

Technical Guide: Methodology for Determining the SPEA

This technical guide is provided to clarify the methodology used by City of Burnaby for determining the Streamside Protection and Enhancement Area (SPEA) for a stream, in accordance with Zoning Bylaw Part 4 - 4.2, the Streamside Protection and Enhancement Development Permit guidelines, and higher level provincial and federal legislation.

Introduction

This guide is used to establish a common understanding among City Planning and Development Department staff, **Qualified Environmental Professionals** (QEPs), landowners and **development** applicants and to ensure a consistent approach in responding to **development** proposals.

The City of Burnaby chose to undertake a path of meeting and exceeding the requirements of the provincial *Riparian Areas Regulation* (RAR), now established as the *Riparian Areas Protection Regulation* (RAPR), after the RAR was introduced in 2006 to replace the *Streamside Protection Regulation* (*Riparian Areas Protection Regulation*, Section 23(1) and (2)). The SPEAs widths as set out in Part 4 - 4.2 of the Zoning Bylaw and the Streamside Protection and Enhancement Development Permit Guidelines found in schedule II of the Zoning Bylaw continue this approach, building on its successful outcomes.

The RAPR and its definitions are referenced in this document as it is the higher-level regulation, which must be met or exceeded, and since various components of interpretation and guidance documents provided for the RAPR can also support Zoning Bylaw Part 4 - 4.2 and the Streamside Protection and Enhancement Development Permit Guidelines where they deal with similar scenarios.

Terms defined in the Zoning Bylaw have been bolded throughout this document for ease of reference.

When is a parcel of land subject to a Streamside Protection and Enhancement Development Permit?

Parcels of land subject to a Development Permit are as shown on the **Streamside Protection and Enhancement Development Permit Area** (DPA) Map in the Official Community Plan and are also identified in Burnaby Map (City Webmap).

Affected parcels are those that contain a **stream**, or are partly or entirely located:

- within 30 metres of the top of bank of a **stream**;
- or within 30 metres of the top of a **ravine** bank for **ravines** that are less than or equal to 60 metres in width, or
- within 10 metres of the top of **ravine** bank for **ravines** that are greater than 60 metres in width, and
- A parcel may be subject to a Streamside Protection and Enhancement Development Permit whether or not it is shown shaded on the Streamside DPA map, if a previously unmapped **stream** is discovered and meets the criteria noted above.

Unless exempted, a Development Permit addressing Streamside Protection and Enhancement must be approved before:

- Subdivision of land;

- Construction of, addition to, or alteration of a building or structure; and
- Alteration of land, including but not limited to clearing of vegetation, grading, changes to landscaping, preparation or construction of services and trails.

The applicable guidelines for Streamside Protection and Enhancement, and the exemptions, are in Schedule II of the Zoning Bylaw.

Determining the SPEA Width on a Specific Parcel of Land

As outlined below in Steps 1 to 5, Burnaby's approach for determining the SPEA is based on methodology consistent with the Simple Assessment methodology from the RAPR but using the vegetation classes as established by the former *Streamside Protection Regulation* and used in Burnaby since 2005.

This approach sets widths for SPEAs based on the following **stream** characteristics – the status of **existing or potential vegetation**, **fish** presence or absence, and **stream** permanence.

Note:

- Multiple different SPEAs may apply if a parcel of land interacts with more than one **stream**, or if the **stream** can be broken into distinct reaches that require different levels of riparian protection
- In cases where **active floodplains** are involved, the location of the **Top of Bank** may need to be determined by a QEP, since the edge of the **active floodplain** may be difficult to determine based on topography alone (indicators such as a change in vegetation may be used, by professionals experienced in riparian vegetation ecology). If in doubt, consult with the City's Environmental Planner.

Be advised that the City of Burnaby has applied this methodology to **stream** reaches across Burnaby to identify a SPEA and that this information is available to the public by contacting the Planning and Development Department or by reviewing a specific parcel of land in Burnaby Map (City online mapping application). In accordance with the Streamside Protection and Enhancement Development Permit guidelines, a Development Permit application may use the parcel specific SPEA as identified by the City of Burnaby or a QEP may undertake the assessment methodology outlined below to calculate the SPEA for acceptance by City staff.

