

Presentation to Carp River Restoration Project  
Project Advisory Committee – Third Party Review  
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I am in favour of restoring the Carp River, BUT...

The Approach to restoring the Carp River raises a variety of issues:

1. Engineering / technical issues;
2. Issues related to Health and Safety, and impacts to private property;
3. Policy / Legislative issues
4. Legal issues
5. Environmental issues

# Need to Evaluate Project using Standard Criteria

Although the Restoration Project may have environmental merit, ensuring the projects approval is based on prescribed procedures should not take a back seat in the Third Party Review despite any of the purported sophistication of the state of the art modeling and environmental benefits of the project.

1. Engineering / technical issues;
2. Issues related to Health and Safety, and impacts to private property;
3. Policy / Legislative issues
4. Legal issues
5. Environmental issues



Technical Guide

## River & Stream Systems: Flooding Hazard Limit



Ontario Ministry of Natural Resources  
Water Resources Section  
300 Water Street, 5<sup>th</sup> Floor, South Tower, P.O. Box 7000  
Peterborough, Ontario K3J 8M5

Standard Criteria includes ...

In preparing the Rivers and Streams Technical Guide, the Ministry intends to document standardized approaches to manage flood susceptible lands across the Province. Designers and review agency staff will find the Guide helpful in their work as it is based on a standard methodology. The material presented will go a long way to avoid and/or reduce the duplication in flood plain calculations and, as a result, should represent a cost saving for flood plain management projects. **Also, the Guide will assist in the approval process and in explaining, or if necessary defending, the methodology when challenged.**

# Model Calibration & Validation

## Excerpts from Technical Guide:

Selection of data for calibration should reflect the intended use of the model.

If the model is to be used exclusively to estimate flood flows of high return periods then the calibration data set should be biased towards such events.

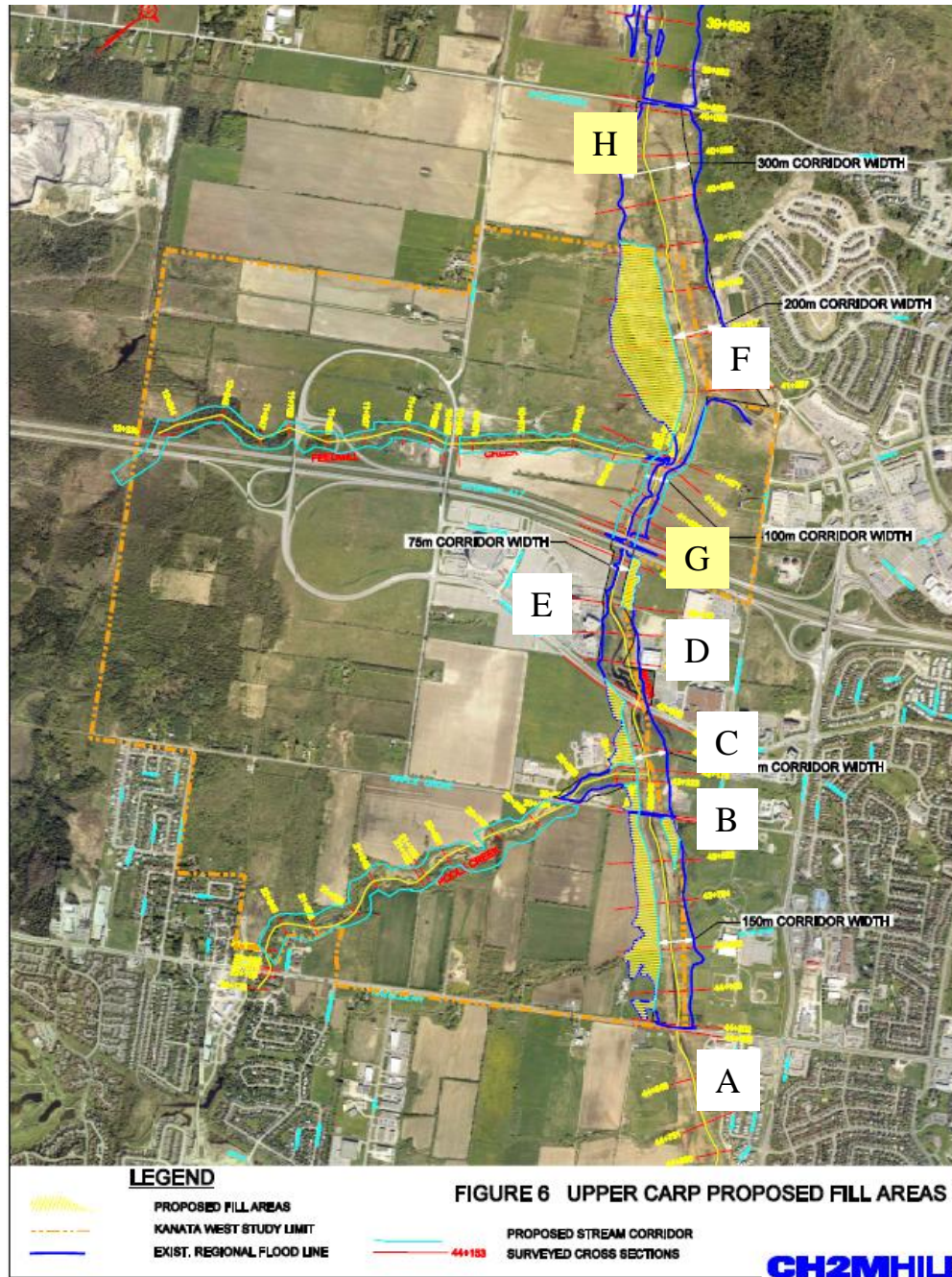
If on the other hand the entire annual flow cycle must be simulated, then a broad range of flows must be included.

