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# TECHNICAL MEMORANDUM

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| **To:** | Livia McEachern, P.Eng., City of Welland<br>Ali Khan, M.A.Sc., P.Eng., City of Welland | **RVA:** | 226408 |
| **From:** | Michael Kong, C.E.T., R.V. Anderson Associates Limited<br>Altaf Hussain, P.Eng., R.V. Anderson Associates Limited | | |
| **Date:** | April 10, 2025 | | |
| **Subject:** | Transportation Master Plan – Appendix 5 – Road Classification Technical Memorandum, City of Welland | | |

## 1.0 Introduction

As part of the ongoing Transportation Master Plan (TMP) study, it has been identified that a reclassification of roads within the City of Welland is necessary. Therefore, the road system within the City of Welland has been assessed using a formal set of road classification criteria. The set of criteria was made with reference to the *Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (2017)*, with specific modifications made to calibrate the criteria to the City of Welland context.

### 1.1 Road Class Types

Freeways and Expressways are roadways of the highest order, usually consisting of multi-lane (more than four total through lanes including two through lanes in each direction), high-speed highways that generally accommodate long-distance travels between different cities and regions. Although they are often used interchangeably, freeways are defined as highways limited to through traffic, with access to the corridor only being provided by interchanges, whereas expressways consist of a divided roadway for through traffic, with access provided through interchanges or controlled access points.

Secondary/King's Highway generally consist of 2-lane or 4-lane (one lane or two lanes in each direction) corridors that transfer traffic between freeways and arterials. They may be divided or undivided, with at-grade intersections and the potential for short sections of Freeways within the overall corridor.

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Arterial Roads are higher-order corridors that are intended to accommodate relatively high volumes of traffic and provide efficient, uninterrupted movement for through volumes (barring interruptions from traffic signals along the corridor). Resultantly, majority of resident and emergency vehicle trips will utilize an arterial roadway at some point in their route.

Collector Roads are intended to carry moderate traffic volumes, with traffic movement and land access having a similar level of importance. In the ideal road system, collector roads will garner traffic from local streets, eventually connecting to the foregoing higher-order roadways to accommodate the larger portion of travel.

Local Roads are intended to provide access to their adjacent land uses. These roadways generally carry much lower volumes than the other classifications, as they are only intended to service trip ends (either origin or destination of a trip).

# 2.0 Road Classification Characteristics

## 2.1 Land Use

The classification of a roadway is heavily influenced by the characteristics of the adjacent land uses. This is because as the nature and intensity of a land use changes, so does the demand that is placed on the adjacent transportation network. For example, in predominantly industrial areas, there will be an increased desire for efficient movement of goods, whereas residential areas desire a greater emphasis on multimodal movements, on-street parking, and land access.

It should be noted that the classification of urban roads contrasts significantly from rural roads, as rural roads are designed to achieve different purposes (i.e., rural roads are designed to accommodate a greater percentage agricultural vehicles). As such, the classifications of urban and rural roads are usually completed separately with their own respective characteristics.

## 2.2 Service Function

Roadways are generally designed to serve a certain purpose, with the primary objective of any roadway being to provide either uninterrupted flow of traffic, access to land, or a balanced combination of both. It is generally understood that the primary objective for freeways and arterials is to provide uninterrupted flow of traffic at higher speeds, as the intended purpose of higher order roads is to enable efficient movement of people and goods. In contrast, the intended function of local roadways is to provide access to land, which generally results in an increased number of traffic disruptions (i.e., pedestrian

crossings) and lower posted speeds. A combination of traffic movement and land access is typically provided by a collector road, which establishes balance through limiting the number of site accesses and fostering higher operating speeds than local roads.

In addition to the intended service function, the roadway classification should also consider the traffic volumes carried by the roadway. Higher order roads are designed to carry larger traffic volumes through increased right-of-way width.