Part I Assessment

Step 1: Is the stream contained within a ravine? (If no, proceed to Step 2.) If yes, determine the average width of the ravine from one Top of Ravine Bank to the other, in relation to the subject lot (see Appendix 1).

- The average width of the **ravine** can be calculated by taking a total of eleven (11) separate **ravine** width measurements evenly spaced apart at 40 metres or per QEP judgement based on the length of **ravine** reach both upstream and downstream from the starting point for the measurements, which is the center of the property. The measurements are averaged. Where the **ravine** evidently transitions and has 'reaches', the QEP should determine the **ravine** width for each separate reach break. Further, where a road crossing or other unnatural modification exists, the measurement should be taken upstream or downstream of the influenced section. Explanation of measurements are to be clear and scientifically defensible in the QEPs report.
- A '**top of bank**' layer is available in Burnaby Map (City online mapping application) that shows **top of bank**, and **top of ravine bank** where a **ravine** condition is present. The City of Burnaby has used this information to pre-determine applicable SPEAs for the two **ravine** conditions in Part 4 - 4.2 of the Zoning Bylaw. A **development** application can be based on this information or a QEP can calculate the **ravine** width based on Burnaby Map, a topographic survey and field reconnaissance, or a combination of these different methods.

Note: generally, the width of a **ravine** should be measured perpendicular to the general orientation of the **stream** (if the **stream** meanders within a **ravine**, these minor deviations should not affect the orientation of the width measurement).

Note: Per Part 4 - 4.2 (3b) of the Zoning Bylaw, the width of the **ravine** as measured from one **top of ravine bank** to the other shall exclude the width of the stream channel within active floodplain boundaries. A conservative estimate of stream channel and active floodplain, based on field reconnaissance or inquiry to the City's environmental planner is sufficient.

- If the average width is less than 60m, proceed to Step 2 and the following steps, measuring the vegetation width from the **top of ravine bank**.
- If the average **ravine** width is greater than 60m, a SPEA of 10m applies, measured from the **top of ravine bank**. (No further steps are necessary.)

Step 2: Determine existing or potential vegetation (EPV) width.

- If the **stream** lies alongside the property that only one side has setbacks applicable to the **development**, take only measurements along this side of the **stream** to determine average EPV width.
- If the **stream** flows through the property such that setbacks on both sides are applicable, take measurements on either side of the stream, at 40m intervals along the channel beginning in the centre of the lot, and determine the average width overall (including measurements from both sides together for one average).
- Using an airphoto of the site and surrounding area, obtain a series of EPV width measurements, beginning at the centre of the lot and extending up and downstream at 40m intervals, to a maximum of 5 intervals upstream and 5 intervals downstream (unless the **stream** is shorter than this length; see below), for a total of 11 measurements.
 - o Include only the **stream** channel being assessed, not higher-order (larger) **streams** into which the **stream** flows, nor smaller tributary channels.
 - o If the **stream** is less than 400m long (such that 11 measurements cannot be made), take as many measurements as possible at 40m intervals.
 - o If the **stream** is less than 80m long in total, take at least three evenly spaced measurements to determine vegetation width.
 - o Ensure that measurements are taken at least 10m from a culvert or road crossing (see below).
 - o If the property is located at the upper or lower end of a **stream**, take 11 measurements if the **stream** length allows.
- Beginning at the center of the subject site, take a width measurement, extending perpendicularly from the **top of bank** to a maximum of 50m or until reaching the edge of a permanent structure¹(building with foundation or a municipal road , not including laneways), then record the EPV widths at 40m intervals in the upstream and downstream direction. The 40m interval is measured along the **top of bank**, not along the **stream** channel.
- If a road crossing or culvert is encountered when measuring along the **stream** for the 40m interval, record the distance measured along the channel up to that structure, move to the opposite side of the structure, and resume interval measurement until a 40m distance is covered.
- The EPV width locations should be located at least 10m from a culvert/bridge or road crossing.²