For a single event model, five events of significant magnitude is recommended this will prove invaluable for testing the accuracy of the calibration and should not be over looked.

Thorough understanding of the flood characteristics of the river and the watershed and the calibration/verification of the model is essential to derive credible results.

Impact assessment has been complicated because of previous encroachments into the Carp River floodplain that have been approved in a piecemeal fashion.

è How is the existing condition to be defined from which impacts of Restoration Project are to be assessed?



**Uncompensated Fill / Encroachment  
Since 1983 FP Mapping**

- A – West Creek Meadows
- B – Sensplex
- C - SMART Technologies
- D – Vorlex
- E – ‘Palladium’ Site
- F – Ex. Terry Fox Dr. Ex.

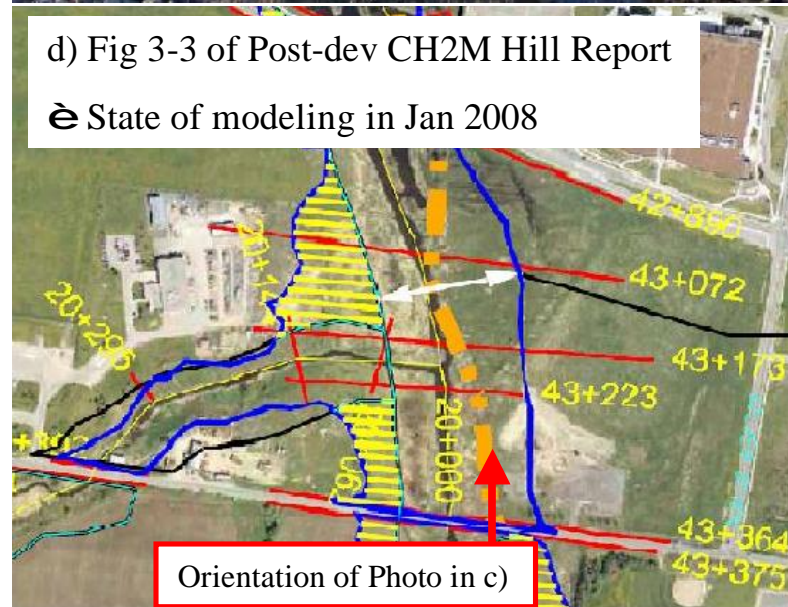
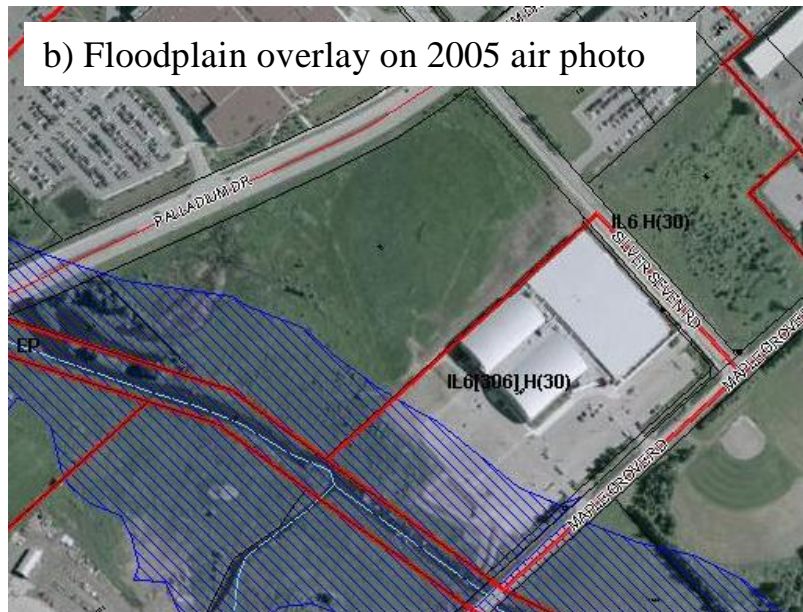
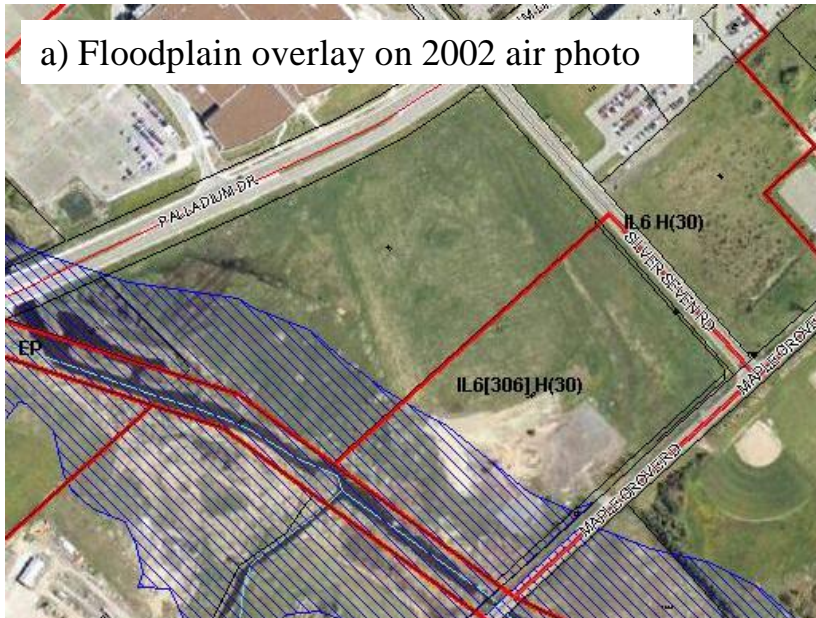
**Future Committed Filling**