## 2.3 Connections

An important characteristic of road classification is to create a connected and continuous network of roadways with similar functions. By doing so, road users can transfer between roadways without controverting the intended use of the roadway (i.e., using a local road as a cut-through route when its intended function is land access). Table 2.1 summarizes the road classification connections for the ideal road network.

*Table 2.1 – Ideal Network Road Classification Connections*

| Road Classification | | Connections | | | | |
|---|---|---|---|---|---|---|
| | Local | Collector | Arterial | King's Highway | Expressway | Freeway |
| Local | ✓ | ✓ | ● | ● | X | X |
| Collector | ✓ | ✓ | ✓ | ● | ● | ● |
| Arterial | ● | ✓ | ✓ | ✓ | ✓ | ✓ |
| King's Highway | ● | ● | ✓ | ✓ | ✓ | ✓ |
| Expressway | X | ● | ✓ | ✓ | ✓ | ✓ |
| Freeway | X | ● | ✓ | ✓ | ✓ | ✓ |

✓ indicates that the two (2) road classifications are an ideal connection.

● indicates that connecting the two (2) road classifications should be avoided, where possible.

X indicates that the two (2) road classifications should not connect under any circumstance.

As shown in Table 2.1, the ideal road network maintains connection between roadways of similar function. There are some circumstances where the ideal connections cannot be made, which may result in locals connecting with arterials and collectors connecting with expressways/freeways; while these connections are not preferrable, they commonly occur in many municipalities and are sometimes unavoidable. There are some connections, however, such as local roads and freeways, that should not be implemented under any circumstance.

## 2.4 Design Consistency

The geometric characteristics of a roadway play an impactful role in shaping the behaviour of its road users. In terms of road classification, the intent should be to provide consistency among roadways with the same classification so that drivers inherently understand the function and purpose of each roadway. Similar to the road classification connections, there will be circumstances where two (2) roadways with significantly different cross-sections meet the criteria for the same classification; in these cases, efforts should be made to provide consistency through operating speeds and driver workload.

As part of the ongoing Official Plan (OP) update for the City, the existing road typical cross-sections were revised. These revised typical cross-sections have been considered in the assessment of each roadway and are briefly described as follows:

Local Road Typical Cross Section consists of a 20-metre-wide right-of-way and provides a 1.5-metre-wide sidewalk on at least one side, a 2-metre-wide boulevard on both sides, and a single 4-metre-wide vehicular travel lane in each direction.

Collector Road Typical Cross Section consists of a 23-metre-wide right-of-way and provides a 1.5-metre-wide sidewalk on one side, and either a 1.5-metre-wide sidewalk or 3-metre-wide multi-use path (MUP) on the other side. The asphalt width is 9 metres, with allocation for vehicles, cyclists, and other roadway amenities being prescribed as needed.

Arterial Road Typical Cross Section consists of a 26-metre-wide right-of-way, providing a 1.5-metre-wide sidewalk on both sides and a 14-metre-wide asphalt width for appropriate allocation of vehicular travel lanes, cycling facilities, and other roadway amenities as needed.

The typical roadway cross sections are provided in Appendix 1.

# 3.0 City of Welland Road Classifications

## 3.1 Classification Criteria

As part of the review of the City's road network, a set of standard road classification criteria has been formulated, with the details of each criterion being calibrated to the context of Welland.

Many of the higher order roadways within the City of Welland are under the jurisdiction of the Region of Niagara or Ministry of Transportation of Ontario (MTO), with the remaining City-owned corridors being classified as locals, collectors, and arterials. However, given

that the City roads represent a wide variety of classification criteria, it is recommended that the City further aggregate the collector classification into minor collectors and major collectors.

The proposed road classification assessment for the City roads is shown in Table 3.1.

