:20	12.70	12.28	0:20	9.46		0:40		7.13	0:40		5.44	1:20		4.74
0:25	69.95	69.55	0:25	13.65		0:25	9.83		0:50		7.48	0:50		5.52	1:40		4.52
0:30	69.95	52.99	0:30	14.85	20.46	0:30	10.25	11.82	1:00	9.75	8.28	1:00	7.08	5.68	2:00	5.30	4.77
0:35	28.88	39.74	0:35	16.43		0:35	10.73		1:10		8.61	1:10		5.86	2:20		4.89
0:40	22.14	26.50	0:40	18.66	30.69	0:40	11.28		1:20		8.80	1:20		6.06	2:40		4.85
0:45	18.66	16.56	0:45	22.14		0:45	11.93	19.70	1:30	11.70	8.13	1:30		6.32	3:00		4.75
0:50	16.43	6.62	0:50	28.88	42.97	0:50	12.70		1:40		8.41	1:40		6.66	3:20		4.93
0:55	14.85	3.31	0:55	69.95		0:55	13.65		1:50		9.01	1:50		6.98	3:40		5.43
1:00	0.00	0.00	1:00	69.95	32.74	1:00	14.85	29.55	2:00	14.95	9.96	2:00	9.10	7.21	4:00	6.81	5.59
			1:05	28.88		1:05	16.43		2:10		11.26	2:10		7.29	4:20		5.88
			1:10	22.14	24.55	1:10	18.66		2:20		12.88	2:20		7.49	4:40		6.29
			1:15	18.66		1:15	22.14	41.38	2:30	21.45	29.75	2:30		7.82	5:00		6.95
			1:20	16.43	16.37	1:20	28.88		2:40		33.06	2:40		8.55	5:20		7.46
			1:25	14.85		1:25	69.95		2:50		32.42	2:50		9.06	5:40		7.78
			1:30	13.65	10.23	1:30	69.95	31.52	3:00	16.25	19.95	3:00	8.09	9.29	6:00	6.06	9.02
			1:35	12.70		1:35	28.88		3:10		15.56	3:10		8.85	6:20		9.59
			1:40	11.93	4.09	1:40	22.14		3:20		12.50	3:20		8.81	6:40		9.17
			1:45	11.28		1:45	18.66	23.64	3:30	13.65	12.56	3:30		9.37	7:00		10.86
			1:50	10.73	2.05	1:50	16.43		3:40		11.30	3:40		10.33	7:20		14.05
			1:55	10.25		1:55	14.85		3:50		10.19	3:50		11.62	7:40		36.04
			2:00	0.00	0.00	2:00	13.65	15.76	4:00	11.05	9.22	4:00	8.09	13.25	8:00	6.06	21.74
						2:05	12.70		4:10		8.43	4:10		25.81	8:20		13.63
						2:10	11.93		4:20		7.78	4:20		34.61	8:40		12.31
						2:15	11.28	9.85	4:30	8.45	7.83	4:30		34.99	9:00		10.05
						2:20	10.73		4:40		7.56	4:40		25.09	9:20		8.48
						2:25	10.25		4:50		7.28	4:50		17.30	9:40		8.24
						2:30	9.83	3.94	5:00	6.50	6.92	5:00	12.13	13.71	10:00	9.08	7.54
						2:35	9.46		5:10		6.68	5:10		12.96	10:20		7.11
						2:40	9.12		5:20		6.52	5:20		12.22	10:40		7.01
						2:45	8.82	1.97	5:30	5.20	6.61	5:30		11.00	11:00		6.60
						2:50	8.55		5:40		6.43	5:40		9.96	11:20		6.20
						2:55	8.30		5:50		6.24	5:50		9.08	11:40		5.76
						3:00	0.00	0.00	6:00	0.00	0.00	6:00	9.10	8.35	12:00	6.81	5.65
												6:10		8.20	12:20		5.83
												6:20		8.06	12:40		5.45
												6:30		7.77	13:00		5.65
												6:40		7.41	13:20		5.32
												6:50		7.12	13:40		5.15
												7:00	9.10	6.94	14:00	6.81	5.13
												7:10		6.95	14:20		5.06
												7:20		6.84	14:40		4.98
												7:30		6.65	15:00		4.91
												7:40		6.45	15:20		4.83
												7:50		6.26	15:40		4.76
												8:00	9.10	6.06	16:00	6.81	4.68
												8:10		5.80	16:20		4.60
												8:20		5.61	16:40		4.52
												8:30		5.52	17:00		4.45
												8:40		5.49	17:20		4.37
												8:50		5.53	17:40		4.30
												9:00	8.09	5.63	18:00	6.06	4.21
												9:10		5.49	18:20		4.14
												9:20		5.31	18:40		4.06
												9:30		5.27	19:00		3.98
												9:40		5.40	19:20		3.91
												9:50		5.34	19:40		3.83
												10:00	8.09	5.19	20:00	6.06	3.76
												10:10		5.09	20:20		3.67
												10:20		5.01	20:40		3.61
												10:30		4.96	21:00		3.53
												10:40		4.98	21:20		3.45
												10:50		4.96	21:40		3.37
												11:00	7.08	4.93	22:00	5.30	3.30
												11:10		4.89	22:20		3.22
												11:20		4.84	22:40		3.14
												11:30		4.81	23:00		3.06
												11:40		4.78	23:20		2.99
												11:50		4.74	23:40		2.91
Rain (mm)												12:00	0.00	0.00	24:00	0.00	0.00
	28.5	27.6		40.2	34.1		49.3	49.3		65.00	65.0		101.10	101.1		151.40	151.4

1:100 YR ZONE 3 DESIGN INTENSITY CURRENT/PRE-DEV (mm/hr)

Table D26

Total Rainfall (mm)

Return Period Storm Duration	2100 Moderate IDF Curve							Current						
	2yr	5yr	10yr	25yr	50yr	100yr	200yr	2yr	5yr	10yr	25yr	50yr	100yr	200yr
5-min	4.2	6.1	7.3	8.9	10.2	11.4	12.7	3.2	4.4	5.2	6.3	7.1	7.9	8.7
10-min	6.3	9.1	10.9	13.4	15.3	17.3	19.4	4.8	6.6	7.8	9.5	10.7	12.0	13.4
15-min	7.8	11.1	13.4	16.7	19.3	22.1	25.0	5.9	8.0	9.6	11.8	13.5	15.3	17.2
30-min	10.9	15.5	18.9	23.7	27.7	32.1	36.9	8.2	11.2	13.5	16.7	19.3	22.2	25.3
1-hr	15.4	21.2	25.0	30.4	35.1	39.9	45.0	11.6	15.3	17.9	21.5	24.5	27.6	30.9
2-hr	22.7	29.3	33.7	39.7	44.5	49.6	55.1	16.8	21.0	23.9	27.9	30.9	34.1	37.5
6-hr	46.3	59.2	67.1	77.6	85.9	94.4	102.9	34.4	42.5	47.8	54.7	59.8	65.0	70.2
12-hr	63.1	82.9	96.2	114.7	130.4	146.9	164.4	46.9	59.4	68.4	80.7	90.6	101.1	112.2
24-hr	86.5	115.8	136.4	165.8	191.2	218.8	248.9	64.9	83.6	97.6	117.3	133.6	151.4	170.8
Annual Exceedance Probability	50%	20%	10%	4%	2%	1%	0.50%	50%	20%	10%	4%	2%	1%	0.50%

Rainfall Intensity (mm/hr)

Return Period Storm Duration	2100 Moderate IDF Curve							Current						
	2yr	5yr	10yr	25yr	50yr	100yr	200yr	2yr	5yr	10yr	25yr	50yr	100yr	200yr
5-min	50.7	73.4	88.5	109.5	126.1	142.9	160.8	38.5	53.1	63.3	77.4	88.0	99.0	110.6
10-min	36.8	52.6	63.1	77.6	89.2	101.0	113.6	27.9	38.0	45.1	54.9	62.2	70.0	78.0
15-min	30.6	43.3	51.8	63.5	72.8	82.5	92.7	23.1	31.3	37.0	44.8	50.8	57.1	63.7
30-min	22.2	31.0	36.9	45.0	51.5	58.3	65.5	16.8	22.4	26.3	31.8	35.9	40.3	44.9
1-hr	16.2	22.2	26.3	31.9	36.5	41.2	46.3	12.2	16.0	18.8	22.5	25.4	28.5	31.7
2-hr	11.8	15.9	18.7	22.6	25.8	29.1	32.7	8.8	11.5	13.4	16.0	18.0	20.1	22.4
6-hr	9.8	13.1	15.4	18.5	21.1	23.8	26.7	7.3	9.4	11.0	13.0	14.7	16.4	18.3
12-hr	5.2	6.7	7.8	9.3	10.5	11.9	13.3	3.8	4.8	5.6	6.5	7.3	8.2	9.1
24-hr	3.8	4.8	5.6	6.6	7.5	8.4	9.4	2.8	3.5	4.0	4.6	5.2	5.8	6.4
Annual Exceedance Probability	50%	20%	10%	4%	2%	1%	0.50%	50%	20%	10%	4%	2%	1%	0.50%

Zone 3 - AVERAGE RAINFALL

Table D27

D6.3 Presentation of Modelling Results

The Owner's Engineer shall submit a report including the following information:

- a) Description of the Development area, the watershed, existing and proposed land uses for the area with comments on conformity to applicable master drainage and neighbourhood servicing plans and any proposed changes with reasons for change.
- b) Drainage map showing the catchment and sub-catchment boundaries, slopes, land uses and soil conditions.
- c) Layout plans and tables of the Development area drainage characteristics for existing and future land use conditions;
- d) Brief description of the modeling approach and the selected modeling program including the name and version of modeling program.
- e) Brief description of modeled catchment and drainage system parameters, design storms and related modeling parameters.
- f) Layout schematic diagrams and data tables of the catchment and drainage system characteristics as modeled for the study area.
- g) Description of modeling results, limitations, conclusions and recommendations including any significant changes to previous drainage plans for the area.
- h) Properly labeled computer model element layout plan together with input and output printouts and computer files.

D7 STORMWATER CONVEYANCE

D7.1 Minor and Major Systems

A minor drainage system shall be provided which may include pipes, ditches, culverts, channels, infiltration systems, and flow control facilities and shall be designed to collect and carry the runoff from frequent storm events specified in Section D3.

A major drainage system shall be provided which may include surface flood paths, ditches, roadways, pipes, watercourses, and flow control facilities and shall be designed to ensure public safety and protection against any property damage under the runoff specified in Section D3 to the satisfaction of the Municipal Engineer. Parts of the major flow route not within dedicated roads or other municipally owned land shall be protected by rights-of-way as required by the Municipal Engineer and clearly identified in the stormwater management plan.

If surface flow is not feasible, the piped system shall be sized to accommodate the major flow and attention must be given to ensuring inlets cannot be blocked or restricted.

Surcharging at major flow inlets is acceptable provided the headwater profile meets the criteria with respect to the Minimum Building Elevation (MBE). Adequate erosion protection shall be provided at the inlet where surcharging is proposed.

D7.2 Pipelines

a) Pipe Diameter

Storm sewer capacity shall be calculated using the Manning Formula under free flow (non-surcharged) conditions.

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

Where	Q	=	flow capacity (m ³ /s)
	A	=	cross sectional area (m ²)
	R	=	hydraulic radius (m)
	S	=	slope of hydraulic grade line (m/m)
	n	=	roughness coefficient
			0.013 for PVC, asbestos cement, clay and concrete pipe
			0.024 for corrugated metal pipe (CMP)

Downsizing of storm sewers shall not be accepted for sizes 600 mm diameter or less, unless accepted by the Municipal Engineer.

The minimum diameter of storm sewers shall be 250 mm except at a terminal section with no catchbasin connections where the diameter may be reduced to 200 mm.

b) Velocity and Grade

The minimum velocity for pipes flowing full or half full shall be 0.75 m/s.

If the design velocity exceeds 2.50 m/s or supercritical flow occurs, the design shall provide for the structural stability and durability of the pipe and manhole(s).

Anchor blocks shall be provided in accordance with MMCD Standard Detail Drawing G8 for grades of 15% or steeper.

Where drainage discharge enters a natural watercourse, adequate riprap protection shall be provided and the maximum velocity limited to 1 m/s.

c) Depth

Minimum depth of cover shall be 1 m for storm sewers up to 600 mm diameter. For larger sewers, or for less cover, the cover design shall be certified by the Owner's Engineer.

Depth of storm sewers shall be adequate to serve properties on both sides of the road and shall allow for future extensions to service all upstream tributary lands for ultimate Development but shall not be deeper than 4.5 m unless approved by the Municipal Engineer.

Where it is not feasible to service the property(s) on the low side of the road with a gravity connection, a rear yard storm sewer shall be provided.

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

d) Sewer Location

Sewers and manholes shall be offset from the vehicular wheel paths wherever possible. Manhole(s) will not be accepted within the curb alignment.

Where it is not technically possible to locate a storm sewer within the dedicated road, a statutory right-of-way shall be provided with a minimum width equal to twice the depth of the pipe from finished grade to the crown. Where there is more than one pipe in the right-of-way, the minimum width shall be based on the deepest pipe and the required separation between pipes shall be taken into account. Separation between sewer pipes, sanitary or storm, shall be 1.2 m. Separation between water and storm sewer pipes shall be 3 m unless otherwise approved by the Regional Public Health Engineer of the Health Authority.

The width of right-of-way shall be sufficient to permit excavation in accordance with WorkSafeBC requirements.

The minimum width of right-of-way and easements shall be for:

- one sewer only – 4.5 m
- two or more utilities – 6 m

The above right-of-way widths may be increased dependent on the depth of utility and will consider topography and soils conditions, at the discretion of the Municipal Engineer.

The Municipal Engineer may require the Owner to register a covenant in favour of the Municipality on a Parcel over which a right-of-way is required and on a Parcel abutting a right-of-way. The covenant shall specify that the foundation of any wall abutting the right-of-way shall be at an elevation no higher than the invert of the lowest utility.

If a manhole, valve chamber, or other appurtenance is located within a right-of-way, a maintenance access right-of-way, of a width and on an alignment acceptable to the Municipal Engineer, shall be provided directly from an existing municipal road. The maintenance access shall be constructed to provide access in all weathers on a base adequate to support a 9 T vehicle loading in accordance with Supplementary Detail Drawing TLG 03.

Rights-of-way shall be entirely on one side of the boundary between Parcels.

D7.3 Manholes and Cleanouts

a) Manhole Locations

Manholes shall be located at:

- intersecting sewers except 100 mm and 150 mm services and catchbasin connections
- changes in grade
- changes in pipe size
- every 150 m for pipes less than 900 mm diameter
- every 200 m for pipes 900 mm diameter and larger
- changes in direction
- downstream end of curvilinear sewers
- upstream end of all sewers, except temporarily in accordance with D7.3 c)

b) Manhole Design

- The invert of the downstream pipe shall be no higher than that of an upstream pipe.
- Inlet sewers, and any service connections, catchbasin and lawn basin leads required, or permitted, to connect directly to manholes, shall enter at the bottom of the manhole except that drop manholes may be used where inlet sewers, connections or leads cannot be steepened or site conditions prevent excavation to the base of an existing manhole. Drops shall be in accordance with MMCD Standard Detail Drawing S3. Connections shall not be in an adverse direction to the outlet flow. For drops in pipes 600 mm diameter and larger, hydraulic conditions must be reviewed by the Owner's Engineer.
- Hydraulic losses shall be calculated for manholes within which there is a significant change of pipeline grade or alignment, or that have more than one upstream sewer connected. Invert drops are not required where there is no change of direction or grade. A change of direction up to 45° shall have a minimum 15 mm drop and a change of direction from 45° to 90° shall have a 30 mm drop.
- Manhole lids located within the boulevard shall have a 1.5 m x 1.5 m asphalt apron surround (see TLD 07).

c) Cleanouts

Permanent cleanouts are not permitted, but temporary cleanouts may be provided at terminal sections of a sewer if:

- future extension of the main is proposed or anticipated
- the length of sewer to the downstream manhole does not exceed 45 m
- the depth of the pipe does not exceed 2 m at the terminal point

D7.4 Catchbasins

Catchbasins shall be provided at regular intervals based on the maximum drainage area noted in this section, along roadways and at:

- low points

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- the upstream end of, but not within or in front of, curb returns, cross walks and wheel chair ramps

Sufficient inlet capacity shall be provided to divert the entire minor flow into the underground pipe system. Where a surface major flow route is not provided, catchbasins shall be designed to intercept the 2100 Climate Change 100 year runoff flowing onto the road from surrounding property.

Combination side and gutter entry catchbasins shall be used:

- on arterial and collector roads
- where the gutter entry capacity is reduced below that of a Dobney B-23 gutter grate to accommodate bicycle traffic
- where the major flow route is to be directed into the pipe system
- at corners, intersections and ends of cul-de-sac on any downhill grade of 5% or greater

The spacing of the catchbasins shall be based on hydraulic requirements. The capacity of a single catchbasin may be calculated by the orifice equation, but only the gutter opening shall be taken into account in combination catchbasins:

$$Q = 0.67 C A (2 g h)^{0.5}$$

Where	Q	=	inlet capacity (m ³ /s)
	0.67	=	clogging factor
	C	=	orifice coefficient (0.8)
	A	=	open area (0.068 m ² for Dobney B-23 grate)
	g	=	gravitational acceleration (9.81 m/s ²)
	h	=	depth of ponding (m)

The spacing shall be established to permit each catchbasin to drain a maximum area of 500 m² on road grades up to 5% and 350 m² on steeper grades.

The minimum size of catchbasin leads is 200 mm for single catchbasins and 250 mm for double catchbasins. Catchbasin leads shall be installed perpendicular to the storm sewer and road centreline. Double catchbasins shall each have separate leads connected by a wye. Catchbasin leads shall have a minimum grade of 1% and a maximum length of 30 m.

Catchbasin leads cannot connect to a manhole unless approved by the Municipal Engineer.

D7.5 Service Connections

- Separate storm service connection shall be provided to every lot within a Development in accordance with Section 6.4 of the Bylaw except where the land can drain to an acceptable alternate existing system.
- When the sewer main replaces an existing ditch, all existing service connections shall be connected to the proposed main.
- Except in the turn around area of a cul-de-sac, connections shall be installed perpendicular to the storm sewer which must be extended if necessary to accommodate this requirement.
- Connections shall generally be located in accordance with Supplementary Detail Drawing TLG 01 but shall, in any case, avoid conflict with all other municipal and non-municipal utilities and appurtenances and allow the maximum number of street trees while avoiding driveway locations if possible.
- The minimum diameter shall be 150 mm except that 100 mm service connections are permitted for one and two family residential lots provided they do not have lawn basins connected to them.
- Connections to new mains shall be made using wye fittings.
- Connections to existing mains shall be made using wye saddles unless otherwise approved by the Municipal Engineer Inserta-tee's may be used if the connection is more than two pipe sizes smaller than main..
- A manhole shall be provided on the storm sewer main for all service connections greater than 250 mm diameter, unless the connection is more than two pipe sizes smaller than the main.
- The minimum grade from main to property line shall be 2% for 100 mm connections and 1.5% for 150 mm. All other sizes shall be based on minimum velocity of 0.75 m/s.
- The minimum depth of a service at the property line shall be 1 m and the maximum shall be 3 m unless otherwise accepted by the Municipal Engineer.
- The service connection at the property line shall be above the hydraulic grade line of the minor flow.
- Inspection chambers shall be provided for all connections in accordance with Standard Detail Drawing TLD 09.

D7.6 Roof Drainage

Provided that a site is graded away from the building towards the street, to a lot grading swale connected to the municipal drainage system or to an approved on-site infiltration system, roof drainage shall be discharged to the ground and dispersed via splash pads at the downspouts but shall not be dispersed towards a front/rear or side yard less than 5m wide unless approved by the Municipal Engineer

D7.7 Site Drainage

A lot grading plan shall be provided by the Owner for:

- a Subdivision other than a Subdivision in a Rural or Agricultural Zone
- a Development in a Commercial, Industrial, Institutional, Multiple Family or Comprehensive Development Zone
- a Development in a Rural, Agricultural or Suburban Residential Zone that has a total impermeable surface area, including building footprint,

driveway, parking, storage and other paved areas greater than 3,700 m² or that covers more than 10% of the Parcel area

The ground surface of Developments and lots within Subdivisions shall be graded in accordance with a lot grading plan accepted by the Municipal Engineer.

Lot grading shall be uniform and consistent except that the area around building sites shall be graded away from the foundations. The centre of lot elevation, as established by a registered British Columbia Land Surveyor, shall not exceed the average elevation of adjacent lots at the adjoining lot lines, unless accepted by the Municipal Engineer, based on site conditions including topography and special features.

The minimum slope shall be 2%. Each lot shall be graded to a swale on the lot with a minimum 600 mm diameter lawn basin at the low end of the swale.

- Swales shall be a maximum of 150 mm deep, have a minimum longitudinal grade of 2% and conform to Supplementary Detail Drawing TLD 04.
- Lawn basins shall be connected to the municipal drainage system by a minimum 150 mm pipe without crossing other lots.

Alternatively, each lot may be graded to drain directly, without crossing other adjacent land, to a Highway or a natural watercourse or, with the approval of the Municipal Engineer, to a park or conservation area, but no concentrated discharge shall be permitted onto such areas by way of a swale, ditch, pipe or other means. Grading towards ravines having a depth greater than 3 m, or towards slopes having a grade greater than 25% is not permitted unless approved by the Municipal Engineer.

Where these methods of site drainage are not possible, the Municipal Engineer may permit a swale and lawn basin on each lot to be connected to a minimum 200 mm pipe crossing adjacent land to connect to the municipal storm sewer system. Such storm drains shall be the ongoing responsibility of the benefitting lot Owners and shall be in a 3 m wide easement in a form acceptable to the Municipal Engineer.

D7.8 Lawn Basins

Lawn basins shall be provided on public and private property where necessary to prevent ponding except where temporary ponding is intended to occur in conjunction with an infiltration system approved by the Municipal Engineer. Lawn basins in gravel areas shall be centered in a 1.5 m x 1.5 m asphalt apron. Lawn basins shall be offset from storm drains. Lawn basin leads shall be a minimum 150 mm diameter, have a minimum slope of 1% and be connected to the storm drain with a wye.

An inspection chamber shall be provided at the property line on lawn basin leads from private properties.

D7.9 French Drains

French drains shall be constructed where required for control of underground seepage. A soils report will be required to support the design to the acceptance of the Municipal Engineer.

D7.10 Rockpits and Drywells

Rockpits or drywells shall only be used for minor drainage systems and with the approval of the Municipal Engineer.

The location and spacing of rockpits or drywells shall be shown on the design drawings submitted for the Municipal Engineer's approval and a report submitted, from the Owner's Engineer, confirming that they shall dispose of flows at least equal to twice the minor system flow calculated in accordance with Schedule B, Sections D3 and D5.

A major flow system shall be provided in accordance with Schedule B, Section D7.1.

D7.11 Ditches

Ditches are not acceptable for permanent servicing of Developments in Service Level Areas 1 and 2.

Ditches adjacent to roadways shall have:

- maximum depth 1 m*
* unless otherwise approved by the Municipal Engineer
- minimum bottom width 0.5 m
- maximum side slope 1.5(H):1(V)
- minimum grade 0.5%
- maximum velocity (unlined ditch) 1 m/s

Where soil conditions are suitable, or where erosion protection is provided, higher velocities may be permitted. If grades are excessive, erosion control structures or ditch enclosure may be required.

The minimum right-of-way width for a ditch shall be 6 m where the ditch crosses private property. The ditch shall be offset in the right-of-way to permit a 3 m wide access for maintenance vehicles. The top of the ditch adjacent to a property boundary, or right-of-way boundary, shall be a minimum 0.5 m away from that boundary.

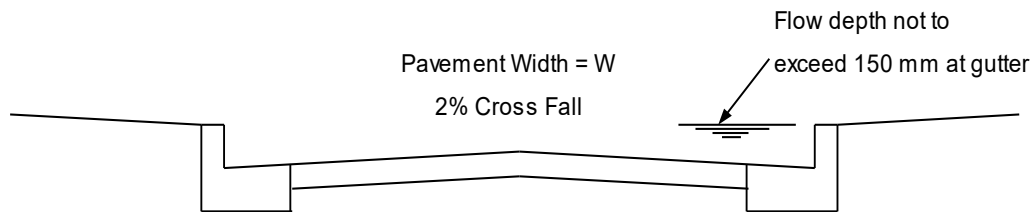
D7.12 Roadway Major Drainage

Roadways with barrier curbs and gutters may be designed to convey the major system flow. Maximum depth of flow shall not exceed 150 mm above the gutter line. Table D20 shall be used for calculating flow capacities.

Drawings and calculations shall be submitted to verify that:

- surface flow is maintained within the road right-of-way of the intended route
- existing and potential roads and Development in the surrounding area are not adversely affected
- the 100 year hydraulic grade line is at least 0.35 m below the lowest MBE of all existing and potential buildings in the area

Intersections shall be designed to ensure the major flow is directed into, and contained within, the intended route.



Flow Capacity $Q = A * V$
 Flow Velocity $V = (1 / n) * (A / P)^{0.667} * (S / 100)^{0.5}$
 Flow Area $A = 0.15W - 0.005W^2$
 Wetted Perimeter $P = 0.3 + W$
 Roughness Coeff $n = 0.013$

Road Grade S %	W = 8.6 A = 0.920		W = 11 A = 1.045		W = 12.2 A = 1.086		W = 15 A = 1.125	
	V m/s	Q m3/s	V m/s	Q m3/s	V m/s	Q m3/s	V m/s	Q m3/s
0.50	1.197	1.101	1.111	1.161	1.066	1.158	0.954	1.073
0.60	1.311	1.206	1.218	1.273	1.168	1.268	1.045	1.176
0.70	1.416	1.303	1.315	1.374	1.261	1.369	1.129	1.270
0.80	1.514	1.393	1.406	1.469	1.349	1.465	1.207	1.358
0.90	1.606	1.478	1.491	1.558	1.430	1.553	1.280	1.440
1.00	1.693	1.558	1.572	1.643	1.508	1.638	1.349	1.518
1.10	1.776	1.634	1.649	1.723	1.581	1.717	1.415	1.592
1.20	1.855	1.707	1.722	1.799	1.652	1.794	1.478	1.663
1.30	1.930	1.776	1.792	1.873	1.719	1.867	1.538	1.730
1.40	2.003	1.843	1.860	1.944	1.784	1.937	1.596	1.796
1.50	2.074	1.908	1.925	2.012	1.847	2.006	1.652	1.859
1.60	2.142	1.971	1.988	2.077	1.907	2.071	1.706	1.919
1.70	2.207	2.030	2.049	2.141	1.966	2.135	1.759	1.979
1.80	2.271	2.089	2.109	2.204	2.023	2.197	1.810	2.036
1.90	2.334	2.147	2.167	2.265	2.078	2.257	1.859	2.091
2.00	2.394	2.202	2.223	2.323	2.132	2.315	1.908	2.147
2.10	2.453	2.257	2.278	2.381	2.185	2.373	1.955	2.199
2.20	2.511	2.310	2.331	2.436	2.236	2.428	2.001	2.251
2.30	2.568	2.363	2.384	2.491	2.287	2.484	2.046	2.302
2.40	2.623	2.413	2.435	2.545	2.336	2.537	2.090	2.351
2.50	2.677	2.463	2.485	2.597	2.384	2.589	2.133	2.400
2.60	2.730	2.512	2.534	2.648	2.431	2.640	2.175	2.447
2.70	2.782	2.559	2.583	2.699	2.477	2.690	2.217	2.494
2.80	2.833	2.606	2.630	2.748	2.523	2.740	2.257	2.539
2.90	2.883	2.652	2.677	2.797	2.568	2.789	2.297	2.584
3.00	2.932	2.697	2.722	2.844	2.611	2.836	2.336	2.628
3.10	2.981	2.743	2.767	2.892	2.655	2.883	2.375	2.672
3.20	3.029	2.787	2.812	2.939	2.697	2.929	2.413	2.715
3.30	3.076	2.830	2.855	2.983	2.739	2.975	2.450	2.756
3.40	3.122	2.872	2.898	3.028	2.780	3.019	2.487	2.798
3.50	3.167	2.914	2.941	3.073	2.821	3.064	2.524	2.840
3.60	3.212	2.955	2.982	3.116	2.861	3.107	2.559	2.879
3.70	3.257	2.996	3.023	3.159	2.900	3.149	2.595	2.919
3.80	3.300	3.036	3.064	3.202	2.939	3.192	2.630	2.959
3.90	3.343	3.076	3.104	3.244	2.977	3.233	2.664	2.997
4.00	3.386	3.115	3.144	3.285	3.015	3.274	2.698	3.035

Note: Shaded portion requires special approval.

Road Surface Used for Major Flood Routing Table D28

D7.13 Major System Ditches

Ditches designed for major flow routing shall be of sufficient width and depth to accommodate the design major flow with a minimum grade of 1%. They shall be located within the road allowance or on a statutory right-of-way in favour of the Municipality with adequate width for vehicular access to the satisfaction of the Municipal Engineer.

D7.14 Culverts

Culverts shall be designed to convey and ensure that there is no adverse impact on adjacent properties from the major flow. The Owner's Engineer shall determine whether the culvert shall operate under inlet or outlet control at design conditions.

The minimum diameter of culverts shall be 450 mm under roads and 300 mm under driveways.

The average water velocity in culverts shall not exceed:

- 1.2 m/s for lengths up to 25 m
- 0.9 m/s for lengths over 25 m

The minimum depth of cover for culverts is 0.375 m, subject to pipe loading criteria.

Inlet and outlet structures shall be provided for all culverts designed for the major flow. Considerations for the installation of energy dissipation and erosion control shall be included in the design.

D7.15 Inlet and Outlet Structures

Circular culverts up to 1200 mm diameter shall have inlet structures in accordance with MMCD Standard Detail Drawing S13 and outlet structures in accordance with Supplementary Detail Drawing TLD 03. Concrete block headwalls in accordance with MMCD Standard Detail Drawing S14 may be used for culverts up to 750 mm diameter.

Riprap protection and/or energy dissipating structures shall be provided for erosion control at outlets having discharge velocities in excess of 1 m/s.

Grills and trashracks in accordance with the above drawings shall be provided at the inlets and outlets of all pipes over 450 mm in diameter except for large culverts in major watercourses at the discretion of the Municipal Engineer.

D8 MUNICIPAL STORMWATER INFILTRATION FACILITIES

Stormwater infiltration facilities shall only be permitted on Highways or other municipal land in accordance with the requirements of a Neighbourhood Servicing Plan.

D9 MUNICIPAL DETENTION PONDS

Unless already constructed by the Municipality, municipal detention ponds shall be provided and designed in accordance with a master drainage plan or neighbourhood servicing plan by the first Owner who undertakes a Development in an area to which the plan applies.

D9.1 Basin Design

Detention ponds shall temporarily store stormwater resulting from heavy rainfall and empty between storms at release rates specified in Section D3. Ponds shall be designed on-line so that low flows are confined to a channel in the bottom of the pond, but shall not be constructed within a creek set-back area. Ponds designed in series are space inefficient for achieving the desired detention and shall not be used unless alternative layouts are not available.

Storage volumes shall be computed by SWMM or HYMO based programs. The model shall be run for storms of different durations ranging from 30 minutes to 24 hours to select the critical storage requirement. Ponds should be designed as 'dry' ponds that have the ability to fully drain out after rainfall events, as opposed to 'wet' ponds that retain a permanent pool volume. The base of the detention live storage must be designed to be above the seasonal high water table elevation.

Limiting dimensions:

- maximum depth of storage (up to 1:100 Year) 2.5 m
- minimum bottom slope 0.5%
- maximum pond side slopes 4(H):1(V)
- length to width ratio between 2:1 and 4:1
- minimum freeboard above maximum water level 0.5 m

The berm shall be constructed of stable impermeable material such as clay, compacted glacial till or provided with an impermeable geo-membrane with permeability coefficient 1×10^{-8} m/s. A cut-off trench shall extend at least 1 m below original grade. Anti-seepage collars shall be placed around any pipes crossing through, or under, the berm.

The low flow channel shall follow an irregularly meandering path along one side of the pond with:

- a depth of 0.5 m
- a width of 1 m
- side slopes of 2(H):1(V)

Each pond shall have a sediment forebay immediately downstream of the inlet. The forebay shall consist of a separate cell, formed by an acceptable barrier, upstream of the low flow channel and be designed to remove sediment for up to a 1:2 year event.

The forebay shall:

- have a maximum depth of 1.2 m
- have non-erosive outlet conditions, taking design exit velocities into account
- be provided with direct access for appropriate maintenance equipment
- be landscaped in such a way as to provide adequate shade
- be designed to provide removal of sediment and contaminants

Where safe to do so, ponds may infiltrate into the subsurface to reduce the required pond volume and provide groundwater recharge and other benefits. Infiltration must be in accordance with the requirements of section D10.3.

D9.2 Inlets and Outlets

The outlet control for storage facilities may be designed using the following orifice and weir equations:

$$\text{Orifice Equation: } Q = C A (2 g H)^{0.5}$$

Where Q = release rate (m^3/s)

C = orifice coefficient (0.62 for sharp or square edge)

A = area of orifice (m^2)

G = gravitational acceleration (9.81 m/s^2)

H = net head on orifice (m)

$$\text{Rectangular Weir Equation: } Q = C L H^{1.5}$$

Where Q = release rate (m^3/s)

C = weir coefficient (from published references)

L = effective length of weir crest (m)

H = net head on weir crest (m)

Multiple outlets or multi-stage outlets may be required to control the rate of outflow and mimic the pre-development flow of the 1 in 2 year, and 1 in 5 year return period storm events. Alternatives to orifice outlets may be used if needed, for example, vortex flow controls. Inlet and outlet structures shall include flow energy dissipation and erosion control. Safety grillage shall be provided with maximum bar spacing of 100 mm for inlets in accordance with MMCD Standard Detail Drawing S13 and 150 mm for outlets larger than 450 mm diameter in accordance with Supplementary Detail Drawing TLD 03. Outlets with grillage shall have a hydraulic capacity at least double the theoretical required capacity to allow for blockages. The velocity through the grate shall not exceed 1 m/s. Locks for access hatches shall be provided to prevent unauthorized entrance to the structure.

D9.3 Overflow

An overflow spillway with capacity to convey at least the 2100 Climate Change 1:100 year flow shall be provided for all storage facilities. The spillway surface shall be finished with erosion resistant materials. The maximum spillway slope shall be 4 horizontal to 1 vertical. The design of the spillway and overflow shall take into account the possibility of blockages in the outlet structure and the consequences of extreme storm events.

D9.4 Access

A minimum 4 m wide, all-weather vehicle access shall be constructed from a public road to the inlet, sediment sump, outlet, emergency overflow and other works requiring maintenance. The maximum grade of the access shall be 8%. The surface shall be finished with asphalt or concrete, suitable for maintenance traffic in accordance with Supplemental Detail Drawing TLG 03.

D9.5 Landscaping, Fencing and Signage

A landscaping plan detailing the reinstatement of grass cover or other approved surface finish shall be provided for all detention ponds. Landscaping shall be installed in accordance with MMCD specifications, the Supplementary Specifications, and to the acceptance of the Township.

Detention ponds shall be surrounded by 1 m high black chain link fencing. Openings, 0.6 m wide, shall be left in the fence for public access. Shrubs shall be planted along both sides of the fence in 1.5 m wide beds in accordance with the Accepted Drawings so that the fence shall be covered within five years. Fences shall be offset 2 m from adjacent trails or service roads and be located at the top of detention pond bank.

A 0.6 m high, single 2x6 rail fence with 6x6 posts shall be erected 1 m from top of the banks of the low flow channel. Plantings shall extend at least 1 m on both sides of the rail fence. The banks of the low flow channel shall be planted with a combination of riparian plants that are selected for seasonal interest and the ability to withstand total immersion in water for short periods of time. Planting shall be supplemented with woody debris, boulders and river rock in the channel to provide a natural stream appearance.

On the upland area above the High Water Level and adjacent to a residential development where rear yards back directly onto the pond area and where there is no trail or service road, provide a mix of trees, shrubs and low grasses.

Signs, as required by the Municipal Engineer, shall be placed at the entry points to the pond warning of occasional deep water.

D9.6 Operation and Maintenance Manual

Three copies of an operation and maintenance manual shall be submitted when the facility is completed and transferred to the Municipality and include:

- record drawings of the completed facility
- brief description of the facility operation including design flows, design depths, and schematic diagrams of the inlet and outlet structures, connections, controls, valves, bypass, overflows, etc.
- manufacturer's operation, service and repair instructions and parts lists

- volume-stage-discharge relationships of all control structures
- general maintenance requirements and emergency procedures
- copies of senior government environmental approvals if applicable

D10 ON-SITE INFILTRATION AND DETENTION

On-site requirements may include stormwater storage facilities and infiltration measures. On-site facilities and measures shall be in accordance with an applicable Master Drainage Plan, Neighbourhood Servicing Plan, or Stormwater Management Plan or, if there are no requirements in an applicable plan, in accordance with this Section.

D10.1 Subdivision

As a condition of Subdivision, the Owner shall register a covenant under Section 219 of the Land Title Act, in a form acceptable to the Municipal Solicitor, to provide infiltration measures on each lot in a residential subdivision, at the discretion of the Municipal Engineer, at the time a building is erected and prior to the issuance of a final acceptance for the lot.

If an existing residence is to be retained on a lot within a Subdivision, at the discretion of the Municipal Engineer, the infiltration measures shall be provided on that lot prior to subdivision approval or security shall be taken in accordance with Section 8 of the Bylaw. The Municipal Engineer may modify the requirements for on-site infiltration measures around an existing residence provided they satisfy the intent of Section D10.3.

D10.2 Building Permits

As a condition of the issuance of a building permit for a multiple family, commercial, industrial or institutional building, the Owner shall provide:

- on-site stormwater storage unless the Parcel is served by a municipal detention pond in accordance with a neighbourhood servicing plan or stormwater management plan; and
- on-site infiltration measures.

As a condition of the issue of a building permit in a Rural, Agricultural or Suburban Residential Zone, the Owner shall provide on-site stormwater storage and infiltration measures if the proposed total impermeable surface area after Development, including building footprint, driveway, parking, storage and other impermeable surfaces, exceeds 3,700 m² or covers more than 10% of the Parcel area.

Building permits for interior renovations and for additions to existing buildings that do not increase the total existing floor area by more than 20% of the floor area existing two years to the date of the application being made shall be exempt from these requirements.

D10.3 Design of On-site Infiltration Measures

On-site infiltration measures in Residential Zones shall consist of infiltration facilities and topsoil in accordance with Supplementary Detail Drawings TLD 12(a), 12(b), and 12(c).

Infiltration facilities required in other Zones shall be designed in accordance with a neighbourhood servicing plan or storm water management plan. Where the Municipality has not finalized a plan, infiltration facilities shall be designed such that for a design storm of 25 mm in 24 hours, post-development infiltration from the entire Parcel is no less than the infiltration that would have occurred prior to any building or impermeable surface on the Parcel. Infiltration measures may include absorbent landscapes, rain gardens and infiltration swales and trenches designed and constructed in accordance with the Design Guidelines and Guideline Specifications in the GVRD Stormwater Source Control Guidelines 2012, as amended from time to time. Soil hydraulic conductivity is to be assessed by a qualified professional on the basis of representative on-site percolation tests conducted when the water table is at least 1 m below the natural grade.

For a subdivision creating more than two additional lots or for a building permit for a site greater than 0.5 ha, the Owner shall submit a report from a qualified professional stating that the proposed infiltration measures shall not cause or contribute to slope instability, down slope flooding or, in high water table, nuisance seepage on other property. The Owner may apply to the Municipal Engineer for a waiver or reduction in infiltration measure requirements if he or she can demonstrate that high water table prevents effective infiltration.

D10.4 Design of On-site Storage Facilities

On-site storage may include parking lot storage, detention ponds or swales, underground storage or other methods approved by the Municipal Engineer. Release rates shall be in accordance with Schedule B, Section D3 and be regulated by a standard flow control chamber in accordance with Supplementary Detail Drawing TLD 01.

Storage volumes shall be calculated using 2100 CLIMATE CHANGE design storms for the post-development condition and CURRENT design storms for the pre-development condition. Calculations may be done using the modified rational method.

The maximum ponding depth in parking lots shall be 100 mm for 1:2 year storm, 150 mm for 1:5 year storm and 200 mm for 1:100 year storm.

D10.5 Responsibility for Operation and Maintenance

The Owner shall register a covenant under Section 219 of the Land Title Act, in a form acceptable to the Municipal Solicitor, to provide that on-site facilities and measures required by this Section shall be maintained in operating condition by the Owner to the satisfaction of the Municipal Engineer and that the Municipal Engineer has the right to inspect them at any time.

D11 STORMWATER QUALITY CONTROL

A water quality control plan may be required as part of the lot grading plan at the discretion of the Municipal Engineer where there are reasonable grounds to anticipate discharge of contaminants to the drainage system.

Grease, oil and sand interceptors shall be provided in accordance with Langley Sewerworks Regulation Bylaw 2018 No. 5367, as amended from time to time.

Bioretention or dry swales with underdrain systems or equivalent shall be provided to treat runoff from all uncovered paved parking areas designed for parking of ten or more vehicles except where the pavement is designed to be porous on a granular base.

D12 MINIMUM BUILDING ELEVATION

The minimum building elevation (MBE) is the elevation of the lowest floor slab in a building or the underside of the floor joists where the lowest floor is constructed over a crawlspace. The crawlspace is a space between a floor and the underlying ground having a maximum height of 1.2 m to the underside of the joists and not used for the storage of goods or equipment damageable by floodwater.

The MBE shall be established at least 0.6 m above the service connection invert and a minimum of 0.35 m above the 100 year hydraulic grade line elevation.

The MBE shall be shown on the storm and sanitary plan and lot grading plan and may not be revised without the approval of the Municipal Engineer.

DESIGN CRITERIA

SECTION R - ROADS

For Table of Contents, refer to beginning of Schedule B

SECTION R - ROADS

R1 GENERAL

Roads shall be provided, designed and constructed, or improved, in accordance with appropriate neighbourhood servicing plans and, except as required by the forgoing, in accordance with the latest edition of the "Geometric Design Guide for Canadian Roads" published by the Transportation Association of Canada.

Where roads are located on steep slopes, as determined by the Municipal Engineer, the Owner shall provide a report from a professional engineer, specializing in geotechnical engineering, on slope stability, surface run off and potential changes to the groundwater regime together with appropriate recommendations and designs for alleviating any negative geotechnical or hydro-geotechnical impacts of road construction and for management of stormwater from uphill slopes.

R2 CLASSIFICATIONS

Roads and bike lanes shall be provided in accordance with the Road Classification and Right-of-Way and Cross Section Maps adopted by Council. The Owner shall consult the Municipal Engineer on the correct classification of all roads to be provided or improved prior to undertaking design. Highway and pavement widths for the appropriate road classification shall be provided in accordance with Table R1 and the Supplementary Detail Drawings with adjustments based on traffic volumes, requirement for turn lanes and predominant type of development as may be required by the Municipal Engineer.

R3 GRADES

Maximum longitudinal grades shall be:

• local residential rural roads	12%
• all arterials	6%
• all other roads and lanes	8%

The minimum longitudinal grade shall be 0.5%.

On steep sites, the Municipal Engineer may consider variations to the above limits. Under no circumstances shall grades be more than 12%.

The maximum allowable grade at an intersection for a minor road with a 50 km/h design speed is 3.5%.

Low points in gutter profiles are not permitted within, or in front of, curb returns, crosswalks or wheel chair ramps.

Table R1

CLASSIFICATION	DESIGN SPEED km/h	HIGHWAY WIDTH m	PAVEMENT WIDTH m	DETAIL DRAWING
URBAN ROADS				
ARTERIAL				
6 lane with bike lanes	to 60	37.0	28.4	TLR 01 / UA1-A
6 lane with bike lanes	> 60	38.0	29.6	TLR 01 / UA1-B
4 lane with bike lanes	to 60	30.0	21.4	TLR 02 / UA2-A
4 lane with bike lanes	> 60	31.0	22.4	TLR 02 / UA2-B
4 lane divided	to 60	27.0	18.4	TLR 03 / UA2-C
4 lane divided	> 60	27.0	18.8	TLR 03 / UA2-D
4 lane with wide curb lanes	to 60	29.0	20.4	TLR 04 / UA2-E
2 lane with wide curb lanes	to 60	22.0	13.4	TLR 04 / UA2-F
2 lane with bike lanes	to 60	22.0	14.0	TLR 05 / UA2-G
COLLECTOR				
Major Collector Residential		20.0	11.4	TLR 06 / UC1-A
Major Collector with bike lanes		22.0	14.0	TLR 07 / UC1-B
Minor Collector Residential		20.0	11.0	TLR 08 / UC1-C
Major Collector - Ind/Comm		22.0	12.2	TLR 09 / UC1-D
Minor Collector - Ind/Comm		22.0	12.2	TLR 09 / UC1-D
LOCAL				
Multifamily Residential		20.0	11.0	TLR 10 / LR1-A
Standard lot residential		20.0	11.0	TLR 10 / LR1-A
Compact lot Res. 2 side pkg		18.5	10.8	TLR 10 / LR1-D
Industrial / Commercial		22.0	12.2	TLR 11 / IND-A
LANES		6.0	5.5	TLR 15
RURAL ROADS				
ARTERIAL				
4 lane		36.0	22.6	TLR 12 / RA-1
2 lane	> 60	20.0	10.9	TLR 12 / RA2-B
COLLECTOR AND GRID LOCAL	to 60	20.0	10.3	TLR 10 / RA2-A
LIMITED LOCAL		20.0	7.3	TLR 13 / RL-1

- Roads shall be Urban in Service Areas 1 and Rural in Service Areas 3 and 4 except that Arterials shall be Urban wherever shown as such on the Road Classification and Right-of-Way and Cross Section Maps.
- Pavement width shall be measured from curb face to curb face on urban roads.
- Bicycle lanes on arterials with design speed > 60 km/h shall be 1.8 m wide.
- Where bicycle lanes are required on arterials with design speed up to 60 km/h they shall be a minimum 1.5 m wide.

R4 HIGHWAY CROSS SECTIONS

Maximum side slopes of earth fills or cuts shall be 1.5H : 1V. Flatter slopes shall be used on unstable ground in accordance with a report from a professional engineer specializing in geotechnical engineering. Statutory rights-of-way shall be provided by the Owner over fill slopes on private property extending from the dedicated road to 1 m beyond the toe of fill.

Boulevards and sidewalks shall have a 2% cross slope from the property line to the curb unless otherwise approved by the Municipal Engineer.

Pavement cross-slopes shall be 2% with the crown in the centre of the pavement.

Pavement cross slopes on through streets may be reduced to a minimum of 0.5% within an intersection.

R5 HORIZONTAL AND VERTICAL CURVES

Horizontal and vertical curves shall be governed by the design speed of the road:

- Locals 50 km/h
- Collectors and rural arterials 50 to 60 km/h
- Arterials 60 to 80 km/h

For cul-de sac, P-Loops and crescent road a 30 km/h design may be used at the discretion of the Municipal Engineer.

The maximum allowable superelevation on arterial and collector roads shall be 4%. No superelevation is permitted on local roads.

There shall be a minimum 20 m tangent between any horizontal curve and an intersection except that a tee intersection may be permitted to the outside curve of a local road. There shall be a 20 m tangent separating 'S' curves.

R6 CURB RETURNS AND CORNER CUTS

Curb return radii, in metres, shall be:

	INTERSECTION WITH		
	LOCAL/FRONTAGE	COLLECTOR	ARTERIAL
Lanes	Curb letdown	7	
Locals	9	9	
Industrial Locals	9	10	
Collectors	9	10	10

Curb return radii at midblock corners shall be 3 m within lanes and 9 m within local streets.

Curb return radii between arterial roads require site specific design taking into account projected volumes, turning movements, truck traffic, and whether turning lanes are provided.

On truck routes, as designated in the Township of Langley Highway and Traffic Bylaw 2010 No. 4758, as amended from time to time, the radii shall allow WB 20 vehicles to make a right turn without crossing out of the nearside lane of the approach road.

The Municipal Engineer may amend these requirements for the better protection of pedestrians and vehicles.

Curb returns shall be provided on all permitted driveway accesses to arterial roads and on driveway accesses generating one hundred or more peak hour trips to and from all other classifications of road.

An intersection with an existing road shall be designed to meet the ultimate classification of the intersecting road as determined by the Road Classification and Right-of-Way and Cross Section Maps.

Property corner truncations shall be provided at all street corners to maintain a minimum 4 m distance from curb face to property line. The minimum truncations at street and lane corners in metres shall be:

CORNER TYPE	CORNER CUT
Arterial and Collector to any Road or Lane	5 x 5
All other road and lane corners	3 x 3
Lane and lane	3 x 3
Roundabouts	6 x 6

R7 CUL-DE-SACS, P-LOOPS AND BARELAND STRATA ROADS

Permanent cul-de-sac or strata road shall not exceed a length of 150 m unless an emergency access is provided.

Within Service Level Areas 3 or 4, the length of a permanent cul-de-sac without an emergency access may be increased to a maximum length of 600 m if:

- the subdivision is constrained by topographic or other physical features
- the Approving Officer does not require access be provided to land lying beyond or around the Subdivision

P-loops shall have a maximum street length of 750 m including a maximum distance of 150 m between the intersecting road and the loop road and be provided with an emergency access.

Within Service Level Areas 3 or 4, the maximum street length of a P-loop may be greater than 750 m provided it cannot give access to more than 60 lots.

The length of a cul-de-sac, P-loop or bareland strata road shall be measured along its centre line from the nearest right-of-way boundary of an intersecting Highway having more than one access. The length of a cul-de-sac shall be measured to the beginning of the turnaround bulb.

The emergency access required shall directly connect the turnaround of a cul-de-sac or the loop road of a P-loop to an adjacent Highway having more than one access, or as is otherwise acceptable to the Municipal Engineer.

Design of cul-de-sac shall be in accordance with Supplementary Detail Drawings TLR 16 to 19 inclusive. Alternatively, the Municipal Engineer may accept a design in accordance with the "Manual of Geometric Design Standards for Canadian Roads" 1999 published by the Transportation Association of Canada, but, in any case, the following minimum radii shall apply to circular turnarounds:

LAND USE	PAVEMENT RADIUS m	ROW RADIUS m
Residential, Multifamily, Suburban, Rural	11.5	15.5
Commercial and Institutional	14	17
Industrial	15	18.5

R8 TEMPORARY TURNAROUNDS

Where a proposed road, lane or bareland strata road exceeds 50 m in length and is to be extended in the future, temporary turnarounds shall be provided.

The road or lane shall be terminated with a temporary asphalt turnaround in accordance with Standard Detail Drawing TLR 18 or 19, or alternative design as permitted in Section R7, and constructed to the standards set out in this Bylaw except that curbs and gutters shall be constructed on their permanent alignment across the temporary turn around and not around its perimeter. A statutory right-of-way granted in favour of the Municipality, and acceptable to the Municipal Engineer, shall be granted over that part of the temporary turnaround that is not within the dedicated road including an additional 1 m beyond the edge of pavement.

No road or lane in the Urban and Special Urban Service Level areas shall be constructed as a temporary cul-de-sac exceeding a length of 150 m as measured from the nearest right-of-way boundary of an intersecting Highway having more than one access to the beginning of the temporary turnaround bulb, unless a temporary or permanent emergency access is provided.

A road or lane may only be constructed as a temporary cul-de-sac if the abutting Parcel onto which it may be extended has Development potential in the opinion of the Approving Officer and in accordance with the Official Community Plan.

R9 EMERGENCY ACCESSSES

Emergency accesses shall be provided in accordance with Sections R7 and R8, and the Municipal Engineer may require the installation of emergency accesses elsewhere in consultation with the Fire Department.

Permanent emergency accesses in the Urban and Special Urban Service Level areas shall be a maximum length of 100 m and designed in accordance with Standard Detail Drawing TLR 20. Permanent emergency accesses shall be straight, unless approved by the Municipal Engineer.

Permanent emergency accesses in the Suburban and Rural Service Level areas and all temporary emergency accesses shall be surfaced with 4 m width of asphalt. Fencing shall not be required, but vehicle barriers shall be provided in Suburban and Rural Service Level areas in accordance with Standard Detail Drawing TLR 22.

A curb letdown shall be provided where an emergency access joins a road with a barrier curb.

R10 INTERSECTIONS

The Owner's Engineer shall assess:

- approach grades and grade transitions
- crossing sight distance
- design speeds
- intersection cross-slopes
- curb returns
- intersection alignment

Intersections shall be at right angles, except that with the approval of the Municipal Engineer, a maximum variation of 15° may be permitted.

The minimum centreline distance between intersections along a road shall be governed by the classifications of that road and of the intersecting roads. The following table shows the minimum permissible distance of an intersection of any road from an intersection of a road with the classification shown in the first column along a road with the classification shown in the other columns.

INTERSECTING ROAD	DISTANCE (in m) BETWEEN INTERSECTIONS ALONG:				
	Arterial	Major Collector	Minor Collector	Local	Lane
Arterial	400				
Major Collector	200	200			
Minor Collector	200	150	100		
Local	X	50	50	50	
Lane	X	*	*	25	*

X indicates that intersections are not permitted.

* Intersection of lanes with collectors or with other lanes shall only be permitted with the approval of the Municipal Engineer.

R11 INTERSECTION ISLANDS

Intersection islands shall be provided at intersections of Arterial/Arterial and Arterial/Major Collector roadways, at the discretion of the Municipal Engineer. Corner cut requirements to be based on vehicle turning template design for WB-19 design vehicle.

R12 HALF ROADS

Half roads shall be provided in accordance with Supplementary Detail Drawing TLR 14. The Owner's Engineer shall complete the design for the full width road and show on the design drawings the portion that is to be completed by others in the future on the abutting land and any temporary features necessary for the half road including provisions for structural support, drainage and grade transition on the opposite side.

R13 EXISTING ROADS

Where existing pavement, curbs, gutters, sidewalks and boulevards adjacent to a Subdivision or Development do not meet the Bylaw standards for horizontal or vertical alignment, cross section or pavement design, the Municipal Engineer may require their replacement to the Bylaw standard. Where replacement is not required, defects must be corrected up to the centre line of the road.

A cross fall of between 2% and 5% shall be provided from the edge of existing pavement to a new gutter. An asphalt taper transition shall be provided between new and existing cross sections. Where traffic flow is toward a decreasing pavement width, the taper shall be 15:1 minimum and, in the opposite direction, 5:1 minimum.

R14 LANES

Lanes shall run in a straight line between streets without any change of alignment unless otherwise approved by the Municipal Engineer. A dead end lane longer than 50 m shall have a hammerhead turnaround.

A lane shall not connect to a collector road within 25 m of the nearest right-of-way boundary of an intersecting Highway.

R15 ROAD BASE AND PAVEMENT DESIGN

The structural design of the road pavement shall be adequate for an expected road life of 20 years under the expected traffic conditions for the class of road.

a) Existing Road Upgrading

Road construction and asphalt overlay design shall be based on the analysis of the results of the Benkelman Beam tests and test holes carried out on the existing road which is to be upgraded, or by the CBR asphalt pavement design method.

b) New Road Construction

The design of new roads shall be based on the results of the analysis of materials from test holes dug on the proposed road site at representative intervals, or by the CBR asphalt pavement design method.

Test holes and samples shall be undertaken by a qualified soils test company and all reports shall be signed and sealed by a qualified professional engineer specializing in geotechnical engineering.

The Benkelman Beam method shall be used on the granular base of all new road construction and, the Maximum Seasonally Adjusted Design Deflections (mean plus two standard deviations) shall be as follows:

Classification	Min Sub-base mm	Min Base mm	Min Asphalt mm		Max Seasonally Adjusted Design Deflection (mm)	
			Base	Surface	Base	Pavement
All Arterial and Industrial Collector	300	100	85	40	1.75	1.00
Other Collector	300	100	50	40	2.20	1.20
Urban Local	200	100	50	35	2.60	1.50
Industrial Local	300	100	50	35	1.75	1.00
Lane	200	100	50	35	3.10	1.50
Rural Local	200	100	75	-	3.40	1.50
Emergency Access	200	100	65		3.1	1.5

Note 1: Recommended sub-base and base thicknesses are minimum requirements. Site conditions may dictate greater thicknesses of granular material to meet design deflection requirements.

Note 2: Where rebound readings are greater than the design reading for the base course, the subgrade should be investigated for potential weakened areas.

Note 3: The standard pavement material is hot mixed, machine laid, asphaltic concrete in accordance with MMCD Specifications.

Driveways with curb returns shall be constructed and paved in accordance with the requirements for the adjoining road.

R16 PAVING PROCEDURE

The paving of all roads with curb and gutter shall be in 2 lifts with thicknesses as shown in Section R15.

The final lift shall be laid prior to one year from the completion inspection or at such time that all construction in the Development is substantially complete and all foreseeable utility construction and service connections are complete.

Asphalt deflectors may be required by the Municipal Engineer to direct road surface runoff into catchbasins until the final lift is laid.

Pavement construction or reconstruction at the intersection of an existing road of equal or lesser classification shall extend past the curb return onto the existing road. At an intersection with a higher classification road, the joint shall be at the edge of its pavement. The final location of the joint shall be approved by the Municipal Engineer. The tie-in to existing pavement shall be with a milled butt joint.

Half roads shall not receive final lift of asphalt pavement until such time as the second half is completed or as directed by the Municipal Engineer. In lieu of construction, the Owner shall deposit with the Municipality, the secured amount for the final lift of asphalt based upon the estimated cost of construction, accepted by the Municipal Engineer, plus 20% contingency.

R17 DRIVEWAYS

All proposed driveway locations shall be shown on the design drawings.

R17.1 Access to Urban Arterial and Collector Roads

Driveway access shall not be permitted to urban arterial roads unless there is no practical alternative.

Any driveway access permitted to urban arterial roads shall be right-in and right-out only, unless approved by the Municipal Engineer.

The Municipal Engineer may require deceleration and acceleration lanes for access off arterial roads for safety reasons and to minimize disruption to traffic flows.

The Municipal Engineer may restrict driveway access onto major collector roads based on site specific review of the Development application including, but not limited to, the number of existing driveways, land uses in the area and forecast traffic volumes.

R17.2 Number of Driveways

Only one driveway shall be provided for each one or two family urban residential lot. For other Zones the Municipal Engineer may consider more are necessary due to physical constraints between different parts of a lot or for the safe movement of vehicles.

R17.3 Driveway Location and Width

The driveway to a lot abutting more than one road, each having a different classification, shall access the road of the lower classification unless the Municipal Engineer considers that to be inappropriate considering the expected nature and volume of traffic and the predominant land use accessed by the lower classification road.

All driveways, except for one directional driveway, shall be at right angles to the road.

All existing driveways not intended to be used upon redevelopment shall be removed and the boulevard reinstated to the standards required in this Bylaw.

a) Residential Zones

Driveways across boulevards in Residential Compact Lot Zones shall be maximum 6 m wide. Other driveways shall be a maximum of 7.5 m wide.

Except in a cul-de-sac, driveways shall not be closer than 1.2 m to, nor further than 1.8 m from, the projection of an internal side lot line across the boulevard. Except for Residential Compact Lot Zones driveways on corner lots shall be at least 7.5 m from the side lot line abutting the intersecting street.

For Residential Compact Lot Zones, driveways on corner lots shall be at least 6 m from the projected lot lines abutting a local road and/or lane; and 7.5 m from the projected lot lines abutting an arterial and/or collector road.

Adjacent lots shall have alternating driveway locations where this shall optimize on-street parking.

b) Rural and Suburban Residential Zones

Driveways on corner lots shall be at least 20 m from the side lot line abutting the intersecting street. Driveways shall have a minimum width of 4 m and a maximum width of 11 m.

c) Other Zones

Driveways to corner lots shall be located no closer than 15 m to the side lot line abutting the intersecting street or, where this is not practical, at the far side of the lot from the intersecting street.

The minimum width of a driveway shall be 4.5 m for one way access and 6.5 m for two way access with a maximum width of 11 m. Where there is more than one driveway access onto a road, the maximum width of the driveway closest to the intersection shall be 9 m. Industrial and rural driveways may be wider if necessary for the safe movement of vehicles and approved by the Municipal Engineer.

Where more than one driveway from a lot is permitted onto the same street, there shall be a minimum of 9 m separation.

Developments generating more than 200 trips in any hour shall provide a 2 m to 4 m wide median in the driveway.

One directional driveways shall be at a maximum of 70° to the road centreline.

Unobstructed on-site or magazine queuing storage shall be provided behind the property line without parking stall or other direct vehicular access, and free from speed bumps, gates or fences, for a distance of:

# of Parking Stalls in the lot	Minimum Length
0 – 50	6 m
50 – 200	13 m
>200	24 m

Additional queuing length may be required by the Municipal Engineer or as determined by a traffic impact study.

If the required queuing storage cannot be provided on site, the Municipal Engineer may require deceleration and queuing storage lanes within, and additional widening of, the road right-of-way.

R17.4 Driveway Grades

Driveways shall be at a maximum grade of 2% from the property line down to the back of sidewalk or, where no sidewalk is required, to the edge of pavement. The first 10 m on the property shall be at a maximum grade of 6% down, and 10% up, from the property line except that 15% up is acceptable for driveways accessing local roads in Residential Zones.

R17.5 Driveway Construction

Except where curb returns are required for driveways in accordance with Section R6, curb letdowns and, where required, sidewalk crossings shall be constructed in accordance with MMCD Standard Detail Drawing C7 at the time of curb construction for all lots that shall have driveway access to roads with barrier curbs.

Driveways crossing rollover curbs shall be constructed with the concrete, base and sub-base requirements for sidewalks as specified on MMCD Standard Detail Drawing C3 or with a minimum thickness of 65 mm asphalt on a minimum 100 mm base behind the sidewalk, or where there is no sidewalk, behind the curb.

R17.6 Driveways for Panhandle Lots

Where a lot consists of a narrow access strip from a road with the only feasible building area being behind another lot, a driveway shall be constructed and paved with asphalt or concrete on the access strip up to the buildable area after installation of all municipal services, gas lines and ducts for underground wiring, where required, to the requirements of the Municipality and to the utility companies. Where lots share a driveway, easements for the works shall be provided to the approval of the Municipal Engineer and any conditions of the utility companies.

R18 SIGNAGE AND PAVEMENT MARKING

Traffic control devices, signs and pavement markings shall be in accordance with the Transportation Association of Canada 1998 Manual of Uniform Traffic Control Devices for Canada revised to December 2002 and Bikeway Traffic Control Guidelines for Canada of December 1998, as amended from time to time.

R19 TRAFFIC IMPACT STUDIES

A traffic impact study in accordance with the Municipality's standard Terms of Reference shall be provided to the acceptance of the Manager of Engineering if, in the opinion of the Municipal Engineer, any of the following conditions apply:

- a) the Development is adjacent to a roadway or intersection with localized safety or capacity deficiencies
- b) the Development is adjacent to a sensitive neighbourhood including a school or park
- c) the Development is for a commercial or industrial use that may generate traffic volumes having a significant impact on the adjacent roadway or intersections
- d) other specific local traffic problems exist which may affect the ability of the road system to accommodate the proposed Development
- e) railway impacts

R20 CURBS, MEDIANS, SIDEWALKS AND WALKWAYS

R20.1 Curbs and Gutters

Both sides of all full width urban roads and lanes shall be provided with concrete curbs and gutters.

Curbs shall be:

- rollover curbs abutting front loaded one and two family residential lots except that barrier curbs shall be provided at rear loaded one and two family residential lots and at curb extensions, along major flood routes in accordance with Section D7.12 and where the longitudinal grade exceeds 6%
- barrier curbs on roads in all other areas
- rollover curbs on all lane
- narrow gutter pan barrier curbs in accordance with Standard Detail Drawing TLR 23 with reverse gutter grade along medians
- barrier curbs fronting Schools and Parks

Wide base curbs shall be provided in accordance with MMCD Standard Detail Drawing C5 except that narrow base reverse curbs shall be provided along medians in accordance with MMCD Standard Detail Drawing C4.

Narrow gutter pan curbs side curb inlet catchbasins shall be provided adjacent to bicycle lanes in accordance with Standard Detail Drawing TLR 23 and TLD 11 respectively.

R20.2 Medians

Medians that are not required to be landscaped shall be leveled and surfaced with stamped concrete to the requirements of the Municipal Engineer.

R20.3 Wheelchair Ramps

Wheelchair ramps shall be provided at all intersections and at other locations where deemed appropriate by the Municipal Engineer. Separate ramps with a minimum width of 1.2 m shall be provided perpendicular to each road at any intersection with a collector or arterial road. Sidewalks, at least 1.2 m wide, shall extend around the top of wheelchair ramps at the same grade as the adjacent sidewalk. In other respects, wheelchair ramps shall be in accordance with MMCD Standard Detail Drawing C8 or C9.

R20.4 Sidewalks

All urban roads shall have sidewalks and, except as provided in this section, they shall have locations, widths and cross slopes in accordance with the applicable Supplementary Detail Drawings and be constructed in accordance with MMCD Standard Detail Drawings C1, C2 and C3.

Sidewalks shall be provided adjacent to rural arterial and collector roads where traffic volumes and characteristics are such that the Municipal Engineer deems them necessary for the safety of pedestrians.

Except in Residential Compact Lot Zones, the Municipal Engineer may permit a sidewalk on one side only of a local road in a one or two family residential or suburban area if the road is an extension of a road with only one sidewalk and it is not a pedestrian link to a trail, park or school.

In Residential Lot Zones, a sidewalk shall be provided on both sides of a cul-de-sac and around the turn around area. In other Zones a sidewalk shall be provided on at least one side of a cul-de-sac up to the first property line within the turnaround area. Where a walkway is to be provided to link the turnaround area to another street, the sidewalk shall extend to connect to the walkway.

A sidewalk abutting a curb adjacent to a school shall be a minimum of 2 m wide.

Sidewalks shall be continuous around curb returns and for a minimum of 3 m beyond the curb return into roads not requiring sidewalks. Sidewalks shall terminate with a ramp to the elevation of the existing ground without encroaching onto the road pavement or drainage path.

The longitudinal grade of a sidewalk shall be consistent with the grade of the road.

Where a meandering walkway connects to a concrete sidewalk there shall be expansion joint material between the walkway and back of sidewalk.

R20.5 Urban Walkways

Unless there are topographical constraints, walkways shall be provided, as required by the Municipal Engineer, to link the ends of cul-de-sac to other streets and to provide pedestrian short cuts which reduce the walking distance from any point to parks, schools, recreational facilities and commercial areas by 400 m or more.

The Municipal Engineer may require midblock walkways and trails terminating opposite a "T" intersection to line up with one side of the intersecting street.

Walkways shall be constructed in accordance with Supplementary Detail Drawing TLR 21.

If the grade exceeds 5%, walkways shall be provided with ramps and landings. Ramps shall not exceed 8.33% grade and 1.2 m long horizontal landings shall be provided at maximum 9 m intervals. If the grade exceeds 8.33%, advisory signs shall be erected at both ends of the walkway. If the grade exceeds 12% steps shall be provided with railings and a bike channel on each side.

R20.6 Handrails

Handrails shall be provided for walkways where grades exceed 12%, beside steps and where grade separation exceeds 0.6 m.

Handrails may also be required by the Municipal Engineer along walkways and sidewalks above major storm sewer outfalls, adjacent to steep side-slopes, or in any location where required, in his opinion, for the protection of the public.

Handrails shall be constructed in accordance with MMCD Standard Detail Drawing C14.

R21 COMMUNITY MAILBOXES

The location of community mail boxes and the provision of any optional site enhancements are subject to the approval of the Municipal Engineer.

Community mail boxes shall not be located on urban arterial roads and shall be at a minimum distance from a property corner or corner cut of 30 m from an intersection with an arterial or collector road and 9 m from an intersection with a local road, lane or driveway with curb returns. They shall be located at least 9 m from the tangent point of a horizontal curve, 5 m from a fire hydrant and 2 m from any municipal or utility company service connection, valve, manhole, access or surface appurtenance. They shall not be located on a vertical curve where sight distance is restricted.

Community mail boxes shall be located on concrete pads at the grade of the sidewalk or road shoulder.

R22 BUS STOPS

Where Development occurs adjacent to a bus stop, provision shall be made for the bus stop either as extra Highway right-of-way dedication or registered statutory right-of-way. A concrete pad shall be provided 9 m long by 3 m wide which width shall include the

width of any sidewalk abutting the curb unless other design is required by the Municipal Engineer.

R23 VERTICAL CLEARANCES

A vertical clearance of 5.5 m shall be provided to communications and guy wires and electrical conductors up to 90 kV. Higher voltage conductors shall be subject to approval of BC Hydro.

R24 NON-MUNICIPAL UTILITIES

Underground wiring ducts and natural gas pipelines shall be located within the road right-of-way as shown on the applicable Standard Drawings for road cross-sections unless otherwise approved by the Municipal Engineer. Wiring ducts and gas pipelines shall be constructed in accordance with the applicable specifications of the respective utility company and in accordance with applicable Construction Requirements and specifications concerning environmental protection, traffic regulation, excavation, trenching, backfilling and surface finish.

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DESIGN CRITERIA

SECTION S - SANITARY

For Table of Contents, refer to beginning of Schedule B

SECTION S - SANITARY SEWERS

S1 GENERAL

Sewer system extensions shall be designed in accordance with any applicable master sewerage plan that has been adopted by the Municipality and any applicable computerized model of the Municipal sanitary sewer system. A system analysis shall be provided unless otherwise exempted by the Municipal Engineer.

S2 DESIGN FLOWS

Sanitary sewers shall be designed for Peak Wet Weather Flow (PWWF) which is the sum of the Peak Dry Weather Flow (PDWF) and infiltration flow.

S2.1 Average Daily Dry Weather Flow

Residential Uses	300 l/day/capita
Commercial	40,000 l/day/ha
Industrial	30,000 l/day/ha
Institutional	40,000 l/day/ha

If reliable information indicates that the non-residential flows shall be greater than the above rates, the higher flows shall be used in the design analysis.

S2.2 Peak Dry Weather Flow

The Peak Dry Weather Flow (PDWF) shall be calculated by the formula:

$$Q = \frac{q P PF}{86,400}$$

Where	Q	=	Peak Dry Weather Flow (l/s)
	q	=	Average Daily Flow (Dry Weather) (l/day/capita)
	P	=	Population
	PF	=	Harmon Peaking Factor:

$$PF = 1 + \frac{14}{4 + \sqrt{0.001 \times P}}$$

For calculating the peaking factor, non-residential areas shall be converted from hectares to capita using an equivalent population of 90 persons per ha.

S2.3 Infiltration Rate

An infiltration rate of 0.17 l/s/ha shall be added to the Peak Dry Weather Flow to determine the Peak Wet Weather Flow.

S3 PIPE FLOW FORMULA

Manning's formula shall be used to size gravity sewers:

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

Where	Q	=	flow capacity (m ³ /s)
	A	=	cross sectional area (m ²)
	R	=	hydraulic radius (m)
	S	=	slope of hydraulic grade line (m/m)
	n	=	roughness coefficient 0.013 for all pipe

Gravity sewers shall be sized such that the depth of Peak Wet Weather Flow shall not exceed 50% of the pipe diameter of 150 and 200 mm pipe, 60% of 250 mm and 70% of 300 mm and larger pipe.

S4 MINIMUM SEWER DIAMETER

The minimum diameter of gravity sewers shall be 200 mm except the last upstream section between manholes may be 150 mm if the sewer cannot be extended in the future.

The diameter of a pipe shall not exceed that of the downstream pipe to which it connects, without permission of the Municipal Engineer.

S5 VELOCITIES

The minimum flow velocity shall be 0.75 m/s during Peak Dry Weather Flow conditions. Consideration shall be given to scour problems where design velocities exceed 2.5 m/s.

S6 GRADE

The minimum grade of sewers is governed by the minimum velocity except that the last section of a 150 mm diameter main that shall not be extended in the future shall have a minimum grade of 1%.

Anchor blocks shall be provided in accordance with MMCD Standard Detail Drawing G8 for grades of 15% or steeper.

S7 MANHOLES

Manholes shall be provided at:

- changes in grade
- changes in direction
- changes in pipe sizes
- intersecting sewers
- terminal sections
- downstream end of curvilinear sewers

Manholes shall be placed where future extensions are anticipated and shall be spaced no greater than 150 m apart.

Sanitary manhole rim elevations in off-road areas shall be designed to be:

- above the adjacent storm manhole rim elevation
- above the surrounding ground so that infiltration from ponding shall not occur

S8 MANHOLE DESIGN DETAILS

The crownline of the downstream pipe shall be no higher than that of an upstream pipe.

The minimum drop in invert levels across manholes shall be:

• Straight run	-	no drop required
• Deflections up to 45°	-	20 mm drop
• Deflections 45° to 90° -		30 mm drop

Inlet sewers, and service connections required, or permitted, to connect directly to manholes, shall enter at the bottom of the manhole except that drop manholes may be used where inlet sewers cannot be steepened or site conditions prevent excavation to the base of an existing manhole. Drops shall be in accordance with MMCD Standard Detail Drawing S3 and S4. Connections shall not be in an adverse direction to the outlet flow. If incoming pipes are 600 mm diameter or larger, hydraulic conditions shall be reviewed by the Owner's Engineer.

S9 CLEANOUTS

Permanent cleanouts are not permitted, but temporary cleanouts may be provided at terminal sections of a main only if:

- future extension of the main is proposed or anticipated
- the length of sewer to the downstream manhole does not exceed 45 m; and
- the depth of the pipe does not exceed 2 m at the terminal point

Cleanouts shall not be considered a permanent structure.

S10 DEPTH

Minimum depth of cover shall be 1 m. Depth of sewers shall be adequate to provide gravity flow service connections to properties on both sides of the road and shall allow for future extensions to service all upstream tributary lands for ultimate development but shall not be deeper than 4.5 m unless approved by the Municipal Engineer.

Where it is not feasible to service by gravity connection, a rear yard sewer may be allowed, upon approval by the Municipal Engineer. See S11 Sewer Location.

S11 SEWER LOCATION

Sanitary sewers shall be located within the road right-of-way under the road asphalt unless otherwise approved by the Municipal Engineer. Sewers and manholes shall be offset from the vehicular wheel paths wherever possible.

Where it is not technically possible to locate a sewer within the dedicated road, a statutory right-of-way shall be provided with a minimum width equal to twice the depth of the pipe from finished grade to the crown. Where there is more than one pipe in the right-of-way, the minimum width shall be based on the deepest pipe and the required separation between pipes shall be taken into account. Separation between two sewer pipes, sanitary or storm, shall be 1.2 m. Separation between water and sewer pipes shall be 3 m unless otherwise approved by the Regional Public Health Engineer of the Health Authority.

The width of right-of-way shall be sufficient to permit excavation in accordance with WorkSafeBC requirements.

The minimum width of right-of-way and easement shall be for:

- one sewer only – 4.5 m
- two or more utilities – 6 m

The above right-of-way widths may be increased dependent on the depth of utility and will consider topography and soils conditions, at the discretion of the Municipal Engineer. The Municipal Engineer may require the Owner to register a covenant in favour of the Municipality on a Parcel over which a right-of-way is required and on a Parcel abutting a right-of-way. The covenant shall specify that the foundation of any wall abutting the right-of-way shall be at an elevation no higher than the invert of the lowest utility unless a geotechnical report is provided and approved by the Municipal Engineer.

If a manhole, valve chamber, or other appurtenance is located within a right-of-way, a maintenance access right-of-way, of a width and on an alignment acceptable to the Municipal Engineer, shall be provided directly from an existing Municipal road. The maintenance access shall be constructed to provide access in all weathers on a base adequate to support a 9 T vehicle loading in accordance with Supplementary Detail Drawing TLG 03.

Rights-of-way shall be entirely on one side of the boundary between Parcels.

S12 SERVICE CONNECTIONS

- Separate sanitary service connection shall be provided to every lot within a Development in accordance with Section 6.4 of the Bylaw. All services shall enter the main at a point above the springline in accordance with MMCD Supplementary Detail Drawing S7.
- Only one service connection shall be permitted to each Parcel unless otherwise approved by the Municipal Engineer.
- Except in the turn around area of a cul-de-sac, connections shall be installed perpendicular to the sewer which must be extended if necessary to accommodate this requirement.
- Connections shall generally be located in accordance with Supplementary Detail Drawing TLG 01 but shall, in any case, avoid conflict with all other municipal and non-municipal utilities and appurtenances and allow the maximum number of street trees while avoiding driveway locations if possible.
- The minimum diameter for service connections shall be 100 mm for single family residential connections and 150 mm for all other connections unless otherwise approved by the Municipal Engineer.
- Connections to new mains shall be made using wye fittings.
- Connections to existing mains shall be made using wye saddles unless otherwise approved by the Municipal Engineer Inserta-tee's may be used if the connection is more than two pipe sizes smaller than main..
- A manhole shall be provided on the sewer main for all service connections where the size of the connection is greater than 250 mm diameter unless the connection is more than two pipe sizes smaller than the main.
- The minimum grade from main to property line shall be 2% for 100 mm and 1.5% for 150 mm connections. All other sizes shall be based on minimum velocity of 0.75 m/s.
- The minimum depth of a service at the property line shall be 1 m and the maximum shall be 3 m unless otherwise accepted by the Municipal Engineer.
- Inspection chambers shall be provided for all connections.
- Sampling manholes complete with smooth flow channel in accordance with Supplementary Detail Drawing TLS 01 shall be provided within the Development site, as close to the property line as possible, for all industrial connections. Sampling manholes shall be provided for other connections at the discretion of the Municipal Engineer.
- Inspection chambers within a driveway must be protected with a concrete box complete with a steel lid in accordance with Supplementary Detail Drawing TLS 02.
- Inspection chambers located within a lane must be placed in a right of way on the private property side of the curb.

S13 SEISMIC PROTECTION

S13.1 Application

The Municipality is divided into areas with estimated seismic movement as follows;

- area A - significant seismic movement potential but less than 0.5 m
- area B - between 0.5 m and 1 m
- area C - between 1 m and 2 m

The Municipality also has areas of high liquefaction susceptibility.

Figure W1 (Schedule B) is provided for information. A Professional Engineer experienced in geotechnical engineering and seismic analysis shall assess each site to determine the seismic movement and liquefaction potential.

Seismic design shall be provided in accordance with this section in area B and area C and in those parts of area A identified as having High Primary Liquefaction Potential (whether or not covered in peat).

S13.2 General Requirements

Non-reinforced concrete pipe shall not be used.

The probable differential movement between pipes and manholes and other structures shall be calculated and accommodated by providing flexible connections. This shall be achieved by the installation of a mechanical coupling or flexible joint close to the structure or manhole barrel and another at the edge of the excavation unless otherwise approved or required by the Municipal Engineer.

S13.3 Areas B and C Requirements

The following requirements apply within those areas of areas B and C:

- within 3 m horizontally of a watermain
- within 100 metres of an environmentally sensitive water body
- within the recharge area for potable water supply
- in other locations where the Municipal Engineer considers that the consequences of failure would be significant

Gravity Sewer Materials and Joints

Sewer mains, connections and fittings shall be designed for ductile deformation to accommodate permanent ground deformation resulting from an earthquake.

Only high density polyethylene with heat butt fused joints is approved.

All pipeline, fittings and appurtenances joints shall be restrained to prevent pullout when subjected to extension forces.

Manhole and Sewer Flotation Control

Manholes and 525 mm diameter and larger gravity sewers located within a liquefiable layer shall be made to resist flotation under liquefaction conditions by designing for neutral buoyancy or by being held down.

Unless alternative design is approved or required by the Municipal Engineer, flotation shall be prevented by providing manhole bases with sufficient thickness of concrete, and encasing pipes in accordance with MMCD Standard Detail Drawing G7 in sufficient thickness of concrete, to achieve neutral buoyancy with pipes half-full.

S13.4 Forcemains

Forcemains shall be designed in accordance with Sections W19 seismic design requirements for watermain.

S14 SANITARY LIFT STATIONS

The use of sanitary lift stations is to be minimized and alternative collection system arrangements considered to avoid pump stations where it is practical to do so. Any proposed use of sanitary lift stations shall receive prior approval from the Municipal Engineer who, in addition to technical design considerations, shall take into account impact on neighbours, aesthetics, noise, odour control, security, landscaping requirements, capital, operation and maintenance costs and energy requirements.

S14.1 Corrosion Protection

In areas identified by the Municipal Engineer, the municipal sanitary collection system shall be protected from hydrogen sulphide corrosion by avoiding having any concrete exposed to the air within the system. This includes a minimum of five (5) manholes and associated pipe sections between them downstream of the end of a forcemain.

S15 PRIVATE ON-SITE SEWERAGE SYSTEMS

Where private on-site sewerage systems are permitted, the type of system will be in accordance with Provincial regulations and On-Site System Requirements by Area, see Figure S1, Schedule B for details.

For a development proposing the use of a septic sewerage system, the Owner shall be required to submit certification from a Qualified Professional (as defined by the Ministry of Health's Sewerage Systems Regulation) that the land proposed for development is suitable and capable of sustaining an onsite sewerage system for the proposed use in accordance with the Ministry of Health's Sewerage System Regulations.

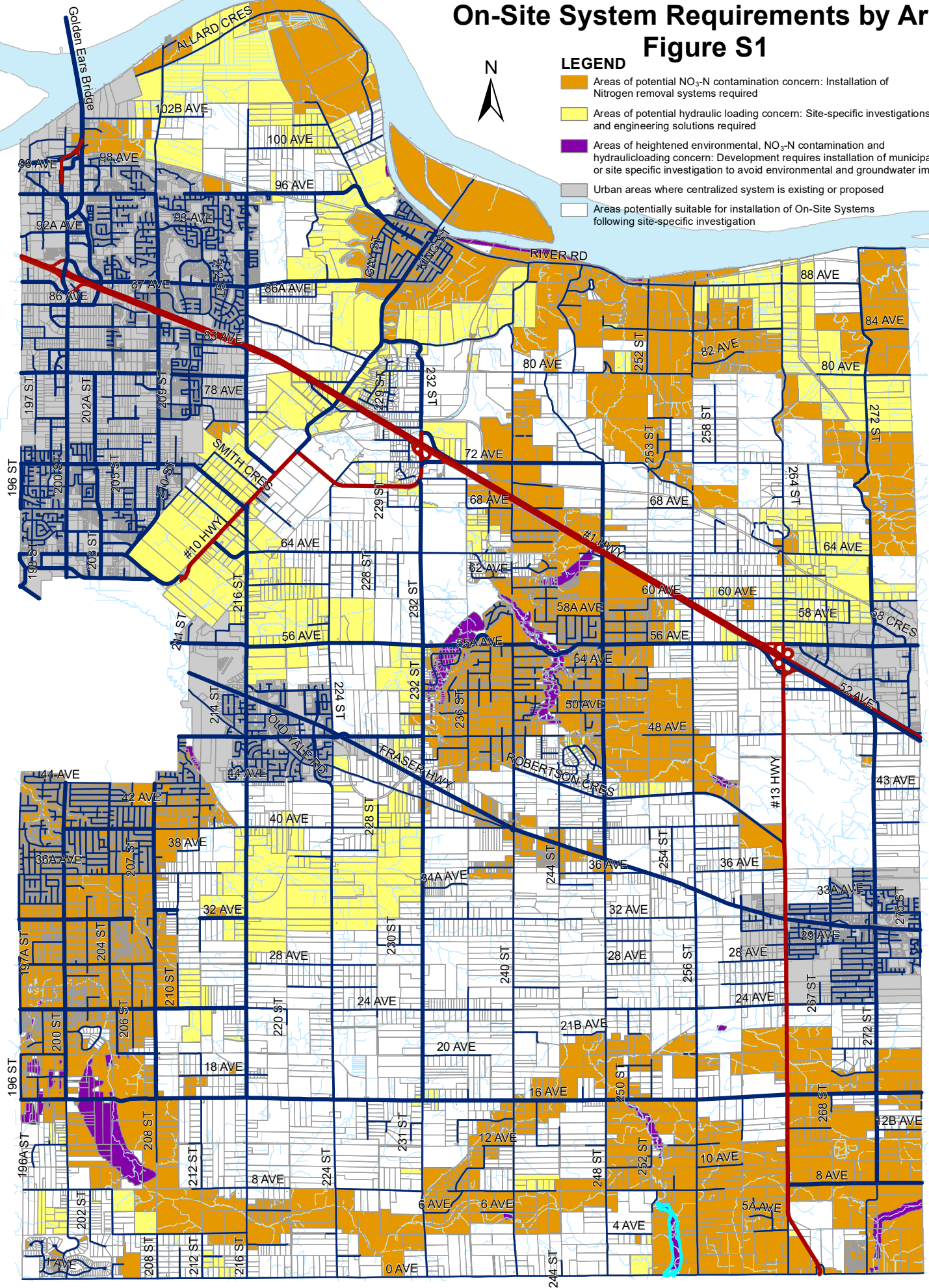
Registration of a Section 219 restrictive covenant securing the design, construction and maintenance of the septic system (including primary and reserved field locations) as required by the Qualified Professional shall also be required for each proposed development lot.

On-Site System Requirements by Area Figure S1



LEGEND

- Areas of potential NO₃-N contamination concern: Installation of Nitrogen removal systems required
- Areas of potential hydraulic loading concern: Site-specific investigations and engineering solutions required
- Areas of heightened environmental, NO₃-N contamination and hydraulic loading concern: Development requires installation of municipal sewer or site specific investigation to avoid environmental and groundwater impacts
- Urban areas where centralized system is existing or proposed
- Areas potentially suitable for installation of On-Site Systems following site-specific investigation



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DESIGN CRITERIA

SECTION W - WATER

For Table of Contents, refer to beginning of Schedule B

SECTION W - WATERWORKS

W1 GENERAL

Water system extensions shall be designed in accordance with any applicable Master Waterworks Plan that has been adopted by the Municipality and shall conform to the requirements of the Provincial Ministry of Health, the Municipal Officer of Health for the Fraser Health Authority and the Drinking Water Protection Act.

W2 DESIGN FLOWS

W2.1 Residential Demands

Maximum Day Demand	1,350	litres/capita/day
Peak Hour Demand	2,000	litres/capita/day

Design populations for calculating water demand shall be in accordance with the Municipality's population predictions or with the planned development in the area to be served, whichever is larger.

W2.2 Industrial, Commercial, and Institutional Demands

In the absence of site specific information, design demands for commercial, industrial and institutional areas shall be:

Maximum Day Demand	1.1	lps/ha
Peak Hour Demand	2	lps/ha

W2.3 Pipe Flow Formula

Hydraulic design computations shall be based on the Hazen-Williams formula:

$$Q = \frac{C D^{2.63} S^{0.54}}{278,780}$$

Where	Q	=	Rate of flow in l/s
	C	=	Roughness coefficient (minimum 125)
	D	=	Internal pipe diameter in mm
	S	=	Slope of hydraulic grade line in m/m

W3 FIRE FLOW DEMANDS

Fire flows shall be based on the publication "Water Supply for Public Fire Protection - A Guide to Recommended Practice 2020" published by Fire Underwriters Survey except that the minimum acceptable fire flows shall be:

Zone	Required Fire Flow
Residential Suburban Residential, Multiple Family	90 l/s
Compact Lot Residential	90 l/s
Comprehensive Commercial and Institutional	150 l/s
Industrial	225 l/s

W4 WATER PRESSURES

Maximum allowable pressure	1035 kPa
Minimum pressure at Peak Hour Demand	300 kPa
Minimum pressure anywhere in system during design Fire Flow and Maximum Day Demand	150 kPa

W5 WATERMAIN SIZE AND LAYOUT

Where it has an up-to-date hydraulic model, the Municipality shall provide information for design calculations.

Watermain size and layout shall be in accordance with Municipal network requirements and shall accommodate the ultimate development projections using the Maximum Day Demand plus Fire Flow or the Peak Hour Demand, whichever has the greater effect on pressure and flow. Watermains shall be sized to provide flows to all adjacent land to meet the requirements of existing Development or Development in accordance with the current Zone or with the land use designated in the Official Community Plan, whichever is greater. Fire flows for watermain sizing and layout shall not be reduced to take fire sprinkler systems into account unless the municipal system is inadequate to provide the Development with the full fire flows required without sprinklers.

Depending on the complexity and extent of the proposed distribution system, the Municipality may require a hydraulic analysis showing minimum flows, velocities and pressures.

Pipe velocity shall not exceed 1.5 m/s nor head loss exceed 1 m per 100 m of length under Peak Hour Demand, nor shall velocity exceed 3.5 m/s under maximum day plus fire flow conditions.

All watermains shall be looped except with the approval of the Municipal Engineer and the Regional Public Health Engineer of the Fraser Health Authority. Where Development is phased, a temporary unlooped watermain up to a maximum length of 200 m may be permitted if the ultimate looping of the main is shown on the key plan for the Development and is acceptable to the Municipal Engineer.

The minimum diameters of watermains servicing fire hydrants shall be 150 mm in single family residential, suburban and rural areas and 200 mm elsewhere.

W6 DEPTH OF COVER

The minimum cover over any watermain shall be 1.2 m with 0.3 m cover over valve stems.

Where it is impractical to provide the minimum cover required, precast concrete slabs shall be used to protect the watermain against excessive loading. The design submission shall show that the slabs are adequate for its intended purposes. Each slab shall be provided with lifting hooks for subsequent access to the watermain.

Concrete encasement shall not be allowed.

W7 WATERMAIN GRADES

The maximum grade of a watermain shall be 10% unless anchor blocks are provided in accordance with MMCD Standard Detail Drawing.

W8 CLEARANCE FROM SEWER PIPES

All cross over points with sanitary or storm sewers shall be indicated on both the plan and profile drawing.

Crossings shall be installed at a minimum angle of 45° between the pipes.

Where the watermain is below, or has less than 0.5 m clearance above any sewer, the next higher class of pipe shall be used, a full pipe length shall be centered across the cross-over point and the end joints shall be wrapped with petroleum tape in accordance with:

- ANSI/AWWA C214 (factory applied)
- ANSI/AWWA C209 (field applied)
- ANSI/AWWA C217 (petroleum tape)

The minimum horizontal clearance between a watermain and a sanitary or storm sewer shall be 3 m. Where it is impractical to provide this minimum clearance, all affected joints shall be protected as above.

W9 VALVES

Valves shall be located as follows:

- a) Valves shall be provided on all legs of "X" or "T" intersections.
- b) No more than 1 hydrant shall be isolated per valve.
- c) Valves in industrial areas shall be positioned to isolate no more than 2 service connections.
- d) Valves shall be not more than 200 m apart in one and two family residential areas or 150 m apart in multiple family and commercial areas. Valve spacing in other areas shall be to the approval of the Municipal Engineer.

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

All direct bury mainline valves shall be gate valves. Butterfly valves shall only be used in circumstances approved by the Municipal Engineer where gate valves are not practical. Valves larger than 400 mm shall be provided with bypass valves and special design may be required by the Municipal Engineer.

W10 HYDRANTS

Hydrants shall be spaced a maximum of 75 m apart adjacent to compact single family, multiple family, commercial, industrial and institutional lots, and 150 m apart for all other residential land uses, with no lot further than 75 m from a hydrant.

Hydrants shall be located at every street intersection except where not required to maintain the permissible spacing. Where the distance between consecutive street intersections exceeds the permissible hydrant spacing, additional hydrants shall be located between intersections.

On arterial roads, hydrants shall be located 1.5 m behind the curb or 0.5 m behind a sidewalk abutting the curb. On other roads, hydrants shall be located 1.2 m from the property line unless otherwise approved by the Municipal Engineer. In mid-block locations, fire hydrants shall be located on line with property corners. Hydrant locations shall not conflict with existing or proposed street lights, power poles, driveways, kiosks and other structures.

On arterial roads, a second valve shall be installed on the hydrant lead, near hydrant, in the boulevard.

On arterial roads with four or more lanes, each side of the road shall be provided with hydrants at the required spacing.

W11 AIR VALVES

Combination air valves shall be installed at the high point of all mains of 300 mm diameter and larger except where the difference in elevation between the high point and low point is less than 600 mm.

Combination air valves shall be sized as follows:

Watermain Size (diameter)	Valve Size (diameter)
300 mm	25 mm
350 to 600 mm	50 mm
Mains greater than 600 mm	Specific Engineered Design

All air valves shall be installed off the travelled portion of the road in accordance with Supplemental Detail Drawing TLW 03.

W12 BLOW DOWNS

Blow-downs shall be installed at the lowest point between valves on all watermains of 300 mm and greater except where the difference in elevation between the high point and low point is less than 600 mm.

W13 BLOW-OFFS

Blow-offs shall be provided at the ends of all watermains installed in accordance with MMCD Standard Detail Drawing W8 for watermains up to 250 mm and Supplementary Detail Drawing TLW 02 for 300 mm watermains. Blow-offs for watermains larger than 300 mm shall require special design. A main line gate valve shall be provided for temporary blow-offs.

All blow-offs shall be located within the pavement area of the road; not in boulevard or gravel area.

W14 THRUST BLOCKS AND JOINT RESTRAINTS

Concrete thrust blocks shall be provided at valves, bends, tees, wyes, reducers and plugs. Thrust block sizes shall be indicated on the design drawings. A reverse thrust block is required on caps and blow-offs.

Joint restraining devices may be used with the approval of the Municipal Engineer in cases where conventional thrust blocks are not feasible, or to augment conventional thrust blocks where the possibility of disturbance exists. Design plans shall identify the type of restraining device to be used and clearly show the minimum required restrained pipe length.

The Municipal Engineer may limit the size and number of taps permitted on a restrained length of pipe.

W15 VALVE CHAMBER DRAINAGE

Chambers or manholes containing valves, blow-offs, meters, or other appurtenances shall not be connected directly to any sewer. Such chambers or manholes shall be drained to the ground surface where they are not subjected to flooding by surface water; or to absorption pits, subject to adequate soil conditions.

W16 SERVICE CONNECTIONS

Service connections shall be provided to every lot within a Development in accordance with Section 6.4 of the Bylaw. The minimum diameter for service connections shall be 25 mm for one and two family residential connections, 37.5 mm for Rowhouse and 150 mm for industrial and commercial connections unless otherwise approved by the Municipal Engineer. All other service connection sizes to be determined based on Building Permit requirements and available flows.

A Professional Engineer with experience in sprinkler system design shall size each water service connection intended to serve fire sprinkler installations. Designs shall conform to National Fire Protection Association standards. All service connections are to be split into separate domestic and fire suppression systems on private property. The domestic system is to be metered as required in the Langley Waterworks Regulation Bylaw.

Except in the turn around area of a cul-de-sac, connections shall be installed perpendicular to the watermain which must be extended if necessary to accommodate this requirement.

Connections shall generally be located in accordance with Supplementary Detail Drawing TLG 01, but shall, in any case, avoid conflict with all other municipal and non-municipal utilities and appurtenances and allow the maximum number of street trees while avoiding driveway locations if possible.

A meter setter and box shall be installed 300 mm inside of the property and clear of the property line. A water meter shall also be installed in accordance with the Langley Waterworks Regulation Bylaw.

A corporation stop and a curb stop on the watermain side of the meter box shall be installed for each 50 mm diameter, or smaller, connection. Connections larger than 50 mm shall be installed with a gate valve flanged to the watermain.

W17 WATERMAIN LOCATION

Watermains shall be located within the road right-of-way under road asphalt unless otherwise approved by the Municipal Engineer.

Where it is not possible to locate a watermain within the dedicated road, a statutory right-of-way shall be provided with a minimum width equal to twice the depth of the pipe from finished grade to the crown. Where there is more than one pipe in the right-of-way, the minimum width shall be based on the deepest pipe and the required separation between pipes shall be taken into account.

The width of right-of-way shall be sufficient to permit excavation in accordance with WorkSafeBC requirements.

The minimum width of right-of-way and easement shall be for:

- one main only – 3 m
- two or more utilities – 6 m

The above right-of-way widths may be increased dependent on the depth of utility and will consider topography and soils conditions, at the discretion of the Municipal Engineer.

The Municipal Engineer may require the Owner to register a covenant in favour of the Municipality on a Parcel over which a right-of-way is required and on a Parcel abutting a right-of-way. The covenant shall specify that the foundation of any wall abutting the right-of-way shall be at an elevation no higher than the invert of the lowest utility.

If a valve or other appurtenance is located within a right-of-way, a maintenance access right-of-way, of a width and on an alignment acceptable to the Municipal Engineer, shall be provided directly from an existing Municipal road. The maintenance access shall be constructed to provide access in all weathers on a base adequate to support a 9 T vehicle loading in accordance with Supplementary Detail Drawing TLG 03.

Rights-of-way shall be entirely on one side of the boundary between Parcels.

W18 GEOTECHNICAL INVESTIGATION

A geotechnical investigation of soil corrosiveness shall be undertaken for all proposed metallic pipes and/or fittings and the Owner's Engineer shall specify any necessary corrosion protection. Geotechnical soil analysis to be carried out based on the 10-point method given under Appendix of AWWA C105. Results of all corrosion testing and subsequent design shall be submitted to the Municipal Engineer for record purposes.

W19 SEISMIC PROTECTION

W19.1 Application

The Municipality is divided into areas with estimated seismic movement as follows:

- area A - significant seismic movement potential but less than 0.5 m
- area B - between 0.5 m and 1 m
- area C - between 1 m and 2 m

The Municipality also has areas of high liquefaction susceptibility.

Water system installations identified on Figure W1 as having seismic movement potential, and/or high liquefaction susceptibility, shall follow the requirements of W19.2 - W19.4 below.

Figure W1 is provided for information. A Professional Engineer experienced in geotechnical engineering and seismic analysis shall assess each site to determine the seismic movement and liquefaction potential.

Seismic design shall be provided in accordance with this section in area B and area C and in those parts of area A identified as having High Primary Liquefaction Potential (whether or not covered in peat).

W19.2 Pipe Materials and Joints

Watermains and fittings shall be designed for ductile deformation to accommodate permanent ground deformation resulting from an earthquake.

Only the following pipe materials and types of joint are approved:

- a) Restrained joint C909 PVCO pipe
- b) Steel with welded joints
- c) High Density Polyethylene, if approved by the Municipal Engineer, with heat fused butt joints

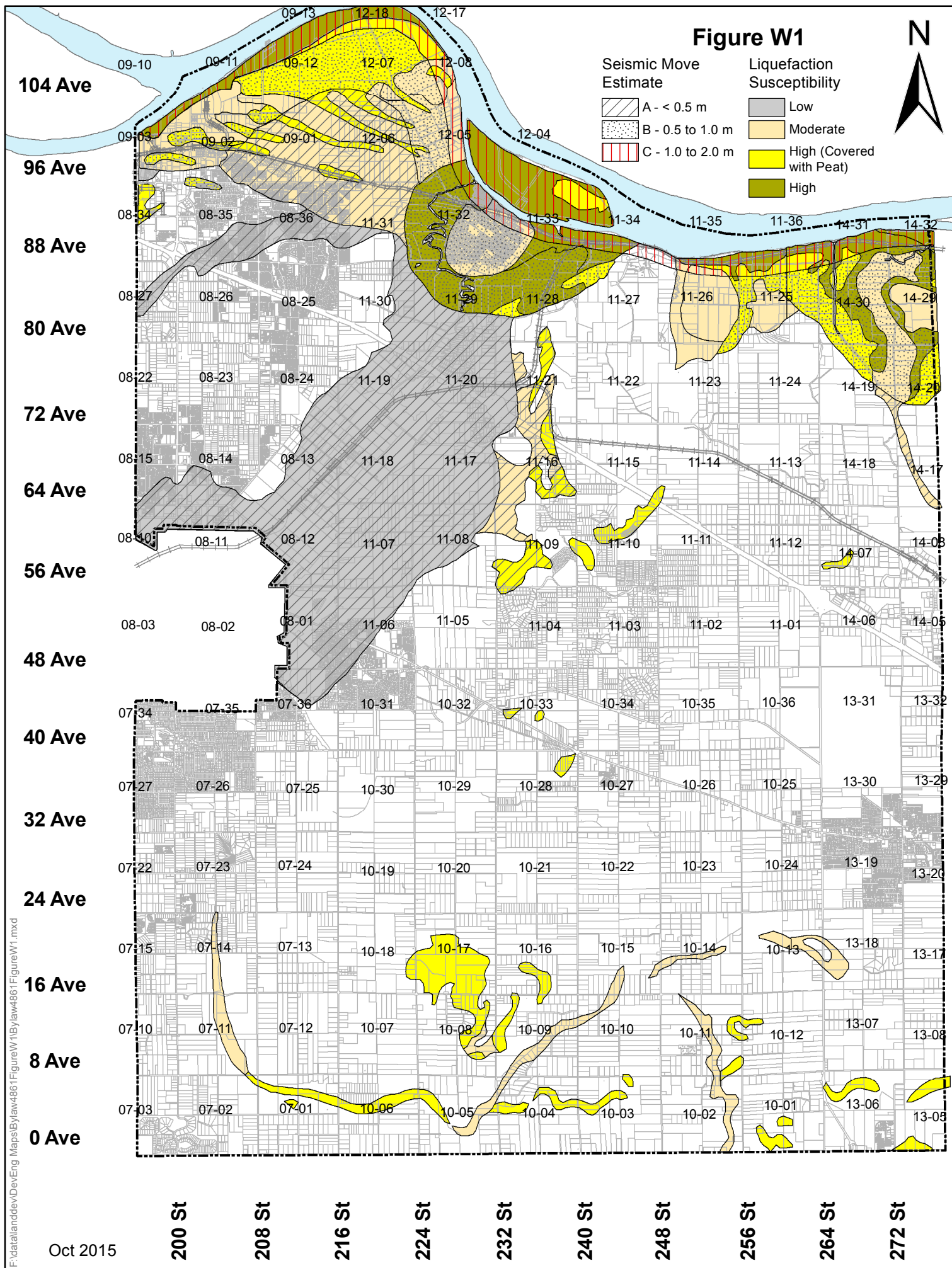
All pipeline, fitting and appurtenance joints shall be restrained to prevent pullout when subjected to extension forces.

