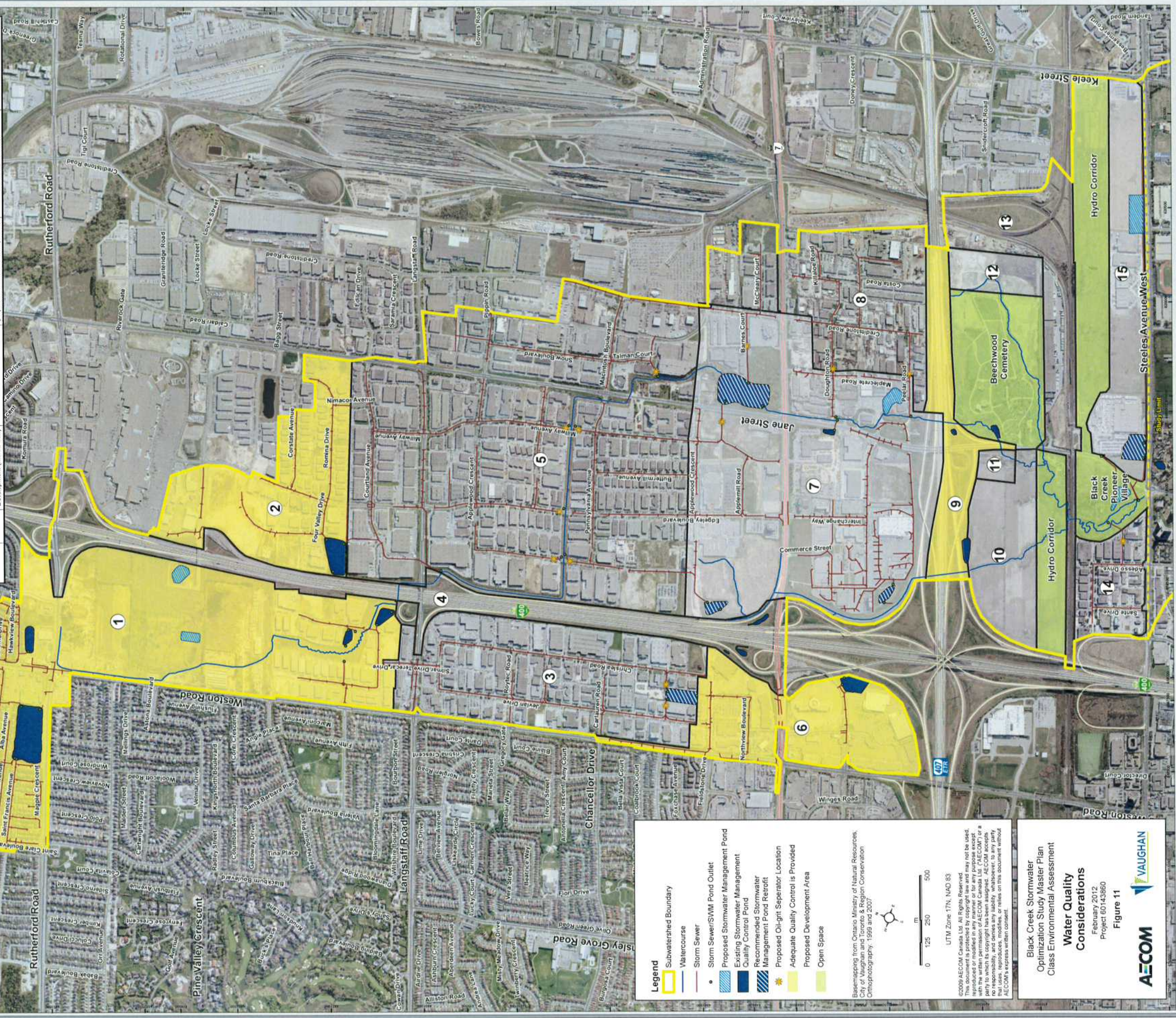


Catchment ID	Area (ha)	Land Use	Current WQ Control	WQ Improvement Alternatives	Recommended Strategy	Proposed SWM Control
1	310	Residential/Commercial/Industrial	Enhanced (80% TSS removal)	None	None	Same as current
2	70	Commercial/Industrial	Enhanced (80% TSS removal)	None	None	Same as current
3	100	Commercial/Industrial	None	1. Do Nothing 2. SWM Pond Retrofit 3. Centralized Oil-Grit Separators	SWM Pond Retrofit	Basic (65% TSS removal)
4	75	Hwy 407 Corridor	None	None	City to discuss potential improvement measures with MTO	TBD
5	317	Commercial/Industrial	Enhanced (80% TSS removal)	1. Do Nothing 2. SWM Pond Retrofit 3. Centralized Oil-Grit Separators	SWM Pond Retrofit	Basic (60% TSS removal)
6	60	Commercial/Industrial	Varies	None	None	Same as current
7	213	Proposed VMC Development (Mixed Use)	None	None (to be addressed through proposed VMC development)	Implement proposed SWM servicing strategy	Enhanced (80% TSS removal)
8	61	Commercial/Industrial	None	1. Do Nothing 2. SWM Pond Retrofit 3. Centralized Oil-Grit Separators	Construct SWM pond	Enhanced (80% TSS removal)
9	30	Hwy 407 Corridor	13 mm/2-hour storm & removal of sediment >40 microns	None	None	Same as current
10	34	Proposed Transit Oriented Development (Mixed Use) and MTO Service Yard	None	None	Implement SWM servicing strategy that satisfies City/TRCA criteria for future development	Enhanced (80% TSS removal)
