



Stormwater Management Criteria Flood Control

Black Creek Pioneer Village
April 26, 2012



Credit Valley
Conservation

Outline

- Overview
- Monitoring Findings & Recent Peak Flow Studies
- Regional Flows
- High Intensity Short Duration Storms
- Flood Management

Flood Control

Objective

Protect downstream properties from flood increases due to upstream development (for the 2-100 year and Regional Storms)



Flood Damage to Private & Public Properties

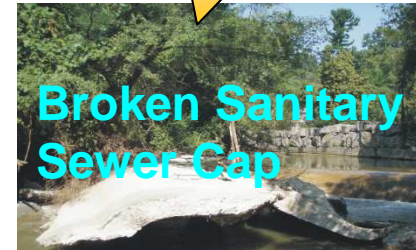
Basement Flood Damage



Front Yard Destruction

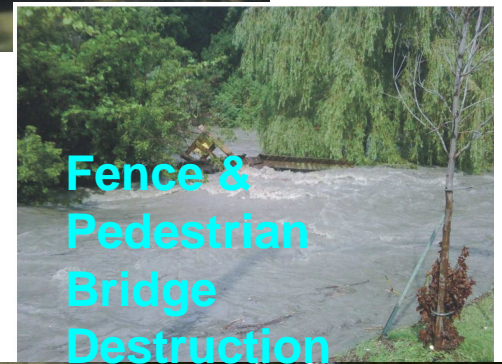


Municipal Infrastructure Damage



Broken Sanitary Sewer Cap

Rear Yard Destruction



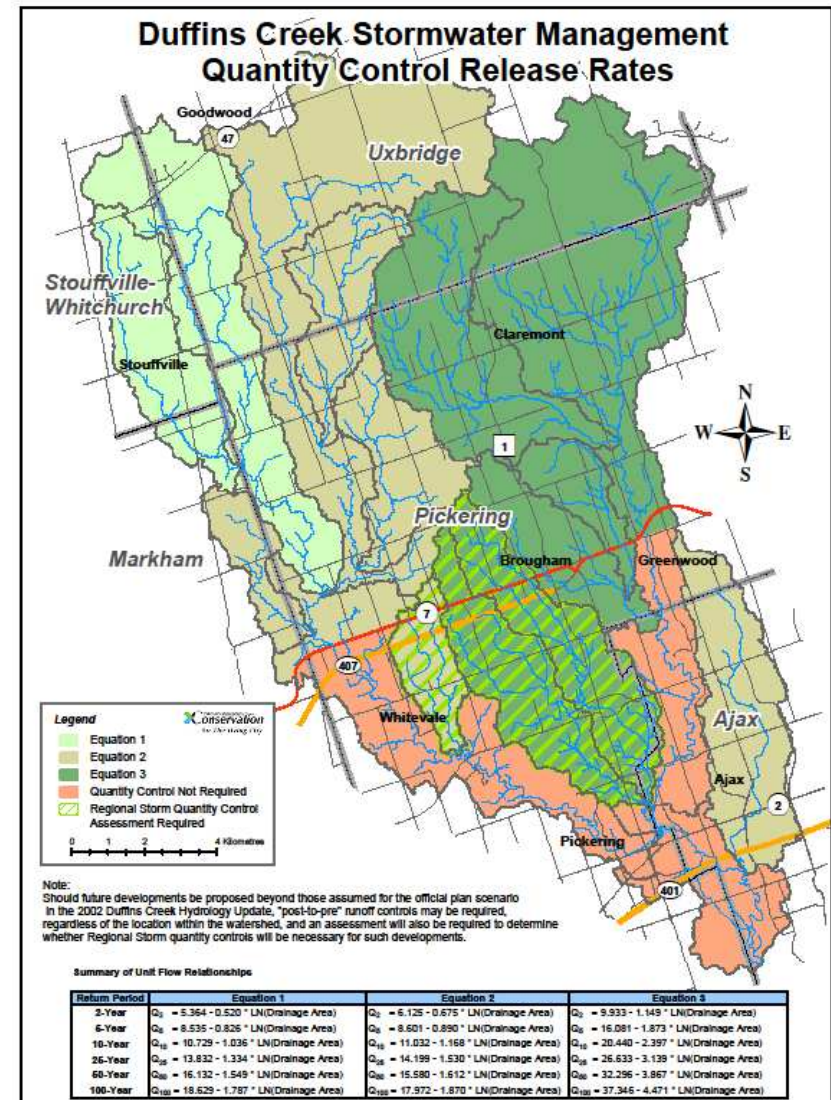
Fence & Pedestrian Bridge Destruction



Road Closure

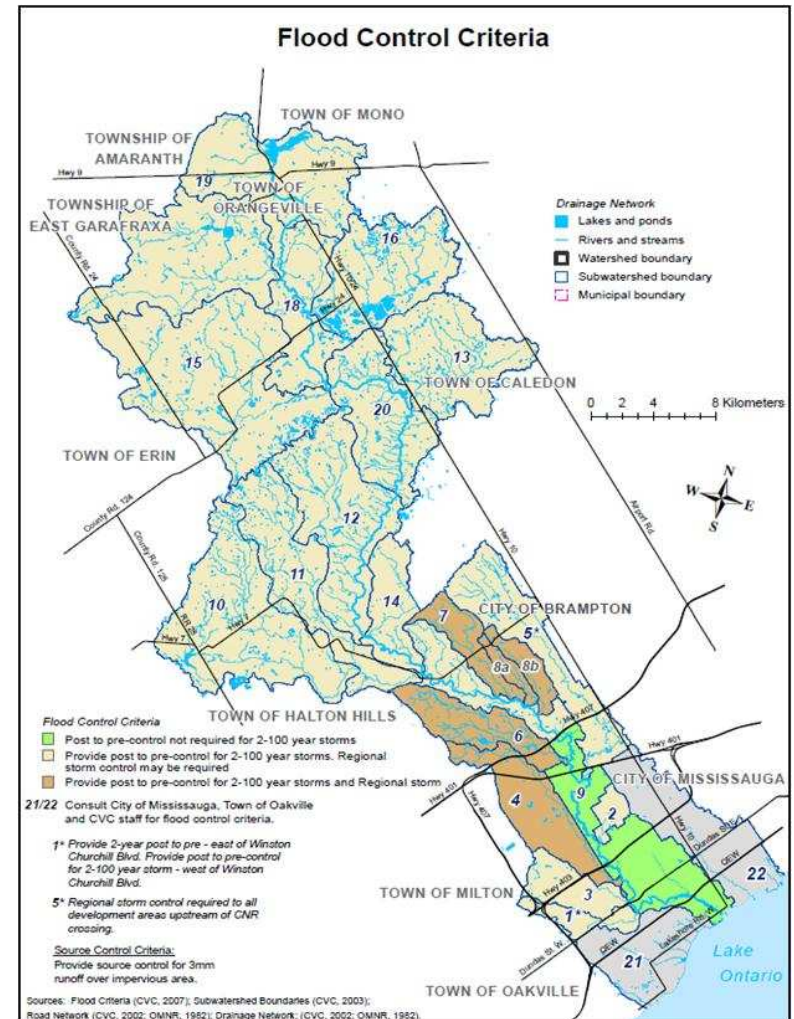
TRCA - Flood Control Criteria

- ❖ Criteria throughout TRCA jurisdiction has been established through detailed hydrology studies for each watershed – summarized in Table 3-1
- ❖ Flow criteria map illustrating the types of control required, unit flow rates and flow targets at key locations have been provided in Appendix A
- ❖ Additional water quantity control may be required as per Municipal criteria (i.e. urban flooding - minor / major system capacity)