W19.3 Connections to Structures

Connections to structures shall have two flexible or mechanical couplings, complete with joint restraints, per connection.

W19.4 Service Connections

Service connections shall have an offset or a loop in order to accommodate movement up to 0.5 m of the pipeline through the soil.



W20 PRIVATE WELLS

W20.1 Regulatory Requirements

A private well intended to supply water for domestic use shall be a drilled well and shall not serve more than one single family residence and its accessory buildings on the same lot. Private wells shall be constructed on every proposed lot in accordance with any groundwater management plan adopted by the Municipality and with provincial legislation and regulations including, but not limited to, the Ground Water Protection Regulation (Water Act 2004, as amended), and Health Hazard Regulation and Sewerage System Regulation (Public Health Act 2008, as amended). For the latter two regulations, a certificate is required from a Professional Engineer or Geoscientist or the Fraser Health Authority stating that the well satisfies the setback requirements specified in the noted regulations (from potential sources of contamination). Each well shall be tested to demonstrate that water is potable and safe to drink in accordance with the Canadian Drinking Water Guidelines (Health Canada) and Drinking Water Protection Regulation (Drinking Water Protection Act 2001).

The above mentioned acts, regulations and guidelines are regularly updated and the requirements at the time of application will apply. Also, at the discretion of the Municipal Engineer, where there are reasonable grounds for concerns with drinking water supply, additional information will be requested.

W20.2 Well Construction

Wells shall be drilled and constructed by a Qualified Well Driller in accordance with the Ground Water Protection Regulation (Water Act 2004, as amended). Any well not meeting municipal requirements or the requirements of the above noted regulations must be decommissioned according to the provincial standards and a Certificate of Well Abandonment submitted.

All on-site facilities, services and measures shall be designed and installed in way not to cause any adverse impacts to the aquifer in use by a municipal well, its groundwater quality and quantity, and the well itself.

W20.3 Minimum Yield and Quality

A private well shall provide a year round sustained yield of not less than 2,500 litres per day per lot and provide a sustained yield of 9 litres per minute for a minimum of 4 hours to meet peak hour water demand.

Water shall be tested and proven safe for human consumption by a laboratory accredited by the B.C. Government for testing of potable water. Water quality shall be in accordance with the Drinking Water Protection Regulation (Drinking Water Protection Act 2001, as amended) as though the private drinking water source is a water supply system regulated by the Drinking Water Protection Act (2001). Testing shall be undertaken for those aesthetic, microbiological, chemical and physical parameters as required for domestic water systems by the Drinking Water Officer or Medical Health Officer (for the Fraser Health Authority) in accordance with the latest edition of the "Canadian Drinking Water Guidelines (Health Canada)" and Drinking Water Protection Regulation (Drinking Water Protection Act 2001, as amended).

W20.4 Well Development, Testing and Certification

Developed wells shall be pumped continuously at a constant rate for a minimum period of four hours and records made of drawdown and recovery at sufficiently short intervals to properly record initial rapid drawdown and recovery, final well yield, recommended pumping rate, and any other aquifer behavior related observations.

The pumping test rate shall be at or greater than the required 13,000 l/d (9 litres per minute). Groundwater samples shall be obtained at regular intervals during the pumping test and analyzed to determine the groundwater quality changes and the final drinking water quality, and whether the drinking water source is safe and potable.

A Professional Engineer or Professional Geoscientist with experience in well construction and testing shall:

- submit Forms F2 to F5 inclusive showing that each well has been tested and meets the requirements of Sections W20.1, W20.2, W20.3 and W20.4
- identify the water supply aquifer and whether a private well is located within a municipal well capture zone and extracting water from same aquifer as the municipal well
- comment on the likelihood of well interference between the municipal water supply well and the private wells, and amongst all the wells present on-site

W20.5 Hydrogeological Evaluation

A detailed hydrogeological evaluation of the proposed Development shall be provided by a Professional Engineer or Geoscientist specializing in the hydrology of groundwater when:

- three or more new wells are proposed in a Development; or
- the Professional Engineer or Geoscientist reviewing the test results considers the yield to be marginal or not indicative of the probable yield during seasons when the water table is lower; or
- significant cumulative well interference is expected; or
- water quality is fluctuating or deemed unsafe as at-risk from surrounding land uses and other hydraulically interconnected surface water features or shows the water supply source may not meet Health Canada's Drinking Water Quality Guidelines in the long term; or
- at the discretion of the Municipal Engineer, where there are reasonable grounds to anticipate risk to a municipal well and its water supply, aquifer assessment and well water protection studies, and implementation of recommendations will be required

The evaluation shall take into account:

- the impact of each proposed well on surface waters, any natural environmental features dependent on groundwater, and on the existing or potential future groundwater supply for neighbouring Parcels

- the cumulative impacts (drawdown interference, watertable decline, etc.) both on on-site wells and neighboring wells, and on any municipal wells in the area; the long term drinking water quality and the potential for degradation of well water quality from septic systems, agricultural operations, commercial operations, hydraulic interconnectivity between surface water features and the source water or from any other potential sources of contamination present in the surrounding (any sources within 500m of the well should be assessed)
- the long term impact of the proposed wells and any proposed facility or service (such as private sewerage system discharges) on the source aquifer

The evaluation report shall include:

- pump test data and aquifer analysis
- water quality analysis and lab reports
- a map showing the proposed subdivision layout and well and septic locations
- local geological and surrounding land use information
- location of surface water and environmental features
- locations of wells and septic systems on neighbouring properties
- any municipal wells and their capture zones present in the area, hydrogeological sections and logs
- information on surrounding land uses especially those deemed to be impacting the water supply source of the proposed development
- all analysis and results along with supporting charts, diagrams, lab reports, etc.
- conclusions and recommendations of the evaluation. The recommendations made in the report must be consistent with the observations and results of analysis

The development (whether single well or three or more wells are proposed) shall not proceed should the water supply source is not demonstrated to be safe and meeting the drinking water quality and quantity requirements of Section W20.

The Municipal Engineer may also attach conditions to development agreement and building permits to ensure conformance to protect the municipal well capture zones and their recharge areas

The Township may request for additional information (additional investigations, testing and analysis, professional opinion, etc.) when a development or services being proposed are seen as interfering with municipal water supply wells and their water quality or quantity.

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DESIGN CRITERIA

SECTION SL – LIGHTING AND TRAFFIC SIGNALS

For Table of Contents, refer to beginning of Schedule B

SECTION SL - LIGHTING AND TRAFFIC SIGNALS

SL1 GENERAL

Street lighting calculations and plans shall be signed and sealed by a professional electrical engineer experienced in street light calculations, and in traffic signal design if required for the Development, referred to as the Design Engineer in this Section of the Schedule. All street lighting shall be LED.

SL2 LIGHTING LEVELS

The luminance method shall be used for design of roadway lighting. The minimum average maintained luminance levels, uniformity ratios and veiling luminance ratios shall be in accordance with the Transportation Association of Canada (TAC) Guide for the Design of Roadway Lighting (2006), as amended from time to time.

Illumination levels for intersecting roadways shall be the sum of each roadway in accordance with TAC.

Lighting of half roads where the ultimate pole spacing is one sided shall meet the ultimate lighting level standards with no additional poles. Lighting for half roads where staggered or opposite pole spacing shall ultimately be required shall initially meet residential local road illumination levels and be designed to meet ultimate requirements with additional poles on the undeveloped side.

The illuminance method shall be used for the design of the lighting of greenway boulevard trails using 5 lux and a 4:1 uniformity ratio.

Required sign illuminance levels and uniformity ratios shall be in accordance with TAC.

SL3 LIGHT POLE SPACING

Spacing and location of poles shall be governed by road width, road configuration, intersecting property lines, luminaire photometrics, mounting heights, required lighting levels and minimum clearances to overhead and underground utilities required by relevant legislation, codes, WorkSafeBC BC and utility companies.

Poles shall be arranged in a one-side, staggered or opposite spacing based on the road classifications listed in Table 1. Where overhead lines conflict with streetlight poles, one-sided spacing may be considered if the required illumination levels and ratios can be achieved. Alternative pole spacing and poles in road medians shall not be permitted unless approved by the Municipal Engineer.

Where possible, poles shall be located close to property lines and not in front of the buildable area of single family residential lots.

Pole locations shall provide for the most street tree planting locations possible by occupying narrow locations not wide enough for street trees.

Streetlight poles shall be offset as shown on the Road Cross Section Supplementary Standard Drawings unless otherwise approved by the Municipal Engineer.

Where possible, luminaires shall be installed on all signal poles to maximize intersection illumination which may require additional street light poles to meet required lighting levels.

TABLE 1 – Light Pole Arrangement	
Road Classification	Light Pole Arrangement
Arterial	Staggered/Opposite
Collector/Local	Staggered
Local	One Sided
Pedestrian Walkways	One Sided

SL4 CIRCUIT SIZE

Service bases shall service a maximum of 25 lights.

Road having staggered lighting shall have separate circuits on either side of road.

SL5 LUMINAIRES, POLES, WATTAGES AND LIGHT SOURCE

Unless otherwise required by the Municipal Engineer, the wattage and mounting height shall match those of existing lights being retained in the same block if the road classification and pedestrian conflict level is the same.

The operating voltage for the street lighting system shall be 120/240V unless otherwise approved by the Municipal Engineer.

LED street lighting shall be 3000K Colour Temperature on local residential roads and 4000K on collector and arterial roads, as well as controlled intersections.

All poles shall be equipped with a steel barrier protecting access to wiring and security hand-hole covers shall be installed.

SL6 DECORATIVE STREET LIGHTING

Decorative street lighting shall be provided in accordance with neighbourhood servicing plans, and the Municipality shall provide the Owner with generic details of the requirements and a list of recognized suppliers.

When decorative street lights are installed, the Owner shall supply to the Municipality one (1) additional spare luminaire and pole for every ten (10) installed.

SL7 LIGHTING CALCULATIONS

The luminance method shall be used for lighting design and calculations shall be in accordance with the TAC Guide for the Design of Roadway Lighting (2006), as amended from time to time.

Lighting calculations shall be completed using suitable computer lighting design software designed to carry out the required calculations by inputting the luminaire manufacturers IESNA formatted photometrics.

Grid spacing for pedestrian walkway/bikeway lighting calculation shall be maximum 1 m.

For calculations where the roadway surface is asphalt, R3 road surface classification shall be used and for calculations where the surface is concrete, R1 road surface classification shall be used.

SL8 TRAFFIC SIGNALS

Prior to starting a traffic signal design, the Owners Engineer shall contact the Municipality to confirm specific requirements of the signal, timing and coordination plans, operational requirements, emergency vehicle pre-emption and other issues or concerns.

Unless otherwise directed by the Municipal Engineer; phase numbering shall be as follows:

- Phase 2 = Northbound
- Phase 4 = Eastbound
- Phase 6 = Southbound
- Phase 8 = Westbound

Signal timing to comply with Safer City Traffic Signal Timing Standard Practices Review March 2008.

Traffic signals shall be designed in accordance with Sections 402.6 of the Ministry of Transportation Electrical and Traffic Engineering Manual except that NEMA phase designations shall be used.

Traffic signal design shall also conform to the British Columbia Motor Vehicle Act and the Manual of Uniform Traffic Control Devices for Canada 2008 Update.

Traffic signal design drawings and timing/coordination plans shall be provided by the Owner and prepared by a professional engineer experienced in such work. Municipal staff shall implement and test all timing plans prior to field installation.

All signal sections shall be LED. Pedestrian heads shall be bimodal LED's

Traffic detection shall be accomplished using a video detection system.

Signals coordination shall be by radio signals.

The Municipal Engineer may require installation of an emergency vehicle pre-emption system.

Traffic signal controllers, signal coordination equipment, video detection equipment (except for cable) and pre-emption equipment, if required, shall be specified and supplied by the Municipality at the cost of the Owner.

SL9 CONDUIT

Conduits shall be parallel or perpendicular to the roadway, and routed in a direct line between adjacent poles or junction boxes except where there are existing or proposed conflicts with the conduit run.

There shall be a maximum four 90° bends in a conduit run. If more bends are unavoidable, junction boxes shall be used.

Street lighting conduits shall be minimum 30 mm diameter RPVC and located at back of curb in a fore boulevard, where there is no fore boulevard behind sidewalk. Signal conduits shall be minimum 50 mm RPVC and minimum 25 mm RPVC for loop stub-outs.

SL10 JUNCTION BOXES

Round plastic junction boxes with galvanized steel lids shall be used:

- where there would otherwise be more than four 90° bends in a conduit run
- where branch conduit runs are required
- in conduit runs over 100 m
- at service panels

Concrete junction boxes with steel lids shall be used for installations in sidewalk or hard landscape areas.

Large concrete junction boxes with galvanized steel lids shall be used for traffic signal installations only in the quadrant where the traffic controller is to be installed.

SL11 CONDUCTORS

Street lighting feeder conductors shall be No. 6 RW90 unless otherwise approved by the Municipal Engineer.

Multi-conductor cable shall be used for traffic signal installations. The cable shall be in a continuous run from the traffic controller to each pole with no splices.

SL12 SERVICE EQUIPMENT

The Design Engineer shall confirm service locations with the utility company.

Street lighting systems are to be controlled with a lighting contactor and with a photocell located on the luminaire nearest the service panel.

Service panels for street lighting systems shall have a 60A - 2P breaker, contactor and photocell bypass switch and shall be mounted in a service base in accordance with MMCD Standard Detail Drawings. Smaller size service panels must be to the approval of the Municipal Engineer and be detailed on the drawings in the form of a wiring diagram or a one line diagram.

Where possible, traffic signal and street lighting systems shall be fed from the same service panel. A combination street lighting and traffic signal service panel shall have a 100A - 2P main breaker, sub-breakers, contactor and photocell by-pass switch. The service panel shall be mounted in a service base or on the side of a streetlight pole or post located near the traffic controller. No signal equipment shall be mounted on the same pole as the service panel.

All services shall be 120/240V single phase 3 wire unless otherwise approved by the Municipal Engineer.

Service bases shall service a maximum of 25 lights.

Roads having staggered lighting shall have separate circuits on either side of the road.

SL13 CONCRETE BASES

When selecting pole base locations search out proposed or existing utility locations and identify sensitive tree root Zones to avoid conflicts. The pole base shall be positioned outside the drip line of trees proposed for retention. The Designer shall coordinate the design with the Landscape Architect where applicable.

Where a custom base is required to accommodate unusual soils conditions or to avoid underground utilities and sensitive tree root Zones, the custom base design shall be provided by a Professional Engineer, licensed to practice structural engineering and meet the approval of the Municipal Engineer.

No more than two conduits shall enter a streetlight pole base unless a junction box is provided.

DESIGN CRITERIA

SECTION L - LANDSCAPE WORKS

For Table of Contents, refer to beginning of Schedule B

SECTION L - LANDSCAPE WORKS

L1 GENERAL

Property owners in the Township of Langley shall manage their lands for noxious weeds and invasive plants as set out in the British Columbia Weed Control Act (B.C. Reg. 66/85); as per information supplied by the Invasive Species Councils of British Columbia and Metro Vancouver; the British Columbia Ministry of Agriculture's Invasive Plant Alert; information distributed by the Township of Langley, and the Langley Environmental Partners Society; and as set out in this Schedule.

Boulevards, road medians and trails shall be provided and landscaped in accordance with this Schedule, the Supplementary Specifications (Schedule C), the Supplementary Detail Drawings (Schedule H) and the Neighbourhood Plan if one has been adopted for the area in which the Development is proposed.

Subject to the requirements of a Neighbourhood Plan, greenway boulevards may be required beside arterial roads, and conventional boulevards shall be provided adjacent to urban roads in all other circumstances.

Subject to other requirements of this Bylaw, landscape design shall be responsive to site conditions and adjacent land use and Development; preserve existing trees, vegetation and topography; and incorporate the principles of crime prevention through environmental design where appropriate.

Landscape requirements set out in this Schedule shall be varied as required by the Municipality to avoid conflict with municipal and non-municipal utilities and appurtenances, driveway locations, traffic site lines and requirements for hard surfacing. A 1.5 m wide grass area clear of all obstructions shall be provided for access to fire hydrants and standpipe connections.

All parts of a fence or a retaining wall, including footings, separating a boulevard or trail from adjacent property shall be located on the adjacent property. This requirement does not necessarily apply to access barrier fences.

L2 NOXIOUS/INVASIVE PLANT SPECIES

The Township of Langley has identified a number of noxious/invasive plant species (where noxious/invasive plants are defined as "harmful invasive alien/non-native/or native species of plants whose introduction or spread threatens the environment, the economy, or society, including human health") of concern where land is acquired by the Township through purchase or development requirement. The following noxious/invasive plant species will require control:

- Knotweed
 - Japanese Knotweed (*Fallopia japonica*, syn. *Polygonum cuspidate*, *Reynoutria japonica*)
 - Bohemian knotweed (*FallopiaX bohemica*)
 - Giant Knotweed (*Fallopia sachalinensis*)
 - Himalayan Knotweed (*Polygonum polystachyum*)
- Giant Hogweed (*Heracleum mantegazzianum*)
- English Ivy (*Hedra helix*)
- Purple Loosestrife (*Lythrum salicaria* L.)
- Himalayan Balsam (*Impatiens glandulifera*)
- Tansy Ragwort (*Senecio jacobaeae*)
- Horsetail (*Equisetum arvense*)

Provide a site assessment/investigation with respect to the presence of noxious/invasive plants, on all lands being dedicated/transferred as road allowance, park/conservation area, or for open space purposes, or otherwise transferred or granted via Statutory Right of Way to the Township of Langley.

- Offsite disposal of all plants of the noxious/invasive plant species and contaminated soil is the preferred method of control.

Any imported growing media, aggregates, rocks, fill, or plant material being used for the purposes of construction development of Greenways, boulevards, road medians, or off-road trails, and any other landscape area, must come free of contamination of the identified noxious/invasive plant species in this Schedule.

Should any of the identified noxious/invasive plant species of this Schedule become evident in Greenways, boulevards, road medians, or off-road trails, and any other landscape area during the one year landscape maintenance/warranty period, or the noxious/invasive plant species monitoring period, they shall be eradicated at the earliest opportunity by the developer's landscape contractor or approved Qualified Professional.

- Final sign-off/Acceptance of any landscape works shall not proceed until all evidence of noxious/invasive plants has been dealt with according to this Schedule.

L3 BOULEVARD AND MEDIAN LANDSCAPING

Boulevard and median landscaping shall be provided as follows along urban roads in Service Level Areas 1 and 2.

L3.1 Conventional Boulevards

The fore boulevard between the curb and sidewalk and the back boulevard between the sidewalk and the property line shall be levelled, drained and finished with grass, unless otherwise required. Street trees shall be planted at offsets as shown on the standard road cross section drawings, as noted in Schedule E, subject to the provisions of Schedule B, Section L3.7.

Sidewalks shall be provided in accordance with Schedule B, Section R20.4 Sidewalks.

Where a boulevard abuts the rear or side of a lot that has its frontage on another street, landscaping shall be provided as described for the back of trail portion of greenway boulevards or if not, a greenway as per Supplementary Detailed Drawing TLP 03.

L3.2 Greenway Boulevards

Greenway boulevards shall be consistent with Supplementary Detail Drawing TLP 28

a) Fore Boulevard

Planting between the curb and trail shall consist of street trees, grass and low shrubs and groundcovers with a mature height of less than 600 mm. Typically, planting beds are centred on street trees and shall be 2 m width by 5 m length.

b) Back of Trail

A maximum of four varieties of shrubs shall be planted between the trail and the property line. Shrubs against the property line shall have a height at maturity of 1000 mm along a picket fence and 1200 mm along a solid fence. A middle row of planting shall be a mixture of evergreen and deciduous shrubs with mature height of 450 mm to 1200 mm. A row of shrubs or groundcover with a mature height between 150 mm to 450 mm height shall be planted closest to the trail. The planting bed shall have an average width of 2 m varying between 1.5 m minimum and 2.5 m maximum.

At the time of planting, tall evergreen shrubs shall be #3 pot size, middle row shrubs shall be #2 pot size and groundcover plants shall be #1 pot size or greater.

c) Trails

Trails in accordance with Section L4, and the Supplementary Detail Drawing TLP 28 shall be provided in greenway boulevards. Grass shall be provided on both sides of a trail at a 0.5 m width.

L3.3 Retaining Walls

Cross slopes of trails and conventional boulevards shall be in accordance with the Roads Design Criteria (see Schedule B and Schedule H). Retaining walls adjacent to boulevards shall be constructed of split face, natural concrete unit wall installed in accordance with the manufacturers' instructions. The top shall be horizontal and any longitudinal grade accommodated in evenly distributed steps of a maximum of 300 mm or the height of a wall unit and cap. A conceptual design for a retaining wall over 1.2 m high shall be submitted to the Municipal Engineer for approval and the structural design shall be certified by a professional engineer. The cap shall be securely attached to the wall.

L3.4 Planted Medians

Medians wider than 1.5 m between backs of curbs and longer than 6 m shall be filled with growing medium, levelled and planted with a minimum of three species of evergreen and deciduous shrubs and groundcovers, and evergreen and deciduous trees. The mature height of shrub and groundcovers shall be a maximum of 1000 mm. The plant size at time of installation shall be # 1 pot size for groundcovers and #2 pot size or greater for shrubs. Deciduous trees shall be 6 cm caliper and evergreen trees 3 m high. Landscaped medians shall have a 450 mm wide concrete splash strip adjacent to the curb and automatic irrigation in accordance with the Supplementary Detail Drawing TLP 25

L3.5 Tree and Plant Selection and Spacing

Street tree plantings should respond to the constraints of the boulevard and building setbacks. Street tree selections should be made from the list in Schedule E, Section E1 and approved by the Township. Street trees should be spaced accordingly and in consideration of utilities, driveways and civil appurtenances in the boulevard. Street trees planted in single family and multiple family residential areas shall be 5 cm caliper and for other areas shall be 6 cm caliper.

New landscaping shall be designed to blend with existing adjacent plantings on the same block. Changes in plant palette shall occur at road intersections.

Plants shall be chosen to provide seasonal colour and interest, hardiness, drought tolerance and ease of maintenance. Maintenance considerations include weed control and the need for minimal pruning. Plants listed in Schedule E, Section E2 shall not be used. The Municipality may also refuse to allow other plants to be used.

Boulevard and median plantings shall be designed to fill in as a mass planting with no exposed soil within three growing seasons.

L3.6 Tree Planting

Tree planting trenches shall be provided in accordance with Supplementary Detail Drawings TLP 23 to 25 in medians and in boulevards where trees are to be planted between the curb and sidewalk. Tree planting trenches shall be continuous except at driveway crossings, street lights, transformers and other

utility structures in the boulevard. Trenches shall be filled with growing medium in accordance with the Supplementary Specifications.

All street trees, whether in front or behind the municipal sidewalk shall be provided with 10 cubic metres of growing medium, including trees that are located within a Hardscape boulevard or where the soil volume is otherwise restricted. Structural Soil, Silva Cell™ Deep Root Partners structural frame, or approved equivalent in accordance with Supplementary Detail Drawings TLP 23 and 24 shall be used to provide the required soil volume while providing the required structural support for adjacent hard surface.

An approved root barrier shall be provided where trees are to be planted adjacent to a sidewalk, driveway or in severely constrained planting areas that do not allow for provision of adequate volumes of acceptable growing medium and where tree roots may interfere with service corridors for underground utilities. The barrier shall be located so that the major root structure shall be restrained from extending into utility corridors and under curbs and sidewalks, but allow for the normal growth of the tree.

L3.7 Tree Clearances

Trees shall be planted at offsets shown in the Supplemental Detail TLP 22 and have the following minimum clearances to the trunk:

Street light poles	6 m
Utility poles	3 m
Manholes, valve boxes, water services	1.2 m
Sewer and drainage service connections	1.5 m
Edge of travelled lane	0.75 m
Edge of driveway, curb return, catchbasin or above ground utility facility	2 m

Where there is a boulevard planting strip between back of curb and sidewalk or trail, trees shall be planted 1 m from the back of curb. If existing street trees on the same block have a lesser setback, the new trees shall match that setback if approved by the Municipality. In other circumstances trees shall be a minimum of 1 m from a sidewalk and 2.5 m from back of curb.

Trees shall be planted no closer to a road intersection than the projection of an 8 m x 8 m site triangle as shown on Supplementary Detail Drawing TLP 26.

L3.8 Time of Plant and Grass Installation

Unless otherwise approved, boulevard planting shall not be undertaken until construction of 80% of the adjacent Development is complete.

Installation of grass sod in the boulevard shall be undertaken prior to the issuance of an occupancy permit of a building on the adjacent lot.

Topsoil and grass in boulevards may be required by the Municipality at the time of subdivision where, in their opinion, the adjacent land shall not be developed in the near future.

L3.9 Irrigation

An underground irrigation system shall be provided in medians and behind the curbs adjacent to greenway boulevards and shrub and groundcover plantings in conventional boulevards consistent with Supplemental Detail Drawing TLP 31. Irrigation design shall be reviewed and sealed by an Irrigation Designer certified by the Irrigation Industry Association of British Columbia. The system shall be metered and automatically activated through a timed control system. Water meters shall be installed as required by the Langley Waterworks Bylaw.

Three copies of an operation and maintenance manual shall be submitted and must include:

- record drawings of the completed irrigation system
- list of manufacturer's operation, service and repair instructions and parts lists
- maintenance procedures

L3.10 Drainage

Surface water shall be controlled by properly grading finished surfaces to avoid standing water on boulevards, public greenspaces, and medians. Sheet flow across trails is permitted. Concentrated flows across trail surfaces are not permitted. Drainage systems connected to the municipal storm sewer system may be required where landscaping is surrounded by hard surfaced boulevards or sidewalks. Where possible, drainage elements should not be in conflict with landscape requirements.

L3.11 Fencing and Associated Landscaping

Except specifically modified in a Development Permit:

- a) Lots with Pedestrian Access across a Greenway Boulevard.

Where there is to be direct pedestrian access to individual dwellings across a greenway boulevard, consistent with Supplemental Detail Drawing TLP 08, a decorative wood picket fence shall be provided along the lot boundary with arbour type gates provided for each dwelling and climbing vines on each gate post. The sidewalk connection from private to public shall be a cast in place concrete walkway to the standards and specifications as provided by the Township of Langley.

- b) Single Family, Commercial, Industrial and Institutional Lots

A continuous solid privacy fence shall be provided along the rear and side boundaries of a lot abutting a boulevard in Service Level Areas 1 and 2, and fence insets shall be provided for planting between the fence and property line. The fence inset shall be planted with evergreen trees and tall evergreen shrubs with a mature height no greater than 1200 mm. At the time of planting, evergreen trees shall have a minimum height of 2.5 m.

- c) Multiple Family Lots including Rowhouse

Except where there is to be direct pedestrian access across a greenway boulevard, a low picket fence shall be provided along the boundary of a multiple family lot or Rowhouse abutting a boulevard in Service Level Areas 1 and 2.

A minimum 1 m wide planted bed with a minimum of two rows of evergreen and deciduous shrubs and groundcovers shall be provided on the boulevard. At the time of planting, shrubs shall be #2 pot size or greater and groundcovers shall be #1 pot size or greater. Refer to Zoning Bylaw 1987 No. 2500, as amended from time to time, within Section 100 Landscaping Screening and Fencing for the matrix identifying landscape area requirements relating to front, side and rear lot lines.

d) Municipal and School Sites

A black vinyl, 1.8 m high, chain link fence and a cedar hedge, 1.5 m high shall be installed at time of planting, along the park or school side of the fence. Both chainlink fence and hedging are to be located on the residential lot side of the property line. The School District does not encourage access gates from private lots onto School property.

If required by the Municipality, a wood rail access barrier fence shall be provided behind the sidewalk or trail, or the curb where there is no sidewalk or trail, adjacent to a park or other municipal property with road frontage longer than 6 m. If the fence is located in grass, a mowing strip shall be provided on each side. If the fence abuts a sidewalk, the posts shall be installed in brackets set in concrete and the fence shall not encroach into the minimum required sidewalk width.

L4 TRAILS

Trails shall conform to this Section and be provided in accordance with a Neighbourhood Plan and as components of separate trail systems. Urban trails shall be provided in Service Areas 1 and 2 and shall be for the shared use of pedestrians and cyclists. Rural trails in Service Areas 3 and 4 shall be shared use trails for pedestrians, cyclists and equestrians.

L4.1 Trail Cross-Section and Surface

The minimum width of trail shall be:

Urban pedestrian and two way bicycle	3 m
Rural shared use	3 m

The minimum right-of-way width for trail systems not located in a boulevard shall be 6 m.

Maximum cross slopes shall be 2% for bicycle use and 5% for pedestrian only use.

Maximum longitudinal slope shall be 10% for bicycle and pedestrian use. For a wheelchair accessible trail, the maximum longitudinal slope is 8%.

There shall be a vertical clearance of 2 m for pedestrians, 2.5 m for cyclists and 3 m for equestrians.

Trail surfaces shall be concrete in boulevards, asphalt in other urban locations and gravel in rural areas.

L4.2 Retaining Walls

Where retaining walls are required they shall be provided in accordance with Section L3.3.

L4.3 Fencing

A black vinyl, 1.5 m high chain link fence, consistent with Supplemental Detail Drawing TLP 07 shall be provided along the boundary of a lot with a trail that is not located within a boulevard, and a cedar hedge, 1.5 m high at time of planting, shall be planted along the private side of the fence. In a conservation area, native shrubs with a mature height of 1 m shall be provided along the trail side of the fence.

A solid wood privacy fence shall be provided along the boundary of a lot with a trail in an ecological greenway. A 3 m planting strip shall be provided between the trail and the property line. Use Supplemental Detail Drawing TLP 06, without the offset reference on approved drawings as necessary.

L4.4 Restrictive Barriers

Where trails in greenway boulevards cross driveways and intersecting roads the following shall be provided:

- wood bollards with pedestrian cautionary signs in accordance with Standard Detail Drawing TLP 13
- lockable, removable, steel restriction posts 6 m behind the pedestrian letdowns

A minimum of one bollard shall be provided on a side shared use trail, with a clearance of 1.4 m from the edge of walkway surface. If a situation warrants, additional bollards may be acceptable with a minimum clear opening between posts of 1.4 m, and the maximum gap shall be 1.6 m.

A bicycle stop baffle shall be provided at a minimum of 600 mm behind the sidewalk, or the curb where there is no sidewalk, where a trail connects to a road other than at a road intersection.

L4.5 Trail Signage

Trail identifier signs shall be installed perpendicular to the trail centreline at intersections with streets, and parallel to the centreline elsewhere. Signs shall conform to the Municipality's standard layout, font type, font size, and colours as specified by the Township of Langley. Prior to fabrication, the Landscape Architect shall confirm the trail name and shall submit colour proofs of the signs to the Township of Langley.

- Blue – PMS 286
- Green – PMS 341
- Yellow – PMS 123
- White
- Black

Sign posts with doggy bag dispensers shall be provided at intersections and trailheads.

Environmental Area signs shall be provided at constructed creeks and naturalized planting areas.

Park identifier signs shall be provided at parks and nodes.

L4.6 Site Furniture

Refer to Schedule D - Approved Materials and Products, Section 4 Landscaping for additional information.

a) Benches

Benches, secured to concrete pads, shall be provided at 80 - 100 m intervals along trails and located for maximum pedestrian comfort and minimal potential for disturbance of neighbours.

b) Bicycle Racks

Bicycle racks shall be provided adjacent to, and at a level with, trails in greenway boulevards in commercial and institutional areas within a good line of sight of building occupants or in high pedestrian traffic areas.

c) Drinking Fountains

Publicly accessible drinking fountains may be required every 1.6 km along greenway boulevard trails where municipal water service is available or as otherwise directed during the plan review phase.

d) Multi-Stream Receptacles

- Receptacles shall be provided along public pathways within 15 m of service access points and roads. All receptacle locations to be approved by the Manager, Green Infrastructure Services.
- Receptacles shall be located no closer than 2.5 m from a public bench.
- Receptacles to be installed by Township of Langley Public Works Department at owner's expense unless otherwise noted by the Manager, Green Infrastructure Services.
- Receptacle pads to be installed by the developer, unless otherwise noted by the Manager, Green Infrastructure Services.

TOWNSHIP OF LANGLEY

**SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW**

SCHEDULE C

**CONSTRUCTION REQUIREMENTS
AND
SPECIFICATIONS**

The Township of Langley “Supplementary Specifications” are supplemental specifications to the **Master Municipal Construction Document – 2009 Edition (Platinum Book)** and take precedence over the MMCD Specifications.

SCHEDULE C
CONSTRUCTION REQUIREMENTS AND SPECIFICATIONS
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SECTION 1 - GENERAL CONSTRUCTION REQUIREMENTS

1.1 Construction Requirements

All Works and Services shall be provided in accordance with this Bylaw and the following documents which shall govern and take precedence in the following order:

1. Any project specific supplementary specifications accepted in writing by the Municipal Engineer;
2. Accepted Drawings;
3. Specifications in Schedule C;
4. Supplementary Detail Drawings in Schedule H;
5. These General Requirements;
6. MMCD Specifications; and
7. MMCD Standard Detail Drawings.

1.2 Pre-Construction Meeting

Before commencing construction of the Works and Services, the Owner together with the Owner's Engineer, Landscape Architect and the Owner's prime contractor(s) shall attend a pre-construction meeting with the Municipal Engineer. The Owner shall submit schedules as follows:

- a construction schedule showing the completion dates of the various parts of the Works and Services;
- the nature and frequency of proposed site meetings and site inspections to determine whether the Works and Services are being constructed in accordance with the Bylaw and Accepted Drawings; and
- the nature and frequency of proposed field and laboratory testing, including video inspection, of workmanship, materials and equipment.

A tree protection plan shall be submitted in accordance with Schedule I of this Bylaw.

The names, qualifications and emergency and regular contact information of the site superintendent, inspectors and any independent inspection and testing agencies must also be submitted at this time.

These schedules, personnel and testing agencies shall be subject to acceptance by the Municipality.

Some variation in these schedules necessitated by unforeseen conditions or circumstances is acceptable, but the average rate of progress of each portion of work and the level of inspection and testing shall be maintained in close conformity with the schedule.

1.3 Permission to Construct

Except as necessary to construct ESC Facilities in accordance with Erosion and Sediment Control Bylaw 2006 No 4381, as amended and tree protection fencing in accordance with Schedule I of this Bylaw, no land clearing, stripping of top soil, excavation, placement of fill,

construction or installation of any kind may be undertaken on a Subdivision site until Permission to Construct has been issued by the Municipal Engineer.

Before Permission to Construct is issued, ESC Facilities and tree protection fencing, both as referred to above, shall be installed, the design drawings must be accepted by the Municipality in accordance with Schedule B Section DR6.3 and the following provided:

- the name of the contractor(s) to be employed by the Owner for installation and construction of the Works and Services and a summary of the projects completed by the contractor(s) that are similar in scope nature and value to the Works and Services;
- the name of the site superintendent who shall supervise the construction of the Works and Services and be on-site at all times throughout its progress and who shall represent the Owner and his contractor during the Owner's absence, together with a resume of his/her related experience;
- registered rights-of-way for Works and Services across lands owned by other parties;
- amendments to existing, registered rights-of-way and easements in favour of other parties to permit Works and Services in accordance with the Bylaw and design drawings;
- a copy of the notice of project to WorkSafeBC of the proposed construction and installation of the Works and Services naming the Owner as the prime contractor in accordance with the Occupational Health and Safety Regulation;
- approvals for crossings of provincial Highways, railway tracks, high pressure gas distribution mains, oil pipelines, B.C. Hydro and any other rights-of-way;
- a Construction Permit from the Regional Public Health Engineer for the installation of any Waterworks;
- documentation to confirm that the Owner submitted a Notification application as required under the Water Act to the Ministry of Environment (MoE) at least 45 days prior to any scheduled in stream work such as installation of bridges, culverts, pipeline crossings and storm water outfalls and a Notification response letter from MoE including any project specific terms and conditions if received during the 45 day waiting period;
- an Approval pursuant to Section 8 of the Water Act issued by the MoE for any project involving the temporary use or diversion of water from a stream;
- a License pursuant to Section 7 of the Water Act issued by MoE for any project involving the permanent use, storage or diversion of water from a stream;
- documentation to confirm that the Owner has notified MoE that work is proposed in an Environmentally Sensitive Area, other than in or near a stream and the response (if any) from MoE;
- a permit for disposal, including burying or dumping, of any solid or liquid wastes on-site issued under Section 10 of the Waste Management Act by MoE;
- an authorization under Subsection 35(2) of the Fisheries Act issued by Fisheries and Oceans Canada for projects which have the potential to cause harmful alteration, disruption or destruction of fish habitat or to cause harm to fish, such as installation of a culvert, removal of streamside vegetation or other works in or about a stream;
- a Highway Use Permit issued by the Municipal Engineer; and

- any other approvals, licences, authorizations, permits or equivalent required by the Municipal Engineer.

The granting of Permission to Construct by the Municipal Engineer does not constitute subdivision approval.

1.4 Materials and Workmanship

The whole of the Works and Services shall be performed in a businesslike manner.

Unless the Municipal Engineer agrees to provide any materials, all materials required for the Works and Services shall be supplied by the Owner and shall conform with the requirements of the Bylaw and the Accepted Drawings. The Owner shall pay on demand for any material supplied by the Municipality.

The Owner shall supply representative samples of materials for the purpose of testing as and when requested by the Municipal Engineer, at no cost to the Municipality.

Any materials which, in the opinion of the Municipal Engineer, do not conform to the requirements of the Bylaw, or are unsuitable for the purposes for which they are intended, shall be rejected. Unless otherwise specified, all materials shall be new. Rejected materials shall not be incorporated into the required Works and Services and shall be replaced by the Owner at his/her own expense with materials accepted by the Municipal Engineer.

The Owner shall be responsible for all materials and store them safely until incorporated into the Works and Services.

1.5 Survey Control

Survey control necessary for installation of the Works and Services shall be the responsibility of the Owner. The survey control shall be carried out accurately and care taken to avoid cumulative errors. All work shall be constructed to the lines and grades shown on the Accepted Drawings.

1.6 Survey Monuments and Legal Postings

All legal posts, stakes, survey monuments and integrated survey monuments within the area of the Works and Services, and all construction stakes and marks on adjoining land, shall be preserved undisturbed and visible. In the event that any of the above are disturbed, lost or destroyed, they shall be replaced to the acceptance of the Municipal Engineer. Actual re-establishment of the monuments shall be undertaken by the Municipality, but all costs for replacement or re-integration shall be borne by the Owner.

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

Additional survey monuments shall be required to achieve a minimum density level as areas become developed. Integrated survey monument locations shall be established by the Municipal Engineer in accordance with provincial standards.

1.7 Work of Others

The Municipal Engineer shall be at liberty to enter upon the site of the work with his workmen and materials to do other work, and the Owner shall afford any such workmen all reasonable facilities to the acceptance of the Municipal Engineer.

The Owner shall arrange his work and dispose of his materials in such a manner as shall not interfere with the work or storage of materials of others upon the site of the Work. The Owner 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 Municipal Engineer.

1.8 Existing Structures and Utilities

At the commencement of construction, the Owner shall expose existing underground utilities and structures under the supervision of the Owner's Engineer or other utility company's representative to confirm the alignment, elevation and pipe material shown on the Accepted Drawings with particular attention to proposed tie-in and crossing points.

Any plans or descriptions, verbal or otherwise of existing utilities and structures provided by the Municipality are intended only as an aid in the location of these items. The Municipality accepts no responsibility for the accuracy of their locations.

1.9 Design Errors, Unknown Conditions, Changes

Any errors, conflicts, inconsistencies or omissions discovered in the design and any discrepancies discovered in the location of existing utilities, that affect the design, shall immediately be reported to the Municipal Engineer.

If, as a result of errors, conflicts, inconsistencies or omissions in design or of the discovery of previously unknown or concealed conditions, it becomes necessary, or in the opinion of the Municipal Engineer desirable, to make any change in the design, installation of the affected Works and Services shall be stopped pending the Owner's Engineer's revision of the Accepted Drawings and their acceptance in writing by the Municipal Engineer.

The Owner shall, if necessary, reconstruct any Works and Services previously installed by the Owner or others or pay for the Municipality or utility company to reconstruct their existing works, in a manner satisfactory to the Municipal Engineer and in conformance with the Bylaw.

No significant changes shall be made to the accepted design and specifications for any reason except as accepted by the Municipal Engineer in writing.

1.10 Hours of Work

Unless otherwise approved by the Municipal Engineer, the Owner shall not execute any work requiring municipal inspection outside the normal working hours (8:30 am to 4:30 pm, Monday to Friday) of the Municipality's inspectors.

1.11 Highway Use Permits

Work undertaken on a Highway or on a gazetted or dedicated Highway right-of-way and all full or partial road closures require a Highway Use Permit issued by the Municipal Engineer under the Highway and Traffic Bylaw.

1.12 Progress of Work

The Owner shall perform his/her work on each section of the Works and Services continuously until completion.

For sanitary and storm sewer mains, the term "section" shall mean that portion of the work from manhole to manhole, inclusive.

For watermains, the term "section" shall mean that portion of the work between any consecutive line valves.

For roadway, sidewalk, curb and gutter, the term "section" shall mean that component of the work between intersections.

The Owner's Engineer shall keep the Municipal Engineer properly and adequately advised of the progress of the construction and installation of the Works and Services.

1.13 Inspections

The Owner's Engineer and Landscape Architect shall provide necessary inspection services to ensure compliance with the Bylaw and the Accepted Drawings.

1. At the request of the Municipal Engineer, the Owner's Engineer shall give 24 hours advance notice of some or all of the following inspections
 - a) prior to covering of each underground municipal utility;
 - b) at the completion of subgrade preparation;
 - c) at the completion of base compaction;
 - d) prior to curbing and sidewalk construction;
 - e) prior to paving.
2. The Owner's Engineer shall provide weekly inspection reports to the Municipality in a form and to a level of detail acceptable to the Municipality.
3. If the Owner's Engineer has not performed full time inspection during installation of all underground facilities, including pipe surround materials and during all required testing and at the times indicated in Section 1.13, 1. a) to e);
 - a) the Owner shall, at the request of the Municipal Engineer and within such time as the Municipal Engineer shall designate, open for inspection any part of the Work and Services that has been covered up; or
 - b) the Municipality may conduct independent testing of any Works and Services, at the cost of the Owner, to ensure they meet the minimum acceptable standards.
4. The Owner's Landscape Architect shall be responsible for inspection of all landscaping work including topsoil, seeding, trees, shrubs and groundcovers.
5. The Owner's Landscape Architect shall provide the following minimum key inspections and subsequent reports to the Municipality:
 - a) Tree protection measures
 - b) Landscape subgrade and trail layout
 - c) Growing medium and installation

- d) Finish grading and drainage
 - e) Plant Installation
 - f) Fencing and Signage
 - g) Landscape Completion Inspection
 - h) Establishment Maintenance Inspections
 - i) Landscape Acceptance Inspection
6. The Owner's Landscape Architect shall inform the Green Infrastructure Services Department when formwork is in place and ready for concrete. Concrete shall not be poured prior to municipal review and confirmation of acceptable layout.

The Municipality does not, by any monitoring or inspection of the Works and Services by the Municipality, warrant or represent that the Works and Services are without defect and such monitoring or inspection does not relieve the Owner's Engineer and Landscape Architect from responsibility for proper engineering and landscape inspection as required by the Bylaw.

1.14 Suspension of Work

The Municipal Engineer may suspend the work, or any part of it, at any time on written notice to the Owner for reasons of public health or safety; or for non-compliance with federal or provincial legislation, regulations or codes, or municipal bylaws or requirements including work that, in the opinion of the Municipal Engineer, does not meet the requirements of this Bylaw.

1.15 Equipment

All specialized equipment used and methods employed in the carrying out of the work shall be subject to the approval of the Municipal Engineer. Care must be taken in turning construction equipment so that no damage occurs to the pavement.

All equipment must be in good working order and inspected to ensure there is no leakage of any contaminants.

1.16 Dewatering

The Owner shall ensure that excavations are continuously dewatered and take all reasonable precautions necessary to prevent flotation of any pipe or structure, settlement of surrounding ground or soil migration.

If well pointing is used to dewater excavations, pumping shall be continued until backfilling operations have been completed. Thereafter, pumping shall be gradually stopped for the portions backfilled to allow a gradual rise in the water table level.

1.17 Blasting, Soil Compaction and Pile Driving

The Municipal Engineer, in giving permission for blasting, rapid impact compaction, pile driving or similar procedures does not assume responsibility for resulting injury, loss of life or damage, and such consent shall not be construed as approval of the methods employed by the Owner in blasting. Any damage caused by blasting shall be repaired by the Owner at his/her own expense.

1.18 Weather Conditions

If the Municipal Engineer determines that weather conditions may prevent proper completion of any portions of the Works and Services, the Municipal Engineer may request additional testing to ensure compliance with industry standards. The Owner shall have no claim against the Municipality for additional testing.

1.19 Work to Fit With Others

All cutting, fitting or patching of the Works and Services shall be done to properly fit or receive existing structures and utilities. Existing works shall not be endangered by cutting, digging or any other operation and the work of others shall not be disturbed or altered except with the written consent of the Municipal Engineer.

1.20 Use of Completed Portions

The Municipality shall have the right to take possession of and use any completed or partially completed portion of the Works and Services, but such possession and use shall not be deemed an acceptance in accordance with Section 1.31. If such prior use increases the cost of uncompleted work or causes refinishing of completed work beyond normal wear and tear, the Owner shall be entitled to such compensation as the Municipal Engineer may determine.

1.21 Use of Fire Hydrants

Hydrants shall only be used in accordance with a Fire Hydrant Permit. Only municipal employees may operate a hydrant.

1.22 Testing of Water and Sewer Mains

Unless otherwise authorized by the Municipal Engineer, testing of all newly constructed water, sanitary or storm sewer mains shall be completed prior to connection to existing municipal mains.

Testing of mains and service connections to the property line shall be done after road base construction and before any asphalt paving.

1.23 Safety and Protection of Property, Trees and Works and Services

The Owner shall take all reasonable precautions to prevent injury to persons, to avoid damage to adjacent property and to avoid or minimize damage to completed and partly complete Works and Services.

If, in the opinion of the Municipal Engineer, a potential safety hazard or risk of property damage or, in the case of work on public land, significant inconvenience to the Municipality or the public may result from the Owner's work, the Municipal Engineer may require the Owner to undertake corrective action upon such notice as he or she deems appropriate. If the Municipal Engineer considers there is immediate danger or some other emergency situation, corrective action may be taken by the Municipality without notice being sent to the Owner, and all related expenses shall be charged to the Owner.

Any damage to municipal property resulting from the activities of the Owner or the Owner's workmen, agents or contractors shall be reinstated by the Municipality at the cost of the Owner

unless otherwise approved by the Municipal Engineer. Reinstatement includes the supply and installation of new materials where existing material is deemed unsuitable for re-use by the Municipal Engineer and any necessary retesting and disinfection.

The Owner shall be responsible for minimizing damage to all trees and vegetation to be retained. Until a Certificate of Acceptance is issued, the Owner shall be responsible for all claims and costs for tree damage including the cost of examination by an ISA Certified Arborist and repair, removal and replacement of trees, as required by the Arborist or the Owner's Landscape Architect. Damage shall be assessed based on the International Society of Arboriculture Guidelines.

1.24 Site Maintenance

The Owner shall at all times maintain the Development site and any other affected and adjacent lands free from accumulations of waste materials, debris and rubbish and not unreasonably encumber them with materials or equipment. Accumulations of waste materials which might constitute a fire hazard shall not be permitted.

The Owner shall keep roads, lanes and walks affected by the work clean and free of all materials and unlicensed equipment at all times. Debris and mud, which is tracked or otherwise deposited onto areas outside the construction site, and any spills, must be promptly cleaned up. Roadways shall be cleaned every day unless otherwise approved by the Municipal Engineer.

Dust preventatives shall be used on temporary haul roads when a dust nuisance is being created. Water may be used to control dust when a road is open to public access, when vehicular traffic is light and sediment control measures are in place.

Cuts in existing public roads shall be patched with hot mix asphalt at the end of each working day.

In accordance with the Erosion and Sediment Control Permit, clean up shall be a continuing process from the start of the work until the Certificate of Acceptance is issued. If dust, mud or other debris are not kept under control to the satisfaction of the Municipal Engineer, the Municipality shall take the necessary steps to undertake the work and all costs incurred shall be charged to the Owner.

1.25 Easement Releases

On completion of the Works and Services on private or Municipal property or Municipal rights-of-way, the Owner shall obtain from each property Owner affected, a formal release in writing and over the property Owner's signature, verifying that the clean-up has been performed and completed to the property Owner's acceptance and that the property Owner has no further claim upon the Owner or the Municipality as a result of such work. A Form of Release shall be required by the Municipal Engineer. All such releases shall be turned over by the Owner to the Municipal Engineer and shall be retained by the Municipal Engineer as a part of the Municipality's records.

1.26 Substantial Completion

On completion of the Works and Services, except for boulevard landscaping and work that must be adjusted after completion of paving, all portions shall be inspected by the Owner and the Owner's Engineer who shall certify that the Works and Services have been constructed and installed in accordance with the Bylaw and the Servicing Agreement. Works and Services not constructed in accordance with the Bylaw and the Accepted Drawings shall not be accepted. The Owner shall, at his/her own expense correct any fault, defect or damage from any cause whatsoever which may prejudicially affect the strength, durability or appearance of any section of the Works and Services.

All existing signs and posts, curbing, sidewalks, drainage ditches and culverts, shrubs, fences and other surface features that have been removed, damaged or disturbed by the construction process shall be restored or replaced by the Owner to a condition equivalent or better than that which existed before the work began.

The Owner shall ensure all new and affected downstream valve boxes, catchbasins, manholes, and sewers are cleaned and made free from all granular, asphaltic, silt and other debris immediately after the Works and Services have been completed.

After correction of any defects and deficiencies, the Owner's Engineer shall submit the releases referred to in Section 1.25 and all test results, video inspection tapes and reports and a copy of a certificate of inspection from the provincial electrical inspector that the street lighting system is approved. The Owner's Engineer shall then request an inspection by the Municipal Engineer.

If not satisfied with the submissions or that all defects and deficiencies have been corrected, the Municipal Engineer shall issue a defects and deficiencies list and may require that all or a portion of said section of the Works and Services be removed and subsequently reconstructed in accordance with the Bylaw and the Accepted Drawings. The Owner's Engineer must resubmit any additional test and video inspection results when corrections have been made.

When of the opinion that the requirements of this section have been satisfactorily completed, the Municipal Engineer shall issue a Certificate of Substantial Completion.

1.27 Maintenance Period for Works and Services Except Landscaping

The maintenance period shall commence on the date shown on the Certificate of Substantial Completion except that if the Municipal Engineer determines that any work completed or deficiencies or defects corrected after the issue of the Certificate of Substantial Completion is of major significance, the maintenance period for that work and any new materials supplied shall commence from the date the Municipal Engineer accepts such completion or remedial work.

The maintenance period shall be the one year period from the date of commencement or until, for Works and Services within a Subdivision, the Subdivision plan has been registered in the Land Title office, whichever is later.

The Owner shall guarantee the stability and sufficiency of the materials and workmanship supplied and the whole of the Work performed and shall be responsible for and shall make good all defects, imperfections, acts of vandalism and settlement damage regardless of cause which become apparent during the Maintenance Period.

The Owner shall ensure that the roads, sidewalks and walkways are kept clean and free of dirt and debris during the Maintenance Period and continue to maintain the Drainage, Erosion and Sediment Control Works.

Any remaining restoration and clean up on public land shall be completed not later than twenty working days following issuance of the Certificate of Substantial Completion otherwise the Municipality may complete the restoration and charge the cost to the Owner.

As soon as possible after completion, and in any case before the Certificate of Acceptance is issued, the Owner shall remove or otherwise dispose of all rubbish, surplus or discarded material, falsework, forms, temporary structures and all equipment and machinery, and shall leave the work, dedicated roads and parks and any land being conveyed to the Municipality in a clean and tidy condition.

Should the Owner fail to make good any defects, imperfections, vandalism acts, settlements or clean-up after being given at least seven (7) days notice in writing during the Maintenance Period, the Municipality shall be entitled to make alternative arrangements for the execution of the repairs and to recover the costs from the Owner. In case of immediate danger or emergency, Section 1.23 applies.

1.28 Record Drawings and Documents Submission

Within 60 days of the issuance of the Certificate of Substantial Completion, the Owner shall deliver Record Documents to the Municipal Engineer in accordance with Schedule B Section DR9.

Within three weeks of receiving the Municipal Engineer's comments on the Record Documents, the Owner's Engineer shall deliver the final corrected Documents in accordance with that Section.

1.29 Landscape Completion Certificate

Upon completion of landscaping in accordance with the conditions set out in MMCD 02933 Section 3.7, 02934 Section 3.9, 02938 Section 3.5 and 02950 Section 3.10 and completion of any required irrigation systems in accordance with Supplementary Specification 02960, the Owner shall notify the Municipality who shall have the Work inspected with the Landscape Architect and, if necessary, issue a list of deficiencies that must be corrected. Upon correction of the deficiencies, to the acceptance of the Municipality, a Landscape Completion Certificate shall be dated and issued

1.30 Maintenance Period for Landscaping

The Maintenance Period shall be the one year period from the date shown on the Landscape Completion Certificate.

During the Maintenance Period, the Owner shall replace any plant material that dies, is damaged or that fails to grow satisfactorily as determined by the Municipality and make good all defects, imperfections, acts of vandalism and settlement damage affecting the irrigation system regardless of cause. All replacements of plant material shall be with plant material of the same kind and size as the original plantings.

The warranty on replacement plant material or irrigation equipment shall extend for a period equal to the original warranty period.

Weed Control: Comply with minimum BC Landscape Standards for Maintenance Level 3, Moderate.

Should the Owner fail to make good any defects, imperfections, vandalism acts, settlements or clean-up after being given at least seven (7) days notice in writing during the maintenance period, the Municipality shall be entitled to make alternative arrangements for the execution of the repairs and to recover the costs from the Owner.

The Municipality may extend the Owner's warranty responsibilities for an additional year if in his opinion, at the end of the initial warranty period, leaf development, growth or overall vigour is not sufficient to ensure future survival.

1.31 Certificate of Acceptance for Works and Services Except Landscaping

A Certificate of Acceptance shall be issued by the Municipality upon expiration of the maintenance period provided all deficiencies and defects, except for normal wear and tear, have been remedied to the Municipal Engineers satisfaction and all requirements of Schedule C, Section 1.27 have been met.

The Owner shall continue to be fully responsible for the condition of Works and Services until such time that they are accepted by the Municipal Engineer.

1.32 Certificate of Acceptance for Landscaping

A Certificate of Acceptance shall be issued by the Municipality upon expiration of the maintenance period provided all deficiencies and defects, except for normal wear and tear, have been remedied to the Manager, Green Infrastructure Services satisfaction and all requirements of Schedule C, Section 1.30 have been met.

The Owner shall continue to be fully responsible for the condition of Works and Services until such time that they are accepted by the Manager, Green Infrastructure Services.

SECTION 2 - SPECIFICATIONS

2.1 Master Municipal Specifications And Standard Detail Drawings

The Specifications and Standard Detail Drawings of the 2009 (Platinum Edition) of the Master Municipal Construction Document (MMCD) are incorporated into Township of Langley Subdivision and Development Servicing Bylaw.

For Works to be Performed under Servicing Agreement

MMCD is written to form part of a contract between an Owner and a contractor, and the MMCD Specifications, either directly or by reference to the General Conditions, include references to the respective responsibilities of the Owner, the Contractor and the Contract Administrator. The applicability of MMCD in connection with this Bylaw is with respect to technical specifications and construction details only, and does not involve the Municipality in the contractual relationship that the Owner has with the contractor(s) hired by the Owner or that the Owner has with professional staff, consultants or other agents. Except as specified elsewhere in this Bylaw, the Municipality places full responsibility for design, construction, installation, inspection, testing and record keeping of Works and Services on the Developer (the Owner) who is required to hire the Owner's Engineer (the Contract Administrator) and the Landscape Architect to undertake duties in accordance with the Bylaw, and MMCD must be interpreted in this way.

MMCD Specifications and Standard Detail Drawings are supplemented by this Section. In case of inconsistency, the Bylaw and Schedules take precedence over MMCD.

This Section may be further supplemented by supplementary specifications and drawings submitted in connection with a specific project and accepted by the Municipal Engineer.

The Supplementary Specifications in this Schedule include some that apply to all Sections, as well as Supplementary Specifications that apply to individual sections of MMCD, which are integrated into MMCD using the same numbering system as in that document.

Following Supplementary Specifications will be applicable to all Sections

- Delete or replace as follows except where required otherwise in subsequent sections:
 - (a) delete references to General Conditions;
 - (b) delete references to "payment";
 - (c) replace "Contract Administrator" with "Owner's Engineer" except in MMCD Specification:
01 55 00;
31 11 41;
32 92 19;
32 92 20;
32 92 23; and,
32 93 01.
 - (d) replace "Contractor" with "Owner";
 - (e) replace "Owner" with "Municipality";
 - (f) replace "Contract Documents" with "this Bylaw and the Accepted Drawings";
 - (g) replace "Supplementary Specifications" with Schedule C of this Bylaw and supplementary specifications accepted for construction by the Municipal Engineer".

- Delete **Measurement and Payment** for all Sections
- Replace **Inspection and Testing** for all Sections with the following:

Testing must be carried out in accordance with the schedule provided to, and accepted by, the Municipal Engineer at the pre-construction meeting in accordance with Paragraph 3 of the General Construction Requirements or as otherwise required by the Municipal Engineer.

The source and material characteristics of granular products and asphalt must be approved as meeting the required specifications by an independent testing agency with CCiL certification prior to receipt of the materials on site.

Testing of the compaction of fill and asphalt and the strength of in-situ concrete must be undertaken by an independent agency, with CCiL certification, as required by the Owner's Engineer to prove conformance to respective Supplementary Specifications.

Testing carried out by the Owner's contractor must be undertaken in the presence of the Owner's Engineer who shall confirm the results.

All tests and reports shall be submitted to the Owner's Engineer for review and interpretation to determine if the Works and Services have been constructed in accordance with the Bylaw and the Accepted Drawings and he or she shall provide the reports to the Municipal Engineer.

2.2 Supplementary Specifications

Division 01 – General Requirements

MMCD Section 01 33 01S Project Record Documents

1.0 GENERAL

Add 1.0.2 Operation and maintenance (O&M) manuals shall be prepared by the Contractor for all projects containing mechanical, electrical or instrumentation materials and equipment, such as but not limited to pump stations, sewage force mains and siphons, district energy systems, flood boxes, control valves and gates, storm water detention and water quality facilities, reservoirs, pressure reducing stations, wells, flow meters and level meters.

O&M manuals shall address all related below-ground and building interior materials and equipment.

1.3 Submission Delete 1.3 and replace with the following: Submit and revise in accordance with Schedule B Section DR9.

1.7 Recording Actual Site Conditions Amend 1.7.2.1 After “appurtenances” insert: “...including exact location of wyes along sanitary sewers and storm drains and elevations of service connections at property lines.”

2.0 PRODUCTS

3.0 EXECUTION

MMCD Section 01 55 00S Traffic Control, Vehicle Access and Parking

1.0 GENERAL

Delete 1.0.5 and replace with the following: Unless alternative arrangements satisfactory to those adversely affected have been made by the Owner, pedestrian and vehicular access to affected properties shall be maintained at all times.

Add 1.0.6 The Contractor is responsible for all temporary traffic control within the project limits The Contractor will provide a Traffic Management Plan (TMP) to the Contract Administrator for approval (5) five working days prior to any work taking place. TMP is to be prepared and sealed by a Professional Engineer of British Columbia.

The TMP shall outline the approach to traffic management, show recognition and minimization of risks indicates signing locations, identify Traffic Control Persons (TCP) stations, show lane shifting and proposed closures.

1.4 Traffic Control Delete 1.4.5 and replace with the following: Do not close any lanes of road or Highway without approval of the Owner. Before re-routing traffic erect suitable signs and devices as approved by the Owner.

Delete 1.4.9.3 and replace with the following: Supply and erect sign, delineators, barricades and miscellaneous warning devices as specified in the Ministry of Transportation and Highways publication 'Traffic Control Manual for Work on Roadways'.

Add 1.4.9.3.1 The Contractor is required to supply Construction Zone information signs (stationary), refer to MMCD 01 58 01 for the required identification signage.

The Contractor is responsible for the removal of the signs at the completion of the work.

Add 1.4.10.8 Provide certification to the Contract Administrator for all traffic control persons upon request.

2.0 PRODUCTS

3.0 EXECUTION

MMCD Section 01 57 01S Environmental Protection

1.0 GENERAL

		Add 1.0.3	Submit an Erosion and Sediment Control Plan (ESC) to the Contract Administrator five (5) days prior to starting construction. No construction activities shall start until all ESC measures are in place.
1.2	Temporary Erosion and Sediment Controls	Delete 1.2.1 and replace with the following:	Properly drain all portions of the site. Protect the site and the watercourses to which it drains, directly or indirectly, against erosion and siltation in accordance with an ESC Plan. The Contractor is responsible for all damage that may be caused by water backing up or flowing over, through, from or along any part of the work or otherwise resulting from his operations. Keep existing culverts, drains, ditches and watercourses affected by the work clear of excavated material at all times. When it is necessary to remove or alter an existing drainage structure, provide suitable alternative measures for handling the drainage. Sweep streets, and clean catch basins, manhole sumps, detention tanks, and maintain siltation controls as often as the Contract Administrator deems necessary, or at the request of the <i>Municipality</i>. Follow all Federal and Provincial regulations and guidelines respecting protection of fish, fish habitat, and watercourses. The Contractor's environmental monitor is responsible for monitoring ongoing compliance with this section.
1.3		Delete 1.3 and replace with the following:	"1.3 Duty to Control Noxious Weeds"

		Add 1.3.1	Immediately control and enclose area containing designated weeds as per the current BC Weed Control Act.
		Add 1.3.2	Immediately notify Contract Administrator of the discovery of any designated noxious weeds.
		Add 1.3.3	Ensure that no equipment is working within 3 metres of the area containing designated noxious weeds.
1.4.3	Pollution Control	Add 1.4.3.5	Immediately contain and clean up any leaks and spills of prohibited materials at the <i>Place of Work</i> .
		Add 1.4.3.6	Ensure that a well-stocked spill kit is on-site at all times and that the Contractor's employees are familiar with appropriate spill response techniques.
		Add 1.4.3.7	Immediately notify the Contract Administrator and the Owner of any leaks or spills of prohibited materials that occur at the <i>Place of Work</i> .
		Add 1.4.3.8	Ensure that any fuel stored on-site is located at least 30 metres from the nearest watercourse, and is placed within a bermed and lined area, in order to prevent leaks or spills into the environment.
		Add 1.4.3.9	Ensure that no equipment fueling or servicing is conducted within 30 metres of a watercourse.
1.9	Archaeological / Historical Resources	Add 1.9	Immediately cease work and inform the Contract Administrator, if any archaeological or historical resources are encountered during construction. Leave these resources in place and do not disturb them in any way.
2.0	PRODUCTS		
3.0	EXECUTION		

MMCD Section 01 58 01S Project Identification

1.0 GENERAL

1.2	Temporary Project Signage	Delete 1.2.1.1 and replace with the following:	Provide and erect, after the pre-construction meeting and prior to commencing work on the site, a project information sign in a location approved by the Owner.
		Append to 1.2.1.3	Show on development sign: name and phone numbers of Owner, Contract Administrator and Contractor in minimum 63 mm high Helvetica Medium lettering with 25 mm spacing, site plan occupying approximately half of the area of the sign, showing the Development site in bold outline in relation to the surrounding area.
		Add 1.2.6	Contractor to provide and erect signage for "Permitted Construction Activity Hours". Template of sign will be provided at time of Highway Use Permit issuance.

2.0 PRODUCTS

3.0 EXECUTION

Division 03 – Concrete

MMCD Section 03 30 20S Concrete Walks, Curbs and Gutters

1.0 GENERAL

1.4	Measurement and Payment	Delete 1.4.8 and replace with the following:	Payment for adjustment of existing catchbasins, inspection chambers, valve boxes and other utility covers required for installation of curb & gutter and walks will be made by lump sum. Adjustment for manholes will be paid separately based on type of adjustment made.

2.0 PRODUCTS

3.0 EXECUTION

3.9	Expansion Joints	Delete 3.9.4 and replace with the following:	Do not use bond break compounds in lieu of expansion joint between back of curb and sidewalk.
3.19	Adjustment of Existing Utility Covers	Add 3.19.1	Steel riser rings for manholes are not accepted. Manholes are to be adjusted by removing frame and cover.
		Add 3.19.2	Certain utility companies may require that their forces adjust their utilities. The Contractor shall be responsible to contact and coordinate with these utility companies. No additional compensation shall be given to the Contractor for this coordination.

MMCD Section 03 30 53S Cast-In-Place Concrete

1.0 GENERAL

2.0 PRODUCTS

3.0 EXECUTION

3.2	Formwork	Add 3.2.4	Formwork for greenway trails and in parks shall be inspected by the Manager of Green Infrastructure Services prior to pouring concrete. A minimum of 72 hours' notice shall be given prior to required inspection.

Division 26 – Electrical

MMCD Section 26 56 01S Roadway Lighting

1.0 GENERAL

1.3	Shop Drawings	Append to 1.3.4	... registered in British Columbia.
1.5	Contractor Qualifications	Add 1.5.3	All on-site traffic signal installations shall be under the responsibility of a primary journeyman electrician with IMSA Level 1 Roadway Lighting Certification and have a minimum of three (3) years' experience maintaining and installing street lighting systems. This primary journeyman electrician is expected to be on the work site and report work progress to the Contract Administrator.

2.0 PRODUCTS

2.1	General	Delete 2.1.2 and replace with the following:	All products supplied to be new, in accordance with <i>Contract Documents</i> . All products are to meet Canadian Electrical Code requirements and be certified by either CSA, UL®, or Intertek Testing Systems (Warnock Hersey) and be supplied with the certifier's label.
		Delete 2.1.3 and replace with the following:	All products shall be in accordance with the Township of Langley's "List of Approved Materials and Products". Any products not listed with in the Approved List shall default to the current BCMOTI specification.

		Delete 2.1.5 and replace with the following:	Equipment models listed within the Township of Langley's List of Approved Materials and Products shall be confirmed with the Township immediately prior to their order to ensure that they are current. Cut-sheets, equipment make, model and serial number list to be provided to the Township by the <i>Contractor</i> .
2.6	Concrete Bases	Add 2.6.2	Maximum of four (4) conduits shall enter the base of a luminaire pole; however, more than four (4) may enter a service base.
2.8	Conductors and Cables	Add 2.8.5	.1 Minimum conductor size to be as follows, unless specified otherwise on Contract Drawings: .1 No 6 AWG for feeder conductors in conduit. .2 No 8 AWG for bond conductors in conduit. .3 No 12 AWG for luminaire conductors in poles.
2.13	Receptacles	Add 2.13.3	Receptacles shall have a spring loaded cast "in use" aluminum covers.
2.14	Luminaires	Add 2.14.6	Refer to the Township of Langley's List of Approved Materials and Products.
2.19	Service Panels	Add 2.19.1	Type 40A 120/240V, 60A 120/240V roadway lighting and 100A 120/240V combination roadway lighting / traffic signal, per Contract Drawings to include items listed within the 2009 MMCD Section 34 41 13 - Traffic Signals - 2.11.2
2.20	Wire Anti-Theft Devices	Add 2.20.1	Handhole access shall utilize "Wire Sentry" type device or equivalent.
3.0	EXECUTION		
3.3	Concrete Bases	Add 3.3.7	Contrary to Standard Detail Drawing E7.3, the position of the 53mm RPVC conduit for service and 35mm RPVC conduit for street lighting shall be reversed.

3.5	Underground Conduit	Delete 3.5.5 and replace with the following:	Empty conduits shall have a No. 8 HB Yellow/Green Mk pull string and capped at both ends.
		Add 3.5.6	Conduits shall be blown out with compressed air, from both ends if necessary, then swabbed out to remove stones, dirt, water and other material which may have entered during installation.
		Add 3.5.7	Conduit depth of bury to be recorded when a trenchless technology method is used.
		Add 3.5.8	Conduit shall not be bent in the field. Only factory bends will be accepted.
3.8	Wiring	Delete 3.8.3 and replace with the following:	Make conductor splices in handholes. See Standard Detail Drawing E7.11 for splice details.
		Delete 3.8.6 and replace with the following:	Wire each luminaire and receptacle separately from the base of pole.
		Delete 3.8.7 and replace with the following:	Neatly arrange and bundle wiring in junction boxes, pole handholes and service panels. Conductor connections in all access points to be installed in the upright position, allowing for easy access
		Delete 3.8.11 and replace with the following:	Bond all luminaires and receptacles with No. 12 RW90 green conductor, and steel junction box lids with No. 8 RW90 green conductor.
3.10	Luminaires and Photocells	Add 3.10.4	NEMA wattage label shall be visible at the bottom of the luminaire on all fixtures.
3.11	Grounding and Bonding	Add 3.11.5	Remove all paint around bonding studs on inside of pole to expose the galvanized or metal surface prior to bonding equipment.
3.13	Pole Finish Application	Delete 3.13 and replace with the following:	.1 Prior to producing a powder finish product the supplier must provide a Certificate of Compliance indicating that they have met or exceeded the following specifications. The supplier will name their independent testing agency and this information will be submitted to the Municipality.

- .2 The application process will be as follows:
 - .1 The pole or product will be hot dip galvanized.
 - .2 Powder will only be applied after the product is completely fabricated. No welding or bending will take place after the powder is applied.
 - .3 The pole or product will be thoroughly cleaned by brush blasting in accordance with SSPC-SP7. The brush blast will maintain a minimum profile of 0.5 mils. If brush blasting is done off site then the product will be covered and shielded from any dirt or moisture during its return to the powder applicator's facility. Where poles or products are not kept clean and dry or have any signs of flash rust they will be returned for further brush blasting.
 - .4 Once at the applicator's facility the pole or product will be thoroughly cleaned and dried with an air gun. All hand marks or grease spots will be cleaned with a mild solvent.
 - .5 After brush blasting, the entire pole or product will be pre-baked in an oven at 220 degrees C for at least 30 minutes to 1 hour, depending on steel thickness. The pre-baking must be done to prevent out-gassing during the curing cycle.
 - .6 The base powder coat will then be applied electrostatically while the pole or product is cooling from the 220 degrees C pre-bake period to allow the powder to melt and fuse to the surface. The base coat will be a minimum of 3 mils in thickness.
 - .7 After base coat is applied and set the topcoat will be applied to a thickness of 3 to 5 mils. The pole or product will be returned to the oven and heated to 190 to 220 degrees C (temperature will not

exceed pre-bake) for a minimum of 25 minutes, depending on steel thickness. Thicker product material may require longer bake cycles to fully cure. Upon removal of the pole or product from the oven it will be left to rest until the pole or product is cool enough to touch.

- .8 Once the topcoat has cured and the poles or product cooled, they will then be individually wrapped (min. 4" overlapping method) with 1/8" foam wrap over the entire pole or product. The poles or product will be bundled together and separated with suitable wood dunnage to avoid contact between the poles, products or other bundles. All bundles themselves will be fully wrapped with foam and with stretch-wrap as noted above. The poles or products will be handled and shipped with great care to prevent damage; damaged product will be cause for rejection of the item(s).

.3 Testing process will be as follows:

- .1 Each run of product in an oven will have at least one sample tested for:
 - .1 Adhesion – The finished powder surface will have minimum pull-off strength exceeding 1000 PSI as tested in accordance with ASTM D4541.
 - .2 Quality – The finished powder surface will be free from any holidays (skips or misses) as tested in accordance with ASTM D4541. The product will also be free from wrinkles, orange peel, cracking, pinholes, fish eyes, blisters, etc. by visual inspection.
 - .3 Colour – The colour will be verified to be within 3 DE of specialized colour.
 - .4 An independent testing firm who are qualified to test powder finish will do the testing at the supplier's expense.

The result of tests must accompany the Certificate of Compliance and will be made available to the Township or their representative upon request. A supplier who fails to test product as noted above will have their product rejected until the testing is completed and the product deemed acceptable by the testing agency.

- .5 Where the tested product fails on a given production run then a minimum of 30 % of the entire production run will be tested. If no other failures are found then the individual failed product will be stripped, reapplied and re-tested until it passes. If any of the 30% of product tested fails then the entire order will be stripped, reapplied and retested until it passes.
- .4 Field repairs will be undertaken as required to fix any scratches or imperfections in the final finish. Field repairs will be done as follows:
 - .1 Feather the damaged area with sandpaper.
 - .2 Clean area with solvent.
 - .3 Let dry.
 - .4 Neatly brush on an application of Aliphatic Urethane Acrylic Semi-Gloss High Build applied at 2-4 mils DFT over the entire sanded and damaged area. The ambient conditions will be dry and over 10 degrees C when the paint is applied.
 - .5 The pole supplier will warranty the integrity of the surface for a minimum of 1 year from the date of installation. The warranty will include all labour and materials required to provide replacement product if required. The powder finish will be the responsibility of the pole supplier. The warranty will apply to fading, blistering, cracking or chipping of the surface.

Division 31 – Earthworks

MMCD Section 31 11 01S Clearing and Grubbing and Mass Excavation

1.0 GENERAL

Delete 1.0.1 and replace with the following:

Section 31 11 01S refers to those sections of the work that are unique to clearing, grubbing and Mass Excavation. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.2 Definitions

Add 1.2.5

Mass Excavation consists of removal and disposal offsite of all above ground and underground structures including pipes, asphalt (regardless of thickness including layered sections), concrete, reinforced concrete.

1.4 Measurement and Payment

1.4.3

Payment for Mass Excavation will be made in Lump Sum.

Clearing and Grubbing in MMCD Section 31 11 01 will be included in this payment. This price shall also include rough grading, loading, shaping, hauling and disposal of material, pavement removal, concrete curb and gutter cutting and removal, median concrete curb cutting and removal, concrete surface cutting and removal, removal of signs, sod cutting and storage or removal. This payment covers all mass excavation carried out under roadways, sidewalks, curbs, driveways, drainage, water and sanitary works, street lights, traffic lights and structural works of the Contract.

2.0 PRODUCTS

3.0 EXECUTION

MMCD Section 31 11 41S Shrub and Tree Preservation

1.0 GENERAL

2.0 PRODUCTS

2.1	Materials	Add 2.1.10	Protective Fencing: Posts - Pressure treated wood 100 mm dia.; Post to be 1.8 metres to 2.0 metres in height at 2.0 metres O.C. Snow fence as per Approved Products List;
		Add 2.1.11	Flagging Tape – 100 millimeter Orange glow - 'Tree Retention Area'.

3.0 EXECUTION

3.1	Existing Trees	Delete 3.1.1 and replace as follows:	Inspect with Contract Administrator and clearly identify on site all shrubs and trees that are to be preserved. Place protective fencing / barricades, prior to commencement of construction, as detailed on the Tree Protection Plan, and maintain fence in good condition during construction.
		Add 3.1.7	The Contractor is responsible for damage to trees which are to remain.
		Add 3.1.8	The Contractor will be responsible for all claims and costs including the cost of examination by an Arborist, repair, removal and replacement of trees, as required by the Arborist and the Contract Administrator for tree damage where proper notification was not received from the Contractor. Damage will be assessed based on the International Society of Arboriculture Guidelines. The term shall be for a period of one year following the date of Total Performance of the <i>Work</i>.

		Add 3.1.9	When work is to be performed inside fenced areas, the Contractor shall take care to avoid damage to existing vegetation. Work to be done inside areas of existing vegetation to be retained includes: .1 Removal of isolated trees as directed by the Landscape Architect. .2 Selective pruning and tree removal at edges to create tidy and well-shaped forest edge. .3 Placing planting soil and planting of trees.
		Add 3.1.10	Do not park, service or fuel vehicles within the vegetation retention areas.
3.2	Raising Grade Around	Delete 3.2	
3.3	Lowering Grade Around Existing Trees	Delete 3.3.2 and replace with the following:	Landscape architect or certified arborist to supervise work if excavation through roots is required. Excavate by hand and cut roots with sharp ax, tree lopper or saw. Landscape Architect or Certified Arborist to advise if additional or alternate measures are required.
3.4	Pruning	Delete 3.4.1 and replace with the following: Add 3.4.2	Prune as directed by Landscape Architect or Certified Arborist. Do not cut roots or branches of retained trees without approval of an ISA Certified Arborist or the Landscape Architect.
3.5	Clean-Up	Add 3.5.3	Remove by hand, not machine, invasive weed species including blackberry and ivy, and remove litter.

MMCD Section 31 23 01S Excavating, Trenching and Backfilling

1.0 GENERAL

1.7	Disposal	Add 1.7.2	Surplus spoil from excavations may only be placed on Lands within the Township where the property owner is in possession of a valid soil deposit permit issued by Township staff as per the current Township of Langley Soil Deposit and Removal Bylaw and the current Township of Langley Soil Deposit & Removal Policy.
1.8	Limitations of Open Trench	Delete 1.8.1 and replace with the following:	Excavate trenches only as far in advance of pipe laying operation as safety, traffic, and weather conditions permit and, in no case, to exceed 30 metres. Before stopping work each day completely backfill and pave every trench on or adjacent to roadways. All other trenches to be completely backfilled before stopping work on last day of work before each weekend or holiday.

2.0 PRODUCTS

3.0 EXECUTION

MMCD Section 31 24 13S Roadway Excavation, Embankment and Compaction

1.0 GENERAL

2.0 PRODUCTS

2.2	Specified Materials	Delete 2.2.1 and replace as follows:	Backfill for embankment fill (subgrade fill) to be approved native, imported granular material or pit run gravel.

3.0 EXECUTION

Division 32 – Road and Site Improvements

MMCD Section 32 11 16.1S Granular Sub-base

1.0 GENERAL

2.0 PRODUCTS

2.1	Specified Materials	Delete 2.1.1 and replace with the following:	Material for road sub-base to be: .1 Crushed granular sub-base. .2 Select granular sub-base.

3.0 EXECUTION

MMCD Section 32 12 16S Hot Mix Asphalt Concrete Paving

1.0 GENERAL

1.6	Inspection and Sting	Add 1.6.3	The frequency of Marshall tests shall be one test for each asphalt type, minimum one per day per site / location.
		Add 1.6.4	For road paving, core locations will be selected for each pass of the paving machine as follows: .1 Across width, core locations will be staggered on each side of the road centerline. .2 Along length, core locations should be spaced evenly every 50 metres, with a minimum of 3 core samples required for lengths shorter than 150 metres.
		Add 1.6.5	For other paving operations, a minimum of one core for every 500 square metres of asphalt mix placed. For areas less than 1500 square metres, a minimum of 3 cores will be required.
		Add 1.6.6	Core holes to be reinstated with hot mix asphalt.

2.0 PRODUCTS

3.0 EXECUTION

3.7	Joints	Delete 3.7.5 and replace with the following:	Construct butt joints at locations as shown on the Contract Drawings and as directed in the field by the Contract Administrator.
3.9	Sidewalks, Driveways and Curbs	Add 3.9.6	Hand tamp a 45 degree bevel on edges of trails for a smooth durable finish.

MMCD Section 32 17 23S Painted Pavement Markings

1.0 GENERAL

2.0 PRODUCTS

3.0 EXECUTION

3.3	Application	Delete 3.3.2.3 and replace with the following:	Paint shall be applied at a rate of not less than 28.25 litres per kilometre per 100 mm width line, thinner not included.
		Delete 3.3.2.8 and replace with the following:	Glass beads shall be applied at a minimum rate of 17 kg beads per kilometre for 100 mm wide single solid line.

MMCD Section 32 31 13S Chain Link Fences and Gates

1.0 GENERAL

2.0 PRODUCTS

2.1	Materials	Delete 2.1.1 and replace with the following:	Fencing, posts, rails, and fabric shall be constructed as indicated on the Contract Drawings and Specifications herein.

Delete 2.1.3 and replace with the following:	Chain-link fence fabric as per Township of Langley Standard Drawing – TLP 07
Delete 2.1.4.1 and replace with the following:	All post and rail sizes as per Township of Langley Standard Drawing – TLP 07
Delete 2.1.4.2	
Delete 2.1.4.3	
Delete 2.1.4.4	
Delete 2.1.5	
Delete 2.1.6 and replace with the following:	Tie wire fasteners as per Township of Langley Standard Drawing – TLP 07
Delete 2.1.7 and replace with the following:	Tension bar as per Township of Langley Standard Drawing – TLP 07
Delete 2.1.8 and replace with the following:	Tension bar bands as per Township of Langley Standard Drawing – TLP 07
Delete 2.1.12	
Delete 2.2.1.1	
Add 2.1.13	Connections: Fence connections to be welded construction and radius-cut.

3.0 EXECUTION

3.2 Installation of Fence	Delete 3.2.2 and replace with the following:	Excavate post holes to dimension shown on Township of Langley Standard Drawing – TLP 07

		Delete 3.2.8 and replace with the following:	Place concrete in post holes then embed posts into concrete to depths shown on Township of Langley Standard Drawing – TLP 07. Extend concrete 40mm above ground level and slope to drain away from posts. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
		Delete 3.2.12 and replace with the following:	Weld top rail and bottom rail between posts and terminal posts. Spot weld overhanging waterproof dome caps to terminal and corner post tops.
		Delete 3.2.15 and replace with the following:	Secure fence fabric to top rails, line posts, and bottom rails as detailed on Township of Langley Standard Drawing – TLP 07. Give tie wires minimum two (2) twists.
		Delete 3.2.16	
		Add 3.2.17	Install asphalt apron (mow strip) under all fencing located in grass areas in accordance to the Township of Langley Standard Drawing – TLP 07.
3.3	Touch Ups	Add 3.3.1	Clean all welded and damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to cleaned surfaces. Pre-heat damaged surfaces according to manufacturer's instructions for zinc-rich paint.
3.4	Cleaning	Add 3.4.1	Clean and trim areas disturbed by operations. Dispose of surplus material as specified in Contract Documents.

MMCD Section 32 91 21S Topsoil and Finish Grading

1.0 GENERAL

1.1	Related Work	Add 1.1.6	Shrubs & Tree Preservation - Section 31 11 41S

2.0 PRODUCTS

2.10	Growing Medium	Delete 2.10.2 and replace with the following:	Growing medium shall be screened, weed free, composted soil mixed according to BC Landscape Standards for the intended use and confirmed with a soil analysis report.

3.0 EXECUTION

3.4	Placing Growing Medium	Delete Table 3 and replace with the following:	<table border="0"><tr><td>Lawn</td><td>150 mm</td></tr><tr><td>Ground Cover</td><td>300 mm</td></tr><tr><td>Shrubs</td><td>450 mm</td></tr><tr><td>Trees</td><td>10 m3</td></tr></table>	Lawn	150 mm	Ground Cover	300 mm	Shrubs	450 mm	Trees	10 m3
Lawn	150 mm										
Ground Cover	300 mm										
Shrubs	450 mm										
Trees	10 m3										
		Add 3.4.6	Scarify soil, feather grades and remove noxious weeds from the edge of tree preservation areas.								
3.7	Acceptance	Delete 3.7.1 and replace with the following:	The Contractor will test growing medium in place by means of independent laboratory analysis to confirm conformance to specifications. All test results to be submitted to the Contract Administrator.								
		Add 3.7.2	All soil depths to be inspected by the Owner for approval.								

MMCD Section 32 92 19S Hydraulic Seeding

1.0 GENERAL

1.1	Related Work	Add 1.1.6	Irrigation - Section 32 93 02S
		Add 1.1.7	Landscaping Establishment Maintenance – Section 32 93 03S

2.0 PRODUCTS

2.1	Grass Seed	Delete 2.1.2 and replace with the following:	Seed mixtures to be approved by Contract Administrator in the original packaging. The seed mixture shall be made up from a minimum of three (3) varieties of Perennial Rye, two (2) varieties of Kentucky Blue Grass and three (3) varieties of Fescue from the following approved varieties: <u>60% Perennial Rye Grass:</u> Elka; Saturn; Barclay; Omega II <u>25% Chewing Fescue:</u> Cindy; Enjoy; Koket <u>15% Kentucky Blue Grass:</u> Shamrock; Geronimo, Merit

3.0 EXECUTION

3.2	Seeding- General	Append to 3.2.2	For hydraulically seeded grass lawn, proportions of seed and fertilizer shall be to the supplier's specifications or as follows, per ha: Turf Seed 225 kg Mulch 225 kg Tackifier 70 kg Fertilizer (19-19-19) 225 kg Water 10,000 l
3.8	Grass Maintenance	Delete 3.8 and replace with the following:	As per section 32 93 03S Landscaping Establishment Maintenance.
3.9	Conditions for Total Performance	Delete 3.9	
3.10	Guarantee / Maintenance	Delete 3.10 and replace with the following:	As per section 32 93 03S Landscaping Establishment Maintenance.

MMCD Section 32 92 20S Seeding

1.0 GENERAL

1.1	Related Work	Add 1.1.6	Irrigation Section 32 93 02S
		Add 1.1.7	Landscaping Establishment Maintenance – Section 32 93 03S

2.0 PRODUCTS

2.1	Grass Seed	Delete 2.1.2 and replace with the following:	Seed mixtures to be approved by Contract Administrator in the original packaging. The seed mixture for boulevard and landscaped areas shall be made up from a minimum of three varieties of Perennial Rye, two varieties of Kentucky Blue Grass and three varieties of Fescue from the following approved varieties: <u>60% Perennial Rye Grass:</u> Elka; Saturn; Barclay; Omega II <u>25% Chewing Fescue:</u> Cindy; Enjoy; Koket <u>15% Kentucky Blue Grass:</u> Shamrock; Geronimo; Merit.

3.0 EXECUTION

3.2	Seeding - General	Delete 3.2.3 and replace with the following:	Seeding operations shall be carried out in the following calendar seasons; .1 Spring (April 1st to June 15th) .2 Fall (August 15th to September 30th) .3 Seeding shall not take place during periods of rain, freezing and/or abnormally hot and dry weather.
		Delete 3.2.2 and replace with the following:	Rates of application of seed and fertilizer shall be to the supplier's specifications or as follows, per ha: Turf Seed 225 kg. Fertilizer (19-19-19) 225 kg.
3.6	Grass Maintenance	Delete 3.6 and Replace with the	As per section 32 93 03S Landscaping Establishment Maintenance.

		following:	
3.7	Conditions for Total Performance	Delete 3.7	
3.8	Guarantee / Maintenance	Delete 3.8 and Replace with the following:	As per section 32 93 03S Landscaping Establishment Maintenance.

MMCD Section 32 92 23S Sodding

1.0 GENERAL

1.1	Related Work	Add 1.1.6	Irrigation – Section 32 93 02S
		Add 1.1.7	Landscaping Establishment Maintenance – Section 32 93 03S

2.0 PRODUCTS

3.0 EXECUTION

3.1	Finish Grade Preparation	Add 3.1.6	Ensure finish grading within 15 mm of design elevation but not uniformly high or low.
		Add 3.1.7	Ensure finished grade does not have irregularities exceeding 25 mm when checked with a 3m straight edge placed in any direction.
3.2	Sodding	Delete 3.2.5 and replace with the following:	Lay sod smooth and flush with adjoining grass areas and paving and top surface of curbs unless shown otherwise on the Contract Drawings or as accepted by the Owner. Ensure there is a full roll width between the new sod and adjoining surfaces. Small cut pieces from a full roll shall not be accepted.
		Add 3.2.13	Do not allow the sod to dry out so that the joints become visible.
3.4	Grass Maintenance	Delete 3.4 and Replace with the following:	As per section 32 93 03S Landscaping Establishment Maintenance.

3.5	Condition for Total Performance	Delete 3.5	
3.6	Guarantee / Maintenance	Delete 3.6 and Replace with the following:	As per section 32 93 03S Landscaping Establishment Maintenance.

MMCD Section 32 93 01S Planting of Trees, Shrubs and Ground Covers

1.0 GENERAL

		Delete 1.0.1 and replace with the following:	Section 32 93 01 refers to those portions of the Work that are unique to the sourcing, supplying, placing and maintaining of the plant material indicated on the Contract Drawings and the Plant List(s). This section must be referenced to and interpreted simultaneously with all other sections pertinent to the Work described herein.
1.1	Related Work	Add 1.1.6	Shrubs & Tree Preservation Section 31 11 41S
		Add 1.1.7	Irrigation Section 32 93 02S
		Add 1.1.8	Landscaping Establishment Maintenance Section 32 93 03S

2.0 PRODUCTS

2.4	Mulch	Amend 2.4.1	Add “composted” after “bark mulch to be...”
2.5	Stakes	Delete 2.5.1 and replace with the following:	Stakes as per Township of Langley Standard Drawing – TLP 25.

3.0 EXECUTION

3.3	Planting	Delete 3.3.3 and Replace with the following:	Location of Planting: Plant trees as shown on the Contract Drawings and according to the Township of Langley Standard Drawing TLP 24 – Tree Planting Notes, unless approved by the Contract Administrator. Tree numbers, spacing and locations will vary according to site conditions and amenities. Stake locations as shown on Contract Drawings and according to the Township of Langley Standard Drawing TLP 24 – Tree Planting Notes and verify with the Contract Administrator prior to planting. If underground obstructions are uncovered, report to the Contract Administrator for resolution.
3.9	Maintenance	Delete 3.9 and Replace with the following:	As per section 32 93 03S Landscaping Establishment Maintenance.
3.10	Conditions for Total Performance	Delete 3.10	
3.11	Guarantee / Maintenance	Delete 3.11 and Replace with the following:	As per section 32 93 03S Landscaping Establishment Maintenance.

3.12	Conditions for Substantial Landscape Performance	Add 3.12.1	The Contract Administrator shall issue a Certificate of Landscape Substantial Completion only when the following conditions exist: .1 Growing Medium quality, fertility levels, depths and surface conditions are as specified. .2 All plants of species and varieties specified and planted in locations shown on Contract Drawings. .3 All plants are healthy and turgid. .4 Water content in growing medium is to the satisfaction of the Contract Administrator. .5 All trees are staked as specified. .6 All pruning is complete to the satisfaction of the Contract Administrator. .7 All planted areas are free of weeds .8 Mulch is in place as required. .9 Specified un-mulched areas are cultivated to leave a loose, friable, water- permeable surface. .10 Specified maintenance procedures have commenced.
3.13	Conditions for Total Landscape Performance	Add 3.13.1	As per section 32 93 03S Landscaping Establishment Maintenance.

MMCD Section 32 93 02S Irrigation

1.0 GENERAL

.1 Section 32 94 01SS refers to those portions of *Work* that are unique to the supply and installation of sleeves, mainlines, lateral lines, electronic control valves, sprinklers, controllers, and all related items necessary to provide a properly operating automatic irrigation system to cover all the applicable landscapes. This Section must be referenced to and interpreted simultaneously with all other sections pertinent to the *Work* described herein.

.2 All details not specifically covered in this Section shall comply with the respective AWWA standards, the BC Building Code (current edition) Part 7 - Plumbing Services and/or manuals of practice as specified in these *Contract Documents*.

1.2	Related Work	.1	Concrete Reinforcement – Section 03 20 01
		.2	Cast-in-Place Concrete – Section 03 30 53
		.3	Aggregates and Granular Materials – Section 31 05 17
		.4	Excavating, Trenching and Backfilling – Section 31 23 01
		.5	Topsoil and Finish Grading – Section 32 91 21
		.6	Seeding – Section 32 92 20
		.7	Sodding – Section 32 92 23
		.8	Planting of Trees, Shrubs and Ground Covers – Section 32 93 01
		.9	Manholes and Catch Basins – Section 33 44 01

1.3	Reference	.1	The Standards for Landscape Irrigation Systems (current edition) shall be the minimum standard for construction except for the modifications and/or additions specified in this section.
		.2	ASTM D1248 – High Density Polyethylene (HDPE) Pipe.
		.3	ASTM D2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
		.4	ASTM D2564 - Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
		.5	BC Building Code (current edition) Part 7 - Plumbing Services.
		.6	B.C.W.W.A Cross Connection Control Manual.
1.4	Qualifications	.1	The Contractor shall be a member in good standing of the Irrigation Industry Association of British Columbia (IIABC) or the Irrigation Association.
		.2	The Contractor shall employ personnel familiar with proper irrigation procedures, under the supervision of a qualified foreman.
		.3	The double check valve assembly and meter shall be installed and tested by a mechanical Contractor licensed to perform the work in British Columbia.
		.4	The Contractor shall be certified in Low-Voltage Electrical Wiring as certified by the British Columbia Institute of Technology or approved equivalent.
		.5	The Contractor shall be certified in Plastic Pipe Fusion by the British Columbia Institute of Technology or an approved equivalent.

2.0 PRODUCTS

2.1	Material Certification	.1	Products having CSA certification to be used where available. Otherwise, certification by a third party accredited by the Standards Council of Canada that products conform to CSA standards is acceptable in lieu of CSA certification.
2.2	Substitutions	.1	Substitutions shall only be permitted with an item of equal or better quality and performance than originally specified and only with the written approval of the Owner. Substitute sprinkler heads shall be considered only when the performance by delivery, pressure, diameter and spacing are all equal to the product originally specified.
2.3	Back-flow Preventer	.1	Double check back-flow preventer valves shall be to CSA B64.5. The back-flow preventer must have brass ball valves on either side for isolation and testing. All exposed pipe and fittings shall be brass. Installation shall be as shown on supplementary drawings.
2.4	Pipe	.1	Pipe shall be PVC 1120 or 1220, Class 200, Class 160 or as indicated on the drawings.
		.2	Pipe shall bear no evidence of interior or exterior extrusion marks and pipe walls shall be uniform, smooth and glossy. Pipe may be pre-belled or with individual, solvent-weld couplings and must conform to ASTM 2241, SC 25663 and SCA B-137-3 specifications.
2.5	Plastic Pipe Fittings and Nipples	.1	Plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip joint ring tight seal, thermo-fusion or screwed.
		.2	Nipples and fittings shall be schedule 40 PVC unless otherwise designated on the standard detail drawings.

2.6	PVC Solvent Connections	.1	Solvent and primers shall be in accordance with manufacturer's specifications for type of pipe used.
2.7	Brass Pipe and Fittings	.1	Brass pipe and fittings shall be schedule 40.
2.8	Isolation Valves	.1	As per Schedule D – Landscape Approved Product List.
2.9	Control Valves	.1	As per Schedule D – Landscape Approved Product List.
2.10	Quick Coupling Valves	.1	As per Schedule D – Landscape Approved Product List.
2.11	Valve Boxes	.1	As per Schedule D – Landscape Approved Product List.
		.2	Quick connect valves and manual gate valves shall be installed in #1419 style valve boxes.
		.3	Mainline supply shutoff valves and winterization valves shall be installed in #1730 style valve boxes.
		.4	Valve boxes to be all from one manufacturer.
2.12	Sprinkler Risers	.1	All motor pop-up sprinklers shall have an adjustable riser assembly (triple swing joint riser) assembled by the use of at least three (3) standard 90 degree street elbows as recommended by the sprinkler manufacturer and/or as shown on the standard detail drawings.
		.2	All sprinkler heads to be installed on Schedule 80 PVC nipples and with 2 PVC street elbows connection nipple to lateral line. Use of Marlex street elbows is not acceptable.
		.3	Other nipples of the swing joint riser shall be the size and length required for proper installation of the sprinkler head, drain valve and/or automatic control valve.

2.13	Swing Joints	.1	As per Schedule D – Landscape Approved Product List
2.14	Sprinkler Heads	.1	Sprinkler head shall be of the types and sizes with the diameter of radius of throw, pressure and discharge. All heads of a particular type and for a particular function in the system shall be of the same make and model with identifying markings in such a position that they can be identified without being removed from the system.
2.15	Automatic Controller	.1	As per Schedule D – Landscape Approved Product List
		.2	Automatic controllers located outside shall be encased in a sturdy, lockable, weatherproof aluminum mounting box.
2.16	Wiring	.1	Wiring to be used for connecting the automatic controllers shall be solid copper conductor installed in accordance with BC Electrical Code.
2.17	Moisture / Rain Sensor	.1	As per Schedule D – Landscape Approved Product List.
3.0	EXECUTION		
3.1	General	.1	Location and installation shall be in accordance with the Contract Drawings.
3.2	Trench Excavation	.1	Trenching shall be in accordance with MMCD section 31 23 01.
		.2	Minimum 300 mm of cover shall be provided for all lateral piping and 450 mm for all mainline piping.
		.3	Bedding shall be on 150 mm sand across the full width of trench.
3.3	Installation of Pipe and Sleeves	.1	PVC pipe ends shall be cut 90 degrees to the pipe length and cleaned of all cutting burrs prior to cementing, using an approved reaming tool. Pipe ends shall be wiped clean with a rag lightly wetted with PVC primer.

		.2	Cement shall be applied with a light coat on the inside of the fitting and a heavier coat on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn to set the cement. Excess cement shall be wiped from the outside of the pipe.
		.3	Threaded connections shall have four full wraps of Teflon tape.
		.4	PVC sleeves shall be installed for all lines under paved areas and project 30 cm either side with a minimum cover of 450 mm. Sleeves shall be twice the pipe diameter of laterals and three times the diameter of main lines.
		.5	Main and supply lines may occupy same trench as sprinkler lines. A minimum horizontal clearance of 150 mm shall be maintained.
		.6	Irrigation lines shall not cross each other at angles of less than 45 degrees. Crossings shall have a minimum 25 mm vertical clearance.
		.7	Irrigation lines shall have a minimum horizontal clearance of 300 mm and a minimum vertical clearance of 150 mm from other services.
3.4	Installation of Valves	.1	Valves shall be installed to manufacturer's specifications in grade level prefabricated boxes in accordance with the Accepted Drawing and Supplementary Detail Drawings. Provision shall be made for positive drainage away from the valve box to prevent flooding. Valve box shall be filled with 150mm depth of 9 - 16mm pea gravel from below the level of the bottom of the valve.
3.5	Connection to Municipal System	.1	A water meter and backflow preventer and irrigation mainline pipe shall be connected to the downstream side of the municipal curb stop or gate valve. The water meter shall be supplied by the Owner without charge.