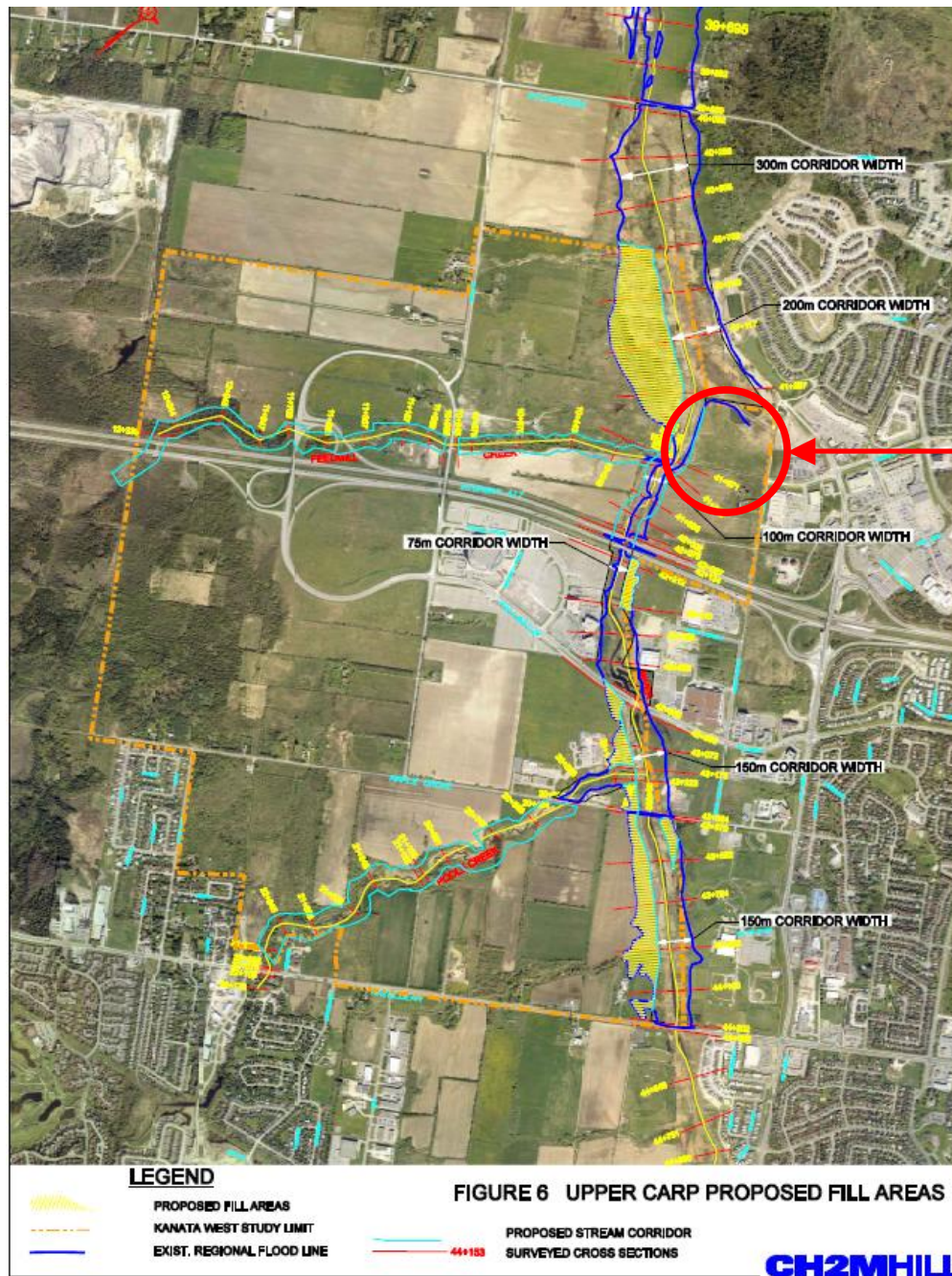
G – 20 Frank Nighbor

H – Terry Fox Drive Extension

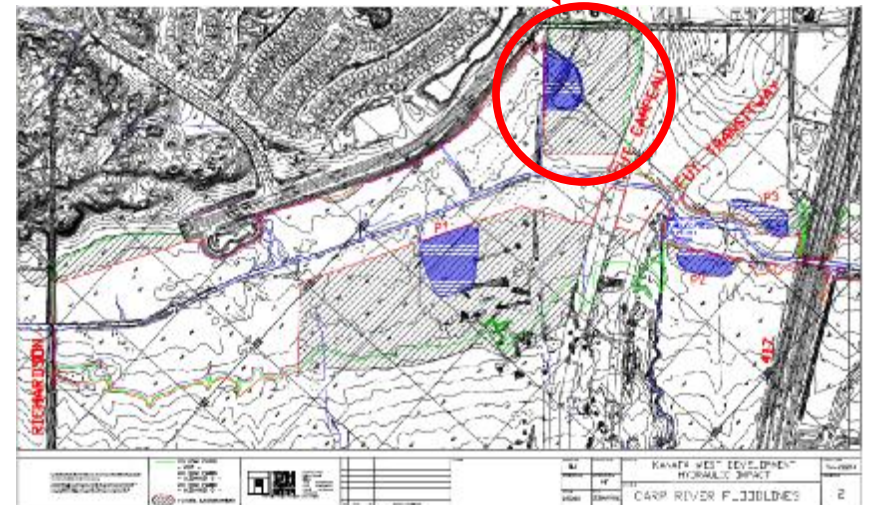
**Kanata West Development  
(primarily Richcraft & Minto Dev.)**