11	5	Proposed TTC Hwy 407 Subway Station	None	None (to be addressed through proposed TTC development)	Implement proposed SWM servicing strategy	Enhanced (80% TSS removal)
12	12	Proposed linear Development	None	None (to be addressed through proposed linear development)	Implement proposed SWM servicing strategy	Enhanced (80% TSS removal)
13	47	CNR Corridor	None	None	City to discuss potential improvement measures with CNR	TBD
14	26	Commercial/Industrial	None	1. Do Nothing 2. SWM Pond Retrofit 3. Centralized Oil-Grit Separators	SWM Pond Retrofit	Enhanced (80% TSS removal)
15	48	Proposed OPA 620 Development (Mixed Use)	None	None (to be addressed through proposed OPA 620 development)	Implement proposed SWM servicing strategy	Enhanced (80% TSS removal)



- Legend**
- Subwatershed Boundary
  - Watercourse
  - Storm Sewer
  - Storm Sewer/SWM Pond Outlet
  - Proposed Stormwater Management Pond
  - Existing Stormwater Management Pond
  - Recommended Stormwater Management Pond Retrofit
  - Proposed Oil-grit Separator Location
  - Adequate Quality Control is Provided
  - Proposed Development Area
  - Open Space

Basemapping from Ontario Ministry of Natural Resources  
City of Vaughan and Toronto & Region Conservation  
Orthorectification - 1999 and 2007

UTM Zone 17N, NAD 83

0 125 250 500  
m

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Black Creek Stormwater  
Optimization Study Master Plan  
Class Environmental Assessment