3.6	Testing and Inspection	.1	All equipment and connections shall be left exposed but without installation of sprinklers until after completion and acceptance of the pressure test. One valve section may be tested at a time provided the mainline has been previously tested. The test section shall be charged with water, capped and pressure tested at 0.69 MPA (100 psi) for 24 hours. All joints and connections shall be checked visually for leaks. All leaks shall be repaired, corrected and tested again. After successful completion of pressure test of each valve section, that section may be completely backfilled.
3.7	Backfilling	.1	Prior to backfilling, all lines, valves and fittings shall be inspected by the Contract Administrator and the Owner.
		.2	Backfilling shall be in accordance with MMCD section 31 23 01 with sand around, and for 150 mm above the pipe and extending across the full width of trench.
3.8	Controller Installation	.1	Irrigation controllers shall be installed as shown and located on the Contract Drawings. The automatic controller shall be easily accessible for maintenance.
3.9	Flushing	.1	The entire sprinkler irrigation system shall be thoroughly flushed with water diverted to remove all direct, scale, and foreign matter of any nature before installing sprinkler heads.
3.10	Installation and Adjustment of Sprinkler Head Locations	.1	Rotary sprinklers shall be installed to manufacturer's specifications after all mains and lateral lines have been thoroughly flushed and tested. Flushing shall be accomplished in a manner to insure adequate pressure and water velocity at any head location being flushed. The swing joints shall be snug and free from leaks. Any joint evidencing leaking shall be removed, re-taped and reinstalled. Where leaking continues on any joint, the faulty nipples and/or elbow shall be removed from the joint and not be re-used

		elsewhere on the project.
	.2	Spray heads shall be installed to manufacturer's specifications on a Triple Swing Joint and set flush with grade. Triple Swing Joint shall be comprised of a minimum of three schedule 40 PVC Street Ells and one schedule 80 PVC Nipple as per supplementary drawings. Joints shall be hand tight and shall be wrapped with Teflon tape or as otherwise indicated by manufacturer.
	.3	Quick coupler valves shall be installed on swing joint assemblies and set flush with grade. Swing joint assembly shall be comprised of a minimum of two schedule 40 PVC Street Ells elbow (threaded), on schedule 40 PVC nipple (length to suit), one brass threaded elbow, one brass threaded street elbow, and one brass 150mm riser.
	.4	Changes in sprinkler head locations to ensure adequate coverage shall be made as required by the Landscape Architect.
	.5	Sprinkler assemblies shall be carefully backfilled and compacted to prevent settling. The sprinkler heads shall be mounted flush to the ground to prevent any damage from maintenance equipment.
	.6	Prior to first mowing of grass, sprinkler heads shall be adjusted to be flush with finish grade or to manufacturer's specifications.
3.11	Balancing System	.1 The components of the sprinkler system shall be balanced to maximize the efficiency of the system by synchronization of the controllers, adjustment of pressure regulators, pressure relief valves, part-circle sprinkler heads and individual station adjustment on the controllers.

3.12	Final Inspection and Familiarization	.1	Upon completion of installation, flushing and pressure testing, the Contractor shall operate the system through a full cycle to the acceptance of the Owner.
		.2	The Contractor shall provide a Certified Irrigation Technician to demonstrate the operation and maintenance requirements of the system to municipal staff.
3.13	Winterization	.1	The entire system shall be winterized at the end of the first season. The main control valve is to be closed and a hose from a 100 or 125 CFM compressor shall be attached to a quick couple valve on the downstream side of the backflow preventer. Allow compressed air to flow into the system and open each solenoid valve individually to allow the water to be expelled from the system. Valves must be opened at least twice to allow all water to be expelled. After all water is expelled from all portions of the system close off the air supply and relieve air pressure from the system.
		.2	Upon completion of winterizing, the Contractor shall submit a letter to the Owner certifying the system was winterized and drained and the date it was accomplished. The Contractor shall be liable for any damage resulting from failure to comply.
3.14	Start-Up	.1	The Contractor shall provide start-up of system the following spring after winterization. The main control valve shall be turned on and the system allowed to fill slowly. Each zone valve shall be opened individually and each sprinkler head checked to confirm proper operation. The irrigation controller shall be adjusted to the correct time of day and appropriate watering time required as directed by the Contract Administrator. The system operation shall be monitored and adjustments made as necessary to ensure proper operation.

3.15 Acceptance .1

Upon acceptance of the system by the Owner, the Contractor shall provide the keys and other tools necessary to operate/drain/activate the system and shall spend sufficient time with municipal staff to ensure they can continue to operate and maintain it properly.

MMCD Section 32 93 03S Landscaping Establishment Maintenance

1.0 GENERAL

		1.0.1	The intent of “establishment” maintenance is to define sufficient care to newly installed plant material for a relatively short period of time to ensure or increase the long-term success of the planting. The objective is the adaptation of plants to a new site in order to obtain the desired effect from the planting while reducing the rate of failure and unnecessary work associated with improper establishment. Establishment maintenance procedures apply to all vegetation including, but not limited to, the following:	
			.1 New trees and shrubs.	
			.2 New grass and sod	
1.1	Related Work	1.1.1	Hydraulic Seeding	Section 32 92 19S
		1.1.2	Seeding	Section 32 92 20S
		1.1.3	Sodding	Section 32 92 23S
		1.1.4	Shrubs & Tree Preservation	Section 32 93 01S
		1.1.5	Irrigation	Section 32 93 02S
1.2	Reference Standards and Legislation	1.2.1	B.C. Landscape Standard latest Edition, jointly published by the B.C. Society of Landscape Architects and the B.C. Landscape and Nursery Association, all Sections.	
		1.2.2	Related Standards and Legislation as listed in Canadian Landscape Standard latest Edition, Section 14.1, Maintenance, General.	
		1.2.3	All <i>Contract Documents</i> and Contract Drawings.	
1.3	Site Review	1.3.1	Maintain a logbook recording all procedures and operations at each visit and any comments regarding conditions. Submit a monthly report to the Owner’s Representative using Form 14.5 Landscape Maintenance Monthly Report – summarizing the operations and comments noted in the logbook.	

1.4	Scheduling	1.4.1	Prepare a schedule of anticipated visits and submit to designated representative at start-up. The schedule shall be based on the B.C. Landscape Standard Table 14-10; RECOMMENDED MAINTENANCE PROCEDURES & FREQUENCIES- MAINTENANCE: <i>Level 3, Moderate</i> .
		1.4.2	Maintenance operations shall be carried out predominately during the growing season between March 1 and November 30, however visits at other times of the year are required.
1.5	Maintenance Period	1.5.1	Provide maintenance of installed landscaping for 12 months following the issuance of the Certificate of Landscape Substantial Completion.
1.6	Maintenance Level	1.6.1	Maintain the landscape according to the B.C. Landscape Standard, Section 13, Table 7, Maintenance Level “3” Moderate.
2.0	PRODUCTS		
2.1	Materials	2.1.1	As specified in the <i>Contract Documents</i> .
2.2	Fertilizers	2.2.1	Comply with the requirements of the B.C. Landscape Standard. Formulations and application rates as required by soil testing.

3.0 EXECUTION

3.1 Plant Material Establishment

3.1.1

Watering

- .1 During the first growing season, water new plants at least every ten (10) days between April 1st and July 31st, and every twenty (20) days between August 1st and September 15th. Minimum 25 gallons per tree per application. All tanks, hoses, probes or other necessary equipment shall be free of deleterious substances that can cause injury or harm to plants or pose a residual environmental risk in the soil.
- .2 During the second growing season, water new plants at least every twenty days between April 1 and July 31 and once between August 1 and September.
- .3 Apply water at an application rate and duration such that the water content reaches field capacity to the full depth of the growing medium. The next application shall take place when the water content reaches 25% of field capacity.
- .4 Monitor soil moisture during the growing season. Scheduled applications of water shall be missed only when rainfall has penetrated the soil fully as required.

3.1.2

Mulching

- .1 Maintain mulches in the original areas and to the original depths.

3.1.3

Weed Control

- .1 Comply with Table 14-7 Weed Control Standard for the Maintenance Level specified.
- .2 Minimum Standard: Comply with B.C. Landscape Standards, Table 14-7, Maintenance Level 3, Moderate.
 - .1 Weed when isolated weed patches have a width of 150 mm (6").
 - .2 Weeding shall kill or remove 90% of weeds.
 - .3 Frequency: Comply with B.C. Landscape Standards, Table 14-10. Remove all weeds from all areas at least once per month throughout the year, every two weeks during the growing season and more frequently in the spring, as required, by hoeing or cultivation to a maximum depth of 80mm or by hand-pulling.

3.1.4

Pest and Disease Control

- .1 Inspect all planted areas for pests and diseases periodically and at least every two months during the growing season by an experienced person. Carry out treatment for pests or diseases promptly and consistently for maximum effectiveness. Comply with all B.C. Pesticide Control Act and municipal requirements.

		3.1.5	Tree Support	.1 Maintain stakes, guy wires and ties as shown in Township of Langley Standard Drawing TLP 25. Check ties at least every two months to ensure that they are not causing a depression in the bark; loosen, repair or replace as necessary. All flagging of guy wires shall be visible and in good repair. .2 All tree plantings to be as shown in Township of Langley Standard Drawing TLP 25.
		3.1.6	Pruning	.1 Comply with BC Landscape Standard 14.3.11 .2 Limit pruning to that necessary to remove dead or injured branches and to correct structural weakness. .3 Maintain the natural shape of the plant.
		3.1.7	Fertilizing	.1 Once during the twelve-month period of establishment maintenance fertilize shrubs, trees and groundcovers according to soil or foliar tissue analysis requirements.
		3.1.8	Litter and Debris	.1 Remove all litter and debris from all areas during each site visit.
3.2	Establishment of Grass Areas	3.2.1	Repairs	.1 Any sodded or seeded areas that show deterioration or bare spots shall be repaired immediately. All sodded areas showing shrinkage due to lack of watering shall be top dressed and seeded with a seed mix that matches the original seed mix, when conditions allow.

- 3.2.2 Mowing
- .1 Mowing shall be carried out at regular intervals as required, to maintain grass at a maximum height of 60 mm. Not more than 1/3 of the grass blade shall be cut at any one mowing. Heavy clippings shall be removed immediately after mowing and trimming.
- 3.2.3 Watering
- .1 Watering shall be carried out when required and with sufficient quantities to prevent grass and underlying soils from drying out.
- 3.2.4 Weeds
- .1 Weed control shall be carried out when density of weeds reaches 25 broadleaf weeds per 100 m²
- .2 Weed control, whether manual or chemical, shall reduce the density of weeds to zero.
- 3.2.5 Fencing
- .1 All seeded or sodded areas shall be adequately protected with warning signs, temporary fencing or other necessary means. Fencing shall be maintained in good condition to provide a continuous barrier until Final Acceptance at which time, unless otherwise agreed in writing by the Owner, fencing shall be removed from the site.
- 3.2.6 Fertilization
- .1 Fertilization application frequency will comply with B.C. landscape Standards Table 14-9 for the maintenance level specified. Fertilizer formulation and application rates as required by soil testing.

3.3	Conditions for Total Landscape Performance	3.3.1	Grass Areas – Sodded, Seeded and Hydraulic Seeded The Owner shall issue Certificate of Landscape Total Performance only when following conditions exist: .1 Growing medium quality, fertility levels, depths and surface conditions are as specified in Contract Documents. .2 Grasses are the required varieties and free of varieties other than those specified. .3 Grass areas are relatively free of weeds, containing no more than two broadleaf weeds or ten annual weeds or weedy grasses per m2. .4 Grass is sufficiently established that its roots are growing into underlying growing medium. .5 Seeded areas have been mown at least twice, to a height of 38 mm, last mowing being within 48h of inspection for acceptance. .6 Grasses established in sufficient density that no surface soil visible when mown to height of 38mm. .7 Specified maintenance procedures have been carried out.

3.3.2

Planted Areas – Trees, Shrubs, and Groundcovers

The Owner shall issue Certificate of Landscape Total Performance only when following conditions exist:

- .1 Growing medium quality, fertility levels, depths and surface conditions are as specified in Contract Documents.
- .2 All plants of species and varieties specified and planted in locations shown on Contract Drawings.
- .3 All plants are healthy and turgid.
- .4 Water content in growing medium is to the satisfaction of the Manager of Green Infrastructure Services.
- .5 All trees are staked as specified.
- .6 All pruning is complete to the satisfaction of the Manager, Green Infrastructure Services.
- .7 All planted areas are free of weeds.
- .8 Mulch is in place as required.
- .9 Specified un-mulched areas are cultivated to leave a loose, friable, water- permeable surface.
- .10 Specified maintenance procedures have been carried out.

3.4	Guarantee / Maintenance	3.4.1	Grass Areas – Sodded, Seeded and Hydraulic Seeded .1 Contractor to guarantee all materials and workmanship for a period of one full year from date of the issuance of the Certificate of Total Landscape Performance unless specified otherwise in Contract Documents. .2 Guarantee includes replacing all seeded areas determined by Owner to be dead or failing at end of guarantee period. Replacements to be made at next appropriate season, and conditions of guarantee will apply to all replacement seeding for one full growing season. .3 Guarantee will not apply to seeded areas damaged after date of Total Landscape Performance by causes beyond Contractor's control, such as vandalism, "acts of God", "excessive wear and tear", or abuse.
		3.4.2	Planted Areas – Trees, Shrubs, and Groundcovers .1 Contractor to guarantee all materials and workmanship for a period of one full year from date of the issuance of the Certificate of Total Landscape Performance unless specified otherwise in Contract Documents. .2 Guarantee includes replacing all plants determined by the Owner to be dead or failing at end of guarantee period. Replacements to be made at next appropriate season, and conditions of guarantee will apply to all replacement seeding for one full growing season. .3 The Owner reserves the right to extend Contractor's guarantee responsibilities for an additional one year if, at end of initial guarantee period, leaf development and growth is not sufficient to ensure future survival.

- .4 Guarantee will not apply to seeded areas damaged after date of Total Landscape Performance by causes beyond Contractor's control, such as vandalism, "acts of God", "excessive wear and tear", or abuse.

Division 33 – Utilities

MMCD Section 33 01 30.1S CCTV Inspection of Pipelines

1.0 GENERAL

- .1 Section 33 01 30.1S refers to those portions of the work that are unique to the requirements for inspecting new and existing sanitary, storm and combined sewer pipe and pipe culverts and the associated laterals and service connections by closed circuit television. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- 1.1 Related Work
 - 1.1.1 Traffic Control, Vehicle Access and Parking – Section 01 55 00
 - 1.1.2 Storm Sewers - Section 33 40 01
 - 1.1.3 Pipe Culverts – Section 33 42 13
 - 1.1.4 Manholes and Catchbasins – Section 33 44 01
 - 1.1.5 Sanitary Sewers – Section 33 30 01
 - 1.1.6 Cleaning of Sewers – Section 33 01 30.2
- 1.2 References
 - 1.2.1 These specifications must be referenced to and interpreted simultaneously with all other Standards and Specifications pertinent to the works described herein.
 - 1.2.2 Reference standards, specification or publications.
 - .1 Pipeline Assessment and Certification Program (PACP) Reference Manual

		1.2.3	Nomenclature
			.1 CCTV Closed Circuit Television
			.2 JPEG Joint Photographic Experts Group
			.3 WMV Windows Media Video
			.4 LACP Lateral Assessment and Certification Program
			.5 PACP Pipeline Assessment and Certification Program
1.3	Work Regulations	1.3.1	Work shall conform to all applicable regulations of WorkSafe BC. The Contractor shall confirm training compliance in the following: 1. Confined space rescue 2. Confined space entry 3. Ventilation 4. Atmospheric monitoring 5. Self-contained breathing apparatus 6. Personal protective equipment
		1.3.2	Contractor shall provide written confirmation to the Contract Administrator that workers have knowledge of confined space entry practices and of equipment required for confined space entry.
1.5	Scheduling of Work	1.5.1	Schedule work to minimize interruptions to existing services.
		1.5.2	Maintain existing flow during inspection survey unless flow reduction measures required per 3.11 Flow Reduction of this Section.
1.6	Measurement for Payment	1.6.1	All units of measurement for payment will be as specified herein unless shown otherwise in Form of Tender.
		1.6.2	CCTV pipeline inspection will be measured in lineal metres. Payment will be made at the unit price bid in Form of Tender.

1.6.3	CCTV lateral service inspection will be measured per lateral inspected. Payment will be made at the unit price bid in Form of Tender.
1.6.4	Measurement will be determined by calibrated electronic measure along the sewer from the inside wall of manhole to inside wall of manhole or end to end of sewer pipe for all sections except where a blockage or obstruction occurs.
1.6.5	For sections of pipe where a blockage or obstruction occurs, measurement will be from the start of inspection (inside wall of manhole) to the point of abandonment of survey.
1.6.6	For sections of pipe with the PACP condition code MCU (camera underwater) that has a continuous distance greater than five (5) metres, the measurement above will be reduced by the distance in excess of the five metres.
1.6.7	Separate payment will not be made for flow control, with the exception of bypass pumping. Bypass pumping for each situation as described in the Form of Tender will be made as lump sum. Payment for bypass pumping as required and only where approved by the Contract Administrator will be made on a per occurrence basis per 3.11 Flow Reduction of this Section.

2.0 PRODUCTS

2.1	Equipment	2.1.1	A Survey Vehicle, containing a separate area for viewing, recording and controlling of the CCTV operation is required as follows: .1 Viewing and control area to be insulated against noise and extremes in temperature. External and internal sources of light to be controlled to ensure the light does not impede the view of the monitor screen. Proper seating accommodation shall be provided to enable one person, in addition to the operator, to clearly view the monitor screen. .2 All equipment utilized within the pipeline

shall be stored outside the viewing, recording and control area.

- .3 Vehicle to be equipped with a mobile telephone for communication with the Engineer for the duration of the work.
- .4 Electrical power for the system to be self contained. External power sources from public or private sources will not be permitted.

2.1.2

Survey Equipment shall have sufficient cables to view the lengths of pipe as specified.

- .1 Survey unit shall be a self-propelled crawler type with a means of transporting the CCTV camera and lateral launched camera in a stable condition through the pipeline.
- .2 Each unit shall carry sufficient numbers of guides and rollers such that, when surveying, all cables are supported away from pipe and manhole edges. All CCTV cables and lines used to measure the camera's location within the pipeline shall be maintained in a taut manner and set at right angles, where possible, to run through or over the measuring equipment.
- .3 Each unit shall interface with a data generator and appropriate software to record the alpha-numeric data associated with the pipeline condition and header reference location information as follow:
 - .1 Title Screen overlay:
 - Project #
 - Contractor
 - City
 - Date
 - Lateral ID (Lateral Segment Reference)
 - Mainline ID
 - Start MH No.

- End MH No
- Use (sanitary/storm)
- Address
- Size
- Material
- Tap distance (m) in mainline
- Survey distance (m) in lateral

.2 Travelling Screen overlay:

- Lateral ID
- Tap distance (m) in mainline
- Survey distance (m) in lateral
- Defect code and description

		2.1.3	The camera shall be capable of producing high quality colour imagery and provide complete inspections and view of all laterals and deficiencies. .1 The camera shall be a “Pan & Tilt “ type having the capability of panning the pipe at 360°, tilt capability of 270°, and the ability to provide complete inspections of service connections up to property line. Lateral camera to be self-leveling. .2 Live picture is to be visible with no interference and capable of registering a minimum of 400 lines of resolution at the periphery. .3 Focus and iris adjustment shall allow optimum picture quality to be achieved and to be remotely adjusted. The adjustment of focus and iris shall provide a focal range from 150mm in front of the camera’s lens to infinity. The distance along the sewer in focus from the initial point of observation shall be a minimum of twice the vertical height of the sewer and lateral. .4 Camera shall be waterproof with a self-contained lighting system capable of being remotely adjusted. Lights to provide an even distribution of light around the pipeline perimeter without the loss of contrast or flare out or picture shadowing.
2.2	Materials	2.2.1	Digital video files are to be stored on an electronic file storage device in WMV format and presented to the Contract Administrator on a regular basis for audits as specified.
		2.2.2	Photographs are to be in colour, with a minimum image size of 90mm x 70mm and shall be reproduced on premium glossy inkjet paper.
3.0	EXECUTION		
3.1	CCTV Inspection	3.1.1	CCTV operator to have received training by NASSCO on PACP and LACP.

- 3.1.2 The Contractor shall submit samples of inspection reports, video (in WMV format) together with corresponding digital data files for the Contract Administrator review within one week of receipt of notice to proceed with contract. This submission shall demonstrate compliance with the contract specifications contained herein and the accepted submission will be used as a benchmark for subsequent inspection report submissions.
- 3.1.3 No inspection surveys are to be carried out under this contract until an acceptable sample inspection report has been approved by the Contract Administrator.
- 3.1.4 Flow in the pipeline is not to exceed approximately 20% of the pipe diameter. Notify of excessive flows, inspect using flow reduction method per 3.11 Flow Reduction of this Section.
- 3.1.5 Steaming and fogging encountered during the inspection survey shall be eliminated by introducing forced air flow by means of fan.
- 3.1.6 Camera lens shall remain free of grease or other deleterious matter to ensure optimal clarity.

- 3.1.7 Inspection video images are to be produced in WMV format.
- .1 The format for naming each video file shall be as follows: 2011-002.wmv (contract_yr-InspectionNo.wmv)
 - .2 2011-002b.wmv (contract_yr-InspectionNo.wmv) in the event that of multiple files for the same report.
 - .3 Create separate digital file for each individual manhole to manhole inspection report. Identify each report title on the DVD menu.
 - .4 Create separate file for each individual sewer lateral inspection report. Clearly identify the lateral ID number on the electronic file name.
 - .5 Create separate file for each service connection inspection report. Clearly identify the service connection number on the electronic file name.
- 3.1.8 Set zero chainage at face of every manhole, or on entrance into pipe, start of pipe culvert, or lateral interface.
- 3.1.9 Report and record on the full length of pipeline from inside face to inside face between manholes or outlet end of pipes and from one end of the pipe culvert to the other. Report and record on the full length of the lateral service and service connection from pipeline interface to property line.
- 3.1.10 Note condition of pipe joints at manhole walls at the beginning and end of each pipeline. Note condition of mainline and lateral interface.

3.1.11

Data generator shall electronically generate, and clearly display on the viewing monitor and video recording, a record of the following minimum information prior to the start of each run:

- .1 Manhole (from-to) / pipe length reference numbers.
- .2 Mainline / lateral and service connection dimensions
- .3 Pipe material (ie vitrified clay, concrete, pvc etc.)
- .4 Type or use of pipe (ie sanitary, storm or combined sewer)
- .5 Date of survey (dd.mm.yyyy)
- .6 Road name / location
- .7 Direction of travel of survey equipment (U or D, Upstream or Downstream)
- .8 Inspection (report) number. Format to be provided by the Contract Administrator.
- .9 Verbal description of all the above on screen information.

3.1.12

Data generator shall continuously electronically generate, and clearly display on the viewing monitor and video recording, a record of the following minimum information during each run:

- .1 Automatic update of the camera's metre reading position from adjusted zero.
- .2 Manhole/pipe length reference numbers.
- .3 Type or use of pipe (ie sanitary, storm or combined sewer)
- .4 The unique inspection/report number of the run.
- .5 Display digital information such that it will not interfere with the video image on the screen.

		3.1.13	The camera shall stop at each defect, change of condition of pipe and service connection to record defect in accordance with PACP and LACP codes.
		3.1.14	Immediately notify Contract Administrator of any blockage or obstruction that will not allow passage of survey equipment.
		3.1.15	Restart the inspection survey from the opposite end of pipeline or culvert when a blockage or obstruction is encountered unless directed by Contract Administrator.
3.2	Recording Resolution	3.2.1	At the beginning of each recording, day of inspection or when a substitute camera is introduced perform necessary checks to ensure recording resolution satisfies these specifications.
3.3	Site Coding Sheets	3.3.1	Each pipeline / lateral length to be recorded according to the PACP and LACP. Any variation from the manual to be noted in the survey report.
		3.3.2	Standard coding form shall be modified as follows: .1 Line 2, field 8 (date) to be eight (8) characters in the format of yyyy.mm.dd (year, month, day) .2 Condition detail number (video count) to be six (6) characters in the format of hh.mm.ss (hours, minutes, seconds) .3 Note observations as to condition of service connections beyond mainline in remarks column using standard codes as per PACP and LACP.
3.4	Camera Position	3.4.1	Position the camera lens centrally in the pipeline connection to a tolerance of $\pm 10\%$ off the vertical centerline axis of the pipeline. For elliptical pipe the camera to be positioned 2/3 the height of the pipe measured from the invert.
		3.4.2	Position the camera lens looking along the longitudinal axis of pipeline except when viewing or panning defects.

3.5	Camera Travel Speed	3.5.1	Travelling speeds of the camera in the pipeline shall be as follows: .1 0.1m/s for diameter less than 200mm. .2 0.15 m/s for diameter 200mm and larger but not exceeding 310 mm; and .3 0.20 m/s for diameter exceeding 310 mm.
3.6	Camera Position Chainage Device	3.6.1	Use a chainage device which enables the cable length to be accurately measured to indicate the location of the camera. .1 Chainage information to be transmitted electronically to control area and displayed on the monitor. .2 Chainage device shall be accurate to within 0.3 m up to the first 50 m of pipe length and within $\pm 1\%$ for lengths exceeding 50 m. .3 Chainage tolerance shall be checked at the start of contract and a minimum of once every two weeks there after or every 5000 m of pipeline inspected, whichever is greater. .4 Provide an audit form showing dates and distances checked to meet both tolerance requirements. Chainage linear measurement to be checked by use of a cable calibration device or tape or electronic measurement between fixed points.
3.7	Photographs and/or Digital Images	3.7.1	Photograph all major defects as defined by condition codes: B, TF, TB, TS, D, FC, FL, FM, H, IR, IG, JO, OB, JS, RB, and X.

	3.7.2	The following data, in alpha-numeric form, shall be overlaid on photographs such that it will not interfere with the defect condition reported:
		.1 Report/job number .2 Metre reading position (chainage) .3 Manhole/pipe length reference numbers (from - to) .4 Photograph number .5 Condition defect code .6 Date of survey (dd.mm.yyyy)
	3.7.3	Capture digital image in JPEG format if required, as specified in contract documents.
		.1 The format for naming each digital image shall be as follows: 2011-002-1212a (contract_yr-InspectionNo-pipeID{a,b,c....}.jpg)
	3.7.4	Co-ordinate photographs with the hard-copy report by reference number and inserting into the report following the relevant section of pipeline inspected.
3.8	Inspection Reporting Hard copies & format	3.8.1 Submit reports to the Contract Administrator within 10 working days of completion of the field work on a continuous basis as the inspection area or pipeline types are finalized.

3.8.2

Present machine printed (hard copy) and computer generated database reports according to the PACP é LACP format as follows:

- .1 Each binder to commence with an index of all survey inspection reports contained within.
- .2 Hard copy reports to be presented in tabular form in accordance with PACP Reference Manual.
- .3 Reports to be presented in sections or drainage areas and/or by pipeline type or as specified in the contract documents.
- .4 Computer database file to contain identical survey report information as the printed report exclusive of photographs.
- .5 Digital information to be presented in tabular configuration in accordance with the Township of Langley standard file format in Microsoft ACCESS (.MDB). Single master databases file to be presented at the end of the project containing all the project CCTV reports on an electronic storage device complete with all WMV video files.
- .6 Include all digital photographs on an electronic storage device.
- .7 Include scale drawings showing highlight inspected pipeline. Drawing to be included as an attachment in the condition report and as a separate PDF file for each section of sewer pipeline surveyed.
- .8 All reports and related reference maps to also be submitted in PDF format.

3.8.3

Present reports in 215 mm x 280 mm three ring (D type) binders. DVD's or USB flash drive containing relevant CCTV inspections surveys to be included in the binder.

		3.8.4	Attach digital media in three hole plastic diskette sheet holder and USB flash drives in two hole plastic sleeve holder in back of binder.
		3.8.5	All dimensions and chainages shall be in metric.
3.9	Flushing and Cleaning	3.9.1	Clean or flush sewers per Section 33 01 30.2 – Cleaning of Sewers no more than 2 days prior to CCTV inspection survey, unless otherwise specified in the contract documents or directed by the Contract Administrator.
3.10	Root Cutting & Removal	3.10.1	Remove roots for condition codes RB where required, to allow for CCTV equipment to pass.
3.11	Flow Reduction	3.11.1	Reduce flow in pipeline to approximately 20% pipe diameter to allow CCTV inspection by combination of the following:
		3.11.2	Schedule work for off peak flow times.
		3.11.3	Plug or block flow at upstream manhole. .1 Plug designed to either plug all flow or impede flow to the approximate 20% pipe diameter. .2 Obtain Contract Administrator's approval prior to plugging or impeding any flow. .3 Remove plug or blocks to slowly return flow to normal without surge or surcharging downstream pipeline.
		3.11.4	Temporary bypass pump flow around inspection section when required, as specified in contract documents. Plug to be flow through with hoses and pump of sufficient capacity to handle the peak flow. Hoses and couplings to be leak free. Flow to be pumped to downstream manhole on same system or run as inspection is to take place. Obtain Contract Administrator's approval prior to setting up temporary bypass pump system.

3.12 Coding Accuracy	3.12.1	Coding accuracy shall be a function of the number of defects or construction features not recorded (omissions) and the correctness of the coding and classification recorded. Coding accuracy to satisfy the following requirements:
	.1 header accuracy 95% .2 detail accuracy 85%	
	3.12.2	The Contractor shall implement a formal coding accuracy verification system at the onset of the work. Coding accuracy to be verified by the Contractor on a random basis on a minimum of 10% of the inspection reports. Contract Administrator will be entitled to review the accuracy verification system and results and be present when the assessments are being conducted.
	3.12.3	A minimum of two accuracy verifications to be performed for each operator for each working week. Coding not satisfying the accuracy requirements to be re-coded and the accuracy of the inspection report immediately preceding and following the non compliant inspection to be verified. Process to be repeated until the proceeding and subsequent inspections meet accuracy requirements.
2.0 PRODUCTS		
2.2 Materials	Append 2.2.1	DVD-R, CD-R or USB are acceptable storage types.
3.0 EXECUTION		
3.1 CCTV Inspection	Delete 3.1.8 and replace with the following:	Windows Media Video (wmv) shall be the digital submission format.
	Delete 3.1.12.6 and replace with the following:	Road name / Location shall be recorded to the nearest address and/or intersection in the video.
	Add 3.1.12.10	Township Project Number and Contractor reference number shall be shown on footnote.

3.8	Inspection Reporting Hard Copies & Digital Format	Add 3.8.2.5.1	Contractor shall provide an additional separate summary report containing: - Attribute field for <u>Video Reference Filename</u> into Inspection or Session Table - Attribute field for Picture Reference Filename into Condition details Table - Flatten the coded values to actual text values.
		Add 3.8.2.8	Digital pdf version of hard copy final report shall be included as part of the submission.

MMCD Section 33 11 01S Waterworks

1.0 GENERAL

2.0 PRODUCTS

2.6	Hydrants	Delete 2.6.1.6 and replace with the following:	Pump nozzle shall be “quick connect” STORZ type. STORZ type nozzle must be painted gloss black with marine enamel based paint.
		Delete 2.6.2 and replace with the following:	Colour: Cloverdale Paint Enamel, Applied by brush Body – Bright Red Part No 11187 or approved equivalent Hose Caps – White
2.7	Underground Service Line Valves and Fittings	Add 2.7.2.3	37 mm and 50 mm shall not be wheel gate valves.
		Add 2.7.3.6	Wheel gate valves shall not be used.

2.8	Granular Pipe Bedding and Surround Material	Add 2.8.3	Bedding and surround material shall be Type 1 under Section 31 05 17 – 2.7 or 19mm minus clear crushed gravel.

3.0 EXECUTION

3.5	Granular Bedding	Delete 3.5.6 and replace with the following:	Place watermain pipe on granular bedding. Place water services on prepared flat bottomed trench free of rock in excess of 50 mm without bedding. Backfill with approved native or imported material and compact as specified. Use hand tools to compact material under 'haunch' areas of pipe and around fittings and other materials.
3.6	Pipe Installation	Add 3.6.15	When the watermain crosses a storm or sanitary sewer, the watermain shall be installed a minimum 0.5 m clear above the sewer. Where this is not possible, the watermain shall have a minimum 0.3 m clearance under the sewer with all joints within a 3.0 m horizontal distance from the sewer wrapped with heat shrink plastic or packed and wrapped with petrolatum tape in accordance to the following standards: .1 ANSI/AWWA C214 (factory applied) .2 ANSI/AWWA C209 (field applied) .3 ANSI/AWWA C217-90 (petrolatum tape) .4 All materials used are to have zero health hazard Installation shall be in accordance with the requirements of the Regional Health Engineer under the Health Act.
3.10	Service Connection Installation	Append to 3.10.1	... Personnel installing service connections shall be certified as being fully trained and competent in tapping watermain.

3.13	Thrust Blocks	Delete 3.13.1 and replace with the following:	Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as shown on Contract Drawings or as directed by Contract Administrator and as detailed on Supplementary Detail Drawing TLW2.
3.17	General Procedures Flushing, Testing, and Disinfection	Delete 3.17 and replace with the following:	As per ANSI/AWWA C651-14
3.18	Cleaning and Preliminary Flushing	Delete 3.18 and replace with the following:	As per ANSI/AWWA C651-14
3.19	Testing Procedures	Delete 3.19 and replace with the following:	As per ANSI/AWWA C651-14
3.20	Disinfection, General	Delete 3.20 and replace with the following:	As per ANSI/AWWA C651-14
3.21	Disinfection, and Flushing Procedures	Delete 3.21 and replace with the following:	As per ANSI/AWWA C651-14

MMCD Section 33 42 13S Pipe Culverts

1.0 GENERAL

2.0 PRODUCTS

2.1	Corrugated Steel Pipe	Delete 2.1 and replace with the following:	Use of corrugated steel pipe for culverts is not permitted.
2.3	Plastic Pipe, Smooth Profile	Delete 2.3 and replace with the following:	Use of smooth profile plastic pipe for culverts is not permitted.
2.4	PVC Pipe, Profile	Delete 2.4 and replace with the following:	Use of PVC plastic pipe for culverts is not permitted.
2.5	HDPE Plastic Pipe, Open Profile	Delete 2.5 and replace with the following:	Use of HDPE plastic pipe open profile for culverts is not permitted.

3.0 EXECUTION

MMCD Section 33 44 01S Manholes and Catchbasins

1.0 GENERAL

2.0 PRODUCTS

2.1	Materials	Delete 2.1.14 and replace with the following:	Joints to have rubber gaskets conforming to ASTM C443.

3.0 EXECUTION

3.3	Manhole Installation	Delete 3.3.17 and replace with the following	Ensure frames conform to design contour of pavement or existing surface. Manhole lids left raised in preparation for paving shall have a rubberized protector ring or asphalt ramp for traffic safety. Supply and use of this equipment is considered incidental to the <i>Work</i> .

Division 34 – Transportation

MMCD Section 34 41 13S Traffic Signals

1.0 GENERAL

1.3	Shop Drawings	Append to 1.3.4	... registered in British Columbia.
1.5	Contractor Qualifications	Add 1.5.3	All on-site traffic signal installations shall be under the responsibility of a primary journeyman electrician with IMSA Level 2 Signal Certification and have successfully completed at least five (5) traffic signal system installations. This primary journeyman electrician shall be on the work site and report work progress to Township of Langley's Traffic Operations staff, in addition to reporting to the Contractor.

2.0 PRODUCTS

2.1	General	Delete 2.1.2 and replace with the following:	All products supplied to be new, in accordance with <i>Contract Documents</i> . All products are to meet Canadian Electrical Code requirements and be certified by either CSA, UL®, or Intertek Testing Systems (Warnock Hersey) and be supplied with the certifier's label
		Delete 2.1.3 and replace with the following:	All products shall be in accordance with the Township of Langley's List of Approved Materials and Products List. Any products not listed with in the Approved List shall default to the current BC MOTI specification.
		Delete 2.1.5 and replace with the following:	Equipment models listed within the Township of Langley's List of Approved Materials and Products shall be confirmed with the Township immediately prior to their order to ensure that they are current. Cut-sheets, equipment make, model and serial number list to be provided to the Township by the contractor for each traffic signal location. Material supplied by Township of Langley and installed by Contractor, shall be shown in the <i>Contract Documents</i> .

	Add 2.1.6	The Township of Langley will supply the following materials from the Operations Centre at cost to the Owner unless otherwise determined by the General Manager: • Traffic controllers and cabinets; • Video detector systems; • Padlocks; • Street name signs; • “New Signal Ahead” signs; • Emergency Vehicle Pre-emption systems; • Radio communications systems to communicate to traffic controllers; • Uninterruptible Power Supply (UPS). The Contractor shall check quantities and verify materials are correct and undamaged, complete a “Materials Release Form” and deliver the materials to the site. The Contractor shall assume all responsibility for the materials from the time they are picked up.
	Add 2.1.7	The Contractor shall notify the Owner in writing seven (7) days prior to materials being picked up.
2.16 Traffic and Pedestrian Signals	Delete 2.16.1 and replace with the following:	Traffic signal heads to be green polycarbonate with 300mm round signal indications, and conform to Section 601 Signal and Pedestrian Heads BCMOTI E&SMS V1. All primary and secondary signal heads shall have yellow aluminum backboards with 75mm border of yellow prismatic retro-reflective sheeting (3M™ Scotchlite™ Diamond Grade™ VIP Reflective Sheeting Series 3990 or approved alternate).
	Delete 2.16.2 and replace with the following:	Signal head backboards with plumbizer gaps or knock out sections will not be accepted for adjustable bracket signal head mounting method.

2.17	LED Signal Modules	Delete 2.17 and replace with the following:	As per Township of Langley's List of Approved Materials and Products.
2.19	Signal Mounting Hardware	Add 2.19.8	Primary signal head safety cable to be 3/32" galvanized steel aircraft cable.
		Add 2.19.9	As per Township of Langley's List of Approved Materials and Products.
2.20	Audible Signals	Delete 2.20 and replace with the following:	As per the Township of Langley's List of Approved Materials and Products.
2.21	Pedestrian / Cyclist Pushbuttons	Delete 2.21 and replace with the following:	As per the Township of Langley's List of Approved Materials and Products.
2.22	Luminaires	Add 2.22.6	As per the Township of Langley's List of Approved Materials and Products.
2.29	Illuminated Crosswalk Signs	Delete 2.29 and replace with the following:	As per the Township of Langley's List of Approved Materials and Products. Illuminated sign safety cable to be 3/32" galvanized steel aircraft cable.
3.0 EXECUTION			
3.1		Add 3.1.5	During the installation of the traffic signal system, maintain the existing traffic signal and/or signs as noted on the Contract Drawings. If temporary or permanent relocations of related traffic signal equipment or signs are required, such equipment shall be reinstated as required under the <i>Contract Documents</i> or as directed by the Contract Administrator.
3.3	Concrete Bases	Add 3.3.7	Contrary to Standard Detail Drawing E7.3, the position of the 53mm RPVC conduit for service and 35mm RPVC conduit for street lighting shall be reversed.
		Add 3.3.8	Lifting cables on concrete controller bases shall be removed after base installation.

3.4	Junction Boxes and Vaults	Add 3.4.5	Junction boxes requiring 3 full sections or more must be approved by the Township of Langley's Traffic Operations staff.
		Add 3.4.6	All junction boxes shall be provided with RPVC bars to support electrical connections and fuse holders. The RPVC bars shall be attached into the junction box side walls with the electrical connections/fuse holders tie-wrapped in place and installed in the up-right position.
3.5	Underground Conduit	Delete 3.5.5 and replace with the following:	Empty conduits shall have a No. 8 HB Yellow/Green Mk pull string and capped at both ends.
		Add 3.5.6	Conduits shall be blown out with compressed air, from both ends if necessary, then swabbed out to remove stones, dirt, water and other material which may have entered during installation.
		Add 3.5.7	All conduits entering poles and cabinets shall be sealed with "Duct Seal".
		Add 3.5.8	Conduit depth of bury to be recorded when a trenchless technology method is used
		Add 3.5.9	Conduit shall not be bent in the field. Only factory bends will be accepted.
3.7	Traffic Signal and Pedestrian Head Mounting	Add 3.5.11	Conduit shall not be bent in the field. Only factory bends will be accepted.
		Delete 3.7.1 and replace with the following:	Install traffic signal and pedestrian signal heads as shown and Standard Detail Drawings E5.2 and E5.9 only.
		Add 3.7.5	Primary traffic signal heads shall be safety cabled to the traffic signal pole arm using 3/32" galvanized steel aircraft cable looped through the traffic signal backboard and fastened with a rope clip.
3.10	Luminaires and Photocells	Add 3.10.4	NEMA wattage label shall be visible at the bottom of the luminaire on all fixtures.

3.14	Wiring	Delete 3.14.3 and replace with the following:	Bond all signal heads and luminaires with No. 12 RW90 green conductor, and steel junction box lids with No. 8 RW90 green conductor.
3.16	Traffic Controller	Add 3.16.8	Silicone sealant shall be applied to both sides of the rubber gasket, which is placed between the traffic signal cabinet and the concrete base to ensure a weather tight seal.
		Add 3.16.9	Traffic cabinet interior shall be kept dry during inclement weather.
3.19	Advance Warning Signs	Add 3.19.2	Contrary to Standard Detail Drawing E10.3, Item A shall be a 300mm signal head section with LED display.
		Add 3.19.3	Advance warning signs shall have yellow prismatic retro-reflective sheeting (3M™ Scotchlite™ Diamond Grade™ VIP Reflective Sheeting Series 3990 or approved alternate).
3.20	Grounding & Bonding	Add 3.20.5	Grounding rod or plate electrodes shall not be installed inside the traffic signal cabinet base.
		Add 3.20.6	Remove all paint around bonding studs on inside of pole to expose the galvanized or metal surface prior to bonding equipment.
3.22	Pole Finish Application	Delete 3.22 and replace with the following:	.1 Prior to producing a powder finish product the supplier must provide a Certificate of Compliance indicating that they have met or exceeded the following specifications. The supplier will name their independent testing agency and this information will be submitted to the Township for their files. .2 The application process will be as follows: .1 The pole or product will be hot dip galvanized. .2 Powder will only be applied after the product is completely fabricated. No welding or bending will take place after the powder is applied. .3 The pole or product will be thoroughly cleaned by brush blasting in

accordance with SSPC-SP7. The brush blast will maintain a minimum profile of 0.5 mils. If brush blasting is done off site then the product will be covered and shielded from any dirt or moisture during its return to the powder applicators facility. Where poles or products are not kept clean and dry or have any signs of flash rust they will be returned for further brush blasting.

- .4 Once at the applicators facility the pole or product will be thoroughly cleaned and dried with an air gun. All hand marks or grease spots will be cleaned with a mild solvent.
- .5 After brush blasting the entire pole or product will be pre-baked in an oven at 220 degrees C for at least 30 minutes to 1 hour, depending on steel thickness. The pre-baking must be done to prevent out-gassing during the curing cycle.
- .6 The base powder coat will then be applied electrostatically while the pole or product is cooling from the 220 degrees C pre-bake period to allow the powder to melt and fuse to the surface. The base coat will be a minimum of 3 mils in thickness.
- .7 After base coat is applied and set the topcoat will be applied to a thickness of 3 to 5 mils. The pole or product will be returned to the oven and heated to 190 to 220 degrees C (temperature will not exceed pre-bake) for a minimum of 25 minutes, depending on steel thickness. Thicker product material may require longer bake cycles to fully cure. Upon removal of the pole or product from the oven it will be left to rest until the pole or

product is cool enough to the touch.

- .8 Once the topcoat has cured and the poles or product cooled, they will then be individually wrapped (min 4" overlapping method) with 1/8" foam wrap over the entire pole or product. The poles or product will be bundled together and separated with suitable wood dunnage to avoid contact between the poles, products or other bundles. All bundles themselves will be fully wrapped with foam and with stretch-wrap as noted above. The poles or products will be handled and shipped with great care to prevent damage; damaged product will be cause for rejection of the item(s).

.3 Testing process will be as follows:

- .1 Each run of product in an oven will have at least one sample tested for:
- .2 Adhesion – The finished powder surface will have minimum pull-off strength exceeding 1000 PSI as tested in accordance with ASTM D4541.
- .3 Quality – The finished powder surface will be free from any holidays (skips or misses) as tested in accordance with ASTM D4541. The product will also be free from wrinkles, orange peel, cracking, pinholes, fish eyes, blisters, etc. by visual inspection.
- .4 Colour – The colour will be verified to be within 3 DE of specified colour.
- .5 An independent testing firm who are qualified to test powder finish will do the testing at the supplier's expense. The result of tests must accompany the Certificate of Compliance and will be made available to the Township or their representative upon request. A

supplier who fails to test product as noted above will have their product rejected until the testing is completed and the product deemed acceptable by the testing agency.

- .6 Where the tested product fails on a given production run then a minimum of 30 % of the entire production run will be tested. If no other failures are found then the individual failed product will be stripped, reapplied and re-tested until it passes. If any of the 30% of product tested fails then the entire order will be stripped, reapplied and retested until it passes.
- .4 Field repairs will be undertaken as required to fix any scratches or imperfections in the final finish. Field repairs will be done as follows:
 - .1 Feather the damaged area with sandpaper.
 - .2 Clean area with solvent.
 - .3 Let dry.
 - .4 Neatly brush on an application of Aliphatic Urethane Acrylic Semi-Gloss High Build applied at 2-4 mils DFT over the entire sanded and damaged area. The ambient conditions will be dry and over 10 degrees C when the paint is applied.
 - .5 The pole supplier will warranty the integrity of the surface for a minimum of 1 year from the date of installation. The warranty will include all labour and materials required to provide replacement product if required. The powder finish will be the responsibility of the pole supplier. The warranty will apply to fading, blistering, cracking or chipping of the surface.

3.26	Uninterruptable Power Supply	Add 3.26.2	Uninterruptable power supply / cabinet to be installed on the back of the traffic controller cabinet as detailed on the Contract Drawings.
3.28	Emergency Vehicle Pre-emption	Add 3.28.1	Emergency vehicle pre-emption system to be installed as detailed on the Contract Drawings.
		Add 3.28.2	Cable shall be continuous with a minimum of 2m of cable slack to be provided at each end, with no splices. Cabinet termination to be completed by Township.
3.29	PTZ/CCTV Cameras	Add 3.29.1	PTZ/CCTV cameras to be installed as detailed on the Contract Drawings. Contact the Township of Langley's Traffic Operations staff prior to installation.
		Add 3.29.2	Cable shall be continuous with a minimum of 2m of cable slack to be provided at each end, with no splices. Cabinet termination to be completed by Township.
3.30	Radio Communications Equipment	Add 3.30.1	Radio communications equipment to be installed as detailed on the Contract Drawings. Contact the Township of Langley's Traffic Operations staff prior to installation.
		Add 3.30.2	Cable shall be continuous with a minimum of 2m of cable slack to be provided at each end, and with no splices. Cabinet termination to be completed by Township.

TOWNSHIP OF LANGLEY

SUBDIVISION AND DEVELOPMENT SERVICING BYLAW

SCHEDULE D

APPROVED MATERIALS AND PRODUCTS

SCHEDULE D

APPROVED MATERIALS AND PRODUCTS

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1. GENERAL

Schedule D lists materials and products that are approved, restricted, or not allowed for Works and Services required by this Bylaw.

If a material or product is not listed in relation to an MMCD or a Supplementary Specification, any product meeting the requirements of such specification shall be accepted.

Where brand names are specified for a product, any proposal for an alternate product requires the approval of the Municipal Engineer.

The Municipal Engineer may vary the requirements of Schedule D in circumstances that he considers to be appropriate.

2. SITEWORK EXCEPT LANDSCAPING

"Generic" means any product of the approved material / type is acceptable if meeting MMCD or Supplementary Specification.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
31 11 45	Shrub and Tree Preservation				
2.1	Materials	Snow Fence	Dupont	L-70	
32 93 23	Sodding				
2.1.3		Sod			Net-free
33 11 01	Waterworks				
2.2.1	Water Main Ductile Iron	Ductile Iron	Canada Pipe	C-350	To be approved by Municipal Engineer.
2.2.2	Water Main PVC	- PVC - PVCO	- Ipex - NAPCO Royal Pipe & Fittings	- Blue Brute - Seal - Bionax	PVC pipe to AWWA C900 / C905/ C909. DR18 Minimum. Compliance with MMCD updated Section 33 11 01 2.2.2.2 for thickened bell and spigot pipe. All PVC / PVCO water mains shall be pigmented blue. Nitro gasket shall be used when hydro carbon is encountered in surrounding soil. Bionax to be accepted for use in seismic condition.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
2.2.3	Water Main HDPE	HDPE	• KWH Pipe • High Performance Pipe • WL Plastics		To be approved by Municipal Engineer.
2.2.4.2/3	Water Main Fitting Ductile Iron	Ductile Iron	• Terminal City Iron Works • Norwood Foundry • Sigma		To be approved by Municipal Engineer. AWWA C153 AWWA C110
2.2.4.4	PVC Injection Molded Fittings	• PVC • PVCO	• IPEX • NAPCO Royal Pipe & Fittings		Fittings to be manufactured to and certified by CSA to CSA Standard B137.2. Fittings to be ULI listed and FM approved. Fittings to have a HDB of 4,000 psi. Fittings to meet NSF Standard 61. IPEX & ROYAL/NAPCO C900 Class 235 5° bend approved.
2.2.4.5	PVC Fabricated Fittings	• PVC • PVCO	• IPEX • Pro-line • Galaxy Plastics		
2.2.9	Nuts and Bolts				Corten Steel
2.2.10	Tie Rod				Corten Steel
2.2.12	Couplings and Flange Coupling Adapters	Plain End Coupler	• Robar • Smith-Blair • Romac • Powerseal • Ford • Krausz Industries	• Robar 1408 • Smith-Blair 461 • Romac XR501 • Powermax 3506 • Ford FC2W • Hymax Grip • Hymax 2	

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
		Flanged Adapter	• Robar • Smith-Blair • Romac • Mueller • EBAA • Clow	• Robar 7404/7406 • Smith-Blair912 • Romac • Mueller • EBAA Iron 1000 • Clow Series 40, DI • Clow Series 90, PVC	
		Restrained Flange Adaptors	• Romac • Uniflange • EBAA	• Romac RFCA • Uniflange RFAP • EBAA 2100	
		Repair Clamps	• Canpac • Mueller • Robar • Clow • Romac	• Canpac CR-2 • Mueller 520 • Robar 400 and 1500 • Clow 100, 200, 300 • Romac SS2	Repair clamps shall be stainless steel.
2.2.13	Joint Restraint Ductile Iron Mains		• UniFlange Series 1400 • EBAA Iron • Clow	• UniFlange Series 1400 • EBAA Iron Megalug1700 • Clow Tufgrip TDG	All joint restraints shall have a pressure rating equal to the mainline pipe. To be approved by Municipal Engineer.
	Joint Restraint PVC / PVCO Mains		• UniFlange • EBAA Iron • Romac	• UniFlange Series 1300 • EBAA Iron MJ Series 1500 • EBAA Iron 1900 • Romac Alpha	No wedge action type for PVC or PVCO pipes. Restraint systems for PVC or PVCO pipe shall be approved by the pipe manufacturer to not reduce the pipe recommended working pressure.
	Restrained Joint Pipe Systems (PVC)		• Ipex • NAPCO Royal Pipe & Fittings	• Ipex Terra Brute • Royal/NAPCO Cobra Lock	

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
	Restrained Joint Pipe Systems (DI)		- US Pipe - McWane	- Field-Lok Gasket - SureStop Gasket	Thrust-Lok will not be allowed.
2.3	Valves and Valve Boxes	75 mm – 300 mm Resilient-seated	- Mueller - Clow Canada - AVK	- Mueller A2362 - Clow 6100 - AVK	All valves shall have epoxy coated ductile iron body to AWWA C 509. With stainless steel bolts.
		350mm or greater Mainline Butterfly Valve	- Pratt - Mueller	- Pratt Groundhog - Mueller Lionseal III	AWWA C 504 Class 150B. With stainless steel bolts.
2.3.4	Blowoff Valve	50mm Resilient Seat Gate Valve	- AVK - Mueller - Clow	- AVK - Mueller A2360 - Clow F6103	AWWA C509
2.3.5	Air Valve		- Apco - Val-Matic - Canpac - Pratt - Crispin	- APCO 140C - Val-Matic 201C - Pratt UL - Crispin UL	
2.3.6	Water Valve Box		- Terminal City - Dobney - Sigma - Armtec	- Dobney D5 - MR6	Nelson type. Cover shall be marked with "Water."
2.3.7	Curb Stop Box		- Dobney - Trojan - Mueller	- Dobney D10 - Trojan VSB - Mueller A726 - Mueller A728	Nelson type. Cover shall be marked with "Water."
	Water Meter		- Sensus - Elster - Neptune		AWWA C700 Min. 150PSi
	Joint Protection	Petrolatum Tape	- Petrowrap - Trenton Tec Tape - Denso		AWWA C209 AWWA C214 AWWA C217-90
2.3.8	Check Valve		Watts	Model 007-QT	CSA / UL Approved

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
2.5	Water Service Connection	High Density Polyethylene	IPex	GoldStripe	Tracer wire to be included.
		PEX	Rehall	Municipex (PexA)	Tracer wire to be included.
2.5.3.2	Saddles for Ductile Iron Mains		• Robar • Canpac • Mueller • Romac	• Robar 2406/2408 • Canpac 313 • Mueller DR2A • Romac 202BS	
2.5.3.3	Saddles for PVC / PVCO Main		• Canpac • Robar • Cambridge Brass • Smith-Blair	• Canpac SC2 • Robar Series 2606 • Cambridge Brass 8403 • Smith-Blair 370	Saddles required for service installation on all PVC / PVCO mains and shall be approved by pipe manufacturer
	Tapping Sleeve for PVCO		• Ford Meter Box • JCM	• Ford FS313 • JCM 422 Series	
	Abandon Service Sleeve		Robar	6636AS	
2.6	Hydrant		• Terminal City • Canada Valve • Clow Canada	• C71P – H105 • “Century” • M93 Brigadier	Must have 100mm Storz fitting on pumper port and painted black, otherwise cap to be painted black.
2.7.2	Corporation Stop	Full Port Ball Valve	• Cambridge Brass • Ford • Mueller • Al-MacDonald	• Cambridge Brass 301 • Ford FB600 • Mueller B25008 • Al-MacDonald 4700	Shall be full-port ball valve to 50 mm only. Use mainline gate valve for sizes >50 mm.
2.7.3	Curb Stop	Full Port Ball Valve	• Cambridge Brass • Ford • Mueller • Al-MacDonald	• Cambridge Brass 202 • Ford B44-343G • Mueller B25209	Shall be full-port ball valve to 50 mm with 90° turn stop. Use mainline gate valve for larger sizes > 50mm.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
				Al-MacDonald 6100	
	Meter Setters	Ball Valve Inlet & ASSE Dual Check Outlet	- Cambridge Brass - Ford - Mueller		
	Meter Pits		Langley Concrete Group	- LCT #37 with cast iron Lid for 20mm and 25mm - LCT #66 with steel lid for 37.55 and 50mm	For outside of roadway use.
3.9	Casing Spacers	As shown on contract drawings	- Uniflange - Calpico	- Uniflange - Calpico	Shall be fabricated cast iron or high density polyethylene insulating spacers designed to center main in the carrier pipe.
33 30 01	Sanitary Sewers				
2.1	Concrete	PVC / PE lined Concrete Pipe	- Langley Concrete Group - Ocean Pipe		To be approved by Municipal Engineer.
2.2	PVC Pipe, Mainline Smooth Profile	PVC SDR35	- IPEX - NAPCO Royal Pipe & Fittings - Diamond - JM Eagle - Northern Pipe Products	- IPEX Ring-Tite - ROYAL/NA PCO Seal - Diamond Sani-21	Sizes > than 750 mm to be approved by the Municipal Engineer.
2.3	Sanitary Service Connection	PVC SDR35 Min 100mm diameter	- IPEX - NAPCO Royal Pipe & Fittings - Diamond - JM Eagle - Northern Pipe Products	- IPEX Ring-Tite - ROYAL/NA PCO Seal - Diamond Sani-21	New PVC main: use manufactured wyes. New or existing ribbed PVC main: use Inserta-Tee.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
	Inspection Chamber	Inspection Chamber	- NAPCO Royal Pipe - Pro-line Fittings - Galaxy Plastics		Series 37 concrete pull box shall be used over driving surface as per MMCD S9 Lid marker Sanitary
		Series 37 Concrete Pull Box	- Langley Concrete Group - Armtec - Diamond Pre-Cast	- LCT #37 with cast iron Lid for 20mm and 25mm - LCT #66 with steel lid for 37.55 and 50mm	
		Inspection Chamber Back-flow check valve	- NAPCO Royal Pipe - Pro-line Fittings - Galaxy Plastics		
	Service Connection Cast Iron Boxes	Cast Iron MR Style	- Westview - Dobney	- TR 8C - MR8	
	Repair Couplers		Rollee, Fernco, Shear Band	Rollee, Fernco, Shear Band	Couplers shall have appropriate adaptor gaskets to suit OD of pipe material being coupled.
33 34 01	Sewage Forcemains				
2.2	Pipes, Joints and Fittings	HDPE with fusion welded joints PVC C900	- KWH Pipe - High Performance Pipe - WL Plastics - IPEX - NAPCO Royal Pipe	C900	AWWA C906. To be approved by Municipal Engineer.
2.3	Valves	Air Valves	- ARI - APCO-ASU - VentoMat		
2.4	Valve Chamber Lid		- Dobney - Westview	Dobney C20	
33 40 01	Storm Sewers				

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
2.1	Concrete Pipe	Non-reinforced Concrete C14-3 Reinforced Concrete C76-III, IV, and V	- Langley Concrete Group - Ocean Pipe		Shall be Q-Cast or PPP Certified.
2.2	PVC Pipe, Mainline Smooth Wall	PVC SDR35	- IPEX - NAPCO Royal Pipe & Fittings - Diamond - JM Eagle - Northern Pipe	- IPEX Ring-Tite - ROYAL/NA PCO Seal - Diamond Sani-21	Sizes > than 750 mm to be approved by the Municipal Engineer.
2.3	PVC Pipe, Mainline Profile		- Ipex - NAPCO Royal Pipe & Fittings	- Ipex UltraRib - Royal Korflo	No spiral ribbed pipe will be allowed.
2.4	HDPE Pipe, Mainline Open Profile	Polypropylene	- Armtec - ADS	- Armtec Boss 2000 - ADS N-12 WT - Sanitite HP	Max dia. 900mm, Min pipe stiffness 320kpa Dual-wall 300-750mm Triple-wall 750-1500mm
2.6	Service Connection	PVC SDR35 Min 150mm diameter	- IPEX - NAPCO Royal Pipe & Fittings - Diamond - JM Eagle - Northern Pipe	- IPEX Ring-Tite - ROYAL/NA PCO Seal - Diamond Sani-21	New PVC main: use manufactured wyes. New concrete main: use PVC stub with bell, pre-cemented with epoxy resin. New or existing ribbed PVC main: use Inserta-Tee. New Profile HDPE mains: Use injection molded PVC manufactured wyes for mains < 300. Other mains: use strap saddles.
	Inspection Chamber	Inspection Chamber	- Le-Ron Plastics Inc. - Pro-line - Galaxy Plastics	- LCT #37 with cast iron Lid for 20mm and 25mm - LCT #66 with steel lid for 37.55 and 50mm	Series 37 concrete pull box shall be used over driving surface as per MMCD S9.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
		Series 37 Concrete Pull Box	- Langley Concrete Group - Armtec - Diamond Pre-Cast		
	Service Connection Cast Iron Boxes	Cast Iron MR Style	- Westview - Dobney	- TR 8 - MR 8	
33 42 13	Pipe Culverts				
2.0	Products				
	End Walls	Concrete	- Langley Concrete Group - Ocean Pipe		Q-Cast or PPP Certified.
		Fiberglass Composite	- CIF Composites - Armtec	Ecolite	For use in poor soil area only.
	Storm Culvert	Reinforced Conc Reinforced Conc Box Corrugated HDPE	- ADS - Armtec	N12 WT Sanitite HP Boss 2000	Max dia. 900mm, Min pipe stiffness 320kpa Dual-wall 300-750mm Triple-wall 750-1500mm Min. dia. 300mm under d/w Min. dia. 400mm under roads. PVC, Ribbed PVC, or corrugated steel requires approval from the municipal engineer for specific installations only. Use HDPE in poor soils Concrete = Q cast or PPP
33 44 01	Manholes and Catchbasins				
2.01	Products				
2.1	Manholes and Catch Basins		- Langley Concrete Group - Ocean Pipe - Diamond Pre-cast		CSA, or Q-Cast or PPP Certified.
2.1.7	Manhole Frame and Cover		- Dobney - Westview Sales Ltd.		Refer to Supplementary Standard Drawings for required lettering on Manhole Covers for sanitary and storm sewers, including in fish habitat areas.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
2.1.7	Telescopic Manhole Frame and Cover		Dobney	AJ633	All arterial roads must use telescopic manhole frame.
2.1.13	Catch Basin and Other Castings	CB Frame	- Dobney - Westview Sales Ltd.	- B24 - TR24	Top Inlet Catch Basin – MMCD Standard Drawing S11.
		CB Grate	- Dobney - Westview Sales Ltd.	- B23 - TR23R&L	Top Inlet Catch Basin – MMCD Standard Drawing S11.
		CB Frame – Side Inlet Assembly	- Dobney - Westview Sales Ltd.	- B39A - TR39A	Refer to Supplementary Standard Drawings COQ-S11A – Side Inlet Catch Basin Assembly.
		CB Grate – Side Inlet Assembly	- Dobney - Westview Sales Ltd.	- B39 - TR39	Refer to Supplementary Standard Drawings COQ-S11A – Side Inlet Catch Basin Assembly.
		Curb Inlet	- Dobney - Westview Sales Ltd.	- B24FTH - TR24C	
		Lawn Basin Grate (600mm Barrel)	- Dobney - Westview Sales Ltd.	- B22A - TR22A	Lawn Drains – MMCD Standard Drawing S12.
		Lawn Basin Grate (300mm Barrel)	- Dobney - Westview Sales Ltd.	- D2A - TR12	Lawn Drains – MMCD Standard Drawing S12.
		Bicycle Friendly CB grate	- Dobney - Westview Sales	- B24A - TR24A	
	Access Hatch		- MSU Mississauga - Bilco - USF Fabrication - Flygt		
	Hydro-Dynamic Grit Separator		- Langley Concrete Group - Contech	- Stormceptor - Vorsentry - CDS	

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
33 49 23	Storm Drainage Water Retention Systems				
2.2	Polypropylene Arched Chamber		ADS Cultec	Stormtech 902HD	
	Polyethylene Arched Chamber		Contech	Chambermaxx	
	HDPE Chamber		Brentwood Industries	Stormtank	
03 40 01	Precast Concrete				
		Concrete MSE Retaining Wall	• Allan Block • Lock Block		

3. ELECTRICAL

The following apply to MMCD and Supplementary Specifications:

Section 26 42 13 Cathodic Protection

Section 26 56 01 Roadway Lighting

Ministry refers to the Ministry of Transportation.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
		Pre-cast Concrete Bases	Langley Concrete Group AE Concrete Fraser Pre-Cast		Ministry approved product.
		Concrete Junction Box	Langley Concrete Group AE Concrete Fraser Pre-Cast	Type 5686 with galvanized steel lid	Ministry approved product.
		Plastic Junction Box	West Coast Engineering Ltd.	#25010 box section with #25310 galvanized steel lid	Ministry approved product.
		R.PVC Conduit & Fittings	• IPEX • NAPCO Royal Pipe & Fittings		To CSA C22.2 No. 211.2 & C22.2 No. 5.
		Trench Marker Tape	• Brandy Indentoline • Panduit • T&B		Yellow marked "danger electrical."
		Anchor Bolts	• West Coast Engineering Ltd. • Nova Pole International		Ministry approved product.
		Poles	• West Coast Engineering Ltd. • Nova Pole International • Polecom		Ministry approved product except for powder coating.
		Signal Head C/W Visors	• Econolite • Eagle	Aluminum or Poly, Green or Yellow	Ministry approved product. Colour must be uniform for complete intersection.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
		Aluminum Yellow Backboard	- Econolite - Eagle		Ministry approved product with 50mm wide ASTM VI retro-reflective tape around the outer edge.
		LED Traffic Signal Displays	Dialight	XL15, Tined Lens	No substitutions
		Bi-Modal Yellow/Green LED Arrow Display	Dialight		Ministry approved product.
		Green LED Arrow Display	Dialight		Ministry approved product.
		Overlay Hand/Person Pedestrian LED Signal Display	- Gelcore - Dialight	16" x 18"	Ministry approved product.
		Countdown Pedestrian LED Display			16" x 18" Overlay Countdown
		Overhead Signal Head Adjustable Bracket	- Econolite - Electromega - ITS	- Pelco-Astro Brac - Pelco-Astro Brac	Cable Mount Bracket Assembly.
		Side Signal Head Mounting	Greenlite Traffic	GEL 189	Ministry approved product.
		Audible Pedestrian Signal Pushbuttons	Polara Engineering Inc. Astrographic Industries RTB APS	Navigator or iNavigator RTB-APS Complete	Yellow housing with walking man symbol.
		Pedestrian Pushbuttons	Polara Engineering Inc.	Bull Dog model BDLM2	Momentary LED Model with Yellow Housing.
		Cobra Head Luminares	LED Roadway Lighting	NXT Series	LED Only. Supplied and wired to accept photocell where required.
		Type A 175W Sign Luminaire	- Holophane - GE	- Predator MoTH PD175MV12K W4G - Versaflood II Sign Lighter V2FS17M1A1 PSN4GRP c/w SOW Cable	Ministry approved product.
		Photocell	Precision Multiple Controls Inc.	8690N (105-285V)	To ANSI C136.10.

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
		LED Lamps	LED Roadway Lighting – NXT series	3000K Low Volume 4000K Arterial & Controlled Intersection	HPS/HID No Longer permitted for New Development
		Decorative LED Fixtures	Lumca	CPL Series	
		Service Panel	Valid Manufacturing Ltd.	MMCD Spec	
		Conductor Tags	Andec Agencies	A400Y	
		Fuses (10A)	- Buss - Gould Shawmut	- BAN-10 - OTM	
		Fuse Holders	- Tron - Gould Shaw	- HEB-AA - GEB-AA	
		Light Pole Security	TransCanada Traffic	WireSentry	
		Light Pole Hand-Hole Covers	- Nova Pole - Valmont	- Nova Lock Security - Valmont Tamper Resistant Hand Hole Cover	
		Extruded Aluminum Signs (advance warning signs)	- Astrographic Industries - Valley Inprotect - Sherine		Ministry Specifications (ASTM sheeting)
		Illuminated Pedestrian Crosswalk Signs	Valid Manufacturing Interprovincial Traffic Systems	PED3x4DLMH	LED down light supplied.
		Autoscope Solo Terra Cable for Video Detection Cameras	- Vision - Econolite	#1175-010 or -011, 3 conductor, 18 AWG, 600V Polyethylene jacket, rated for conduit	
		Opticom Pre-emption Cable	3M Opticom cable	700 series Model 138	764 Detector Cards
		Battery Backup	Alpha		

MMCD Section	Section Description	Product	Manufacturer	Approved Model	Restrictions/Additional Specifications
		Radio Communication	Encom	5.8 GHz	

4. LANDSCAPING

Where brand names are specified for a product, any proposal for an alternate product requires the approval of the Manager of Parks Design and Development.

The Manager may vary the requirements of Schedule D in circumstances that he considers it to be appropriate.

Product Name	Manufacturer/Supplier	Model Name and Number	Comments
Benches	Benchworks	Teak Heritage Natural	Murrayville Murray's Corner
	Frances Andrew	24 Series Model G24322 Surface mount Black	Brookwood 200 Street
		C10-3A With Fort Langley cast inset legs	Fort Langley Downtown
		C10-3A	Walnut Grove 88 Avenue
		Centennial C22-3A Black	East – West greenways in Northeast Yorkson
		Pipeline P15-76 with arms Black	Aldergrove On 272 Street between 29 Avenue - Bertrand Creek
		Pipeline P15-76 armless Grey	Walnut Grove 88 Avenue
		S4-61	Murrayville Core
	Habitat	Victor Stanley Goblet FR-7 6' Black	East –West greenways in Southwest Gordon Estates and Northeast Yorkson
		Victor Stanley Classic C-138 6' black	North-South Greenways Southwest Gordon 200 Street Northeast Yorkson 200 Street

Product Name	Manufacturer/Supplier	Model Name and Number	Comments
	Playtech	Urban Accessories Transit Bay With back – Black Without back- Black	Aldergrove Fraser Highway 270 Street – 273 Street
	Sudden Fun	Prestige PP301D Green	Willowbrook 197 Street and 198 Street 64 Avenue – Willowbrook Drive
	Wishbone	Bayview BV-6 Black with tan Slats	Willoughby Northeast Gordon Estates Greenways 72 Avenue, 70 Avenue, 68 Avenue 208 Street, 207 Street, 206 Street Northwest Yorkson Greenways 84 Avenue, 82 Avenue, 80 Avenue, 200 Street, 208 Street
Bike Rack	Cora	W4508 Black	Confirm bike capacity with Green Infrastructure Services
	Playtech Distributers Inc.	Heritage Castings & Ironworks 9410, Black	Aldergrove on Fraser Highway Between 270 Street and 276 Street Fort Langley Downtown
	Frances Andrew Site Furnishings Ltd.	E12 BRO1 – Black	Brookswood
		Frances Andrew Site Furnishing, L24-32TOL, Glossy black	Fort Langley Downtown
Doggy bag Dispensers	MBM Metal Fabricators	Model: G3 (6x4x15 T Shirt Bags)	
Doggy Bags	Polypak Ltd.	T-Shirt bags, TS-0615 WH	
Drinking Fountain	Frances Andrew Site Furnishings Ltd.	DF-2-BF-BH, Glossy Black	Free standing drinking fountain with bottle filler and dog bowl attachment lug.
Fence Post Bracket	Country Lumber	Simpson Strong Tie CBSS NER-422 – 6mm	
Geotextile Fabric/Filtercloth	Nilex	C-34/4533 non- woven	

Product Name	Manufacturer/Supplier	Model Name and Number	Comments
Granular Surface Course	Jack Cewe	Rock Dust	Pipeline Pit Coquitlam See Specs for sieve requirements Not suitable for Equestrian Trails
	Lehigh	10mm Screenings or Crusher Dust	Skyway or Sechelt Pit See Specs for sieve requirements Suitable for Equestrian Trails
	Mainland Sand and Gravel	9mm minus	See Specs for sieve requirements Suitable for Equestrian Trails
Irrigation	Rainbird	Potted Latching Solenoid	Solenoid
		TBOS Rain Shut-off Device	Moisture Monitor
		TBOS – multi station, battery operated	Valve controller
		Schedule 40 PVC unless otherwise designated	Nipples and fittings
		PVC 1120 or 1220 Class 200, Class 60 or as indicated on drawings	Pipe
		#5RC	Quick coupler
		Rotary nozzles	
		PGA-PRS solenoid	Valve with PRS Dial
	NDS	NDS Model 1324, drop in stainless steel bolt down cover	Valve box
Multi-stream waste receptacle	To be specified by the Township of Langley	To be specified by the Township of Langley	To be installed by the Township, unless otherwise noted by the Manager, Green Infrastructure Services
Padlocks	Habitat Systems Inc. Acklands Granger - Surrey	SM52 #1 Master Key	For bollards, doggy bag dispensers and gates
Paving Support	Deep Root Products	Silva Cell™	Tree Installation
Paving Support	Deep Root Products	Silva Cell™	Tree Installation
Picnic Table	Sanderson Concrete Inc.	Standard or accessible Columbia table plain concrete seats with cedar top	
Pre-cast sign post footing	Ericsson Manufacturing Ltd.	B-37 kg	For ToL dome signs

Product Name	Manufacturer/Supplier	Model Name and Number	Comments
Reflective Tape (MMCD 32 31 13)	Acklands Grainger 3M dealers General products	3M diamond 100mm wide red reflective tape 981-32-4x50	Bollards, gate
Rigid cell pavers	Nilex	Tufftrack Grassroad pavers	Emergency access across greenway
	Presto GeoBlock Rigid Paving System	Geoblock Porous Pavers	Emergency access across greenway
	Playtech Distributers Inc.	Grass Pave2	Emergency access across greenway
Root barrier (MMCD 32 93 01)	Deep Root Products	UB 12-2 UB 18-2	Tree installation see detail for depth
	Vespro Inc.	RS-12 RS - 18	Tree installation see detail for depth
Security Nut	OEM Hardware ½" Triple Groove Security Nut 113-7GN	3/8" Triple groove security nut Part No. 316-TGN	Sign installation, bench installation, bike rack installation
Structural Soil (MMCD 32 91 21)	Veratec (Formerly Yardworks)	Sure Base	10 cubic meters of growing medium (not including aggregate) required per tree
Topsoil (MMCD 32 91 21 – 2.10)	Veratec (Formerly Yardworks)	Growing Medium	Must conform to relevant specification section
	Richmond Energy Garden and Compost (formerly Fraser Richmond Soil and Fibre)	Growing Medium	Must conform to relevant specification section
	Eco-Soil	Growing Medium	Must conform to relevant specification section
	West Creek Farms	Growing Medium	Must conform to relevant specification section
	Gawley and Sons	Growing Medium	Must conform to relevant specification section
	Alnor	Growing Medium	Must conform to relevant specification section
Tree Grate (MMCD 32 93 01)	Dobney Foundry Ltd.	Dobney Foundry Ltd SP48, Black	
Tree strapping (MMCD 32 93 01)	Dinesen Nurseries	50mm – woven polyester banding	Tree installation
Tree trunk protector (MMCD 32 93 01)	Pacific Arborist Supplies	ArborGuard + AG 9-4	Tree installation
	NorthWest Landscape & Stone Supply	ArborGuard + AG 9-4	Tree installation

TOWNSHIP OF LANGLEY

**SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW**

SCHEDULE E

ACCEPTED STREET TREES

AND

PLANTS NOT ACCEPTED FOR USE

SCHEDULE E

**ACCEPTED STREET TREES AND
PLANTS NOT ACCEPTED FOR USE**

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E1. ACCEPTED STREET TREES

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Very Large	Aesculus x Carnea 'Briotii'	Ruby Red Horse Chestnut	Up to 80	10-12		Moderate	Dense	Red	Yellow	See end of table3
Large	Abies grandis	Grand Fir	25	10-12		Moderate	Moderate	-	-	See end of table3
Large	Acer rubrum 'Autumn Flame'	Autumn Fantasy Maple	15	10-12		Fast	Moderate	-	Bright red	-
Large	Acer rubrum x freemanii 'Jeffersred'	Autumn Blaze Maple	15	10-12		Moderate	Moderate	-	Orange-red	-
Large	Acer saccharum	Sugar Maple	20	10-12		Moderate	Dense	-	Yellow Red	Stronger & slower than Norway Maple
Large	Betula nigra	River Birch	12-20	10-12		Fast	Moderate	-	Yellow	See end of table ³
Large	Cercidiphyllum japonica	Katsura Tree	15-20	8-10		Slow	Open	-	Scarlet	Protect from hot sun and dry wind
Large	Davidia involucrata	Dove Tree	10-20	10-12		Moderate	Moderate	White	-	Large brown fruit hangs on over winter
Large	Fagus sylvatica	European Beech	10-20	12-15		Slow	Dense	-	Bronze	Leaves purple or copper
Large	Fagus sylvatica 'Dawyck Purple'	Dawyck Purple Beech	20	8-10		Slow	Moderate	-	Dark purple	-
Large	Fagus sylvatica 'Purpurea'	Purple European Beech	10-20	12-15		Slow	Dense	-	Bronze	Leaves purple or copper
Large	Fagus sylvatica 'Riversii'	Rivers Purple Beech	10-20	12-15		Slow	Dense	-	Purple-bronze	Purple foliage

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Large	Fraxinus americana 'Empire'	Empire Ash	20	8-10		Moderate	Moderate	-	Rusty purple	Seedless
Large	Fraxinus pennsylvanica 'Marshall'	Marshall's Ash	15-25	10-12		Moderate	Dense	-	Yellow	Few or no seeds
Large	Ginkgo biloba	Maidenhair Tree	12-18	12-15		Slow	Open	-	Yellow	-
Large	Gleditsia triacanthos inermis 'Shademaster'	Honey Locust	10-18	10-12		Fairly rapid	Open	-	Yellow	Upright
Large	Gleditsia triacanthos inermis 'Skyline'	Skyline	20	10-12		Fairly rapid	Open	-	Yellow	Dark green leaves
Large	Gleditsia triacanthos 'Suncole'	Sunburst Honey Locust	10-18	10-12		Fairly rapid	Open	-	Yellow	Yellow
Large	Magnolia grandiflora	Evergreen Magnolia	20-40	8-10		Slow	Moderate	Large creamy	-	-
Large	Phellodendron amurense	Cork Tree	9-14	9-15		Moderate	Open	Yellow-green	Yellow	Fragrant leaf, interesting bark
Large	Quercus coccinea	Scarlet Oak	10-22	10-12		Moderate	Moderate	-	Scarlet	For median use only
Large	Quercus garryana	Oregon White Oak	6-15	10-12		Moderate	Moderate	-	-	Roots non-aggressive, deep ¹
Large	Quercus palustris	Pin Oak	12-27	10-12		Moderate	Dense	-	Scarlet	Horizontal branching ²
Large	Quercus phellos	Willow Oak	6-20	10-12		Fairly rapid	Moderate	-	Yellow	Fine texture foliage ¹

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Large	Quercus rubra	Red Oak	25	12-15		Rapid	Dense	-	Red	See end of table ³
Large	Quercus shumardii	Shumard Oak	15	10-12		Moderate	Moderate	-	Red	Dark green foliage ¹
Large	Robina pseudoacacia cultivaris	Black Locust	10-15	10-12		Fast	Moderate	-	Yellow	See end of table ³
Large	Thuja plicata	Western Red Cedar	25	10-12		Rapid	Open	-	-	See end of table ³
Medium to Large	Catalpa speciosa	Northern Catalpa	12+	8+		Moderate-fast	Moderate	Orchid shaped white	Yellow	Greenways parks
Medium to Large	Prunus serrulata 'Amanogawa'	Amanogawa Cherry	10-22	10-12		Moderate	Moderate	Pale pink	Red	Bronze foliage
Medium	Acer x freemanii	Scarlet Sentinel Maple	13	8-10		Moderate	Moderate	-	-	-
Medium	Acer platanoides 'Crimson King'	Crimson King Maple	15-25	10-12		Moderate	Dense	-	Red Brown	-
Medium	Acer platanoides 'Crimson Sentry'	Crimson Sentry Maple	12	8-10		Moderate	Moderate	-	Deep purple	-
Medium	Acer platanoides 'Deborah'	Deborah Maple	13	8-10		Moderate	Moderate	-	Bronze	Early reddish leaves, turn bronze-green
Medium	Acer platanoides 'Drummondii'	Variegated Maple	10	8-10		Moderate	Moderate	-	Yellow	-
Medium	Acer platanoides 'Emerald Queen'	Emerald Queen Maple	10	8-10		Moderate	Moderate	-	Yellow	-

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Medium	Acer platanoides 'Fairview'	Fairview Maple	15	8-10		Moderate	Moderate	-	Yellow	Reddish new growth, bronze-green mature growth
Medium	Acer platanoides 'Princeton Gold'	Princeton Gold Maple	13	8-10		Moderate	Moderate	-	Yellow	-
Medium	Acer platanoides 'Summershade'	Summershade Maples	11	12		Moderate	Moderate	-	Yellow	Light green
Medium	Acer pseudoplatanus	Sycamore Maple	12	10-12		Moderate	Dense	-	Yellow	-
Medium	Acer pseudoplatanus 'Atropurpureum'	Spaethii Maple	12	10-12		Moderate	Dense	-	Yellow	Purple underside of green leaf
Medium	Acer rubrum	Red Maple	13	10 - 12		Fairly Rapid	Dense	-	Red	-
Medium	Acer rubrum 'Autumn Flame'	Autumn Flame Maple	12	8-10		Moderate	Moderate	-	Red	-
Medium	Acer rubrum 'Bowhall'	Bowhall Maple	13	8-10		Moderate	Moderate	-	Yellow orange reddish orange	-
Medium	Acer rubrum 'Karpick'	Karpick Maple	15	8-10		Moderate	Moderate	-	Yellow to orange	-
Medium	Acer rubrum 'Morgan'	Morgan Maple	14	10-12		Moderate	Dense	-	Orange-red	-
Medium	Acer rubrum 'October Glory'	October Glory Maple	6 - 16	8-10		Moderate	Moderate	-	Deep red	-
Medium	Acer rubrum 'Red Sunset'	Red Sunset Maple	11	8-10		Moderate	Moderate	-	Red	-

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Medium	Acer truncatum 'Norwegian Sunset'	Norwegian Sunset Maple	14	8-10		Moderate	Moderate	-	Red	-
Medium	Acer truncatum 'Pacific Sunset'	Pacific Sunset Maple	10	8-10		Moderate	Moderate	-	Red	-
Medium	Acer x freemanii 'Jeffersred'	Autumn Blaze Maple	10	8-10		Moderate	Moderate	-	Orange-red	-
Medium	Carpinus betulus	European Hornbeam	13	8-10		Moderate	Dense	-	Yellow	-
Medium	Carpinus betulus 'Fastigiata'	Pyramidal European Hornbeam	11	8-10		Moderate	-	-	Yellow	-
Medium	Carpinus betulus 'Fastigiata'	Fastigate Hornbeam	10	8-10		Moderate	Dense	-	Yellow	-
Medium	Carpinus betulus 'Frans Fontaine'	Frans Fontaine Hornbeam	15	8-10		Moderate	Moderate	-	Yellow	-
Medium	Catalpa bignoides	Catalpa/Indian Bean Tree	8-12	8+		Moderate-fast	Moderate	Orchid shaped white	Yellow	Smaller than speciose, greenways parks
Medium	Catalpa bignoides 'Aurea'	Golden Catalpa/Golden Indian Bean Tree	8-12	8+		Moderate-fast	Moderate	Orchid shaped white	Yellow, reddish tinge in spring	Smaller than speciose, greenways parks
Medium	Cedrus atlantica	Atlantic Cedar	13	10-12		Slow	Open	-	-	See end of table ³
Medium	Cercis canadensis	Eastern Redbud	12	10-12		Fairly rapid	Open	Purple pink	Yellow	Some horizontal branching in age
Medium	Chamaecyparis nootkatensis	Yellow Cedar	15	8-10		Slow	Moderate	-	-	Graceful ³

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Medium	Cladrastis kentukea'	Yellowwood	8-12	8+		Moderate	Moderate	White	Yellow	All areas but medians
Medium	Cladrastis kentukea Perkins Pink'	Perkin's Pink Yellowwood	8-12	8+		Moderate	Moderate	Pink	Yellow	All areas but medians
Medium	Fagus sylvatica	Golden Fastigate Beech	10	8-10		Slow	moderate	-	Yellow	-
Medium	Fagus sylvatica 'Fastigiata'	Dawyck Beech	12	8-10		Moderate	Moderate	-	Purple	-
Medium	Fraxinus americana	White Ash	6-12	10-12		Fairly rapid	Dense	-	Purple	-
Medium	Fraxinus americana 'Autumn Applause'	Autumn Applause Ash	12-15	10-12		Rapid	Dense	-	Purple	-
Medium	Fraxinus excelsior	European Ash	12	10-12		Fairly rapid	Open	-	Yellow	Male, seedless variety
Medium	Fraxinus excelsior 'Westhof's Glorie'	Westhof's Glory Ash	12-15	10-12		Rapid	Open	-	Yellow	-
Medium	Fraxinus oxycarpa	Raywood Ash	15	10-12		Rapid	Open	-	Yellow	-
Medium	Fraxinus pennsylvanica 'Patmore'	Patmore Green Ash	13	10-12		Moderate	Open	-	Yellow	Seedless
Medium	Fraxinus pennsylvanica 'Summit'	Summit Ash	15	10-12		Moderate	Open	-	Yellow	Seedless
Medium	Ginkgo biloba 'Princeton Sentry'	Princeton Sentry Maidenhair	14	10-12		Moderate	Open	-	Bright yellow	-

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Medium	<i>Gleditsia triacanthos</i> 'Halka'	Halka Honey Locust	15	10-12		Moderate	Open	-	Yellow	-
Medium	<i>Halesia monticola</i>	Mountain Silver Bell	13	10-12		Moderate	Open	White	Yellow	-
Medium	<i>Liriodendron tulipifera</i>	Tulip Tree	10-18	12-15		Fairly Rapid	Dense	-	Yellow	Unique tulip-shaped leaves ³
Medium	<i>Liriodendron tulipifera</i> 'Fastigiatum'	Columnar Tulip Tree	13	12-15		Fairly rapid	Dense	-	Yellow	Unique tulip-shaped leaves ³
Medium	<i>Liquidambar styraciflua</i>	American Sweet Gum	12-18	10-12		Moderate	Dense	-	Scarlet	Bark deeply furrowed
Medium	<i>Liquidambar styraciflua</i> 'Worplesdon'	Worplesdon Sweetgum	10-20	10-12		Moderate	Moderate	-	Orange Purple	-
Medium	<i>Metasequoia glyptostroboides</i>	Dawn Redwood	8-15	12-15		Rapid	Moderate	-	-	Deciduous conifer ³
Medium	<i>Nyssa sylvatica</i>	Black Gum	13	10		Slow	Moderate	-	Hot coppery red	-
Medium	<i>Oxydendrum arboreum</i>	Sourwood	7-12	4-8	 	Very slow	Moderate-Dense	White	Red	Stunning fall colour, all areas but medians
Medium	<i>Parrotia persica</i>	Persian Ironwood	7-12	7-10	 	Slow	Moderate		Yellow Orange Red	Low branching vibrant fall colour ³

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Medium	<i>Pseudotsuga menziesii</i>	Douglas Fir	15	10-12		Moderate	Open	-	-	BC native tree ³
Medium	<i>Quercus palustris</i> 'Pringreen'	Green Pillar Pin Oak	12-18	3-5		Moderate	Moderate	-	-	Showy fall colour, all areas
Medium	<i>Quercus shumardii</i>	Shumard Oak	10	10-12		Moderate	Open	-	Scarlet	For median use only
Medium	<i>Zelkova serrata</i> 'Green Vase'	Green Vase Zelkova	25	10-12		Fairly rapid	Dense	-	Yellow-orange	Finer textured
Small	<i>Abies fraser</i>	Fraser Fir	9	8-10		Moderate	Moderate	-	-	See end of table ³
Small	<i>Acer buergerianum</i>	Trident Maple	15-18	10		Moderate	Open	-	Red Orange	Consider for R-CL compact and rowhouse lots
Small	<i>Acer campestre</i> 'Evelyn'	Queen Elizabeth Maple	8	10		Moderate	Moderate	-	Yellow	Consider for R-CL compact and rowhouse lots
Small	<i>Acer davidii</i>	Snake Bark Maple	10	10-12		Moderate	Dense	-	Yellow Purple	Consider for R-CL compact and rowhouse lots
Small	<i>Acer ginnala</i>	Amur Maple	10	8-10		Rapid	Dense	-	Scarlet	See end of table ³
Small	<i>Acer griseum</i>	Paperbark Maple	6	8-10		Moderate	Open	-	Red	Consider for R-CL compact and rowhouse lots
Small	<i>Acer negundo</i>	Box Elder	10	8-10		Fast	Open	-	Yellow-green	Consider for R-CL compact and rowhouse lots
Small	<i>Acer palmatum</i>	Japanese Maple	6	8-10		Moderate	Open	-	Depends on variety	Consider for R-CL compact and rowhouse lots

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Small	Acer platanoides 'Columnar'	Columnar Maple	13	8-10		Moderate	Moderate	-	Dark green	Stiff parallel branches
Small	Acer platanoides 'Globosum'	Globe Norway Maple	14	10-12		Fairly Rapid	Dense	Yellow	Yellow	Consider for R-CL compact and rowhouse lots
Small	Amelanchier canadensis	Shadblow Serviceberry	4	8-10		Slow	Open	White	Yellow Red	Consider for R-CL compact and rowhouse lots
Small	Amelanchier laevis	Alleghany Serviceberry	5-8	8 - 10		Fairly rapid	Moderate	White	Yellow Red	Consider for R-CL compact and rowhouse lots
Small	Carpinus japonica	Japanese Hornbeam	6-10	8-10		Moderate	Dense	-	Bronze	Consider for R-CL compact and rowhouse lots
Small	Cercis canadensis	Redbud	9	8-10		moderate	Dense	-	-	See end of table ³
Small	Chionanthus virginicus	Fringe Tree	3-6	2.5-4		Slow	Moderate	Showy, fragrant white	Yellow	All areas but medians
Small	Cornus florida	Flowering Dogwood	6	8-10		Moderate	Dense	White	Scarlet	Consider for R-CL compact and rowhouse lots
Small	Cornus kousa 'Satomi'	Satomi Dogwood	5-10	8-10		Moderate	Open	-	-	Consider for R-CL compact and rowhouse lots
Small	Cornus nuttallii 'Eddie's White Wonder'	Pacific Flowering Dogwood	6	8-10		Moderate	Open	White	Red	Consider for R-CL compact and rowhouse lots
Small	Cornus rutgan	Stellar Pink Dogwood	9	8-10		Moderate	Open	Light pink	Bright Red	Consider for R-CL compact and rowhouse lots
Small	Crataegus crusgalli	Cockspur Hawthorne	6	8-10		Moderate	dense	Small white	-	Thorns, red persistent fruit ³

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Small	<i>Crataegus laevigata</i>	Hawthorne	6	8-10		Moderate	dense	Scarlet to rose	-	See end of table ³
Small	<i>Crataegus lavalleyi</i>	Carriere Hawthorn	10	8-10		Moderate	Dense	White	Bronze	Orange persistent fruit ³
Small	<i>Fraxinus pennsylvanica</i> 'Johnson'	Leprechaun Ash	5-8	8-10		Moderate	Dense	-	Yellow	Consider for R-CL compact and rowhouse lots
Small	<i>Koeleruteria paniculata</i>	Golden Rain Tree	4.5-7	6-8		Slow-moderate	Open	Showy sulphur yellow	Yellow	All areas but medians
Small	<i>Magnolia</i> 'Galaxy'	Galaxy Magnolia	6	8-10		Moderate	Moderate	Red-purple	Reddish	Consider for R-CL compact and rowhouse lots
Small	<i>Magnolia kobus</i>	Kobus Magnolia	9	10-12		Rapid	Moderate	White	Yellow	Consider for R-CL compact and rowhouse lots
Small	<i>Magnolia sieboldii</i>	Oyama Magnolia	9-12	8-10		Moderate	Moderate	White	Yellow	Consider for R-CL compact and rowhouse lots
Small	<i>Magnolia x soulangiana</i>	Saucer Magnolia	9	8-10		Moderate	Open	White	Yellow	Consider for R-CL compact and rowhouse lots
Small	<i>Magnolia stellata</i>	Stellar Pink Magnolia	7	8-10		Moderate	Moderate	Pink	Yellow	Consider for R-CL compact and rowhouse lots
Small	<i>Malus floribunda</i>	Flowering Crabapple	10	8-10		Moderate	Dense	White	Yellow	Deep pink buds ³
Small	<i>Ostrya virginiana</i>	American Hop Hornbeam	7-12	6-9		Slow	Moderate	-	Yellow	Seed pods have winter interest, all areas

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Small	Parrotia persica	Persian Ironwood	4-8	8-10		Slow	Moderate	-	Yellow Orange Red	Only higher branching smaller cultivars to be used as street trees
Small	Pinus contorta	Shore Pine	6-9	10-12		Moderate	Open	-	-	See end of table ³
Small	Prunus 'Newport'	Newport Plum	10	8-10		Moderate	Dense	Pink	Purple	Reddish-purple foliage ³
Small	Prunus serrulata 'Akebono'	Japanese Flowering Cherry	7	10-12		Moderate	Moderate	Light pink	Red	Consider for R-CL compact and rowhouse lots
Small	Prunus serrulata 'Kwanzen'	Japanese Flowering Cherry	6-8	10-12		Moderate	Moderate	Rosy pink	Red	Bronze foliage ³
Small	Quercus robur	English Oak	6-8	10-12		Fairly rapid	Open	-	Yellow Brown	For median use only
Small	Sorbus aucuparia	Mountain Ash	9	8-10		Moderate		White	-	Red fruit ³
Small	Stewartia pseudocamellia	Japanese Stewartia	5-8	8-10		Slow	Open	White	Orange-red to purple-red	Consider for R-CL compact and rowhouse lots
Small	Styrax japonicus	Snowdrop Tree	8	8-10		Slow to moderate	Open	White	Yellow	Consider for R-CL compact and rowhouse lots
Small	Styrax obassia	Fragrant Snowbell	7	8-10		Moderate	Dense	White	Yellow	Consider for R-CL compact and rowhouse lots

Size	Botanical Name	Common Name	Height m	Spacing m	Tree Form	Growth Rate	Shade	Flower	Autumn Colour	Comments
Small	Syringa reticulata	Ivory Silk Tree	7	8-10		Moderate	Moderate	Cream	-	Consider for R-CL compact and rowhouse lots

¹ For median use only.

² Use sparingly as a street tree and only where there is a wider boulevard.

³ Do not use as a street tree. Use only in the back of greenways or larger park areas.

E2. PLANTS NOT ACCEPTED FOR USE IN PUBLIC LANDSCAPE AREAS

Poisonous plants including, but not limited to, plants listed in Children's Playspaces and Equipment CAN/CSA-Z614-98, shall not be permitted.

Invasive species are not permitted including, but not limited to:

SHRUBS	COMMON NAME
Buddleia davidii	Butterfly bush
Cytisus scoparius	Scotch broom
Daphne laureola	Spurge laurel
Fallopia japonica	Japanese knotweed
Heracleum mantegazzianum	Giant hogweed
Ilex aquifolium	English holly
Pinus mugo	Mugo pine
Viburnum opulus	Snowball bush
Viburnum tinus	Laurustina viburnum
Viburnum davidii	David viburnum
Bamboos including but not limited to Arundinaria spp.; Bambusa spp. and Phyllostachys spp.	All bamboo plants
PERENNIALS	
Clematis vitalba	Old man's beard
Foeniculum vulgare	Common fennel
Impatiens gladiifera	Policeman's helmet / Himalayan balsam
Iris pseudoacorus	Yellow flag iris
Lysimachia vulgaris	Garden loosestrife
Lythrium salicaria	Purple loosestrife
Nymphaea odorata	Fragrant water lily
Phalaris arundinacea	Reed canary grass/Ribbon Grass
Polygonum albertii	Silver lace vine
Senecia jacobea	Tansy ragwort
Verbena honariensis	Purple verbena
GROUNDCOVERS	
Arctostaphylos uva ursa	Kinnickinnick
Festuca glauca	Blue fescue grass
Hedera helix	English ivy
Erica spp.	Heaths
Lamium galeobdolon	Lamium / yellow archangel
Rubus discolor	Himalayan blackberry
Vinca spp.	Periwinkle

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TOWNSHIP OF LANGLEY

SUBDIVISION AND DEVELOPMENT SERVICING BYLAW

SCHEDULE F

SERVICING AGREEMENT



THE CORPORATION OF THE TOWNSHIP OF LANGLEY

SERVICING AGREEMENT

No. _____

between

THE CORPORATION OF THE TOWNSHIP OF LANGLEY

and

THIS AGREEMENT made this _____ day of _____, 20__ ;

BETWEEN: THE CORPORATION OF THE TOWNSHIP OF LANGLEY, a District Municipality incorporated under the Municipal Act of the Province of British Columbia, and having its Municipal Offices at 20338 - 65 Avenue, Langley, British Columbia, (hereinafter called the Municipality)

OF THE FIRST PART

AND: _____
(hereinafter called the Owner)
OF THE SECOND PART

WHEREAS:

A. The Owner holds an interest in lands and premises within the Township of Langley, in the Province of British Columbia, more particularly known and described as follows:

(hereinafter called the Lands)

B. The Owner desires to subdivide the Lands or develop on the Lands.

C. The Approving Officer of the Municipality has agreed to approve the subdivision of the Lands or the Building Inspector has agreed to issue a building permit subject to the terms and conditions contained in this Contract, the posting with the Municipality of the Security Deposit described herein and satisfaction of any other applicable terms and conditions.

NOW THEREFORE THIS AGREEMENT WITNESSES that in consideration of the promises, covenants and agreements hereinafter set forth, the parties hereto covenant, agree, represent and promise as follows:

APPENDICES

1. The following Appendices shall be read with and form part of this Agreement:

Appendix "A" - A copy of the subdivision plan of the Lands or of the Building Permit application;

Appendix "B" - A list of the Works and Services and an estimate of their respective construction costs.

Appendix "C" - Design drawings to be used for the Works and Services.

OWNER TO DO WORK

2. The Owner covenants and agrees to construct and provide all the Works and Services listed and shown on Appendices "B" and "C" hereto, as accepted by the Municipality, in accordance with the standards contained in the Municipality's Subdivision and Development Servicing Bylaw (hereinafter called the Bylaw). The Owner shall from time to time and at all times so long as it exercises any rights of ownership in the said Lands upon the request of the Municipal Engineer, and to the satisfaction of the Municipality make, do and execute or cause or procure to be made, done and executed, all such further acts, deeds, rights-of-way, easements and assurances for the more effectual carrying out of this Agreement.

TRANSFER OF INTEREST IN WORKS

3. The Owner covenants and agrees with the Municipality to assign, transfer and convey to the Municipality all of its right, title and interest in the Works and Services on any and all of the Lands, upon or in which the Works and Services are situated, upon the completion of the Works and Services, (as witnessed by the issuance of a Certificate of Substantial Completion).

PERMISSION TO DO WORK

4. The Municipality covenants and agrees to permit the Owner to construct the Works and Services, including that portion of the Works and Services to be constructed on dedicated Highways controlled by the Municipality; on the terms and conditions herein, as specified in Appendix C. Nothing in this Agreement shall be construed as an undertaking, promise or covenant on the part of the Municipality to make available the use of or access to the Works and Services for any purpose, and without limiting the foregoing, for the purpose of serving the Lands or any other real property whatsoever either owned or controlled by the Owner or its associates or otherwise, but rather the Municipality reserves the right in its sole and absolute discretion to make available, operate, alter, use, extend, diminish,

		discontinue, tear up, sell, rent or otherwise dispose of the Works and Services as the Municipality from time to time deems fit.
CHANGES TO BYLAWS	5.	The Owner covenants and agrees to comply with any changes in requirements or standards enacted by bylaw prior to the issuance by the General Manager Engineering of the Municipality (hereinafter called the Municipal Engineer) of Permission to Construct the Works and Services contemplated by this Agreement.
LOT GRADING	6.	The Owner covenants and agrees to adhere in all respects to the contours, elevations and drainage patterns indicated on the lot grading plan which is attached to Appendix "C" to this Agreement.
START OF WORK	7.	The Owner covenants and agrees not to commence work until the Municipal Engineer provides the Owner with written Permission to Construct.
COMPLETION OF WORK	8.	The Owner shall complete the construction of the Works and Services, specified in Appendix "C" as Project No. _____ of the Municipality to the satisfaction of the Municipality, within one (1) year from the date of this Agreement. In the event the landscape work cannot be completed due to inclement weather conditions, the Security Deposit as required in Clause 20 shall be renewed so as to include two complete growing seasons.
OWNER TO GRANT RIGHTS- OF-WAY	9.	The Owner covenants and agrees to grant to the Municipality all necessary road dedications, statutory rights-of-way and easements over the said Lands to accommodate the said Works and Services and, where the said Works and Services are located upon or under privately owned lands other than the said Lands, to obtain at the Owner's expense and to the satisfaction of the Municipal Engineer, all necessary road dedications, statutory rights-of-way and easements over such Lands, in favour of the Municipality where applicable, to accommodate the said Works and Services.
DESIGN	10.	The Owner covenants and agrees that all Works and Services required herein, except for trees, boulevard plantings, trails, greenways, development fence, fence inset plantings and associated irrigation (hereinafter called Landscape Works), shall be designed by a Professional Engineer (hereinafter called the Owner's Engineer) who shall be registered with the Association of Professional Engineers and Geoscientists of British Columbia and retained by the Owner and shall also be responsible for inspection, testing and record keeping and other responsibilities required of the Owner's Engineer according to the Bylaw. Plans and specifications for the said Works and Services shall be

prepared by or under the direct supervision of the Owner's Engineer and all plans shall bear his seal and signature.

The Owner covenants and agrees that all Landscape Works shall be designed by a Landscape Architect who shall be registered with the British Columbia Society of Landscape Architects. Plans and specifications for Landscape Works shall be prepared by or under the direct supervision of the said Landscape Architect and all plans shall bear his seal and signature.

The Owner covenants and agrees to ensure that the Owner's Engineer maintains professional liability, and errors and omissions insurance to a value of \$1,000,000 per occurrence, during the term of his engagement.

The Owner covenants and agrees to retain the Owner's Engineer and Landscape Architect during the construction and maintenance period for the purposes of inspection to ensure compliance with the accepted design and to provide certification of the record drawings and to perform other duties all in accordance with the Bylaw.

DESIGN DRAWINGS

11. The Owner covenants and agrees that the Owner shall construct fully completed Works and Services, in accordance with sound engineering and construction practice and in a good and workmanlike manner and to the satisfaction of the Municipal Engineer and in strict compliance with the plans and specifications prepared by:

under Drawing Nos.:

and as accepted for the purposes of this Agreement by the Development Engineering Department of the Municipality on the ____ day of _____, 20__.