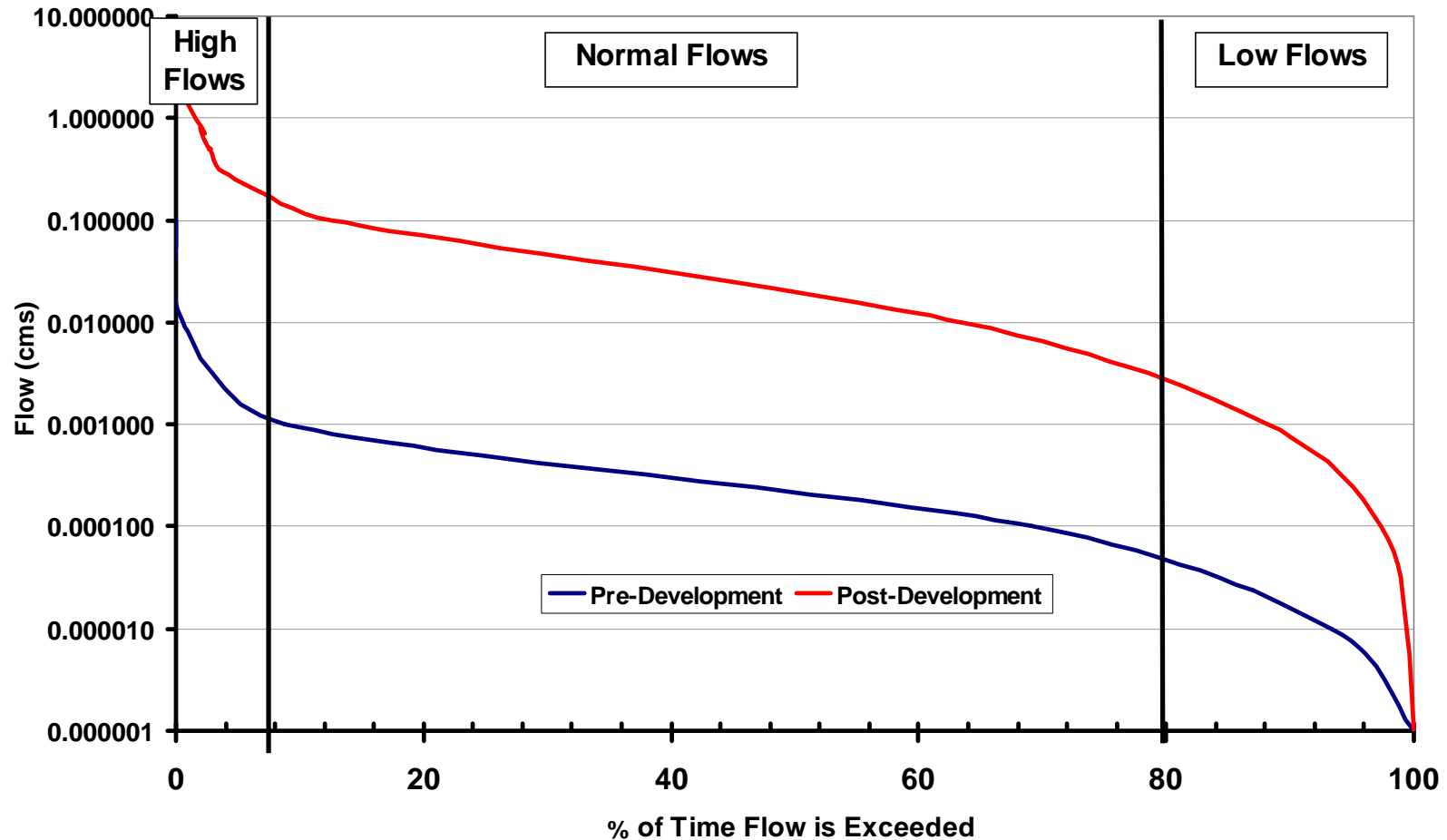


CVC - Flood Control Criteria

- ❖ Criteria throughout CVC jurisdiction has been established through detailed subwatershed studies – summarized in Table 3-1 and 3-2
- ❖ Flood control criteria map illustrating the types of control required are provided on Figure 3-2
- ❖ Minimum 3 mm of source control
- ❖ Downstream impact assessment



Watershed Monitoring Findings



- **Increasing trends in streamflow, despite development happens with SWM Ponds**

Summary of 100 Year Flow

Existing Conditions (2001)

Hyd No.	Point of Interest	Drainage Area	2002 Study	Present Study
4315	Credit River d/s Silver Creek Outlet	638.96		
4320	Credit River at Norval Gauge	641.44	258	244
4323	Credit River d/s Subcatchment 903	646.74	-	246
4325	Credit River d/s Subcatchment 905	647.98	-	245
4330	Credit River d/s Subcatchment 908	653.26	236	248
4333	Credit River near Mississauga Road	655.33	237	248
4335	Credit River d/s Subcatchment 911	656.02	-	249
4340	Credit River d/s Huttonville Creek	668.53	244	256
4342	Credit River d/s Subcatchment 912	670.19	244	256
4372	Credit River d/s Springbrook Creek	675.37	248	260
4375	Credit River at Steeles Avenue	676.61	-	261
4450	Credit River d/s Churchill Trib	684.89	252	272
4455	Credit River at Highway 407	687.07	-	272
4460	Credit River d/s Subcatchment 915	693.30	258	274
4525	Credit River d/s Levi Creek	717.60	281	298