Table 3.1 – City of Welland Proposed Urban Road Classification Criteria

| Criteria | Locals | Minor Collector | Major Collector | Arterial |
|---|---|---|---|---|
| Service Function | Land access is primary consideration | Traffic movement and land access of equal importance | Traffic movement and land access of equal importance | Traffic movement is primary consideration |
| Typical Traffic Volume (veh/day) | < 3,000 | < 5,000 | 5,000 – 12,000 | > 10,000 |
| Flow Characteristics | Interrupted flow | Interrupted flow | Interrupted flow | Uninterrupted flow except at traffic signals |
| Posted Speed (km/h)* | 40 | 40 – 50 | 50 – 60 | 60 – 70 |
| Vehicle Type | Passenger and service vehicles | Passenger and service vehicles | All types | All types |
| Desirable Connections | Locals, collectors | Locals, collectors, arterials | Locals, collectors, arterials | Collectors, arterials, expressways, freeways |
| Transit Service | Not permitted | Generally avoided | Permitted | Permitted |
| Accommodation of Cyclists** | No restrictions or special facilities. | MUP on one side | No restrictions. Dedicated facilities recommended | No restrictions. Dedicated facilities recommended |
| Accommodation of Pedestrians | Sidewalk on one side | Sidewalk on both sides, unless MUP on one side | Sidewalks provided on both sides | Sidewalks provided on both sides |
| On-Street Parking | One or both sides | One or both sides | One or both sides | No parking |
| Traffic Calming | Where warranted | Where warranted | Not permitted | Not permitted |
| Minimum Intersection Spacing (m) | 60 | 60 | 120 | 200 |
| Typical Right-of-Way Width (m) | 20 | 23 | 23-26 | 26 |

*School zones or other regulatory restrictions could further reduce posted speed

**Use OTM Book 18 as a guide to select the correct cycling facility for the roadway.

It is important to note that most roadways, especially in older communities, will not correspond solely with one section. In these cases, there is a certain degree of ambiguity

regarding the roadway's hierarchy and planning judgement must be applied to properly assign the appropriate classification.

# 4.0 Recommended Road Classifications

Using the methodology outlined in foregoing sections, a reclassification of all City-owned roadways has been completed utilizing the proposed criteria noted in Table 3.1, in addition to 2051 horizon year planning modelling information that is reflective of housing and employment intensification within the City. Table 4.0 presents the list of roadways within Welland that have an updated classification.