CHANGES TO DESIGN	12. If, as a result of errors, conflicts, inconsistencies or omissions in design or of the discovery of previously unknown or concealed conditions, it becomes necessary, or in the opinion of the Municipal Engineer desirable, to make any change in the design of all or a portion of the Works and Services, then installation of the affected Works and Services shall be stopped pending the Owner's Engineer's revision of the Accepted Drawings and their acceptance in writing by the Municipal Engineer. The Owner covenants and agrees not to make any changes to the accepted design and specifications for any reason except as approved by the Municipal Engineer in writing. Should the Works and Services, as provided herein, prove to be in any way defective or should they not operate to the satisfaction of the Municipal Engineer, then the Owner shall, at his own expense modify and reconstruct the Works and Services so that the Works and Services shall be fully operative and function to the satisfaction of the Municipal Engineer.
SUBSTANTIAL COMPLETION	13a. A Certificate of Substantial Completion shall be provided by the Municipal Engineer in accordance with the Bylaw on the completion of the construction (except for Landscape Works) listing any deficiencies the correction or completion of which Municipal Engineer permits to be deferred. The Certificate of Substantial Completion shall not be construed as acceptance of the Works and Services.
LANDSCAPE COMPLETION CERTIFICATE	13b. A Landscape Completion Certificate shall be provided by the Municipality on the completion of Landscape Works and upon the correction of all deficiencies in such work.
RECORD DRAWINGS AND TEST RESULTS	14. The Owner covenants and agrees to submit to the Municipality the final record drawings and records of construction, and test results, as accepted by the Municipal Engineer, pursuant to the Bylaw, within 60 days of the date of the Certificate of Substantial Completion.
MAINTENANCE PERIOD AND RESPONSIBILITY	15. The Owner covenants and agrees to maintain every part of the Works and Services, except for Landscape Works, in perfect order and in complete repair for a period of one year (Maintenance Period) from the date shown on the Certificate of Substantial Completion in accordance with the requirements of the Bylaw and to make good, at its sole cost and expense, any and all defects and deficiencies in the Works and Services including without limitation defects and deficiencies arising from or related to design, construction, installation and materials. If the Municipal Engineer determines that any work completed, or deficiencies or defects corrected, after the issue of the Certificate of Substantial Completion are of major significance, then the Maintenance Period for that work or correction including

any new materials supplied shall commence from the date the Municipal Engineer accepts the completion of such remedial work.

The Owner covenants and agrees to maintain the Landscape Works for a period of one year from the date shown on the Landscape Completion Certificate in complete accordance with the requirements of the Bylaw.

Should the Owner, for any reason, fail to maintain when ordered, then the Municipal Engineer, at his option, after giving the Owner seven days written notice (emergencies excepted), may, but is not obligated to, do so, and the whole costs, charges and expenses so incurred by the Municipality shall be payable by the Owner, as provided for herein. The decision of the Municipal Engineer shall be final with respect to the necessity for repairs, or the adequacy of any work done.

Once any watermains covered by this Agreement are connected to the Municipal water system, only Municipal crews or contractors under the direct supervision of the Municipality may undertake work on such watermains. As such, Municipal crews or contractors retained by the Municipality shall correct any defects, imperfections, acts of vandalism, settlements and/or rechlorination and flushing on such watermains which is deemed by the Municipal Engineer to be necessary during the one year period from the date shown on the Certificate of Substantial Completion and the whole of such costs, charges and expenses so incurred by the Municipality in undertaking such work including but not limited to contractor costs shall be payable by the Owner as provided for herein. Any rechlorination and flushing work on any watermain shall be considered to be "emergency" work and as such the Owner may not receive prior notice that such work is being undertaken by the Municipality.

CERTIFICATE OF ACCEPTANCE

16. A Certificate of Acceptance shall be provided by the Municipality in accordance with the Bylaw upon satisfactory completion by the Owner of all of the covenants and conditions in this Agreement, including the maintenance of the Works and Services, correction of all deficiencies, receipt of record drawings and service record cards, and the expiry of the maintenance period, but excluding covenants and conditions related to Landscape Works. All Works and Services remain at the risk of the Owner until the Certificate of Acceptance for the Works and Services has been issued.

The Municipality covenants and agrees upon satisfactory completion by the Owner of all of the Landscape Works, including the one year maintenance period, to provide the Owner with a Landscape Acceptance Certificate, signed by the Municipality. The Landscape Works remain at the risk of the

Owner until the Landscape Acceptance Certificate has been issued. The development fence and fence inset plantings remain the responsibility of the Owner in accordance with the terms of the restrictive covenant registered against the property.

BUILDING PERMITS

17. The Owner covenants and agrees that the Municipality shall not issue building permits, except for show home, for lots within the subdivision until all essential services have been completed and accepted by the Municipal Engineer.

If the foregoing Works and Services have not been installed and accepted, show home permits may be issued to a maximum of 10% of the lots in the register subdivision with a minimum of one show home per subdivision. A building permit required for renovation to, or moving of, an existing building within the subdivision shall be considered a show home permit. All show home permits shall be subject to provision of adequate access for emergency vehicles and fire flow protection to the acceptance of the Municipal Engineer.

When applying for show home permits, the Owner and Builder must acknowledge on the standard form provided by the Permits, Licence and Inspection Services Department that there shall be no request for occupancy for final inspection until all the foregoing Works and Services have been accepted by the Municipality for the lots upon which the show homes have been built.

The Owner covenants and agrees to inform any purchaser of a lot within the subdivision of the restrictions with respect to building permits set out in this section.

OWNER INDEMNIFIES MUNICIPALITY

18. The Owner covenants and agrees to save harmless and indemnify the Municipality against:
- (a) 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 Works and Services;
 - (b) all expenses and costs which may be incurred by reason of the construction, installation, maintenance or repair of the Works and Services resulting in damage to any property owned in whole or in part by the Municipality for which the Municipality by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, install, maintain or repair;
 - (c) all expenses and costs which may be incurred by reason of liens for non-payment of labour or materials, WorkSafeBC, Employment Insurance, Federal or Provincial tax, check-off or encroachments owing to mistakes in survey;

- (d) all actions and proceedings, costs, damages, expenses, claims and demands whatsoever and whomsoever brought by reason of the Municipality, its officers, employees, servants, agents and invitees reviewing, accepting or approving the design, specifications, materials and methods of construction and inspecting the Works and Services and performing any work on accordance with this Agreement
- (e) all expenses and costs which may be incurred by the Municipality as a result of faulty workmanship and defective material in any of the Works and Services installed by the Owner.

The above clauses shall not be construed as to extinguish any rights which the Municipality would have were it not for the inclusion of Clause 19 in this Agreement.

INSURANCE COVERAGE

19. Prior to the commencement of any work, the Owner shall obtain and maintain in force during the term of the Servicing Agreement and the completed operations period, a policy of insurance with limits not less than those shown in the following items:
- (a) Comprehensive Public Liability Insurance of at least \$3,000,000 on a per occurrence and limit basis. Any deductible is the sole responsibility of the Owner.
 - (b) Motor Vehicle Insurance for public liability and property damage providing coverage of at least \$3,000,000 inclusive on owned, non-owned or hired vehicles.
 - (c) Completed operations coverage on a per occurrence and limit basis of at least \$3,000,000 for a period of 24 months. (usually 12 or 24 months)

In all policies of insurance providing coverage called for by this clause (except motor vehicle insurance), the Municipality shall be named as an additional insured, and all such insurance shall contain a provision that the insurance shall apply as though a separate policy has been issued to each named insured. In all such policies, each contractor engaged in the Work shall be named as an additional insured in respect of the performance of the Work, and each such policy shall provide that no expiry, cancellation or material change in the policy shall become effective until after thirty days notice of such cancellation or change shall have been given to the Municipality by registered mail.

As a condition precedent to the issuing of Permission to Construct, the Owner shall be required to deliver to the Municipality an Insurance Certificate in a form acceptable to the Municipality signed by a licensed insurance agent.

SECURITY DEPOSIT 20.

20. As security for the due performance of all of the covenants and promises contained in this Agreement the Owner has forthwith deposited with the Municipality a security deposit in the amount of \$_____, in the form of cash or a Letter of Credit acceptable to the Municipality (herein called the Security Deposit).

FORFEIT OF SECURITY DEPOSIT 21.

21. In the event that the Owner is in default of its obligations under this Agreement including a failure to construct and install the Works and Services prescribed herein within the time specified in Clause 8, the said Security Deposit of \$ _____ may be forfeited to the Municipality.

The Owner shall be deemed to be in default of this Agreement if the Owner files a voluntary petition of bankruptcy, or is adjudicated bankrupt or insolvent, or files any petition or answer seeking any reorganization, arrangement, liquidation, dissolution or similar under any enactment respecting bankruptcy, insolvency or other relief for debtors.

DESIGN BOND 22

22. Where security is provided in lieu of accepted working drawings, (hereinafter called a Design Bond) the Owner agrees to have the working drawings completed to the satisfaction of the Municipal Engineer within 90 days of the date of this Agreement. Failure to do so shall result in forfeiture of the Design Bond in the amount of \$ _____ which shall be used by the Municipality to complete the design. Once forfeited the bond becomes non-refundable in whole or in part.

USE OF SECURITY 23.

23. If the Owner is in default of any of its obligations in respect to the construction and installation of the Works and Services or any portion thereof, the Municipality may cash the Security Deposit to secure completion of all or a portion of the Works and Services in compliance with the terms of this Agreement and any payment obligations of the Owner in respect of the Works and Services that remain unpaid including the discharge of any builders' liens, and such monies shall be applied to remedy the default and complete all or any portion of the Works and Services and to satisfy the Owners warranties in respect of same in place and stead of the Owner and ensure compliance with the terms of this Agreement. In addition the Municipality may cash, retain and use the Security Deposit to remedy any emergency condition which, in the sole opinion of the Municipal Engineer, is associated with, arises from or is a result of the Works and Services and requires expedient action. Notwithstanding the foregoing, the Municipality may cash, retain or use the Security Deposit to pay, settle or compromise any claim against the Municipality for which the Owner indemnified the Municipality pursuant to Clause 18. If the proceeds from the Security Deposit is not sufficient to pay all costs and expenses incurred by the Municipality in completing all or a portion of the

Works and Services including the Municipality's normal overhead charges and satisfying the warranties thereof, curing other default by the Owner, or satisfying any amounts owing to the Municipality pursuant to Clause 18 the Owner shall forthwith pay to the Municipality the difference upon receipt from the Municipality of invoices for the same together with all interest thereon at the commercial prime rate of interest plus two percent from the date of receipt by the Owner of the invoices for the same and continuing until payment in full.

RELEASE OF SECURITY

24. If the Municipal Engineer is of the opinion that the Works and Services or any portion thereof have been adequately completed, and the Owner's covenants performed in compliance with this Agreement, and if there is no litigation pending or threatened by any third party against the Municipality as a result of, or arising from, the construction of the Works and Services, the Municipal Engineer may make, but is not obligated to, partial or complete release of the security deposit in such amounts as he may deem proper as follows:
- (a) the Owner's Engineer shall prepare, certify and submit an estimate of the quantity, value and percentage of the Works and Services completed and upon verification by the estimate, the Municipal Engineer may release security to a maximum of 90% of the value estimated;
 - (b) partial release of security deposits shall not be made more frequently than once per month;
 - (c) upon issuance of the Certificate of Substantial Completion by the Municipal Engineer, the Municipality shall reduce the deposit to 10% of all outstanding Works and Services plus outstanding deficiencies and as-builts and service record cards. This deposit shall be retained to ensure payment of any maintenance or repair of the Works and Services required during the maintenance period as well as submission of as-built drawings and service record cards. This deposit does not apply to approved hydro or telephone or cablevision company installations;
 - (d) notwithstanding subsection (c), any amount of the deposit related to Landscape Works where landscape security is greater than \$100,000.00, draw downs are based on completed works for a maximum of three (3) draw downs. First drawn down at minimum 50% completion for a minimum \$50,000.00 and minimum of \$50,000.00 held until the Municipal Engineer issues the Landscape Completion Certificate, at which time the Municipality shall reduce that portion of the deposit to 10% of the deposit amount;
 - (e) any costs incurred by the Municipality which are recoverable by the Municipality from the Owner, shall be deducted from any authorized partial refund irrespective

- of whether or not the recoverable amount relates to the portion of work for which a partial refund was authorized;
- (f) reductions in the security deposit may be denied if, in the opinion of the Municipal Engineer, it would be reduced below the amount required to cover the uncompleted Works and Services. Security deposit reductions are for the convenience of the Owner and shall not be taken as acceptance of the material and work or as a release of the Owner from his responsibilities for the Works and Services;
 - (g) security held by the Municipality for hydro and telephone and cablevision company installations shall be released only upon written confirmation from the respective utility companies stating that those works are complete and constructed to their specifications.

**RETURN OF
MAINTENANCE
SECURITY**

- 25. If the Municipal Engineer is satisfied that the Owner has complied with the covenants contained in this agreement and if there is no litigation pending or threatened by any third party against the Municipality as a result of, or arising from, the construction of the Works and Services, and the Municipal Engineer has issued a Certificate of Acceptance, the Maintenance Deposit shall be returned to the Owner and after the Municipality has issued a Landscape Acceptance Certificate, the Landscape Works maintenance deposit shall be returned to the Owner and thereafter the Owner's responsibility for the Works and Services shall cease.

ADMINISTRATION FEE

- 26. The Owner covenants and agrees to pay to the Municipality a non-refundable fee in the amount of \$ _____ to cover Municipal administration and processing costs. These fees are payable prior to the signing of this Agreement or the commencement of construction of the Works and Services.

**CASH IN LIEU OF
CONSTRUCTION**

- 27. The Owner has made a non-refundable cash payment of \$ _____, in the form of cash or certified cheque, to cover the cost of required Works and Services considered by the Municipal Engineer to be premature. This payment shall be used by the Municipality at such time as the construction of the Works and Services becomes feasible.

NO OTHER REPRESENTATIONS	28.	It is understood and agreed that the Municipality has made no representations, covenants, warranties, guarantees, promises or agreements (verbal or otherwise) with the Developer other than those in this agreement.
COMPLIANCE WITH BYLAWS	29.	The Works and Services and the Development herein shall comply with all of the bylaws of The Corporation of the Township of Langley.
NO WAIVER	30.	The Owner covenants and agrees that nothing contained or implied herein shall prejudice or affect the rights and powers of the Municipality in the exercise of its functions under any public and private statutes, bylaws, orders and regulations, all of which may be fully and effectively exercised in relation to the said Lands as if the Agreement had not been executed and delivered by the Owner.
MUNICIPAL CHARGES	31.	The Owner covenants and agrees to pay the Municipality any and all costs and expenses which the Municipality has incurred in constructing watermain tie-ins, utility connections and any other work undertaken by the Municipality on behalf of the Owner. The payment for such work shall be made by the Owner within 30 days of the date of the invoice, mailed to the Owner by the Municipality. Upon receiving payment and upon request of the Owner, the Municipality shall reduce the letter of credit for the invoiced amount. Should payment not be received by the Municipality within 30 days of the date on the Municipality's invoice to the Owner, the Municipality shall draw the invoiced amount from the Security Deposit posted by the Owner.
NO INTEREST	32.	The Owner agrees that no interest on the Design Bond, the Security Deposits, or the Maintenance Securities shall be paid to the Owner.
CONTRACTORS	33.	The Owner shall not employ any person or contractor who, in the opinion of the Municipal Engineer is unfit or not skilled in the work assigned to him and the Owner shall at all times, in connection with the execution of the Works and Services, keep and employ a competent general superintendent capable of speaking, reading and writing English, and any explanations, orders, instructions, directions and requests given by the Municipal Engineer to the superintendent shall be deemed to have been given to the Owner.
RELIANCE ON ENGINEER	34.	The Owner covenants and agrees that the Owner relies exclusively on his own engineer and contractor and that the Municipality does not, by its approvals, inspections or acceptance of the Works and Services, warrant or represent that the Works and Services are without fault or defect and that all approvals and inspection of the Works and Services given or made by the Municipality are for the sole benefit of the

Municipality and shall in no way relieve or excuse the Owner from constructing and installing the Works and Services in strict compliance with the provisions of this Agreement.

ASSIGNMENT

35. This Agreement shall not be assigned by the Owner without the approval of the Municipal Engineer.

**PRIME
CONTRACTOR**

36. Pursuant to Section 118 of the Workers Compensation Act, R.S.B.C. 1996, c492 (as amended) (the "WCA") the parties hereby acknowledge and agree that in respect of all matters pertaining to the Works and this Agreement the Owner shall, for the purposes of the WCA;
- (a) appoint a prime contractor as defined in the WCA, satisfactory to the Municipality and prior to the Owner commencing the Works;
 - (b) ensuring that the prime contractor performs its function as prime contractor pursuant to the WCA and the *Occupational Health and Safety Regulations, B.C. Reg. 296/97*;
 - (c) obtain from the prime contractor, WorkSafeBC clearance letters for all employers, contractors and subcontractors, except for the Municipality, before such employer, contractor or subcontractor commences the Works; and
 - (d) report to the Municipality, as required, with respect to the prime contractor's performance under (b) above.

**LATECOMER
CHARGES**

37. The Owner covenants and agrees that the Owner does not consider any of the Works constructed or installed by the Owner to be Excess or Extended Services pursuant to Section 507 of the Local Government Act, as amended from time to time, and further covenants and agrees that if any of the Works constructed or installed by the Owner are determined to be Excess or Extended Services pursuant to Section 507 of the Local Government Act, as amended from time to time, then the length of any obligation of the Municipality to collect latecomer's charges shall not exceed fifteen (15) years after the date the Works are constructed and installed and the Owner shall reimburse the Municipality for any costs whatsoever incurred by the Municipality in the preparation and administration of any latecomer's resolutions and agreements including without limitation legal, accounting, engineering, consulting and administration costs (including those incurred internally by the Municipality) and the Owner shall not, nor shall it permit the registered Owners of the Lands to, apply for nor enter into any latecomer agreements with the Municipality with respect to the Works except in accordance with the provisions of this section and the Owner hereby releases and discharges the Municipality, its officers, employees, servants, agents and invitees and covenants and agrees to indemnify and save harmless the Municipality, its officers, employees, servants, agents and

invitees from and against all damages, losses, costs, actions, causes of action, claims, demands and expenses (including legal fees and litigation costs) which may arise or accrue to any person, firm or corporation against the Municipality, its officers, employees, servants, agents and invitees for which the Municipality, its officers, employees, servants, agents and invitees may pay, incur, sustain or be put to by reason of the application of Section 507 of the Local Government Act as amended from time to time.

WHENEVER

the word "shall" is used in this Agreement it shall be construed as imperative (mandatory).

WHENEVER

the singular or the masculine is used in the Agreement it shall be construed as meaning the plural or the feminine or body corporate or politic where the context or the parties hereto so require.

THIS CONTRACT

shall enure to the benefit of and be binding upon the parties hereto, their respective successors and assigns.

IN WITNESS WHEREOF

the parties hereto have executed this contract the day and year first above written.

**FOR CORPORATE
BODY**

SIGNED BY:

_____)
_____)
In the presence of: _____)
(witness): _____)
Signature _____)
Name _____)
Address _____)
Occupation _____)

**FOR PRIVATE
INDIVIDUAL**

SIGNED BY:

_____)
_____)
In the presence of: _____)
(witness): _____)
Signature _____)
Name _____)
Address _____)
Occupation _____)

**FOR THE
CORPORATION OF
THE TOWNSHIP OF
LANGLEY**

SIGNED BY GENERAL MANAGER,)
ENGINEERING & COMMUNITY)
DEVELOPMENT)
For and on behalf of)
THE CORPORATION OF THE)
TOWNSHIP OF LANGLEY)

_____)
GENERAL MANAGER, ENGINEERING)
& COMMUNITY DEVELOPMENT)

SIGNED BY TOWNSHIP CLERK)
For and on behalf of)
THE CORPORATION OF THE)
TOWNSHIP OF LANGLEY)

_____)
TOWNSHIP CLERK)

In the presence of:)
(as to both Township signatures))

_____)
Name:)
Address:)
Occupation:)

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TOWNSHIP OF LANGLEY

SUBDIVISION AND DEVELOPMENT SERVICING BYLAW

SCHEDULE G

STANDARD FORMS

SCHEDULE G - STANDARD FORMS

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STANDARD FORM F1

CERTIFICATE OF FIELD REVIEWS¹

By signing and sealing this Certificate I certify that all construction services required under the Subdivision and Development Servicing Bylaw of the Township of Langley for the subdivision of:

Legal Description: _____

Project No: _____

which services were approved for construction under drawing numbers:

Drawing No.	Date	Drawing No.	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

have been field reviewed by or under my direction.

Further that the "Record Drawings" hereby submitted reasonably represent the Works and Services as installed for the aforementioned subdivision or development. These Works and Services were installed with sufficient field reviews to ascertain that the work substantially complied in all material respects with the accepted design drawings, the Langley Subdivision and Development Servicing Bylaw and as required by the *Engineer and Geoscientist Act* Code of Ethics.

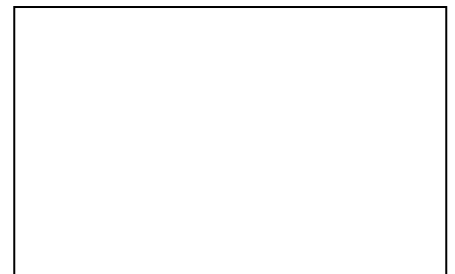
Signature: _____

Name: _____

Company: _____

Address: _____

Date: _____



Engineer's Seal

¹"field reviews" are defined to mean those reviews of the work:

- (a) At the subdivision or development site approved for subdivision or development, and
- (b) Where applicable, at fabrication locations where components are fabricated for use at the site that a professional engineer in his or her professional discretion considers necessary to ascertain whether the work substantially complies in all material respects with the approved for construction drawings prepared by a professional engineer and approved for subdivision or development.

STANDARD FORM F1A

CERTIFICATE OF TEST RESULTS

By signing and sealing this Certificate I certify that all construction TESTING required under MMCD and the Subdivision and Development Servicing Bylaw of the Township of Langley for the Development of:

Legal Description: _____

Project No: _____

have been reviewed and accepted:

Item	Description	Date Accepted
1. Green Infrastructure Services	Walkways/Trails (layout)	_____
	Fences (installed)	_____
2. Lot Grading	Certification	_____
3. Sanitary Sewers	Pressure Test	_____
	Video Inspection Tests	_____
4. Storm Sewers	Video Inspection Test	_____
5. Watermain	Pressure Test	_____
	Chlorination & Flushing	_____
	Bacteriological Test	_____
6. Road Base	Benkelman Beam Test	_____
	Density Tests on Trenches	_____
	Sieve Tests* (base, sub base trench and pipe bedding material)	_____
	Sidewalks*	_____
7. Density Testing	Curbs	_____
	Emergency Access	_____
	Curb & Gutter	_____
8. Concrete Testing	Sidewalks*	_____
	Core and Density Tests*	_____
	Asphalt Paving/Sampling Test*	_____

*Includes material and concrete for meandering walkways or trails located within greenways.

Signature: _____

Name: _____

Company: _____

Address: _____

Date: _____



Engineer's Seal

STANDARD FORM F2

PRIVATE WELL CERTIFICATION

Pursuant to Schedule "B" of the Subdivision and Development Servicing Bylaw, which requires that each lot to be created and/or each existing lot forming part of the proposed Development can be serviced with potable water in accordance with the requirements of the Bylaw for the Development of:

Legal Description: _____

Project No: _____

I certify that a quantity of not less than 2,500 litres per day has been proven for each existing or proposed lot in the Development.

I certify that each well within the subdivision has been tested and is capable of continuously providing water at a rate of 9 litres per minute for a four hour period.

I certify that the water has been tested and proven safe for human consumption by a laboratory accredited by the B.C. Government for testing of potable water and is in accordance with the Drinking Water Protection Regulation as though the source is a water supply system regulated by the Drinking Water Protection Act, 2001.

I certify that the water has been tested for the aesthetic, microbiological, chemical and physical parameters required to be tested for domestic water systems by the Drinking Water Officer or Medical Officer of Health for the Fraser Health Authority and meets the Guidelines recommended in the latest edition of the " Canadian Drinking Water Quality Guidelines, Health Canada".

Professional Engineer responsible water sample collection for test:

Signature: _____

Name: _____

Company: _____

Address: _____

Date: _____



Engineer's Seal

Form F-2 shall be submitted with completed sets of Forms F-3, F-4 and F-5 for each well as required pursuant to Section W19 of Schedule "B".

STANDARD FORM F3
WELL PUMP - TEST FIELD

DATE: _____

WELL ID PLATE NO: _____

TEST NO: _____
SHEET: _____ of _____

□ *Recovery*

[illegible]

STANDARD FORM F4

WELL PUMP - DRAWDOWN AND RECOVERY GRAPH

OWNER'S NAME: _____

DATE: _____

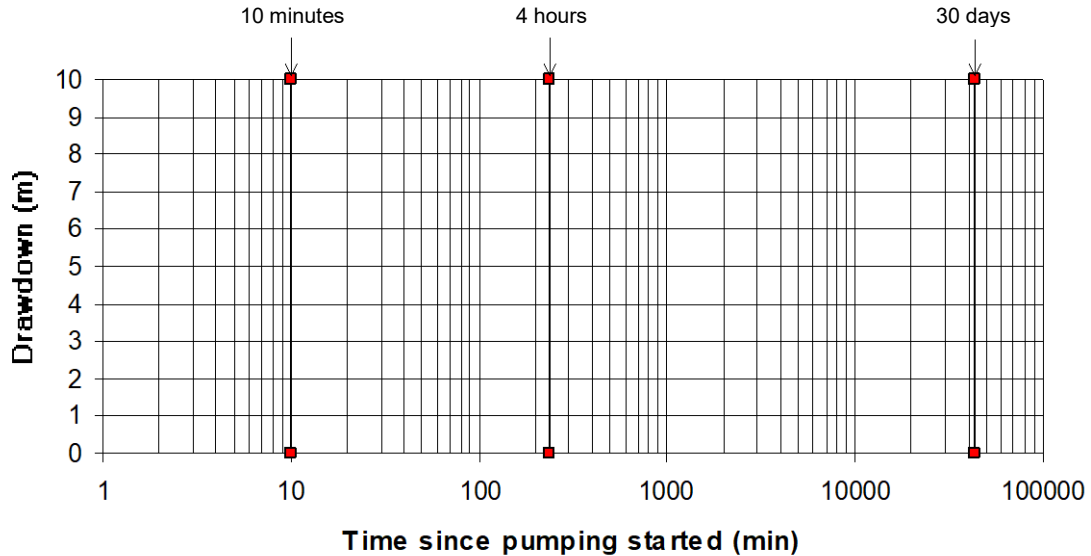
APPLICATION NO: _____

WELL ID PLATE NO: _____

LOCATION: _____

TEST NO: _____

SHEET: _____ of _____



Dp	=	Depth of proposed pump suction	=	_____ m
Dtw	=	Depth of static water level	=	_____ m
S30	=	Drawdown at 30 days	=	_____ m
D	=	Adjustment for seasonal decline	=	_____ m
SF	=	Safety factor	=	1.0
Qh	=	Pumping rate	=	_____ lpm
Sh1	=	Drawdown at 10 min	=	_____ m
Sh2	=	Drawdown at 4h	=	_____ m

For calculating drawdown values:

SL1	=	$(Q_i/Q_h) \times Sh1$
SL2	=	$(Q_i/Q_h) \times Sh2$

	Tests run in	D
Use these estimate minimum adjustments for seasonal decline (D) if other local data or hydrogeologist's opinion is not available:	Aug Sep Oct	2.0 m
	Nov Dec Jan May Jun Jul	4.0 m
	Feb Mar Apr	6.0 m

Minimum available drawdown = $D_p - (D_{tw} + S_{30} + D + SF)$ = _____ m

If the calculated minimum available drawdown is negative, then either the pump has to be set lower or the well is not capable of supplying water for a house.

STANDARD FORM F5

WELL PUMP - TEST SUMMARY

OWNER'S NAME: _____ DATE: _____
 APPLICATION NO: _____ WELL ID PLATE NO: _____
 LOCATION: _____ TEST NO: _____
 _____ SHEET: _____ of _____

Well Completion Date	Screen Design (mark one)	Local Name & Description of Aquifer
Depth _____ m	☐ Open Hole ☐ Slotted Casing	_____
Diameter _____ mm	☐ Screen ☐ Gravel Pack	_____
Static Water Level _____ m	☐ Other _____	_____
	Screen interval _____ m to _____ m	_____

Pump Test

Start: Date (d/m/y) _____ Time (h:m) _____

Pump Type: ☐ Elect submersible ☐ Jet ☐ Air lift
☐ Other (describe): _____

Test pump set at _____ m below ground

Water level sounded by: ☐ Electric tape ☐ Air bubbler ☐ Steel tape
☐ Other (describe): _____

Flow measured by:: ☐ Container & Watch ☐ Flow meter ☐ Orifice & tube
☐ Other (describe): _____

Test

Initial non-pumping level _____ m
 Constant rate of yield _____ lpm
 Pump Test duration _____ h
 Drawdown at end of test _____ m
 Recovery duration _____ h
 Level at end of test _____ m
 Recommended pumping rate _____ lpm

Water Samples Taken During Test

Chemical Analysis ☐ Yes ☐ No
 Bacterial Analysis ☐ Yes ☐ No
 Water Temperature _____ °C
 Any particular gas smells noted _____

Comments on clarity of water:

Other comments:

STANDARD FORM F6
COST SHARING AGREEMENT

Between: The Corporation of the Township of Langley (Municipality) and

Name: _____

Address: _____

(Owner)

The Municipality agrees to pay up to the amount of \$ _____ towards the installation described as:

3. It is agreed between the parties to this agreement that the above amount paid shall be full compensation for the excess capacity required by the Municipality and that all costs associated in any way whatsoever with this installation which are in excess of the above amount shall be the full responsibility of the Owner to pay.
2. It is further agreed that the above amount will be paid as follows:
 - (a) Upon issuance of substantial completion \$ _____
 - (b) Upon receipt of all "Record Drawings" \$ _____
3. It is agreed that it is the sole responsibility of the Owner to arrange for the design and installation of the works according to Municipal requirements.

Owner's Signature

Signed, Sealed and Delivered by
the above named in the presence
of:

Municipal Engineer
Corporation of the Township of Langley

Name of Witness

Signature of Witness

Address of Witness

Date Signed

STANDARD FORM F7
INSURANCE CERTIFICATE

RE: OWNER: _____

TOWNSHIP PROJECT NO: _____

INSURANCE POLICY NO: _____

Pursuant to Schedule "F" of the Subdivision and Development Servicing Bylaw, the Developer is required to obtain and maintain in force during the term of the Servicing Agreement, an insurance policy acceptable to the Municipality.

I hereby certify that the attached insurance policy provides insurance coverage as required pursuant to clause 19 of the Servicing Agreement between the Corporation of the Township of Langley and the Owner and that the attached insurance policy is valid for the period of the Servicing Agreement (one year).

Certified by:

Authorized Insurance Agent: _____

Company _____

Address: _____

Insurance requirements pursuant to clause 19 of the Servicing Agreement

Prior to the commencement of any work, the Owner shall obtain and maintain in force during the term of the Servicing Agreement and the completed operations period, a policy of insurance with limits not less than those shown in the following items:

- a) Comprehensive Public Liability Insurance of at least \$3,000,000 on a per occurrence and limit basis. Any deductible is the sole responsibility of the Owner.
- b) Motor Vehicle Insurance for public liability and property damage providing coverage of at least \$3,000,000 inclusive on owned, non-owned or hired vehicles.
- c) Completed operations coverage on a per occurrence and limit basis of at least \$3,000,000 for a period of 24 months. (usually 12 or 24 months)

In all policies of insurance providing coverage called for by this clause (except motor vehicle insurance), the Municipality shall be named as an additional insured, and all such insurance shall contain a provision that the insurance shall apply as though a separate policy has been issued to each named insured. In all such policies, each contractor engaged in the Work shall be named as an additional insured in respect of the performance of the Work, and each such policy shall provide that no expiry, cancellation or material change in the policy shall become effective until after thirty days notice of such cancellation or change shall have been given to the Municipality by registered mail.

As a condition precedent to the issuing of Permission to Construct, the Owner shall be required to deliver to the Municipality an Insurance Certificate in a form acceptable to the Municipality signed by a licensed insurance agent.

STANDARD FORM F8
DRAINAGE CERTIFICATE

RE: DEVELOPER: _____

TOWNSHIP PROJECT NO: _____

Pursuant to Section D of Schedule “B” of the Subdivision and Development Servicing Bylaw:

I hereby certify that downstream drainage facilities for a distance of 1.5 km have been checked with respect to line, grade and size, and that the downstream facilities are capable of handling the projected increase in drainage created by this project, without causing any adverse effect to Municipal or private property.

Professional Engineer responsible for design:

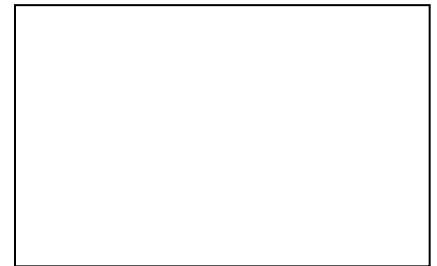
Signature: _____

Name: _____

Company: _____

Address: _____

Date: _____



Engineer's Seal

STANDARD FORM F9

COMMITMENT BY OWNER AND ENGINEER

Township of Langley

Date: _____

Attn. _____

Re: Proposed Development of _____

This confirms that an agreement has been executed between:

Owner: _____ and

Owner's Engineer: _____

in connection with the above Development and provides for the Owner's Engineer to undertake, directly or through sub-consultants, until a Certificate of Acceptance has been issued by the Municipal Engineer of the Township of Langley, to:

1. review existing systems and design requirements, concepts and parameters with the Municipal Engineer;
2. arrange for topographic, pick-up and legal surveys and environmental, geotechnical, hydrogeotechnical, or other studies that may be necessary for satisfactory design or as required by the Municipal Engineer;
3. submit conceptual designs if required by the Municipal Engineer;
4. submit detailed design plans and specifications in accordance with municipal bylaws and the requirements of utility companies and government agencies and to the satisfaction of the Municipal Engineer;
5. provide initial cost estimates and periodic cost estimates of uncompleted work to the Municipal Engineer for calculation of security retention;
6. discuss the submissions under 3, 4 and 5 with municipal staff as required by the Municipal Engineer;
7. attend pre-construction meeting as required by the Municipal Engineer;
8. undertake contract administration services using qualified personnel during construction and the maintenance period including:
 - a) survey control to permit construction layout by contractors;
 - b) interpretation of plans and specifications;
 - c) periodic, or full time, resident field review as required by the Subdivision and Development Servicing Bylaw (the Bylaw) to determine if the work substantially complies in all material respects with the approved design and with municipal bylaws and with the requirements of utility companies and government agencies;
 - d) giving advance notification of field reviews to the Municipal Engineer as required by the Bylaw;
 - e) review and interpretation of test and field review reports;
 - f) determination, and advising the Municipal Engineer, of corrective action required as a result of c) and e);
 - g) keeping a record of site visits and any corrective action taken as a result of f);
 - h) attending construction progress meetings; and
 - i) conducting final field review to identify deficiencies.
9. submit weekly summary reports during construction and the maintenance period including test and field reviews and his review and interpretation thereof all as required by the Municipal Engineer;
10. submit Field Review Certificates and other certifications required by the Bylaw;
11. conduct field reviews with the Municipal Engineer as required;
12. submit record drawings, service record cards and operation and maintenance manuals in the form required by the Municipal engineer.

Reference to the Municipal Engineer above includes any person authorized to act on the Municipal Engineer's behalf.

If sub-consultants, or others with specialist responsibility, are employed on components of the work, the Owner's Engineer will act as the prime consultant for co-coordinating and reviewing overall design, layout and field review and test reports, and for communicating with the Municipal Engineer.

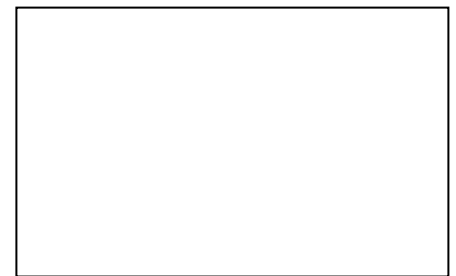
The Municipal Engineer may request a summary of project's the Owner's Engineer and/or sub-consultants have completed that are similar in scope, nature and value to the Works and Services. The summary must include the names, curriculum vitae and employer of individuals assigned responsibility for various aspects of the work.

The Owner's Engineer and each sub-consultant carries professional liability insurance of \$1,000,000 per claim and commits to continue the insurance throughout construction and the maintenance period.

We, the Owner and Owner's Engineer both acknowledge our separate responsibilities to each and to notify the Municipal Engineer as soon as possible prior to, or, if that is not possible, within one working day, if the Owner's Engineer ceases to be retained for all of the duties described or is unable to carry them out. Notification will be in writing delivered to the Municipal office or transmitted by fax.

I, the Owner's Engineer, will notify the Municipal Engineer as soon as possible prior to, or, if that is not possible, within one working day, of a decision or circumstance that results in a sub-consultant or other specialist ceasing to be retained on this project.

Name of Owner's
Engineer: _____
Signature of Authorized
Representative: _____
Address: _____



Engineer's Seal

I/we the Owner will stop construction as soon as it is safe to do so in the event the Owner's Engineer ceases to be retained, or is unable to carry out the described duties, until a new Commitment by Owner and Engineer has been delivered to the Municipal Engineer and he has authorized work to recommence. I/we will continue essential maintenance of the site.

I/we, the Owner, understand that the Municipality will rely on the expertise of the Owner's Engineer in performing services referred to in this Commitment letter. I/we acknowledge that review and field reviews by staff or others on behalf of the Municipality do not relieve the Owner from complying with the requirements of the bylaws.

Name of Owner: _____
Signature of Authorized
Representative: _____
Address: _____

STANDARD FORM F10

COMMITMENT BY OWNER & LANDSCAPE ARCHITECT

Township of Langley

Date: _____

Attn. _____

Re: Proposed Development of _____

This confirms that an agreement has been executed between:

Owner: _____ and

Owner's Landscape Architect: _____

in connection with the above Development and provides for the Landscape Architect to undertake, directly or through sub-consultants, until a Landscape Acceptance Certificate has been issued by the Municipality, to:

1. review existing landscape systems and design requirements, concepts and parameters with the Municipality;
2. review topographic, pick-up and legal surveys and environmental, or other studies that may be necessary for satisfactory design or as required by the Municipality;
3. submit conceptual designs if required by the Municipality;
4. submit detailed design plans and specifications in accordance with municipal bylaws and Neighbourhood Plans to the satisfaction of the Municipality;
5. provide coordinated plans with other consultants, including, but not limited to, Civil and Architectural.
6. provide initial cost estimates and periodic cost estimates of uncompleted work to the Municipality for calculation of security retention;
7. discuss the submissions under 3, 4, 5, and 6 with municipal staff as required by the Municipality;
8. attend pre-construction meeting as required by the Municipality;
9. undertake contract administration services using qualified personnel during construction and the establishment maintenance period including:
 - a) interpretation of plans and specifications;
 - b) periodic field reviews as required by the Subdivision and Development Servicing Bylaw (the Bylaw) to determine if the work substantially complies in all material respects with the approved design and with municipal bylaws and with the requirements of Neighbourhood Plans;
 - c) giving advance notification of field reviews to the Municipality
 - d) review and interpretation of test and field review reports;
 - e) determination, and advising the Municipality, of corrective action required as a result of b) and d);
 - f) keeping a record of site visits and any corrective action taken as a result of e);
 - g) attending construction progress meetings; and
 - h) conducting final field reviews to identify deficiencies;
10. submit monthly summary reports during construction including test and field review reports and review and interpretation;
11. submit bi-monthly summary reports through the Establishment Maintenance Period in the growing season months of April through October (min 4 field reviews/summary reports to be submitted during growing season);
12. submit Field Review Certificates and other certifications required by the Bylaw;
13. conduct field reviews with the Municipality as required, including but not limited to those identified in Schedule C – Construction Requirements and Specifications,
14. submit record drawings and operation and maintenance manuals in the form required by the Municipality;
15. submit BCSLA Landscape Schedules L and C-L or off-site landscape works.

Reference to the Municipality above includes any person authorized to act on the Municipality's behalf.

If sub-consultants, or others with specialist responsibility, are employed on components of the landscape works, the Landscape Architect will act as the prime consultant for co-coordinating and reviewing overall design, layout and field review and test reports, and for communicating with the Municipality.

The Municipality may request a summary of project's the Owner's Landscape Architect and/or sub-consultants have completed that are similar in scope, nature and value to the Works and Services. The summary must include the names, curriculum vitae and employer of individuals assigned responsibility for various aspects of the work.

The Landscape Architect and each sub-consultant my carry professional liability insurance of \$1,000,000 per claim and commit to continue the insurance throughout construction and the establishment maintenance period.

LANDSCAPE ARCHITECT AND HOMEOWNER INTERFACE

The Landscape Architect is to liaise with home owners at time of street tree planting and fencing installation. This will entail; the notification of commencement of work; answer home owner inquiries; and resolve home owner concerns. Modifications to the approved plans may be considered provided they are acceptable to the Township of Langley and satisfy the intent of the Bylaw.

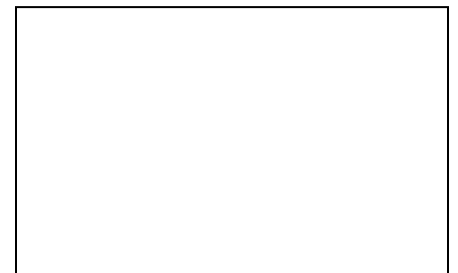
We, the Owner and Landscape Architect both acknowledge our separate responsibilities to each and to notify the Municipality as soon as possible prior to, or, if that is not possible, within one working day, if the Landscape Architect ceases to be retained for all of the duties described or is unable to carry them out. Notification will be in writing delivered to the Municipal office or transmitted by fax.

I, the Landscape Architect, will notify the Municipality as soon as possible prior to, or, if that is not possible, within one working day, of a decision or circumstance that results in a sub-consultant or other specialist ceasing to be retained on this project.

Name of Landscape Architect: _____

Signature of Authorized Representative: _____

Address: _____



Landscape Architect's Seal

I/we the Owner will stop construction as soon as it is safe to do so in the event the Landscape Architect ceases to be retained, or is unable to carry out the described duties, until a new Commitment by Owner and Landscape Architect has been delivered to the Municipality and he has authorized work to recommence. I/we will continue essential maintenance of the site.

I/we, the Owner, understand that the Municipality will rely on the expertise of the Landscape Architect in performing services referred to in this Commitment letter. I/we acknowledge that review and field reviews by staff or others on behalf of the Municipality do not relieve the Owner from complying with the requirements of the bylaws.

Name of Owner: _____

Signature of Authorized Representative: _____

Address: _____

STANDARD FORM F11

CERTIFICATE OF DEFICIENCY INSPECTION

By signing and sealing this Certificate I/We hereby advise that I/We have inspected the deficiencies identified on the Township of Langley's substantial completion/final inspection letter dated _____ and confirm all deficiencies have been completed as identified below.

All items identified on the Inspector's deficiency letter must be addressed in the space provided below. Ensure you complete a description of repair, or repair progress, in order to continue with inspections at this project.

LEGAL DESCRIPTION: _____
PROJECT NO: _____

Deficiency No.	Deficiency Status	Description of Repair

I/We therefore request that the Township perform a deficiency inspection and proceed with issuance of substantial completion/final acceptance.

NOTE: If the above deficiencies are found to be incomplete and, in the opinion of the Municipal Engineer, a re-inspection is required, a re-inspection fee must first be paid prior to any further municipal inspections.

Signature: _____

Name: _____

Company: _____

Address: _____

Date: _____



Engineer's Seal

STANDARD FORM F12

CERTIFICATE OF SWM/LOT GRADING

For the subdivision of:

LEGAL DESCRIPTION: _____

PROJECT NO: _____

By signing and sealing this Certificate I/We certify that the rough lot grading has been completed in accordance with the attached Stormwater Management/Lot Grading Plan and confirm that:

All final grades as shown on the stormwater management/lot grading plan dated _____ have been adhered to within a tolerance of ± 100 mm and in no case alters from the effective function of the accepted stormwater management/lot grading plan.

All developers' swales have been installed in accordance with the certified stormwater management/lot grading plan.

All catch basins, lawn basins and associated pipework have been installed in accordance with the certified lot grading and storm sewer drawings.

All sub surface storm sewer systems have been installed in accordance with the certified stormwater management/lot grading plan.

Areas in which the depth of fill exceeds 0.5 m have been compacted in accordance with the requirements stated on the stormwater management/lot grading plan or applicable soils report.

Signature: _____

Name: _____

Company: _____

Address: _____

Date: _____



Engineer's Seal

STANDARD FORM F13

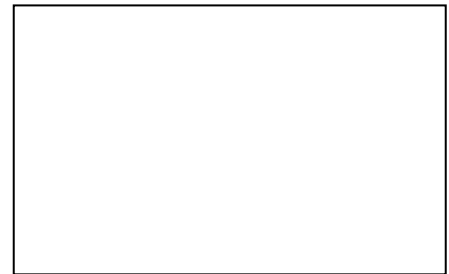
CERTIFICATE OF SUBSTANTIAL COMPLETION INSPECTION

By signing and sealing this Certificate I/We hereby advise that we have submitted all testing as indicated on the materials checklist issued at the pre-con meeting, provided sufficient field reviews during construction, and have determined that all works and/or deficiencies have been completed and/or rectified to the requirements of the Accepted Drawings, Master Municipal Construction Documents (MMCD) and applicable Municipal bylaws.

In accordance with Schedule C Section 1.26 of the Township of Langley Subdivision and Development Servicing Bylaw 2018 No. 5382, as amended, I/We request that the Municipality perform an inspection for Substantial Completion and attach a copy of the deficiency list we provided to the contractor from our field review.

LEGAL DESCRIPTION: _____
PROJECT No: _____

Signature: _____
Name: _____
Company: _____
Address: _____
Date: _____



Engineer's Seal

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TOWNSHIP OF LANGLEY

SUBDIVISION AND DEVELOPMENT SERVICING BYLAW

SCHEDULE H

SUPPLEMENTARY DETAIL DRAWINGS

SCHEDULE H – SUPPLEMENTARY DETAIL DRAWINGS

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GENERAL NOTES AND NUMBERING SYSTEMS

The *Supplementary Detail Drawings* as contained in this Schedule are primarily concerned with clarifying the Design Criteria. Construction details and practices are specified in the *Standard Detail Drawings* in the *Master Municipal Construction Documents* (MMCD). The *Supplementary Detail Drawings* are supplemental to the *Standard Detail Drawings*. However, in case of conflict, the *Supplementary Detail Drawings* take precedence over the *Standard Detail Drawings*.

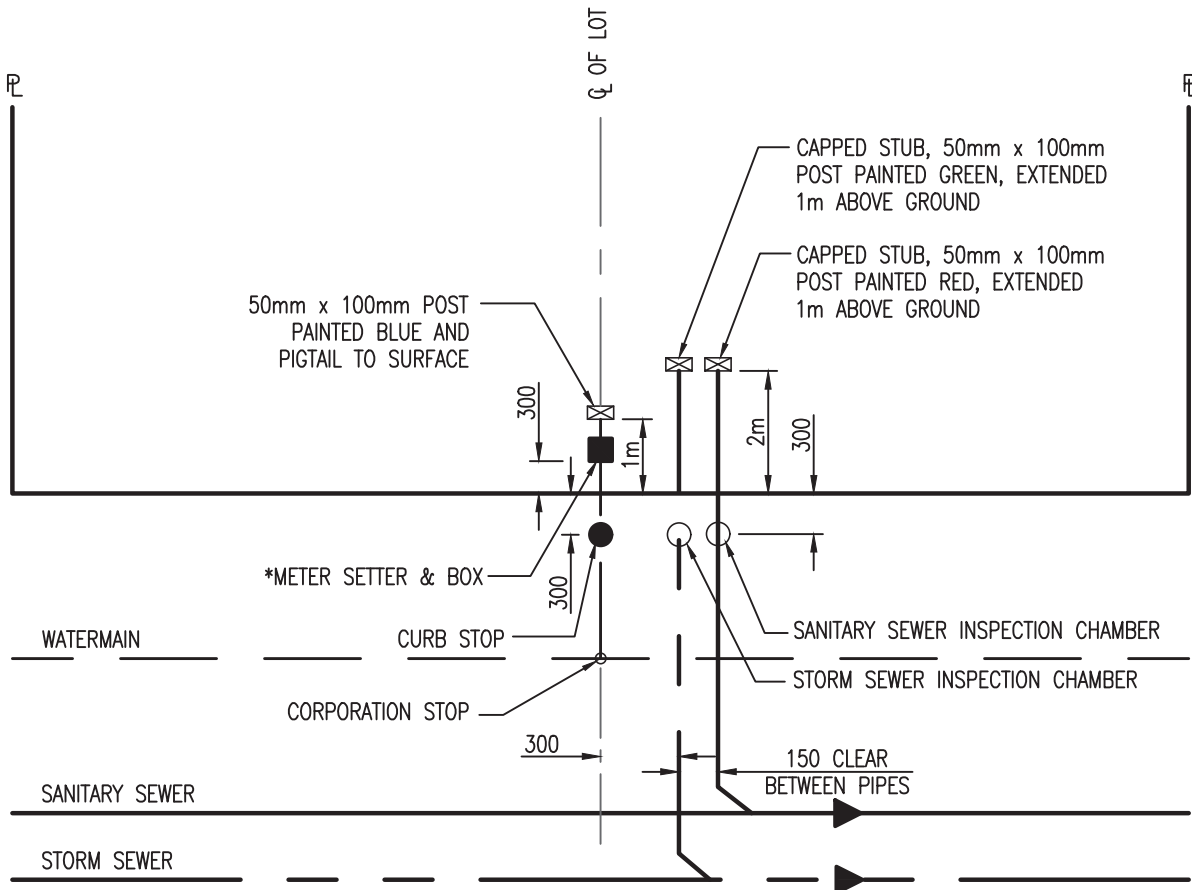
The *Standard Detail Drawing* numbers in the MMCD are prefixed by a single letter to indicate works or services. To avoid possible confusion, the *Supplementary Detail Drawing* numbers are further prefixed by "TL". The 2 numbering systems are summarized as follows:

	Supplementary Detail Drawings	Standard Detail Drawings in MMCD
General	TLG 1, 2, 3...	G 1, 2, 3
Road	TLR 1, 2, 3...	R 1, 2, 3
Drainage	TLD 1, 2, 3	S 1, 2, 3
Sanitary Sewers	TLS 1, 2, 3	S 1, 2, 3
Water	TLW 1, 2, 3	W 1, 2, 3
Landscape	TLP 1, 2, 3	
Concrete & Misc.		C 1, 2, 3
Electrical		E 1, 2, 3

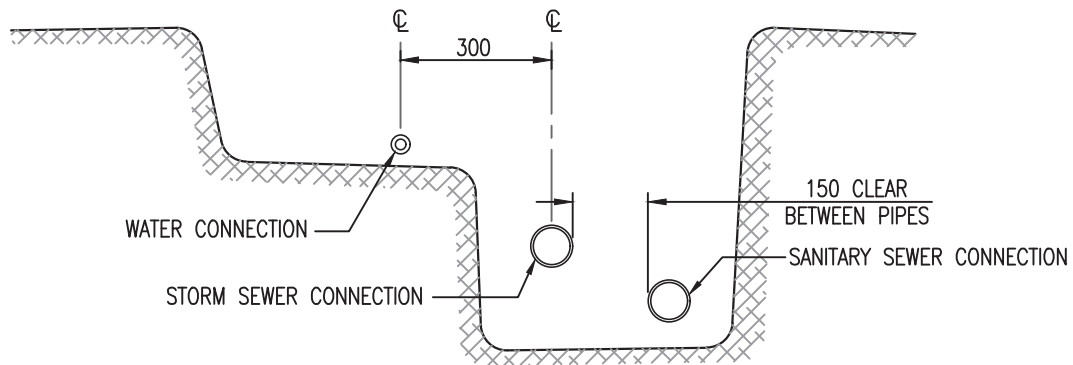
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GENERAL SUPPLEMENTARY DRAWINGS

#6076
02/12/24



PLAN



ELEVATION

*SEE TLW 8 FOR WATER METER – UP TO 50mm SERVICE

NOTES:

- 1) FOR TYPICAL WATER CONNECTION SEE STD. MMCD W2a
- 2) FOR TYPICAL SANITARY CONNECTION SEE STD. MMCD S7
- 3) FOR TYPICAL STORM CONNECTION SEE STD. TLD 9
- 4) SEE SCHEDULE B – DESIGN CRITERIA SECTION W16, S13, D7.5 FOR ADDITIONAL DETAILS ON SERVICE CONNECTION LOCATION
- 5) FOR A SAMPLE SERVICE RECORD CARD SEE TLG 02

TITLE

TYPICAL LOT SERVICE CONNECTION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0018 (OLD #)



TLG 01

Township of Langley SERVICE RECORD CARD		Address 6907 - 213 ST.		Project # 08-13-0010	
23 68 213 ST 22 69 21 70 (SKETCH PLAN)		Type of Building S.F.D.		Lot No. 69	
		Roll No. BY TWP		WATER AS-BUILT DATE MARCH 30, 1996 SIZE & TYPE 25mm Ø POLY TUBING METER N/A LOCATION TO R 9.8m NORTH OF SOUTHWEST CORNER OF PROPERTY	
		SANITARY AS-BUILT DATE MARCH 29, 1996 SIZE & TYPE 100mm Ø PVC LOCATION TO R 9.2m NORTH OF SOUTHWEST CORNER OF PROPERTY DEPTH 1.4m			
		STORM AS-BUILT DATE MARCH 29, 1996 SIZE & TYPE 150mm Ø PVC LOCATION TO R 9.5m NORTH OF SOUTHWEST CORNER OF PROPERTY DEPTH 1.45m			

NOTE:

- 1) SERVICE CARDS SHALL BE ON 65lb (270gsm) WHITE CARD STOCK.
- 2) TEMPLATE OF SERVICE RECORD CAN BE OBTAINED ON THE TOWNSHIP OF LANGLEY WEB PAGE AT WWW.TOL.CA/

TITLE

SAMPLE SERVICE RECORD CARD

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

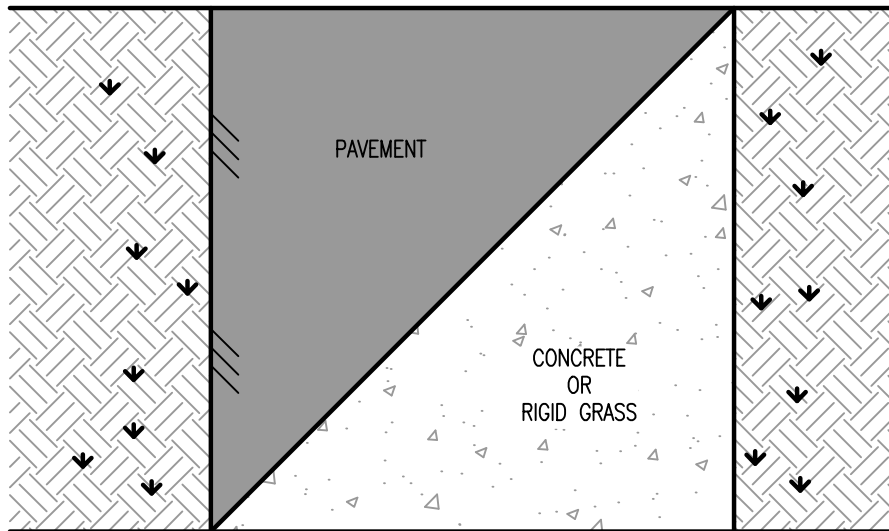
DATE APR 2019

APPROVED

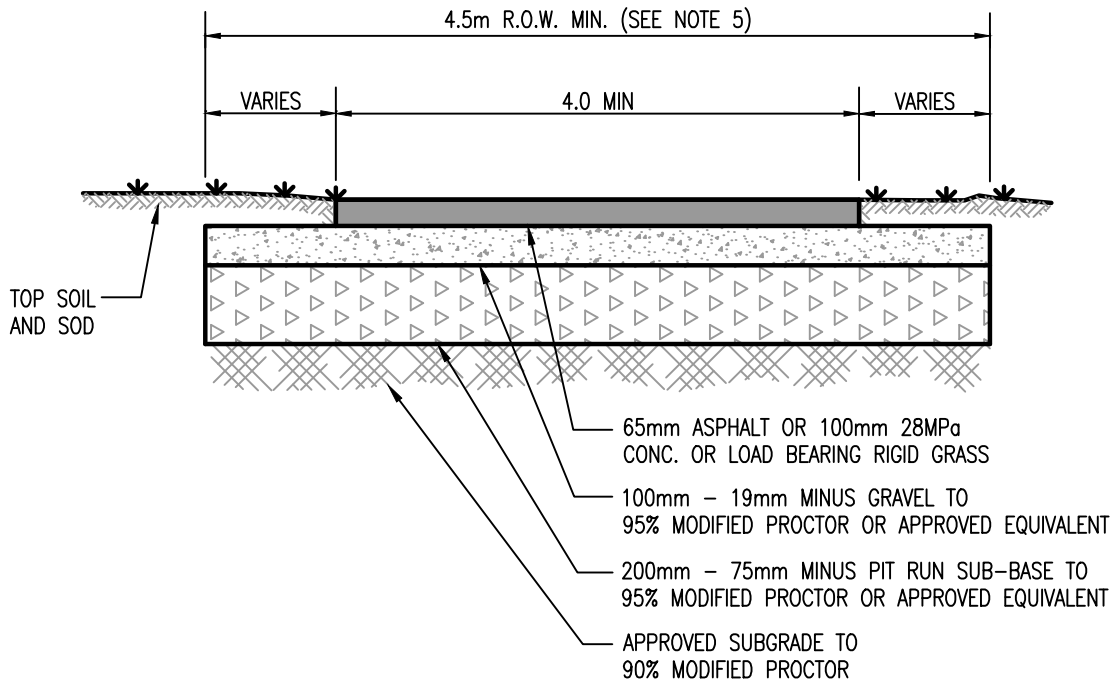
S.D.S.B. No.: SCBE0019 (OLD #)



TLG 02



PLAN VIEW



SECTION

NOTES:

- 1) ACCESS TO BE CONSTRUCTED PRIOR TO SUBSTANTIAL COMPLETION
- 2) ACCESS TO CONFORM TO FINAL LOT GRADE
- 3) ACCESS TO HAVE MIN. 1.0% CROSSFALL AND MAXIMUM 2.0% CROSSFALL
- 4) SEE STD. DWG. TLP 20 FOR RIGID GRASS DETAILS
- 5) DEPENDING ON THE DEPTH OF WATERMAIN; ROW WIDTH MAY BE REDUCED TO 3.0m / 2.5m TRAVEL SURFACE

TITLE

RIGHT OF WAY ACCESS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

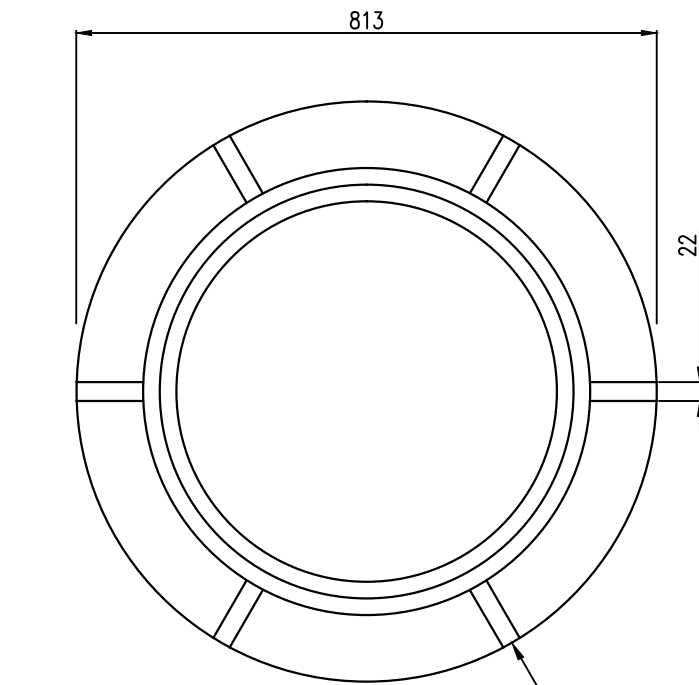
DATE APR 2019

APPROVED

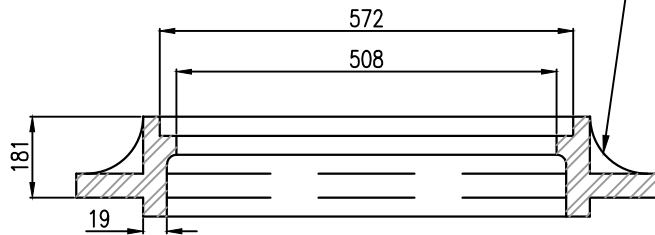
S.D.S.B. No.: SCBE0021 (OLD #)



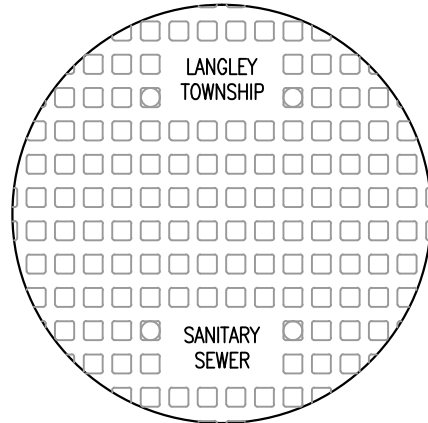
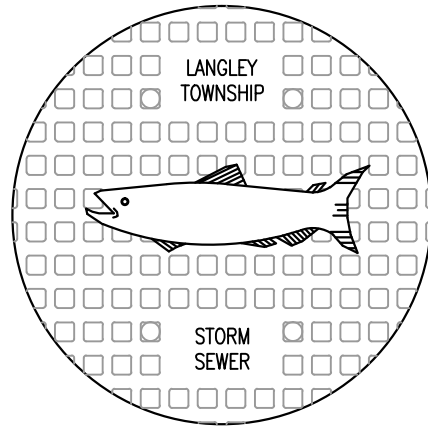
TLG 03



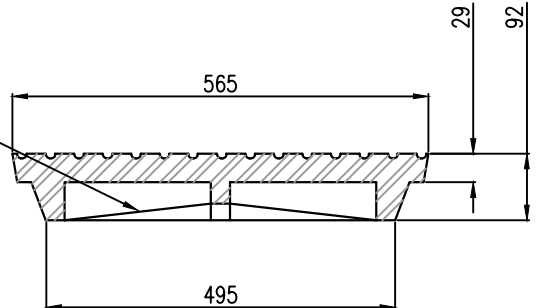
SIX (6) EQUALLY SPACED RIBS



FRAME



SIX (6) EQUALLY SPACED RIBS - 22 THICK



COVER

NOTES:

- 1) LETTERING SHALL BE 25mm FLATTENED FACE GOTHIC LETTERING
- 2) SERVICE IDENTIFICATION TO BE "STORM SEWER", "SANITARY SEWER" OR "WATER" AS APPROPRIATE
- 3) BOTH FRAME AND COVER SHALL BE MACHINED FOR A NON-ROCKING FIT IN ALL POSITIONS
- 4) REFER TO SCHEDULE D FOR APPROVED FRAME AND COVER DETAILS

TITLE

MANHOLE FRAME AND COVER

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

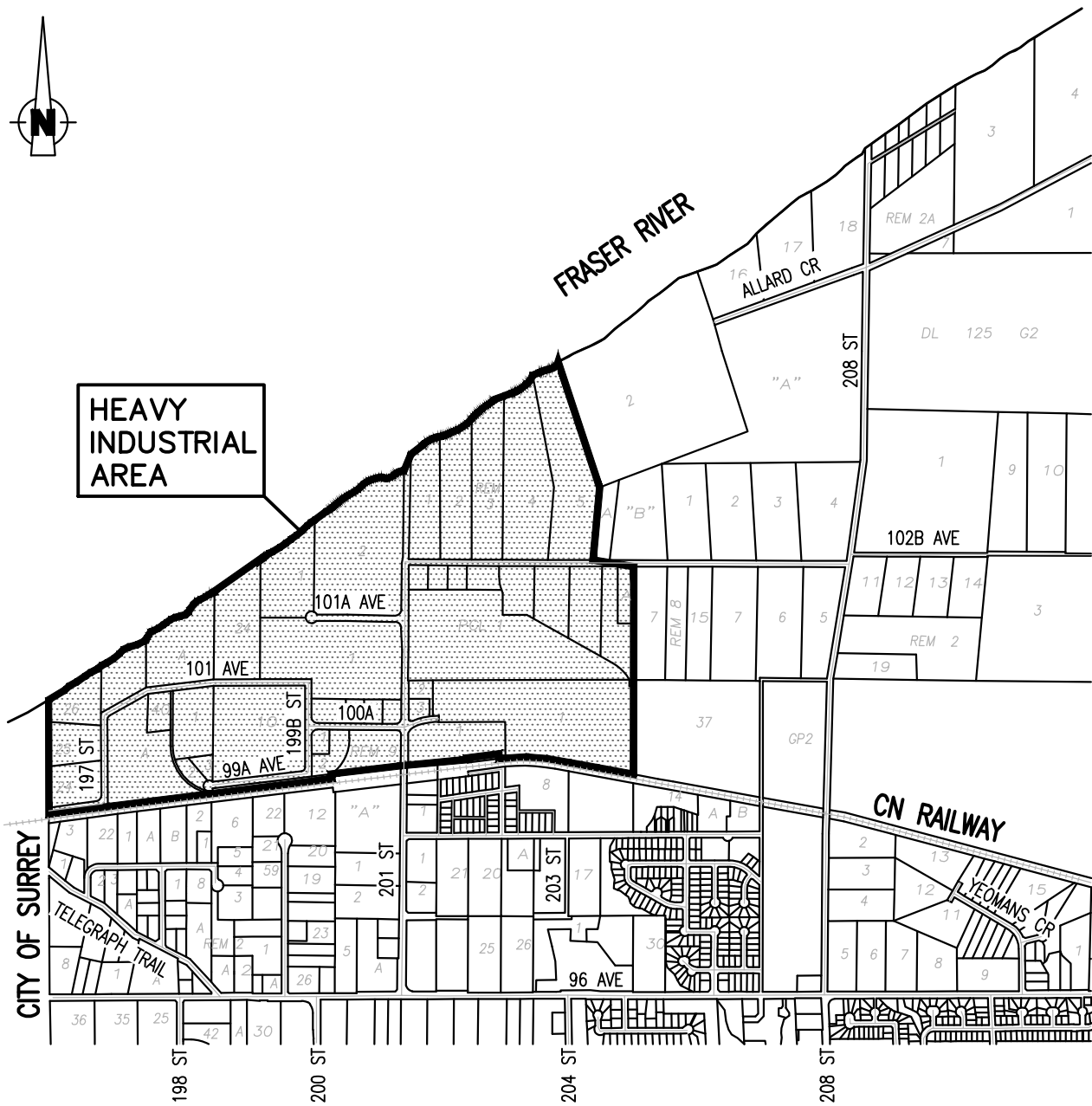
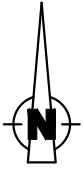
DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0022 (OLD #)



TLG 04



TITLE

HEAVY INDUSTRIAL AREA OF NORTHWEST LANGLEY OVERHEAD DISTRIBUTION WIRING PERMITTED

THE CORPORATION OF THE TOWNSHIP OF LANGLEY

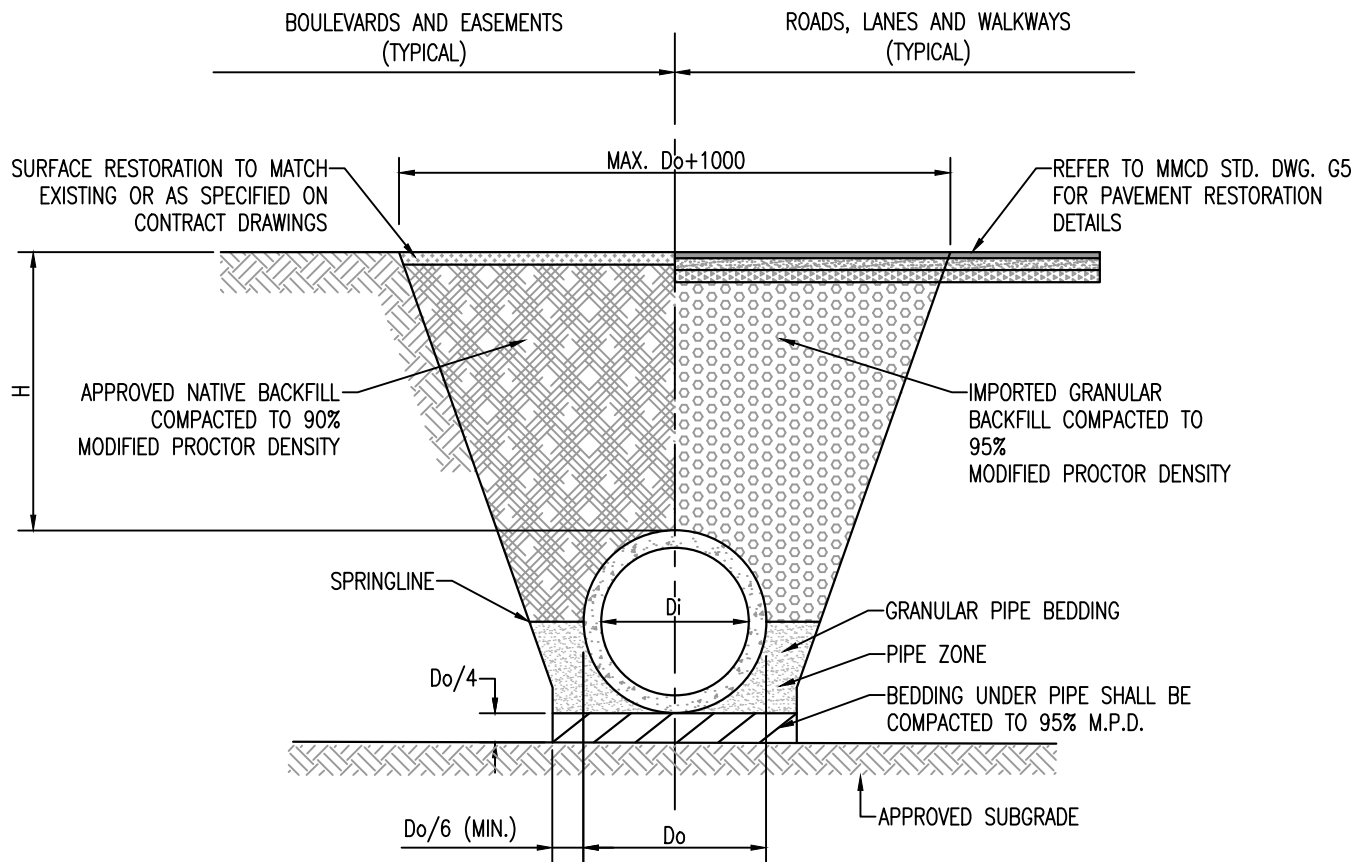
DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0051 (OLD #)



TLG 05



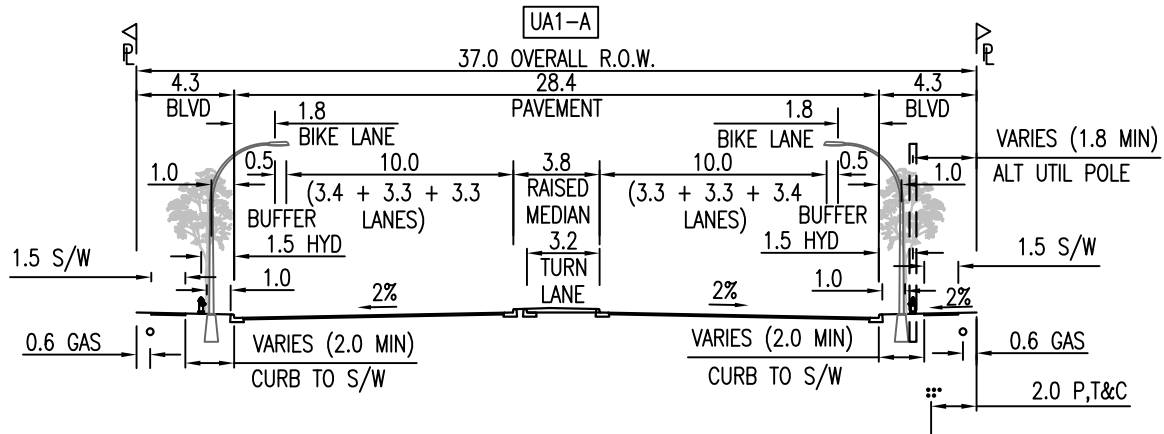
NOTATIONS:
 D_i = INSIDE DIAMETER OF THE PIPE, (mm).
 D_o = OUTSIDE DIAMETER OF THE PIPE, (mm).
 H = DESIGN HEIGHT OF EARTH ABOVE THE TOP OF THE PIPE (m).

NOTES:
 1) THIS DETAIL FOR PRECAST CONCRETE AND DUCTILE IRON PIPE ONLY

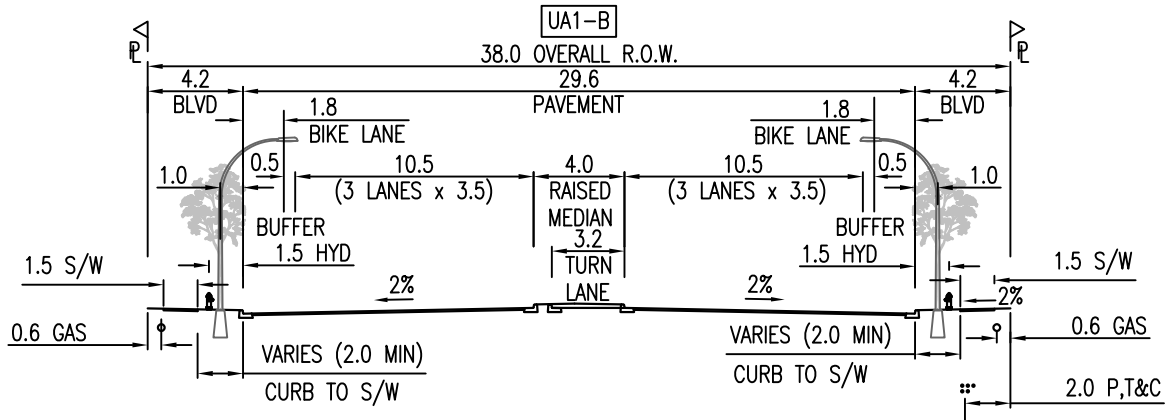
TITLE UTILITY TRENCH FOR RIGID PIPE	
THE CORPORATION OF THE TOWNSHIP OF LANGLEY	DATE APR 2019 APPROVED S.D.S.B. No.:
TLG 06	C:\Standard Drawings\schedule N - 2016 supplementary std detail dwg\TLG 06.dwg

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ROAD SUPPLEMENTARY DRAWINGS



6 LANE DIVIDED + BIKE LANES
≤ 60km/hr



6 LANE DIVIDED + BIKE LANES
> 60km/hr and ≤ 80km/hr

NOTES:

- 1) MB = MODIFIED BARRIER CURB – SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL
- 5) 0.5M BUFFER IS TO BE RAISED WITH CURB AND MAY BE PAINTED AS AN INTERIM MEASURE
- 6) DELINEATOR POSTS MAY BE CONSIDERED WHERE APPROPRIATE

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN ARTERIAL 6 LANE DESIGN SPEED ≤ 60km/hr	UA1-A	2	37	28.4	4.3	MB	INCLUDES 1.8m WIDE BIKE LANES
URBAN ARTERIAL 6 LANE DESIGN SPEED > 60km/hr	UA1-B	2	38	29.6	4.2	MB	INCLUDES 1.8m WIDE BIKE LANES

TITLE

URBAN ARTERIAL ROADS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

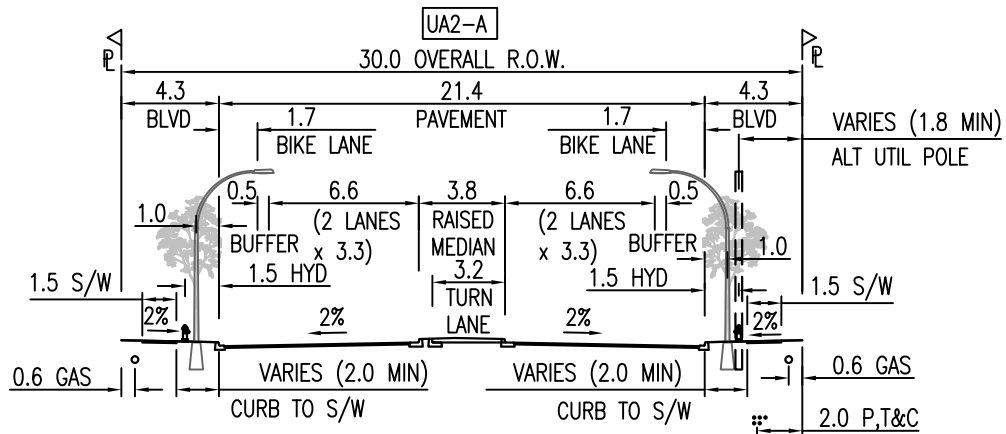
DATE APR 2019

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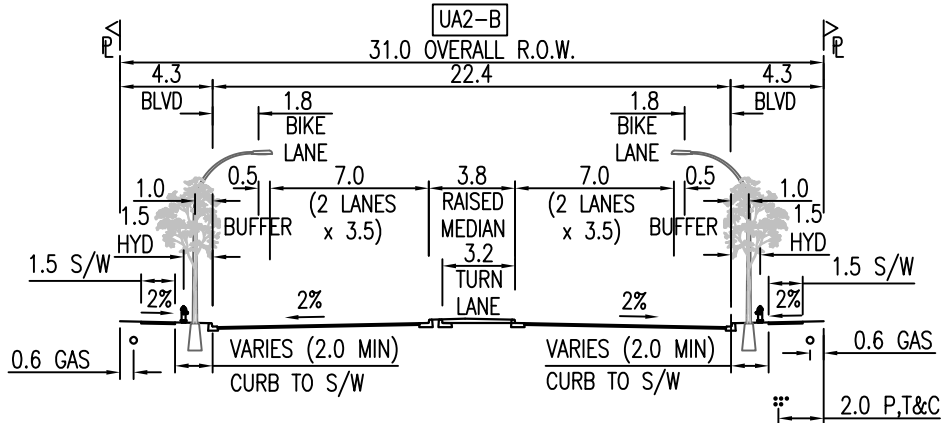
S.D.S.B. No.:



TLR 01



4 LANE DIVIDED + BIKE LANES
<=60km/hr



4 LANE DIVIDED + BIKE LANES
>60km/hr and <=80km/hr

NOTES:

- 1) MB = MODIFIED BARRIER CURB - SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL
- 5) 0.5M BUFFER IS TO BE RAISED WITH CURB AND MAY BE PAINTED AS AN INTERIM MEASURE
- 6) DELINEATOR POSTS MAY BE CONSIDERED WHERE APPROPRIATE

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN ARTERIAL 4 LANE DESIGN SPEED <=60km/hr	UA2-A	2	30	21.4	4.3	MB	INCLUDES 1.7m WIDE BIKE LANES
URBAN ARTERIAL 4 LANE DESIGN SPEED > 60km/hr	UA2-B	2	31	22.4	4.3	MB	INCLUDES 1.8m WIDE BIKE LANES

TITLE

URBAN ARTERIAL ROADS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

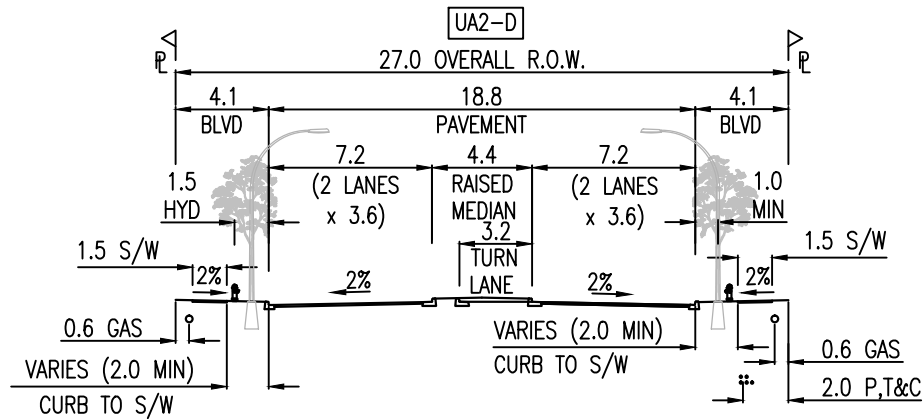
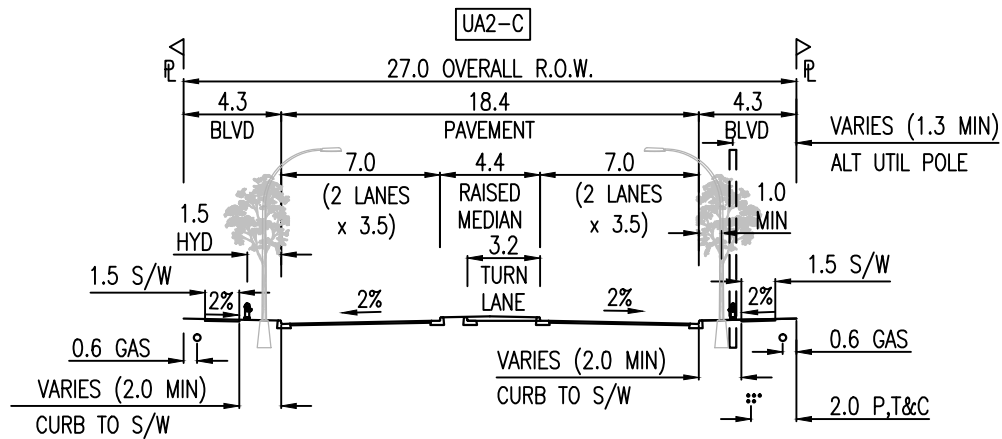
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 02



NOTES:

- 1) MB = MODIFIED BARRIER CURB – SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN ARTERIAL 4 LANE DESIGN SPEED ≤60km/hr	UA2-C	2	27	18.4	4.3	B	NO BIKE LANES
URBAN ARTERIAL 4 LANE DESIGN SPEED > 60km/hr	UA2-D	2	27	18.8	4.1	B	NO BIKE LANES

TITLE

URBAN ARTERIAL ROADS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

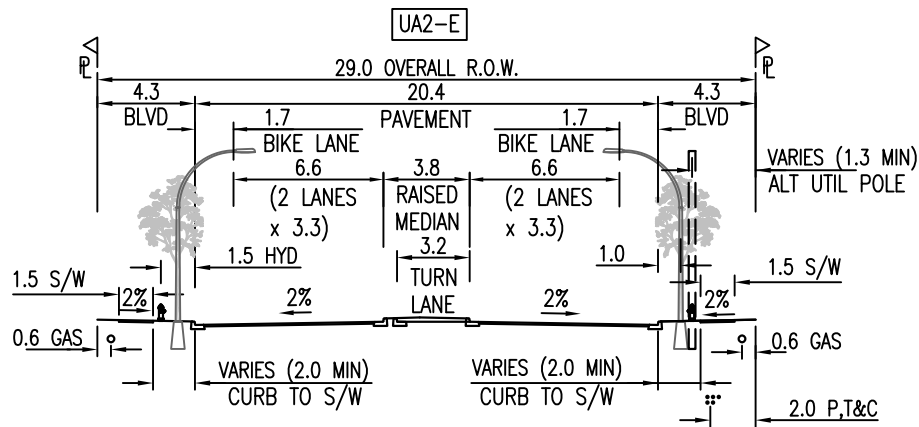
DATE APR 2019

APPROVED

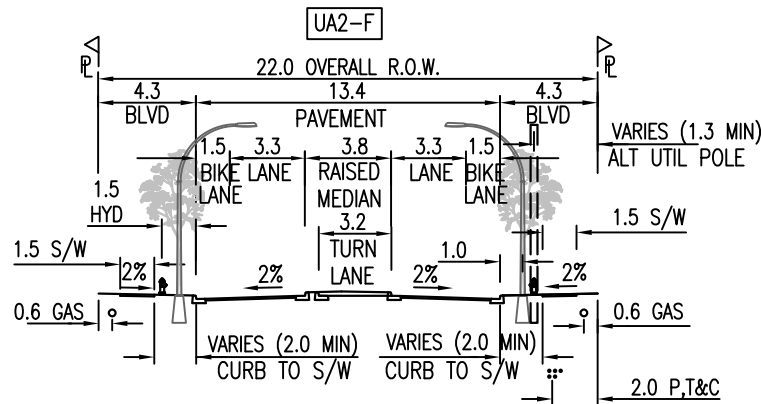
S.D.S.B. No.:



TLR 03



4 LANE DIVIDED RETROFIT FOR BIKE LANES ON EXISTING ROADS ≤60km/hr



2 LANE DIVIDED RETROFIT FOR BIKE LANES ON EXISTING ROADS ≤60km/hr

NOTES:

- 1) MB = MODIFIED BARRIER CURB - SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL
- 5) FOR 4 LANE DIVIDED ROADS, NEW ROADS USE UA2-A OR UA2-B
- 6) FOR 2 LANE DIVIDED ROADS, NEW ROADS USE UA2-G
- 7) DELINEATOR POSTS MAY BE CONSIDERED WHERE APPROPRIATE

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN ARTERIAL 4 LANE DESIGN SPEED ≤60km/hr	UA2-E	2	29	20.4	4.3	MB	INCLUDES 1.7m WIDE BIKE LANES
URBAN ARTERIAL 2 LANE DESIGN SPEED ≤60km/hr	UA2-F	2	22.0	13.4	4.3	MB	INCLUDES 1.5m WIDE BIKE LANES

TITLE

URBAN ARTERIAL ROAD

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

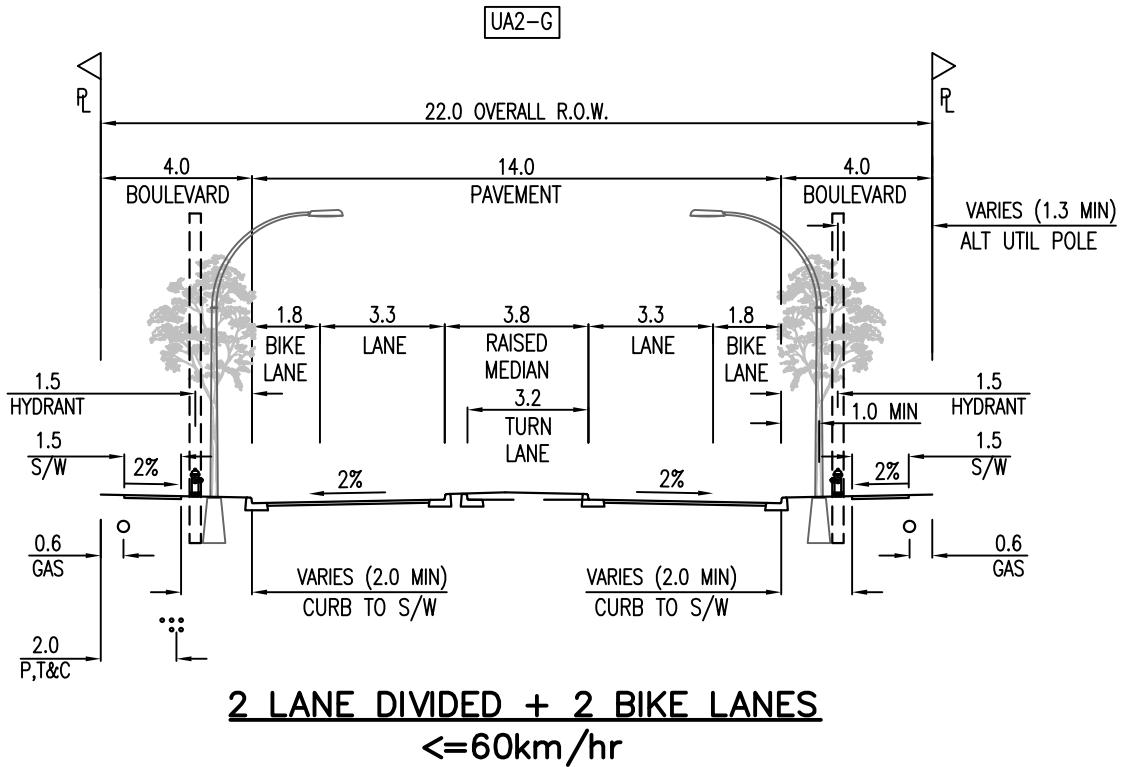
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 04



NOTES:

- 1) MB = MODIFIED BARRIER CURB - SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL
- 5) DELINEATOR POSTS MAY BE CONSIDERED WHERE APPROPRIATE

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN ARTERIAL 2 LANE DESIGN SPEED <=60km/hr	UA2-G	2	22	14.0	4.0	MB	INCLUDES 1.8m WIDE BIKE LANES

TITLE

URBAN ARTERIAL ROAD

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

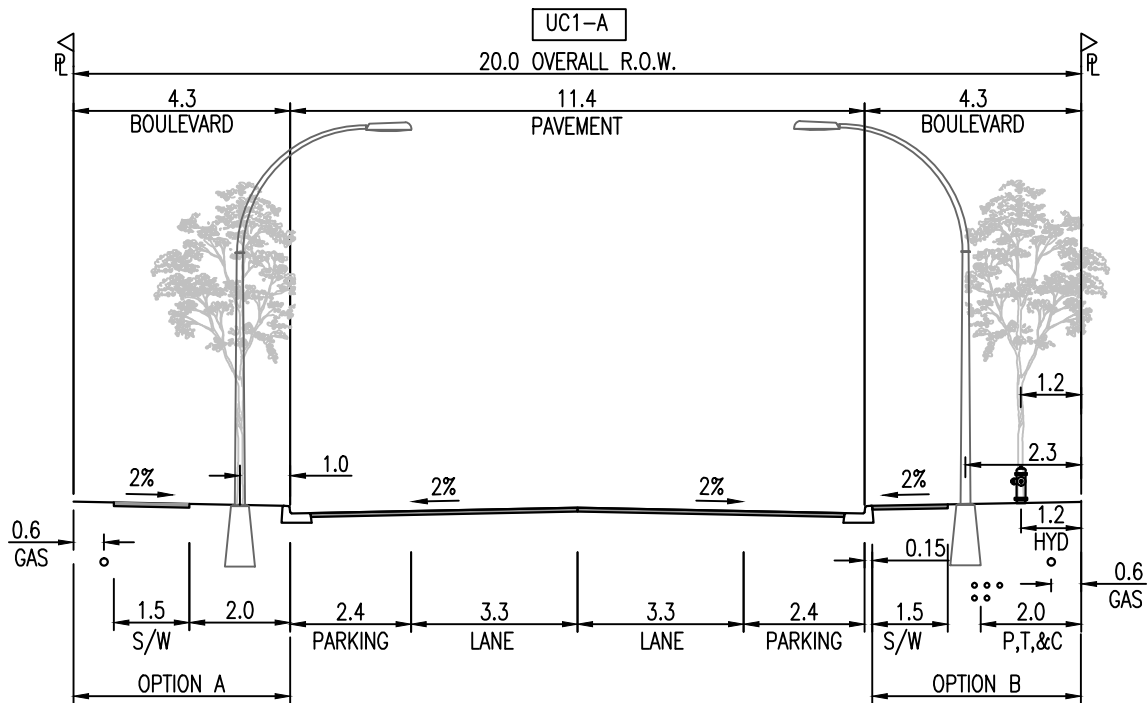
DATE APR 2019

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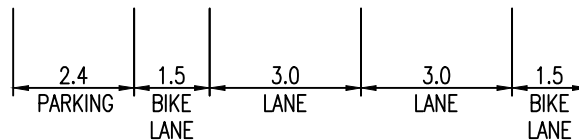
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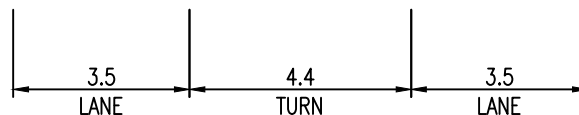
TLR 05



LANING OPTION 1
2 TRAVEL LANES + 2 PARKING LANES



LANING OPTION 2
2 TRAVEL LANES + 1 PARKING LANE + 2 BIKE LANES



LANING OPTION 3
2 TRAVEL LANES + TWO WAY LEFT TURN LANE

NOTES:

- 1) MB = MODIFIED BARRIER CURB – SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN MAJOR COLLECTOR – RESIDENTIAL	UC1-A	2	20	11.4	4.3	B OR R	LIMITED DRIVEWAY ACCESS

TITLE

URBAN MAJOR COLLECTOR RESIDENTIAL ROADS



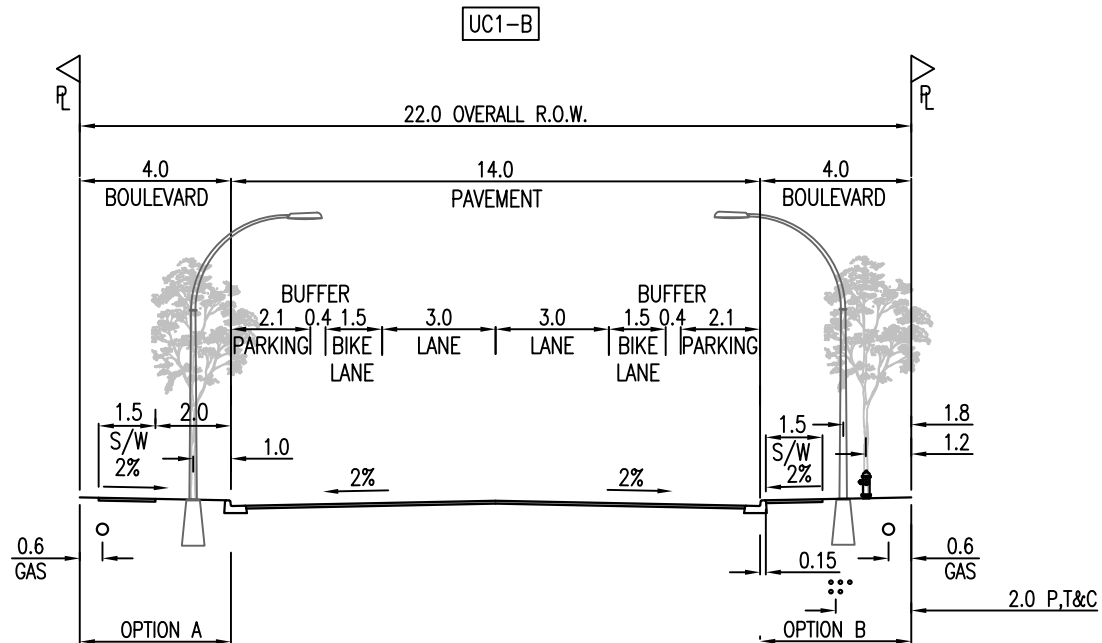
**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

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S.D.S.B. No.:

TLR 06

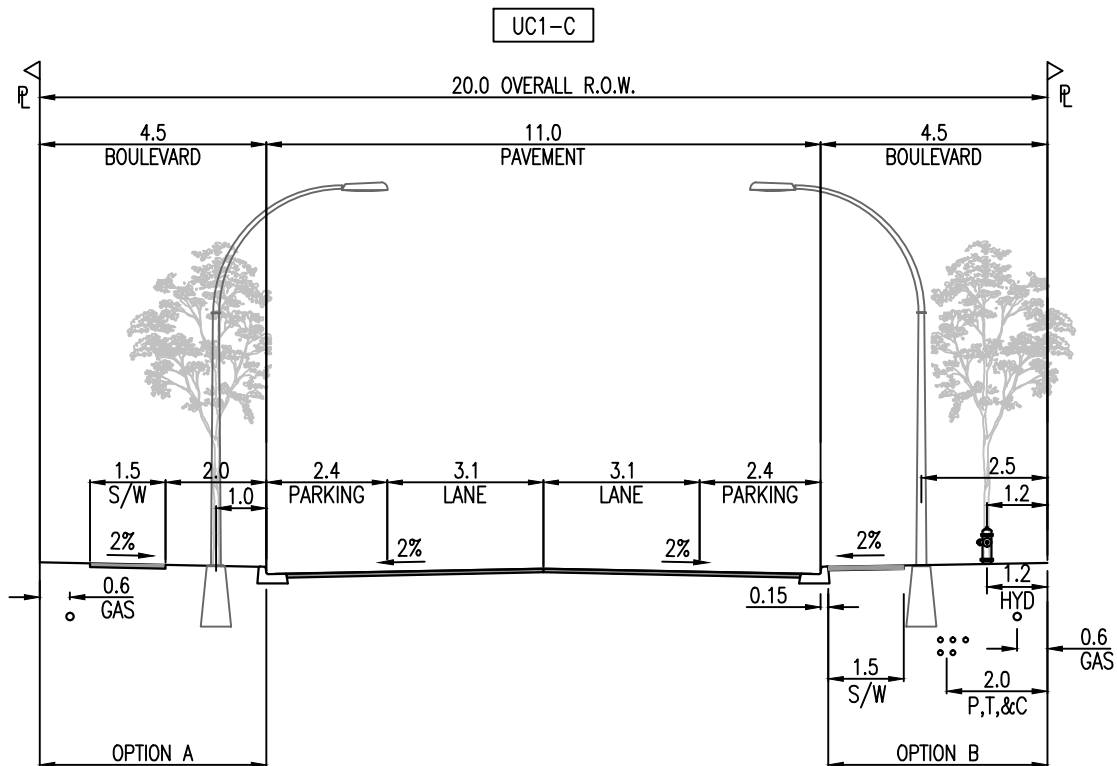


NOTES:

- 1) "FRONT LOADED" RESIDENTIAL LOTS SHALL HAVE ROLL-OVER CURB AND GUTTER
- 2) "REAR LOADED" RESIDENTIAL LOTS SHALL HAVE BARRIER CURB AND GUTTER
- 3) MB = MODIFIED BARRIER CURB - SEE TLR 23 FOR DETAILS
- 4) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 5) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 6) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL
- 7) DELINEATOR POSTS MAY BE CONSIDERED WHERE APPROPRIATE

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN MAJOR COLLECTOR - RESIDENTIAL DESIGN SPEED <=50km/hr	UC1-B	2	22.0	14.0	4.0	B/R	LIMITED DRIVEWAY ACCESS, PARKING BOTH SIDES
TITLE URBAN MAJOR COLLECTOR ROAD							 TLR 07
THE CORPORATION OF THE TOWNSHIP OF LANGLEY						DATE	
						APPROVED	
						S.D.S.B. No.:	



2 TRAVEL LANES + 2 PARKING LANES

NOTES:

- 1) MB = MODIFIED BARRIER CURB - SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
MINOR COLLECTOR - RESIDENTIAL	UC1-C	2	20	11.0	4.5	B OR R	DRIVEWAY ACCESS PERMITTED