Summary of Regional Storm Flood Flow

Existing Conditions – 2001

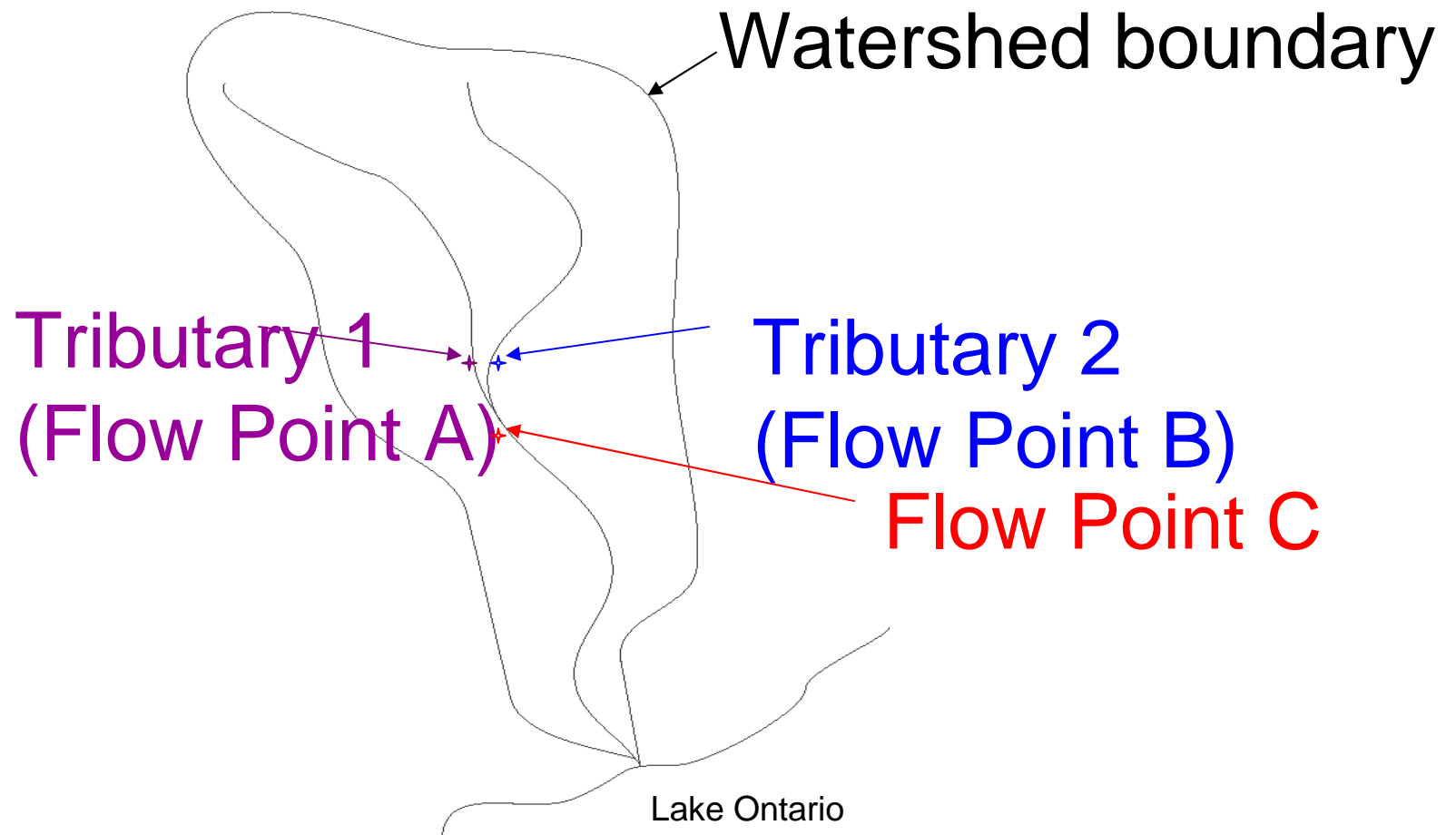
Hyd No.	Point of Interest	Rainfall Adjust,ment Factor	Phillips FDRP 1984	2002 Study	Present Study
4315	Credit River d/s Silver Creek Outlet	0.766	-	-	715
4320	Credit River at Norval Gauge	0.766	676	-	716
4323	Credit River d/s Sub catchment 903	0.766	-	-	719
4325	Credit River d/s Sub catchment 905	0.766	-	-	719
4330	Credit River d/s Sub catchment 908	0.766	-	-	720
4333	Credit River near Mississauga Road	0.766	-	-	720
4335	Credit River d/s Sub catchment 911	0.766	662	-	720