# Example of Unaccounted Encroachment – Sensplex & SMART Technologies





Updated topography reveals other low lying areas should be added to 1983 floodplain area



**Piecemeal approach and approval of development involving 1000's m<sup>3</sup> of fill of Regulated floodplain is inconsistent with Mining and Lands Commissioner's Decisions**

**Example: Report to Transportation Committee and Council - 28 July 2004**

**Terry Fox Drive - RICHARDSON SIDE ROAD TO GOULBOURN FORCED ROAD (environmental assessment addendum)**

“An estimated **45,000** cubic metres of floodplain storage area will be lost due to the proposed EA Addendum alignment. The proposed EA Addendum alignment is approximately 18,000 cubic metres more than the 2000 ESR alignment that had a total impacted of about 27,000 cubic metres. The MVCA is aware of this additional floodplain impact, and have agreed that **the loss of floodplain storage will have a negligible effect on the Carp River's flood regime since the Carp River is wide and shallow** in the vicinity of the proposed Terry Fox Drive alignment.”

**Chalmers vs. Grand River Conservation Authority – April 25, 1997**

The Appeal involved the GRCA's refusal to approve the creation of two new lots involving a volume of fill estimated at between **1800 and 2400 cubic metres**.

The Appellant's consultants (TSH) tried to argue that the amount of fill was reasonable based on calculated flood level increases of **1.9 inches** which they thought was “minimal”.

–  
“**The tribunal finds that granting permission in this case would constitute a precedent for new residential development of other portions of the flood plain in one zone concept areas, involving considerable placing of fill which has measured impacts upstream.**”

“**The tribunal finds that it will adopt the words of Mr. Lorant, whose expert evidence matters of watershed management bears considerable weight, in finding that the proposed filling and construction poses a dangerous precedent, both in terms of the Chalmers land itself and on the ability of this and other conservation authorities to manage watersheds within their jurisdictions.**”

# “Model Torture” VS. Standard Criteria

## Excerpt from LRIA Criteria

The following hydraulic characteristics of the natural river channel shall remain the same in the proposed channel:

- 1) travel time (not to be decreased); and
- 2) the stage storage and stage discharge relationships of the natural river and its flood plain are to be maintained (evaluated in 0.3 m elevation increments from the channel bed to the flood level per Provincial Natural Hazards Technical Guide, 2002).

These criteria maintain a flood plain area in the channelized reach identical to that of the original watercourse. **The strength of these criteria is that they are straightforward to apply and easily verified by the approving agency.**

**Table 1**  
April 18th, 2006 - Carp River from Richardson Side Road to Hazeldean Road  
Comparison of "riparian" storage volumes and travel times - existing channel and floodplain vs future channel and overbank storage  
Derived from HEC-RAS channel output

Frequency (yr) ->		2		5		10		25		50		100	
Reach		Exchange	Storage	Exchange	Storage	Exchange	Storage	Exchange	Storage	Exchange	Storage	Exchange	Storage
Richardson to Hazeldean	Existing	318	100	487	140	681	210	0	0	0	0	0	0
	Future	321	100	484	140	681	210	0	0	0	0	0	0
	Change	3	0	-3	0	-3	0	0	0	0	0	0	0

Cumulative Volumes (x1000 m <sup>3</sup> )		Existing						Future					
Station	Station	2	5	10	25	50	100	2	5	10	25	50	100
4480.0	Hazeldean	1210	1350	2007	342	560	109	489	886	1415	2070	342	560
4480.0	Richardson	320.0	1000	2014	342	560	109	489	886	1415	2070	342	560
	Reach Storage	212	487	940	0	0	663	301	400	664	0	0	664