TITLE

URBAN MINOR COLLECTOR RESIDENTIAL ROADS



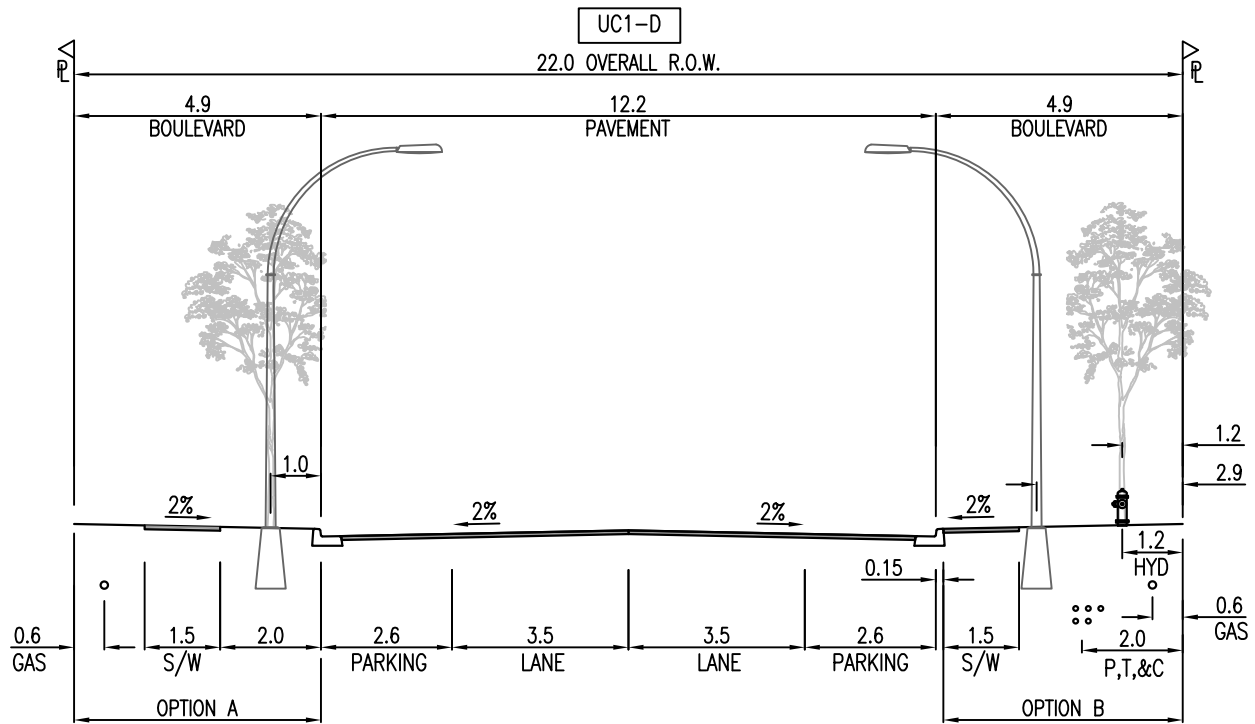
**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

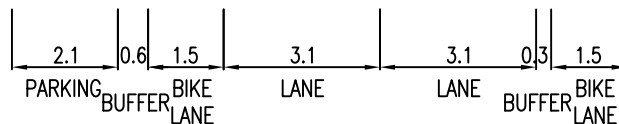
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S.D.S.B. No.:

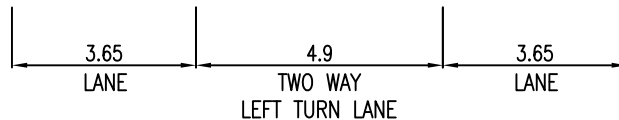
TLR 08



LANING OPTION 1
2 TRAVEL LANES + 2 PARKING LANES



LANING OPTION 2
2 TRAVEL LANES + 1 PARKING LANE + 2 BIKE LANES



LANING OPTION 3
2 TRAVEL LANES + TWO WAY LEFT TURN LANE

NOTES:

$\leq 50\text{km/hr}$

- 1) MB = MODIFIED BARRIER CURB - SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL
- 5) UC1-D IS FOR RETROFITTING EXISTING ROADS. NEW ROADS USE UC1-B
- 6) DELINEATOR POSTS MAY BE CONSIDERED WHERE APPROPRIATE

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION & TYPICAL ZONING	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN MAJOR & URBAN MINOR - INDUSTRIAL/COMMERCIAL DESIGN SPEED $\leq 50\text{km/hr}$	UC1-D	2	22	12.2	4.9	B	LIMITED DRIVEWAY ACCESS

TITLE

INDUSTRIAL/COMMERICAL ROADS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

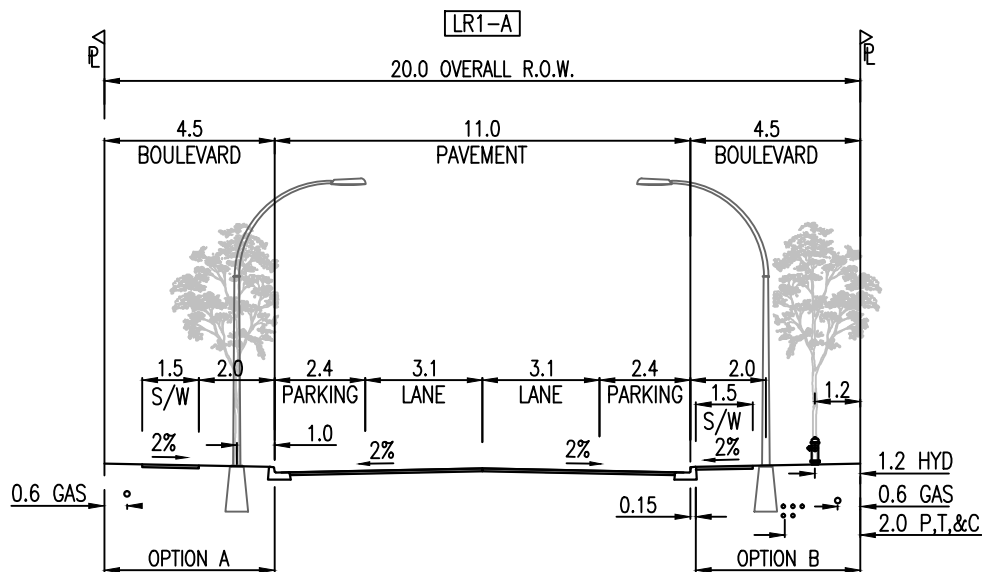
DATE APR 2019

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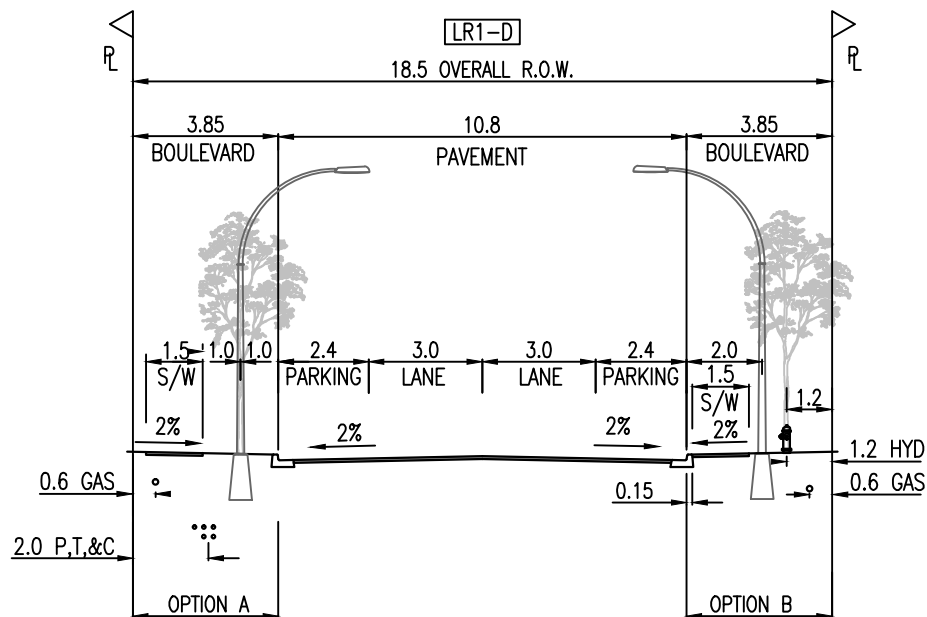
S.D.S.B. No.:



TLR 09



2 TRAVEL LANES + 2 PARKING LANES



2 TRAVEL LANES + 2 PARKING LANES

NOTES:

- 1) MB = MODIFIED BARRIER CURB SEE TLR 23 FOR DETAILS
- 2) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 3) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 4) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
LOCAL - STANDARD LOT RESIDENTIAL & MULTIFAMILY	LR1-A	2	20	11	4.5	B	PARKING BOTH SIDES
LOCAL - RESIDENTIAL	LR1-D	2	18.5	10.8	3.85	R/B	PARKING BOTH SIDES

TITLE

LOCAL RESIDENTIAL ROADS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

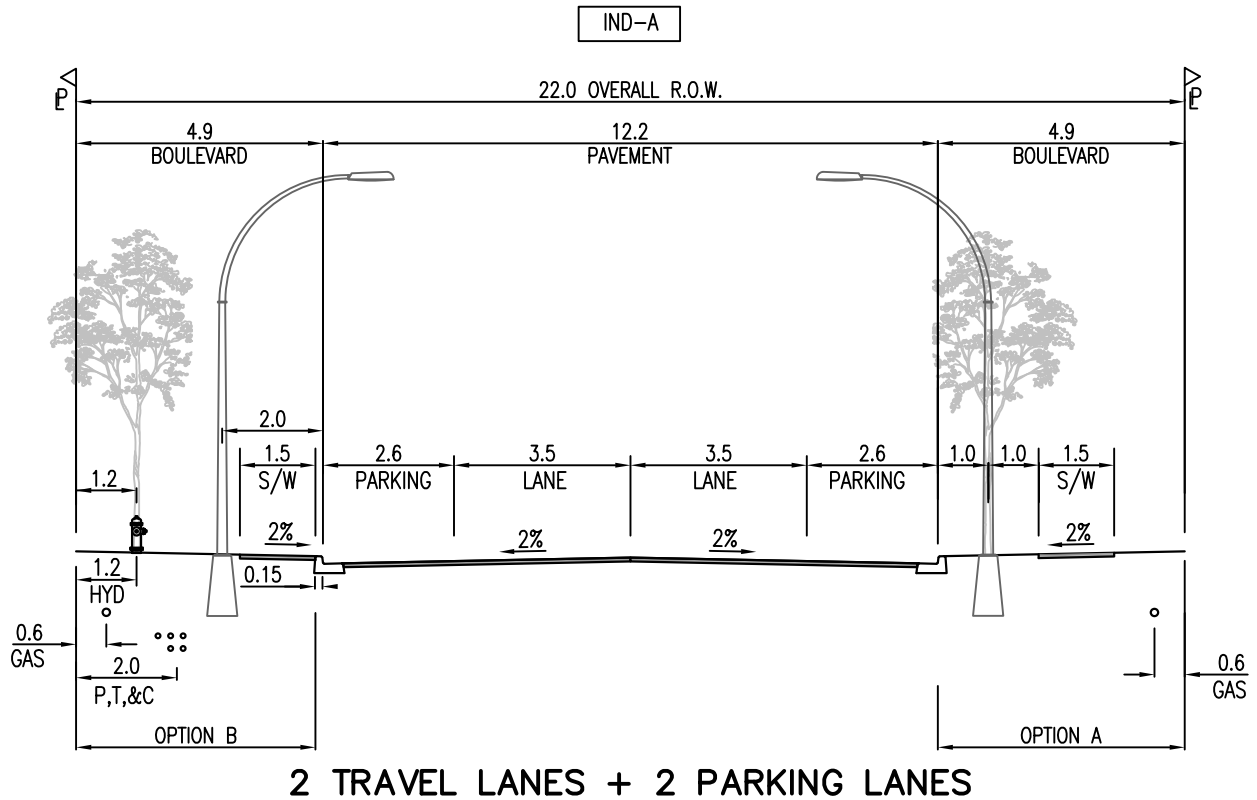
DATE APR 2019

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S.D.S.B. No.:



TLR 10



NOTES:

- 1) TYPICAL SECTION SHOWS BOULEVARD STANDARD DEPENDING ON SIDEWALK LOCATION
- 2) MB = MODIFIED BARRIER CURB - SEE TLR 23 FOR DETAILS
- 3) PAVEMENT WIDTH MEASURED FROM FACE OF CURB TO FACE OF CURB
- 4) SEE TLP 28 FOR STREETLIGHT LOCATIONS
- 5) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS, KEEP ALL UTILITIES CLEAR OF CURBS
- 6) WHERE GREENWAY EXISTS, BOULEVARD TO BE IN ADDITION TO GREENWAY PARCEL

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION & TYPICAL ZONING	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
LOCAL INDUSTRIAL	IND-A	2	22	12.2	4.9	B	PARKING BOTH SIDES

TITLE

LOCAL INDUSTRIAL ROADS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

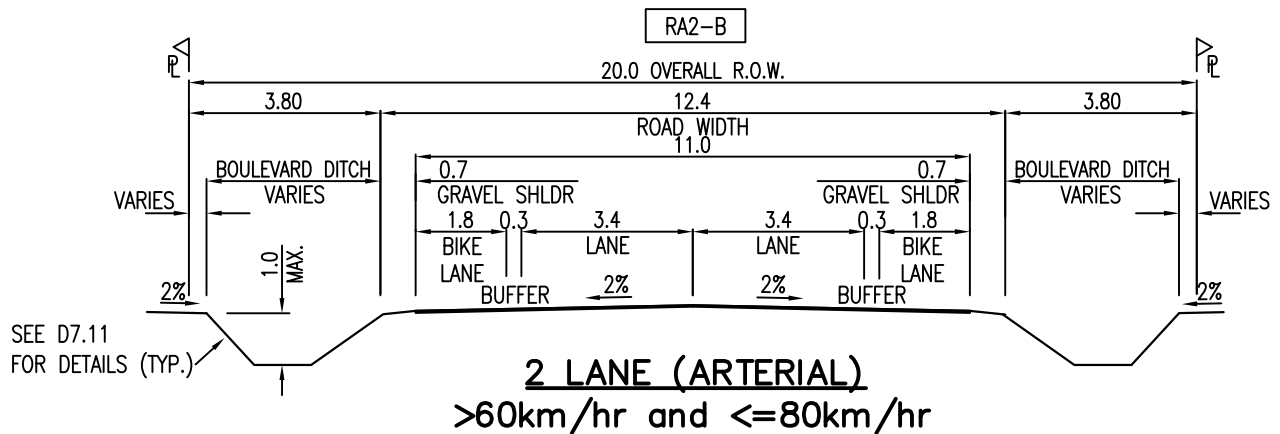
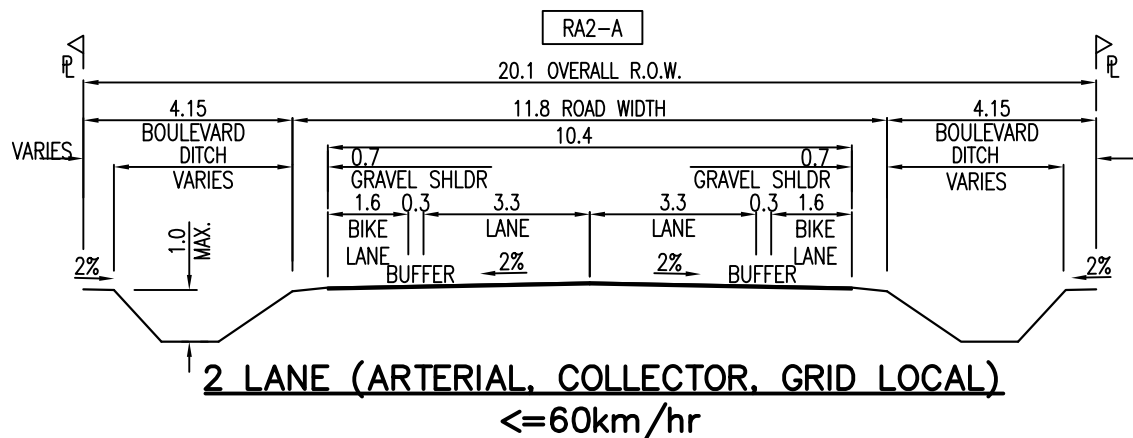
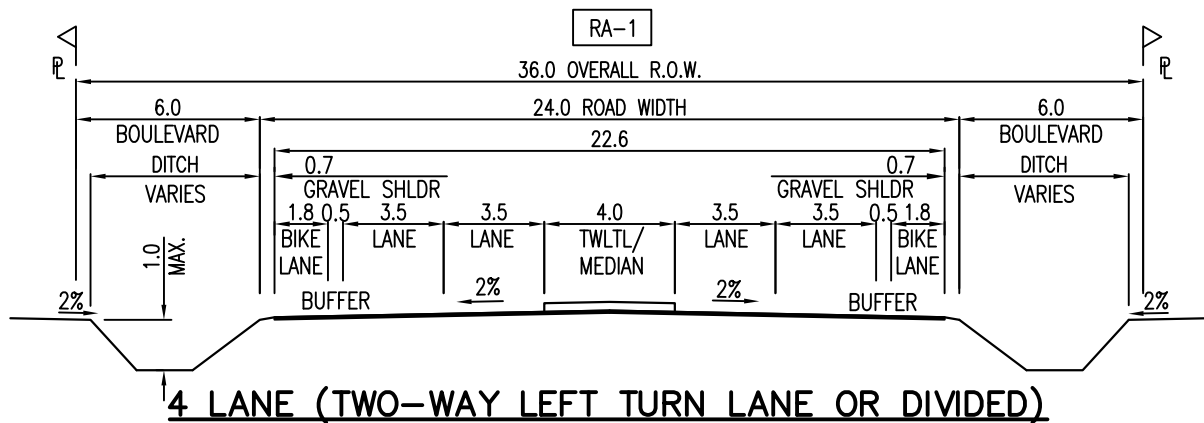
DATE APR 2019

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S.D.S.B. No.:



TLR 11



NOTE:

- 1) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS
- 2) DELINEATOR POSTS MAY BE CONSIDERED WHERE APPROPRIATE

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
ARTERIAL - RURAL (4 LANE)	RA-1	36	22.6	6.0	N/A	1.8M BIKE LANE, 0.7M GRAVEL SHOULDER
ARTERIAL, COLLECTOR, GRID LOCAL - RURAL DESIGN SPEED <=60km/hr	RA2-A	20	10.4	4.15	N/A	1.6M BIKE LANE, 0.7M GRAVEL SHOULDER
ARTERIAL - RURAL (2 LANE) DESIGN SPEED >60km/hr	RA2-B	20	11.0	3.80	N/A	1.8M BIKE LANE, 0.7M GRAVEL SHOULDER

TITLE **RURAL ROADS**

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

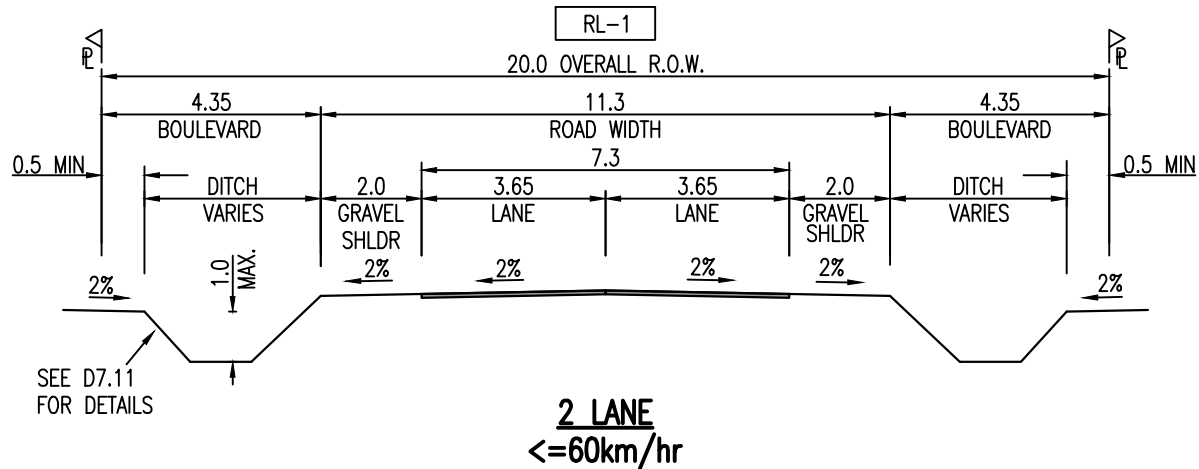
DATE **APR 2019**

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S.D.S.B. No.:



TLR 12

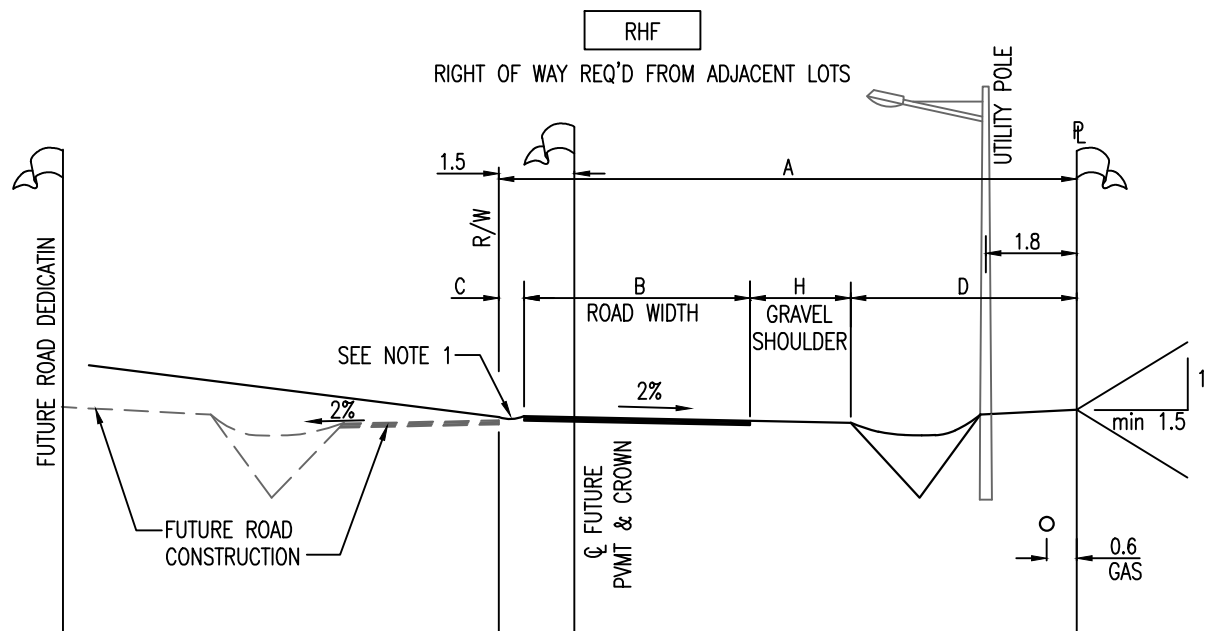
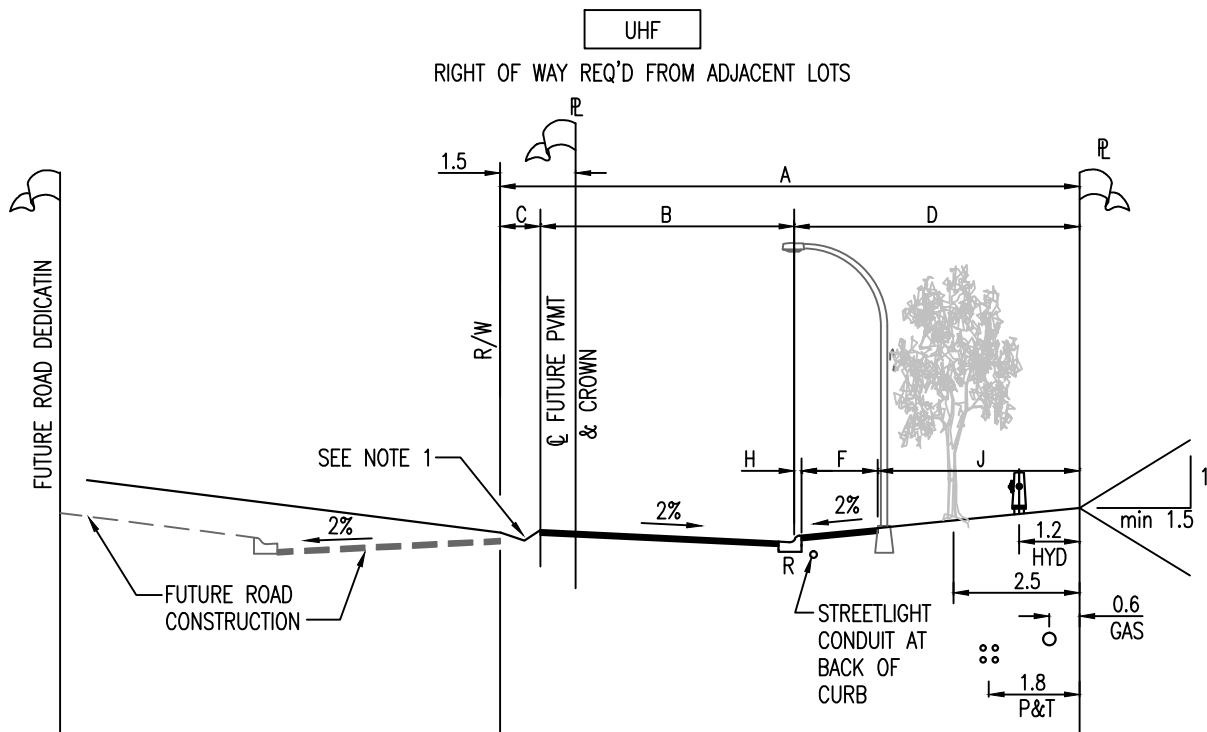


NOTE:

1) WATER, STORM, & SANITARY LOCATIONS VARY, KEEP MANHOLES CLEAR OF WHEELPATHS

ALL DIMENSIONS IN METERS

ROAD CLASSIFICATION	ROAD TYPE	NO. OF S/W	ROW	PVMT	BLVD	CURB TYPE	OPERATIONAL CHARACTERISTICS
2 LANE LOCAL DESIGN SPEED <=60km/hr	RL-1	0	20	7.3	4.35	N/A	2.0 GRAVEL SHOULDER
TITLE LIMITED LOCAL RURAL ROADS							 TLR 13
THE CORPORATION OF THE TOWNSHIP OF LANGLEY						DATE	APR 2019
						APPROVED	
						S.D.S.B. No.:	



NOTE:

- 1) LAWN DRAINS AND SWALE AS DIRECTED BY MUNICIPAL ENGINEER

ALL DIMENSIONS IN METERS

TYPICAL ZONING LAND USE	ROAD TYPE	NO. OF S/W	ROW A	PMVT B	SWALE C	BLVD W/P&T D	WIDTH S/W F	CURB -S/W H	PL TO S/W J	CURB TYPE	OPERATIONAL CHARACTERISTICS
URBAN HALF ROAD	UHF	1	11.5	6.0	0.5	5.0	1.5	0.15	3.35	R, B	INTERIM; NO PARKING
RURAL HALF ROAD	RHF	ON ROAD (LOC'N OF S/W)	11.5	6.0	0.8	2.7		2 (W/GRVL SHLDR)	N/A	N/A	NO PARKING

TITLE HALF ROAD

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

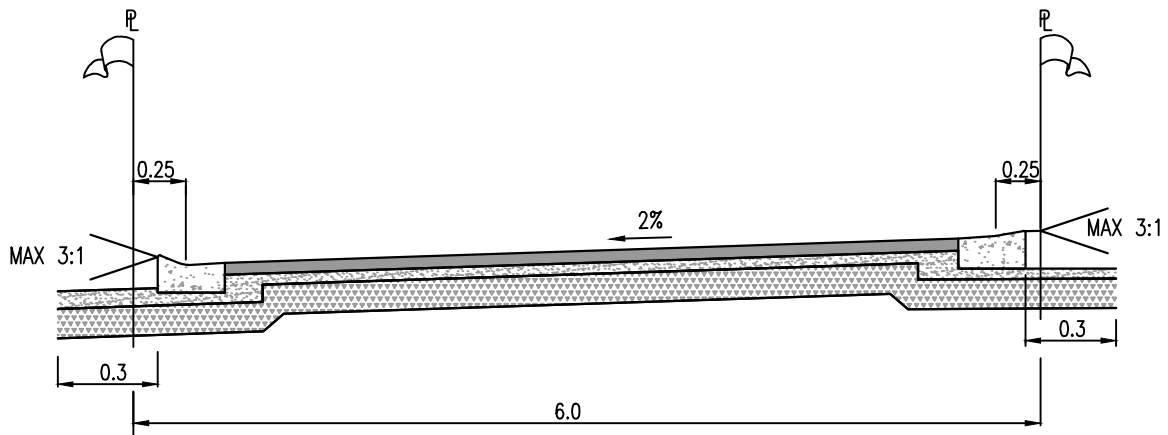
DATE APR 2019

APPROVED

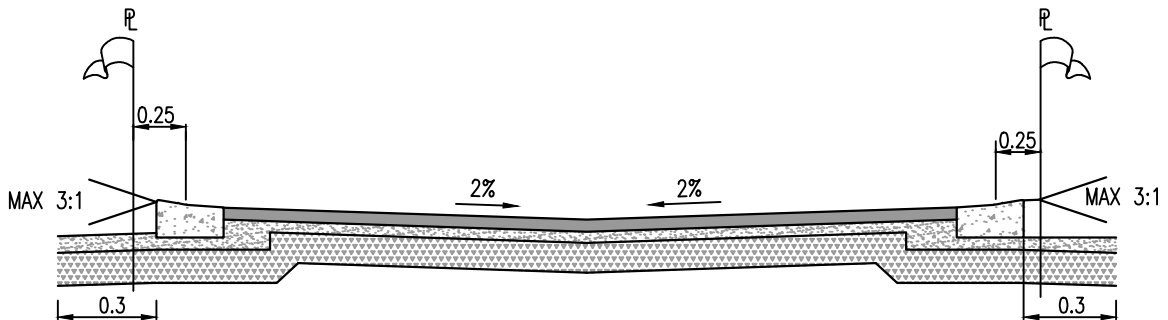
S.D.S.B. No.:



TLR 14



TYPE "A"



TYPE "B"

NOTES:

- 1) UNDERGROUND UTILITIES AS REQUIRED
- 2) INSPECTION CHAMBERS LOCATED IN ASPHALT REFER TO TLS 2 AND TLS 3 FOR DETAILS

ALL DIMENSIONS IN METERS

TITLE

LANE

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

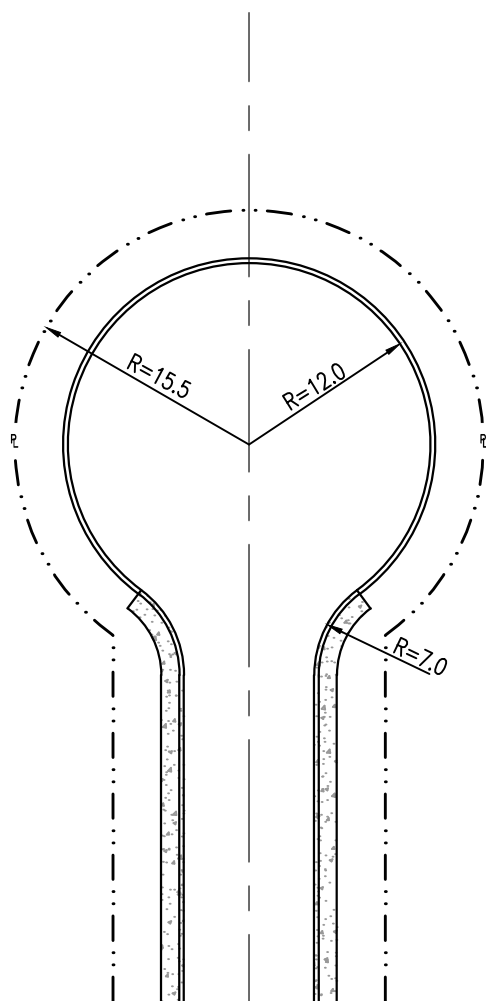
DATE APR 2019

APPROVED

S.D.S.B. No.:

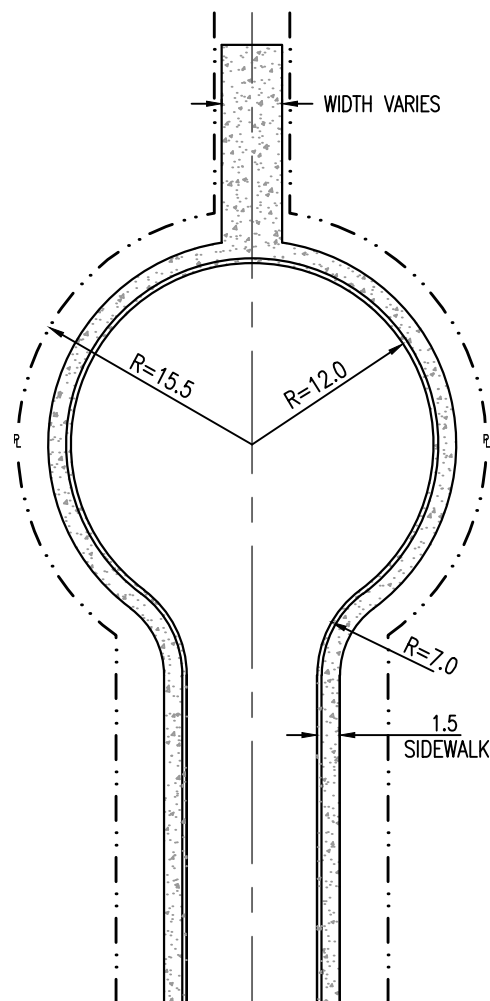


TLR 15



CUL-DE-SAC WITHOUT WALKWAY

TYPE "A"



CUL-DE-SAC WITH WALKWAY

TYPE "B"

NOTES:

- 1) PAVEMENT STRUCTURE OF CUL-DE-SAC SHALL BE SAME AS SPECIFIED FOR ROAD
- 2) USE A MINIMUM CROSSFALL OF 2% FOR CUL-DE-SAC
- 3) REFER TO DRAWINGS TLR 10 AND TLR 11 FOR ROAD CROSS SECTION DETAILS
- 4) FOR TYPE "A" – EXTEND SIDEWALK TO NEAREST PROPERTY LINE WITHIN THE BULB.
- 5) FOR TYPE "B" – REFER TO DRAWING TLR 20 FOR EMERGENCY ACCESS DETAILS
REFER TO DRAWING TLR 21 FOR WALKWAY DETAILS

ALL DIMENSIONS IN METERS

TITLE

URBAN CUL-DE-SACS

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

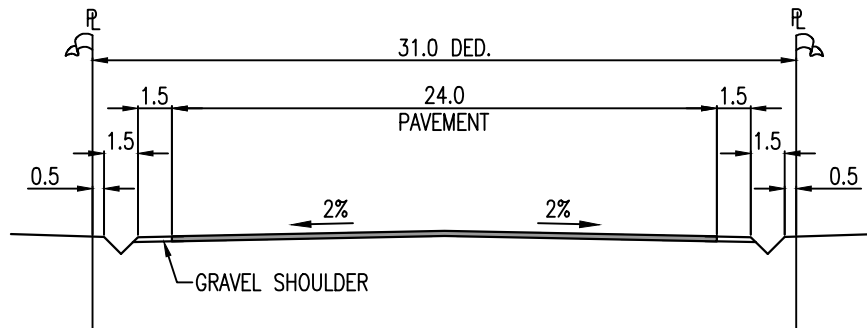
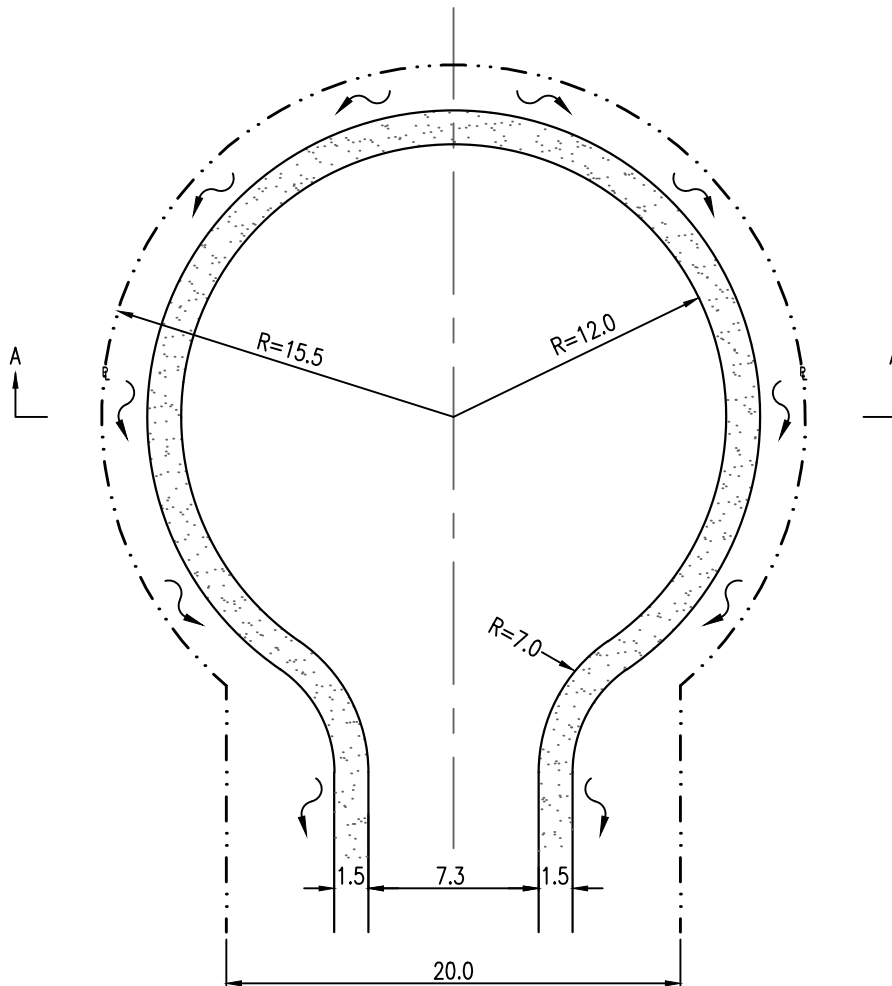
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 16



SECTION A-A

NOTES:

- 1) PAVEMENT STRUCTURE OF CUL-DE-SAC SHALL BE SAME AS SPECIFIED FOR ROAD
- 2) USE A MINIMUM CROSSFALL OF 2% FOR CUL-DE-SAC

ALL DIMENSIONS IN METERS

TITLE **RURAL CUL-DE-SAC**

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

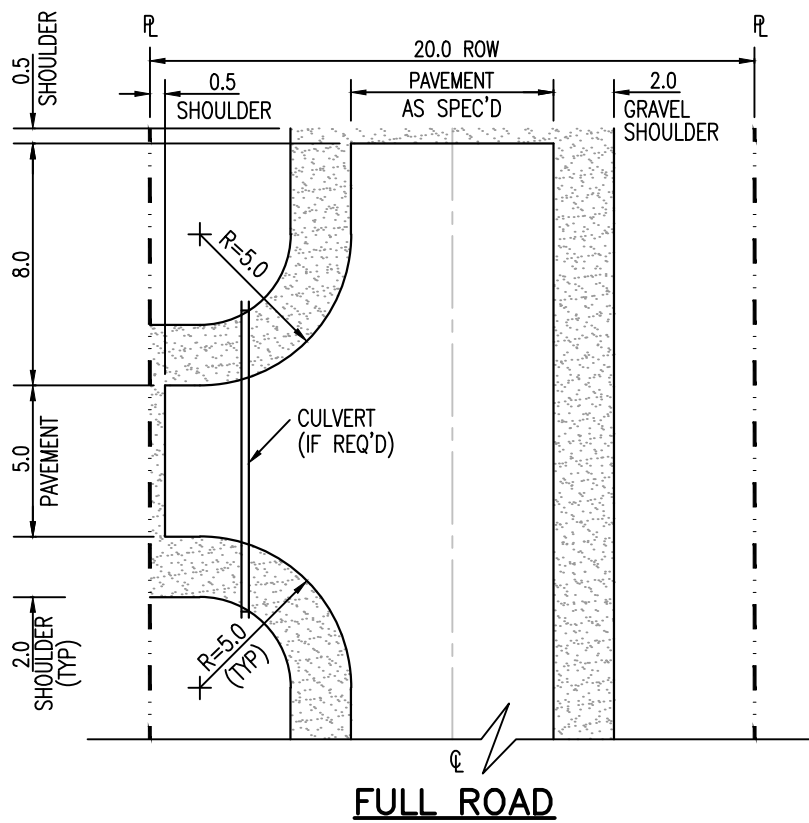
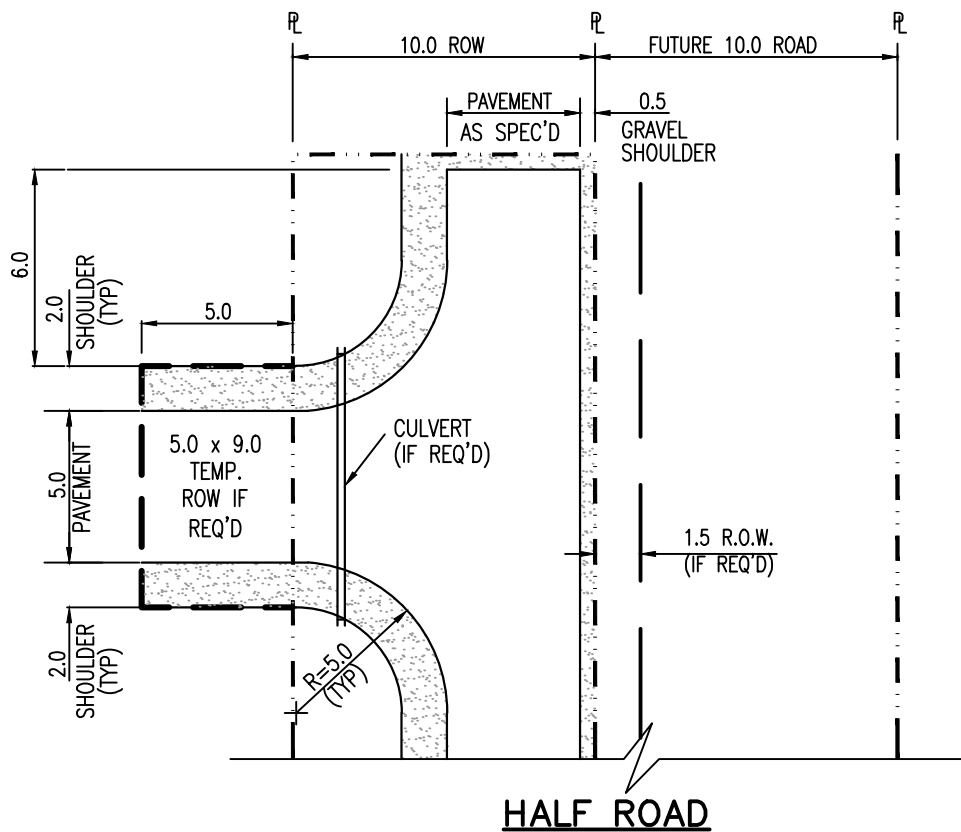
DATE **APR 2019**

APPROVED

S.D.S.B. No.:



TLR 17



ALL DIMENSIONS IN METERS

HAMMERHEAD TURNAROUND

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

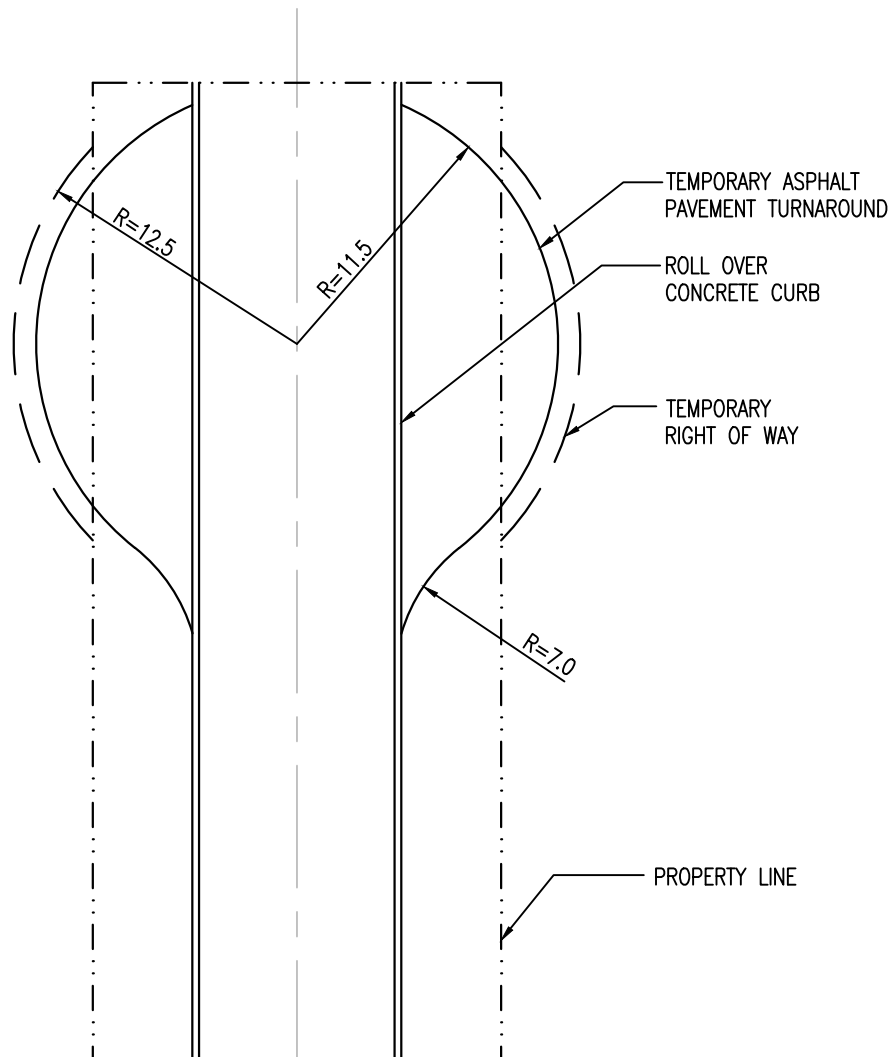
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 18

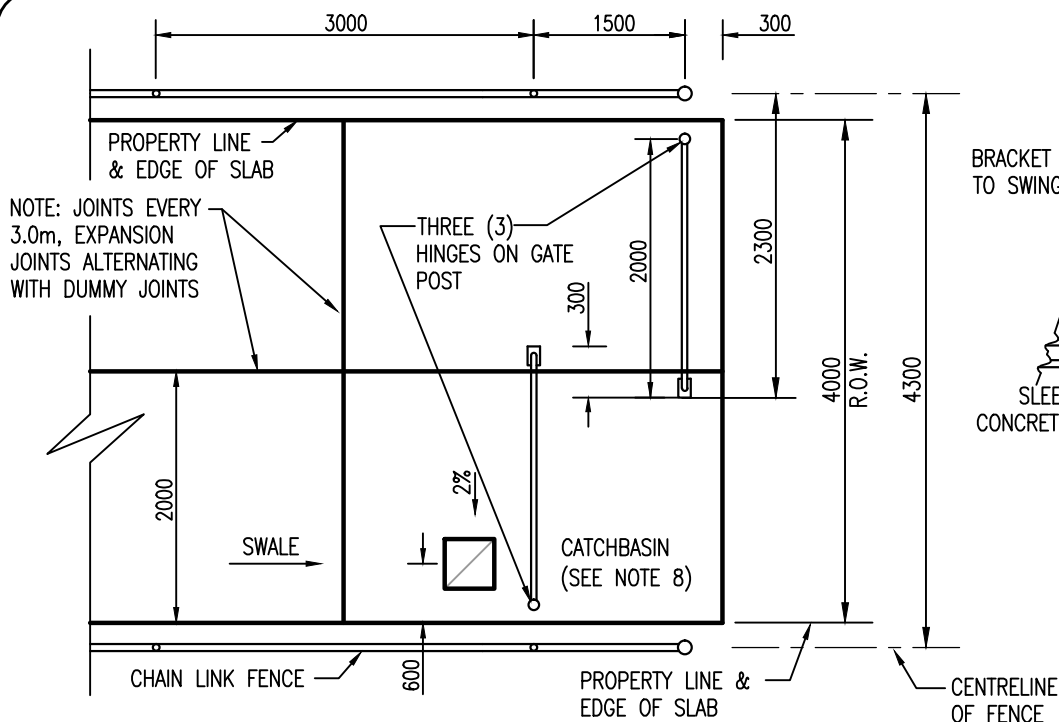


NOTE:

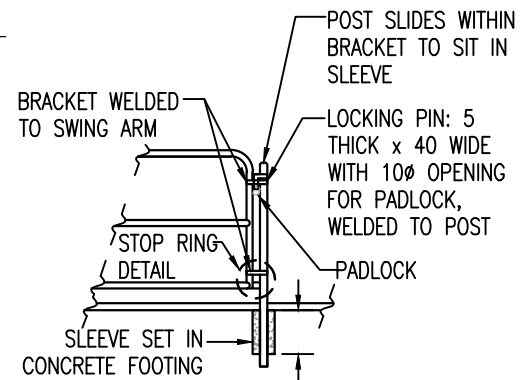
- 1) OWNER TO DEPOSIT CASH IN LIEU TO THE TOL FOR REMOVAL & RESTORATION OF ADDITIONAL PAVEMENT REQUIRED FOR TURNAROUND.

ALL DIMENSIONS IN METERS

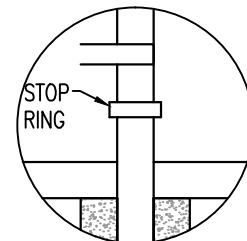
TITLE		TEMPORARY URBAN TURNAROUND	Township of Langley  2014.0075
THE CORPORATION OF THE TOWNSHIP OF LANGLEY		DATE	
		APPROVED	
		S.D.S.B. No.:	
			TLR 19



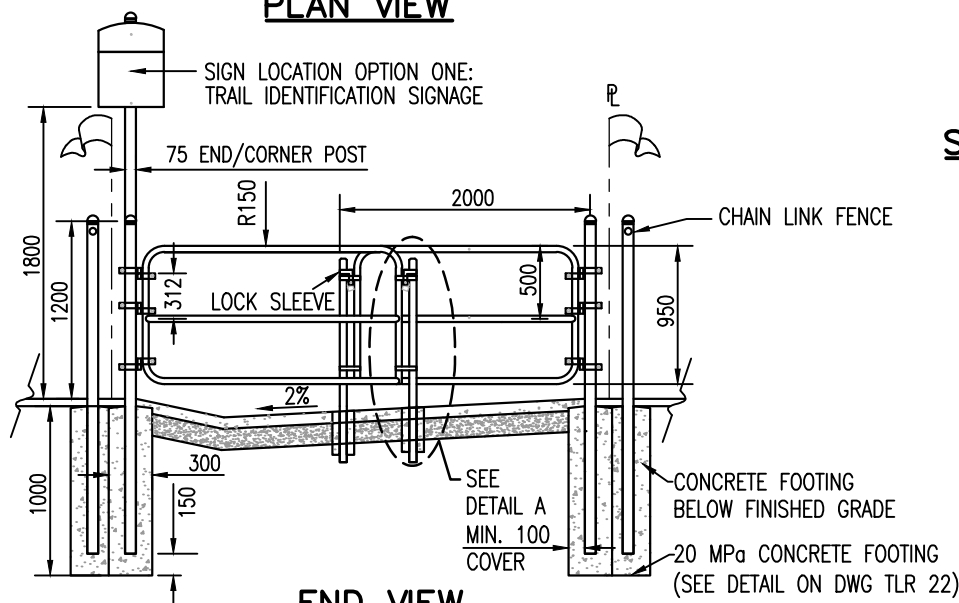
PLAN VIEW



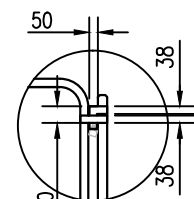
DETAIL 'A'



STOP RING DETAIL



END VIEW



LOCK DETAIL DIMENSIONS

NOTES:

- 1) JOINTS TO BE RADIUS CUT, WELDED AND GROUND SMOOTH.
- 2) GALVANIZE GATES AFTER FABRICATION.
- 3) AFTER INSTALLATION, TOUCH UP GATES AND WELDS WITH TWO (2) COATS OF GALVANIZED PAINT.
- 4) THREE (3) HINGES PER GATE, WELDED, NOT BOLTED, TO GATE AND WELDED TO POSTS
- 5) ALL RAILS AND POSTS TO BE SCHEDULE 40
- 6) MINIMUM 1% LONGITUDINAL GRADE AND MINIMUM 2% CROSSFALL (SEE MMCD C10).
- 7) ALL DIMENSIONS IN MILLIMETERS
- 8) SWALE AND CATCH BASINS TO BE PROVIDED FOR DRAINAGE AS PER STANDARD DRAWING MMCD C10
- 9) FOR ACCESS GREATER THAN 4.0m, GATE LENGTH TO BE EXTENDED TO SUIT
- 10) SEE TLR 21 FOR EMERGENCY ACCESS STRUCTURE

ALL DIMENSIONS IN MILLIMETERS
UNLESS NOTED OTHERWISE

EMERGENCY ACCESS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

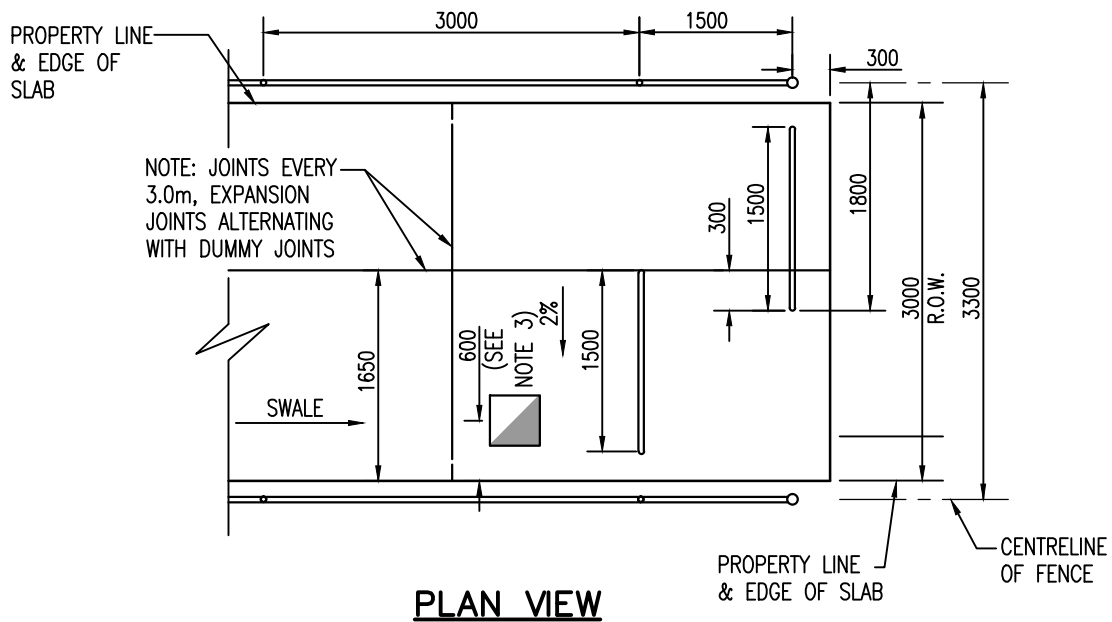
DATE APR 2019

APPROVED

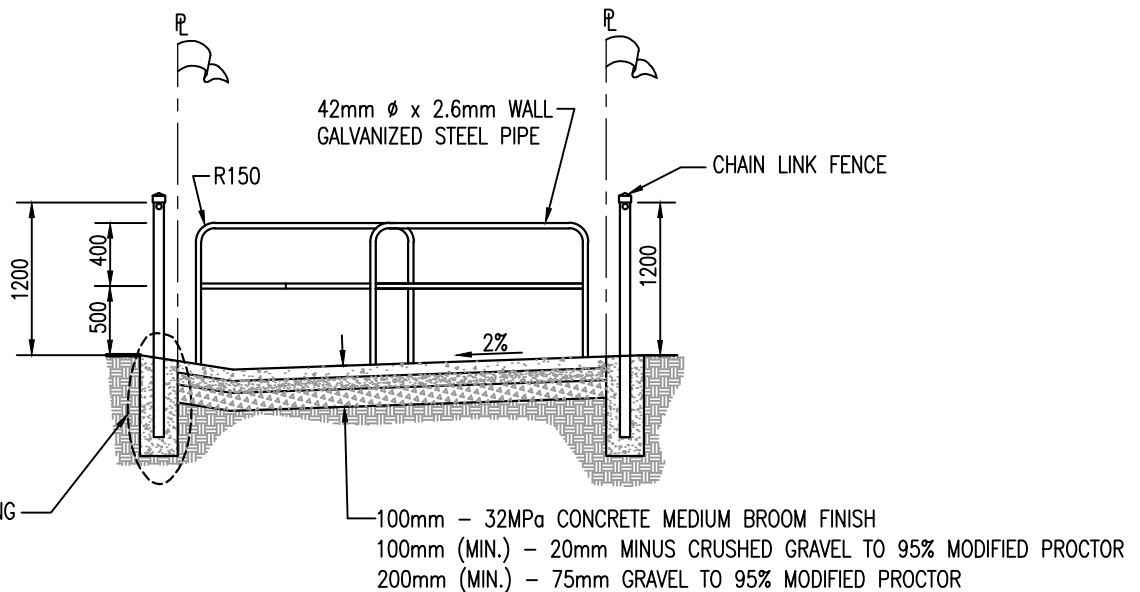
S.D.S.B. No.: SCBE0015 (OLD #)



TLR 20



PLAN VIEW



END VIEW

NOTES:

- 1) PIPES: 42mm ϕ x 2.6mm WALL THICKNESS SCHEDULE 40 STEEL PIPE
- 2) JOINTS:
 - RADIUS CUT AND WELDED
 - GROUND SMOOTH
 - PRIME AND PAINT TWO (2) COATS MINIMUM WITH ZINC-RICH PAINT
- 3) SWALE AND CATCH BASINS TO BE PROVIDED FOR DRAINAGE AS PER STANDARD DRAWING MMCD C10
- 4) 1% MIN. LONGITUDINAL GRADE AND 2% CROSSFALL
- 5) ALL DIMENSIONS ARE IN MILLIMETRES

ALL DIMENSIONS IN MILLIMETERS
UNLESS NOTED OTHERWISE

TITLE

**WALKWAY WITH FIXED BAFFLE
BARRIER INSTALLATION**

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

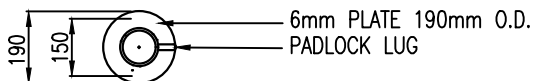
APPROVED

S.D.S.B. No.: SCBE0053 (OLD #)

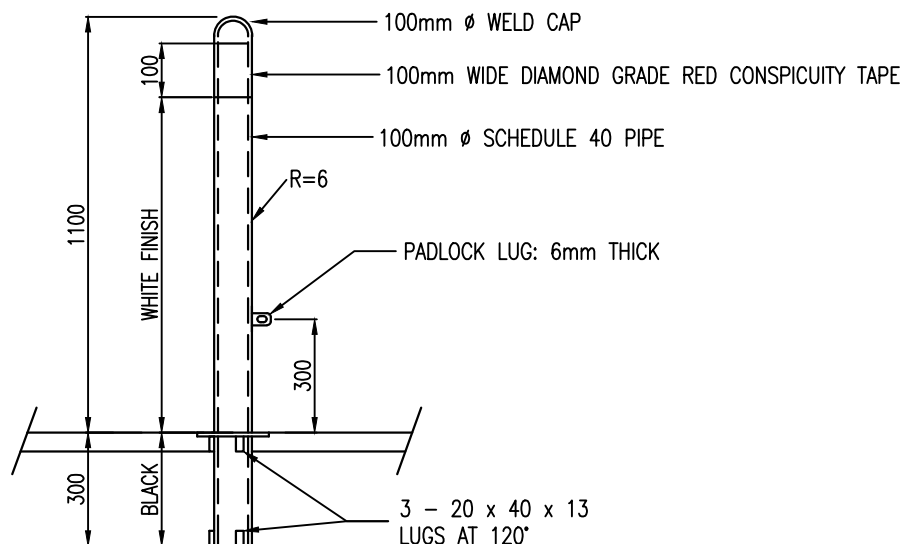


TLR 21

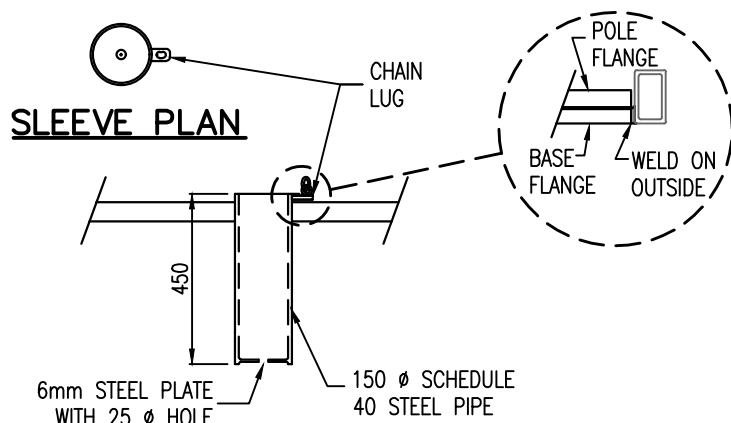
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02/12/24



POST PLAN



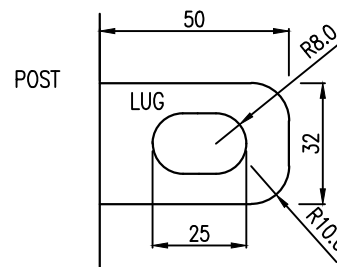
POST ELEVATION



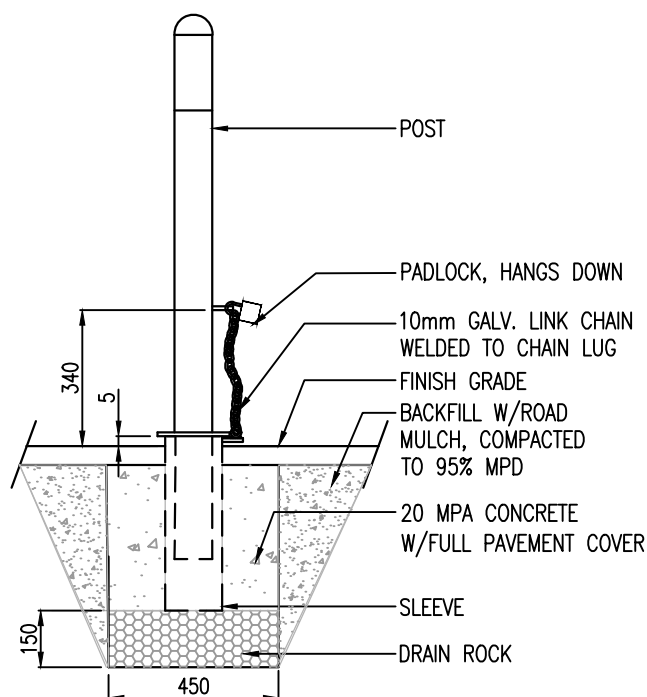
SLEEVE ELEVATION

NOTES:

- 1) ALL PIPE TO BE ASTM A53 SEAMLESS PIPE
- 2) EXPOSED PARTS TO BE PRIMED
- 3) EXPOSED PARTS TO BE PAINTED WITH TWO COATS OF HIGH GLOSS ENAMEL PAINT
- 4) ALL UNPAINTED COMPONENTS TO BE HOT DIPPED GALV. AFTER FABRICATION
- 5) CONTRACTOR SUPPLIED PADLOCK: SM52 #1 MASTER KEYED
- 6) ON GREENWAY (M.U.P.) A MINIMUM OF ONE BOLLARD WITH A CLEARANCE OF 1.4m FROM EDGE OF WALKWAY SURFACE
- 7) IF SITUATION WARRANTS ADDITIONAL BOLLARDS MAY BE ACCEPTABLE WITH A 1.4m CLEAR OPENING BETWEEN BOLLARDS



PADLOCK LUG



ASSEMBLY

ALL DIMENSIONS IN MILLIMETERS
UNLESS NOTED OTHERWISE

TITLE

BOLLARD – REMOVABLE RESTRICTION POST

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

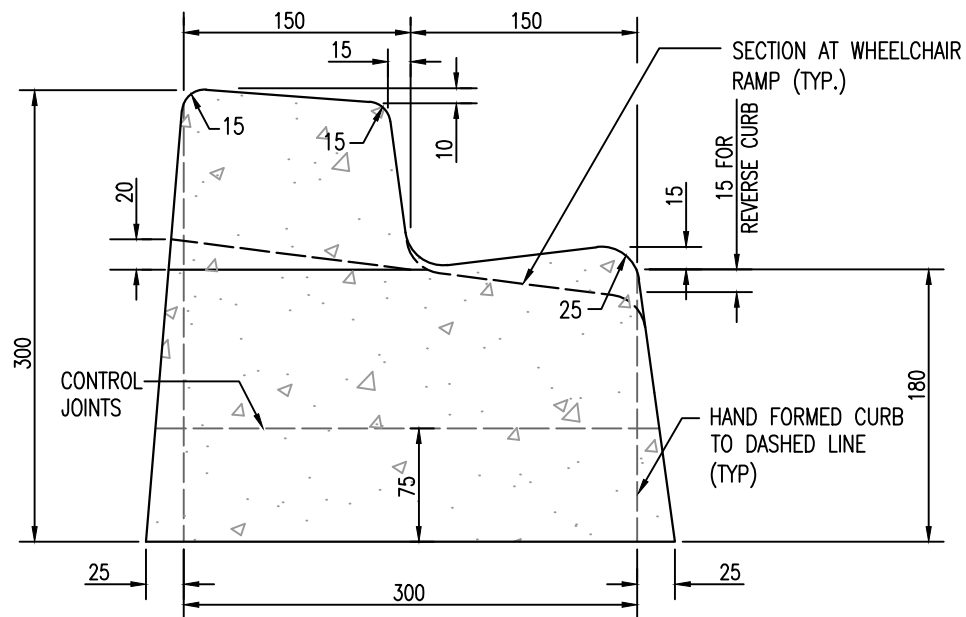
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 22



NOTE:

TO BE USED IN CONJUNCTION W/CURB INLET CATCHBASIN – SEE STD. DWG TLD 11 FOR DETAILS

ALL DIMENSIONS IN MILLIMETERS
UNLESS NOTED OTHERWISE

TITLE

MODIFIED BARRIER CURB

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 23

REFER TO
TOWNSHIP OF LANGLEY
PAVEMENT CUT POLICY

TITLE

UTILITY TRENCH PAVEMENT RESTORATION
(LONGITUDINAL/CROSSING)

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 24

REFER TO
TOWNSHIP OF LANGLEY
PAVEMENT CUT POLICY

TITLE

UTILITY TRENCH PAVEMENT RESTORATION
(LONGITUDINAL/CROSSING)

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 25

REFER TO
TOWNSHIP OF LANGLEY
PAVEMENT CUT POLICY

TITLE

PAVEMENT CUTTING

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 26

REFER TO
TOWNSHIP OF LANGLEY
PAVEMENT CUT POLICY

TITLE

PAVEMENT CUTTING

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

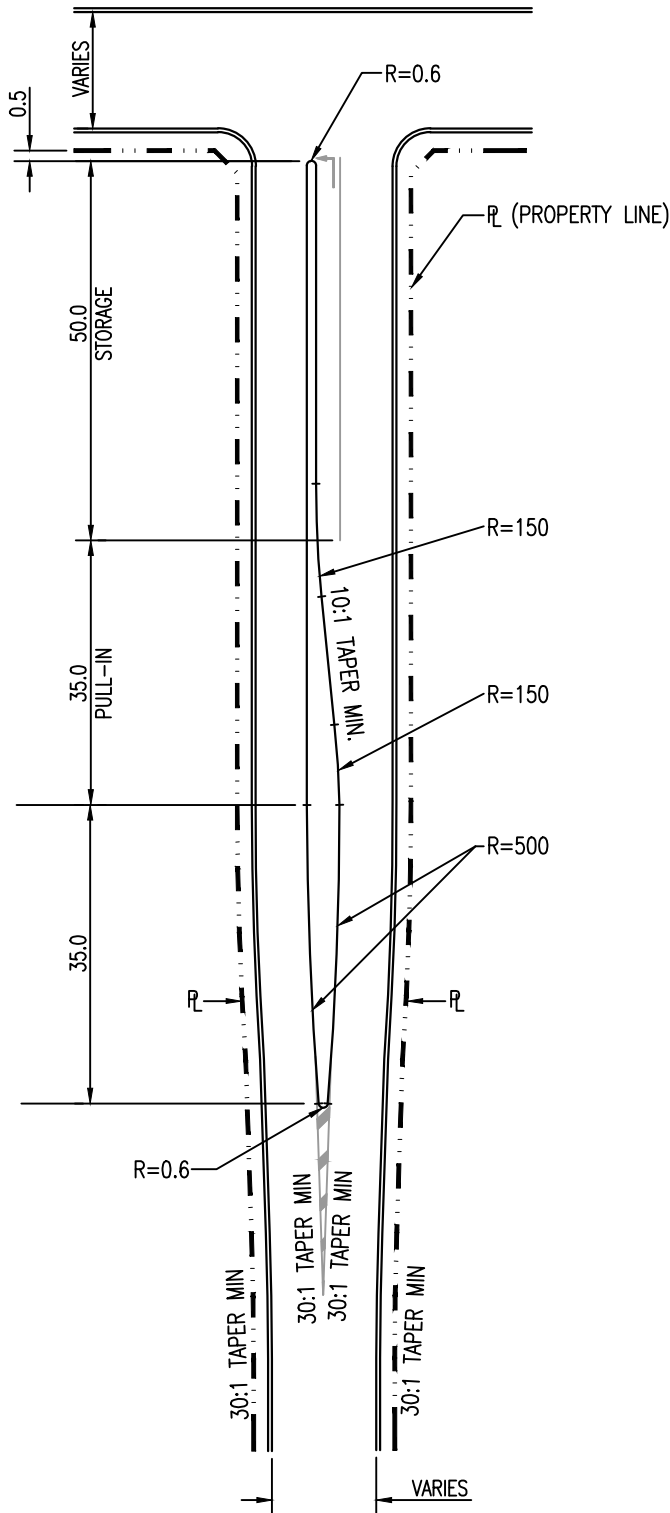
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 27



NOTES:

- 1) SEE STANDARD DRAWINGS FOR CROSS SECTION DIMENSIONS.
- 2) SEE SCHEDULE B, SECTION L2.4, FOR LANDSCAPE REQUIREMENTS IN MEDIAN

ALL DIMENSIONS IN METERS

TITLE

TYPICAL LEFT TURN LANE

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

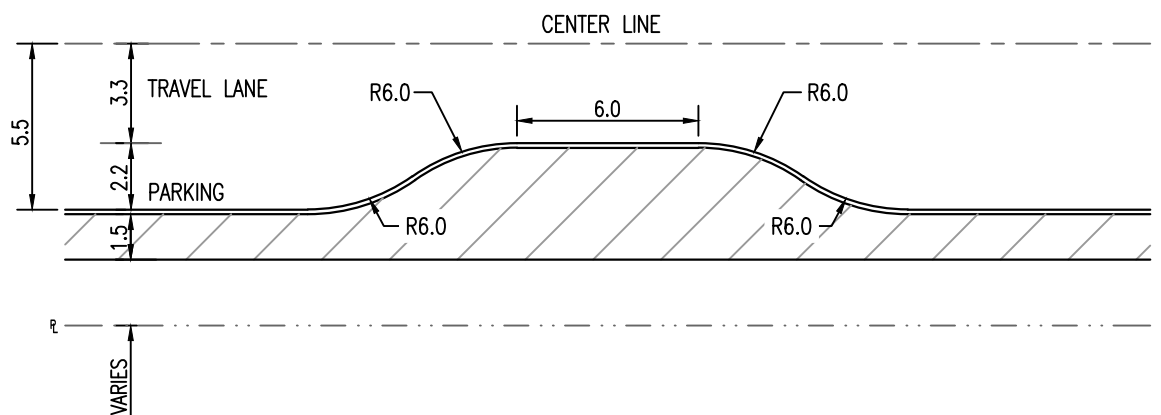
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLR 28



ALL DIMENSIONS IN METERS

TITLE 11.0m URBAN MINOR COLLECTOR CURB EXTENSION

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

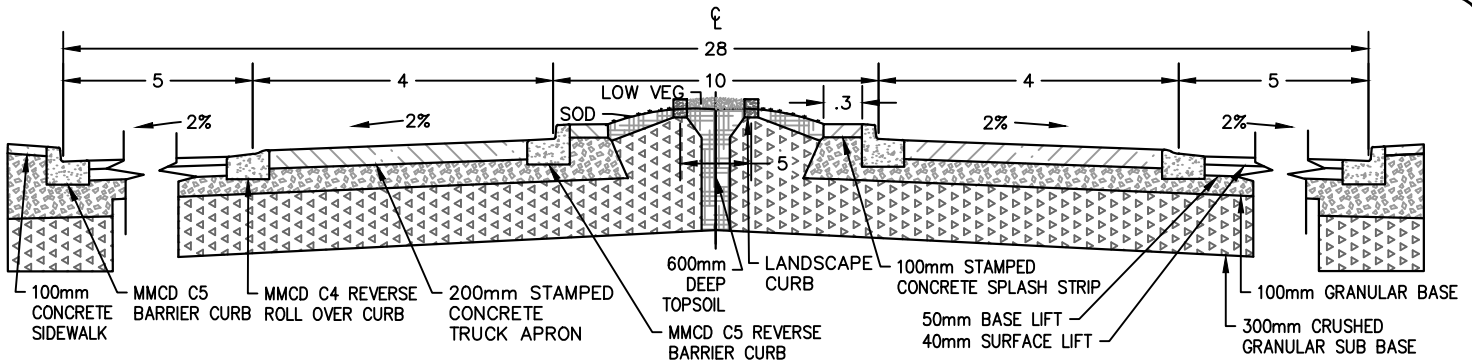
DATE APR 2019

APPROVED

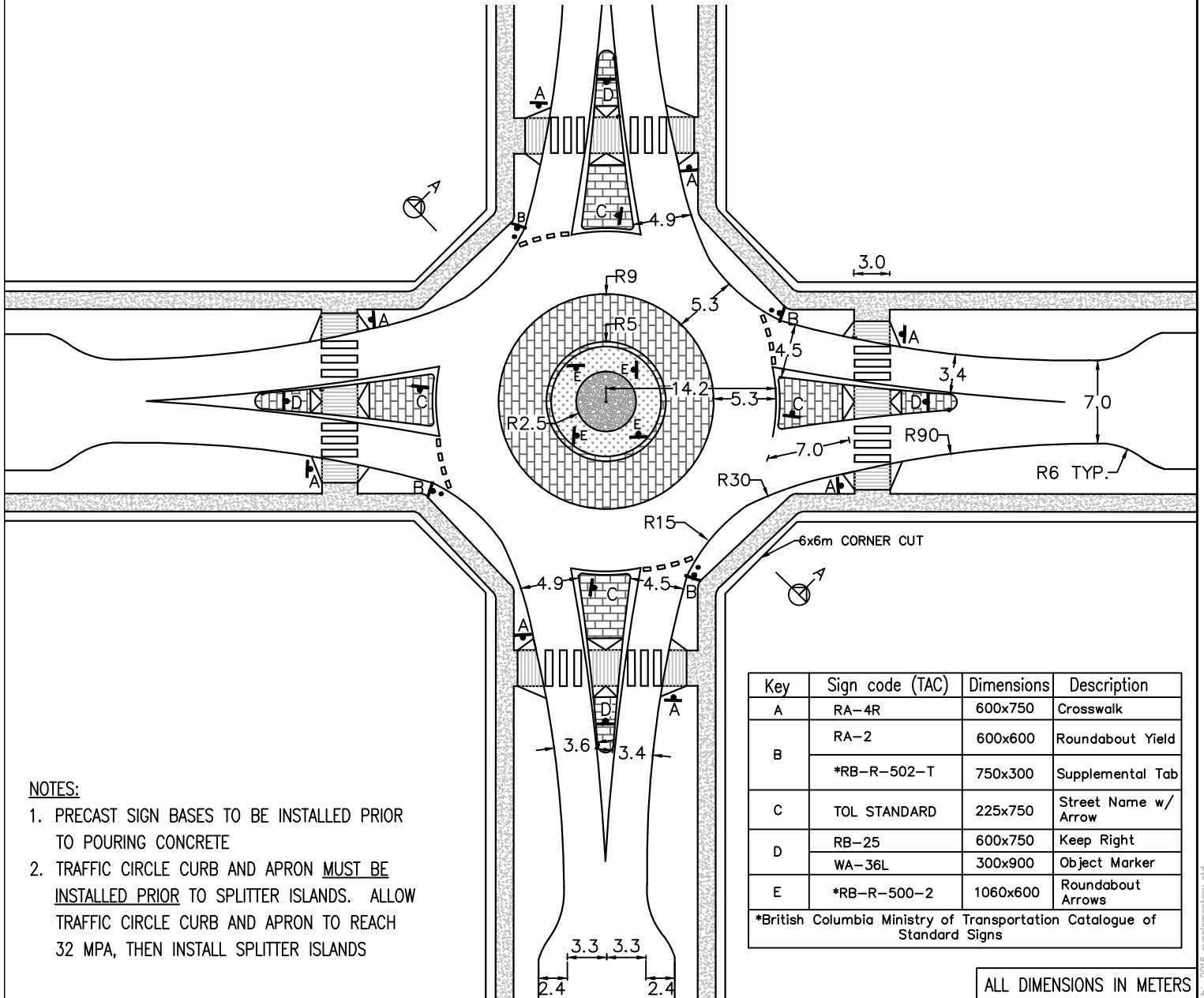
S.D.S.B. No.:



TLR 29



SECTION A-A
N.T.S.



NOTES:

1. PRECAST SIGN BASES TO BE INSTALLED PRIOR TO POURING CONCRETE
2. TRAFFIC CIRCLE CURB AND APRON MUST BE INSTALLED PRIOR TO SPLITTER ISLANDS. ALLOW TRAFFIC CIRCLE CURB AND APRON TO REACH 32 MPA, THEN INSTALL SPLITTER ISLANDS

Key	Sign code (TAC)	Dimensions	Description
A	RA-4R	600x750	Crosswalk
B	RA-2	600x600	Roundabout Yield
	*RB-R-502-T	750x300	Supplemental Tab
C	TOL STANDARD	225x750	Street Name w/ Arrow
D	RB-25	600x750	Keep Right
	WA-36L	300x900	Object Marker
E	*RB-R-500-2	1060x600	Roundabout Arrows

*British Columbia Ministry of Transportation Catalogue of Standard Signs

ALL DIMENSIONS IN METERS

TITLE

ROUNDAABOUT DETAIL – COLLECTOR, COLLECTOR

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

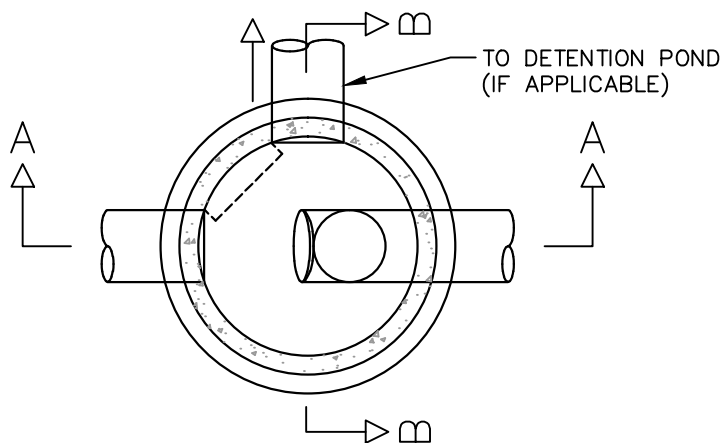
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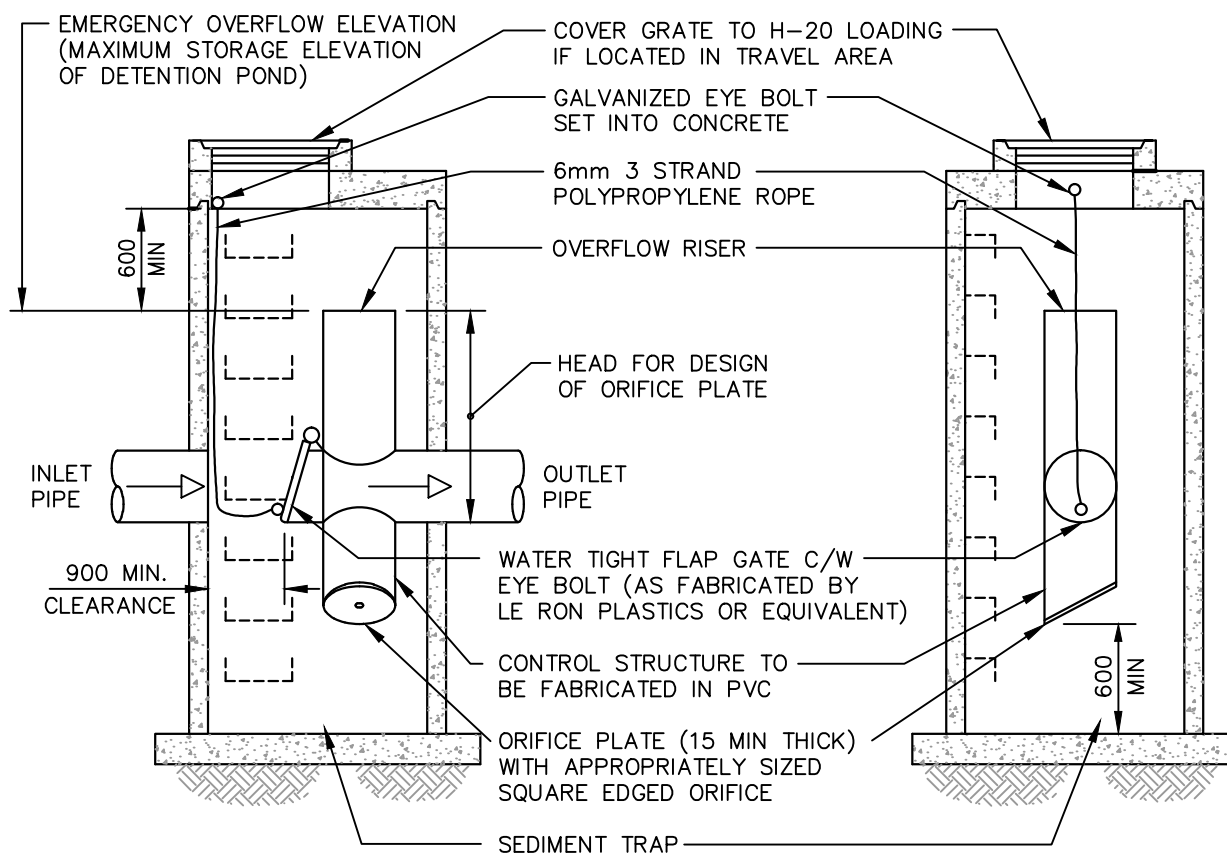
TLR 30

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DRAINAGE SUPPLEMENTARY DRAWINGS



PLAN



**STANDARD 1800 ϕ MANHOLE
SECTION A-A**

**STANDARD 1800 ϕ MANHOLE
SECTION B-B**

NOTE:

- 1) ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS OTHERWISE STATED
- 2) MAY BE USED IF OUTLET PIPE DIAMETER IS 450mm OR LESS

TITLE

STORM FLOW CONTROL MANHOLE

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

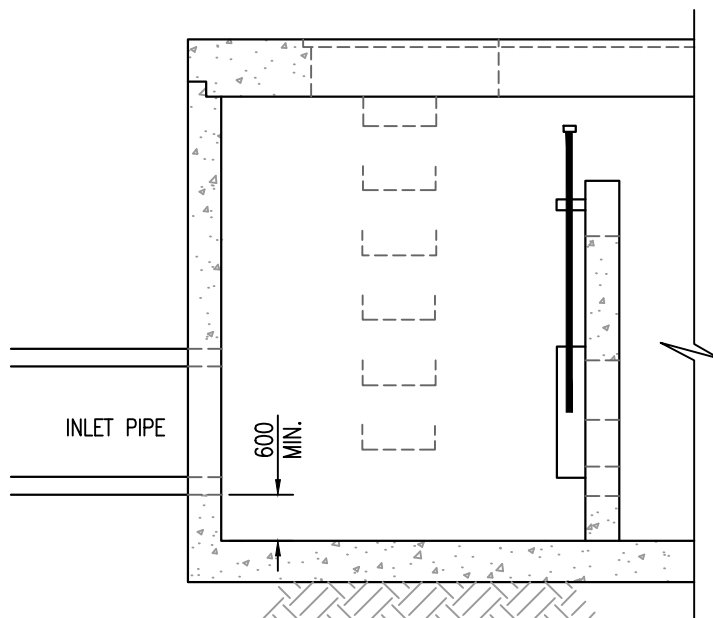
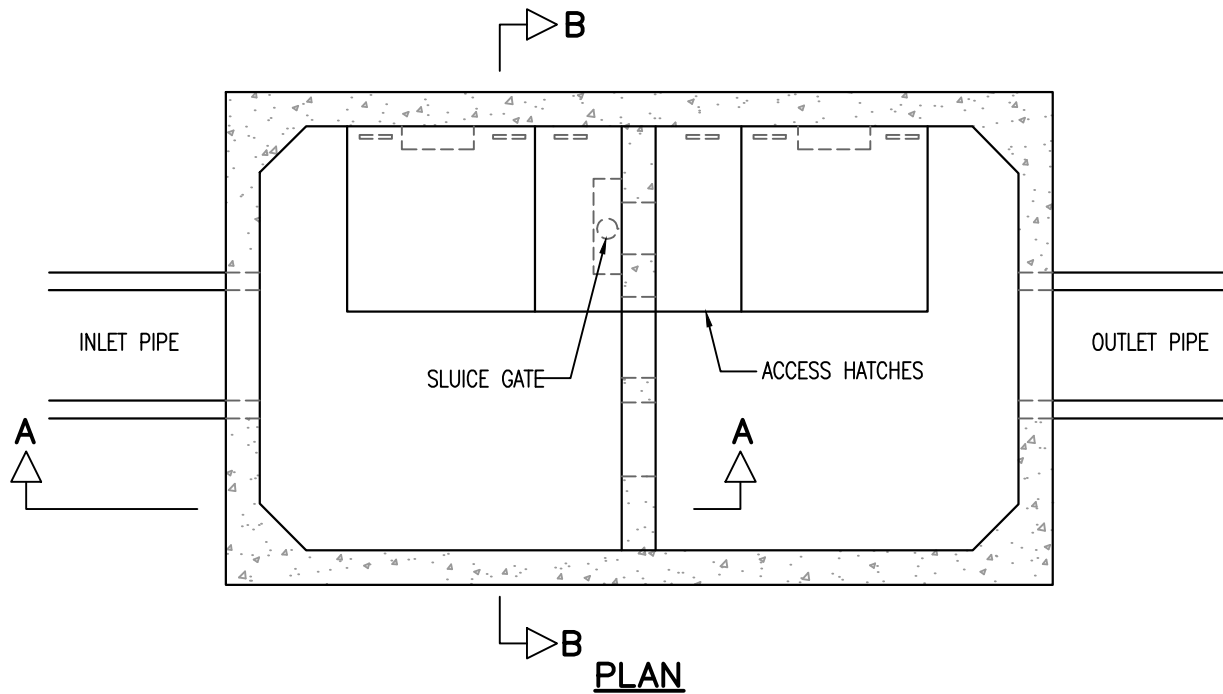
DATE APR 2019

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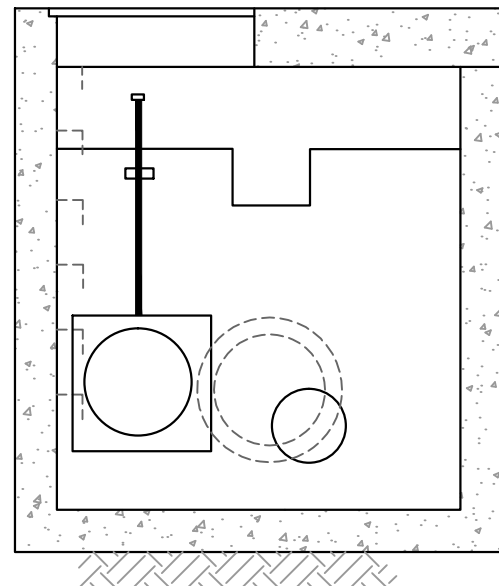
S.D.S.B. No.: SCBE0010 (OLD #)



TLD 01



SECTION A-A



SECTION B-B

NOTES:

- 1) CHAMBER IS REQUIRED WHEN OUTLET PIPES ARE GREATER THAN 450mm DIAMETER
- 2) ACCESS HATCHES TO SUPPORT H₂O LOADING UNLESS PROTECTED FROM VEHICLES
- 3) HATCHES TO BE RUST RESISTANT, TAMPER PROOF, AND HAVE SPRING LOADED LIFT ASSIST
- 4) MIDDLE HATCH CAN BE REPLACED BY VALVE BOX (TO OPERATE SLUDGE GATE)
- 5) SLUDGE GATE TO BE ARMTEC 20-IDC OR EQUIVALENT

TITLE

STORM FLOW CONTROL CHAMBER

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

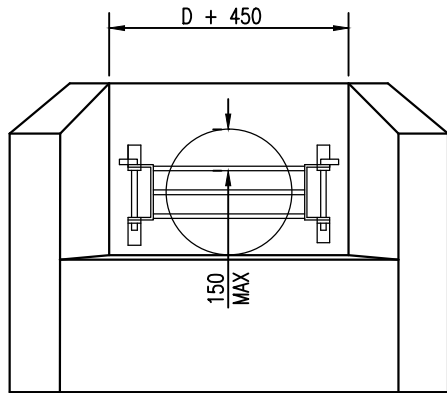
DATE APR 2019

APPROVED

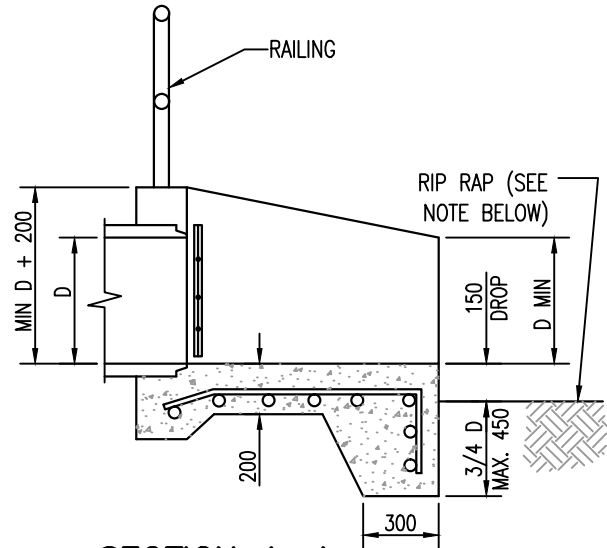
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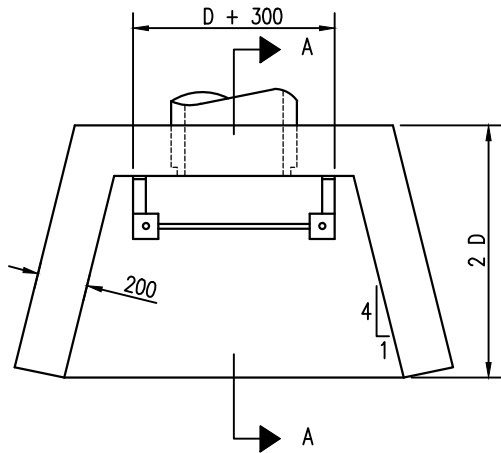
TLD 02



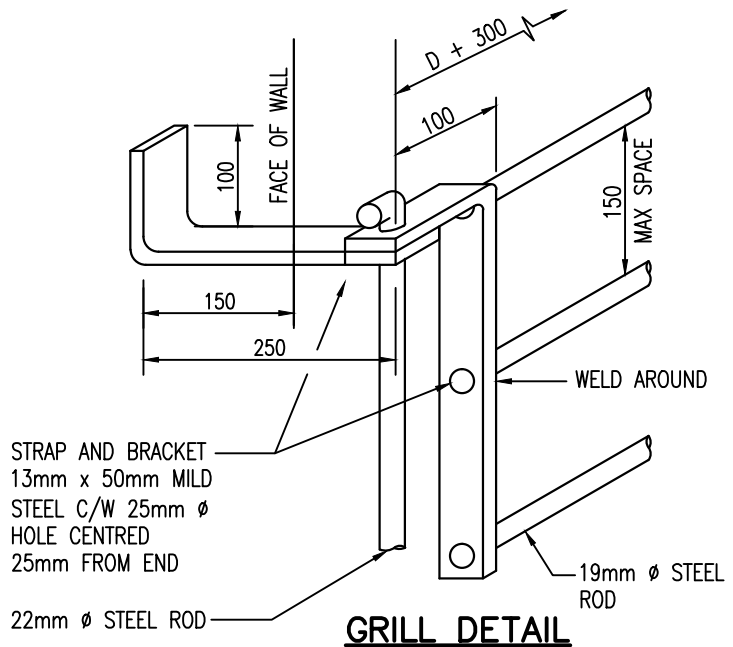
ELEVATION



SECTION A-A



PLAN



GRILL DETAIL

NOTES:

- 1) RIP RAP SHALL BE PLACED ON BOTTOM AND SIDES OF CHANNEL TO DESIGN WATER LEVEL AND DOWNSTREAM DISTANCE OF 1.5 TIMES THE DESIGN WATER VELOCITY (MIN. 1.0m)
- 2) PIPE SIZES LARGER THAN 1200mm ϕ , WATER VELOCITIES GREATER THAN 2.13m/s OR WALLS HIGHER THAN 2.0m SHALL REQUIRE A SPECIAL DESIGN FOR THE STRUCTURE
- 3) 10M REBAR AT 200mm BOTH WAYS AND CENTERED PLUS (1) 10M REBAR AROUND PIPE
- 4) REBARS TO HAVE MINIMUM 50mm COVER
- 5) CONCRETE TO BE 21 MPa AT 28 DAYS
- 6) CHAMFER ALL EXPOSED CORNERS 25mm
- 7) PLACE GRANULAR BACKFILL BEHIND WALL FOR DRAINAGE
- 8) GRILLAGE NOT REQUIRED ON PIPE LESS THAN 450mm ϕ
- 9) ALL GRILLAGE MATERIALS TO BE GALVANIZED

TITLE

OUTLET STRUCTURE

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

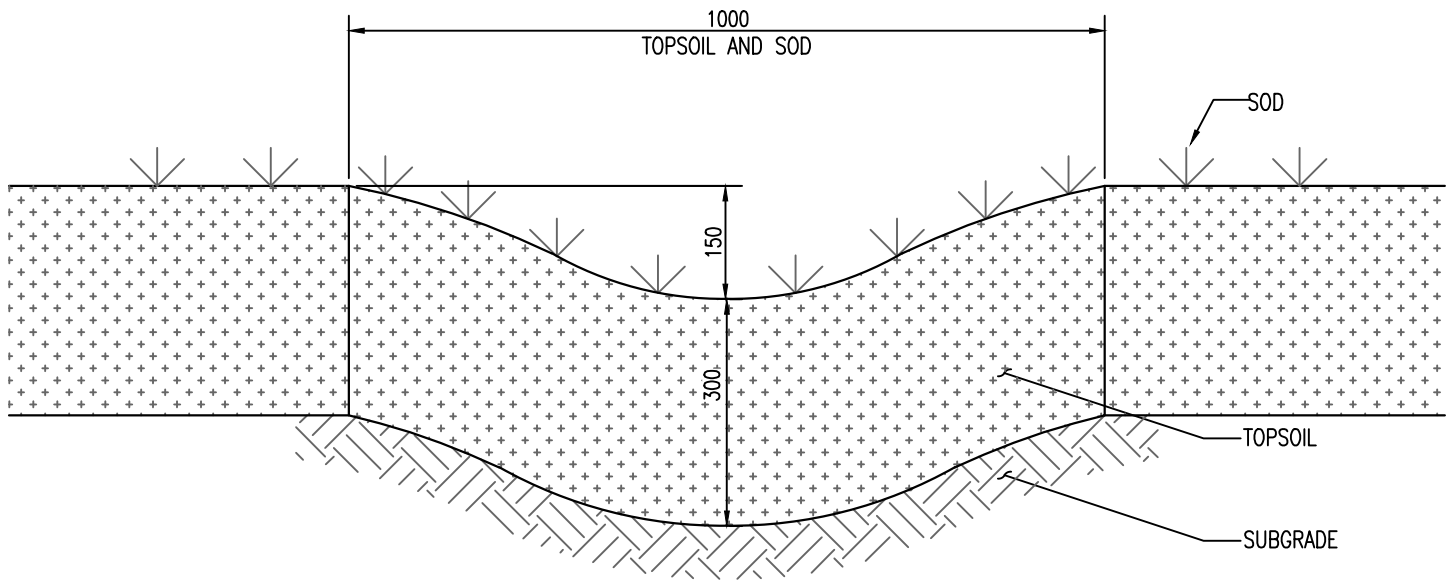
DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0023 (OLD #)



TLD 03



TITLE

SWALE

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

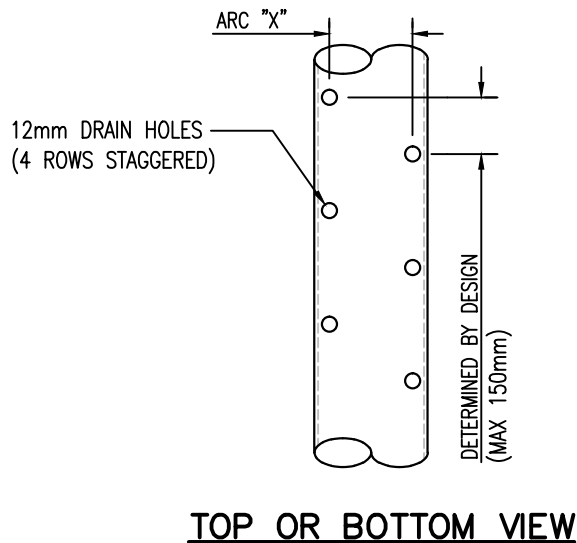
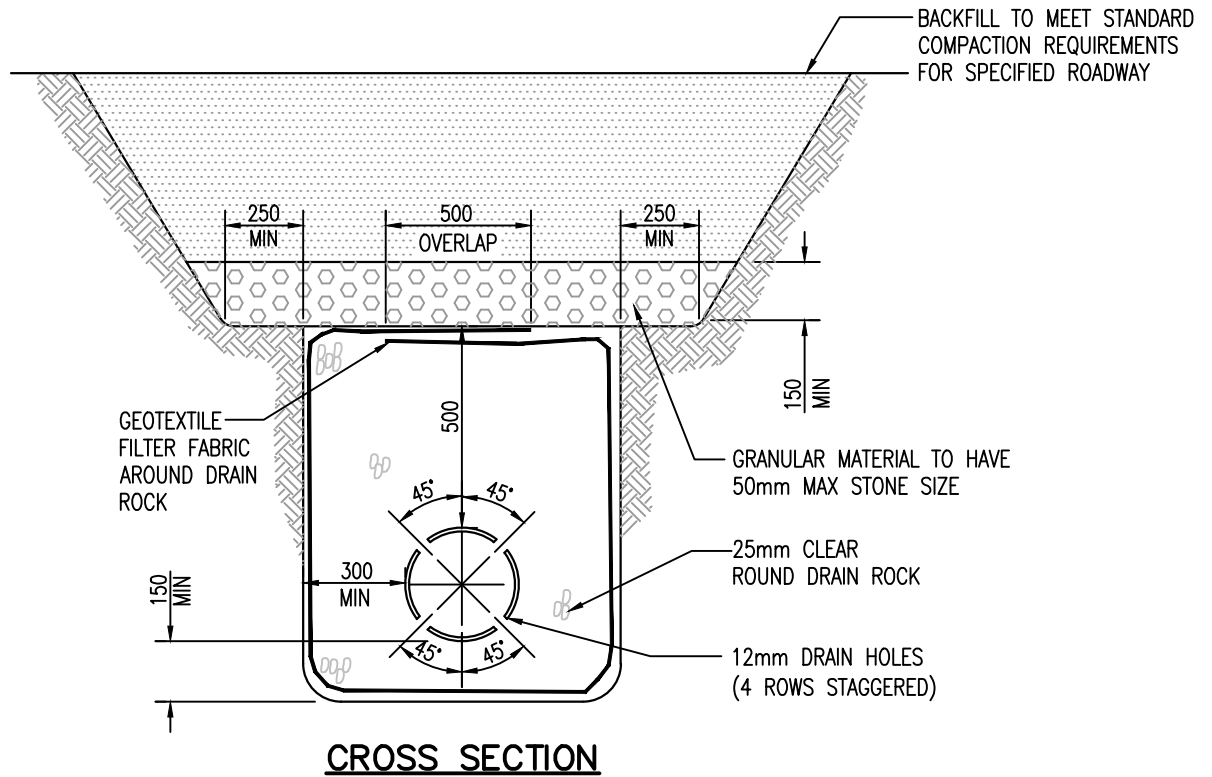
DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0025 (OLD #)