4340	Credit River d/s Huttonville Creek	0.766	-	542	739
4342	Credit River d/s Sub catchment 912	0.744	-	-	704
4372	Credit River d/s Springbrook Creek	0.744	-	-	706
4375	Credit River at Steeles Avenue	0.744	-	-	706
4450	Credit River d/s Churchill Trib	0.744	694	527	709
4455	Credit River at Highway 407	0.733	679	534	691
4460	Credit River d/s Sub catchment 915	0.733	-	-	692
4525	Credit River d/s Levi Creek	0.733	-	536	704

TRCA (2002) Flood Flow Predictions

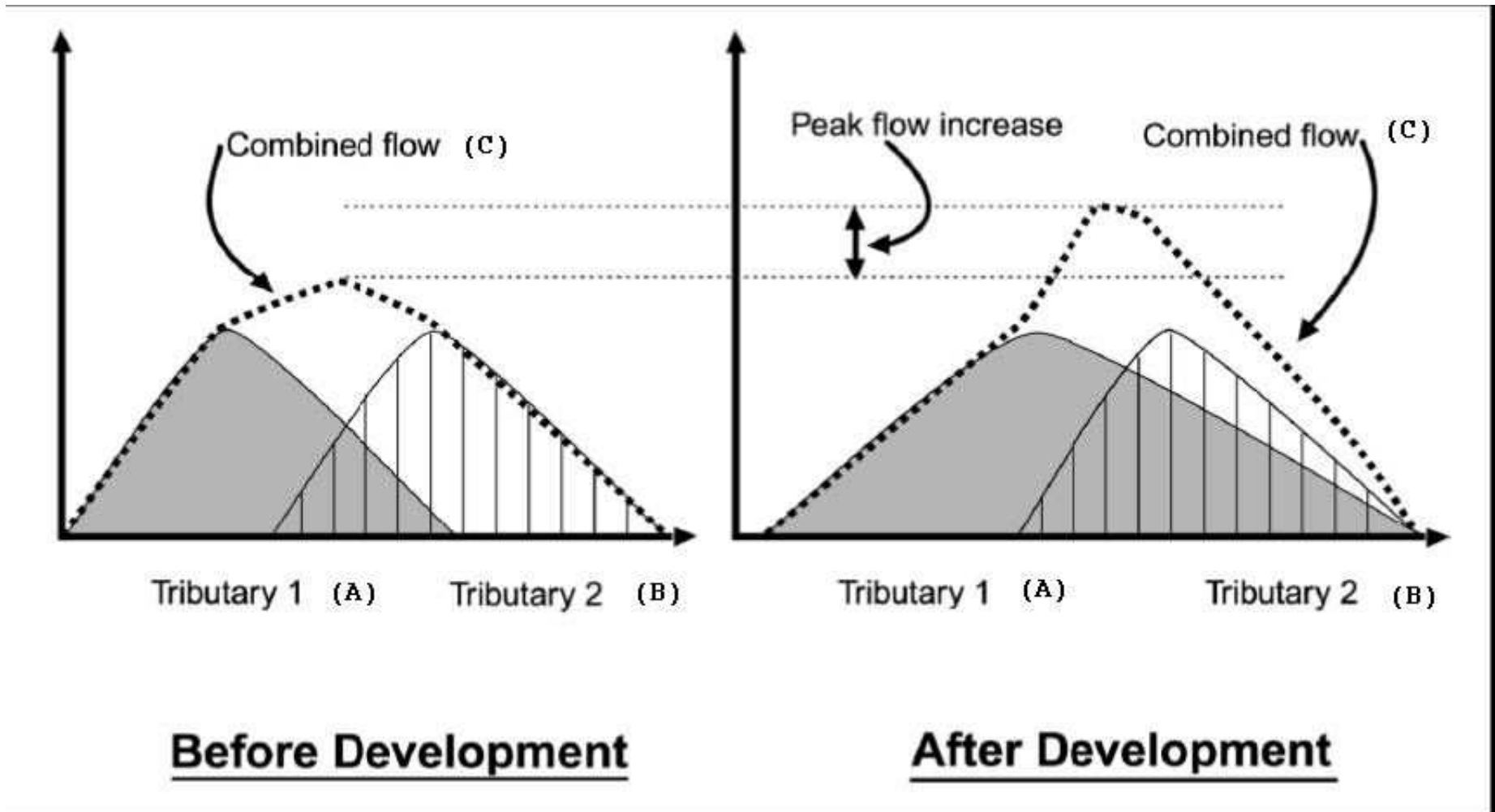
(Projected 37% Watershed Urbanization)