**Water Quality Considerations**

February 2012  
Project 60143960  
Figure 11

**AECOM** **VAUGHAN**

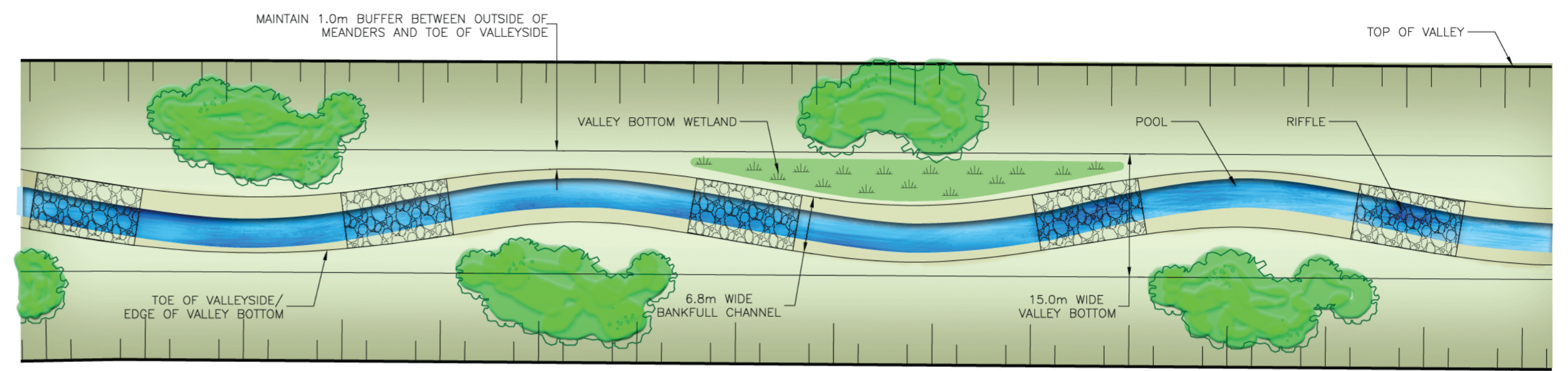
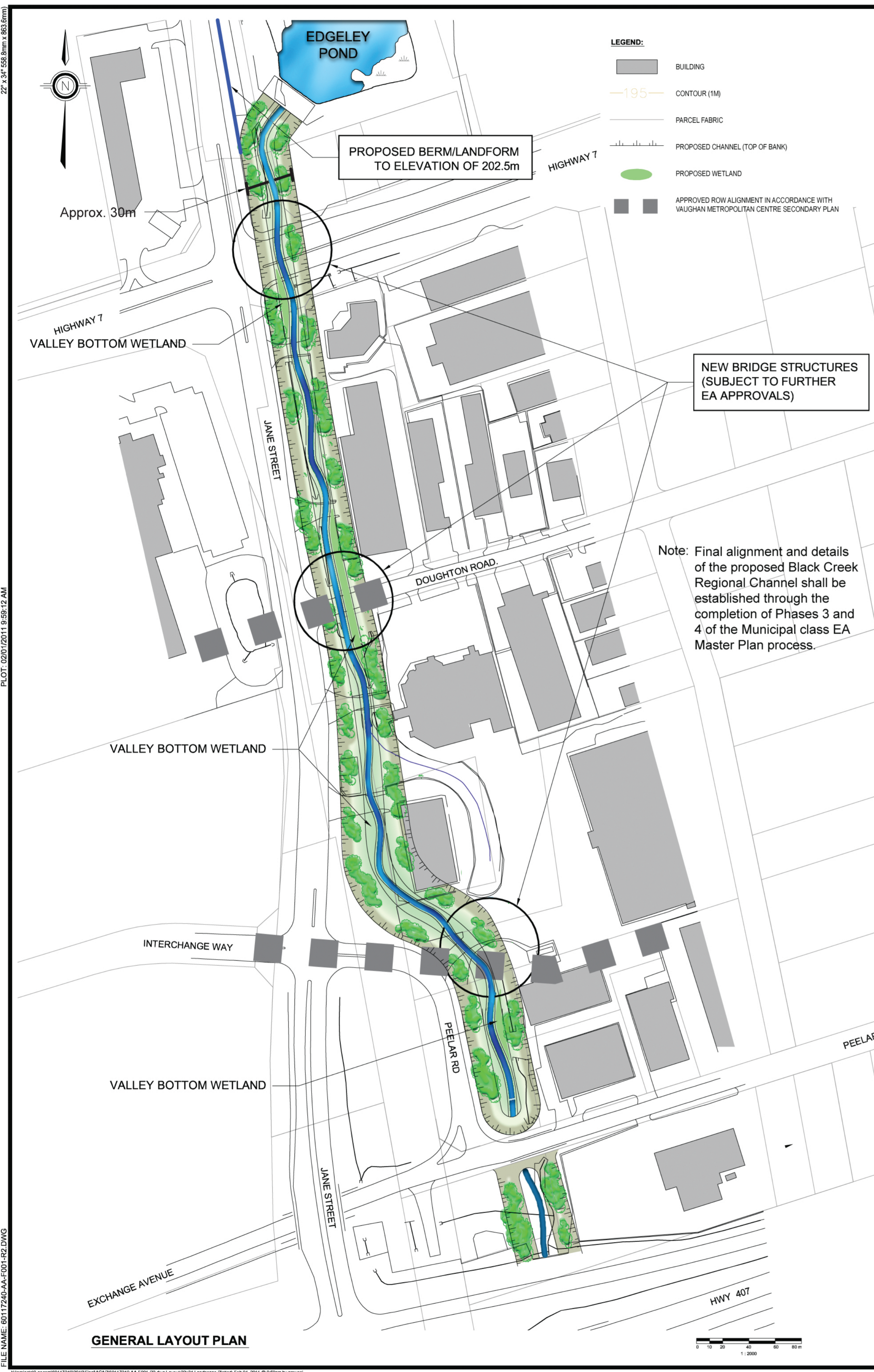