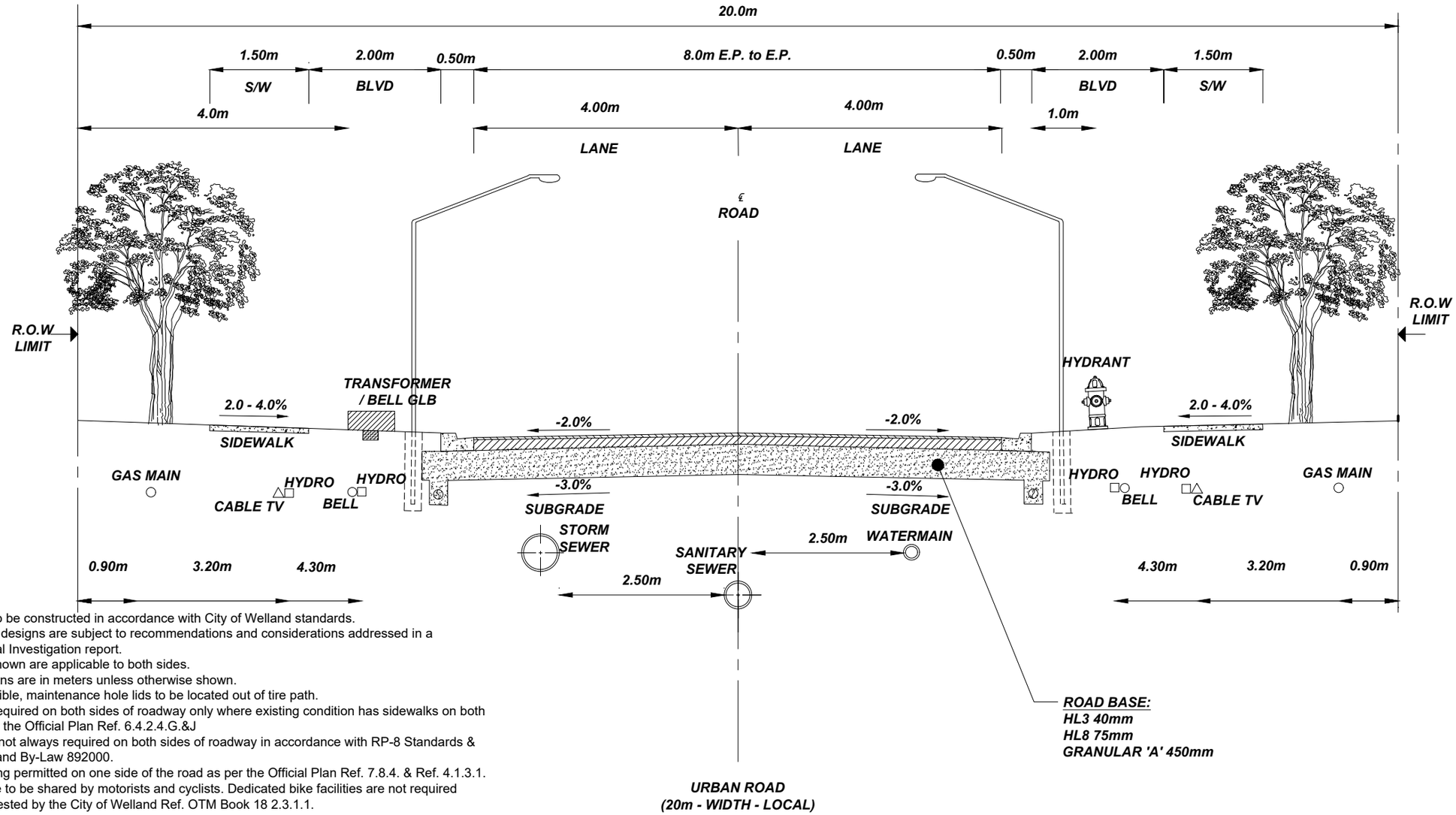
Table 4.0 – Recommended Updated Classifications for City of Welland Roads

| Roadway | Segment | | Existing Classification | Proposed Classification |
|---|---|---|---|---|
| | West/North Limit | East/South Limit | | |
| Aqueduct Street | Thorold Road | Chippawa Street | Collector | Local |
| Broadway | Riverside Drive | Prince Charles Drive | Collector | Major Collector |
| Burgar Street | Division Street | Lincoln Street | Collector | Minor Collector |
| Clare Avenue | Municipal Boundary | Webber Road | Collector | Major Collector |
| Colbeck Drive | Prince Charles Drive | Southern Terminus | Collector | Minor Collector |
| Colbeck Drive | Webber Road | South Pelham Road | Local | Major Collector |
| Daimler Parkway | Highway 406 | Midland Place/Shoreview Drive | Local | Major Collector |
| Denistoun Street | West Main Street | Lincoln Street | Collector | Major Collector |
| Division Street | East Main Street | Burgar Street | Collector | Major Collector |
| Downs Drive | River Road | Ross Street | Collector | Minor Collector |
| Elm Street | Forks Road | Municipal Boundary | Collector | Major Collector |
| Fell Street | Merritt Street | Church Street | Collector | Local |
| First Avenue | Woodlawn Road | Prince Charles Drive | Collector | Major Collector |
| Fitch Street | Prince Charles Drive | First Avenue | Collector | Major Collector |
| Fitch Street | First Street | Shotwell Street | Local/Collector | Minor Collector |