	Location	HSPF Site	2 yr (m ³ /s)		10 yr (m ³ /s)		100 yr (m ³ /s)		Reg. (m ³ /s)	
			Exist.	Fut. ¹	Exist.	Fut. ¹	Exist.	Fut. ¹	Exist.	Fut. ²
Main	Centreville Creek, upstream of Albion Hills reservoir	1	7.2	9.8	15.5	21.2	28.1	39.2	178.9	191.6
	Upper Humber River at York/Peel boundary	7	25.4	38.3	56.0	84.0	102.7	153.5	536.6	682.3
	Outlet of Cold Creek	9	9.8	12.7	20.8	27.1	37.3	49.0	157.9	320.3
	Outlet of Rainbow Creek/Robinson Creek system	10	32.4	34.9	62.8	78.8	111.0	151.8	351.7	448.2
	Main Humber River u/s of East Humber confluence	17	26.9	42.2	60.7	94.7	111.8	173.4	442.1	581.5
	Rainbow Creek near Wilson Avenue	31	13.1	14.9	25.4	37.1	42.9	74.7	134.4	184.0
	Main Humber in Woodbridge	n/a	48.9	68.1	109.8	146.1	201.4	268.1	716.7	920.3
	Main Humber at Bolton	n/a	18.6	27.2	40.9	58.8	75.4	108.0	427.2	456.4
West	West Humber River d/s of Claireville Dam	11	62.5	57.1	123.7	116.6	210.6	197.8	639.3	626.4
	West Humber East Branch 1 outlet	13	9.6	7.0	16.9	13.2	26.4	25.9	74.3	115.8
	West Humber East Branch 2 outlet	14	5.9	4.9	11.3	10.0	18.6	17.3	53.1	58.9
	West Humber Main Branch u/s of West Branch	19	32.1	31.3	61.9	60.9	102.3	100.2	313.1	334.6
	West Humber West Branch u/s of Main Branch	21	19.1	18.6	37.4	35.7	63.3	59.0	204.9	189.0
East	Outlet of West Humber to the Main Humber River	34	62.4	57.0	124.2	117.2	213.0	202.9	603.5	670.9
	Outlet of East Humber River to the Main Humber River	5	24.9	26.6	52.1	55.0	92.8	99.5	446.4	469.7
	Outlet of Purpleville Creek	16	10.0	10.9	20.4	22.2	35.8	39.4	143.4	163.9
L	East Humber River u/s of Purpleville Creek confluence	30	17.3	19.4	36.7	40.1	56.0	71.4	309.9	326.7
	Main Humber River near Steeles Avenue	18	55.3	77.0	115.7	169.1	223.9	306.8	761.8	1051.0
Black	Outlet of Humber River to Lake Ontario	33	174.6	175.0	326.7	334.5	553.4	573.5	1412.2	1856.9
	Black Creek at Steeles Avenue	29	30.5	30.4	54.3	54.9	94.5	95.1	152.1	186.7
	Outlet of Black Creek to the Humber River	32	84.5	82.0	153.9	151.3	257.4	254.8	538.1	563.8
	Black Creek at Hwy 401	n/a	60.3	55.7	122.3	114.7	209.3	200.6	348.6	379.1