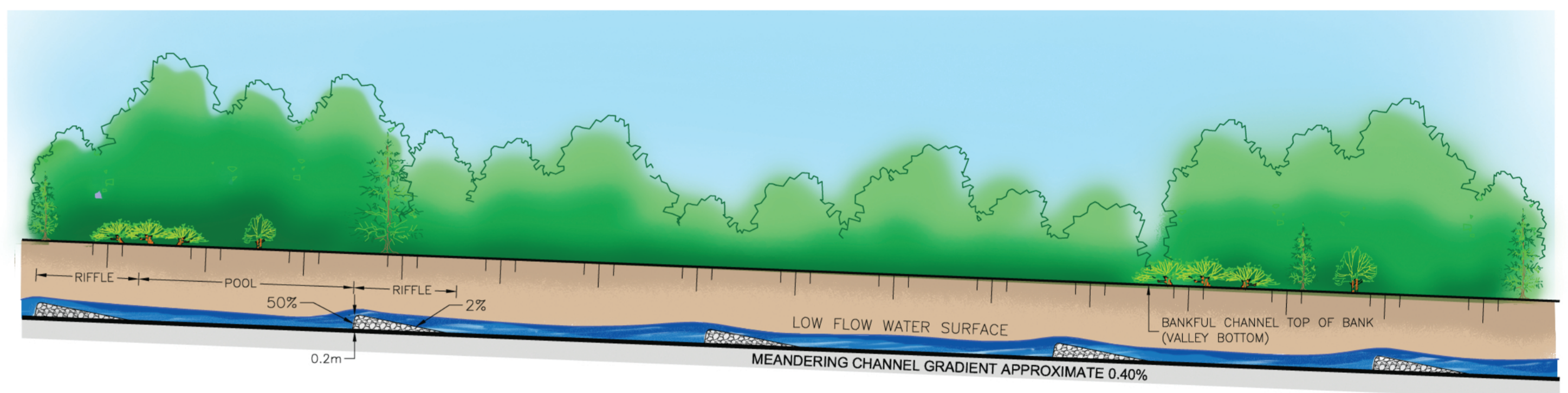
Erosion Site	Reach	Erosion Observations	Cause of Erosion	Recommended Restoration Strategy	Lead Organization	Priority
ES1	1	Significant erosion is occurring along outer bank of meander near the existing storm sewer outfall and cobblestone deflector.	Natural erosion along outer bank of meander, with concentrated flow near the edge of the outflanked cobblestone deflection berm.	Replace rip-rap deflection berm with cobble riffle, construct flow retarding bars along upstream end of meander and install brush mattress along eroding bank.	City of Vaughan (in consultation with landowner - TRCA)	Low
ES2	1	Undercutting of bank has resulted in the collapse of an old wooden fence into the channel.	Natural erosion along outer bank of meander is causing undercutting and subsequent collapse of fence.	Remove collapsed segment of fence from channel and install live stakes along eroding bank.	City of Vaughan (in consultation with landowner - TRCA)	Low
ES3	1	Gabion baskets along west bank near SWM pond overflow spillway have been undermined and are collapsing into channel.	Degradation (down-cutting) and natural erosion along outer bank of meander, exacerbated by periodic pond overflow.	Remove gabion baskets, re-grade bank to match adjacent portions of the channel and install live stakes.	City of Vaughan (in consultation with landowner - TRCA)	Medium
ES4	1	Discontinuous rip-rap and filter cloth lining banks have narrowed channel and exacerbated bank erosion.	Increased velocities through narrow channel, and local flow obstructions have concentrated flow along banks.	Remove rip-rap and filter cloth, restore bank and install live stakes along bank.	City of Vaughan (in consultation with landowner - TRCA)	Low
ES5	1	Erosion is occurring along ~2m high outer bank of meander.	Erosion along outer bank of meander is the result of natural fluvial processes.	No restoration proposed, given natural fluvial process and no immediate risk to public safety or property.	N/A	N/A
ES6	West Tributary	Erosion of gravel road embankment causing the transport of fill material into channel and localized bed scour at outlet of culvert.	Surface runoff has formed rills and outflow from perched culvert is causing incised gully into gravel road embankment.	Install erosion blankets on the road fill embankments and increase plantings along the lower portion of the downstream embankment to help trap sediment.	City of Vaughan (in consultation with landowner - MEI, as part of proposed development)	Low
ES7	2	Erosion along the outer bank of the meander at the toe of the CN Rail embankment, where channel is forced to bend sharply westward.	Trajectory of flow from upstream segment of bed-armoured channel is angled directly into railway embankment.	Install and monitor erosion pins along outer bank of meander to determine the rate of erosion, followed by the implementation of appropriate erosion protection measures.	City of Vaughan (in consultation with landowner - CN Rail)	High
ES8	2	Improperly placed boulders, debris and cobble weirs have exacerbated local bank erosion.	Boulders, debris and cobble weirs have reduced the channel capacity and are deflecting flow into un-armoured portions of banks.	Remove the flow-obstructing materials from the channel to increase capacity and consider the installation of bioengineering measures along un-armoured banks.	City of Vaughan (in consultation with landowner - MEI, as part of proposed development)	Low
ES9	2	High valley-side cut-bank is gradually being undercut along outer meander bank, above which private property extends to the crest of the slope.	Degradation (down-cutting) and natural erosion along outer bank of meander, exacerbated by local bed steepness and seepage from lower valley-side.	Install and monitor erosion pins along outer bank of meander to determine the rate of erosion, followed by the implementation of appropriate erosion protection measures.	City of Vaughan (in consultation with landowner - MEI, as part of proposed development)	High