¹ This is based: a) on older RAR Methodology (2007), used by City of Burnaby, indicating that only buildings with foundations are considered permanent structures for purposes of measuring EPV, and b) the rationale that municipal roads should also be considered permanent, since for all practical purposes such structures will not be taken out (if they *are* proposed to be taken out in a particular case, or could be, they should not be considered 'permanent'). This modified approach is justified as long as the resulting SPEA is not less than what would result from application of the Detailed RAPR methodology. Note that other types of permanent structures may be grandparented within streamside protection and enhancement areas where they already exist, at the discretion of the City and following the policy on existing buildings.

² Reference: BC Riparian Areas Regulation Assessment Methodology for Simple Assessment, modified for Burnaby's vegetation classes.

- Up to 11 measurements should be made for a single-sided assessment, and 22 measurements for a dual-sided assessment (i.e. if a **stream** runs through a property such that setbacks from both sides affect **development**).
- EPV calculation should be based on similar **development** and land use conditions. The distance upstream and downstream of a subject lot for which EPV measurements are taken may be modified by the QEP if a significantly different land use or **development** condition is encountered. For example, where an already developed lot is located near a park or natural area, these areas may be excluded from the EPV calculation.
- Calculate the average EPV width from the above measurements. Use this width to determine which vegetation category applies per Part 4 - 4.2 of the Zoning Bylaw (see Part III below).

Step 3: Determine if a stream is fish-bearing or non-fish-bearing (note: default is fish-bearing).

The City of Burnaby's watercourse classification GIS layer assigns a watercourse classification of Class A (**fish-bearing**) or Class B (**non-fish bearing**) to most mapped **streams** in Burnaby based on the factors noted below. A QEP, as part of a **development** application, must assess the status of unclassified **streams** and may reassess an existing classification, for consideration of the City. A QEP may propose a change in status based on evidence and rationale as noted below.

Some methods to determine **fish** presence include:

- Burnaby watercourse classification (see Burnaby Map)
- FISS database and other historical records
- Staff records and observations
- Stewardship groups records and observations

In order to demonstrate absence of fish, one of the following conditions must be met (Reference: BC Riparian Areas Protection Regulation Technical Assessment Manual Methodology):

- **Stream** gradient is >20% AND there is no upstream low-gradient or lake system where resident **fish** species could be present.
- A natural barrier to **fish** passage occurs, such as falls or steep cascades too high even in high flows for **fish** to jump, AND there is no upstream low-gradient or lake system where resident **fish** species could be present.
- Human made permanent barriers (that cannot be reasonably modified to allow **fish** passage) are present and prevent **fish** passage, AND there is no upstream low-gradient or lake system where resident **fish** species could be present.
- Very low flows or absence of flows occur during critical life history stages that preclude migration and upstream access AND there is no upstream low-gradient or lake system where resident **fish** species could be present to populate the reach in question at certain times of year.
- If barriers or grades are not factors but **fish** are suspected to be absent from the system, a detailed **fish** sampling procedure must be carried out, including sampling at various times of year and flow conditions, throughout the entire length of **stream** (not just at the property/location in question).

Step 4: Determine if stream is permanent or non-permanent. Permanent stream “means a stream that typically contains continuous surface waters or flows for periods more than 6 months duration.” In the absence of strong evidence to make this determination, the stream should be assumed to be permanent.

- This is interpreted to mean that flowing water can be seen flowing over the surface of the **stream** channel continuously over 6 months (at no time in any 6 month period of the year is the **stream** completely “dry”). Daily flow records are rarely kept for small **streams**, therefore characteristics such as topography, drainage area, geology, riparian vegetation, etc., may be used to estimate the probability of permanent status.

Part II – Calculate Streamside Protection and Enhancement Area (SPEA)

Step 5: Using the information gathered in Part I, to determine the SPEA.

Existing or Potential Vegetation (EPV) Categories: use the average vegetation width calculated in Step 2; for the purpose of categorization round to the nearest metre.