Travel Time (hours)		2		5		10		25		50		100	
Reach		Exchange	Time	Exchange	Time	Exchange	Time	Exchange	Time	Exchange	Time	Exchange	Time
Richardson to Hazeldean	Existing	1.2	4.0	0.2	5.4	0.1	6.0	0.0	6.0	0.0	6.0	0.0	6.0
	Future	1.2	4.0	0.2	5.4	0.1	6.0	0.0	6.0	0.0	6.0	0.0	6.0
	Change	0	0	0	0	0	0	0	0	0	0	0	0

Cumulative Travel Times (hours)		Existing						Future					
Station	Station	2	5	10	25	50	100	2	5	10	25	50	100
4480.0	Hazeldean	17.7	14.8	15.8	24	30	100	12.7	15.1	12.9	22	33	100
4480.0	Richardson	17.4	14.4	15.4	24	30	100	12.4	14.8	12.6	22	33	100
	Reach travel time	0.3	0.4	0.4	0.0	0.0	0.0	0.3	0.3	0.3	0.0	0.0	0.0

**TABLE 2**  
Carp River from Richardson Side Road to Hazeldean Road  
Comparison of "riparian" storage volumes and travel times - existing channel and floodplain vs future channel and floodplain storage in overbank and riparian areas - no overbank structures  
Derived from HEC-RAS channel output

Frequency (years) ->		2		5		10		25		50		100	
Reach		Exchange	Storage	Exchange	Storage	Exchange	Storage	Exchange	Storage	Exchange	Storage	Exchange	Storage
Richardson to Hazeldean	Existing	212	416	487	140	681	210	0	0	0	0	0	0
	Future	212	416	487	140	681	210	0	0	0	0	0	0
	Change	0	0	0	0	0	0	0	0	0	0	0	0

Cumulative Volumes (x1000 m <sup>3</sup> )		Existing						Future					
Station	Station	2	5	10	25	50	100	2	5	10	25	50	100
4480.0	Hazeldean	1267	1500	2110	342	560	109	1267	1500	2110	342	560	109
4480.0	Richardson	1267	1500	2110	342	560	109	1267	1500	2110	342	560	109
	Reach Storage Volume	212	416	487	0	0	780	374	428	612	0	0	612

Travel Time (hours)		2		5		10		25		50		100	
Reach		Exchange	Time	Exchange	Time	Exchange	Time	Exchange	Time	Exchange	Time	Exchange	Time
Richardson to Hazeldean	Existing	0.2	4.7	0.2	6.1	0.1	6.7	0.0	6.7	0.0	6.7	0.0	6.7
	Future	0.2	4.7	0.2	6.1	0.1	6.7	0.0	6.7	0.0	6.7	0.0	6.7
	Change	0	0	0	0	0	0	0	0	0	0	0	0

Cumulative Travel Times (hours)		Existing						Future					
Station	Station	2	5	10	25	50	100	2	5	10	25	50	100
4480.0	Hazeldean	18.2	16.2	16.4	23.2	27.9	100	16.1	15.3	14.5	22.4	27.9	100
4480.0	Richardson	18.2	16.2	16.4	23.2	27.9	100	16.1	15.3	14.5	22.4	27.9	100
	Reach travel time	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