ES10	2	High valley-side cut-bank below a Hydro One transmission tower is gradually being undercut along the outer bank of a meander.	Natural erosion along outer bank of meander.	The proposed realignment of Black Creek to facilitate the TTC Spadina Subway Extension project (Hwy 407 station) will address the erosion issues identified at this location.	Toronto Transit Commission	Medium
ES11	2	Erosion along outer bank of meander, at the edge of a farm access driveway and residential property.	Natural erosion along outer bank of meander.	The proposed realignment of Black Creek to facilitate the TTC Spadina Subway Extension project (Hwy 407 station) will address the erosion issues identified at this location.	Toronto Transit Commission	Low
ES12	East Tributary	Considerable erosion is occurring along the northern bank of the channel, approximately 1m from the base of an existing Hydro One tower.	Degradation (down-cutting), widening and local retrogressive erosion (head-cutting).	The proposed realignment of Black Creek to facilitate the TTC Spadina Subway Extension project (Hwy 407 station) will address the erosion issues identified at this location.	Toronto Transit Commission	High
ES13	3	Localized bank instability along the berm between the channel and Beechwood Cemetery pond.	Natural widening of historically narrowed and straightened channel segment.	Realign and re-size the channel in the vicinity of the pond and protect the berm from future erosion through installation of geotextile and rip-rap.	City of Vaughan (in consultation with landowner - Beechwood Cemetery)	High
ES14	3	Erosion is occurring along ~2m high outer bank of meander.	Degradation (down-cutting) and natural erosion along outer bank of meander.	No restoration proposed, given natural fluvial process and no immediate risk to public safety or property.	N/A	N/A
ES15	3	Minor erosion is occurring along the toe of the valley-side, above which the eastbound on-ramp to Hwy 407 is set back ~30m.	Natural erosion along the toe of the steep valley-side.	Install and monitor erosion pins along outer bank of meander to determine the rate of erosion, followed by the implementation of appropriate erosion protection measures.	City of Vaughan (in consultation with landowner - MTO)	Low
ES16	4	Severe undercutting of alternate banks, which has caused the banks to collapse and the creation of obstructions to flow.	Degradation (down-cutting) of banks, which has led to channel entrenchment and thalweg sinuosity within the historically straightened reach.	Install and monitor erosion pins along outer bank of meander to determine the rate of erosion, followed by the implementation of appropriate erosion protection measures.	City of Vaughan (in consultation with landowner)	Medium
ES17	4	Gabion basket retaining wall has been undermined by scouring of the channel bed, which has resulted in significant structural instability.	Degradation (down-cutting) and erosion of foundation soils of the gabion basket retaining wall.	Geotechnical assessment to be carried out, followed by the replacement of the retaining wall structure and the construction of a stable pool-riffle sequence within the channel.	City of Vaughan (in consultation with landowner)	High
ES18	4	An unused road crossing has been overtopped and breached by floods, resulting in partial channel blockage by rubble, debris and fallen trees and inundation of a mature forest upstream of the crossing.	Fluvial incision and colluvial collapses while floodwaters overtopped undercapacity and/or blocked CSP culverts beneath the unused road crossing.	Remove the destroyed culverts, rubble and debris and reconstruct the channel and valley such that floodwaters are safely conveyed and aquatic and terrestrial habitats are restored.	City of Vaughan (in consultation with landowner)	Low