TLD 04



NOTES:

- 1) USE PERFORATED PVC PIPES
- 2) FIELD PERFORATION OF PIPE SHALL BE TO THIS STANDARD. FACTORY PERFORATED PIPE MUST BE APPROVED BY THE MUNICIPAL ENGINEER
- 3) PROVIDE 0.5m MIN OVERLAP FOR LONGITUDINAL OR TRANSVERSE JOINTS IN FABRIC
- 4) GEOTEXTILE FILTER FABRIC TO BE APPROVED BY THE MUNICIPAL ENGINEER
- 5) ENSURE NO SILT OR CLAY LENS IS LOCATED ADJACENT TO TRENCH WALL

TITLE EXFILTRATION TRENCH

THE CORPORATION OF THE TOWNSHIP OF LANGLEY

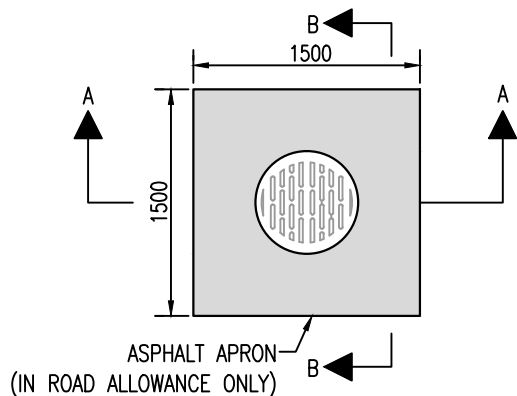
DATE APR 2019

APPROVED

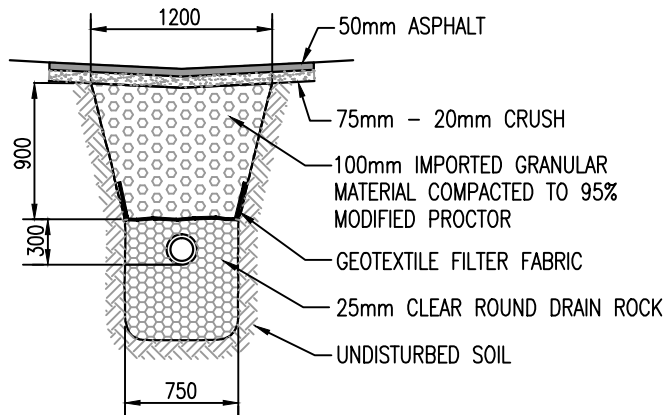
S.D.S.B. No.: SCBE0011(OLD #)



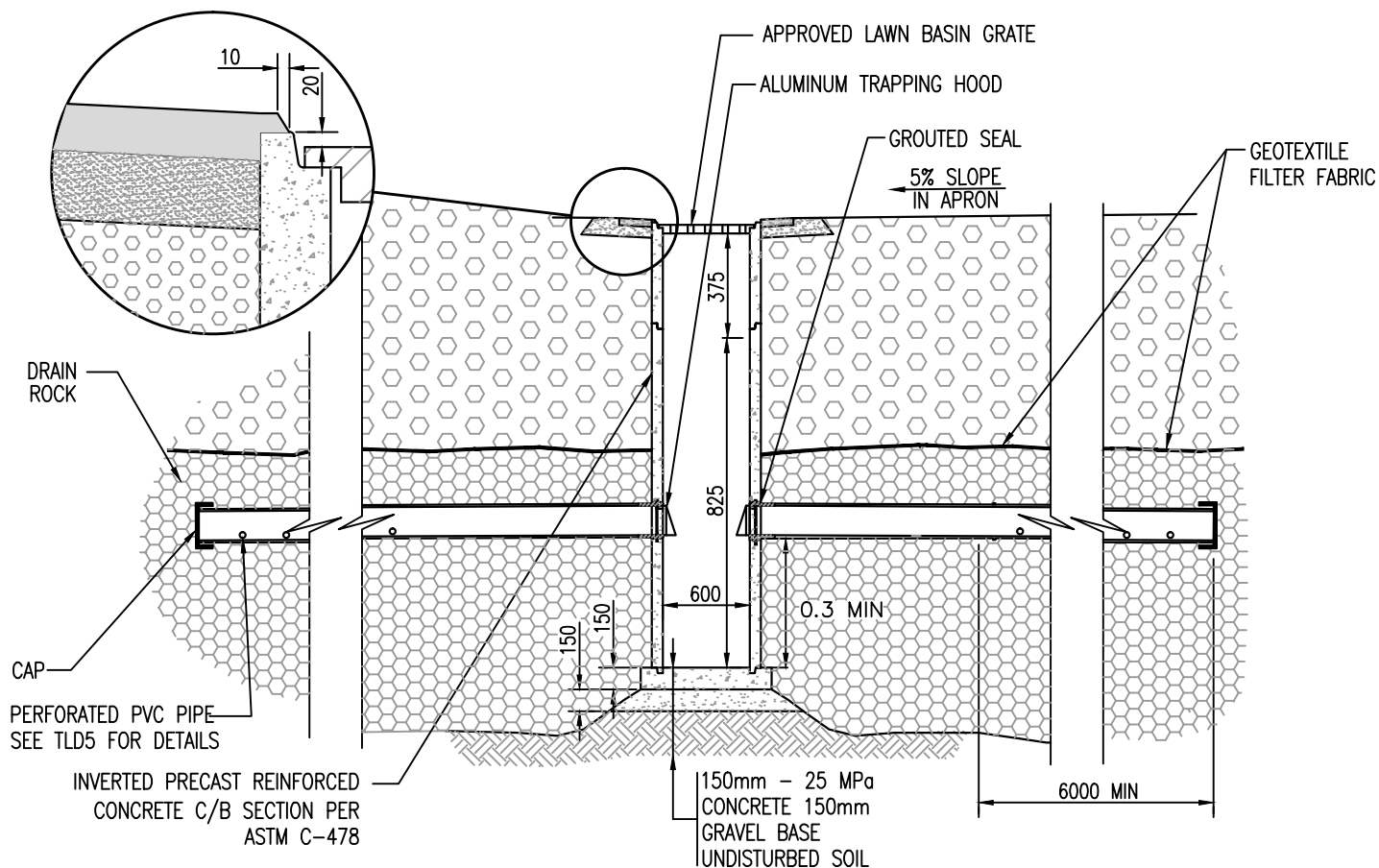
TLD 06



PLAN



SECTION B-B



SECTION A-A

NOTES:

- 1) DISCHARGE PIPES TO BE ALIGNED PARALLEL TO THE ROAD CENTERLINE
- 2) TRENCH DEPTH SHALL BE AS REQUIRED TO REACH PERVIOUS UNDISTURBED SOIL
- 3) GEOTEXTILE FILTER FABRIC TO BE APPROVED BY THE MUNICIPAL ENGINEER

TITLE

ROCK PIT

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

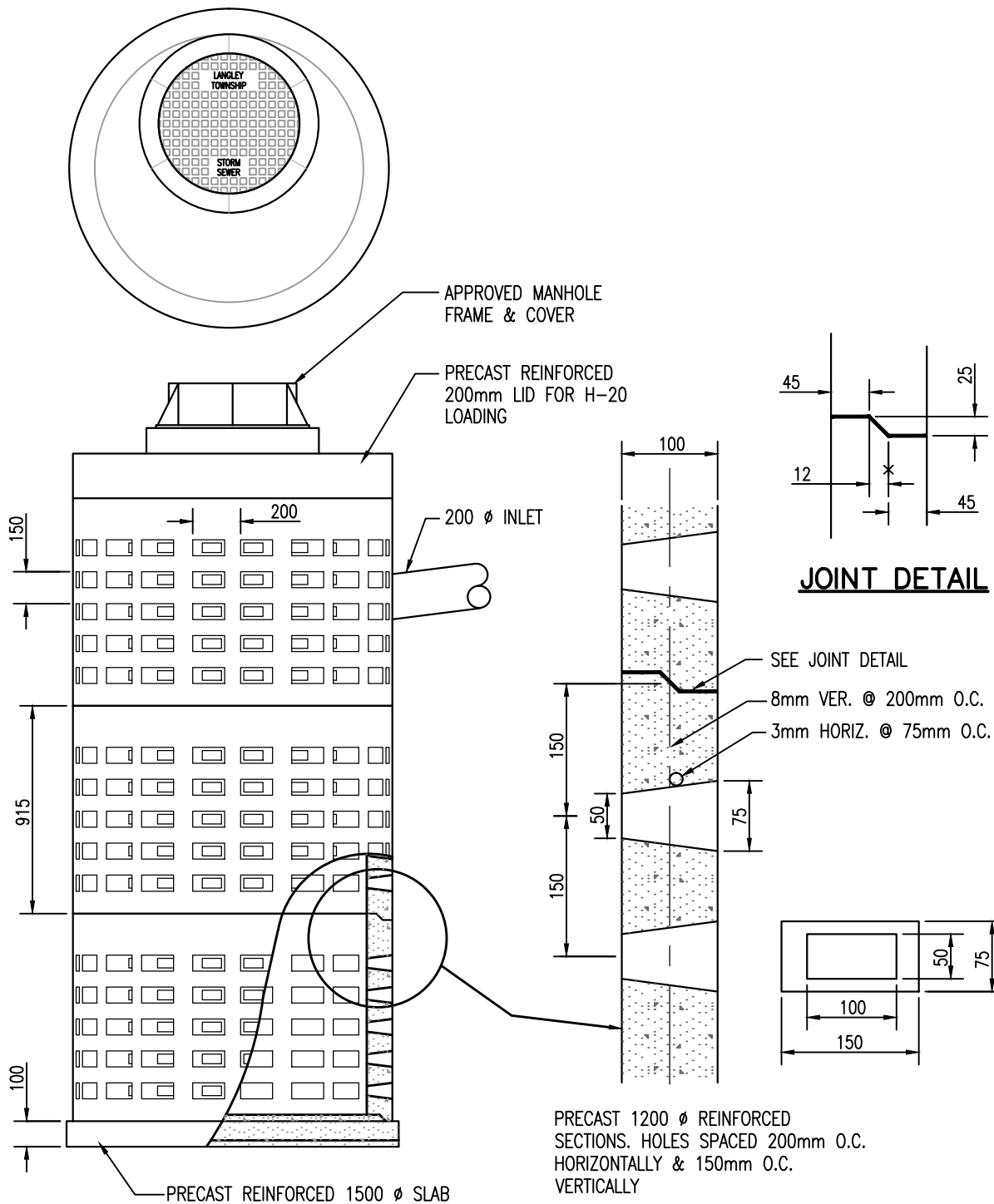
DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0027 (OLD #)



TLD 07



NOTES:

- 1) RUNGS SHALL BE INSTALLED AS PER STANDARD MANHOLE

TITLE

DRAINAGE DRYWELL INSTALLATION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

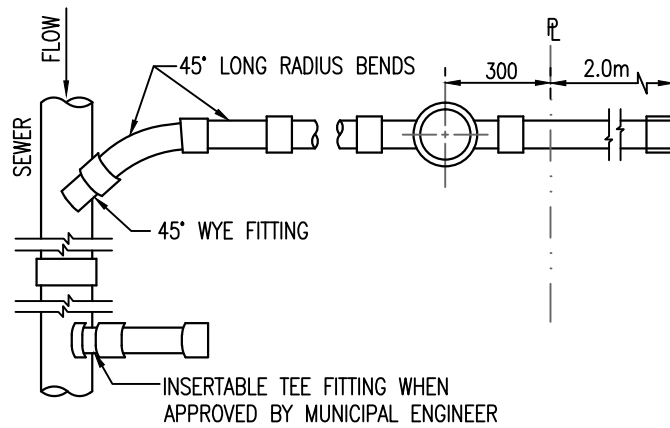
DATE APR 2019

APPROVED

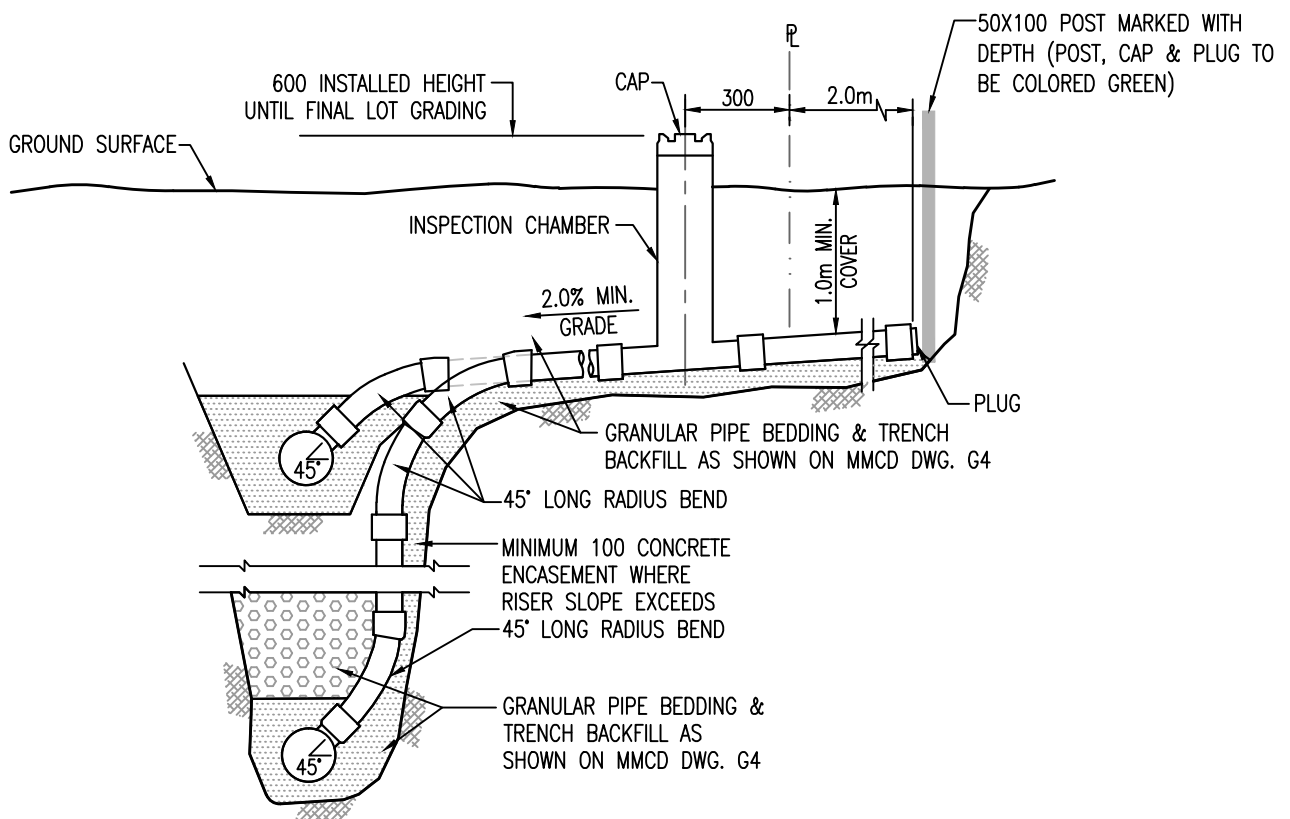
S.D.S.B. No.: SCBE0029 (OLD #)



TLD 08



PLAN



ELEVATION

NOTES:

- 1) CONNECTIONS TO BE 100mm ϕ OR AS SPECIFIED ON CONTRACT DRAWINGS
- 2) RISER TYPE SERVICE TO BE USED ONLY WHEN SERVICE IS MORE THAN 2.4m ABOVE WYE INVERT OR AS DIRECTED BY CONTRACT ADMINISTRATOR
- 3) LOCATION OF SERVICE & MARKER AS SHOWN ON CONTRACT DRAWINGS
- 4) SEE MMCD STANDARD DETAIL DRAWING S9 FOR DETAILS OF INSPECTION CHAMBER & INSTALLATION REQUIREMENTS.

TITLE

STORM SEWER SERVICE CONNECTION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

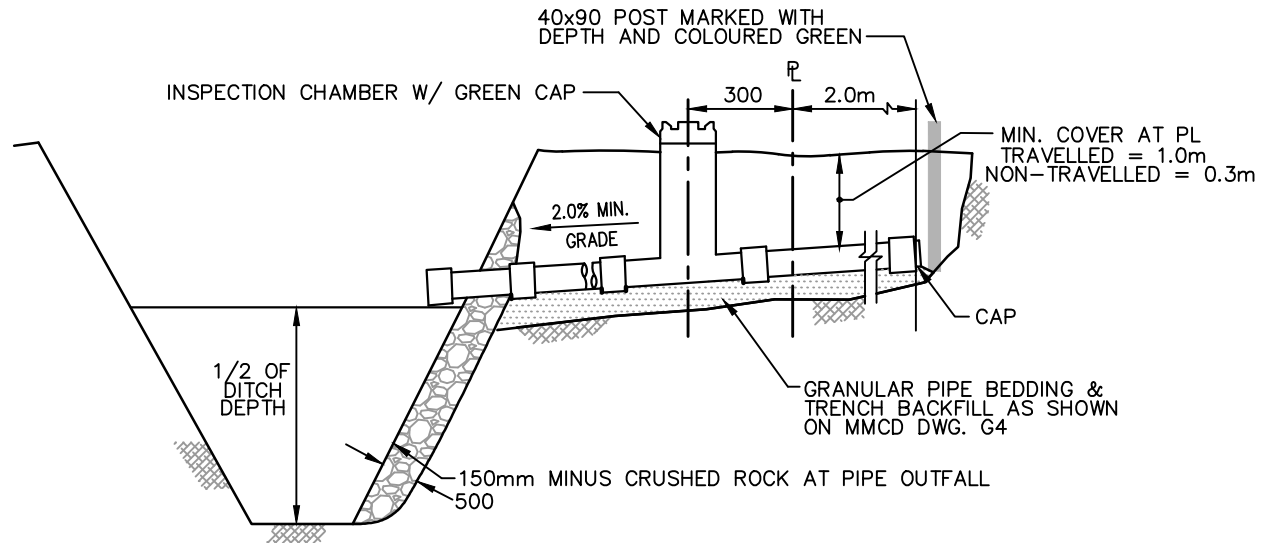
DATE APR 2019

APPROVED

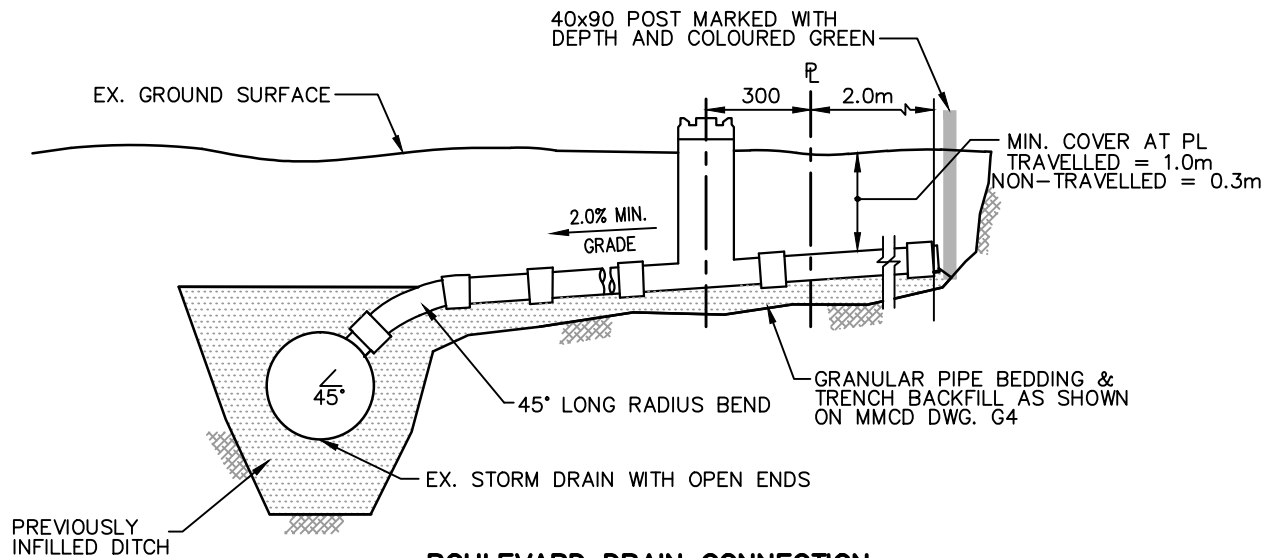
S.D.S.B. No.:



TLD 09



OPEN DITCH CONNECTION



BOULEVARD DRAIN CONNECTION

NOTES:

- 1) CONNECTIONS SHOWN TO BE 100Ø MIN OR AS SPECIFIED ON CONTRACT DRAWINGS.
- 2) CRUSHED ROCK ARMORING FOR DITCH CONNECTIONS TO BE MIN. WIDTH OF 0.5m AND 0.5m THICK.
- 3) SEE MMCD STANDARD DETAIL DRAWING S9 FOR DETAILS OF INSPECTION CHAMBER & INSTALLATION REQUIREMENTS.
- 4) RE-USE OF AN EXISTING SERVICE SHALL BE PER. CURRENT STANDARD AND INSPECTION.

TITLE

STORM SEWER SERVICE CONNECTION TO OPEN DITCH AND DRAIN

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

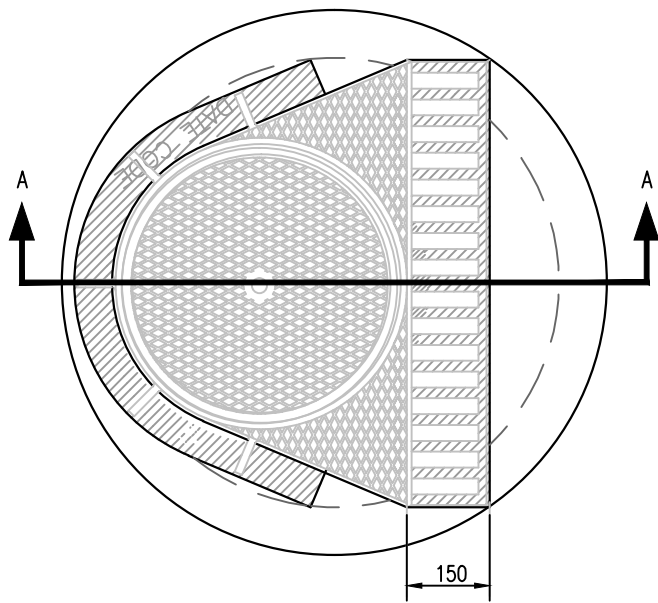
DATE APR 2019

APPROVED

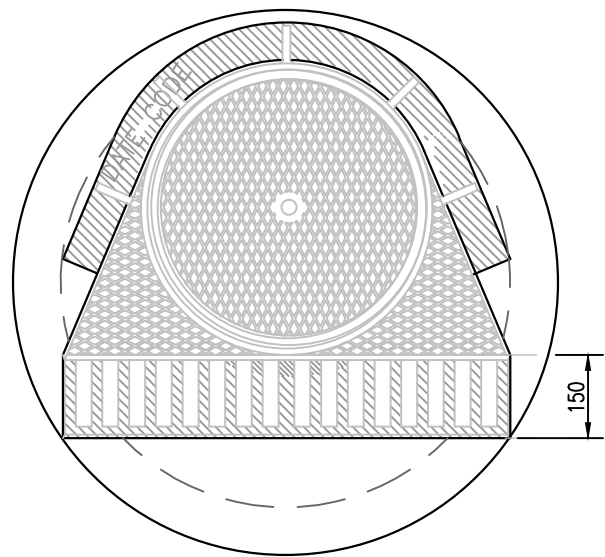
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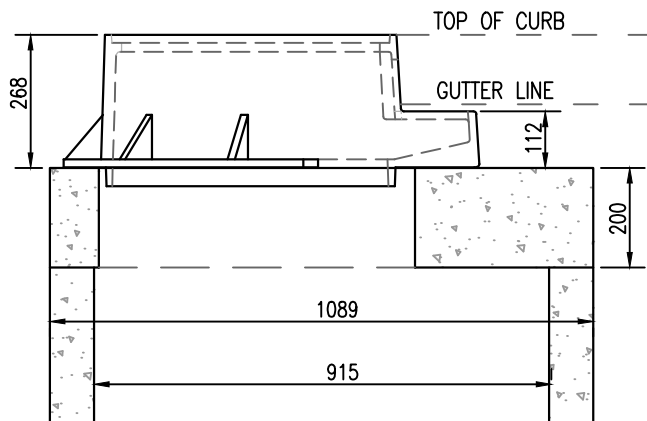
TLD 10



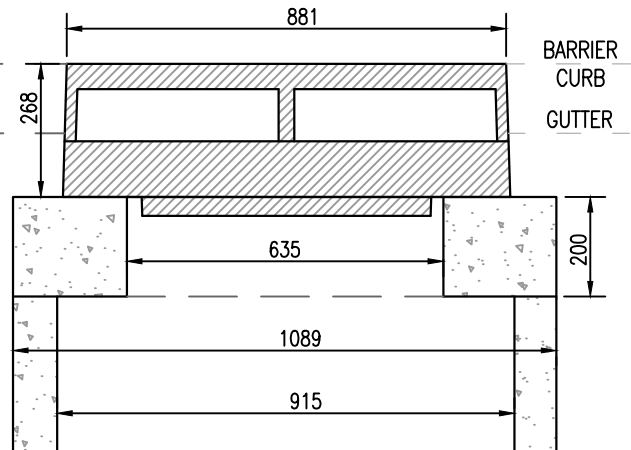
PLAN



PLAN



SECTION A-A



CURB VIEW

NOTES:

- 1) REFERENCE MODIFIED CURB DETAILS
- 2) REFER TO DOBNEY FRAME NO. SM96-F OR APPROVED EQUIVALENT
- 3) INSTALL ONLY ON BIKE LANES

TITLE

CURB INLET CATCH BASIN

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

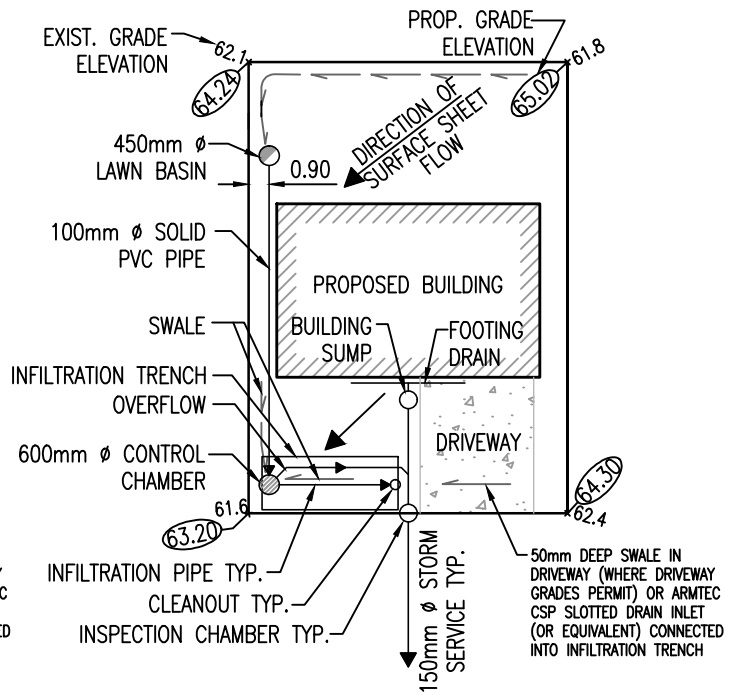
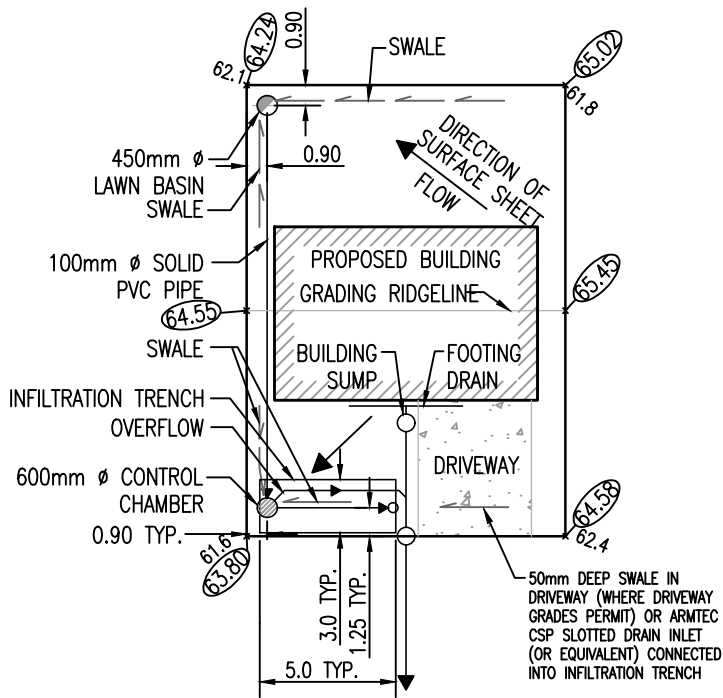
DATE APR 2019

APPROVED

S.D.S.B. No.:

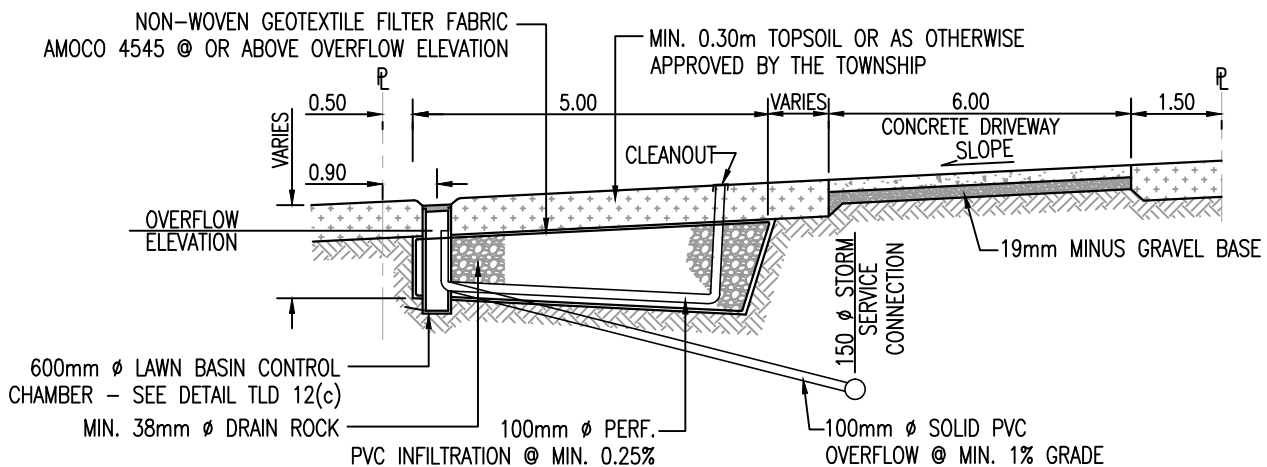


TLD 11



TYPICAL SELF DRAINING LOT INFILTRATION IN FRONT LAWN

N.T.S.



TYPICAL PROFILE THROUGH INFILTRATION FACILITY (OUTSIDE OF DRIVEWAY)

N.T.S.

- NOTE:
 1) SEE TLD 04 FOR SWALE DETAIL
 2) SEE TLD 12(c) FOR ADDITIONAL REQUIREMENTS

ALL DIMENSIONS IN METERS
UNLESS NOTED OTHERWISE

TITLE

INDIVIDUAL LOT INFILTRATION FACILITY OUTSIDE OF DRIVEWAY

THE CORPORATION OF THE TOWNSHIP OF LANGLEY

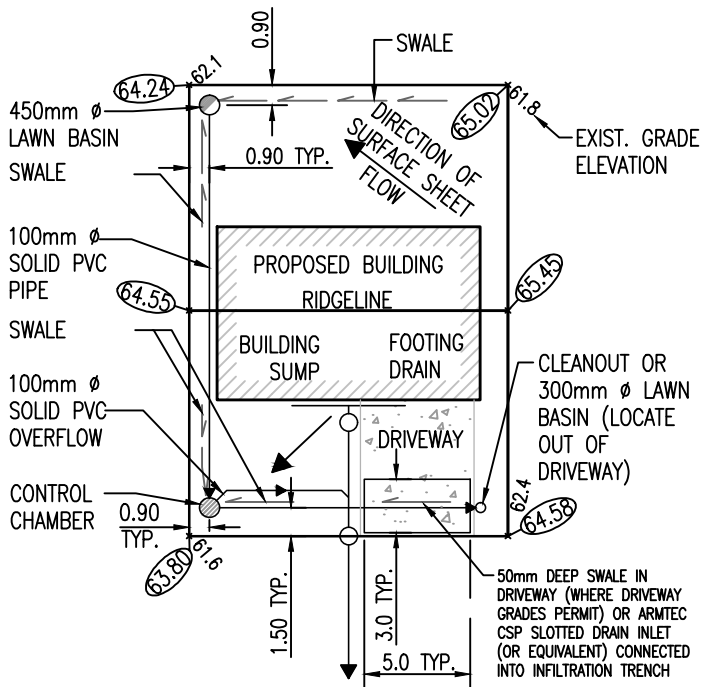
DATE APR 2019

APPROVED

S.D.S.B. No.:

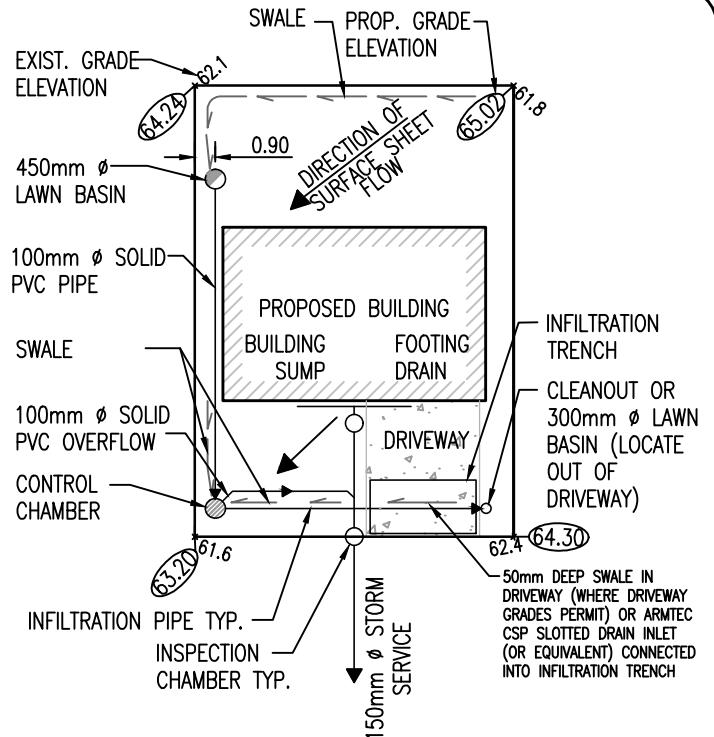


TLD 12(a)



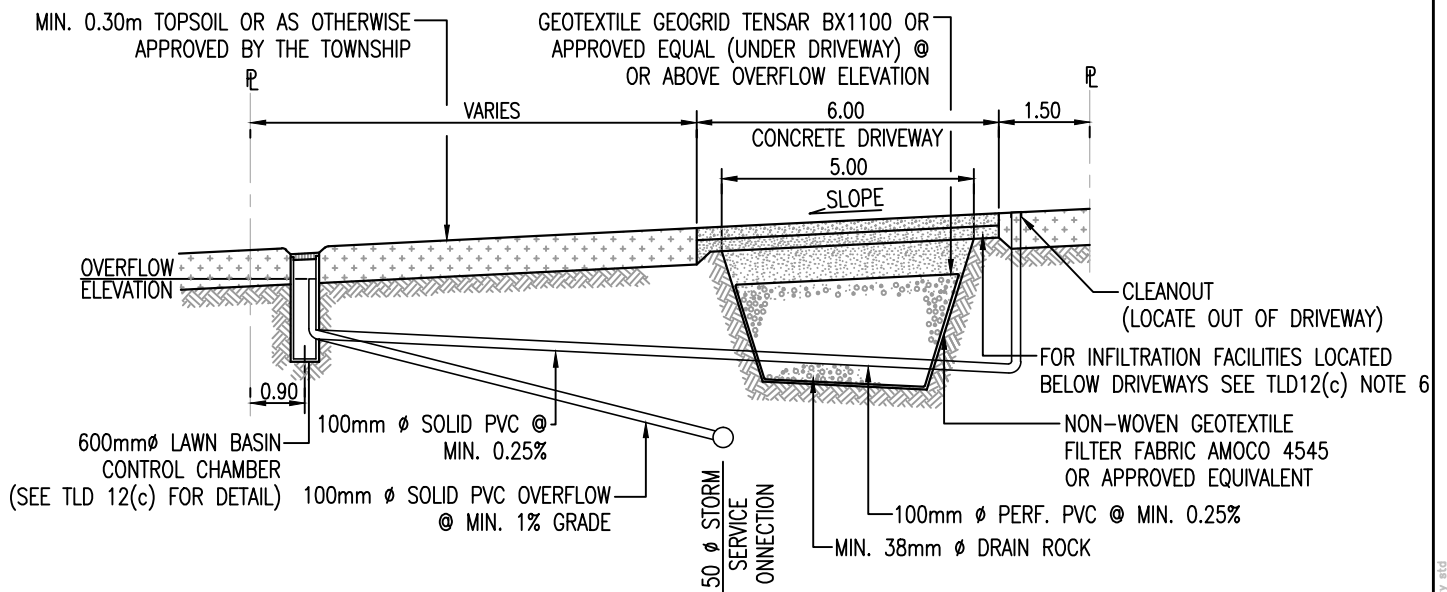
**TYPICAL SELF DRAINING LOT
FRONT & REAR LOT DRAINAGE
(UNDER DRIVEWAY)**

N.T.S.



**TYPICAL SELF DRAINING
LOT FRONT LOT DRAINAGE
(UNDER DRIVEWAY)**

N.T.S.



**TYPICAL PROFILE THROUGH INFILTRATION FACILITY
(UNDER DRIVEWAY)**

N.T.S.

ALL DIMENSIONS IN METERS
UNLESS NOTED OTHERWISE

TITLE

INDIVIDUAL LOT INFILTRATION FACILITY UNDER DRIVEWAY

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

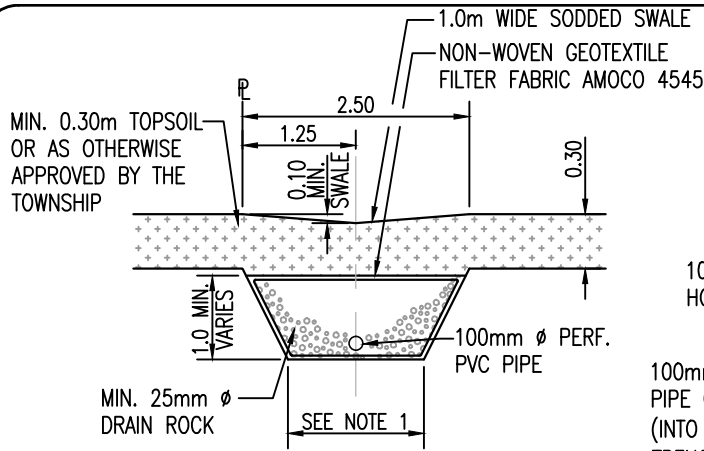
DATE APR 2019

APPROVED

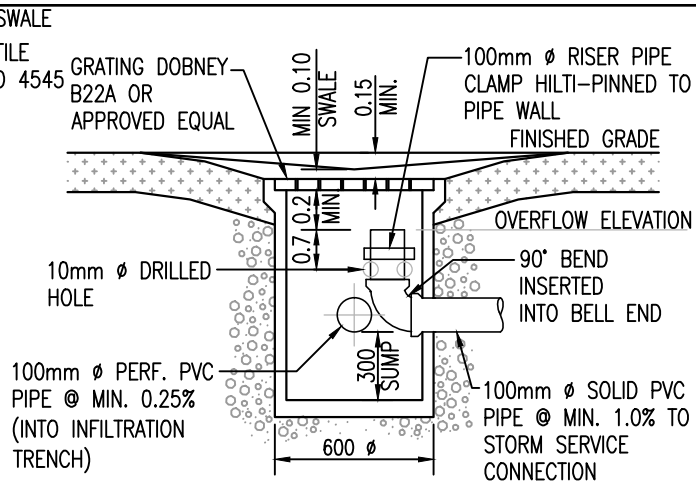
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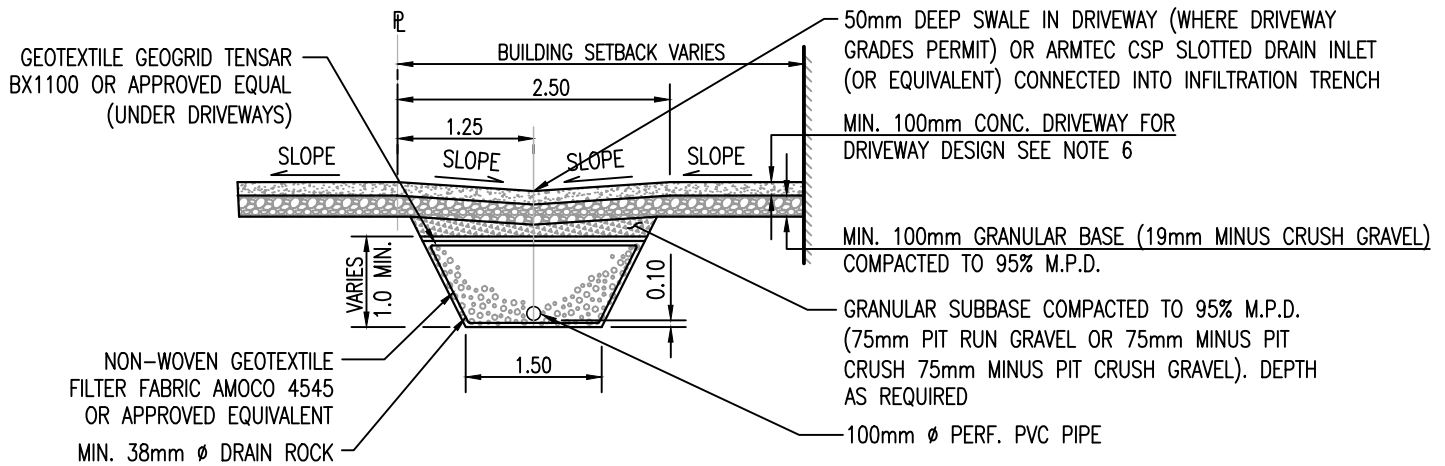
TLD 12(b)



**TYPICAL CROSS SECTION
THROUGH INFILTRATION FACILITY
(OUTSIDE OF DRIVEWAY)**
N.T.S.



**600mmØ CONTROL
CHAMBER DETAIL**
N.T.S.



**TYPICAL CROSS SECTION
THROUGH INFILTRATION FACILITY (UNDER DRIVEWAY)**
N.T.S.

NOTES:

- 1) THE BASE AREA OF INDIVIDUAL LOTS INFILTRATION FACILITIES SHALL BE 3m x 5m UNLESS OTHERWISE APPROVED BY THE TOWNSHIP OR ENGINEERING CONSULTANT
- 2) DOWNSPOUT LEADERS TO DISCHARGE TO SPLASH PADS DIRECTED TO FRONT OR REAR YARD (I.E. NO SIDE YARD DISCHARGE)
- 3) LOCATION AND SHAPE OF THE FACILITY IS VARIABLE AND CAN DIFFER FROM THE "TYPICAL" ARRANGEMENT SHOWN ON THIS DRAWING TO ACCOMMODATE VARIOUS HOUSE PLANS AND THEIR SITING ON THE LOT. THE FACILITY SHALL BE:
 - (a) LOCATED FULLY WITHIN THE LOT
 - (b) SEPARATED FROM THE HOUSE FOUNDATION WALL BY A MIN. 1.0m WIDE "BARRIER" OF IMPERVIOUS SOIL (I.E. CLAY [NO DRAIN ROCK]) AND PLASTIC SHEETING TO PREVENT PASSAGE OF STORED WATER TO THE HOUSE FOUNDATION DRAINAGE SYSTEM
- 4) NO SILT OR CLAY BASED SOD TO BE USED. TOPSOIL (MIN. 300mm THICK) SHALL BE PLACED UNDER THE ENTIRE SODDED AREA ON TOP OF SCARIFIED AND PREPARED BED - TYPICALLY AT THE FRONT AND BACK OF LOT
- 5) DESIGN OF INDIVIDUAL LOT INFILTRATION FACILITIES, INSPECTION OF PROPER INSTALLATION, AND FINAL CERTIFICATION OF THE FACILITY SHALL BE CONDUCTED BY A PROFESSIONAL ENGINEER
- 6) WHERE A DRIVEWAY IS TO BE CONSTRUCTED OVER AN INFILTRATION TRENCH THE HOUSE BUILDER MUST RETAIN A GEOTECHNICAL ENGINEER TO DESIGN AND INSPECT THE DRIVEWAY AT BUILDING PERMIT STAGE

ALL DIMENSIONS IN METERS
UNLESS NOTED OTHERWISE

TITLE

INDIVIDUAL LOT INFILTRATION FACILITY

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

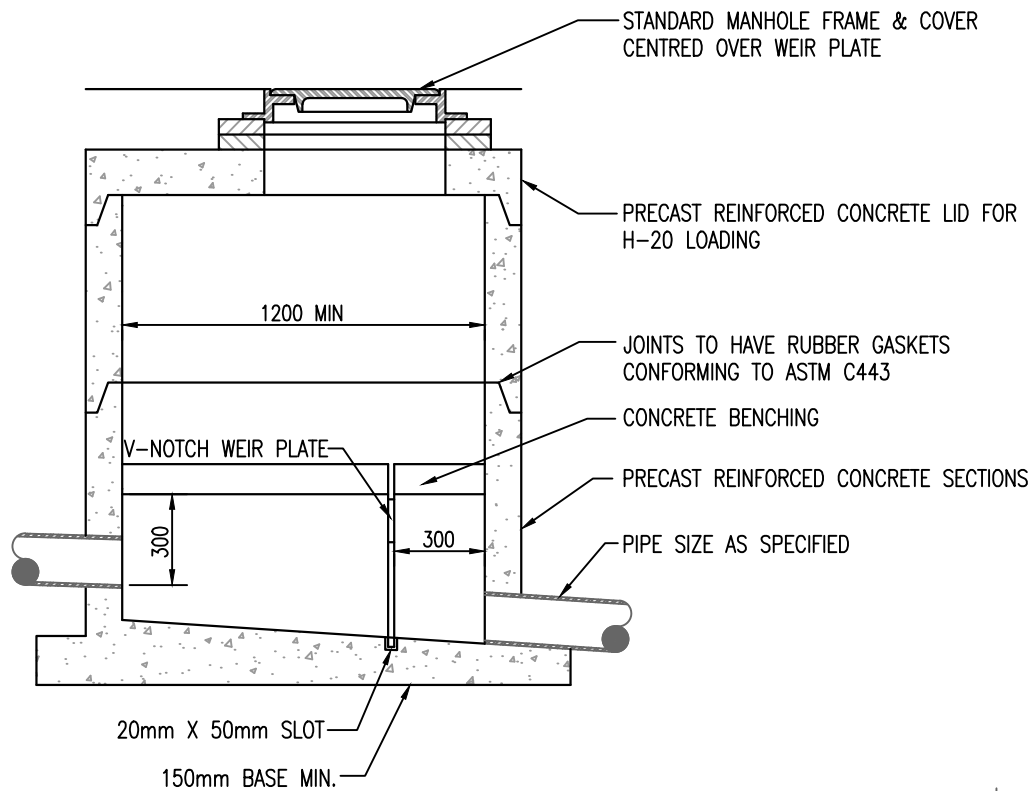
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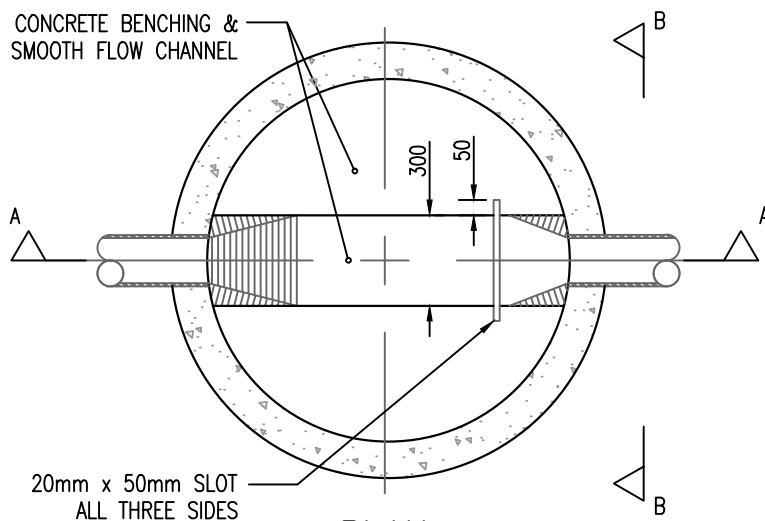
TLD 12(c)

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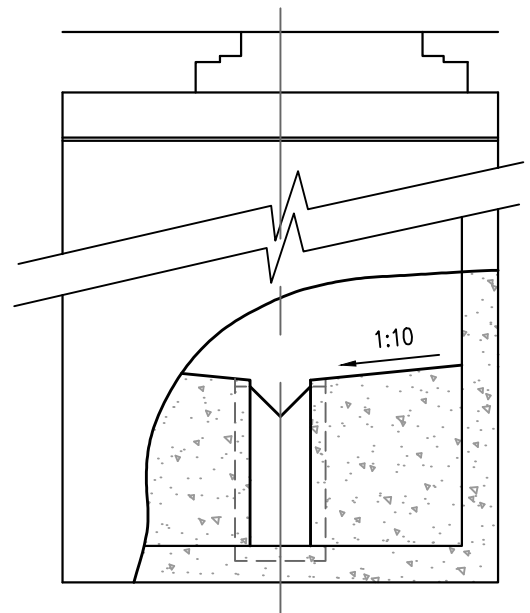
SANITARY SEWER SUPPLEMENTARY DRAWINGS



A-A



PLAN



B-B

NOTES:

- 1) STANDARD RUNGS TO BE PROVIDED FOR ACCESS.
- 2) VINYL MANHOLE SEAL OR EQUIVALENT (DENSOTAPE OR SANDED NIPPLES) REQUIRED FOR P.V.C. PIPES.
- 3) WEIR PLATE SUPPLIED BY MUNICIPALITY.

TITLE

SANITARY SAMPLING MANHOLE

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

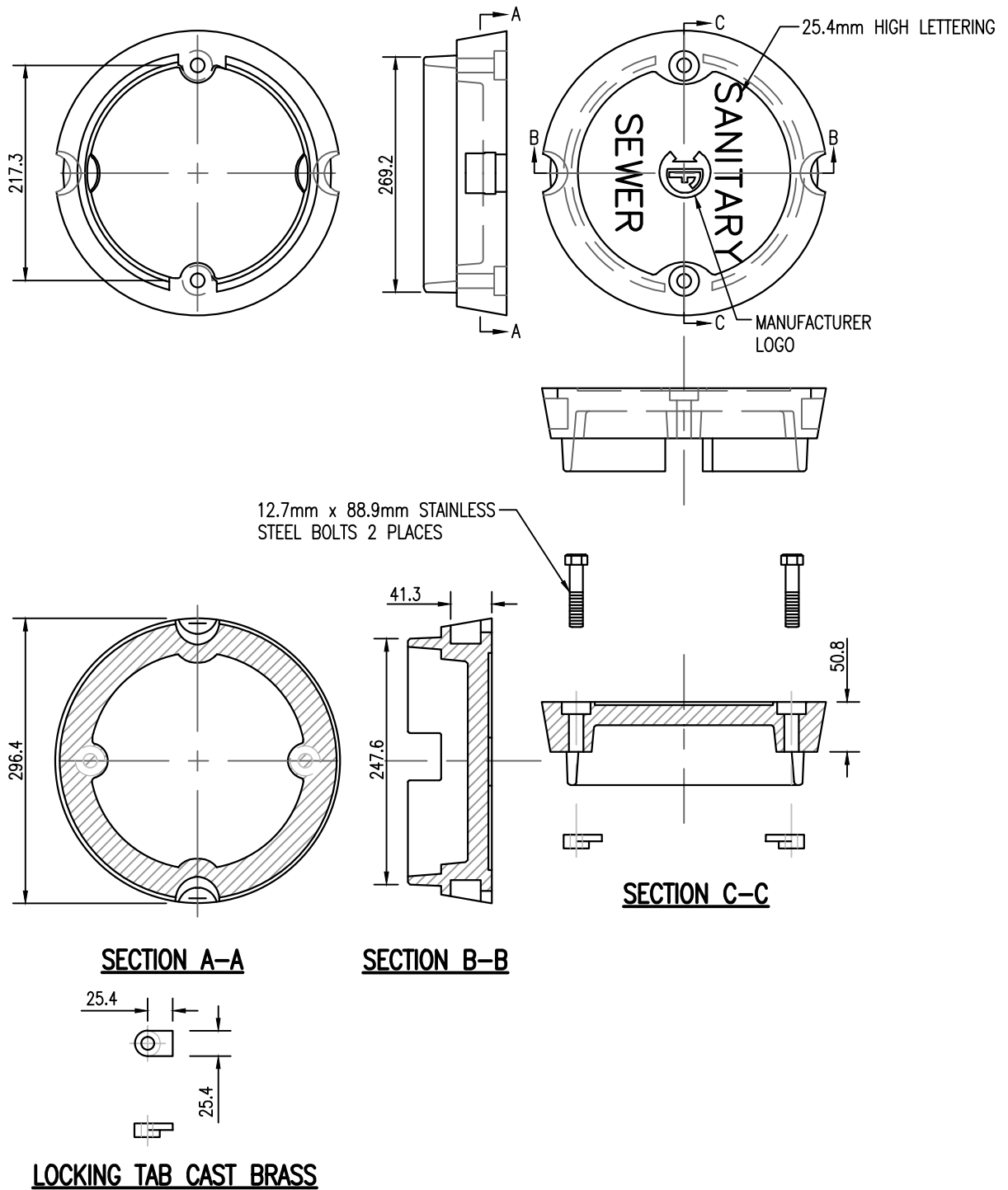
DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0030 (OLD #)



TLS 01



TITLE

MR-10 LOCKING LID

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

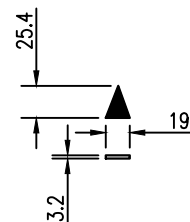
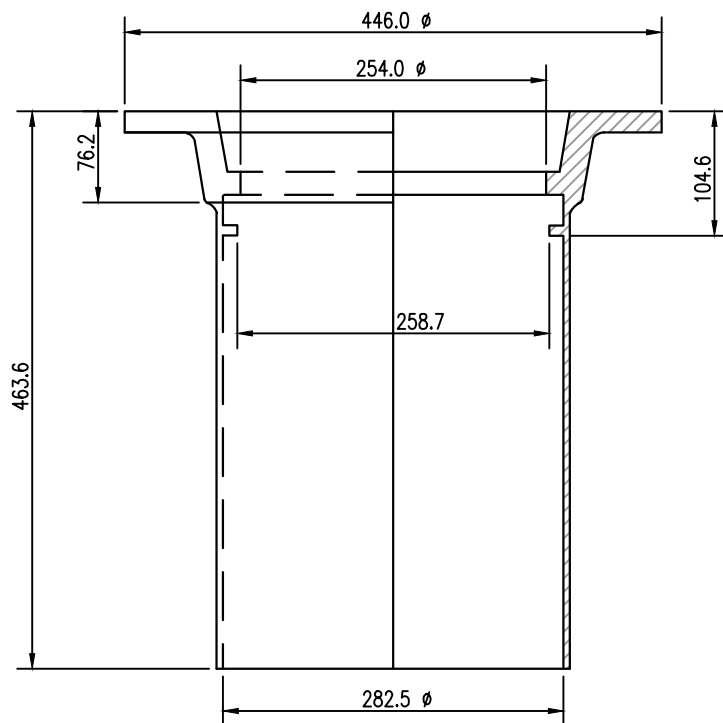
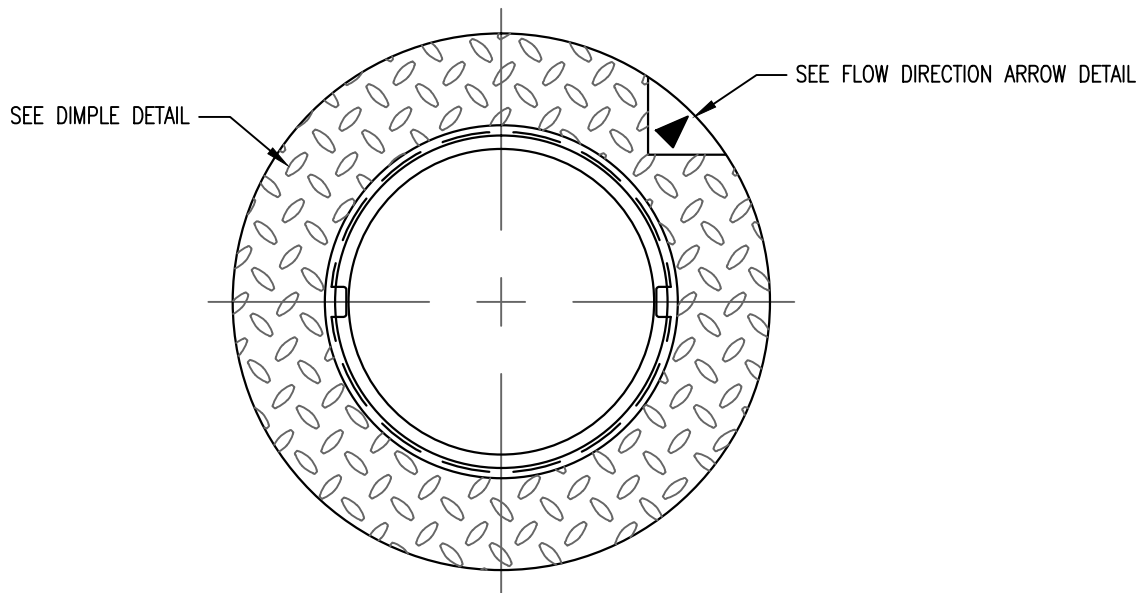
DATE APR 2019

APPROVED

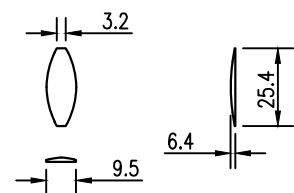
S.D.S.B. No.:



TLS 02



**FLOW DIRECTION
ARROW DETAIL**



DIMPLE DETAIL

TITLE VALVE BOX COVER

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

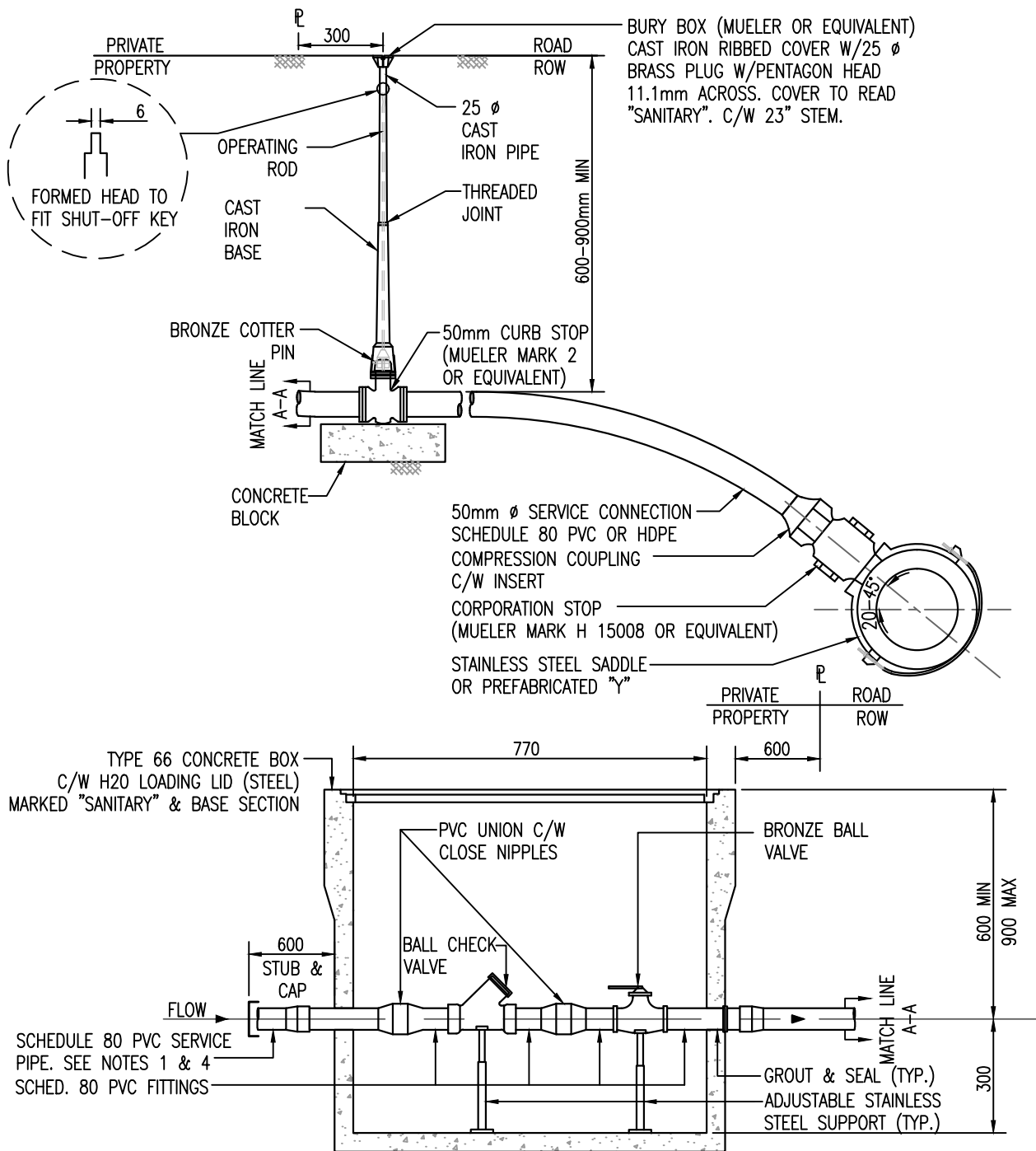
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLS 03



SERVICE CONNECTION CHAMBER DETAIL

NTS

NOTES:

- 1) ALL PIPE SIZES REFER TO INSIDE DIAMETER (ID)
- 2) SERVICE PIPE MINIMUM ID: 50mm
- 3) CHAMBER ACCESS IS TO BE UNOBSTRUCTED
- 4) ALL MATERIALS & FITTINGS TO AWWA C900

TITLE

PRIVATE RESIDENTIAL LOW PRESSURE SANITARY SERVICE

THE CORPORATION OF THE TOWNSHIP OF LANGLEY

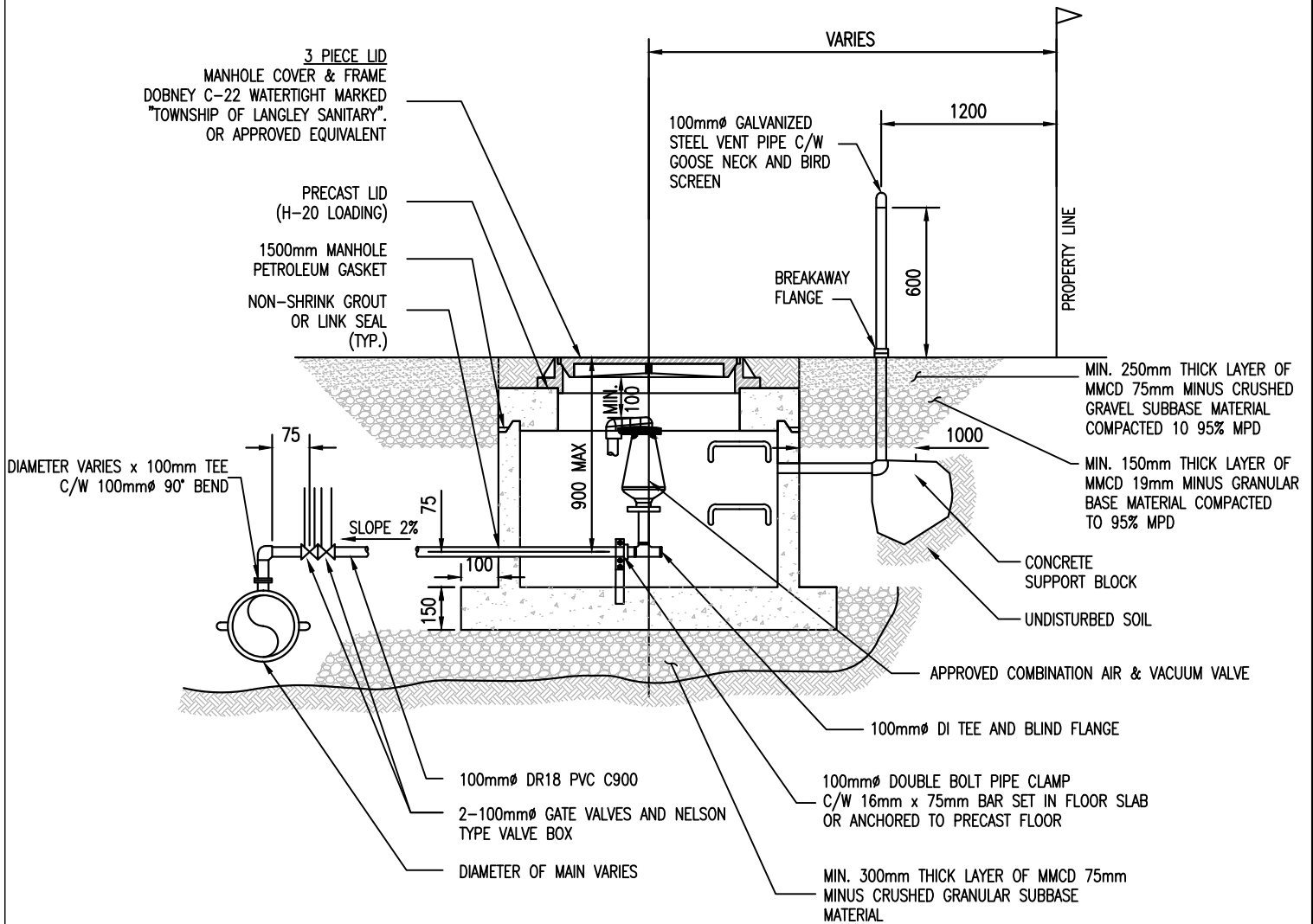
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLS 04



TITLE

SANITARY AIR AND VACUUM VALVE CHAMBER

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

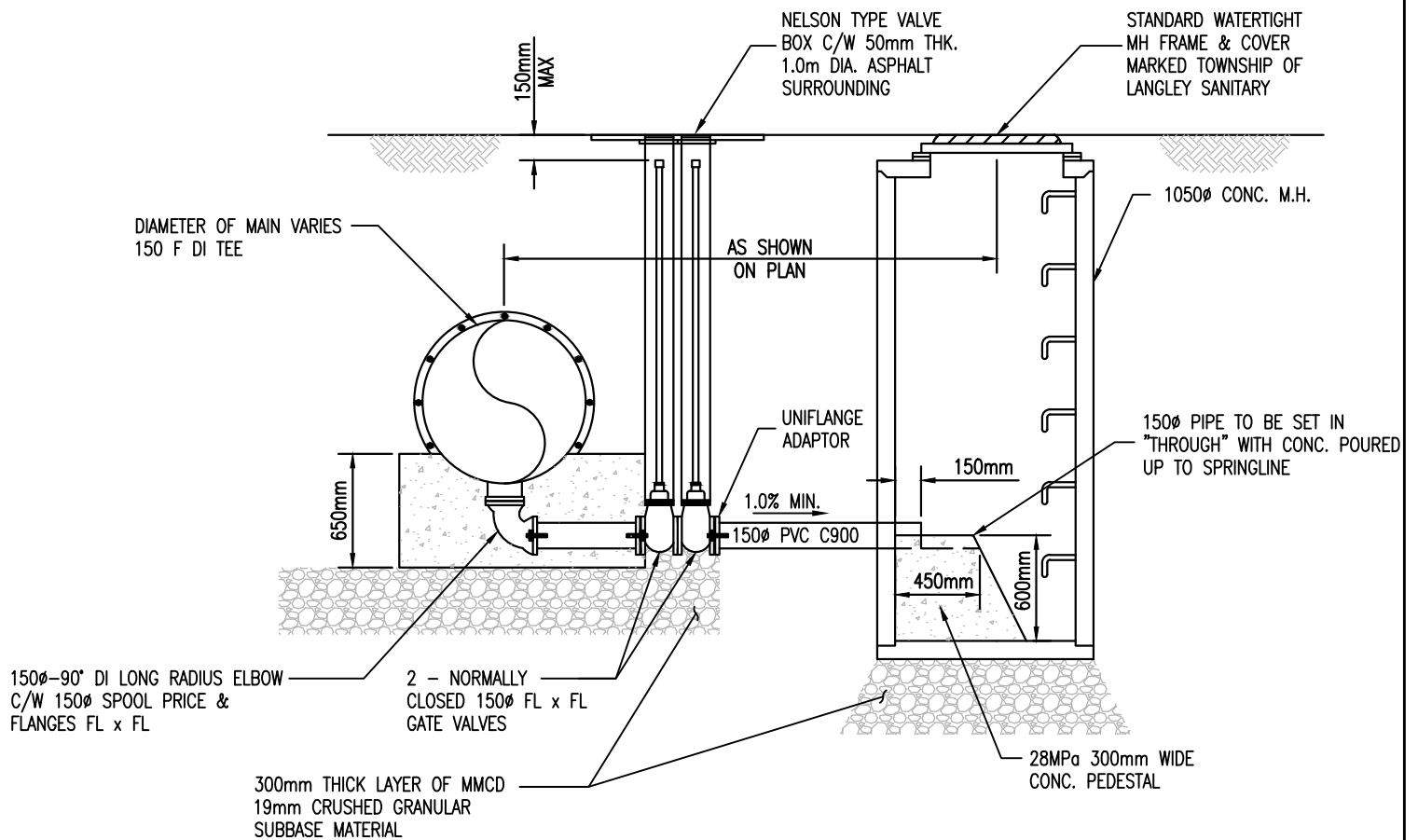
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLS 05



TITLE

SANITARY BLOW DOWN ASSEMBLY

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLS 06

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WATER SUPPLEMENTARY DRAWINGS

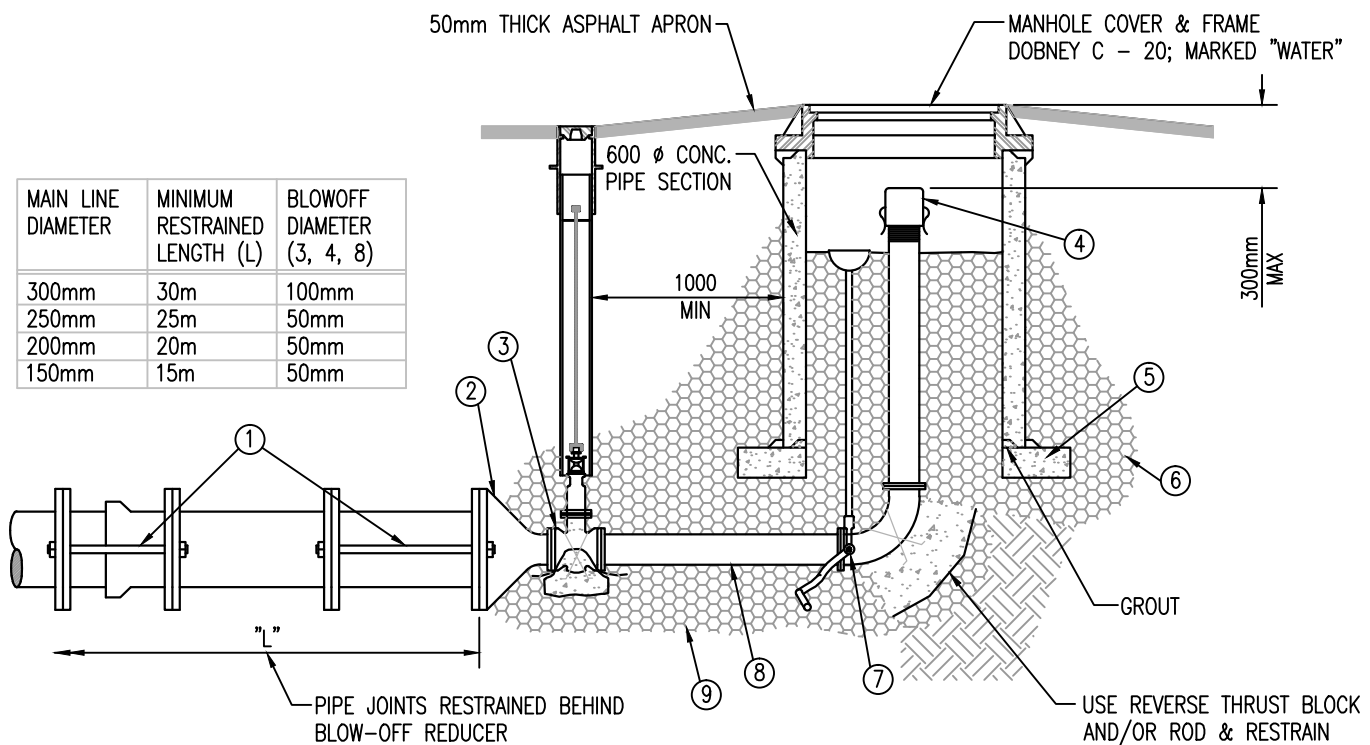
WATERMAIN FITTING			SOIL BEARING CAPACITY & MINIMUM THRUST BLOCK AREAS					
			SOFT CLAY	SAND	SAND & GRAVEL	SAND & GRAVEL WITH CLAY	SAND & GRAVEL CEMENTED WITH CLAY	HARDPAN
Diam.	TYPE	THRUST	23.94 Kpa	47.88 Kpa	71.82 Kpa	95.76 Kpa	191.52 Kpa	239.40 Kpa
100mm	Cap, Tee or Wye	11 kN	0.5 m2	0.3 m2	0.2 m2	0.2 m2	0.1 m2	0.1 m2
	11 1/4 Bend	3 kN	0.1 m2	0.1 m2	0.1 m2	0.1 m2	0.1 m2	0.1 m2
	22 1/2 Bend	5 kN	0.2 m2	0.1 m2	0.1 m2	0.1 m2	0.1 m2	0.1 m2
	45 Bend	9 kN	0.4 m2	0.2 m2	0.2 m2	0.1 m2	0.1 m2	0.1 m2
	90 Bend	16 kN	0.7 m2	0.4 m2	0.3 m2	0.2 m2	0.1 m2	0.1 m2
150mm	Cap, Tee or Wye	1.1 kN	1.1 m2	0.6 m2	0.4 m2	0.3 m2	0.2 m2	0.2 m2
	11 1/4 Bend	5 kN	0.1 m2	0.1 m2	0.1 m2	0.1 m2	0.1 m2	0.1 m2
	22 1/2 Bend	10 kN	0.2 m2	0.2 m2	0.2 m2	0.1 m2	0.1 m2	0.1 m2
	45 Bend	19 kN	0.8 m2	0.4 m2	0.3 m2	0.2 m2	0.1 m2	0.1 m2
	90 Bend	35 kN	1.5 m2	0.8 m2	0.5 m2	0.4 m2	0.2 m2	0.2 m2
200mm	Cap, Tee or Wye	44 kN	1.9 m2	1.0 m2	0.7 m2	0.5 m2	0.3 m2	0.2 m2
	11 1/4 Bend	9 kN	0.4 m2	0.2 m2	0.2 m2	0.1 m2	0.1 m2	0.1 m2
	22 1/2 Bend	17 kN	0.8 m2	0.4 m2	0.3 m2	0.2 m2	0.1 m2	0.1 m2
	45 Bend	34 kN	1.4 m2	0.7 m2	0.5 m2	0.4 m2	0.2 m2	0.2 m2
	90 Bend	62 kN	2.6 m2	1.3 m2	0.9 m2	1.1 m2	0.4 m2	0.3 m2
250mm	Cap, Tee or Wye	68 kN	2.9 m2	1.5 m2	1.0 m2	0.8 m2	0.4 m2	0.3 m2
	11 1/4 Bend	14 kN	0.6 m2	0.3 m2	0.2 m2	0.2 m2	0.1 m2	0.1 m2
	22 1/2 Bend	27 kN	1.2 m2	0.6 m2	0.4 m2	0.3 m2	0.2 m2	0.2 m2
	45 Bend	52 kN	2.2 m2	1.1 m2	0.8 m2	0.6 m2	0.3 m2	0.3 m2
	90 Bend	96 kN	4.1 m2	2.1 m2	1.4 m2	1.1 m2	0.6 m2	0.5 m2
300mm	Cap, Tee or Wye	98 kN	4.1 m2	2.1 m2	1.4 m2	1.1 m2	0.6 m2	0.5 m2
	11 1/4 Bend	20 kN	0.8 m2	0.4 m2	0.3 m2	0.2 m2	0.1 m2	0.1 m2
	22 1/2 Bend	39 kN	1.6 m2	0.8 m2	0.6 m2	0.4 m2	0.2 m2	0.2 m2
	45 Bend	75 kN	3.2 m2	1.6 m2	1.1 m2	0.8 m2	0.4 m2	0.4 m2
	90 Bend	138 kN	5.8 m2	2.9 m2	2.0 m2	1.5 m2	0.8 m2	0.6 m2
350mm	Cap, Tee or Wye	133 kN	5.6 m2	2.8 m2	1.9 m2	1.4 m2	0.7 m2	0.6 m2
	11 1/4 Bend	27 kN	1.1 m2	0.6 m2	0.4 m2	0.3 m2	0.2 m2	0.2 m2
	22 1/2 Bend	52 kN	2.2 m2	1.1 m2	0.8 m2	0.6 m2	0.3 m2	0.3 m2
	45 Bend	102 kN	4.3 m2	2.2 m2	1.5 m2	1.1 m2	0.6 m2	0.5 m2
	90 Bend	188 kN	7.9 m2	4.0 m2	2.7 m2	2.0 m2	1.0 m2	0.8 m2
400mm	Cap, Tee or Wye	174 kN	7.3 m2	3.7 m2	2.5 m2	1.9 m2	1.0 m2	0.8 m2
	11 1/4 Bend	34 kN	1.5 m2	0.8 m2	0.5 m2	0.4 m2	0.2 m2	0.2 m2
	22 1/2 Bend	68 kN	2.9 m2	1.5 m2	1.0 m2	0.8 m2	0.4 m2	0.3 m2
	45 Bend	133 kN	5.6 m2	2.8 m2	1.9 m2	1.4 m2	0.7 m2	0.6 m2
	90 Bend	246 kN	10.3 m2	5.2 m2	3.5 m2	2.6 m2	1.3 m2	1.1 m2

NOTES:

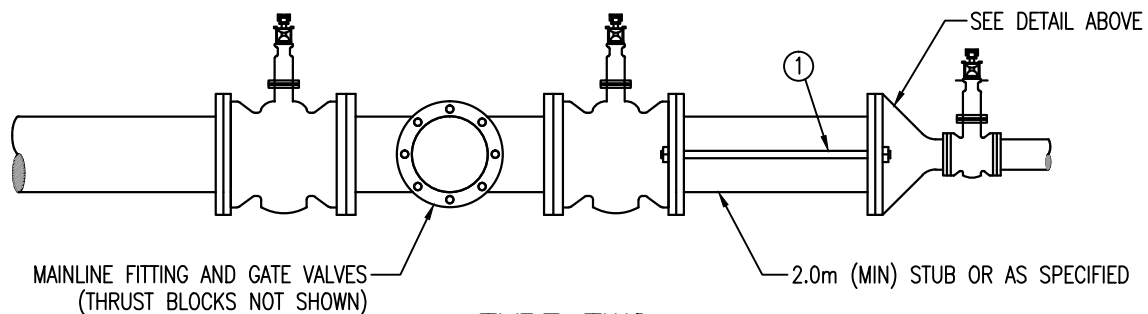
- 1) SOIL BEARING STRENGTHS ARE APPROXIMATE ONLY AND SHALL BE VERIFIED BY FIELD INVESTIGATIONS. THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED NATIVE MATERIAL
- 2) THRUST AND BEARING AREAS ARE BASED ON A TEST PRESSURE OF 1380 KPa (200 Psi)

TITLE		WATERMAIN FITTING MINIMUM THRUST BLOCK AREA		
THE CORPORATION OF THE TOWNSHIP OF LANGLEY		DATE	APR 2019	
		APPROVED		
		S.D.S.B. No.:	SCBE0055 (OLD #)	TLW 01

MAIN LINE DIAMETER	MINIMUM RESTRAINED LENGTH (L)	BLOWOFF DIAMETER (3, 4, 8)
300mm	30m	100mm
250mm	25m	50mm
200mm	20m	50mm
150mm	15m	50mm



TYPE ONE (DEAD END)



TYPE TWO

NOTES:

- 1) 19mm TIE-RODS (OR AS SPECIFIED)
- 2) HUB x FLANGE REDUCER
- 3) F x F GATE VALVE AND STD. VALVE BOX
- 4) CAM-LOCK CONNECTOR AND CAP
- 5) PRECAST CONCRETE MANHOLE RISER RING SECTION WITH EXTENDED BASE
- 6) 6mm POLY OVER DRAIN ROCK
- 7) 19mm CURB STOP AND BURY BOX, CONNECT TO BLOW OFF WITH THREADED COMPRESSION COUPLING AND 19mm POLY TUBE.
- 8) GALVANIZED SCH. 40 STEEL PIPE (TYP)
- 9) DRAIN ROCK - 20mm TO 50mm
- 10) INSTALLATION TO BE INSPECTED BY THE MUNICIPAL INSPECTOR PRIOR TO BACK FILLING

TITLE

WATERMAIN BLOW-OFF

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

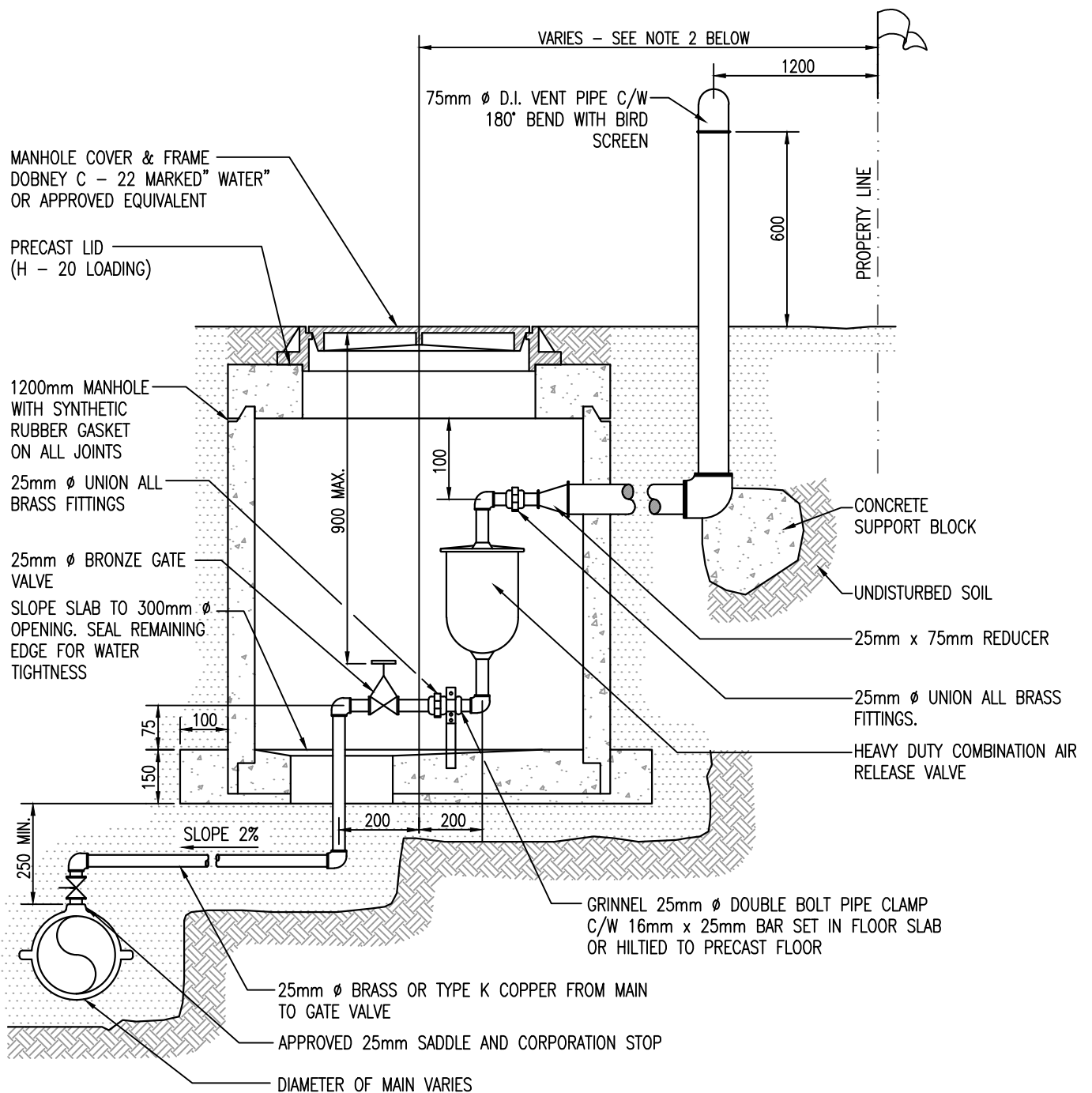
DATE APR 2019

APPROVED

S.D.S.B. No.: SCBE0054 (OLD #)



TLW 02



NOTES:

- 1) SPECIAL DESIGN REQUIRED WHEN DISTANCE FROM TOP OF MAIN TO MANHOLE COVER IS LESS THAN 1.2m.
- 2) MANHOLE TO BE CENTERED 525mm FROM BACK OF SIDEWALK WHERE SIDEWALK IS ON THE SAME SIDE OF ROAD AS WATERMAIN OTHERWISE LOCATE IN BOULEVARD CENTRED AT 3.0m FROM PROPERTY LINE IN URBAN AREAS OR 4.0m FROM PROPERTY LINE IN RURAL AREAS C/W ACCESS PAD AND APPROVED CULVERT WHERE REQUIRED.

TITLE

AIR AND VACUUM VALVE CHAMBER

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

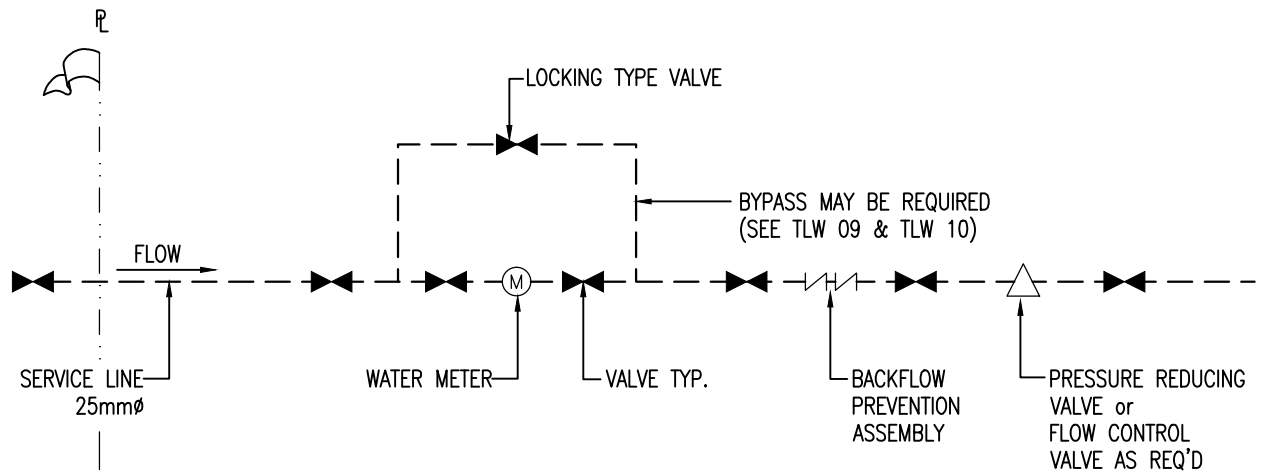
DATE APR 2019

APPROVED

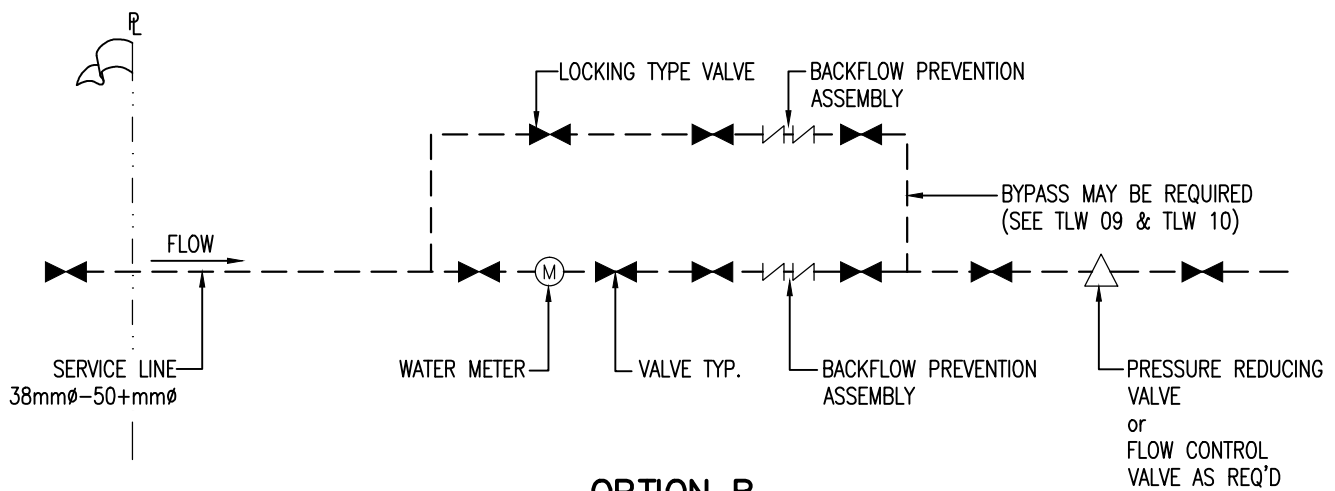
S.D.S.B. No.: SCBE0056 (OLD #)



TLW 03



OPTION A

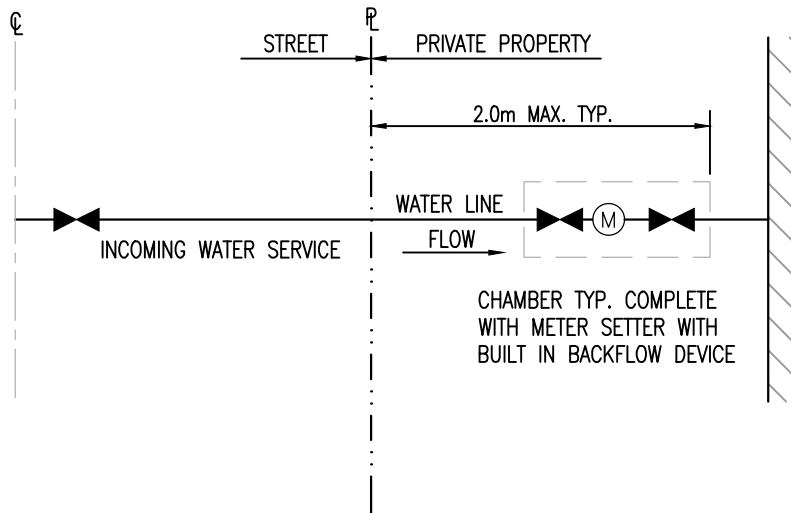


OPTION B

NOTES:

- 1) OPTION A: RECOMMENDED METER/BACKFLOW/PRV ASSEMBLY
- 2) OPTION B: WHERE IT IS DESIRED TO HAVE A BYPASS FOR THE BACKFLOW PREVENTION ASSEMBLY, THE BYPASS MUST ALSO CONTAIN A BACKFLOW PREVENTION ASSEMBLY PROVIDING EQUIVALENT PROTECTION
- 3) FOR BOTH OPTIONS, ALL TAKEOFFS MUST BE AFTER THE BACKFLOW PREVENTION ASSEMBLY AND WATER METER
- 4) SEE SUPPLEMENTARY DRAWINGS TLW 8, 9, 10, 11, 12, 13, 14 FOR DETAILS
- 5) FIRE SUPPRESSION IS NOT REFLECTED IN OPTIONS A OR B

TITLE	RECOMMENDED METER/BACKFLOW/PRV ASSEMBLY PATTERN	 TLW 04
THE CORPORATION OF THE TOWNSHIP OF LANGLEY	DATE APR 2019	
	APPROVED _____ S.D.S.B. No.: _____	



**SINGLE FAMILY RESIDENTIAL
OUTSIDE SETTING WITH METER SETTER**

NOTES:

- 1) THE ABOVE DIAGRAM IS INTENDED TO SHOW METER LOCATION AND ESSENTIAL SERVICE VALVES. VALVES AND PIPING FOR FIRE PROTECTION ARE NOT SHOWN.