## 2006 Project Approval by MNR & MVC was based on LRIA Exception Criteria

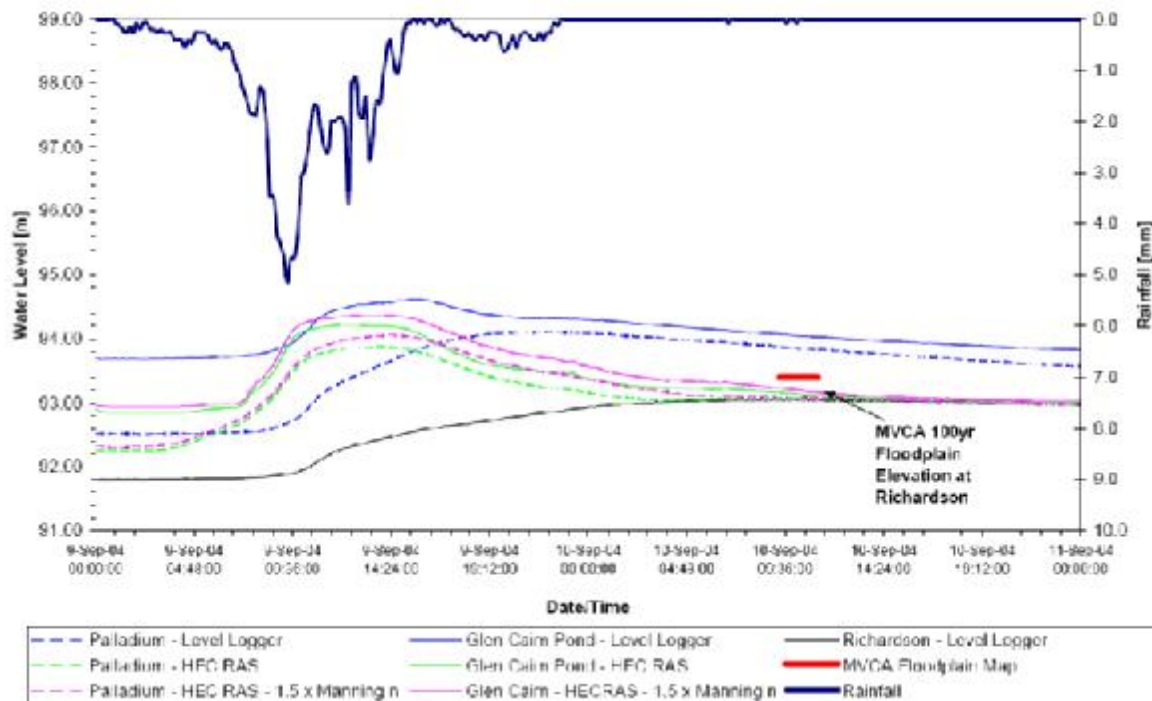
Exceptions may be considered where the following objectives of the criteria are met:

- 1) the cumulative impacts of all future works in the watershed are quantified through sub-watershed studies and are considered insignificant;
  - è 200 Ha of Fernbank Development not accounted (could add to the list Municipal Drains to be constructed in Goulbourn Township).
- 2) there are no downstream impacts (i.e., channel outlets to one of the Great Lakes);
  - è 1909 Ontario Court of Appeal Decision affirmed “point of sufficient outlet” is about 7 km downstream of Richardson Sideroad below the Village of Carp
- 3) the discharge storage relationship of the water course is maintained on an incremental basis for all floods from the 2 year return flood to the flood per provincial standards for defining natural hazards;
  - è Provincial Standards – Technical Guidelines – model calibration and validation

### **AND**

- 4) routing calculations are provided which conclusively demonstrate that there would be no increase in downstream peak flows and total storage has been maintained or increased.
  - è Figure 3.3 of CH2M Hill Existing Conditions Report demonstrates poor model calibration of Sept 9 2004 event – cannot conclusively demonstrate storage or travel time criteria satisfied

**FIGURE 3-3: Carp River - "Hurricane Frances" September 9, 2004  
Water Levels (Recorded & Modeled)**



Note the large difference between the level logger observations and the HEC RAS predicted levels and time to peak level at Palladium Drive and at Glen Cairn Pond. (Results at Richardson Road not provided in report figure).

The difference is as much as 1m or more for days and days - suggesting a very poorly calibrated model - particularly when this is the fundamental issue - the difference is a measurement of how accurate the computer models simulate floodplain storage.

**Main problem is the insufficient outlet downstream of Richardson Sideroad:**

è Main error in model calibration – model over-estimates conveyance capacity of downstream channel

è Explains why existing watercourse has filled with sediment and requires improvements

è Unless downstream improvements to 1909 “sufficient outlet” are undertaken the restored channel will eventually need to be reconstructed entirely at City’s cost

è Fernbank Development and Goulbourn Twp Municipal Drain projects will further aggravate poor drainage conditions

City has obligation to respect downstream residents’ Common Law Rights.