- I. ≥ 50m
- II. 30m to 49m
- III. 15m to 29m
- IV. <15m

The width of a SPEA shall be as set out in Tables 4-4.2a and 4-4.2b below (extracted from the Zoning Bylaw). Using Table 4-4.2a consider the average EPV, **fish-bearing** status, and **stream** permanence to arrive at the minimum required SPEA.

(a) Minimum width of SPEA for streams including streams in **ravines** less than 60 m wide (as measured from **top of bank to top of bank**, excluding **stream** channel within **active floodplain** boundaries) shall be as follows:

Table 4-4.2a | Minimum SPEA for Ravines Less than 60 m

Average Width of Existing or Potential Vegetation	SPEA		
	<i>Fish-Bearing Stream</i>	<i>Non-Fish-Bearing Stream</i>	
		Permanent Stream	Non-Permanent Stream
50 m	Min. 30 m	Min. 30 m	Min. 15 m
30 m to < 50 m	Min. 30 m	Min. 30 m	Min. 15 m
15 m to < 30 m	Min. 15 m*	Min. 15 m	Min. 15 m
< 15 m	Min. 15 m*	Min. 5 m, Max 15 m*	Min. 5 m, Max 15 m*

*Minimum width of SPEA is the greater of:

(a) width of average existing or potential vegetation; and (b) the minimum SPEA width indicated.

(b) Minimum width of SPEA for streams in **ravines** more than 60 m wide (as measured from top of bank to top of bank, excluding stream channel within active floodplain boundaries) and ditches shall be as follows:

Table 4-4.2b | Minimum SPEA for Ravines Greater than 60 m and Ditches

Watercourse Category	SPEA
Stream in a ravine that is more than 60 m wide	Min. 10 m
Ditch that is a fish-bearing stream	Min. 10 m
Ditch that is a non-fish-bearing stream	Min. 5 m

Appendix 1 - Top of Bank and Top of Ravine Bank

Note that the RAPR states that a **ravine** must have two sides and cannot occur next to a lake. If there is only one side to the steep slope area, the usual **top of bank** definition would apply.

The determination of a '**ravine**' is important because if the width of the **ravine**, from one **top of ravine bank** (TORB) to the opposite TORB is greater than 60m, the Riparian Assessment Area and the streamside protection and enhancement area required is 10m. For **ravines** less than 60m wide, the normal setback, as for **streams** not in a **ravine**, applies as outlined above (measured from the TORB), and may be as much as 30m.

For illustration, the following diagram shows four scenarios, in order to demonstrate different types of "**top of bank**" situations.

Scenario 1 shows a simple topographic '**top of bank**,' where the TOB is determined based on the criteria of being the point at which there is a break in slope greater than 15m at less than 3:1 slope. The riparian assessment area is measured from these lines on either side of the **stream**, back 30m, to determine if the proposed **development** is subject to the streamside protection and enhancement **development** permit. If **development** is proposed within this area, the SPEA would also be measured from the TOB.

Scenario 2 shows a situation where the **top of bank** is the 'edge of the **active floodplain**,' and is determined based on a change in vegetation and soil characteristics rather than topography. In these situations, it is particularly important to ensure the site is assessed by a QEP.

Scenario 3 shows a simple **ravine** with the **top of ravine bank** (TORB) as the location where the slope changes to less than 3:1, for more than 15m. The width of the **ravine** from one TORB to the other affects the width of the riparian assessment area and SPEA, as stated above.

Scenario 4 shows a **ravine** with a 'bench' located within the **ravine** that has less than a 3:1 slope and is wider than 15m. This feature makes the edge of the bench the TORB, as it is the first break in slope fitting these criteria. In this case the opposite TORB is at a higher elevation. The horizontal distance between the two TORB is the width of the **ravine**, used to determine if a 10m or wider setback applies. The setback is measured from the TORB. On the slope on the left of the diagram, the slopes above the TORB are not considered to be part of the '**ravine**' for the purposes of the bylaw (and provincial regulation), and may or may not be entirely included in the setback. If a proponent wishes to construct a building on the slope, they must still comply with geotechnical requirements. In some cases the Planning and Development Department (or higher jurisdictions) may still require protection of those slopes if necessary to protect downslope values including the riparian zone.