TITLE

**TYPICAL WATER METER AND BACKFLOW DEVICE
INSTALLATIONS – OUTSIDE SETTING**

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

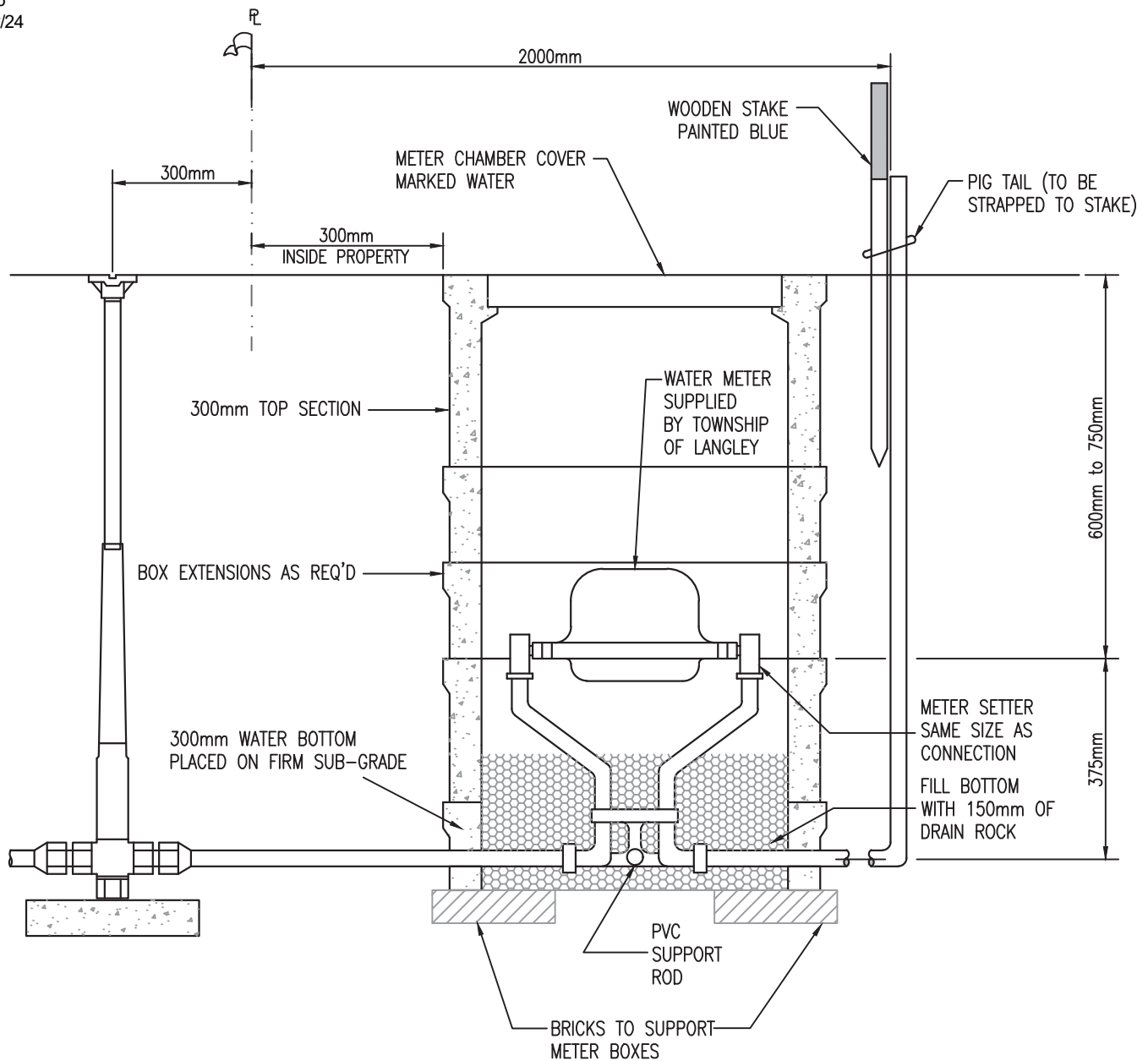
APPROVED

S.D.S.B. No.:



TLW 05

#6076
02/12/24



NOTES:

- 1) METER BOX IN D/W TO INSTALL H2O LOADING STEEL LID
- 2) METER CHAMBER TO BE INSTALLED SHALL HAVE 1.0m CLEARANCE ON ALL SIDES
- 3) METER BOX AS PER SCHEDULE 'D' OR APPROVED EQUIVALENT
- 4) COVER TO BE PLASTIC REINFORCED LID MARKED "WATER METER" OR APPROVED EQUAL
- 5) METER SETTER TO BE COPPER METER SETTER FOR THREADED SPUD END METER. 375mm HIGH COMPLETE WITH IDLER, WITH BRACE PIPE EYELET, FULL PORT BALL INLET VALVE AND ASSE OR CSA APPROVED DUAL CHECK VALVE, LINE CONNECTIONS TO BE QUICK TIGHTENING COMPRESSION COUPLINGS OR APPROVED EQUIVALENT

TITLE

**WATER METER CHAMBER FOR
SERVICE CONNECTIONS UP TO 50mm**

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

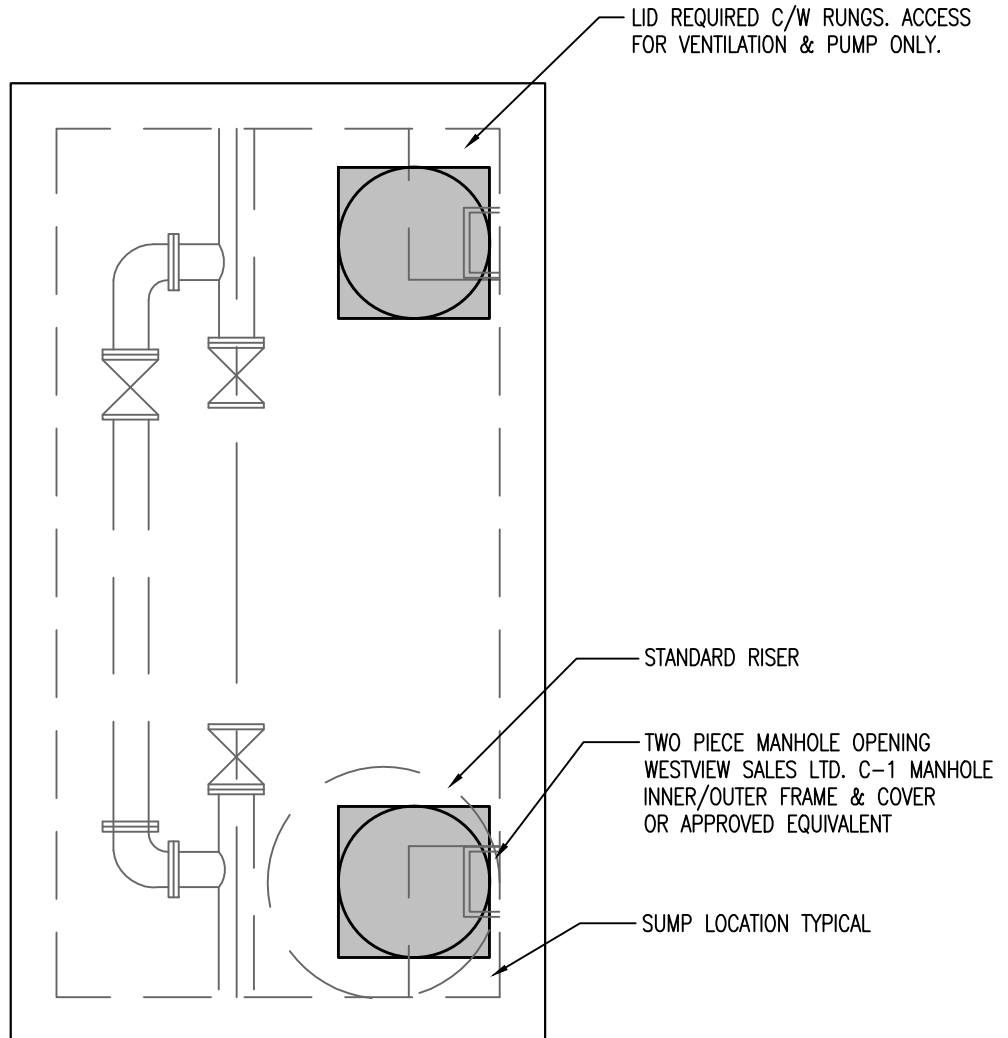
DATE APR 2019

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S.D.S.B. No.:



TLW 06



PLAN VIEW

NOTES:

1. WHEN ORDERING METER CHAMBER LOCATE ACCESS AS SHOWN
2. METER CHAMBERS ARE TO BE COMPLETE W/RUNGS

TITLE PIPING & CHAMBER ACCESS DETAIL FOR 75mm TO 250mm
WATER METERS – OUTSIDE SETTING

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

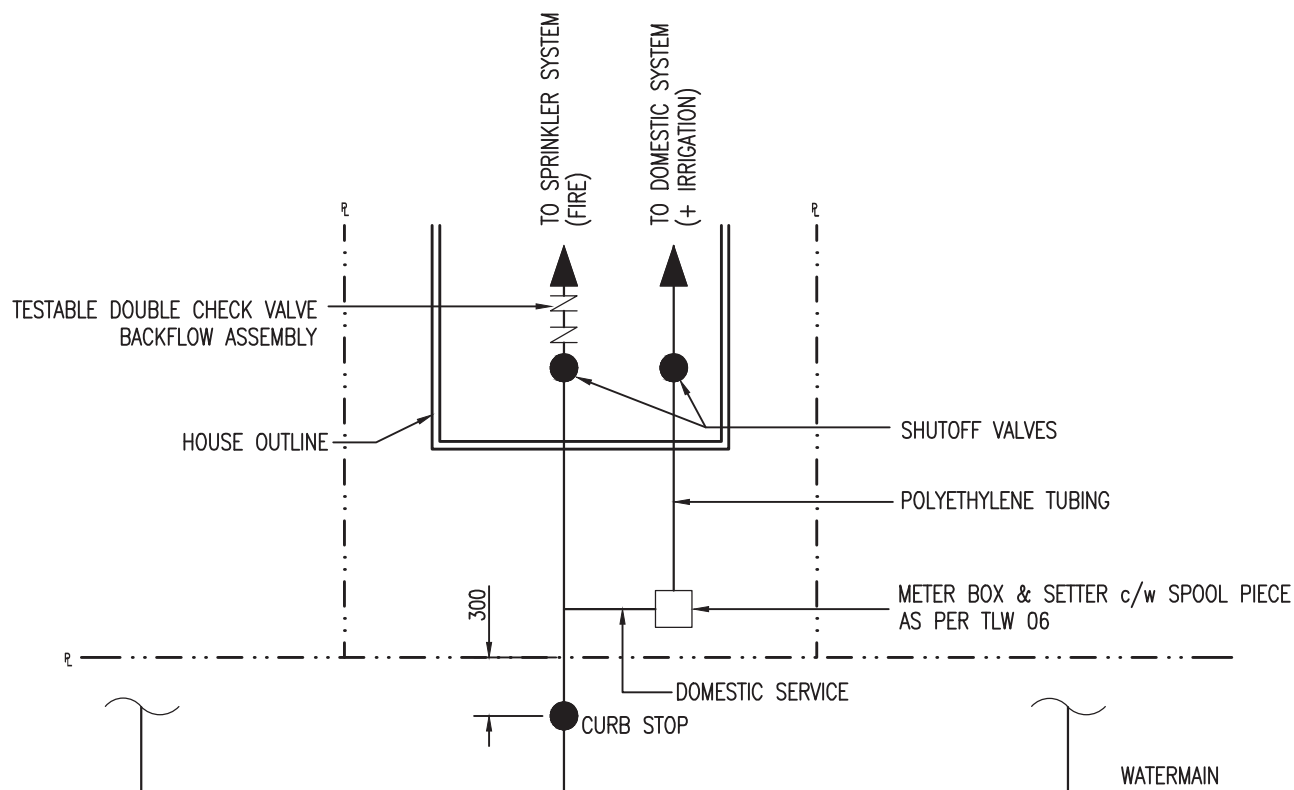
DATE APR 2019

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S.D.S.B. No.:



TLW 07



NOTE:

- 1) CONNECTIONS GREATER THAN 50mm REQUIRE GATE VALVE AT MAIN
- 2) AUTOMATIC IRRIGATION REQUIRES AN APPROVED BACKFLOW DEVICE

TITLE

WATER SERVICE CONNECTION FOR SPRINKLERED HOMES (38mm OR 50mm)

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

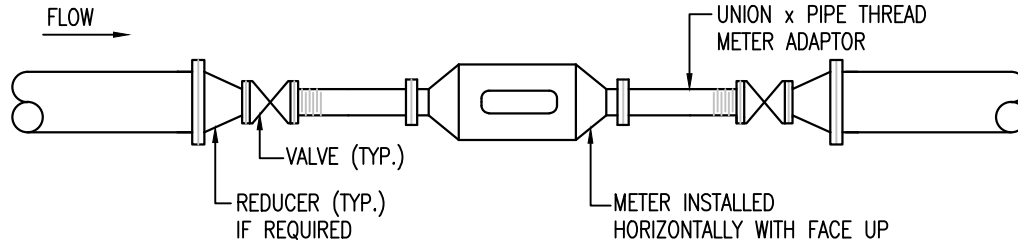
DATE APR 2019

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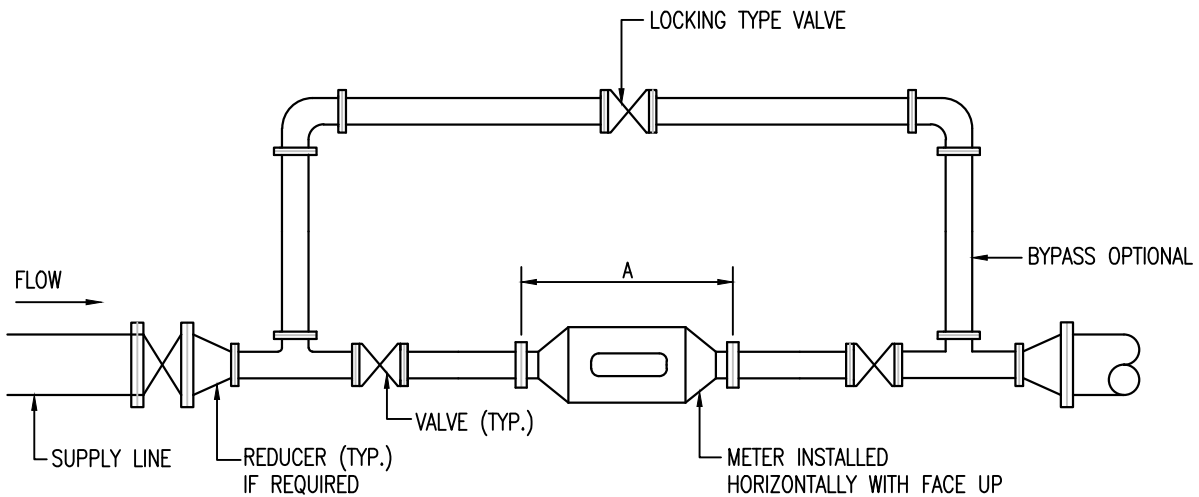
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TLW 08



OPTION A
PLAN



OPTION B
PLAN

METER SIZE	A	MINIMUM BYPASS SIZES
25mm	272mm	NOT REQUIRED
37mm	330mm	NOT REQUIRED
50mm	432mm	REQUIRED
NOTE: DIMENSIONS AS GIVEN ARE NOT GUARANTEED TO BE CORRECT, CONFIRM DIMENSIONS WITH MATERIAL SUPPLIER PRIOR TO ORDERING MATERIAL.		

NOTE:

WATER METER SUPPLIED BY THE TOWNSHIP OF LANGLEY

TITLE

PIPING DETAIL FOR 25mm TO 50mm
WATER METERS – INSIDE SETTING

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

DATE APR 2019

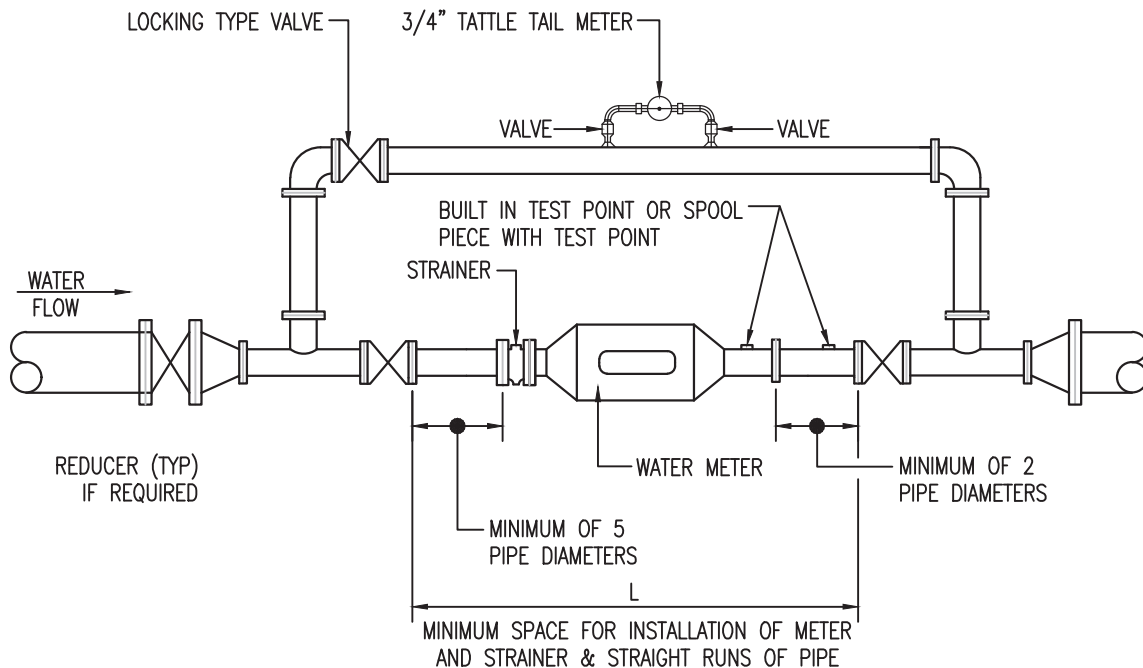
APPROVED

S.D.S.B. No.:



TLW 09

#6076
02/12/24



PLAN

METER SIZE	L	HEIGHT FROM FLOOR TO CENTRE LINE OF PIPE	MINIMUM BY-PASS SIZE
75mm (3")	1.0m	0.50m - 1.00m (20" - 40")	50mm - (2")
100mm (4")	1.3m	0.50m - 1.00m (20" - 40")	75mm - (3")
150mm (6")	1.5m	0.50m - 1.00m (20" - 40")	100mm - (4")
200mm (8")	2.2m	0.50m - 1.00m (20" - 40")	150mm - (6")
250mm (10")	2.8m	0.50m - 1.00m (20" - 40")	200mm - (8")
NOTE: DIMENSIONS AS GIVEN ARE NOT GUARANTEED TO BE CORRECT, CONFIRM DIMENSIONS WITH MATERIAL SUPPLIER BEFORE ORDERING ANY MATERIAL			

NOTES:

WATER METER SUPPLIED BY THE TOWNSHIP OF LANGLEY

TITLE

PIPING DETAIL FOR 75mm TO 250mm WATER METERS – INSIDE SETTING

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

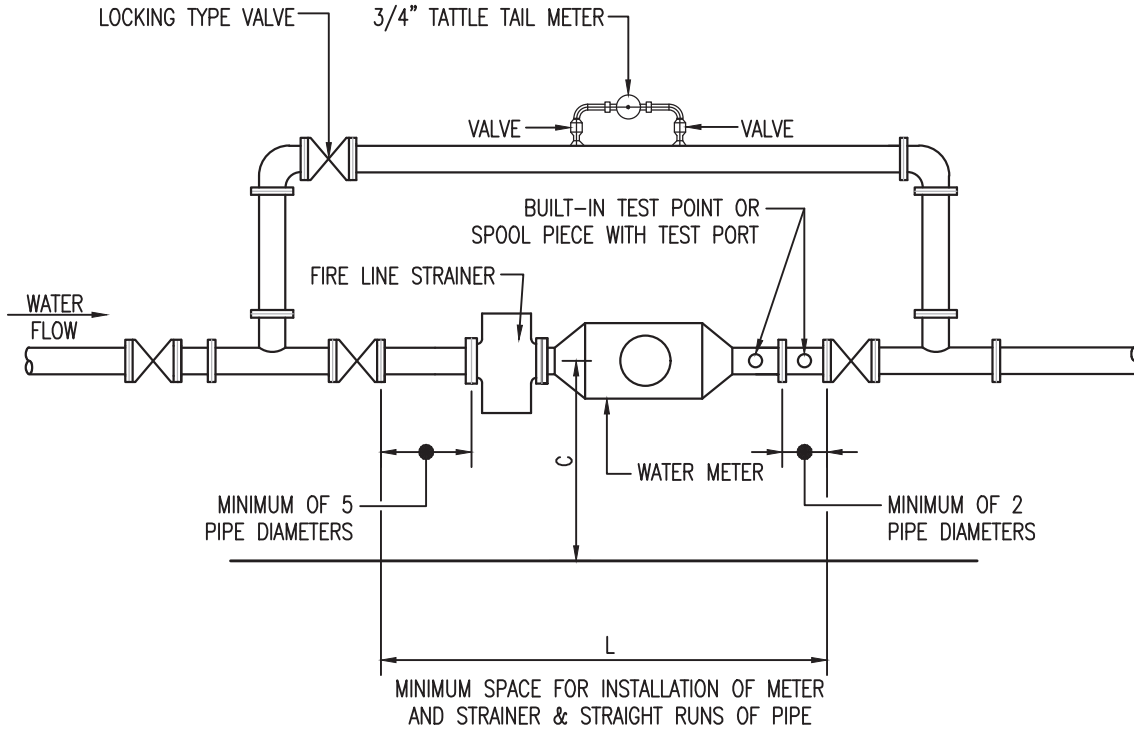
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLW 10



PLAN

METER SIZE	L	HEIGHT FROM FLOOR TO CL. OF PIPING	DISTANCE FROM WALL C	MIN BY-PASS SIZE
100mm (4")	1.5m	0.50m – 1.00m (20" – 40")	0.60m (24")	100mm (4")
150mm (6")	2.2m	0.50m – 1.00m (20" – 40")	0.60m (24")	100mm (4")
200mm (8")	2.8m	0.50m – 1.00m (20" – 40")	0.75m (30")	150mm (6")
250mm (10")	2.9m	0.50m – 1.00m (20" – 40")	0.75m (30")	200mm (8")
NOTE: DIMENSIONS AS GIVEN ARE NOT GUARANTEED TO BE CORRECT, CONFIRM DIMENSIONS WITH MATERIAL SUPPLIER PRIOR TO ORDERING MATERIAL				

NOTES:

WATER METER AND RELATED APPURTENANCES TO BE SUPPLIED BY THE OWNER FOR FIRE LINES

TITLE

PIPING DETAIL FOR 100mm TO 250mm FIRE LINE METERS – INSIDE SETTINGS

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLW 11

#6076
02/12/24

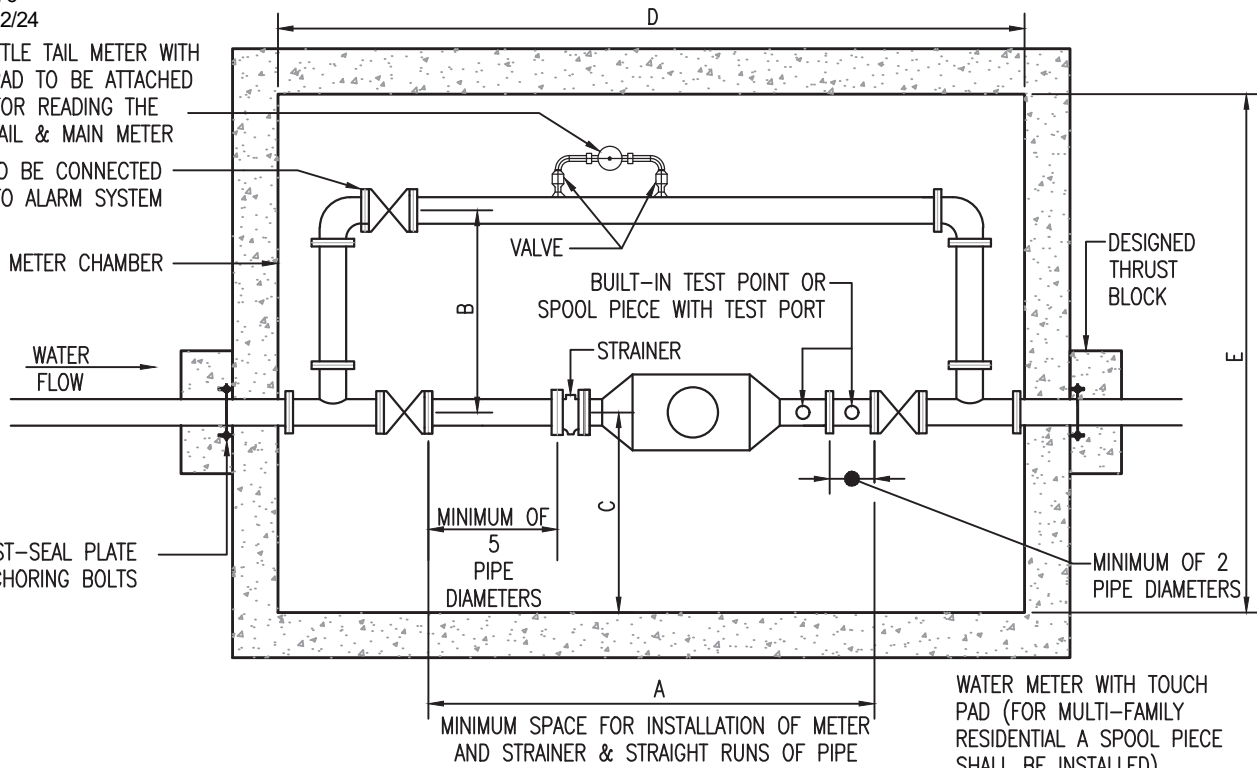
3/4" TATTLE TAIL METER WITH
TOUCH PAD TO BE ATTACHED
TO LID FOR READING THE
TATTLE TAIL & MAIN METER

VALVE TO BE CONNECTED
TO ALARM SYSTEM

METER CHAMBER

WATER
FLOW

THRUST-SEAL PLATE
C/W ANCHORING BOLTS



PLAN

METER SIZE	INSIDE HEIGHT OF CHAMBER	A	B	C	D	E	MIN BY-PASS SIZE	CHAMBER MODEL
75mm (3")	2.0m	1.0m (40")	0.28m (11")	0.40m (16")	2.48m (98")	1.02m (40")	50mm (2")	3152
100mm (4")	2.0m	1.3m (52")	0.32m (12")	0.42m (16")	2.85m (112")	1.08m (43")	75mm (3")	3152
150mm (6")	2.0m	1.7m (69")	0.37m (14")	0.44m (17")	3.66m (144")	1.18m (47")	100mm (4")	4212
200mm (8")	2.0m	2.2m (85")	0.42m (17")	0.47m (19")	4.22m (166")	1.29m (51")	150mm (6")	4712
250mm (10")	2.0m	2.8m (110")	0.48m (19")	0.50m (20")	5.13m (201")	1.41m (55")	200mm (8")	SPECIAL ORDER

NOTE: DIMENSIONS AS GIVEN ARE NOT GUARANTEED TO BE CORRECT, CONFIRM DIMENSIONS WITH MATERIAL SUPPLIER PRIOR TO ORDERING MATERIAL

NOTES:

- 1) HEIGHT FROM FLOOR TO CENTERLINE OF PIPING 0.50m TO 1.0m (20" TO 40"). ALL CHAMBERS TO BE A.E. CONCRETE PRECAST PRODUCTS LTD. OR APPROVED EQUAL. SUMP DRAINER TO BE B.C.A. SUMP DRAINER ASSEMBLY MODEL A OR B OR APPROVED EQUAL. REFER TO DWG TLW 10 WHEN ORDERING METER CHAMBERS.
- 2) WATER METER SUPPLIED BY THE TOWNSHIP OF LANGLEY.
- 3) SEE TLW 13, 14 FOR BACKFLOW PREVENTER DETAILS.

TITLE PIPING & CHAMBER DETAIL FOR 75mm TO 250mm WATER METERS – BYPASS INSIDE

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

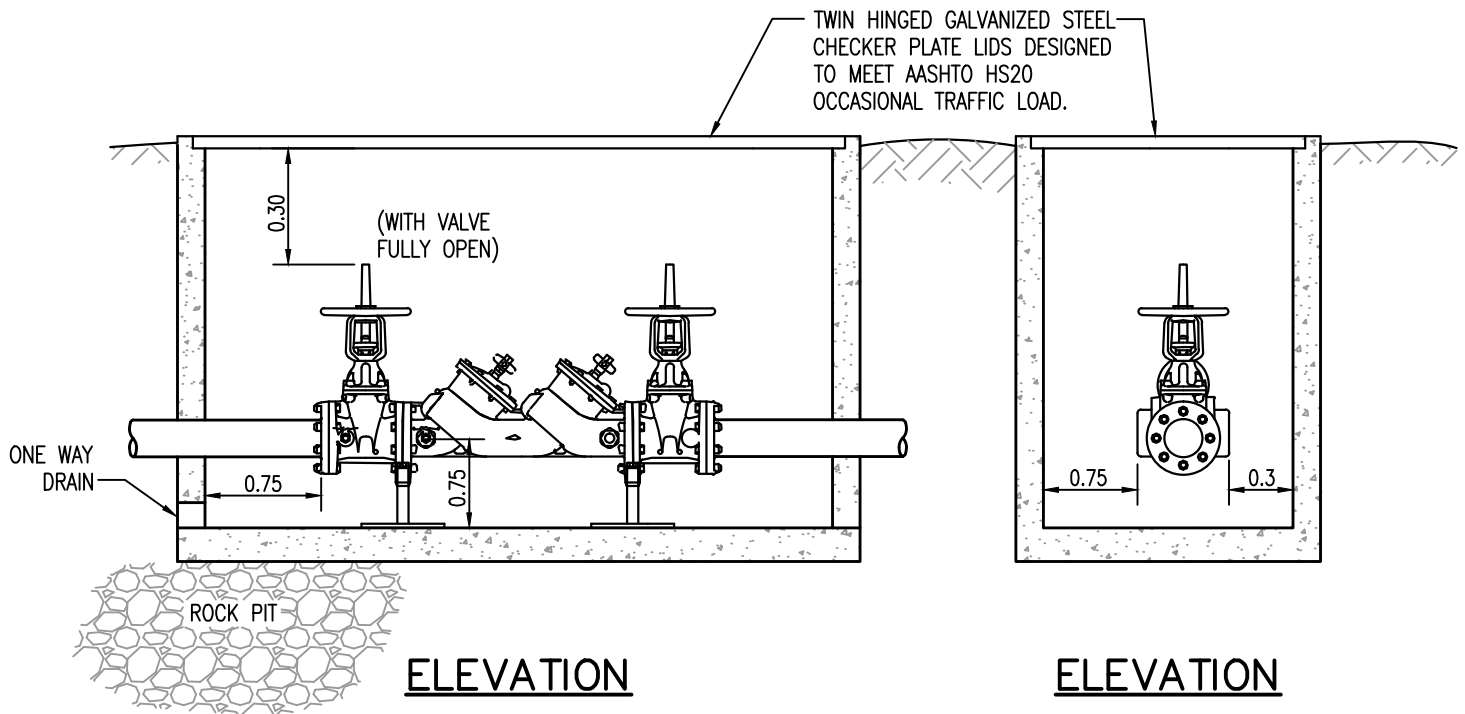
DATE APR 2019

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S.D.S.B. No.:



TLW 12



NOTES:

- 1) 8mm RESILIENT SEATED FULL PORT STOPCOCK OR EXISTING SIZE AS SUPPLIED ON ACCEPTED ASSEMBLY
- 2) TEST COCKS POINT TO BE PLUGGED (WATERTIGHT) IF ASSEMBLY IS INSTALLED BELOW GROUND
- 3) CHAMBER MAY DRAIN TO DAYLIGHT OR ROCK PIT
- 4) CENTERLINE HEIGHT ABOVE FLOOR AT A MINIMUM 0.75m
- 5) MINIMUM CLEARANCE ABOVE DEVICE IS 0.30m
- 6) INSULATION SHALL NOT INTERFERE WITH OPERATION & MAINTENANCE OF ASSEMBLY
- 7) WATERTIGHT GROUT TO BE USED AT PIPE ENTRANCE AND EXIT
- 8) DCVA MUST BE TESTED AFTER INSTALLATION, PRIOR TO ACCEPTANCE. RESULTS SHALL BE FORWARDED TO TOWNSHIP OF LANGLEY

TITLE MINIMUM CLEARANCE FOR DOUBLE CHECK VALVE ASSEMBLY
& DOUBLE CHECK DETECTOR ASSEMBLY INSTALLATIONS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

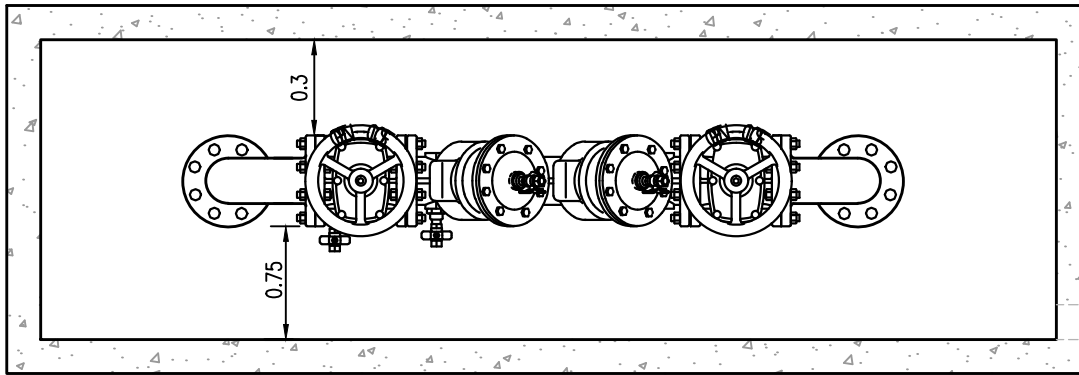
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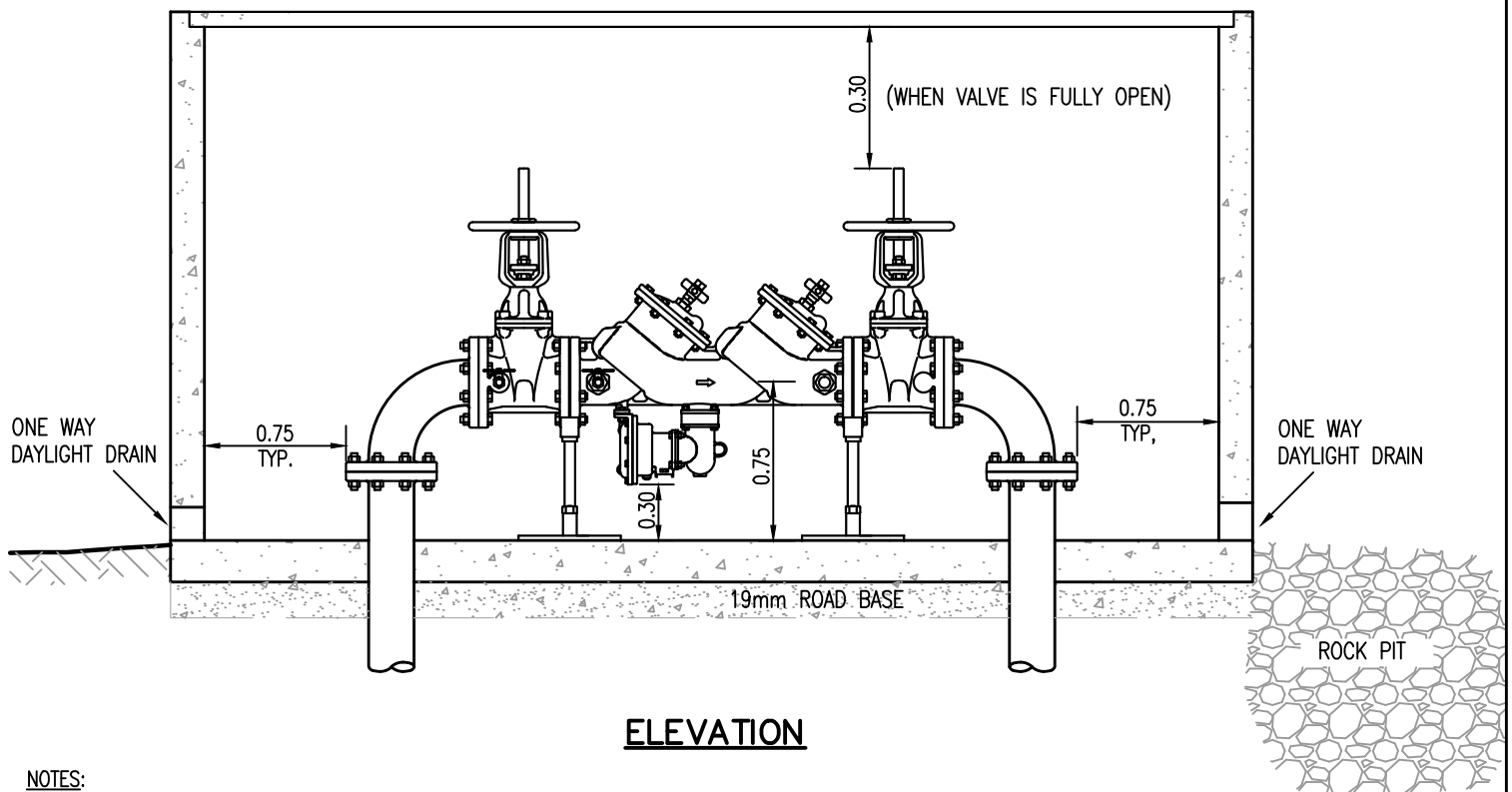
S.D.S.B. No.:



TLW 13



PLAN



ELEVATION

NOTES:

- 1) RPBA SHALL NOT BE INSTALLED IN A BELOW GROUND CHAMBER
- 2) 8mm RESILIENT SEATED FULL PORT STOPCOCK OR EXISTING SIZE AS SUPPLIED ON ACCEPTED ASSEMBLY
- 3) CHAMBER MAY DRAIN TO DAYLIGHT OR ROCK PIT
- 4) CENTERLINE HEIGHT ABOVE FLOOR AT A MINIMUM 0.75m
- 5) MINIMUM CLEARANCE ABOVE DEVICE IS 0.30m
- 6) RPBA MUST BE ACCESSIBLE AND PROTECTED FROM FREEZING
- 7) INSULATION SHALL NOT INTERFERE WITH OPERATION & MAINTENANCE OF ASSEMBLY
- 8) WATERTIGHT GROUT TO BE USED AT PIPE ENTRANCE AND EXIT
- 9) RPBA MUST BE TESTED AFTER INSTALLATION, PRIOR TO ACCEPTANCE. RESULTS SHALL BE FORWARDED TO TOWNSHIP OF LANGLEY

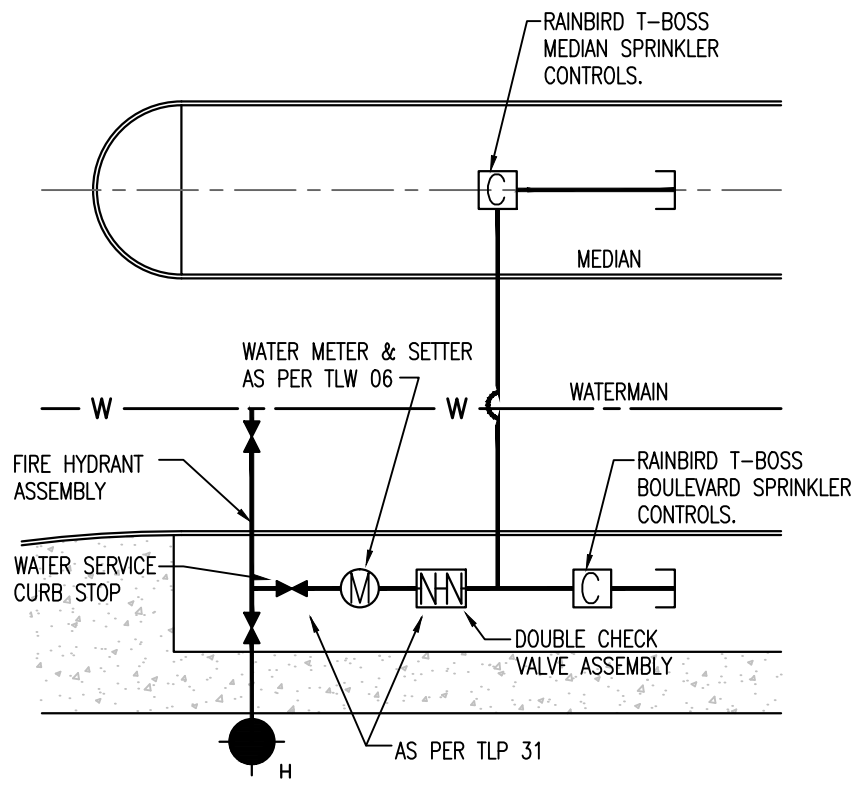
TITLE
**MINIMUM CLEARANCES FOR REDUCED PRESSURE BACKFLOW ASSEMBLY
& REDUCED PRESSURE DETECTOR ASSEMBLY INSTALLATIONS**

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019
APPROVED
S.D.S.B. No.:



TLW 14



NOTE:

SEE SECTION W10 FOR DETAILS ON VALVE LOCATIONS ON ARTERIAL ROAD.

TITLE

WATER SERVICES FOR BOULEVARD LANDSCAPING

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

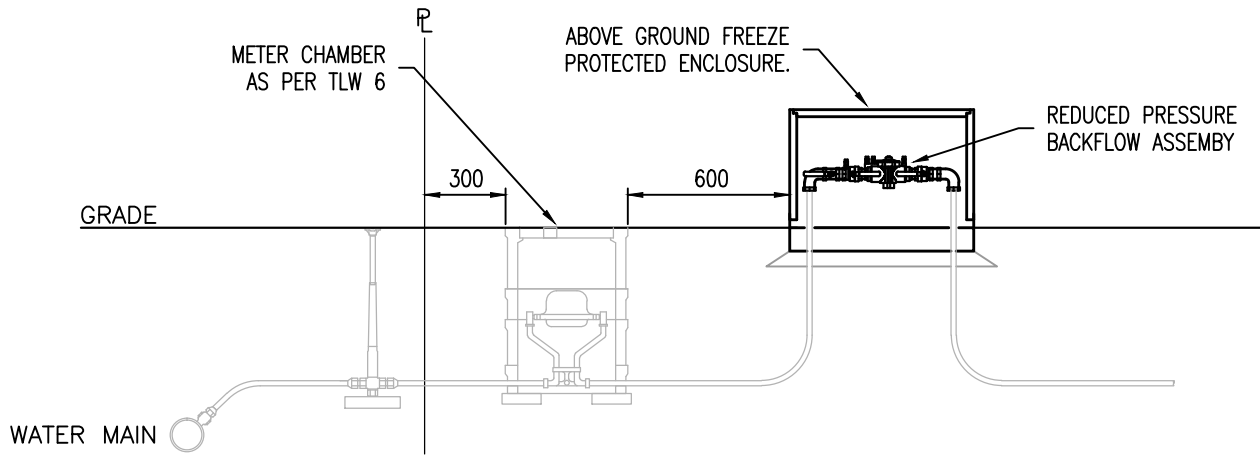
DATE APR 2019

APPROVED

S.D.S.B. No.:

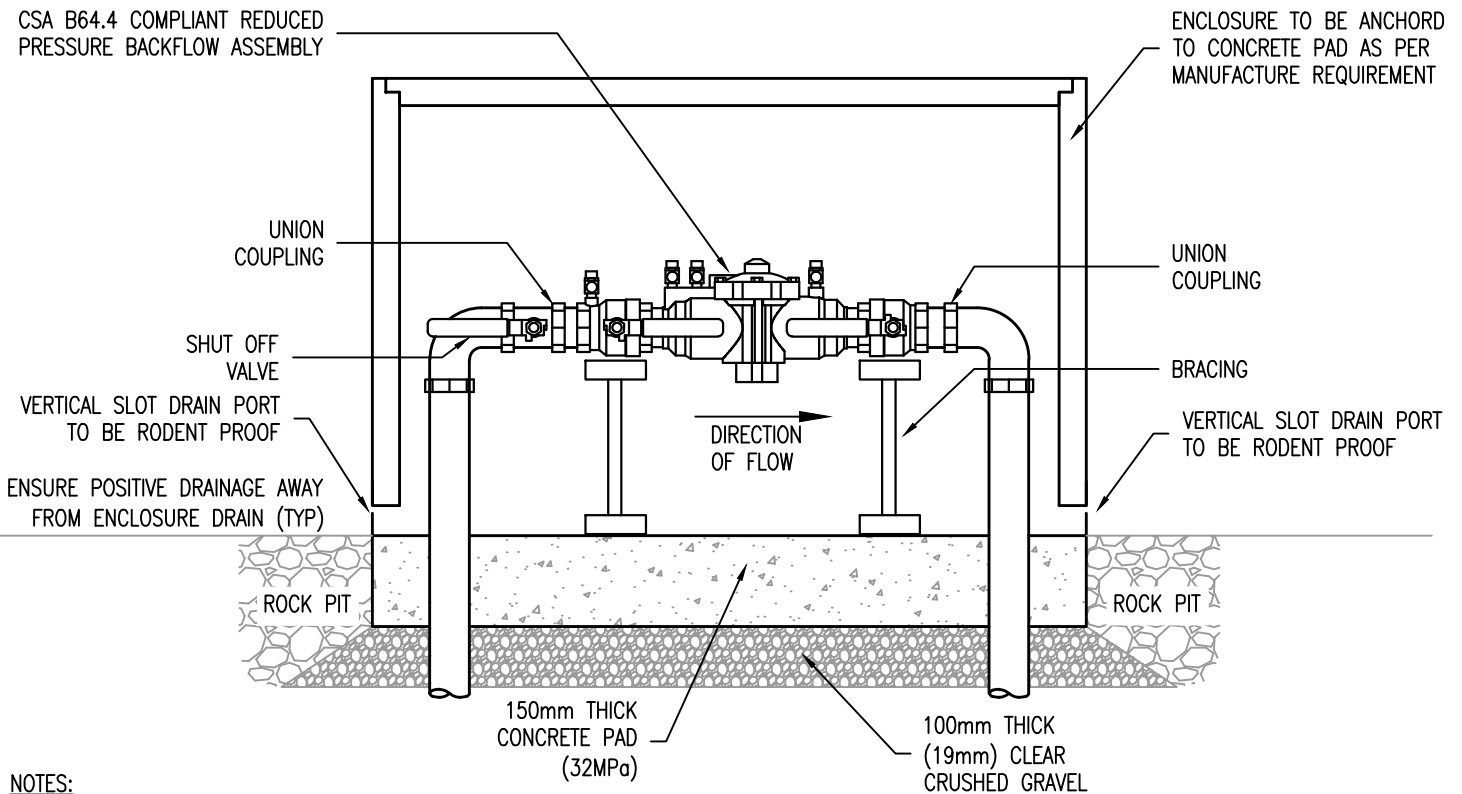


TLW 15



WATER SERVICE PROFILE

N.T.S.



NOTES:

- 1) ABOVE GROUND ENCLOSURE SHALL BE:
 - a. FREEZE PROTECTED AS PER NFPA 3-3.1.8 AND 3.6.1.3.2
 - b. ASSE 1060 COMPLIANT OR IN ACCORDANCE TO CSA B64.10-17 6.12
- 2) RPBA SHALL NOT BE INSTALLED IN A BELOW GROUND CHAMBER
- 3) 8mm RESILIENT SEATED FULL PORT STOPCOCK OR EXISTING SIZE AS SUPPLIED ON ACCEPTED ASSEMBLY
- 4) CHAMBER MAY DRAIN TO DAYLIGHT OR ROCK PIT
- 5) CENTERLINE HEIGHT ABOVE FLOOR AT A MINIMUM 0.75m
- 6) MINIMUM CLEARANCE ABOVE DEVICE IS 0.30m
- 7) RPBA MUST BE ACCESSIBLE AND PROTECTED FROM FREEZING
- 8) INSULATION SHALL NOT INTERFERE WITH OPERATION & MAINTENANCE OF ASSEMBLY
- 9) WATERTIGHT GROUT TO BE USED AT PIPE ENTRANCE AND EXIT
- 10) RPBA MUST BE TESTED AFTER INSTALLATION, PRIOR TO ACCEPTANCE. RESULTS SHALL BE FORWARDED TO TOWNSHIP OF LANGLEY

TITLE

RESIDENTIAL REDUCED PRESSURE BACKFLOW ASSEMBLY

THE CORPORATION OF THE TOWNSHIP OF LANGLEY

DATE APR 2019

APPROVED

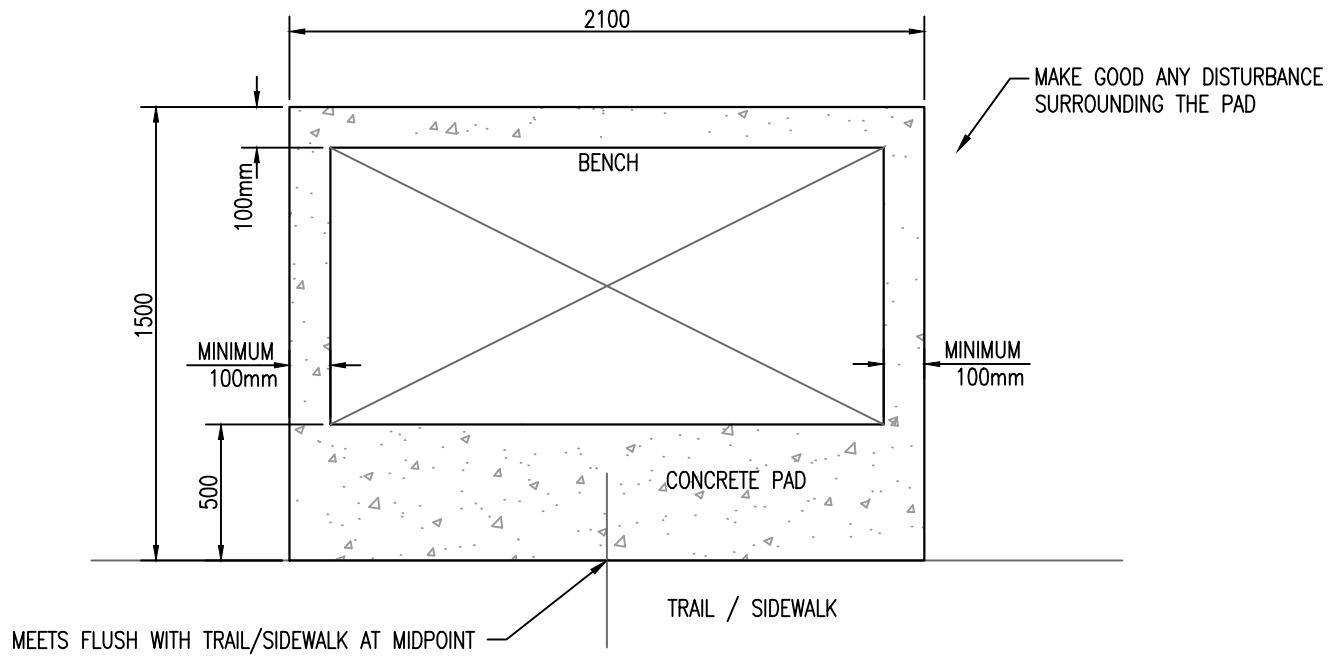
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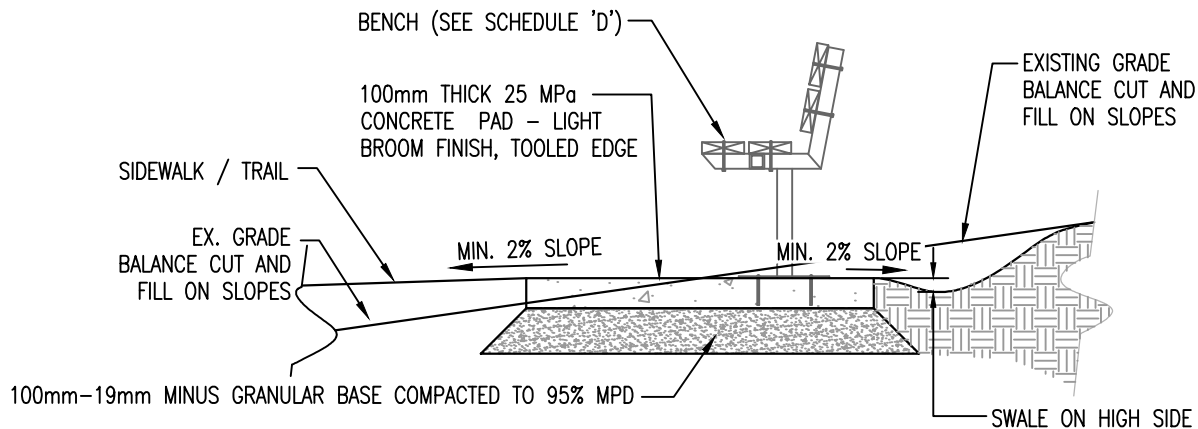
TLW 16

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STREET TREE AND BOULEVARD PLANTING SUPPLEMENTARY DRAWINGS



PLAN VIEW



SECTION / ELEVATION

NOTES:

- 1) SURFACE MOUNT BENCH TO CONCRETE PAD WITH 3/8" TRIPLE GROOVE SECURITY NUT (PART NO. 316-TGN) OR APPROVED EQUIVALENT
- 2) BENCH TO BE LEVEL.
- 3) RESTORE EXISTING LANDSCAPE.
- 4) CONCRETE PAD - MIN. 100mm THICK MEETS FLUSH TO PATHWAY GRADE AT MIDPOINT WITH A MAXIMUM 2% SLOPE FOR POSITIVE DRAINAGE.
- 5) REVIEW OF PAD TRANSITION TO MEET TRAIL/SIDEWALK AT MID-POINT TO BE REVIEWED BY TOWNSHIP ON GRADES GREATER THAN 4%.
- 6) NO STANDING WATER ON BENCH PADS
- 7) TOWNSHIP TO CONFIRM ALL BENCH LOCATIONS PRIOR TO INSTALL

TITLE **BENCH INSTALLATION**

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

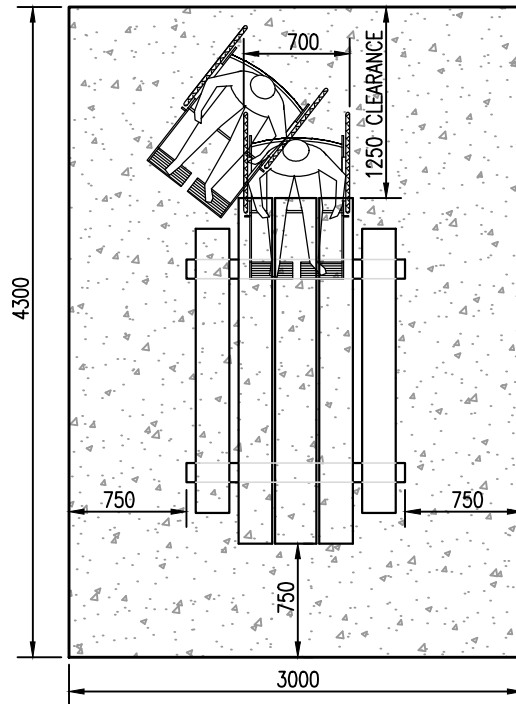
DATE APR 2019

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S.D.S.B. No.:



TLP 01



PLAN VIEW

NOTES:

- 1) CONCRETE PAD WITH 2% SLOPE TO DRAIN
- 2) COLUMBIA MODEL ACCESSIBLE PICNIC TABLE TO HAVE CEDAR TOP AND PLAIN FINISHED CONCRETE SEATS – SEE SCHEDULE D
- 3) ALL EDGES ON TABLE AND SEAT SLABS ARE FREE OF ROUGH EDGES.
- 4) MANUFACTURER SUPPLIED CAST-IN-PLACE ANCHORS AND MOUNTING BRACKETS SHALL BE USED FOR FASTENING OVER CONCRETE

TITLE

PICNIC TABLE AND PAD INSTALLATION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

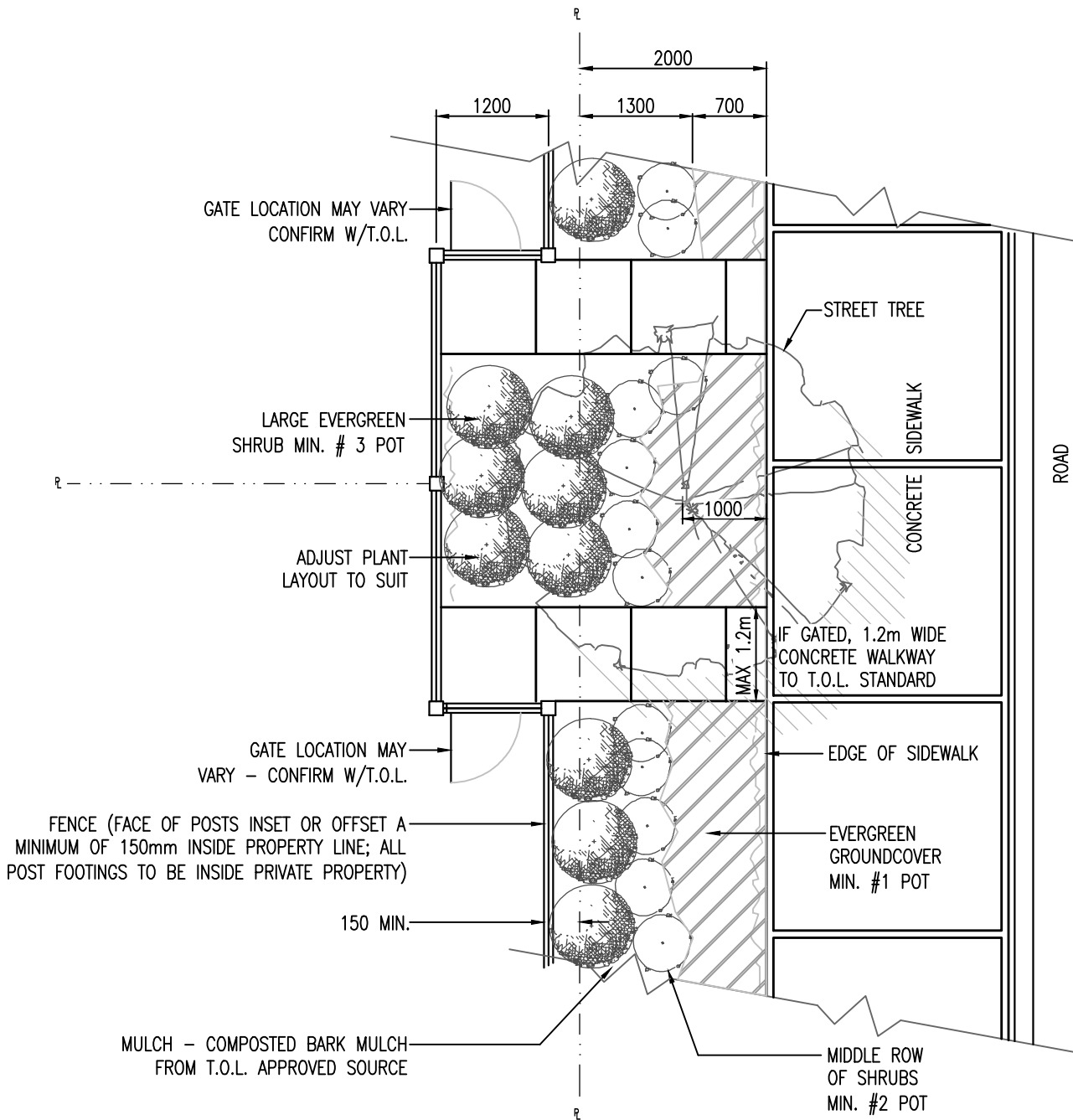
DATE APR 2019

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S.D.S.B. No.:



TLP 02



NOTES:

- 1) REFER TO SCHEDULE B, SECTION L - LANDSCAPE WORKS
- 2) FOR ADDITIONAL INFORMATION REFER TO TLP 5/6
- 3) MULCH - REFER TO SCHEDULE 'D'

TITLE

REAR YARD BOULEVARD INSET PLANTING SEQUENCE

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

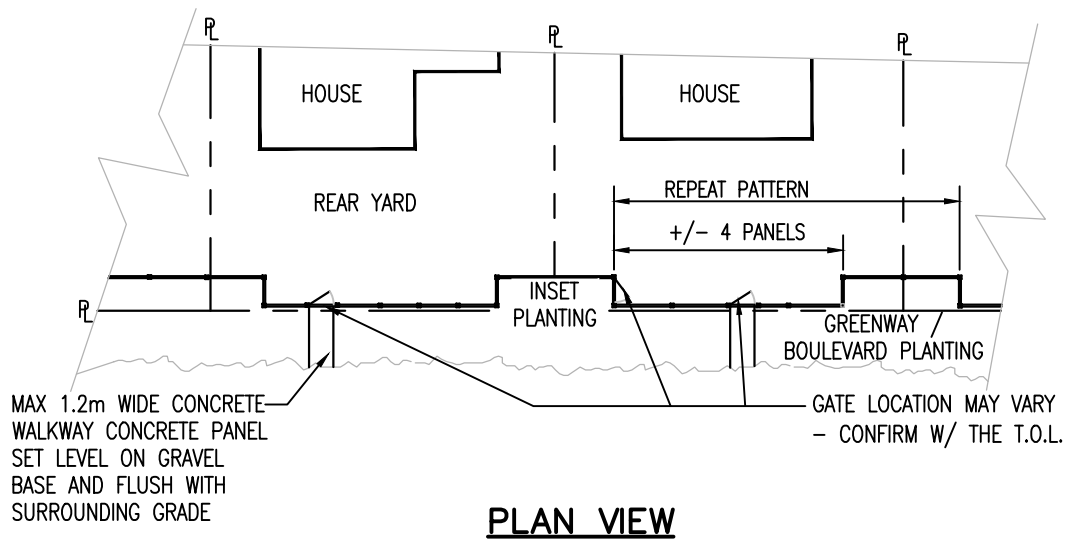
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S.D.S.B. No.:



TLP 03



NOTE:

- 1) LOCATE PLANTED INSETS AT SIDE LOT LINE. FOR ADDITIONAL INFORMATION, REFER TO TLP 03

TITLE

FENCE LAYOUT – REAR AND SIDE YARD

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

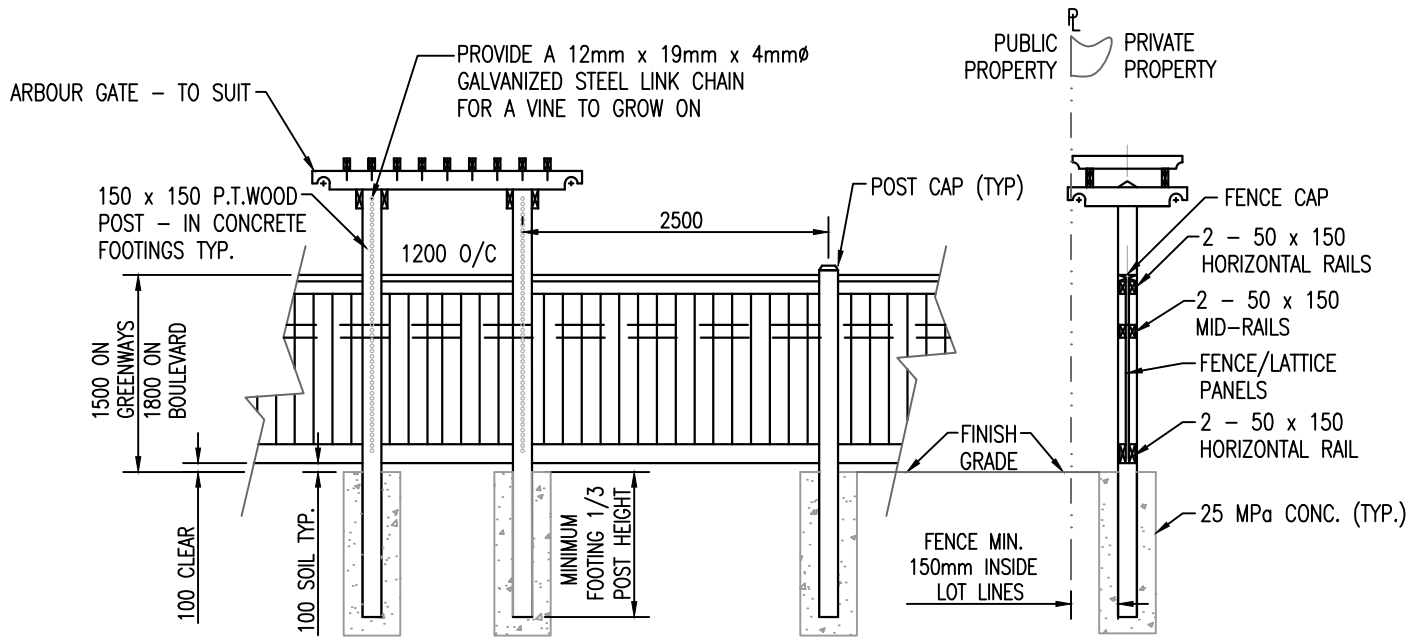
DATE APR 2019

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S.D.S.B. No.:

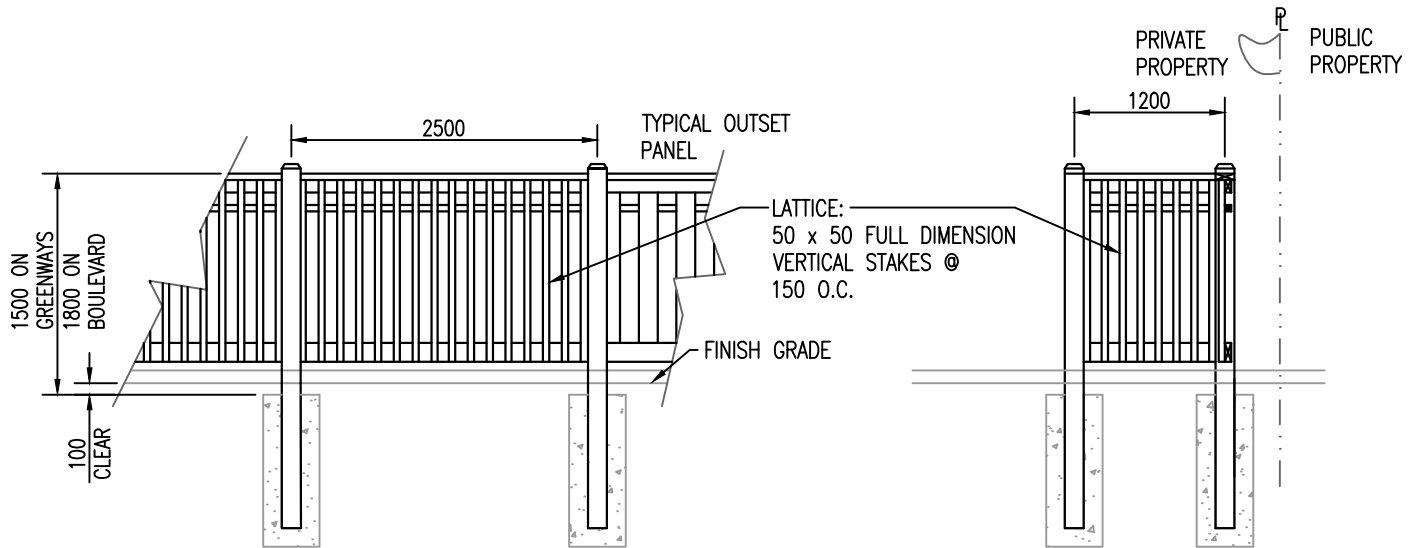


TLP 05



FRONT ELEVATION - OUTSET PANEL

SIDE ELEVATION



FRONT ELEVATION - INSET PANEL

SIDE ELEVATION

NOTES:

- 1) GATE OPENINGS ON URBAN GREENWAYS ONLY
- 2) ARBOR FENCE PANEL TO BE FIXED OR IN-SWING GATE TO HOME OWNER'S PREFERENCE
- 3) REFER TO TLP 05 FENCE LAYOUT
- 4) REFER TO TLP 14 WOOD NOTES

TITLE

FENCE - REAR YARD ON GREENWAY/LOCAL

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

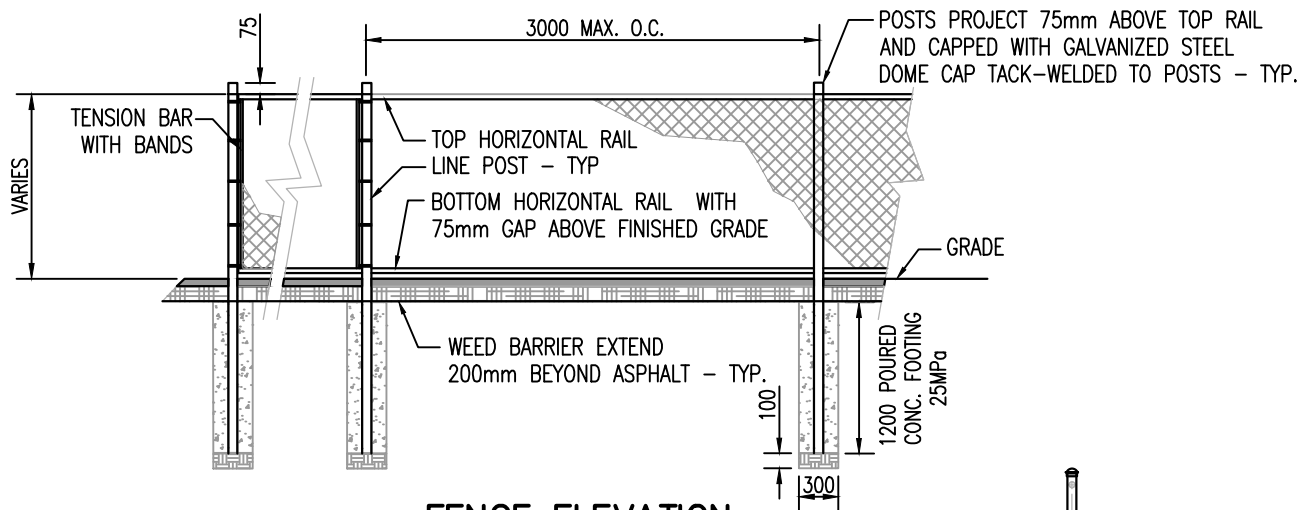
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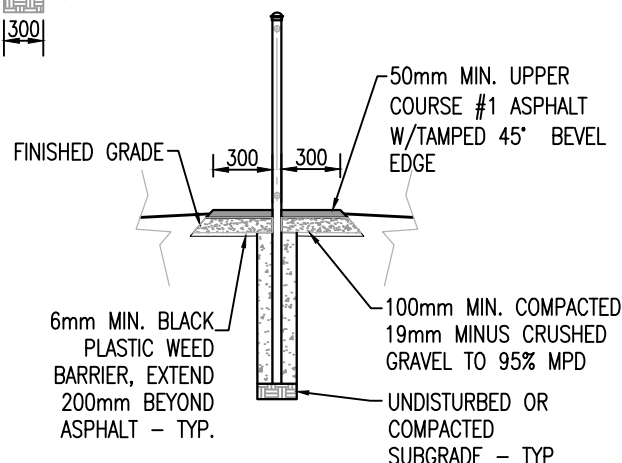
TLP 06



FENCE ELEVATION

NOTES:

- 1) FENCE MATERIAL SHALL BE AS PER MMCD 32 31 13 AND SPECIFICATIONS BELOW
- 2) PIPES: SEE PIPE SCHEDULE
- 3) JOINTS:
 - RADIUS CUT AND WELDED
 - GRIND SMOOTH
 - PRIME PAINT TWO (2) COATS MINIMUM WITH ZINC-RICH PAINT
- 4) WIRE TIES: 3.55mm (9 GAUGE) GALVANIZED STEEL
 - HORIZONTAL RAILS - EVERY OTHER KNUCKLE
 - AT 150mm MIN ON VERTICAL RAILS
- 5) TENSION BARS: 16mm x 5mm (5/8" x 3/16") GALVANIZED STEEL
- 6) TENSION BANDS:
 - SPACED 380mm MAXIMUM O.C.
 - NOT LESS THAN FIVE (5) BANDS PER BAR
- 7) ALL TENSION BARS, CLAPS, FASTENINGS, HOG RINGS, TENSION, WIRE, POST CAPS, AND OTHER ACCESSORIES SHALL BE HOT-DIP GALVANIZED.
- 8) TENSION WIRE, WHERE APPLICABLE, SHALL BE 5mm (6 GAUGE) GALV. STEEL WIRE
- 9) TRIM OR BEND DOWN SHARP, PROTRUDING, AND EXCESS WIRE TIE ENDS TO REMOVE HAZARD
- 10) SINGLE DIAGONAL BRACE RAILS TO BE INSTALLED EVERY 30m AND/OR AT EVERY CHANGE IN DIRECTION
- 11) MESH FABRIC
 - 50 x 50 SQUARE 9 GA. BLACK VINYL COATED CHAINLINK
 - FABRIC KNUCKLED AT THE SALVAGE EDGE
- 12) GRADE THE WORKING AREA LEVEL OR TO AN EVEN FALL UNLESS OTHERWISE STATED ON DRAWINGS OR IN DESCRIPTIVE DOCUMENTATION.
- 13) ASPHALT MOWING STRIP
 - NOT REQUIRED WHERE THERE IS NATIVE OR ORNAMENTAL LANDSCAPE PLANTINGS ON BOTH SIDES OF FENCE.
- 14) GATES AND/OR CLEAR OPENINGS ONLY AS INDICATED ON PLAN.



SECTION

PIPE SCHEDULE – FENCING

TYPE	NOMINAL	O.D. Ø	I.D. Ø	WALL THICKNESS	DESIGNATION	FINISH
HORIZONTAL AND BRACE RAILS	32mm	42mm	35mm	3.5mm MIN.	SCHEDULE 40	GALVANIZED
LINE POSTS	50mm	60mm	52mm	4.0mm MIN.	SCHEDULE 40	GALVANIZED
TERMINAL AND CORNER POSTS	75mm	89mm	78mm	5.5mm MIN.	SCHEDULE 40	GALVANIZED

TITLE

FENCE – CHAINLINK

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

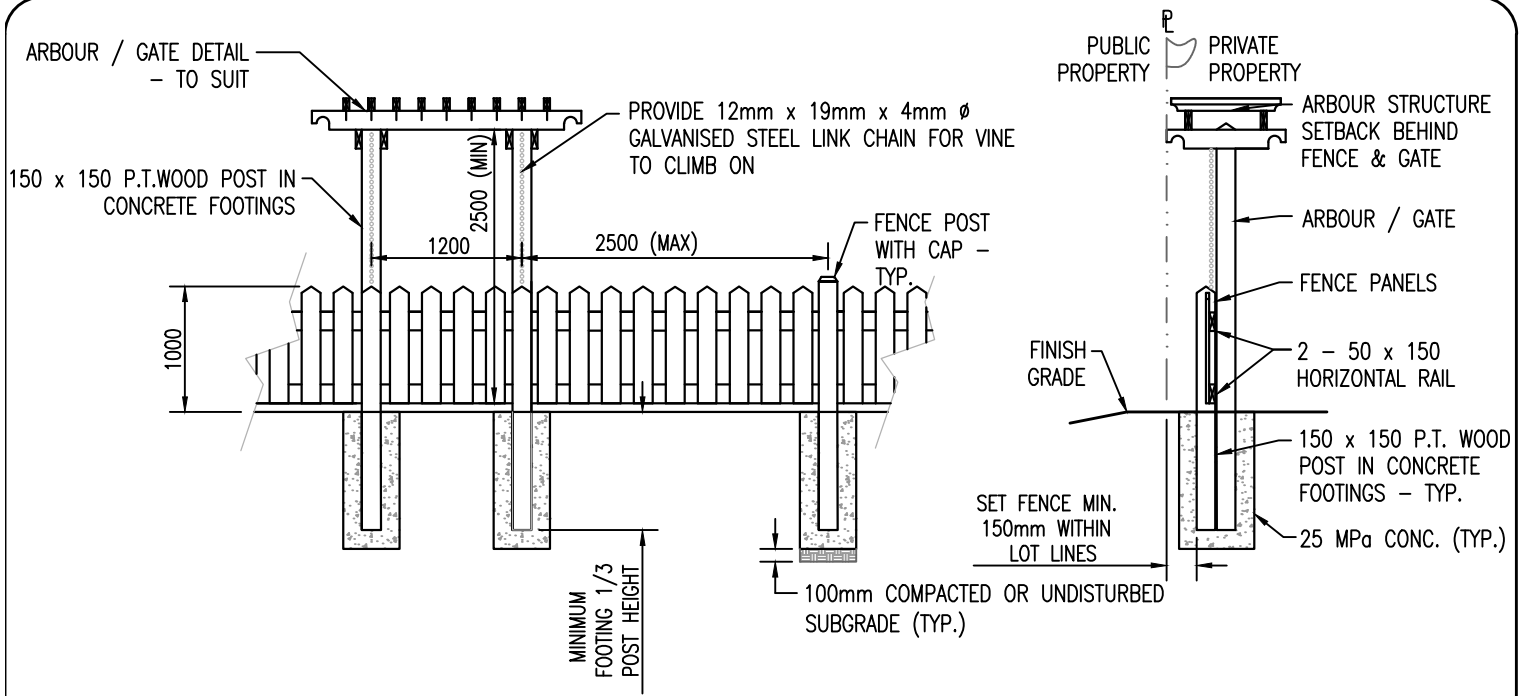
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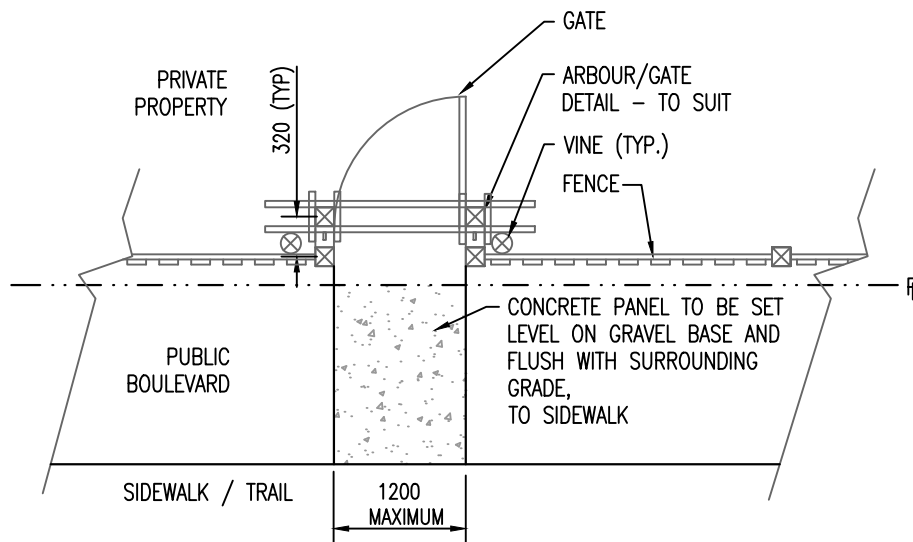


TLP 07



FRONT ELEVATION - TYPICAL OUTSET PANEL

SECTION/ELEVATION



PLAN VIEW - ARBOUR/GATE ENTRANCE

NOTES:

- 1) SET FENCE POSTS IN CONCRETE FOOTING WITH A MINIMUM 1/3 POST LENGTH AND 300mm ϕ POST HOLE
- 2) ARBOR FENCE PANEL TO BE IN-SWING GATE COMPLETE WITH LATCH
- 3) REFER TO TLP 14 WOOD NOTES
- 4) ALL PRESSURE TREATED WOOD TO HAVE ONE (1) COAT WHITE PRIMER AND TWO (2) COATS FINISH EXTERIOR WHITE

TITLE

FENCE INSTALLATION - FRONT GREENWAY

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

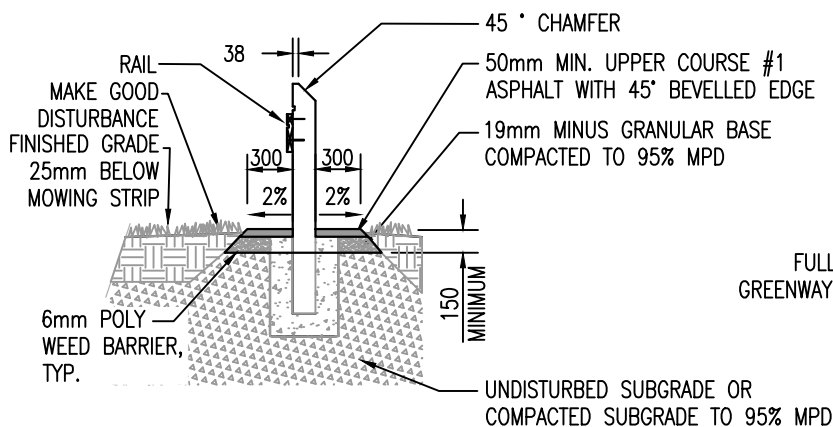
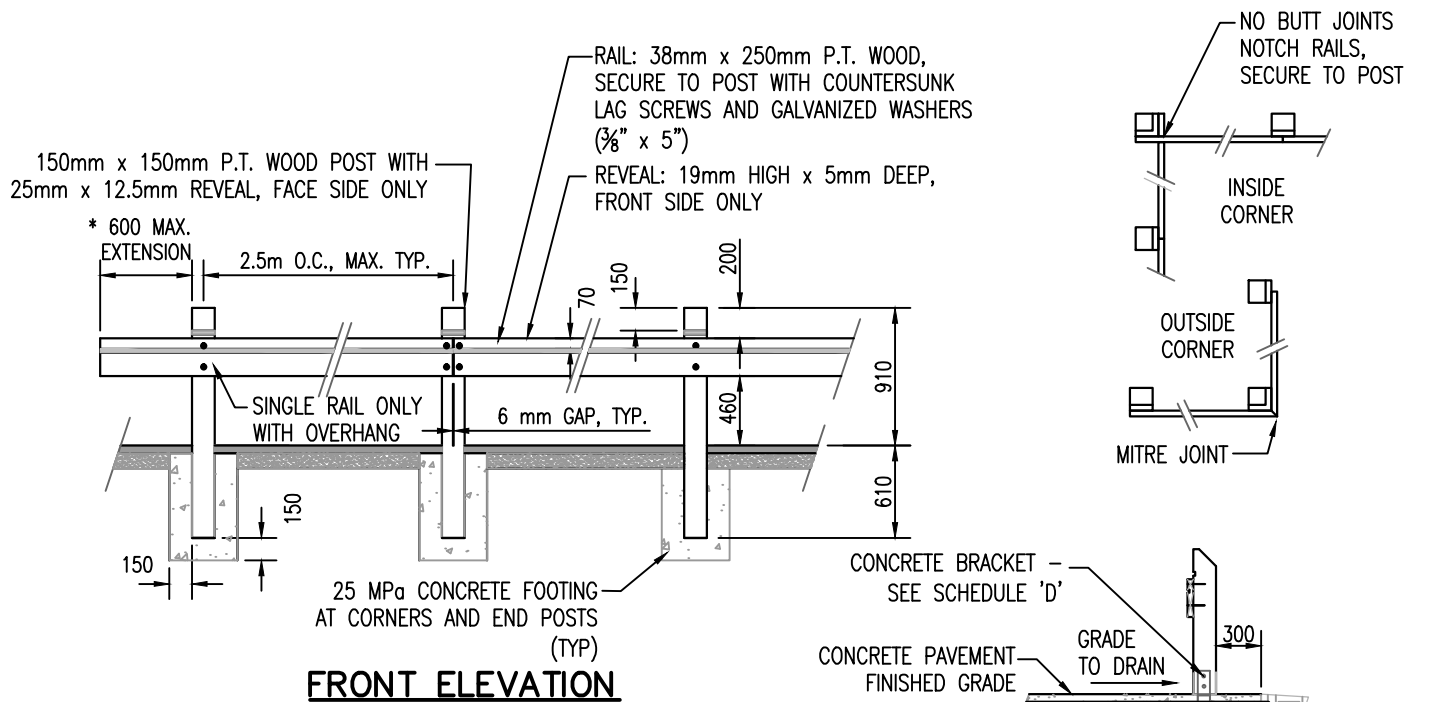
DATE APR 2019

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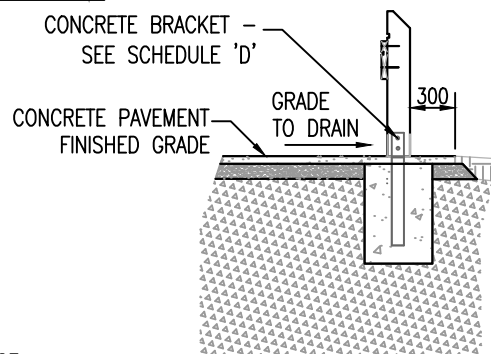
TLP 08



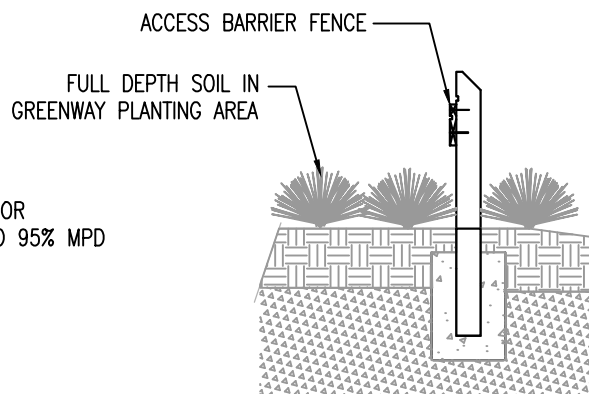
**SECTION / ELEVATION
WITH MOWING STRIP**

NOTES:

- 1) MOWING STRIP REQUIRED WHERE SOD MEETS FENCE
- 2) REFER TO TLP 14 WOOD NOTES
- 3) THE MAXIMUM OPENING BETWEEN EXTENSIONS IS 1.2m. WHERE ACCESS OPENINGS ARE LESS THAN 1.2m, POST TO POST, RAILS END FLUSH WITH POST. WHERE POST SPACING AT ACCESS OPENINGS ARE GREATER THAN 1.2m, POST TO POST, ADD RAIL EXTENSIONS.
- 4) RAILS FACE TRAIL/SIDEWALK/ROAD
- 5) FENCE NOT TO BE INSTALLED IN ROAD ALLOWANCE



**SECTION / ELEVATION
WITH CONCRETE ATTACHMENT**



**SECTION / ELEVATION
WITHOUT MOWING STRIP**

TITLE

FENCE – ACCESS BARRIER

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

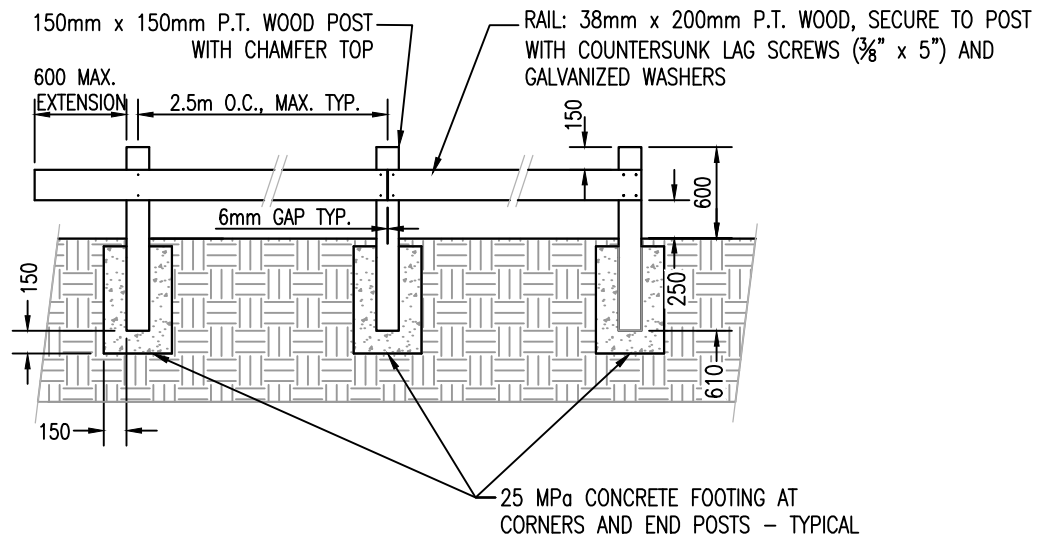
DATE APR 2019

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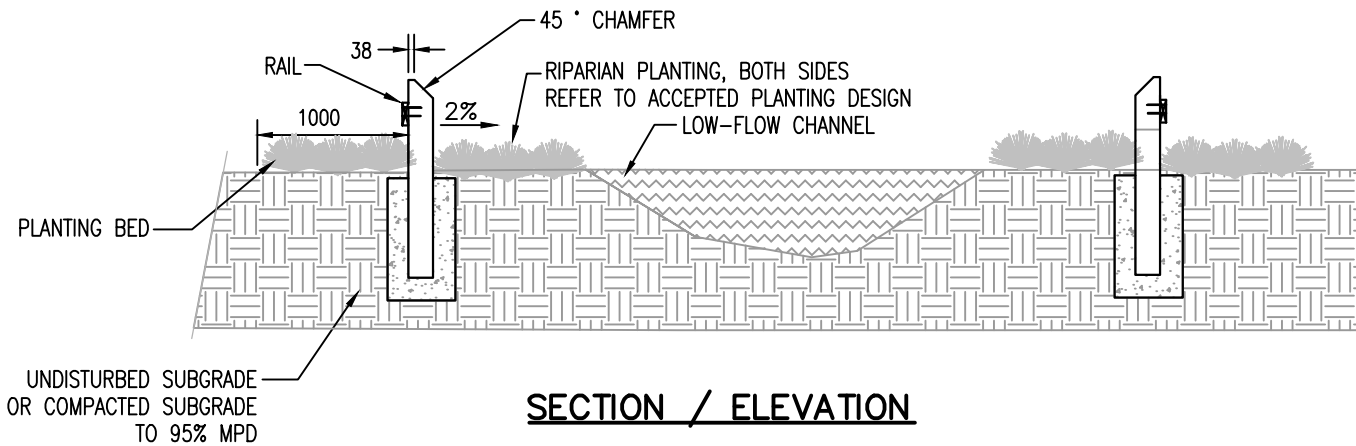
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TLP 09



FRONT ELEVATION



SECTION / ELEVATION

NOTES:

- 1) REFER TO TLP 14 WOOD NOTES
- 2) RAIL TO END FLUSH WITH POST UNLESS A RAIL EXTENSION IS REQUIRED.
- 3) RAIL EXTENSION MAX. 600 BEYOND THE EDGE OF THE POST.
- 4) RAILS FACE AWAY FROM LOW FLOW CHANNEL.
- 5) REFER TO CIVIL PLANS FOR GRADING INFORMATION

TITLE

FENCE INSTALLATION – LOW FLOW CHANNEL

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLP 10

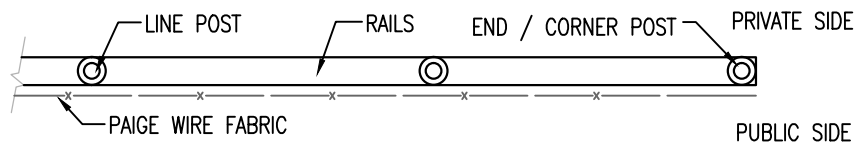
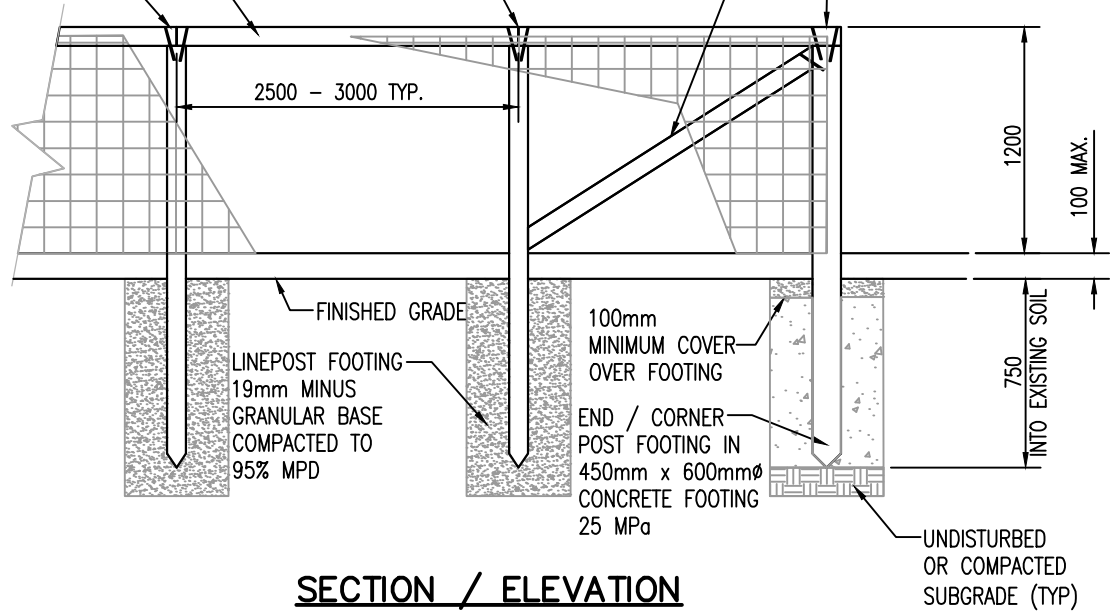
10 ROW - 120mm x 120mm OPENINGS MIN.; 1200mm HEIGHT.; 12 - 1/2 GAUGE GALVANIZED STEEL HIGH TENSILE PAIGE WIRE SECURED TO POSTS AND TOP RAIL WITH 1 - 1/4" FENCE STAPLES AT 600mm O.C.

100mm Ø TOP RAIL ALONG ALL SECTIONS SECURE WITH 200mm GALVANIZED SPIRAL SPIKES

100mm Ø LINE POSTS ALONG STRAIGHT SECTIONS

100mm Ø CROSS BRACE POST - AT CORNERS (BOTH DIRECTIONS) AND END POSTS - BRACES BOLTED WITH 150mm GALV. LAG BOLTS

150mm Ø END / CORNER POST



NOTES:

- 1) REFER TO TLP14 WOOD NOTES
- 2) DOUBLE SPAN INTERMEDIATE TENSIONING ASSEMBLY SHOULD BE USED WHEN FENCE SPAN EXCEEDS 60m

TITLE FENCE INSTALLATION - PAIGE WIRE WITH SINGLE RAIL

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

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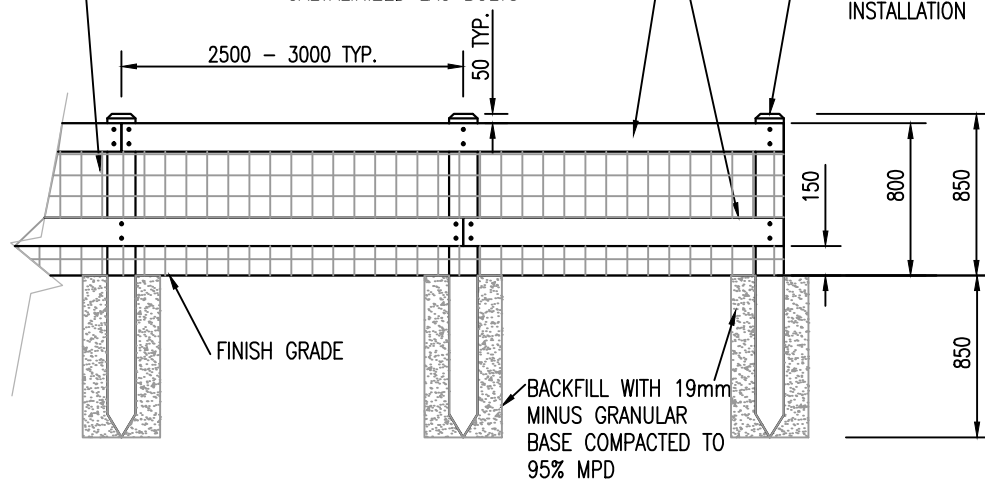


TLP 11

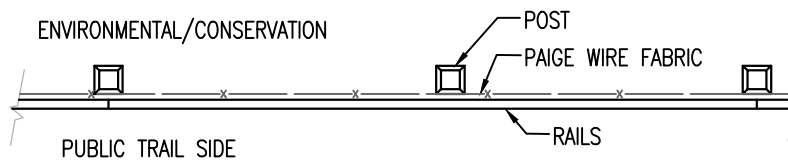
10 ROW, 800mm HT.; 120 x 120
OPENING; 12-1/2 GAUGE GALV.
STEEL HIGH TENSILE PAIGE WIRE TO
FACE CONSERVATION AREA SECURED
TO POST, TOP, AND BOTTOM RAIL
WITH 32mm FENCE STAPLES @
200mm O.C.

150mm x 50mm P.T. TOP AND
BOTTOM RAILS - SECURE WITH
COUNTERSUNK 3/8" x 5"
GALVALINIZED LAG BOLTS

150 x 150 P.T. POST W/
25 x 25 CHAMFER
RECHAMFER POST TOPS IF
SPLINTERED DURING
INSTALLATION



ELEVATION



TOP VIEW

NOTES:

- 1) REFER TO TLP 14 WOOD NOTES
- 2) RAIL TO END FLUSH W/ POST WHERE ACCESS OPENINGS ARE 1.2m WIDE OR LESS FROM POST TO POST.
- 3) RAIL FACES TRAIL/SIDEWALK/ROAD.

TITLE

FENCE - STREAMSIDE

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

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S.D.S.B. No.:



TLP 12

2 - PEDESTRIAN SIGNS
FACING ROAD

SEE PARK PRODUCTS
LIST FOR SIGN SPECS.

PEDESTRIAN:
200 x 200



RECESS 25mm DEEP

300 x 300 CSA PRESSURE TREATED WOOD BOLLARDS - TYP. WITH CHAMFERED CAP

SIGN: PEDESTRIAN - SECURE SIGNS AT ALL 4 CORNERS WITH GALVANIZED #8 x 25mm T.O.L. TAMPER PROOF WOOD SCREWS

FINISH GRADE, SLOPE TO DRAIN 100mm TOPSOIL W/GRASS OR PLANTED LANDSCAPE SURROUNDING

19mm MINUS GRANULAR BASE COMPACTED TO 95% MPD

150 ALL SIDES, TYP.

300

75

50

50

150

600

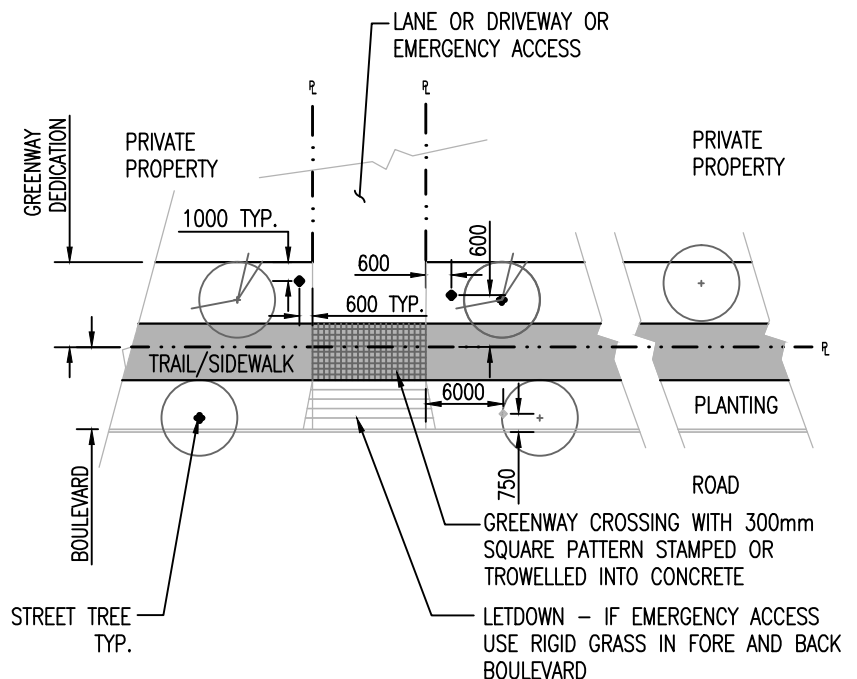
750

1000

ENWAY LOCATION

PRIVATE PROPERTY

SECTION/
ELEVATION



NOTE:
1) REFER TO TLP 14 WOOD NOTES

BOLLARD AT GREENWAY CROSSINGS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

S.D.S.B. No.:



TLP 13

NOTES:

1. PROVIDE A FORTY-FIVE (45) DAY MINIMUM WEATHERING PERIOD FOR ALL PRESSURE TREATED WOOD MATERIALS. ALL WOOD SHALL BE SEASONED AND PRESSURE TREATED (A REQUIREMENT OF MINISTRY OF ENVIRONMENT).
2. ALL ITEMS SHALL BE TREATED WITH WOOD PRESERVATIVE. ALL ITEMS WITH DIRECT PEDESTRIAN CONTACT SHALL BE TREATED WITH ACQ (ALKALINE COPPER QUATERNARY).
3. ALL SURFACES EXPOSED AS A RESULT OF CUTTING, BORING OR RELIEVING SHALL BE TREATED WITH A BRUSH ON WOOD PRESERVATIVE, AS NOTED ABOVE, TO MAINTAIN THE INTEGRITY OF THE FACTORY APPLIED PRESERVATIVE TREATMENT. TWO (2) MANUAL APPLICATIONS SHALL BE APPLIED TO THESE EXPOSED SURFACES.
4. WHEN WORKING NEAR OR OVER CREEKS:
 - ALL WORK TO BE UNDERTAKEN IN SUCH A MANNER AS TO PREVENT RELEASE OF SILT, SEDIMENT, OR SEDIMENT-LADEN WATER, RAW CONCRETE, OR CONCRETE LEACHATE, OR ANY OTHER DELETERIOUS SUBSTANCES INTO ANY DITCH, WATERCOURSE, RAVINE, OR STORM SEWER SYSTEM. STANDARDS FOR SEDIMENT AND EROSION CONTROL AS PER THE LAND DEVELOPMENT GUIDELINES FOR THE PROTECTION OF AQUATIC HABITAT (M.O.E. AND D.F.O.) MUST BE ADHERED TO.
 - TAKE MEASURES AS NECESSARY TO PREVENT RELEASE OF SILTS, SEDIMENTS, AND CHEMICALS INTO THE WATERCOURSE.
 - CONSTRUCTION AND EXCAVATION WASTES, OVERBURDEN, SOIL, OR OTHER SUBSTANCES DELETERIOUS TO AQUATIC LIFE MUST BE DISPOSED OF IN SUCH A MANNER AND LOCATION AS TO PREVENT THEIR ENTRY INTO ANY WATERCOURSE, DITCH, RAVINE, OR STORM SEWER SYSTEM.
 - ALL PRECAUTIONS SHALL BE TAKEN TO PREVENT ANY WOOD PRESERVATIVES FROM SPILLING ONTO THE GROUND OR ENTERING THE WATERCOURSE. ANY APPLICATION OF WOOD PRESERVATIVES ON SITE MUST BE UNDERTAKEN UPLAND, WELL AWAY FROM ANY WATERCOURSE. THERE MUST BE NO APPLICATION OF PRESERVATIVES ON INSTALLED MATERIALS, ON OR OVER WATER UNDER ANY CIRCUMSTANCES.
5. ALL NAIL AND SCREW FASTENERS SHALL BE COUNTERSUNK. ALL COUNTERSUNK EDGES SHALL BE RELIEVED SO AS TO PROVIDE A SPLINTER FREE EDGE.
6. ALL DESIGN INFORMATION SHOWN OR IMPLIED SHALL BE VERIFIED ON SITE BY CONTRACTOR. ANY DISCREPANCIES BETWEEN WHAT IS INDICATED ON DRAWINGS AND WHAT IS EVIDENT IN THE FIELD SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGNATED INSPECTING AUTHORITY PRIOR TO ANY FIELD WORK OR OFF-SITE PRE-FABRICATION TAKING PLACE.
7. COUNTER SINKING ON CAPS AND TOP RAIL ARE FILLED WITH WOOD PLUGS IN WATERPROOF EPOXY ADHESIVE FLUSH AND SMOOTH WITH WOOD SURFACE.
8. BUTT SPLICES SHALL BE LOCATED AT CENTERS OF POSTS AND/OR BEAMS
9. ALL EXPOSED EDGES ON ANGLED CAP RAIL AND OTHER RAILS SHALL BE CHAMFERED TO PROVIDE A SMOOTH EDGE. EXPOSED BUTT ENDS OF ALL HANDRAILS SHALL BE SMOOTH FINISHED WITH 6.0mm RADIUS RELIEVED EDGES.
10. ALL FASTENERS AND HARDWARE ITEMS SHALL BE HOT-DIP GALVANIZED STEEL WHERE ANY CUTS OR ABRASIONS TO THE FACTORY APPLIED GALVANIZED COATING OCCURS. THE CONTRACTOR SHALL MANUALLY APPLY TWO (2) COATS OF AN APPROVED ZINC RICH PRIMER SUCH AS GALVICON OR APPROVED EQUIVALENT.
11. TOLERANCES AND CONDITIONS FOR ACCEPTANCE OF WORK SHALL BE AS FOLLOWS:
 - SPACING OF POSTS SHALL BE WITHIN $\pm 25.0\text{mm}$;
 - DECK BOARDS SHALL BE FLUSH WITHIN $\pm 2.0\text{mm}$ OF ADJACENT BOARDS;
 - HANDRAILS SHALL BE STRAIGHT AND TRUE TO LINE;
 - WOOD TIMBER SECTIONS SHALL BE FULL, STRAIGHT, AND TRUE TO LINE;
 - ALL WOOD SHALL BE STRAIGHT GRAINED, FREE OF KNOTS, CHECKS, WAIN, SPLITS, OR UNSIGHTLY BLEMISHES;
 - ALL WOOD SHALL BE APPROVED BY OWNER OR OWNERS REPRESENTATIVE PRIOR TO USE;
 - ALL FOOTING HOLES SHALL BE INSPECTED AND APPROVED BY ENGINEER PRIOR TO PLACEMENT OF CONCRETE;
 - CONSTRUCTION FENCING SHALL BE PLACED AROUND CONSTRUCTION ZONE AND ALL EXCAVATIONS MADE SAFE WHEN CONTRACTOR OR CONTRACTOR'S PERSONNEL ARE NOT ON SITE;
 - CONSTRUCTION SITE AND OFFLOADING AREAS SHALL BE KEPT CLEAN, ORGANIZED, AND SAFE ON A DAILY BASIS;
 - SITE SHALL BE KEPT FREE OF DEBRIS AND CONTAMINANTS;
 - ALL WASTES SHALL BE REMOVED OFF-SITE ON A REGULAR BASIS DURING CONSTRUCTION.
12. CONTRACTOR SHALL SEEK APPROVAL OF OWNER AND CONTRACT ADMINISTRATOR PRIOR TO ANY PROPOSED CHANGES HE/SHE MAY PUT FORWARD FOR FASTENERS SCHEDULE. APPROVAL SHALL BE SOUGHT A MINIMUM OF FIVE (5) WORKING DAYS PRIOR TO ANTICIPATED NEED.
13. STRUCTURAL DESIGN TO CONSULTING STRUCTURAL ENGINEERS' SPECIFICATIONS.