Typical Watershed



How changes in timing can increase peak flows



Main Humber River - 1979

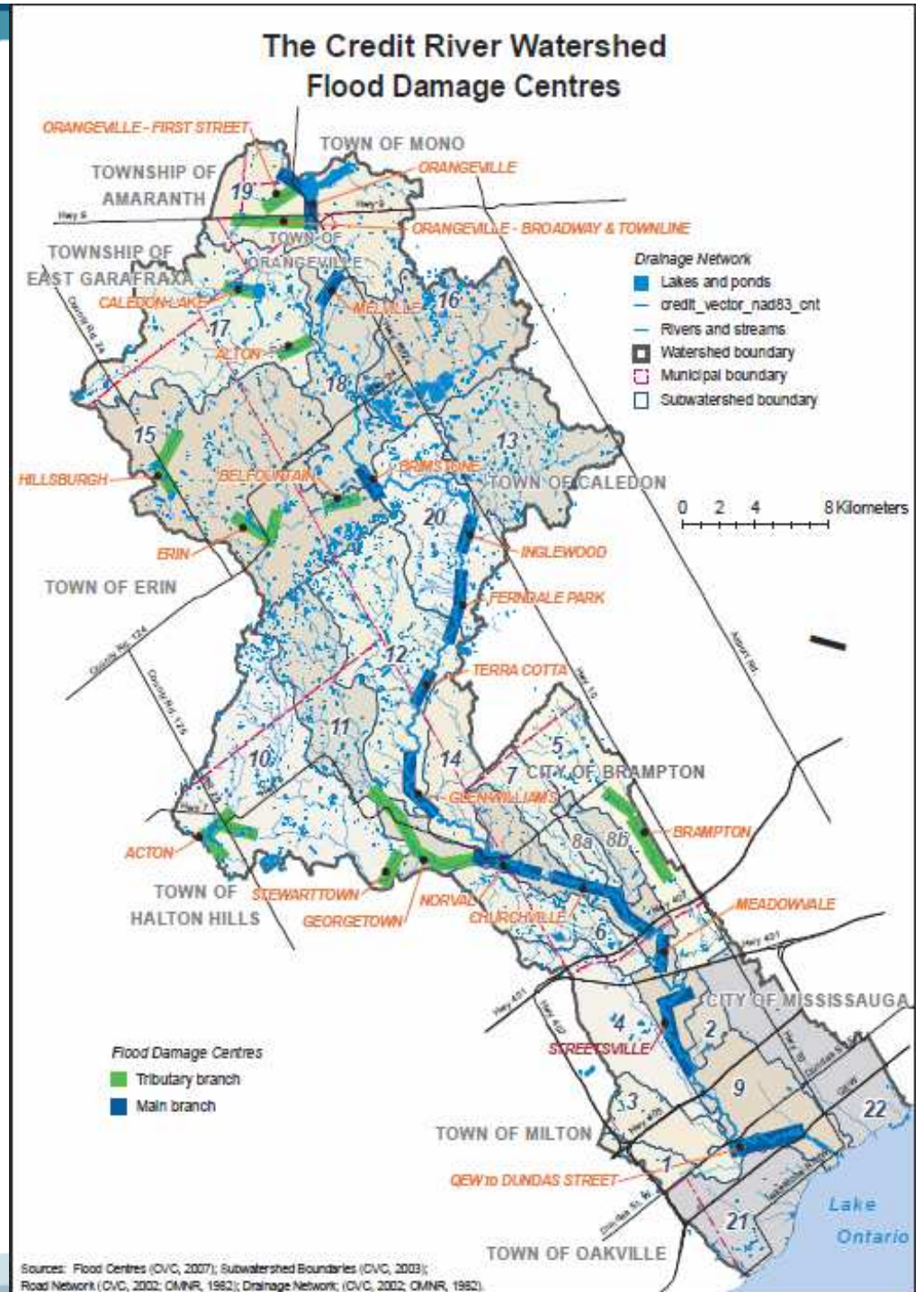


Main Humber River - 2006

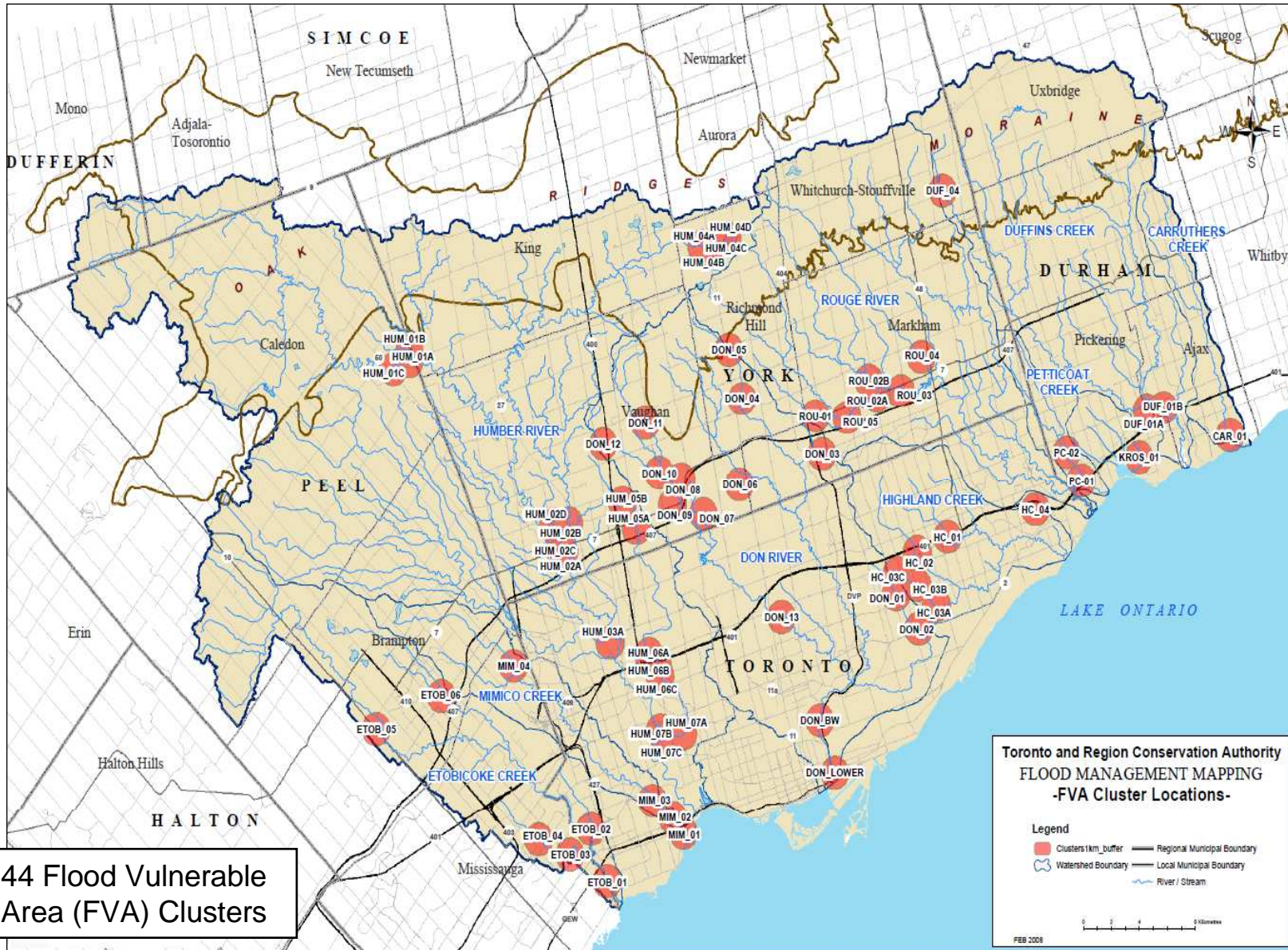


Flood Damage Centres

- 22 Flood damage centres
- Flood damage occur at 1:5 year design event level for 16 out of the 22 flood damage centres



Flood Damage Centres



44 Flood Vulnerable Area (FVA) Clusters

Summary Statistics of Extreme Rainfall Events