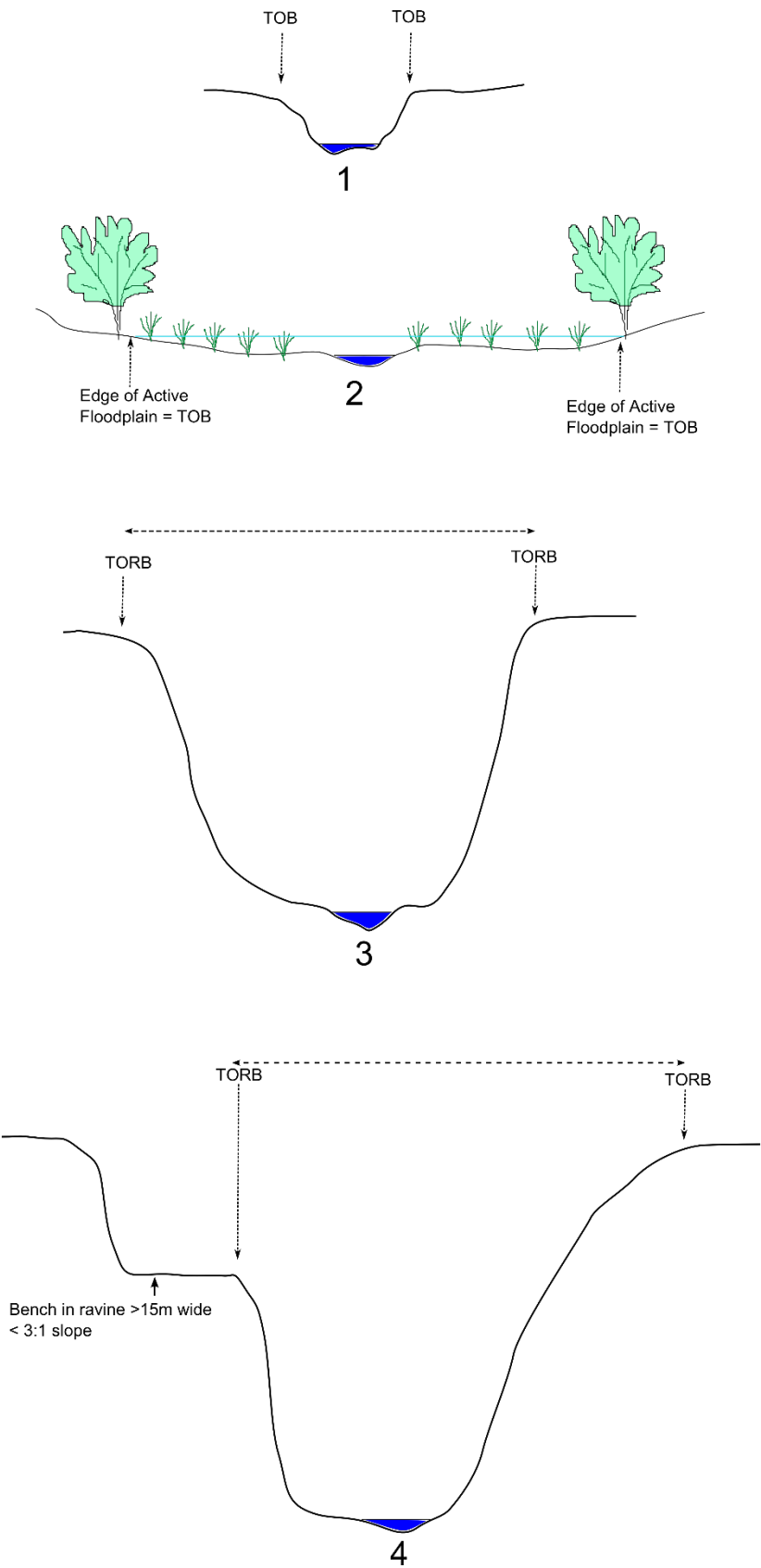


Diagram: Top of Bank and Top of Ravine Bank (see previous description, refer to numbers in sketch)