| Roadway | Segment | | Existing Classification | Proposed Classification |
|---|---|---|---|---|
| | West/North Limit | East/South Limit | | |
| Forks Road | Prince Charles Drive | Easterly Terminus | Collector | Major Collector |
| Hagar Street | Burgar Street | Wellington Street | Collector | Minor Collector |
| Hellems Avenue | East Main Street | Lincoln Street | Collector | Major Collector |
| Memorial Park Drive | Lincoln Street | Ontario Road | Collector | Major Collector |
| Merritt Street | Fitch Street | Fell Street | Collector | Local |
| Ontario Road | Southworth Street | Memorial Park Drive | Collector | Major Collector |
| Plymouth Road | Lincoln Street | Ontario Road | Collector | Major Collector |
| Primeway Drive | River Road | Woodlawn Road | Local | Major Collector |
| Quaker Road | Niagara Street | Towpath Road | Collector | Major Collector |
| Ridge Road | Rusholme Road | Highway 58A | Collector | Major Collector |
| River Road | Municipal Boundary | South Pelham Road | Local | Major Collector |
| River Road | Woodlawn Road | East Main Street | Collector | Minor Collector |
| River Road | Primeway Drive | Woodlawn Road | Local | Major Collector |
| Riverside Drive | Princes Charles Drive | Webber Road | Arterial | Major Collector |
| Ross Street | Downs Drive | East Main Street | Collector | Minor Collector |
| Rusholme Road | Ridge Road | Highway 58A | Collector | Major Collector |
| South Pelham Road | Webber Road | River Road | Collector | Major Collector |
| Thorold Road | Niagara Street | Chippawa Street | Collector | Major Collector |
| Towpath Road | Quaker Road | Municipal Boundary | Local | Major Collector |
| Wellington Street | East Main Street | Lincoln Street | Collector | Arterial |
| Willson Road | Willson Way | Fitch Street | Collector | Minor Collector |
| Willson Road | Fitch Street | Endicott Terrace | Collector | Local |