Note: The proposed scheduling of the recommended restoration strategy priorities is 1-3 years (high), 3-5 years (medium) and >5 years (low).

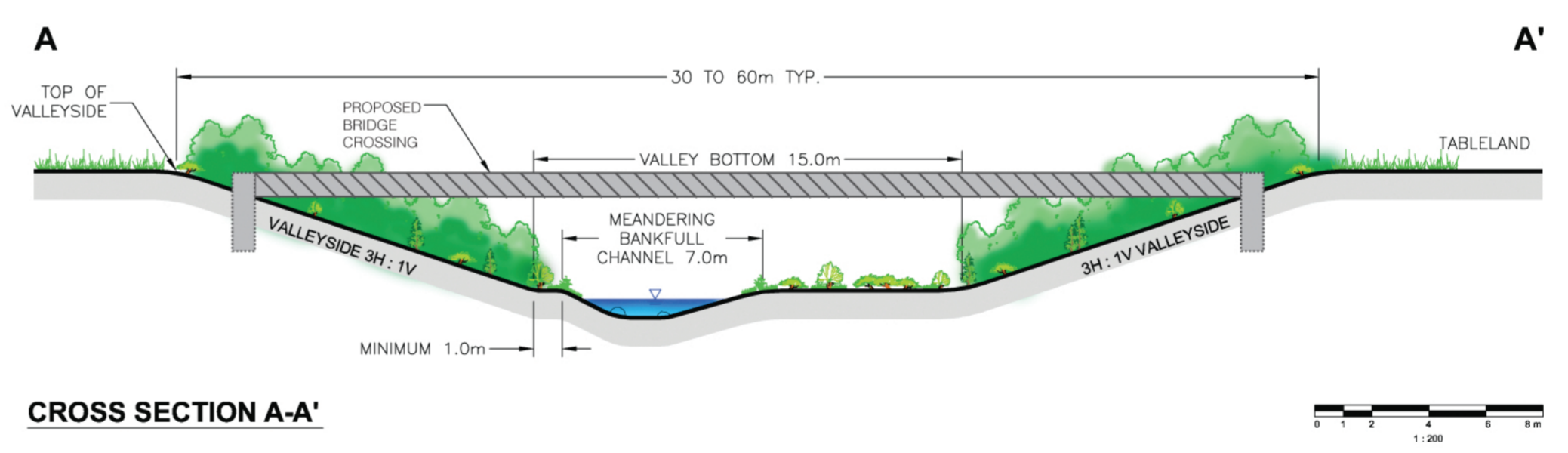




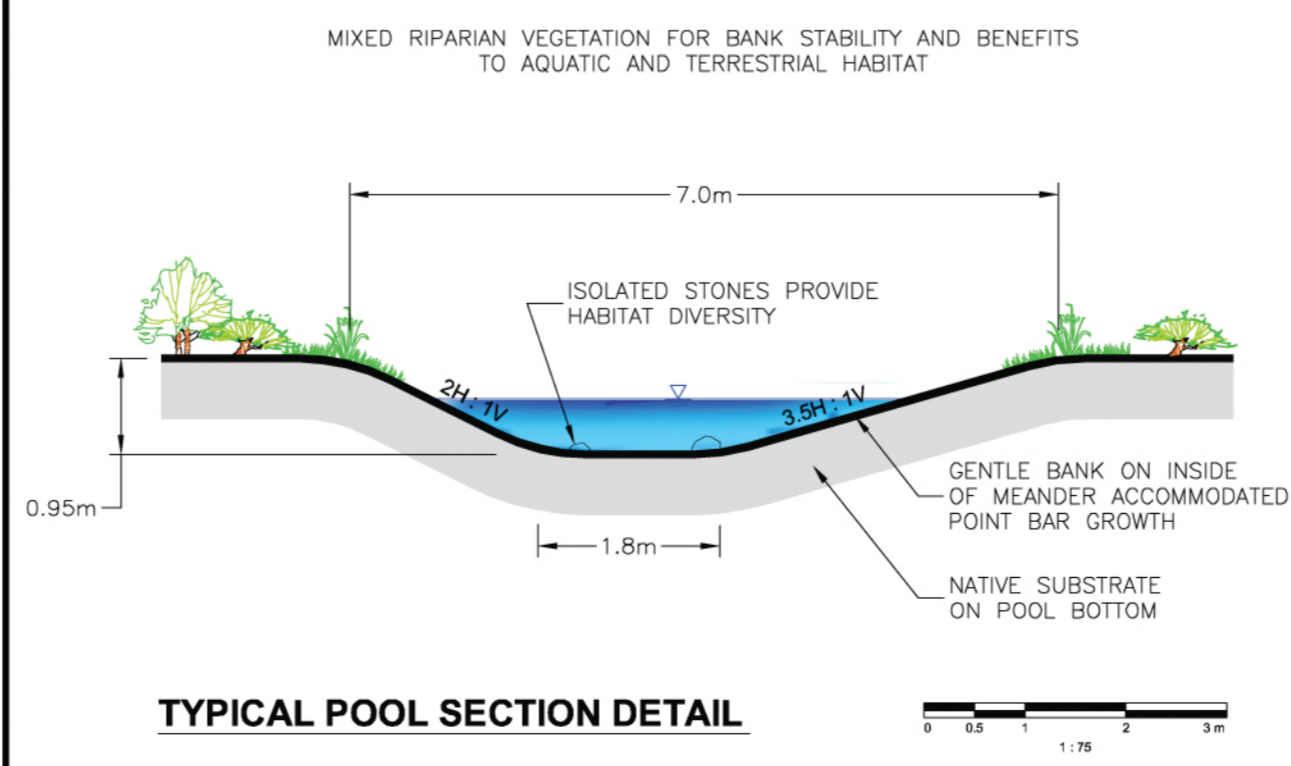
TYPICAL CHANNEL PLAN



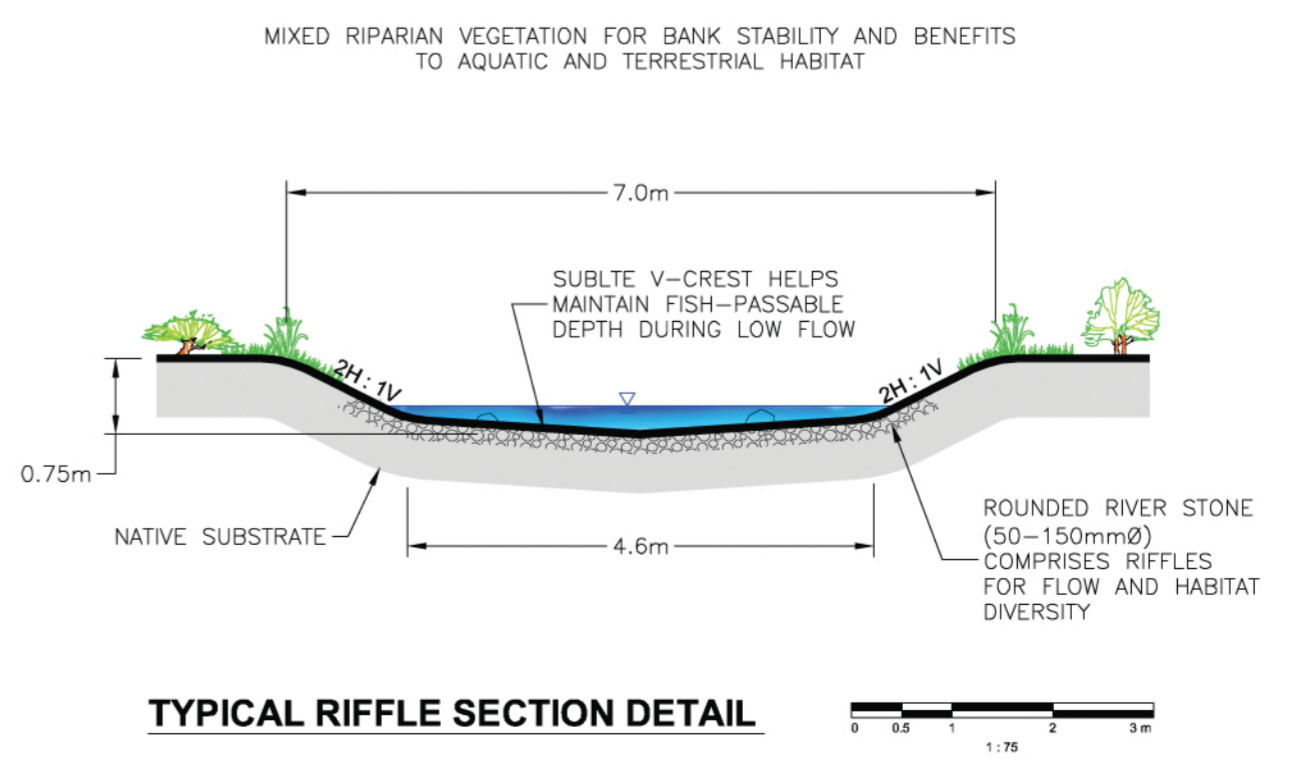
TYPICAL CHANNEL PROFILE



CROSS SECTION A-A'



TYPICAL POOL SECTION DETAIL



TYPICAL RIFFLE SECTION DETAIL

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**Black Creek Stormwater Optimization Study Channelization Concept for Preferred EA Flood Control Alternative (F4)**

PROJECT NUMBER	DATE	FIGURE
60117240	May, 2011	13

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