Appendix 2 - Streams in City of Burnaby: definition, interpretation and mapping

- Per the Zoning Bylaw and for the purpose of the Streamside Protection and Enhancement Development Permit : a '**stream**' means a source of water supply, whether usually containing water or not, including a pond, lake, river, creek, brook, **ditch**, spring or **wetland** that is integral to a **stream** and provides **fish** habitat (Class A or A/O) or water, food, and nutrients downstream (Class B).
- The above definition aligns with the *Riparian Areas Protection Regulation* (RAPR), is interpreted similarly, i.e. "a **stream** (is defined) as any **stream** – natural or human-made – that provides **fish** habitat that contains water on a perennial or seasonal basis, is scoured by water or contains observable deposits of mineral alluvium, or has a continuous channel bed including a stream that is obscured by overhanging or bridging vegetation or soil mats. A **stream** may not itself be inhabited by **fish**, but may provide water, food and nutrients to streams that do support **fish**." Side channels, intermittent streams, seasonally wetted contiguous areas are included by the definition of as stream which includes **active floodplains** and **wetlands** connected to **streams**." (RAPR Technical Assessment Manual, November 2019, V1.1)
- The term "integral" in the stream definition means "connected by surface flow." Flows through culverts are still normally considered to be surface flow, since the culvert is a human-made structure, and the flows may still support downstream **fish** habitat.
- Stream channels are required to have evidence of scour and/or deposits of alluvium or has a continuous channel bed including a watercourse that is obscured by overhanging or bridging vegetation or soil mats. Therefore, an area that contains, for example, a temporary pool of water and does not have these characteristics would not be considered a **stream**. Note, however, that the term "**stream**" includes other features in addition to channels, as noted above.
- The term '**wetland**' is defined in the Streamside Protection and Enhancement Development Permit guidelines as follows: means land that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal conditions does support, plant species that are typical of inundated or saturated soil conditions, including swamps, marshes, bogs, fens, estuaries, and similar areas that are not part of the active floodplain of a stream, and where such land is connected by surface flow to a stream.
- **Active floodplain** is defined in the Streamside Protection and Enhancement Development Permit guidelines and can be delineated based on documented frequency of flooding, presence of deposited debris or fluvial sediments, and vegetation/soil characteristics. The boundary of the **active floodplain** may be different from City floodplain mapping, which is usually based on a 200 year flood and is intended for purposes related to planning and building. Small watercourses may or may not have active floodplains, and it is important to correctly identify such areas, since this forms the line from which the *Streamside Protection and Enhancement Area* is measured, unless there is a topographic **top of bank** or **top of ravine bank** involved. In Burnaby, '**top of bank**' as defined in Part 4 - 4.2 of the Zoning Bylaw is representative of 'stream boundary' as defined in the RAPR with consideration of Burnaby's urbanized watersheds and streams.

The City of Burnaby applies streamside protection to land parcels adjacent to the Fraser River and tidally influenced **streams** within the Big Bend area. With respect to identifying the top of bank for the Fraser River, and with professional judgement of the QEP, the following criteria should be considered:

- In cases where there is no dike on the subject site, or where an existing dike was constructed outside of the foreshore, the **top of bank** is located at the edge of the **active flood plain** or natural boundary of the river. The location of a future dike should be setback and designed to allow for riparian protection and restoration.
- In cases where there is an existing dike in the foreshore, the **top of bank** is located at the crest of the dike
- Note that a **stream** that appears to be a '**ditch**' may be considered a **channelized stream** with regards to the application of the Streamside Protection and Enhancement Development Permit, e.g. in areas where natural **streams** or **wetlands** were dug-out to facilitate drainage, but that still fit the definition of a **stream**. **Ditches** not considered streams are exempt from the Streamside Protection and Enhancement Development Permit, these features are generally straight, entirely man-made (not part of the historical drainage network), only carry flows during and immediately after a rain event, from runoff of localized areas, and will not meet the definition of a stream under the provincial *Riparian Areas Protection Regulation* or *Water Sustainability Act*.
- Burnaby Map presents the following digital layers for information and use:
 - o **Top of bank** and **top of ravine bank**, based on GIS analysis of topography and LiDAR data sets
 - o **Stream, ditch**, and **wetland** mapping, based on GIS analysis of topography, overland flow and LiDAR data sets
 - o Watercourse Classifications based on **fish-bearing** and **non-fish bearing** status. This data set is a compilation of provincial databases, historical field assessments, and local knowledge
- Through the Streamside Protection and Enhancement Development Permit process, the City of Burnaby may require a QEP to assess a parcel for presence of unmapped **streams**, including **ditches** and **wetlands**. Burnaby Map contains a separate layer of mapped **ditches**, which may be used by the City or a QEP to plan a field assessment.
- A landowner or QEP is recommended to contact the Environmental Planner at the City of Burnaby regarding any questions about **stream** mapping and interpretation in relation to the Streamside Protection and Enhancement Development Permit.

Appendix 3 – Connection to Section 6.23 Streamside Protection and Enhancement Areas in the Repealed Zoning Bylaw (Bylaw 4742)

Tables 4-4.2a and 4-4.2b referenced in this document have been extracted from the current Zoning Bylaw and are based on Burnaby's streamside protection provisions as set out in Section 6.23 of the repealed Zoning Bylaw (Bylaw 4742), which was adopted in 2005. These former streamside protection provisions are noted below for information.

- A. **Streamside Protection and Enhancement Areas** are those areas determined with reference to the following **existing or potential vegetation** conditions by measuring perpendicularly away from the **top of the bank** or **top of the ravine bank** on either side of a **stream**:
 - i. intact and continuous areas of **existing or potential vegetation** equal to or greater than 50 metres wide;
 - ii. limited but continuous areas of **existing or potential vegetation** equal to 30 metres wide or discontinuous but occasionally wider areas of **existing or potential vegetation** between 30 and 50 metres wide;
 - iii. narrow but continuous areas of **existing or potential vegetation** equal to 15 metres wide or discontinuous but occasionally wider areas of **existing or potential vegetation** between 15 and 30 metres wide;
 - iv. very narrow but continuous areas of **existing or potential vegetation** up to 5 metres wide or discontinuous but occasionally wider areas of **existing or potential vegetation** between 5 and 15 metres wide interspersed with **permanent structures**.

- B. With reference to vegetation conditions in section A above, **streamside protection and enhancement areas** must be:
 - i. if subsection (a)(i) or (ii) applies, at least 30 metres wide measured perpendicularly away from the **top of bank** for all **fish bearing streams** or for **non fish bearing streams** that are **permanent**;
 - ii. if subsection (a)(i), (ii) or (iii) applies, at least 15 metres wide measured perpendicularly away from the **top of bank** for **non fish bearing streams** that are **non-permanent**;
 - iii. if subsection (a)(iii) applies, at least 15 metres wide measured perpendicularly away from the **top of bank** for **non fish bearing streams** that are **permanent**;
 - iv. if subsection (a)(iii) or (iv) applies, the greater of the widths determined under subsection (a) (iii) or (iv) or at least 15 metres wide measured perpendicularly away from the **top of the bank** for all **fish bearing streams**;
 - v. if subsection (a)(iv) applies, at least 5 and up to 15 metres wide measured perpendicularly away from the **top of the bank** for all **non fish bearing streams**.

- C. If a **stream** is in a **ravine** that is less than 60 metres wide in total width from **top of the ravine bank** to **top of ravine bank**, not including the **stream** channel within its **active floodplain** boundaries, protection is to be consistent with subsection (b)(i) through (v), where appropriate, from the **top of ravine bank**.

- D. If a **stream** is in a **ravine** that is more than 60 metres in total width from **top of ravine bank** to **top of ravine bank**, not including the **stream** channel within its **active floodplain** boundaries, a streamside protection and enhancement area must be at least 10 metres wide measured perpendicularly away from the **top of ravine bank**.