**APPENDIX 1**

# Typical Roadway Cross Sections

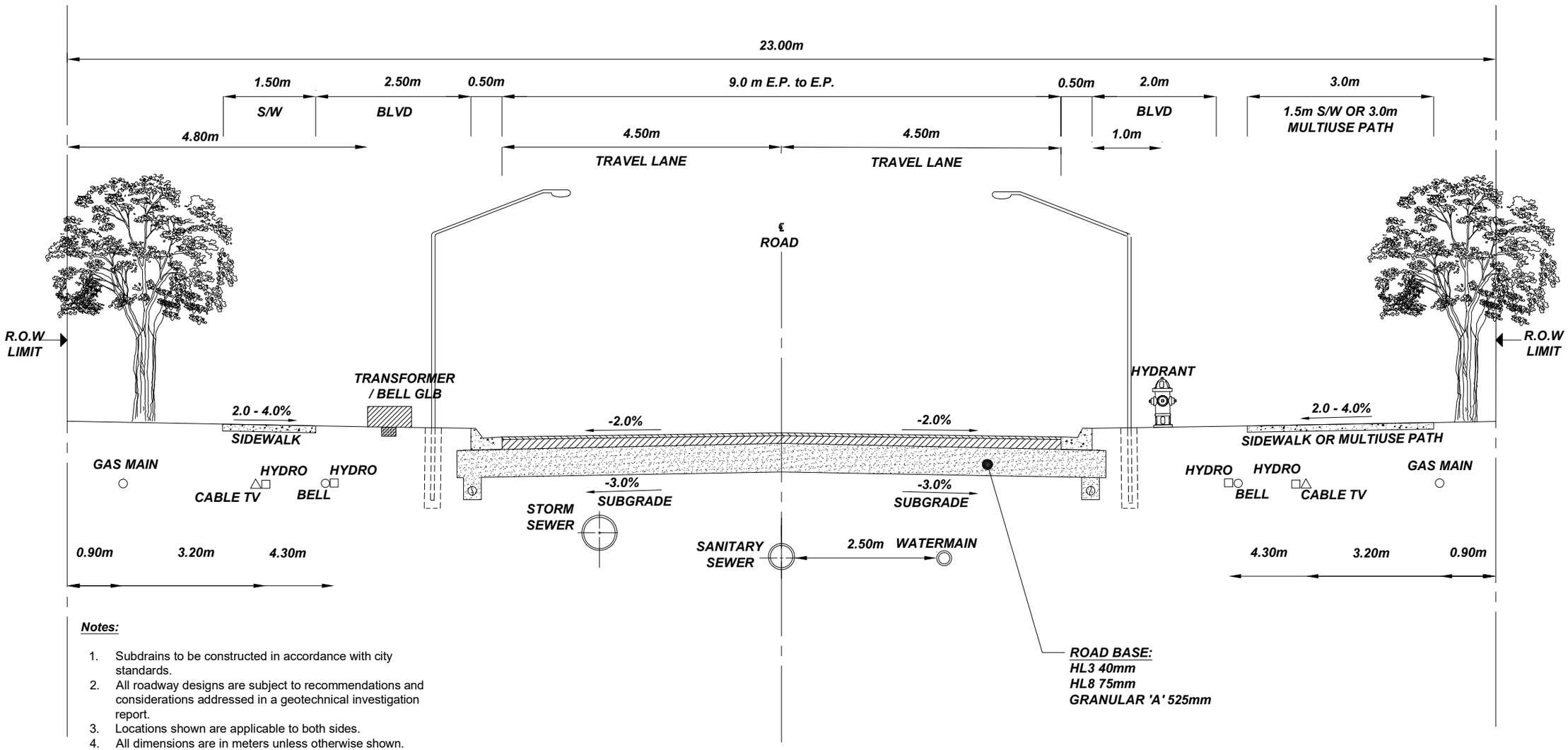



**Notes:**

1. Subdrains to be constructed in accordance with City of Welland standards.
2. All roadway designs are subject to recommendations and considerations addressed in a Geotechnical Investigation report.
3. Locations shown are applicable to both sides.
4. All dimensions are in meters unless otherwise shown.
5. Where possible, maintenance hole lids to be located out of tire path.
6. Sidewalks required on both sides of roadway only where existing condition has sidewalks on both sides as per the Official Plan Ref. 6.4.2.4.G.&J
7. Streetlights not always required on both sides of roadway in accordance with RP-8 Standards & City of Welland By-Law 892000.
8. Street parking permitted on one side of the road as per the Official Plan Ref. 7.8.4. & Ref. 4.1.3.1.
9. All lanes are to be shared by motorists and cyclists. Dedicated bike facilities are not required unless requested by the City of Welland Ref. OTM Book 18 2.3.1.1.

| | | | | |
|---|---|---|---|---|
| CITY OF WELLAND<br>INFRASTRUCTURE AND DEVELOPMENT SERVICES | July 21, 2023 | N.T.S | Dwg No: W-1 | TYPICAL ROAD SECTION<br>URBAN–LOCAL ROAD (20m WIDTH) |
| | Drawn By: B.W. | Checked By: J.T. | Revision: - | |

F:\City Standards Dwgs\CrossSections(20m–26m)