TITLE

WOOD NOTES

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

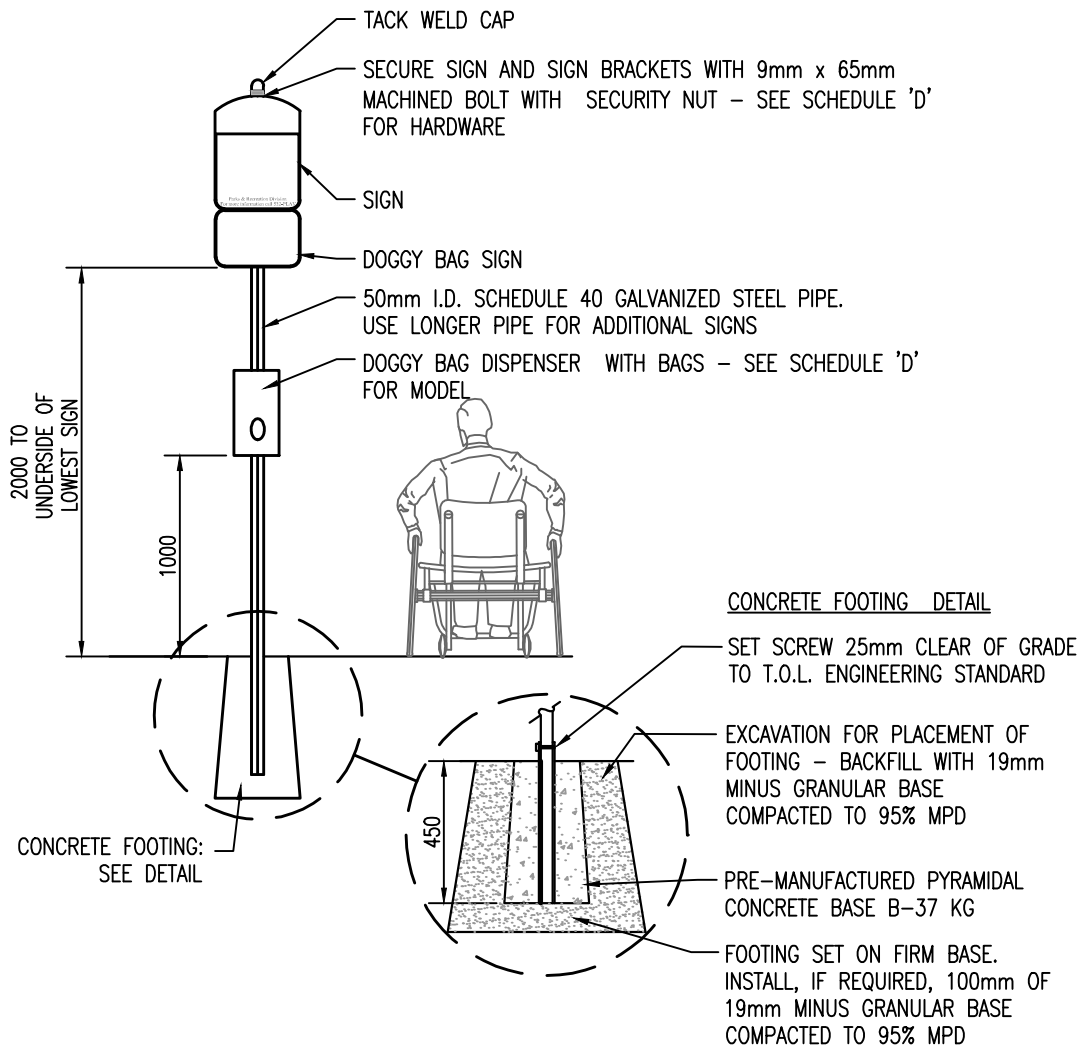
DATE APR 2019

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S.D.S.B. No.:



TLP 14



NOTES:

- 1) FOR DOUBLE-SIDED SIGNS USE ADDITIONAL BOLTS ON SIGN HANGER BRACKETS

TITLE

SIGN POST INSTALLATION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

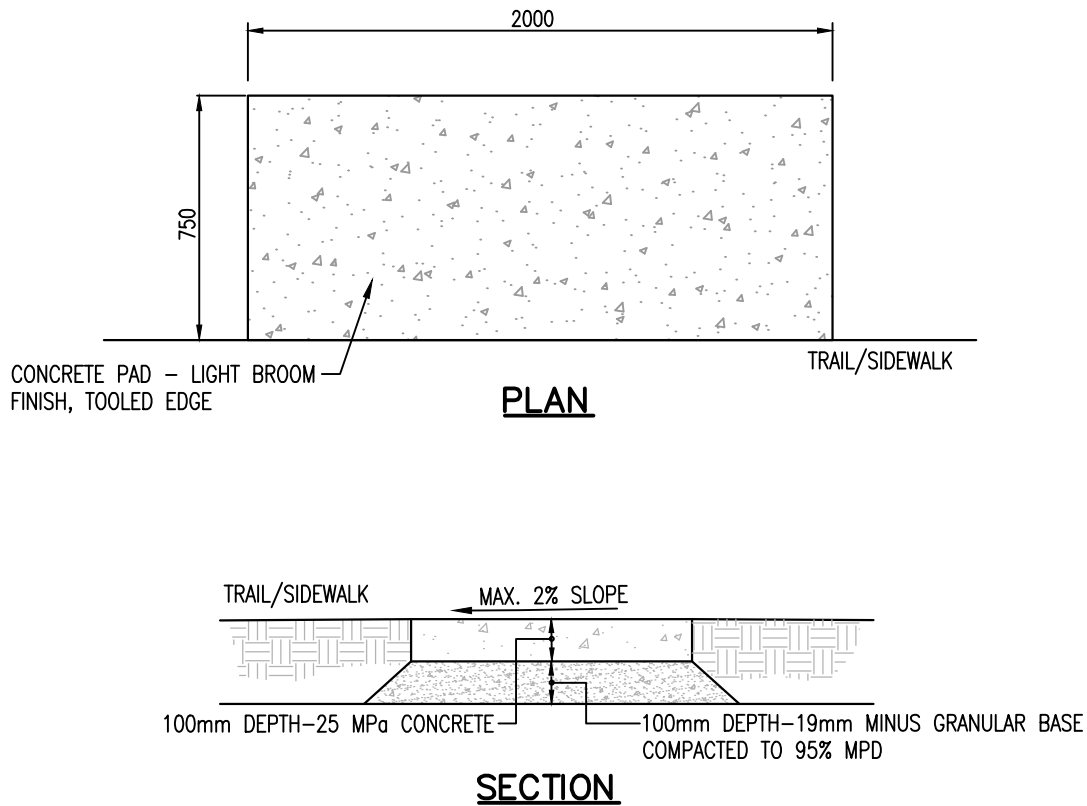
DATE APR 2019

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S.D.S.B. No.:



TLP 15



NOTES:

- 1) WHEN APPLICABLE, FIX MULTI-STREAM RECEPTACLE TO CONCRETE PAD WITH HILTI SCREW and KH-EZ 1/4" x 2-5/8".
- 2) RESTORE EXISTING LANDSCAPE.
- 3) CONCRETE PAD - MEETS FLUSH TO PATHWAY GRADE AT MIDPOINT WITH A MAXIMUM 2% SLOPE FOR POSITIVE DRAINAGE .
- 4) PAD TRANSITION TO MEET TRAIL/SIDEWALK AT MID-POINT TO BE REVIEWED BY TOWNSHIP ON GRADES GREATER THAN 4%.
- 5) NO STANDING WATER ON MULTI-STREAM RECEPTACLE PADS.
- 6) TOWNSHIP TO CONFIRM ALL WASTE RECEPTACLE LOCATIONS.

TITLE

MULTI-STREAM RECEPTACLE CONCRETE PAD

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

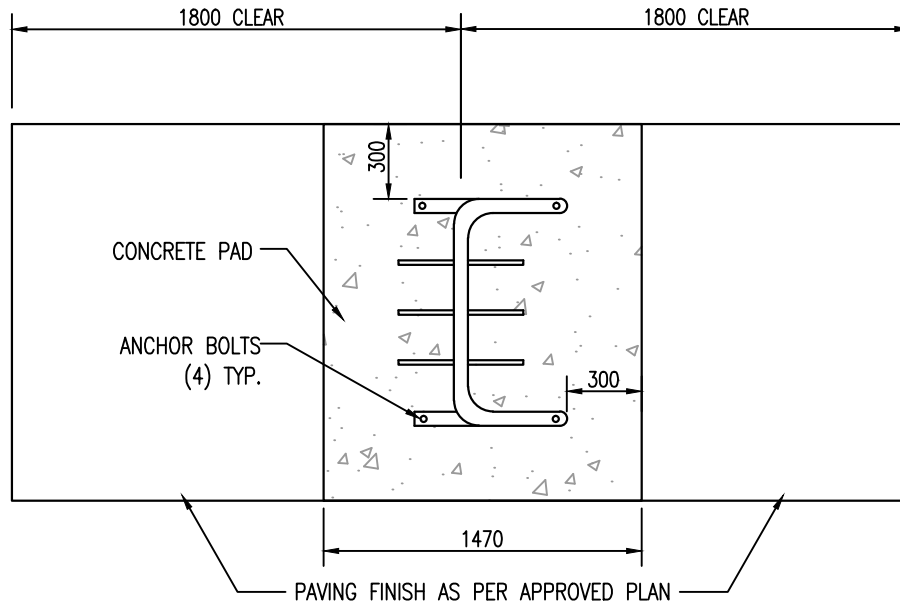
DATE OCT 2017

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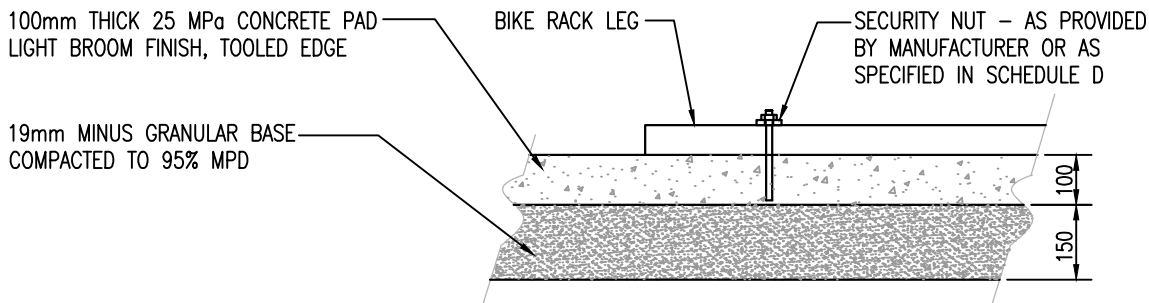
S.D.S.B. No.:



TLP 16



PLAN VIEW



INSTALLATION DETAIL

BICYCLE CAPACITY	CONCRETE PAD
4	1510 x 1470
6	1510 x 1470
8	1870 x 1470

NOTES:

- 1) BIKE RACK – SEE SCHEDULE 'D'
- 2) REFER TO MANUFACTURERS' GUIDE FOR INSTALLATION

TITLE

BIKE RACK INSTALLATION

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

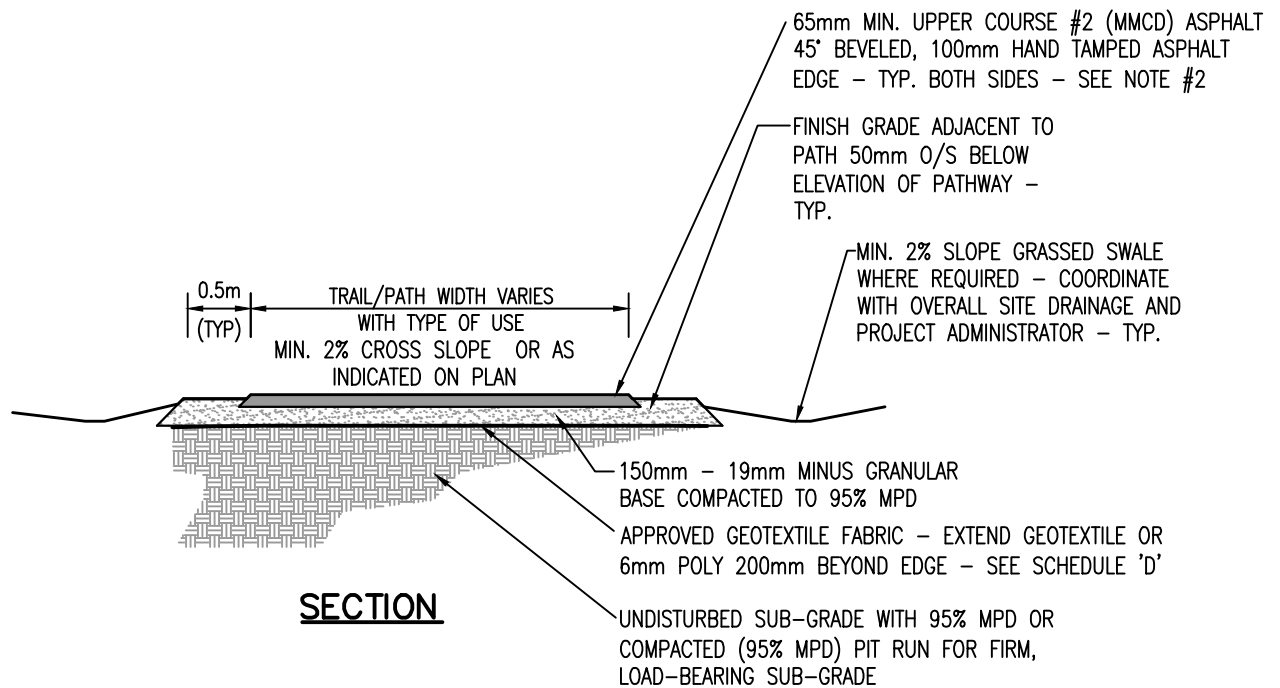
DATE APR 2019

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S.D.S.B. No.:



TLP 17



NOTES:

- 1) EXCAVATE ALL ORGANICS TO A MINIMUM OF 150mm TO SUB-GRADE PRIOR TO PLACEMENT OF WEED BARRIER AND BASE COURSE TYPICAL.
- 2) WHERE ASPHALT TRAIL MAY BE CONSTRUCTED OVER T.O.L. UTILITY SERVICES - SUCH AS SEWER, STORM, OR WATER - TRAIL MUST BE CONSTRUCTED TO HIGHWAY LOADING STANDARD
- 3) ADDITIONAL SUB-GRADE MATERIALS MAY BE REQUIRED TO PROVIDE ACCEPTABLE TRAIL GRADING.
- 4) TRAIL CLEARANCE ZONE ADJACENT TO BOTH SIDES OF TRAIL/PATHWAY TO BE CLEAR OF OBSTRUCTIONS, VEGETATION, AND TALL GRASS FOR 1.0m BEYOND EDGE OF TRAIL SURFACE AND OVERHEAD TO BE CLEAR FOR 2.5m ABOVE SURFACE OF TRAIL/PATHWAY

TITLE

ASPHALT TRAIL CONSTRUCTION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

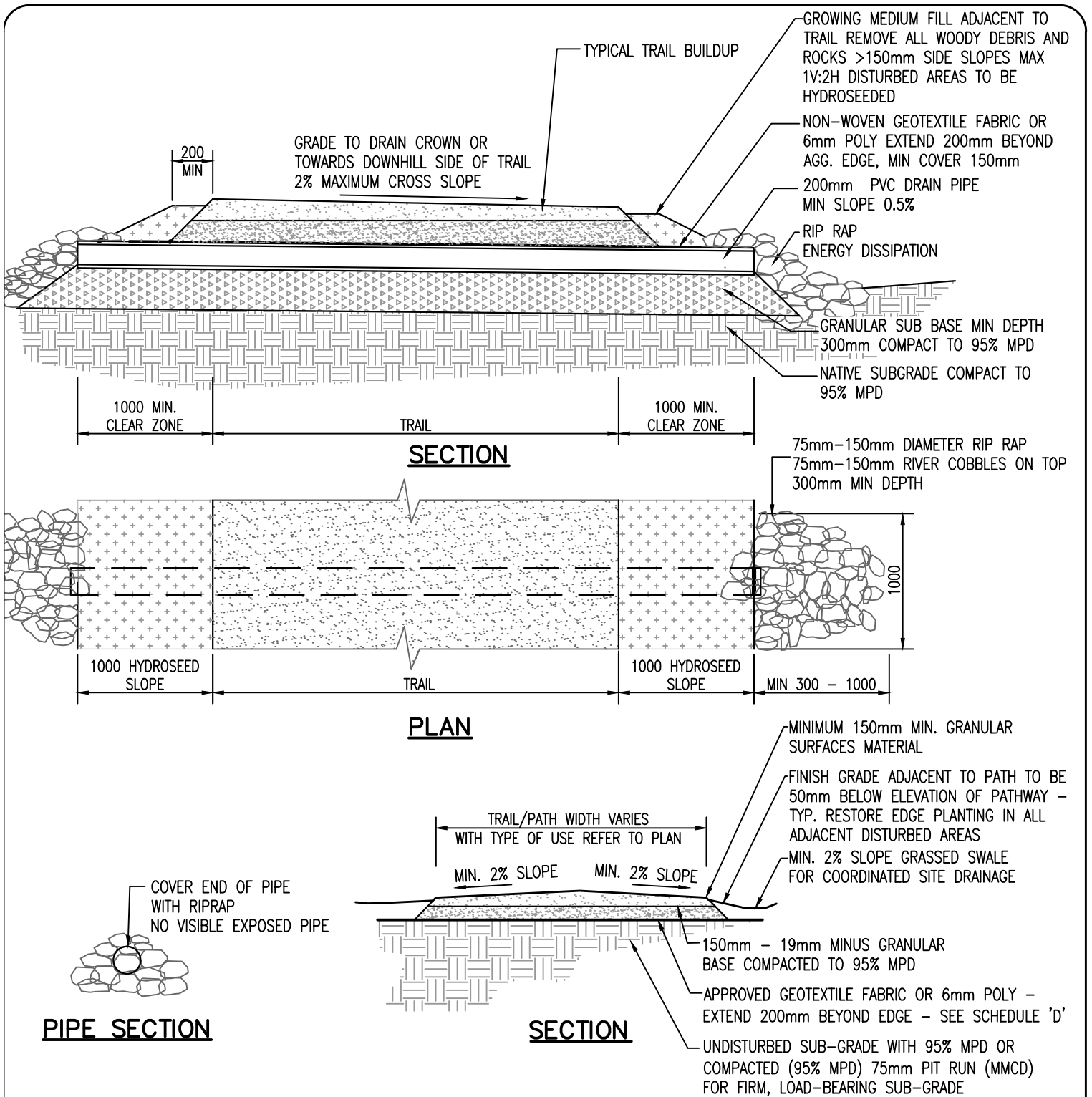
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLP 18



NOTES:

- 1) EXCAVATE ALL ORGANICS TO A MINIMUM OF 225mm TO SUB-GRADE PRIOR TO PLACEMENT OF WEED BARRIER AND BASE COURSE (TYP)
- 2) ADDITIONAL SUB-GRADE MATERIALS MAY BE REQUIRED TO PROVIDE ACCEPTABLE TRAIL GRADING.
- 3) TRAIL CLEARANCE ZONE ADJACENT TO BOTH SIDES OF TRAIL/PATHWAY TO BE CLEAR OF OBSTRUCTIONS, VEGETATION, AND TALL GRASS FOR 1.0m BEYOND EDGE OF TRAIL SURFACE AND OVERHEAD TO BE CLEAR FOR 2.5m ABOVE SURFACE OF TRAIL/PATHWAY

TITLE

GRANULAR TRAIL CONSTRUCTION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

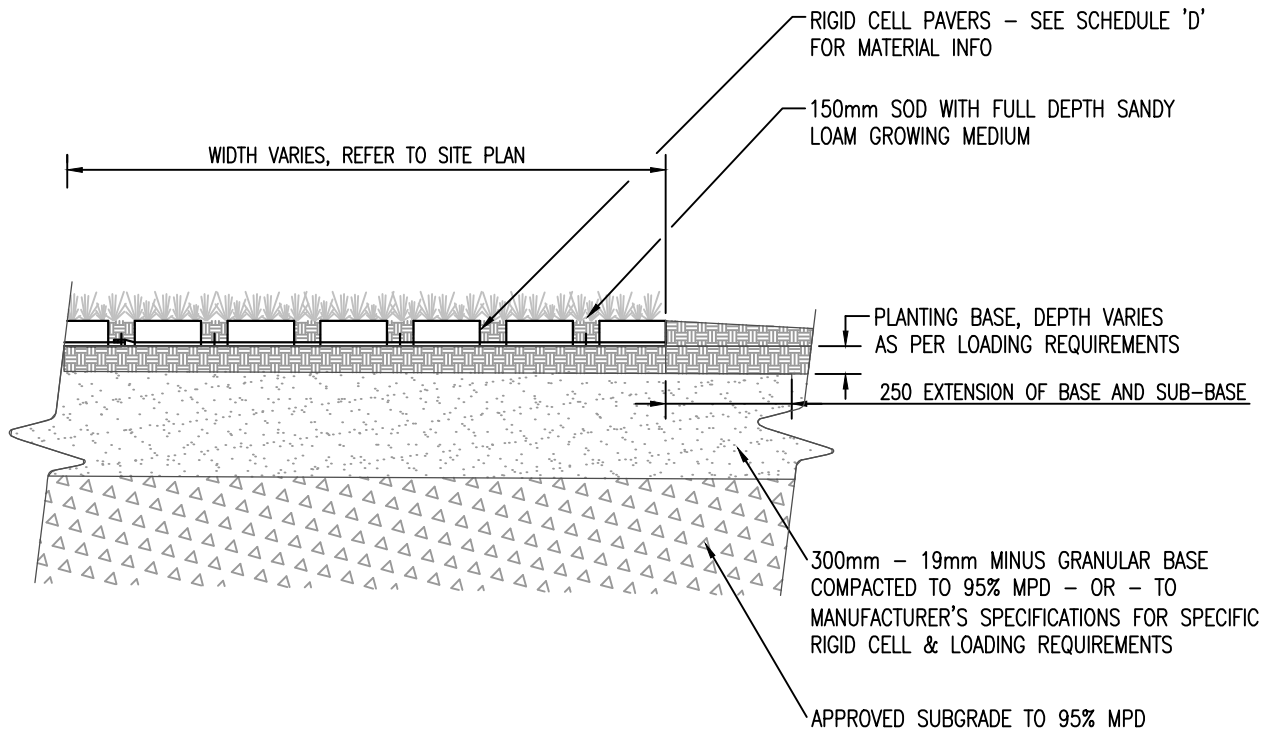
DATE APR 2019

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S.D.S.B. No.:



TLP 19



NOTES:

- 1) ACCESS TO CONFORM TO FINAL LOT GRADE
- 2) ACCESS TO HAVE MINIMUM 1% AND MAXIMUM 2% CROSSFALL.
- 3) ACCESS TO BE CONSTRUCTED PRIOR TO SUBSTANTIAL COMPLETION.
- 4) MAXIMUM LONGITUDINAL GRADE 3%; OTHERWISE USE ASPHALT OR POROUS CONCRETE WITHIN R.O.W. / ACCESS

TITLE

RIGID GRASS – EMERGENCY ACCESS

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

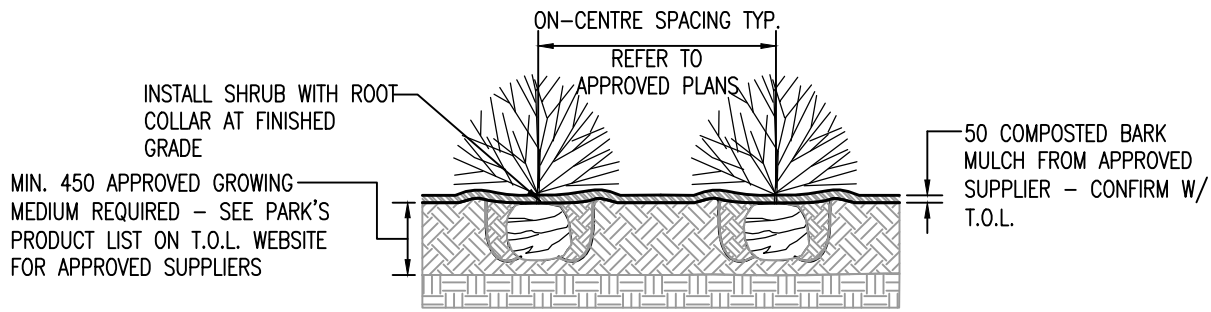
DATE APR 2019

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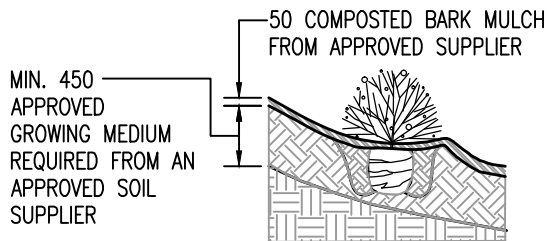
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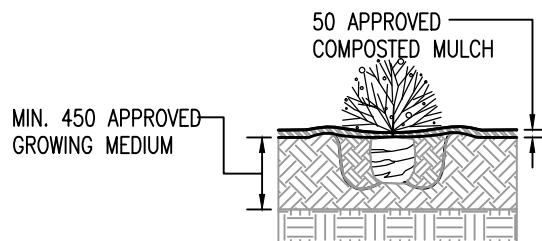
TLP 20



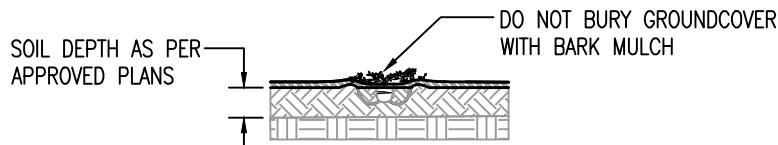
MEDIUM – LARGE SHRUB PLANTING



SHRUB PLANTING ON SLOPES



SMALL SHRUB PLANTING



GROUNDCOVER PLANTING

NOTES:

- 1) REFER TO THE LATEST BC LANDSCAPE STANDARD.
- 2) PROVIDE 450 MINIMUM DEPTH GROWING MEDIUM FOR PLANTED LANDSCAPE AREAS, FROM APPROVED SOIL SOURCE – SEE SCHEDULE 'D'
- 3) PRIOR TO INSTALLATION OF GROWING MEDIUM, SCARIFY SIDE AND BOTTOM SURFACE OF UNDISTURBED SUBGRADE IN PLANTING AREAS AND PITS.
- 4) AT TIME OF PLANTING:
 - REMOVE ALL STRING, TWINE, POTS, TAGS, ETC...
 - LOOSEN AND DROP ALL SACKING/BURLAP TO BOTTOM OF PLANTING HOLE
 - MOISTEN SOIL AROUND ROOT BALLS

TITLE

SHRUB & GROUNDCOVER PLANTING INSTALLATION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLP 21

GENERAL

1. THE FINAL LOCATION, PLANTING, SPECIES SELECTION AND SIZES SHALL BE COMPLETED TO THE SATISFACTION OF THE MANAGER, GREEN INFRASTRUCTURE SERVICES. THE OWNER IS RESPONSIBLE FOR CONTACTING GREEN INFRASTRUCTURE SERVICES STAFF FOR REVIEW OF PLANTING LOCATIONS AND OF THE STREET TREE STAKING LOCATIONS – PRIOR TO PLANTING.
2. THE OWNER SHALL BE RESPONSIBLE FOR OBTAINING A HIGHWAYS USE PERMIT FROM ENGINEERING DIVISION FOR INSTALLING, LOCATING OR TEMPORARILY STORING STREET TREES AND OTHER MATERIAL WITHIN A HIGHWAY (ROAD RIGHT-OF-WAY) OR IF UNLOADING MAY POTENTIALLY INTERFERE WITH TRAFFIC FLOWS ON PUBLIC ROADS. THIS PERMIT SHALL BE OBTAINED PRIOR TO COMMENCEMENT OF THE OFF-SITE WORKS (TYPICALLY STREET TREE, BOULEVARD AND GREENWAY PLANTING).
3. USE TREE INSTALLATION DETAIL TLP 23, 24 AND 25

LOCATION OF PLANTING

4. STREET TREES SHALL BE SPACED AS NOTED ON THE DRAWINGS, UNLESS OTHERWISE APPROVED BY MANAGER, GREEN INFRASTRUCTURE SERVICES. TREES SHALL BE SIZED AS NOTED ON THE DRAWINGS AND NO LESS THAN 3.0m IN HEIGHT WITH A MINIMUM CLEAR STEM HEIGHT OF 1.8m TO THE LOWEST BRANCH. ACTUAL TREE NUMBERS, SPACING AND LOCATIONS WILL VARY ACCORDING TO SITE CONDITIONS AND AMENITIES.
5. LOCATIONS SHALL BE IDENTIFIED WITH STAKES OR PAINTED MARKINGS BY THE OWNER. IF UNDERGROUND OBSTRUCTIONS ARE UNCOVERED THESE ARE TO BE REPORTED TO THE LANDSCAPE ARCHITECT FOR RESOLUTION PRIOR TO PLANTING. NOTE: A TREE STAKING REVIEW AND TREE INSPECTION MUST BE REQUESTED BY THE DEVELOPER/CONTRACTOR PRIOR TO TREE PLANTING TAKING PLACE. CONTACT GREEN INFRASTRUCTURE SERVICES STAFF TO SCHEDULE THE REVIEW.
6. NO TREE SUBSTITUTIONS SHALL BE PERMITTED WITHOUT THE EXPRESS WRITTEN PERMISSION OF THE T.O.L. URBAN FORESTRY.

MINIMUM TREE PLANTING CLEARANCES

7. TREES SHALL HAVE THE FOLLOWING MINIMUM CLEARANCES FROM:
 - STREET LIGHT POLES 6.0m
 - UTILITY POLES 3.0m
 - EDGE OF DRIVEWAY, CURB RETURN, CATCHBASIN OR ABOVE GROUND UTILITY FACILITY 2.0m
 - SEWER AND DRAINAGE SERVICE CONNECTION/FIRE HYDRANTS 1.5m
 - MANHOLES, VALVE BOXES, WATER SERVICES 1.2m
 - BCH LPT/PMT/VISTA SWITCH VAULTS 2.25m

WHERE THERE IS A BOULEVARD PLANTING STRIP BETWEEN THE BACK OF CURB AND FRONT OF THE SIDEWALK, TREES SHALL BE PLANTED A MIN. OF 1.0m FROM BACK OF CURB AND 1.0m FROM BACK OF SIDEWALK

IN OTHER CIRCUMSTANCES TREES SHALL BE PLANTED 1.0m FROM THE BACK OF THE SIDEWALK AND 2.5m FROM BACK OF CURB.

TREES SHALL BE NO CLOSER TO A ROAD INTERSECTION THAN THE PROJECTION OF AN 8.0m x 8.0m SIGHT TRIANGLE, AS SHOWN IN TLP 26.

CONDITION

8. ALL PLANT MATERIAL SHALL BE OF GOOD HEALTH AND VIGOR WITH NO VISIBLE SIGNS OF DISEASE, INSECT PESTS, DAMAGE OR OTHER OBJECTIONABLE DISFIGUREMENTS.
9. ALL PLANT MATERIAL, TOP SOIL, SHIPPING PROCEDURES AND HANDLING PRACTICES SHALL CONFORM TO THE MOST RECENT BC LANDSCAPE STANDARDS, SPECIFICATIONS AND GUIDELINES IN FORCE AT THE TIME OF INSTALLATION AND SHALL MEET ALL MINIMUM CRITERIA OF THE SUBDIVISION AND DEVELOPMENT SERVICING BYLAW.
10. REFER TO SCHEDULE B, SECTION L2.6 – PROVIDE 10m³ OF APPROVED GROWING MEDIUM PER TREE OR APPROVED EQUIVALENT.

TITLE

TREE PLANTING NOTES

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

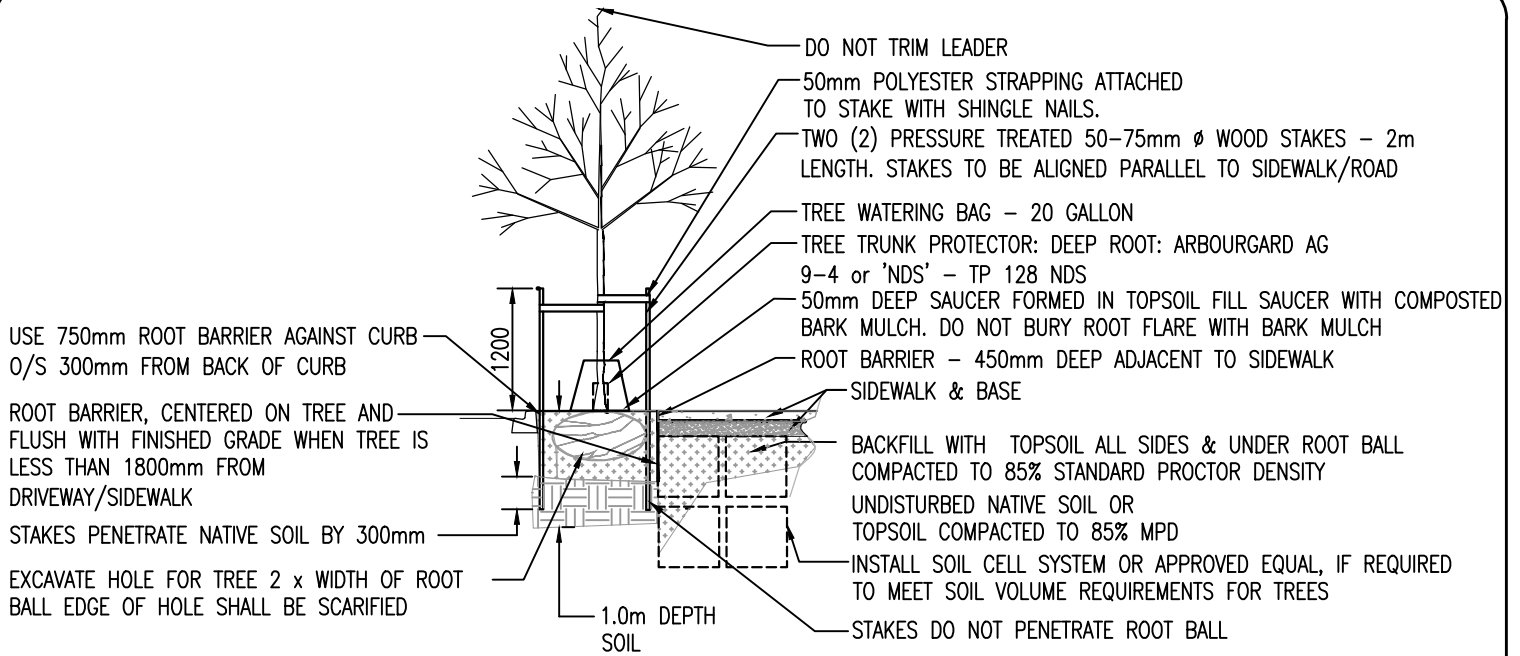
DATE APR 2019

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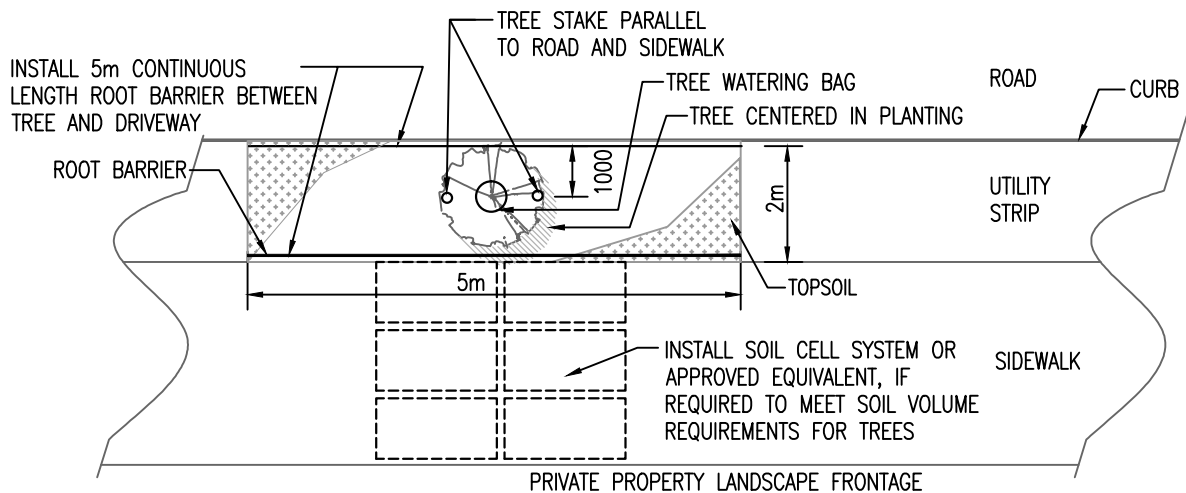
S.D.S.B. No.:



TLP 22



ELEVATION



PLAN VIEW

NOTES:

1. CONTACT GREEN INFRASTRUCTURE SERVICES STAFF TO REVIEW PLANTING HOLE EXCAVATION PRIOR TO INSTALLATION OF TOPSOIL.
2. SACKING/BURLAP TO BE LOOSENEED AND DROPPED TO THE BOTTOM OF THE PLANTING HOLE. ALL STRING, TWINE, ETC. TO BE REMOVED.
3. ALL WIRE BASKETS SHALL HAVE THE TOP 1/3 OF THE WIRE REMOVED PRIOR TO PLANTING.
4. ALL TREES SHALL BE SINGLE STEMMED.
5. ALL TREES SHALL BE WATERED WITH TREE WATERING BAGS FOR TWO (2) GROWING SEASONS. TREE WATERING BAGS SHALL BE FILLED WITH WATER ONCE EVERY SEVEN (7) DAYS UNLESS STATED OTHERWISE BY CONTRACT. CONTRACTOR IS RESPONSIBLE TO REPLACE DAMAGED OR VANDALIZED TREE WATERING BAGS. TREE WATERING BAGS TO BE REMOVED AFTER WATERING SEASON. WATERING BAG TO REMAIN WITH TREE UNTIL END OF MAINTENANCE PERIOD.
6. PROVIDE 10m³ GROWING MEDIUM PER TREE OR APPROVED EQUIVALENT.

TITLE

TREE INSTALLATION DETAIL – SOFTSCAPE

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

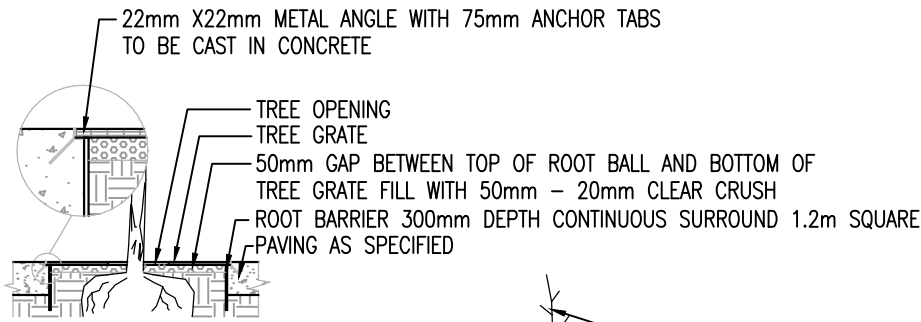
DATE APR 2019

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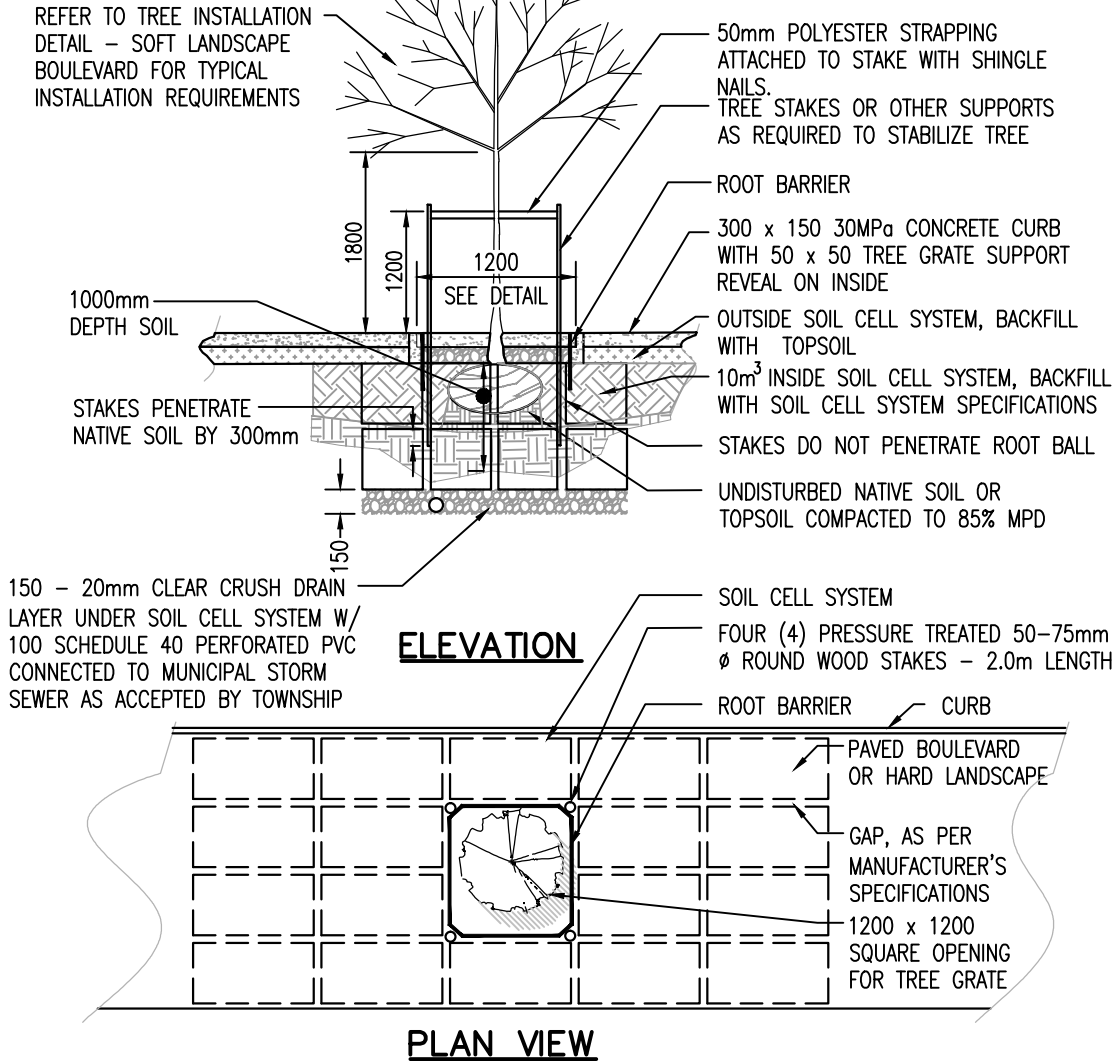
S.D.S.B. No.:



TLP 23



DETAIL



NOTES:

- 1) SACKING/BURLAP TO BE LOOSENEED AND DROPPED TO THE BOTTOM OF THE PLANTING HOLE. ALL STRING, TWINE, ETC. TO BE REMOVED.
- 2) ALL WIRE BASKETS SHALL HAVE THE TOP 1/3 OF THE WIRE REMOVED PRIOR TO PLANTING.
- 3) ALL TREES SHALL BE SINGLE STEMMED.

TITLE

TREE INSTALLATION DETAIL IN PAVED BOULEVARD

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

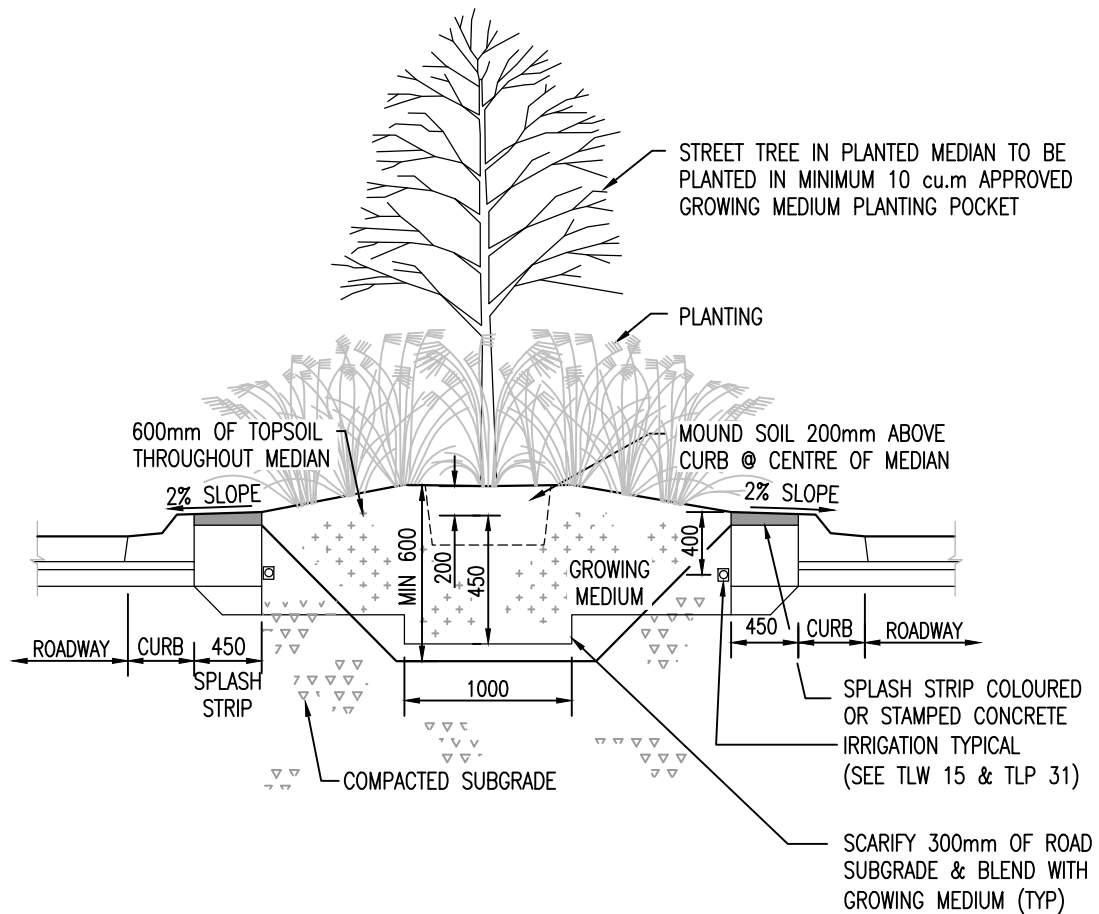
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLP 24



NOTES:

- 1) ADJACENT TOPSOIL TO BE COMPACTED TO PREVENT SETTLEMENT BELOW LEVEL OF SPLASH STRIP.
- 2) SPLASH STRIP PATTERN & COLOR AS PER PROJECT DRAWINGS.

TITLE

TYPICAL PLANTED MEDIAN INSTALLATION

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

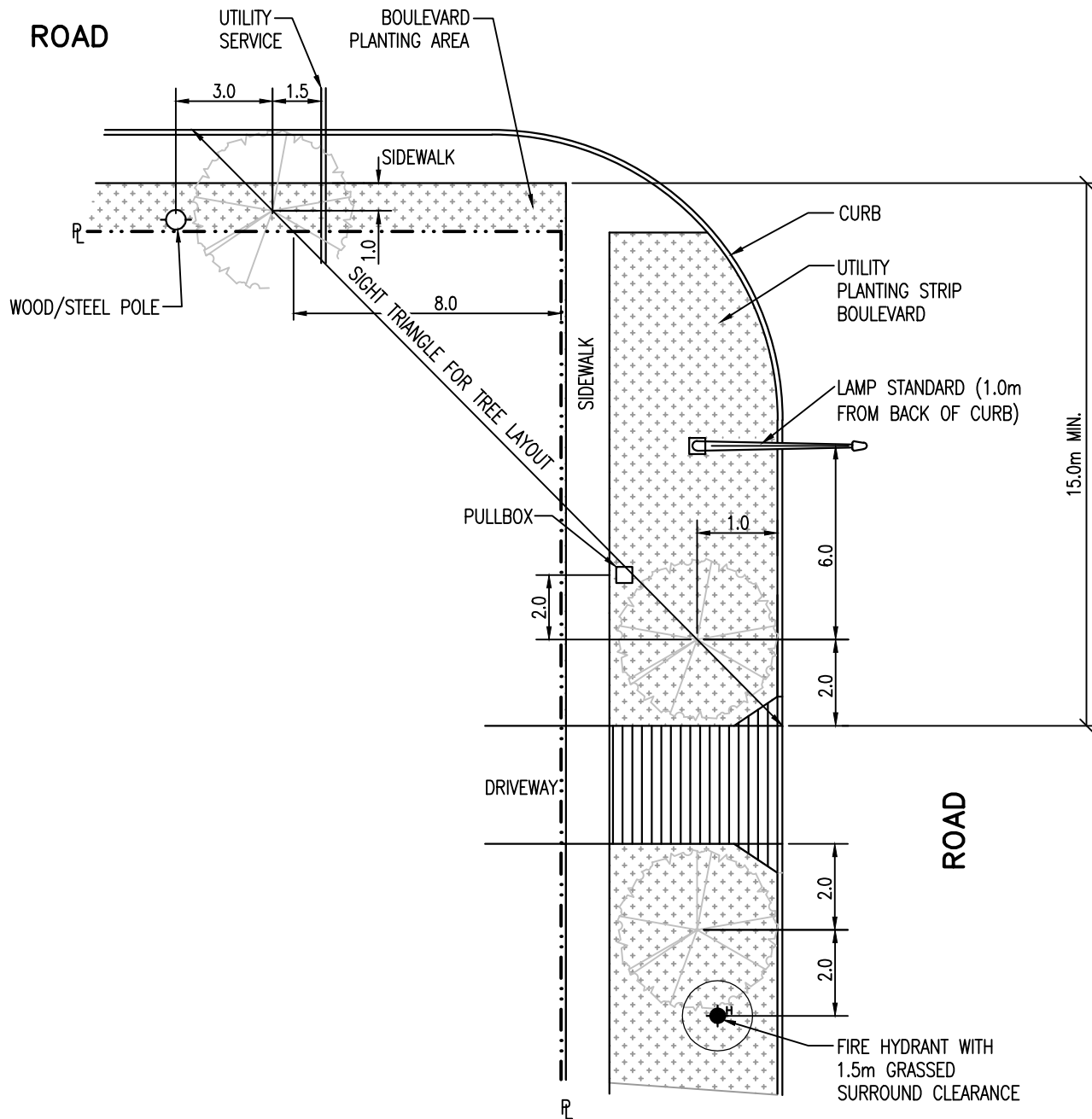
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLP 25



TITLE

TYPICAL TREE SETBACKS/CLEARANCES

THE CORPORATION OF THE
TOWNSHIP OF LANGLEY

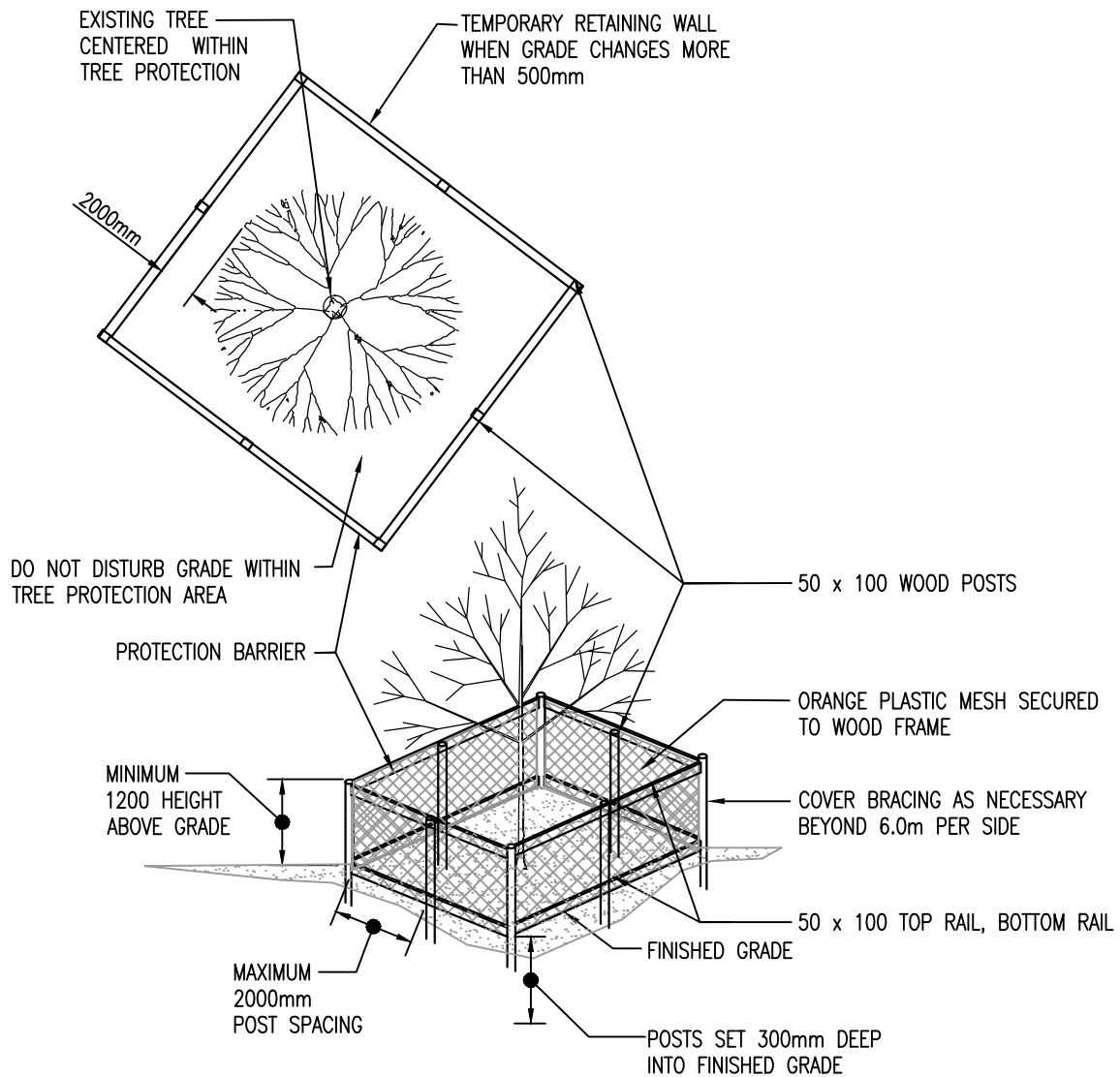
DATE APR 2019

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S.D.S.B. No.:



TLP 26



NOTES:

- 1) INSTALL TREE PROTECTION BARRIER BEFORE SITE CLEARING AND INITIATION OF CONSTRUCTION.
- 2) MAINTAIN TREE PROTECTION BARRIER DURING CLEARING AND SITE CONSTRUCTION.
- 3) KEEP AREA WITHIN OR AGAINST PROTECTION BARRIER CLEAR OF BUILDING MATERIALS, LITTER AND STANDING WATER.
- 4) DO NOT DISTURB EXISTING GRADES WITHIN TREE PROTECTION AREA FOR PROTECTED RETAINED TREES.
- 5) THE DEVELOPER IS RESPONSIBLE FOR MAINTENANCE WITHIN TREE PROTECTION BARRIER. DAMAGED TREES WILL BE REPLACED AT DEVELOPER'S COST.
- 6) SCHEDULE I IN SUBDIVISION & DEVELOPMENT SERVICING BYLAW PRESCRIBES PENALTIES FOR NON-COMPLIANCE WITH BYLAW.
- 7) ANY DISRUPTION OR PLANTING WITHIN THE TREE PROTECTION AREA IS TO BE SUPERVISED BY THE PROJECT ARBOURIST OR LANDSCAPE ARCHITECT.
- 8) RETAINED TREES TO BE WATERED TO ENSURE TREE HEALTH.

TITLE

TREE PROTECTION DETAIL

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

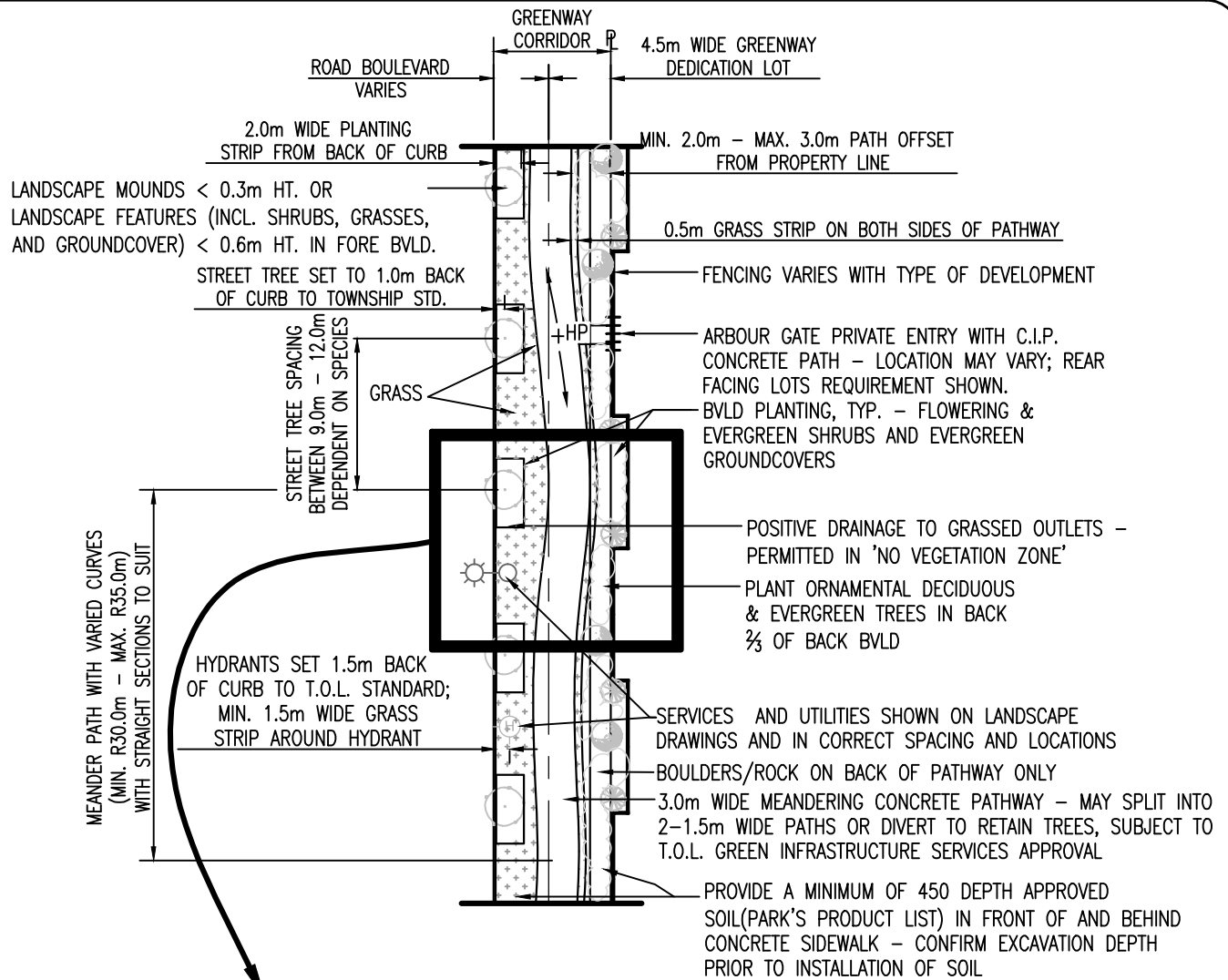
DATE APR 2019

APPROVED

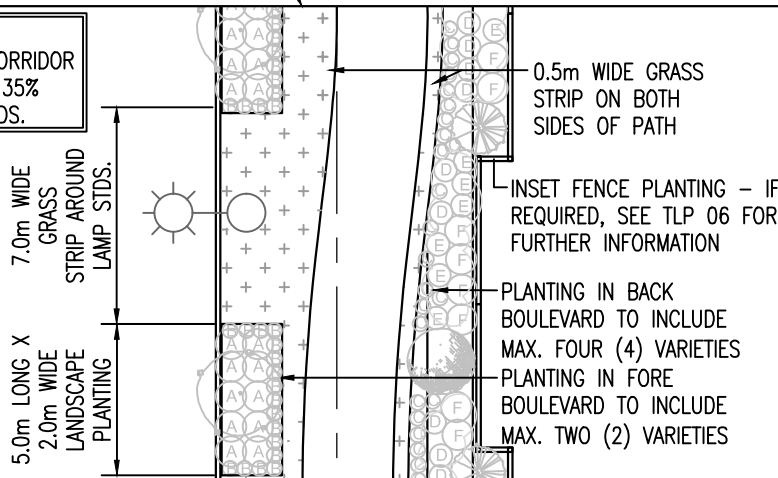
S.D.S.B. No.:



TLP 27



NOTE:
GREENWAY CORRIDOR TO BE MAX. 35% PLANTING BEDS.



NOTES:

1) ONE LINE TEMP. IRRIGATION SYSTEM REQUIRED BACK OF CURB - FULL COVERAGE OF GREENWAY - REQUIRED FOR ONE YEAR ESTABLISHMENT MAINTENANCE;

2) SITE FURNITURE SUCH AS BENCHES, LITTER RECEPTACLES AND PARK/TRAIL IDENTIFICATION SIGNAGE MAY BE REQUIRED;

3) ALL LANDSCAPE SHALL BE IN COMPLIANCE WITH HIGHWAY & TRAFFIC BYLAW AND APPROVAL OF GREEN INFRASTRUCTURE SERVICES;

4) USE COMPOSTED BARK MULCH IN GREENWAY CORRIDORS FROM APPROVED SOURCE;

5) 0.6m MAXIMUM HEIGHT OF SHRUBS, GRASSES AND GROUNDCOVER IN FORE-BOULEVARD;

INCLUDE THE FOLLOWING NOTES ON SUBMITTED DRAWINGS:

A) LANDSCAPE DRAWINGS AND CIVIL DRAWINGS SHALL BE COORDINATED.

B) CONCRETE FORMWORK LAYOUT TO BE REVIEWED AND CONFIRMED BY GREEN INFRASTRUCTURE SERVICES STAFF (TEL.: 604.533.6034); PRIOR TO INSTALLATION OF CONCRETE.

C) LAYOUT, MATERIALS AND CONSTRUCTION OF MUNICIPAL GREENWAYS SHALL BE TO THE SATISFACTION OF THE MANAGER OF GREEN INFRASTRUCTURE SERVICES.

TITLE

URBAN GREENWAY CORRIDOR LAYOUT GUIDE

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

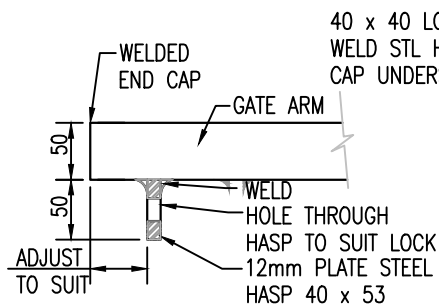
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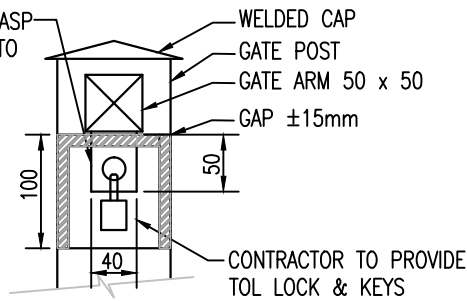
TLP 28



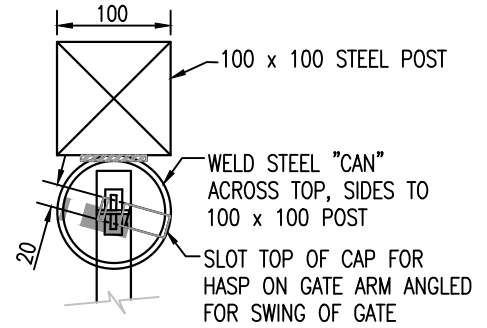
TITLE		GATE-BICYCLE STOP BAFFLE		
THE CORPORATION OF THE TOWNSHIP OF LANGLEY		DATE	APR 2019	
		APPROVED		
		S.D.S.B. No.:		
				TLP 29



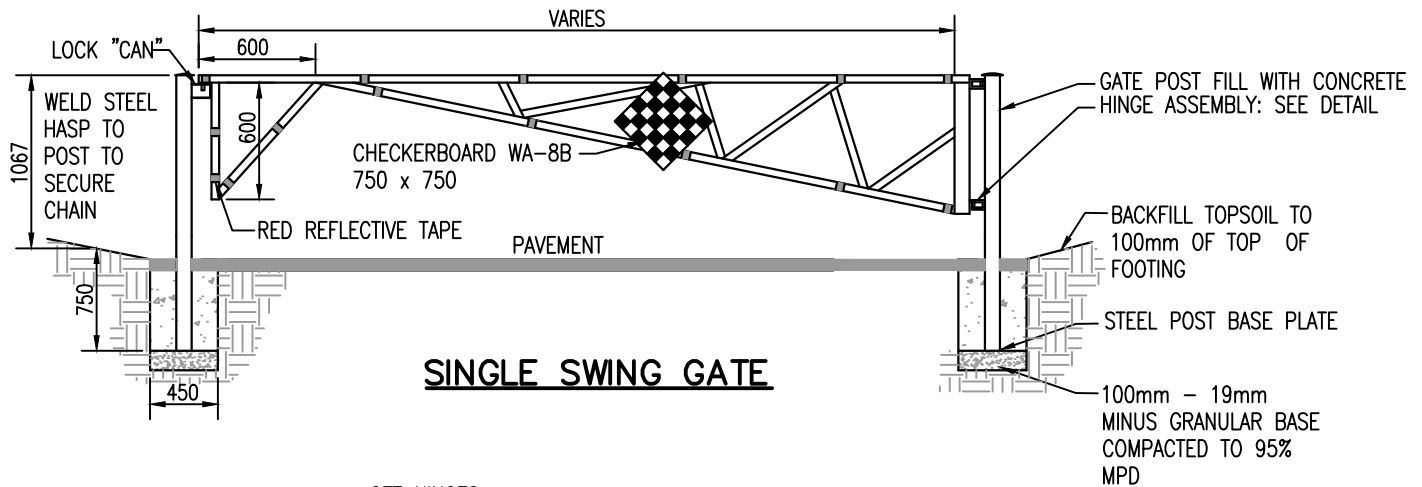
**ELEVATION LOCKING
TAB DETAIL**



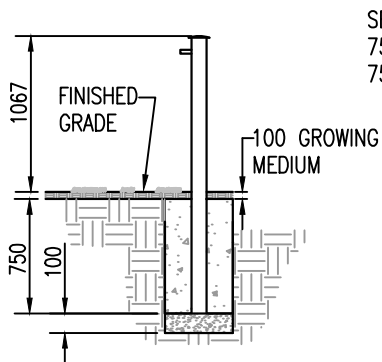
SECTION HINGE DETAIL



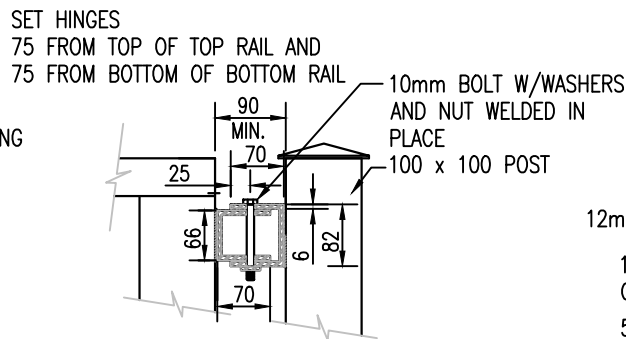
PLAN HINGE DETAIL



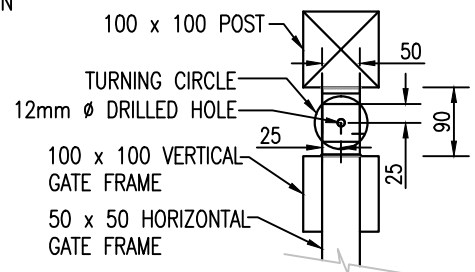
SINGLE SWING GATE



**SWING GATE LOCKING
POST- OPEN**



**SECTION HINGE
DETAIL**



**PLAN HINGE
DETAIL**

NOTES:

- 1) POSTS ARE 100 x 100 SCHEDULE 40 WALL HOLLOW SQUARE STEEL TUBING
- 2) GATE IS MADE WITH 50 x 50 SCHEDULE 40 HOLLOW SQUARE TUBING. BUTT - WELD ALL JOINTS GRIND SMOOTH.
- 3) POST BASE PLATES ARE 300 x 300 x 6mm PLATE STEEL FILLET WELD TO POST
- 4) CONCRETE TO BE 25 MPa
- 5) CLEAN PRIME AND PAINT (TWO COATS) WHITE OIL BASE EXTERIOR ENAMEL ON ALL EXPOSED STEEL SURFACES, TYPICAL

TITLE

GATE - VEHICLE SWING

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

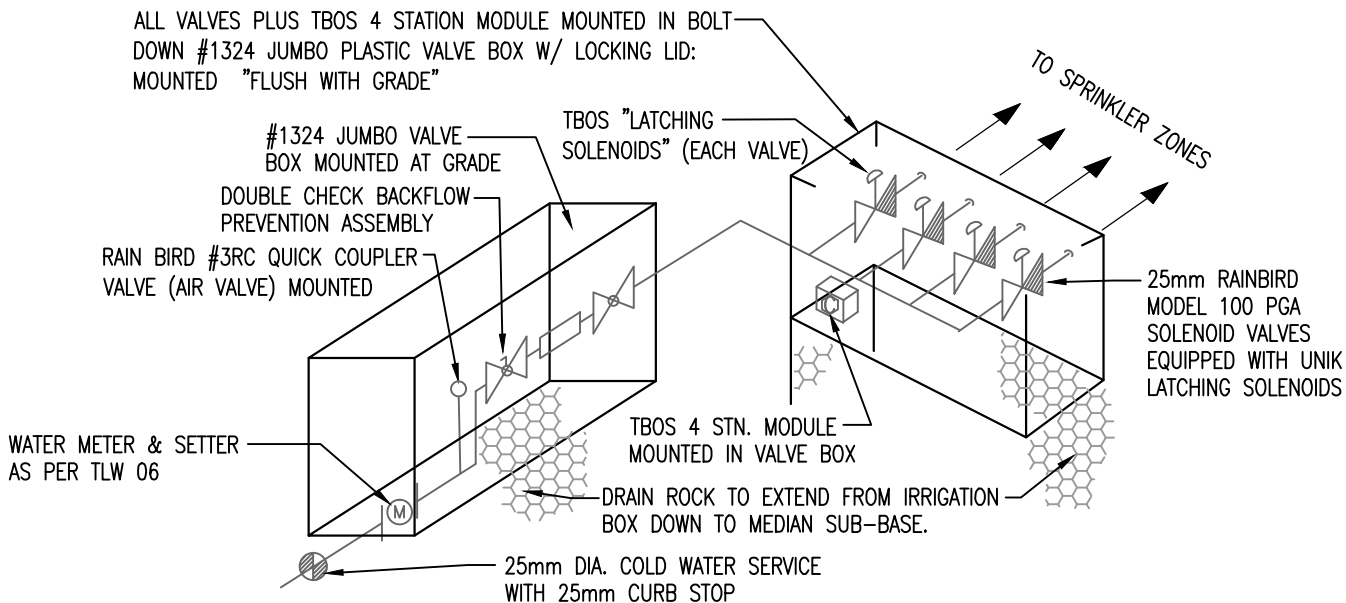
DATE APR 2019

APPROVED

S.D.S.B. No.:



TLP 30



SCHEMATIC

LEGEND:

-  RAINBIRD MODEL 100 PGA 25mm SOLENOID VALVES EQUIPPED WITH 'LATCHING SOLENOIDS" AND MOUNTED IN A #1324 JUMBO VALVE BOX WITH BOLT DOWN LID. W/ PRS-D
-  FEBCO 25mm 805-Y BACKFLOW PREVENTION ASSEMBLY MOUNTED FLUSH W/ GRADE IN A #1324 JUMBO VALVE BOX W/ LOCKING LID ADJACENT TO THE BOX CONTAINING THE SOLENOID VALVES.
-  RAINBIRD MODEL #RC3 QUICK COUPLER VALVE MOUNTED AT GRADE LEVEL AND MARKED, TO BE USED FOR WINTERIZING THE SYSTEM. (AIR VALVE)
-  25mm COLD WATER SERVICE (BY OTHERS) WITH CURB STOP (3/4" IN TRAFFIC ISLANDS)
-  RAINBIRD MODEL TBOS 4 STATION CONTROL MODULE (BATTERY OPERATED) TO BE MOUNTED ON THE INSIDE OF THE VALVE BOX.
-  WATER METER & SETTER - 25mm SERVICE AS PER TLW 06

NOTES:

- 1) CONNECTIONS AND CONTROLS IN MEDIANS TO HAVE ALL OF COMPONENTS (i.e. BACK FLOW DEVICE, AIR VALVE; SOLENOID VALVE & CONTROLLER MOUNTED BELOW GRADE IN AN NDS MODEL 1324 BOLT DOWN VALVE BOX W/ TAMPER PROOF SS SECURITY BOLTS.
- 2) DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY TO HAVE WATERTIGHT TEST COCK PLUGS
- 3) ALL BURIED PVC PIPE TO BE CLASS 200 FOR SIZES UP TO 25mm.
- 4) SUPPLY TO THE TOWNSHIP RAINBIRD TBOS "FIELD TRANSMITTER" IS REQUIRED FOR THIS SYSTEM.
- 5) SUPPLY TO THE TOWNSHIP RAINBIRD #3 RC QUICK COUPLER KEY IS REQUIRED, ONE AT EACH VALVE BOX
- 6) WINTERIZATION OF SYSTEM AS PART OF ESTABLISHMENT MAINTENANCE BY DEVELOPER
- 7) ACTIVATION AND DEMONSTRATION OF SYSTEM PRIOR TO ISSUANCE OF ACCEPTANCE CERTIFICATE.
- 8) ALL WORK TO IIABC STANDARDS FOR LANDSCAPE IRRIGATION SYSTEMS (CURRENT EDITION)
- 9) ANY TEMPORARY SYSTEMS NOT TO THE IIABC STANDARD MUST BE REMOVED AND ALL DAMAGED LANDSCAPE MADE GOOD BEFORE TOWNSHIP ACCEPTANCE

TITLE IRRIGATION NOTES

**THE CORPORATION OF THE
TOWNSHIP OF LANGLEY**

DATE APR 2019

APPROVED

S.D.S.B. No.:



TLP 31

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TOWNSHIP OF LANGLEY

**SUBDIVISION AND DEVELOPMENT SERVICING
BYLAW**

SCHEDULE I

TREE PROTECTION

SCHEDULE I
TREE PROTECTION
TABLE OF CONTENTS

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1. DEFINITIONS

For the purposes of Schedule “I” the following definitions shall apply:

“Arborist” means an arborist certified by the International Society of Arboriculture.

“Community Plan” means a plan adopted by Council pursuant to Sections 472 and 473 of the Local Government Act.

“Council” means the Council of the Corporation of the Township of Langley.

“Development Application” means an application submitted to the Municipality pursuant to Development Application, Fee and Procedure Bylaw 1987 No. 2470, as amended and includes an application for a Rezoning or Land Use Contract Amendment or Discharge, Heritage Revitalization Agreement or Amendment, Heritage Alteration Permit, Development Permit, Development Variance Permit, Temporary Use Permit or an application for a Subdivision.

“Developable Area” means the area of the subject property(ies) excluding greenway and park dedication; streamside areas protected under restrictive covenant or dedication, and landscape buffers (ALR and highway). Roads are required for a development and are included as developable area in the Tree Protection Tree Replacement calculations.

“Development Permit Application” means an application submitted to Council for a Development Permit, Development Variance Permit, Heritage Alteration Permit or Land Use Contract Amendment not amending use or density.

“Final Landscape Plan” means a landscape plan and cost estimate submission that has been reviewed and stamped as accepted by the Manager of Green Infrastructure Services.

“Integrated Site Design Concept” (ISDC) means a plan prepared by an Architect, Engineer, Landscape Architect or Planner, registered with the applicable provincial professional organization. The scale of the plan must match the scale of the Tree Survey. The primary purpose of the ISDC is to integrate Significant Trees deemed suitable for retention, as identified in a Tree Survey and Tree Evaluation Report, into an applicant’s preliminary site Development plans. The ISDC must show existing topographic elevations, the location of significant trees to be removed and retained, proposed conceptual elevations of major development components, proposed (ultimate) site grading within 10 metres of all proposed retained trees, the proposed location of all underground servicing mainlines, the proposed location of buildings, driveways, roadways, landscaped areas and detention/siltation ponds with required grade changes. The siting of all development related components must utilize techniques designed to maximize the retention, long term health and survival of Significant Trees identified for retention. An ISDC is only required after an approval in principle meaning third reading of a rezoning bylaw application or prior to development related permit approval.”

“Manager of Green Infrastructure Services” means the Manager of Green Infrastructure Services of the Municipality or designate.

“Municipality” means the Corporation of the Township of Langley.

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“Replacement Tree” means 2.5 metres in height evergreen trees and 6 cm caliper B&B deciduous trees in equal proportions provided in accordance with Schedule B of this Bylaw.

“Retained and Replacement Tree Acceptance Certificate” means a certificate contained within this Bylaw that is issued upon acceptance of all Schedule I requirements and which ends the one year maintenance period and releases the remaining landscape security held.

“Retained and Replacement Tree Completion Certificate” means a certificate contained within this Bylaw that is issued upon completion of all Schedule I requirements and which starts the one year maintenance period and reduces the landscape security amount to ten (10) percent.

“Rezoning Bylaw Application” means an application submitted to Council pursuant to Development Application Procedures Bylaw 2018 No. 5428 as amended for a Rezoning Bylaw Amendment, Heritage Revitalization Agreement or Land Use Contract Discharge or Amendment changing use or density.

“Security” means the monies or Letters of Credit assuring the successful completion of all tree retention, protection and replacement works and measures as required by this Bylaw; and submitted in an amount acceptable to the Manager of Green Infrastructure Services. The security may be held within a servicing agreement or independently when there is no servicing agreement.

“Servicing Agreement” means an agreement between an Owner and the Municipality securing Works and Services required to support a Development Application.

“Significant Tree” includes

- a) all trees:
 - i. with a trunk diameter equal to or greater than 30 cm (12 inches) measured 1.4 meters above the highest point of the natural grade of the ground measured from the base of the tree, and
 - ii. determined by a Landscape Architect or Arborist to be in “excellent” or “good” condition, pursuant to Table 4.1 of the Guide for Plant Appraisal (10th edition), as may be amended from time to time
- b) the following trees over 3 m / 10’ height: Arbutus, Garry Oak, Pacific Yew, all Pine, Western Red Cedar, Douglas Fir and Grand Fir, Pacific Dogwood; Redwood and Sequoia, Maidenhair and Monkey Puzzle or other non-native trees;
- c) all ‘heritage’ trees designated by Council or identified in the Langley Heritage Listing;
- d) alders, birch, big leaf maple and hemlock over 3 m / 10’ height in designated greenways;
- e) Significant Trees outside of the Developable Area must be identified and evaluated but are not eligible for credit against tree replacement requirements.

“Street Tree” means a tree planted within a Municipal road allowance pursuant to the Municipality’s Street Tree and Boulevard Planting Policy.

“Top”, “Topping” or “Topped” means the cutting or removal of the dominant leader or leaders of a tree.

“Tree Evaluation Report” means a written report prepared by an Arborist or Landscape Architect and submitted for review and acceptance by the Manager of Green Infrastructure Services in which the overall health of trees and Significant Trees is discussed and good candidates for retention identified. Each Significant Tree is to be tagged, numbered and identified in the Tree Survey and is to be listed and evaluated individually in the Report with the sequence of listed trees following a logical progression across the tree survey drawing. The Tree Evaluation Report shall influence the Integrated Site Design Concept and Tree Retention Plan including Development layout, the location of buildings, services, roads, driveways, utilities and final grades. Evaluate trees in greenways, park dedications and streamside areas. Identify trees suitable for retention and, trees that are hazardous trees. Make recommendations for tree retention and tree removal.

“Tree Management Plan” means an overall plan prepared in accordance with this Schedule by an Arborist or Landscape Architect and submitted for review and acceptance by the Manager of Green Infrastructure Services which includes a Tree Survey, Tree Evaluation Report, Tree Protection Plan, Tree Summary Schedule and Tree Replacement Plan.

“Tree Protection Plan” means a plan prepared in accordance with Appendix A of this Schedule by an Arborist or Landscape Architect and submitted for review and acceptance by the Manager of Green Infrastructure Services in which significant trees intended to be retained and the methods to protect these trees during the land Development and building construction process are identified.

“Tree Replacement Plan” means a plan prepared in accordance with Appendix B of this Schedule by an Arborist or Landscape Architect, integrated with the landscape plan and submitted for review and acceptance by the Manager of Green Infrastructure Services.

“Tree Summary Schedule” means a summary of tree survey, evaluation, retention, replacement and protection data prepared in accordance with Appendix C of this Schedule by an Arborist or Landscape Architect and submitted for review and acceptance by the Manager of Green Infrastructure Services.

“Tree Survey” means a 600 x 800 mm (approximate) legible hardcopy drawing of the Development Application site at a minimum 1:500 scale prepared and certified by a registered B.C. Land Surveyor and includes all existing lot lines, rights-of-way, easements, lot lines for greenway and streamside dedications, limits of ALR and highway buffers, spot elevations at base of significant trees, existing street trees, watercourses, tops of bank, restrictive covenant areas and all Significant Trees located within five (5) metres on adjacent properties, within the outer ten (10) metres of a conservation area and all trees and Significant Trees located on developable land outside of a conservation area which are tagged, numbered and correctly labeled with common and scientific names and submitted for the review and acceptance by the Manager of Green Infrastructure Services. The number and type of Significant Trees within a conservation area and not located by survey, may be estimated. Large stands of cottonwood and/or alder can be shown with canopy edge lines and an estimated number of trees provided for each stand.

2. APPLICATION

2.1 The provisions contained in this Schedule apply to all lands in the Municipality for which a Development Application has been submitted

- a) for multiple family, single family and comprehensive residential Development Applications , including seniors, assisted living, congregate care and community care Development Applications, at the time an application for Rezoning is being considered by Council;
- b) for all other Development Applications at the time an application for Rezoning is being considered by Council, except where the lands are designated as a mandatory development permit area and a restrictive covenant has been registered against the title of each parcel, which is the subject of the Development Application prohibiting the on-site clearing or removal of any vegetation, the alteration of on-site grades, the removal or deposition of soil or other materials from or to the Development site; or the commencement or installation of on-site works, services or utilities until a Development Permit has first been issued by Council;
- c) where rezoning is not required, at the time of Development Permit;
- d) where a restrictive covenant is required in accordance with subsection b) above, it shall be registered against the title of the property and a Tree Survey submitted for review and acceptance of the Manager of Green Infrastructure Services, prior to the Development Application being submitted to Council for its consideration;
- e) where a Development Permit has been issued for a portion of a lot, the restrictive covenant referenced in subsection b) above may be amended to apply only to that portion of the lot not covered by the Development Permit; or
- f) at the time of subdivision when subsections a) to d) above do not apply.

2.2 Notwithstanding the above, the terms and conditions of this Schedule do not apply to:

- a) any trees other than Significant Trees as defined in this Schedule;
- b) Trees located and protected within environmental areas, conservation areas, non-disturbance areas or land to be dedicated or transferred to the Municipality for park purposes;
- c) to trees and Significant Trees pruned, cut or removed pursuant to the Hydro Power and Authority Act or pruned, cut or removed by the Municipality on lands or rights-of-way owned or controlled by the Municipality;
- d) lands in the Agricultural Land Reserve.

3. PROHIBITION

- 3.1 No person shall cut, remove, relocate, knock down, “top” or damage any Significant Tree or permit, cause or authorize any Significant Tree to be cut, removed, relocated, knocked down, “topped” or damaged except where permitted by and in accordance with the terms of this Bylaw.
- 3.2 No person shall permit, cause or authorize land or vegetation to be cleared, land to be regraded, soil or any other substance to be removed or deposited, or works, services or utilities to be installed that compromises or may compromise the health or safety of any Significant Tree except where permitted by and in accordance with the terms of this Bylaw.
- 3.3 No person shall permit, authorize or undertake servicing, construction or clearing of any kind to commence, nor shall any building or other permit be issued that allows for or results in the removal of vegetation, deposit or removal of soil or other material, regraded or changing the contour of land, commencement of road works, or the installation of works, services and utilities unless protective fencing has been installed protecting Significant Trees and other trees to be retained, greenways, conservation areas and parkland in accordance with the provisions of this Bylaw, to the acceptance of the Manager of Green Infrastructure Services.
- 3.4 No person shall cut, remove, relocate, knock down, “top” or damage any tree or Significant Tree or permit, authorize or cause any tree or Significant Tree to be cut, removed, knocked down, “topped” or damaged in an environmental or conservation area, greenway, buffer, public park, or on lands owned or to be dedicated to the Municipality, without the written permission of the Manager of Green Infrastructure Services. For tree removal from streamside areas on private property, comply with Provincial Tree Replacement guidelines.
- 3.5 Notwithstanding Sections 3.1, 3.2 and 3.3 above, a Significant Tree:
 - a) may be pruned, but not “topped” where such pruning is required and carried out using sound arboricultural practice; and
 - b) may be cut, removed or relocated with the written permission of and subject to any conditions imposed by the Manager of Green Infrastructure Services, including the planting of replacement trees or provision of monies in lieu, where there is imminent danger of the tree or any part of the tree falling and damaging the property or safety of individuals.
- 3.6 Notwithstanding Sections 3.1, 3.2 and 3.3 above, Significant Trees may only be cut, removed or relocated, or land cleared, regraded, soil or other material deposited or removed, or otherwise prepared for Development if a Tree Management Plan has been submitted to the acceptance of the Manager of Green Infrastructure Services and Council approval, where applicable, has previously been granted. Only those significant trees shown on the tree management plan for removal may be cut, removed or relocated. Significant trees that are cut or removed which have been identified for retention to be compensated at a 5:1 ratio or through a cash in lieu payment.

4. RECONSIDERATION

- 4.1 Variations from this Schedule not accepted by the Manager of Green Infrastructure Services as being consistent with the intent of this Schedule may be appealed to Council by submission of a Development Variance Permit Application and fee pursuant to provisions of the Municipality's Development Application Procedures Bylaw 2018 No. 5428 as amended.

5. REPORT TO COUNCIL

- 5.1 Where a Development Application has been determined to be inconsistent with or fails to comply with the provisions of this Bylaw, the Community Development Division Report to Council accompanying the Development Application and related bylaw or permit shall indicate to Council the manner in which the Development Application or related bylaw or permit is inconsistent with or fails to comply with the provisions of this Bylaw, and what recommended penalty amendments, or compensation is to be provided by the applicant if Council or the Approving Officer were to give further consideration to the Development Application.
- 5.2 Where Section 5.1 applies, Council or in the case of a subdivision, the Approving Officer may consider:
- a) that additional replacement trees be provided as compensation; or
 - b) a monetary amount in lieu be required as compensation; or
 - c) further reviews be given to the Development Application, bylaw or permit; or
 - d) the denial of or an amendment to the Development Application, bylaw or permit; or
 - e) any combination of a) to d) above.

6. DEVELOPMENT APPLICATIONS

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6.1 A Development Application must include submission of the following documents to the acceptance of the Manager of Green Infrastructure Services:

- a) a Tree Survey;
- b) a Tree Evaluation Report; and
- c) a fully complete Tree Summary Schedule in accordance with Appendix C of this Schedule.

Section 6.1 does not apply where:

- a) a Development Application proposing to create five (5) or less single family residential lots or multiple family units, in which case Appendix D of this Schedule applies; or
- b) the items described in Section 6.1 have previously been submitted and considered by Council for the same site and continue to be acceptable to the Manager of Green Infrastructure Services; or
- c) the Manager of Green Infrastructure Services has determined that completion or submission of one or more of these items is unnecessary or would serve no useful purpose.

6.2 Subject to Section 2.1, Council may refuse to consider final reading of a Rezoning Bylaw Amendment, or issuance of a Development Permit, or the Municipality's Approving Officer may refuse to give final subdivision approval until all of the following have been submitted for review and accepted by the Manager of Green Infrastructure Services:

- a) a Tree Replacement Plan in accordance with Appendix B (where applicable);
- b) a Tree Protection Plan in accordance with Appendices A or D (where applicable);
- c) a Final Landscape Plan (where applicable);
- d) Security acceptable to the Manager of Green Infrastructure Services in accordance with Section 7 (where applicable); and
- e) written confirmation from the Owner and an Arborist or Landscape Architect that the Arborist or Landscape Architect has been engaged to be responsible for the implementation of the requirements of the Tree Management Plan including tree identification, on-site protective fencing, and conducting regular site reviews with monthly reports submitted to the Manager of Green Infrastructure Services to ensure the requirements of the approved Tree Management Plan and this Bylaw are adhered to. The Arborist or Landscape Architect shall ensure that all retained and planted trees are maintained within accepted arboricultural practices and standards.

7. SECURITY

- 7.1 Submission of a written cost estimate for all replacement trees, retained trees and for on-site tree protection fencing. Retained trees that are in association with an existing residence that shall be retained, on a new lot, do not need to be included in the security calculations for existing trees.

For the purposes of Schedule I, security calculations, shall be provided as follows:

- a) Replacement Trees @ \$500.00 each
 - b) Retained Trees located on lands or lots not to be dedicated as park or conservation area or otherwise transferred to the Municipality @ \$1,750.00 each
 - c) Designated Heritage Trees @ \$5,000.00 each
 - d) Protective Fencing of Retained Trees, conservation and environment areas, greenways, parks, and buffers @ \$25.00 per lineal metre of fence
 - e) For applications of 5 or less residential units or lots (Appendix D), security for Retained Trees shall be capped at a maximum of \$8,750 per lot even if the number of Retained Trees exceeds 5 trees per lot.
- 7.2 Security shall be provided in the form of cash, certified cheque, bank draft or letter of credit after a final Tree Management Plan is accepted, as follows:
- a) in an amount equivalent to 100% of the Arborist's or Landscape Architect's accepted estimate of the value of the tree protection, tree replacement and landscape works including labour, installation and one-year maintenance costs, to the acceptance of the Manager of Green Infrastructure Services;
 - b) in compliance with the Municipality's letter of credit requirements pursuant to this Bylaw;
 - c) ten (10) percent of the security amount shall be held by the Municipality for a one (1) year maintenance period following issuance of a Landscaped Retained and Replacement Tree Completion Certificate; and
 - d) the security amount shall be incorporated within a Servicing Agreement where one is required pursuant to this Bylaw, or where there is no Servicing Agreement, by means of a Letter of Credit to the acceptance of the Manager of Green Infrastructure Services. Administration fees as detailed in this Bylaw shall be collected for all security held by Letter of Credit outside of a Servicing Agreement.
- The maintenance security holdback will be released at the end of the one (1) year period following issuance of a Retained and Replacement Tree Acceptance Certificate, after the establishment and good health of all retained and replacement trees is confirmed.

8. GENERAL

- 8.1 Street Trees shall be provided in addition to the requirements of this Schedule.
- 8.2 The requirements of this Schedule are in addition to landscape, screening and fencing requirements of Zoning Bylaw No. 2500, as amended, the requirements of a Development Permit, Development Variance Permit, Heritage Revitalization Agreement or Heritage Alteration Permit, or the requirements of a Community or Neighbourhood Plan.
- 8.3 Tree Retention shall be taken into consideration during the preparation of Neighbourhood Plans.
- 8.4 The requirements of this Schedule are the responsibility of the applicant/Owner and are non-transferable to subsequent builders or lot Owners

Appendix A - Tree Protection Plan

A Tree Protection Plan shall be prepared by an Arborist or Landscape Architect consistent with the Integrated Site Design Concept previously accepted by the Manager of Green Infrastructure Services and on which:

1. the significant trees located on the development site, municipal dedication, or environmental area, with their location, crown size, caliper and existing elevations in relation to site Development components such as buildings, roads, driveways, fences, detention/siltation ponds, utilities, service connections and proposed finished grade elevations are clearly indicated;
2. retained trees, including existing street trees, with appropriate protective fencing and non-disturbance zones are clearly indicated;
3. written assurance that all retained trees are clearly shown on Engineering Drawings to ensure that proposed Engineering works can avoid tree locations;
4. the Municipality's detail for tree protection fencing is included along with notes requiring the protective fencing to be installed prior to clearing of the site, no storage of materials within the protection fencing area and project specific notes regarding pruning or other recommendations from the written Arborist's or Landscape Architect's Tree Evaluation Report; and
5. is submitted for review and acceptance by the Manager of Green Infrastructure Services.

Appendix B - Tree Replacement Plan

1. A Tree Replacement Plan shall be prepared by an Arborist or Landscape Architect at a scale and orientation matching the tree survey and shall be submitted for review and acceptance by the Manager of Green Infrastructure Services.
2. The number of Replacement Trees to be provided shall be calculated on the basis of the number of gross developable acres times thirty (30), minus three (3) times the number of retained significant trees on the property. Land or significant trees located in designated environmental areas, greenways or buffers shall not form part of the calculation.
3. Replacement Trees shall be:
 - a) a minimum of fifty percent (50%) conifer trees;
 - b) a minimum caliper and/or height in accordance with Appendix B Section 5 of this schedule;
 - c) of a type and variety acceptable to the Manager of Green Infrastructure Services; and
 - d) suitable for the site conditions and proposed use.
4. Replacement Trees shall be planted in accordance with a Tree Replacement Plan accepted by the Manager of Green Infrastructure Services:
 - a) on individual lots; or
 - b) in park, landscape, greenway, buffer or environmental areas within, adjacent to or nearby the Development site; or
 - c) in a combination of locations including other off-site locations acceptable to the Manager of Green Infrastructure Services; or
 - d) where the Manager of Green Infrastructure Services has determined that the planting of Replacement Trees would not be technically feasible or would be premature, a cash in lieu payment in an amount equivalent to 120% of the estimated value of the Replacement Trees including labour and installation, shall be paid to the Municipality to fulfill the replacement tree requirements.
5. Recommended Replacement Trees are:
 - a) Refer to Schedule B, Section L – Use the right tree for the right place. Considerations for tree choice include: mature plant size; sightlines for residents/building occupants/trail users; the anticipated maintenance level; compatibility with light exposure and soil water conditions; resistance to pests and disease, and; tolerance of disturbance such as foot traffic.

Evergreen Trees @ a minimum of 2.5 m ht.:

Abies amabilis – Amabilis Fir
Abies grandis – Grand Fir
Abies lasiocarpa – Alpine Fir
Chamaecyparis nootkatensis – Nootka Cypress
Larix occidentalis – Western Larch/West American Larch
Larix laricina – Tamarack/Hackmatack/American Larch
Picea engelmannii – Engelman Spruce
Picea glauca – Blue Spruce
Picea omorika var. – Serbian Spruce
Picea sitchensis – Sitka Spruce
Pinus contorta – Western Shore Pine
Pseudotsuga menziesii – Douglas-Fir
Taxus brevifolia – Pacific Yew
Thuja plicata – Western Red Cedar

Broadleaf Evergreen Trees @ 6 cm Cal.:

Magnolia grandiflora var. – Southern Evergreen Magnolia

Deciduous Trees @ 6 cm cal.:

Native Deciduous

Acer circinatum – Vine Maple
Cascara sagrada (*Rhamnus purshiana*) - Cascara
Cornus nuttallii – Pacific Dogwood
Sorbus americana – N. American Mountain Ash
Malus fusca – N. American Crab Apple/Oregon Crab Apple
Crataegus sp. - N. American hawthorn

Exotic Non-native Deciduous

Acer palmatum var. – Japanese Maple
Acer rubrum/griseum/ginnala/negundo/davidii, etc. – E. North American Maples
Cercis canadensis var. – Canadian Redbud
Cercidiphyllum japonica - Katsura
Cornus kousa – Kousa Dogwood (Korea, Japan)
Cornus X ‘Eddies White Wonder’ – N. American cultivar of *C. florida* and *C. nuttallii*
Davidia involucre – Dove tree
Fraxinus oxycarpa ‘Raywood’ – Raywood Ash
Fagus sylvatica ‘Riversii’ – Rivers European Beech
Gleditsia triacanthos inermis ‘Shade Master’/var. – Honey Locust
Liquidambar styraciflua – Sweet Gum
Liriodendron tulipifera – Tulip Tree
Magnolia stellata – Star Magnolia
Magnolia soulangiana var. – Saucer Magnolia
Malus sp. var. – ornamental flowering Crab Apples
Parrotia persica – Persian Ironwood
Prunus yedoensis ‘Akebono’/*Prunus blireiana* – ornamental flowering Plums
Quercus sp. - Oak
Sorbus aucuparia – European Mountain Ash

Appendix C - Tree Summary Schedule

TOL Project # _____

Project Name:		
Project Location:		
Owner Name, Address, Telephone, Fax & Email:		
SUMMARY OF SIGNIFICANT TREES IDENTIFIED, RETAINED, REMOVED & REPLACED		
1.	Number of Significant Trees identified on developable site (from Tree Survey)	Evergreen _____ Deciduous _____
2.	Number of Significant Trees to be removed	
3.	Net number of Significant Trees to be retained and protected (1 minus 2)	
4.	Number of Replacement Trees required = a) (30 trees/acre x _____ acres of gross developable land) – [minus] b) (3 x total number of Retained Trees)	a) _____ minus b) _____ = _____
5.	Total number of Retained or Replacement Trees (3 + 4)	
6.	Number of Replacement Trees to be planted <u>on-site</u>	
7.	Number of Replacement Trees to be planted <u>off-site</u>	
7.	Proposed locations for replacement trees planted <u>off-site</u> :	
8.	Number of Retained and Replacement Trees divided by # of Residential Units (where applicable)	
9.	Estimate of Number of Significant Trees in non-disturbance environmental areas above the top of bank	
10.	Number of Street Trees to be planted (estimate)	
11	Total number of Trees in place following Development (5 + 10). This excludes significant trees located in environmental areas and designated buffers	
Confirmation: I have reviewed the completed Appendix C above and I confirm its accuracy. Name of Arborist or Landscape Architect: _____ Company: _____ Telephone: _____ Fax: _____ Email: _____ Signature: _____ Date: _____ (Arborist/Landscape Architect)		
Confirmation: A certified Arborist or Landscape Architect identified above has been engaged to provide monthly inspections and reports to confirm adherence to the accepted Tree Management Plan and requirements of Schedule I of Bylaw No. 5382, as amended from time to time. Signature (Owner): _____ Date: _____		

Appendix D - Tree Management Plan for Residential Developments of 5 or Less Residential Units or Lots

The following requirements provide a simplified application of the Tree Protection Bylaw for residential Developments of 5 or less residential units or lots. A Development Application shall not be submitted to Council for consideration until Sections 1 to 5 of Appendix D have been submitted for review and accepted by the Manager of Green Infrastructure Services.

1. Submission of a Tree Survey and site plan showing the location of trees and significant trees on the property delineated with a circle or other appropriate symbol. Trees to be removed should be shown with an X or other appropriate symbol over the top of the location symbol. The plan should note the number of trees to be saved, removed or relocated and the total number of significant trees on site.
2. Inclusion of the on-site Tree Protection Fencing Detail on the Tree Survey, if there are existing trees to be retained.
3. Submission of a completed Tree Summary Schedule that includes the number of replacement trees in compliance with Appendix B of this Bylaw that shall be planted by the Owner.
4. Submission of a written cost estimate for all replacement trees, retained trees and for on-site tree protection fencing. Retained trees that are in association with an existing residence that shall be retained on a new lot do not need to be included in the security calculations for Retained Trees.
5. For the purpose of Schedule I and Appendix D, security calculations shall be provided in conformance with Section 7 of this Schedule I.