Extreme Rainfall Event	Total Rainfall Amount (mm)	Duration (hr)	1 Hr Max. Intensity (mm/hr)
Peterborough (Trent University), July 14-15, 2004	250.0	16.5	87.2
Toronto (Nashdene Yard), August 19, 2005	153.4	12.5	116.6
Hamilton (Stoney Creek), July 25-26, 2009	135.5	35.0	60.8
Mississauga (Cooksville Creek), August 4, 2009	68.0	1.0	68.0
Hurricane Hazel, 15 October, 1954	285.0	48.0	52.5
100 Year Design Storm	118.0	24.0	50.0



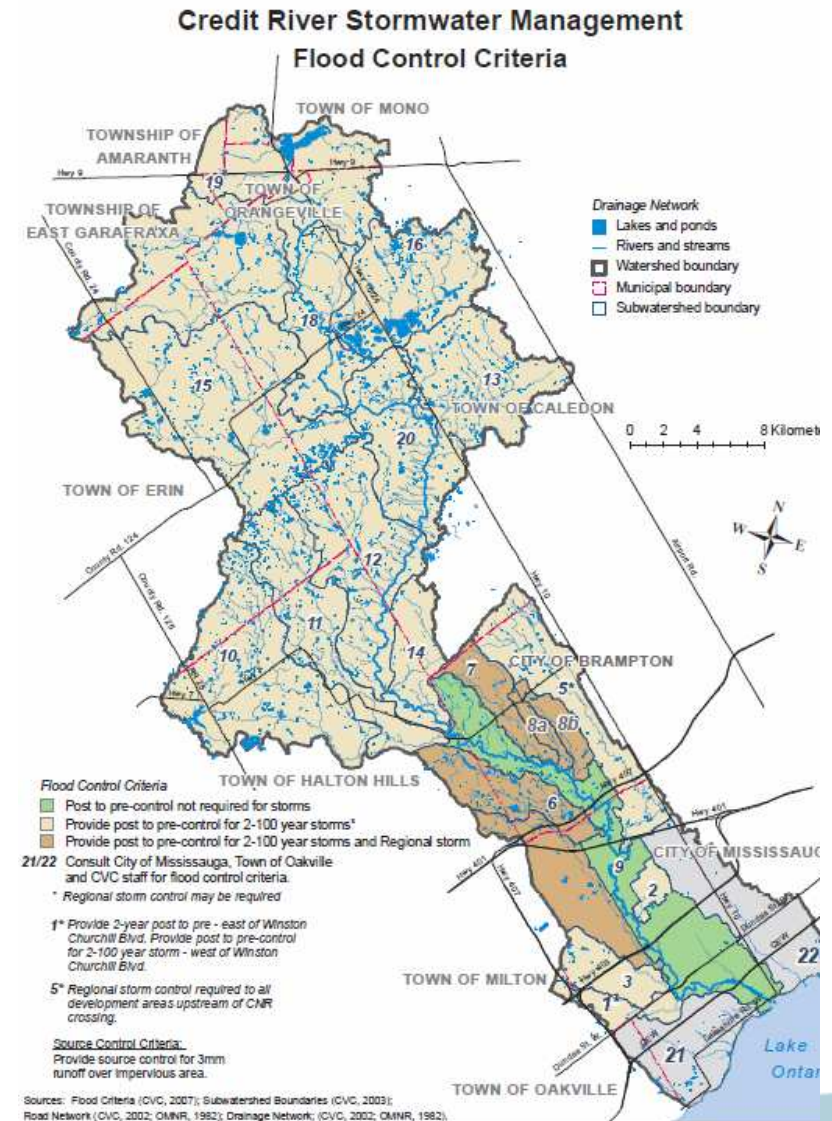
Comparison of Road Crossing Capacity with Extreme Event Peak Flows