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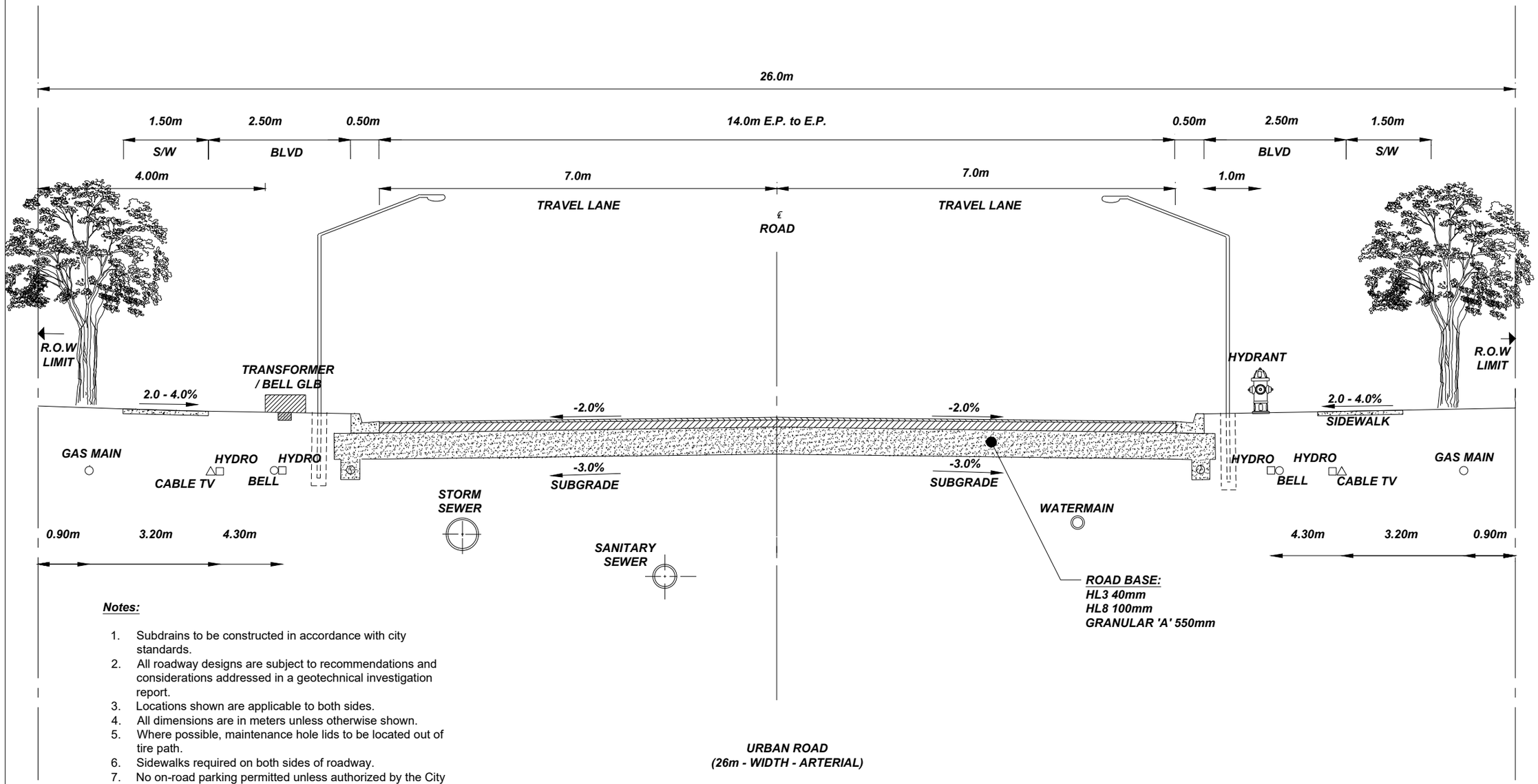
5. Where possible, maintenance hole lids to be located out of tire path.
6. Sidewalks required on both sides of roadway
7. No on-road parking permitted unless authorized by the city.
8. Appropriate cycling facilities included based on OTM Book 18.

**URBAN ROAD**
**(23m - WIDTH - COLLECTOR)**

| | | | | |
|---|---|---|---|---|
| CITY OF WELLAND<br>INFRASTRUCTURE AND DEVELOPMENT SERVICES | Date: July 21, 2023 | Scale: N.T.S | Dwg No: W-4 | TYPICAL ROAD SECTION<br>URBAN–COLLECTOR ROAD (23m WIDTH) |
| | Drawn By: B.W. | Checked By: J.T. | Revision: - | |

F:\City Standards Dwgs\CrossSections(20m–26m)

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| | | | | |
|---|---|---|---|---|
| CITY OF WELLAND<br>INFRASTRUCTURE AND DEVELOPMENT SERVICES | July 21, 2023 | N.T.S | Dwg No: W-5 | TYPICAL ROAD SECTION<br>URBAN–ARTERIAL ROAD (26m WIDTH) |
| | Drawn By: B.W. | Checked By: J.T. | Revision: - | |

F:\City Standards Dwgs\CrossSections(20m–26m)