Road Crossing Name	100 yr Design Flow (m ³ /s)	Crossing Capacity (m ³ /s)	Toronto (m ³ /s)	Peterborough (m ³ /s)	Hamilton (m ³ /s)	Mississauga (m ³ /s)
Main Branch						
Queen Elizabeth Way	210	110	624	673	409	328
Dundas Street East	210	160	462	454	291	272
<i>CPR</i>	<i>210</i>	<i>250</i>	<i>443</i>	<i>430</i>	<i>271</i>	<i>254</i>
Central Parkway East	195	195	425	389	248	236
<i>Mississauga Valley Blvd.</i>	<i>180</i>	<i>220</i>	<i>391</i>	<i>378</i>	<i>234</i>	<i>222</i>
Hurontario Street	115	115	238	187	129	120
HWY 403	115	115	200	139	101	97
East Branch						
HWY 403	60	50	217	162	114	108
Burnhamthorpe Road	-	40	272	245	164	146



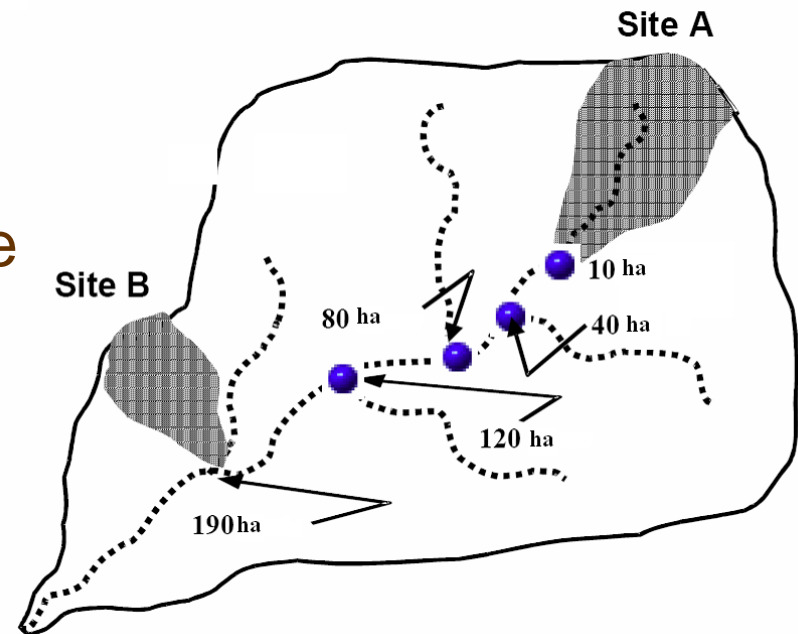
Flood Control Criteria- CVC

- Provide post to pre control for 2 to 100 year design storm events
- Regional storm control (based on subwatershed study recommendations)
- **Provide source control for 3 mm runoff over impervious area**
- **D/S Impact Assessment**
Large sites with multiple SWM facilities or development that will have a potential to dramatically impact downstream areas.



D/S Impact Assessment

The proponent is required to assess the impact of development downstream to the point, where the developed property is 10% of the total drainage area.



For example, for a 10 hectare site the assessment would have to take place down to a point where the total accumulated drainage area is 100 hectare.

Regional Flood Control

- As part of MESP and Subwatershed Planning, impacts on the regulatory flood hazard should be assessed on a watershed basis
- If an increase in flood risk is apparent, the increase must be mitigated through the development process using acceptable SWM practices and/or flood remedial works in consultation with the CA, Municipality and the MNR
- Currently CVC and TRCA is undertaking Hydrology updates to further understand the impacts of land use changes on flood risk.
- *Additional analysis on high intensity short duration storms may be required.*

Questions?

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