# Flow Conditions at Richardson Sideroad

Sept 9 2004 – Looking Upstream



Spring Freshet 2004 – Looking Upstream



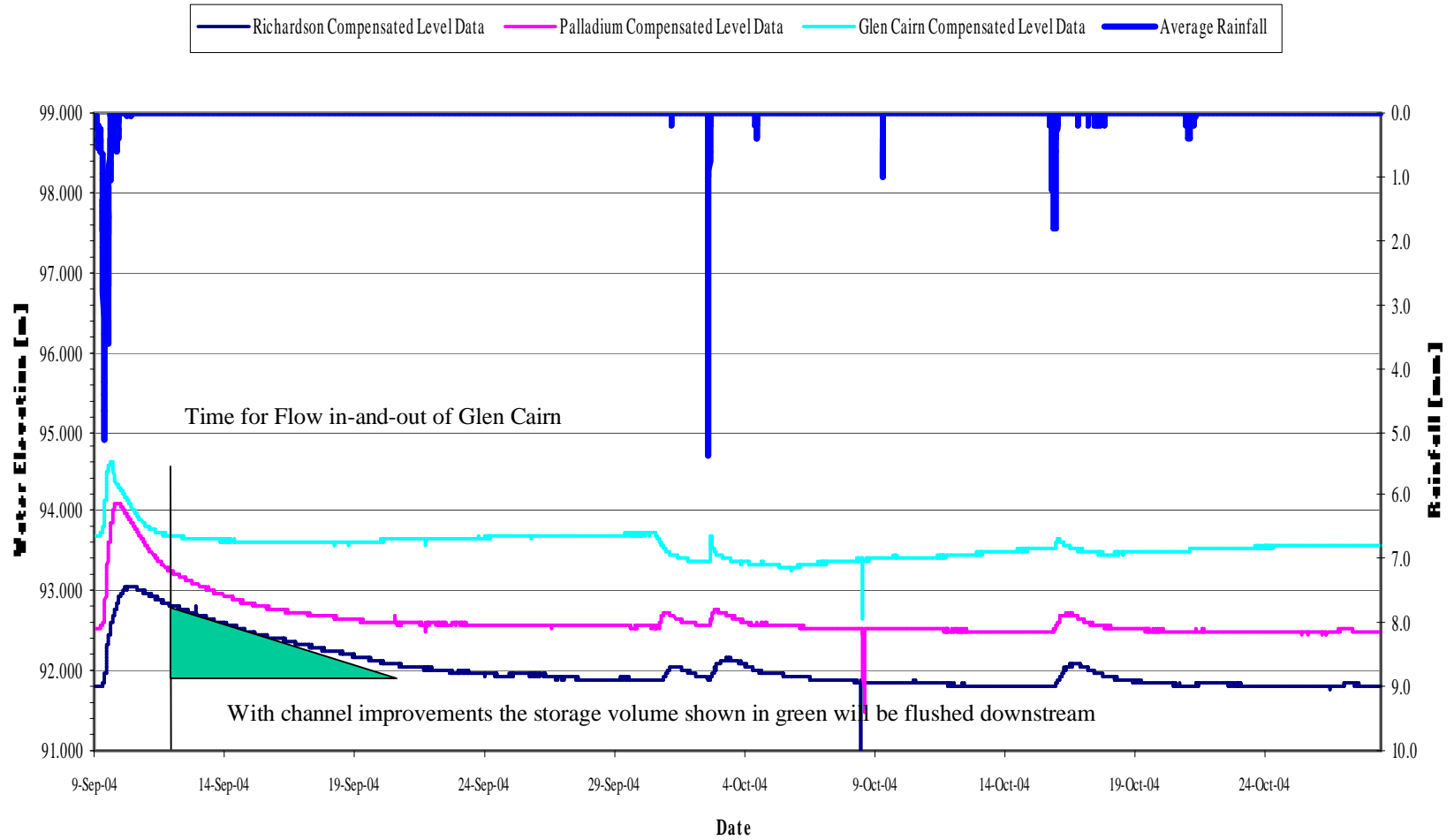
Sept 10 2004 – Upstream



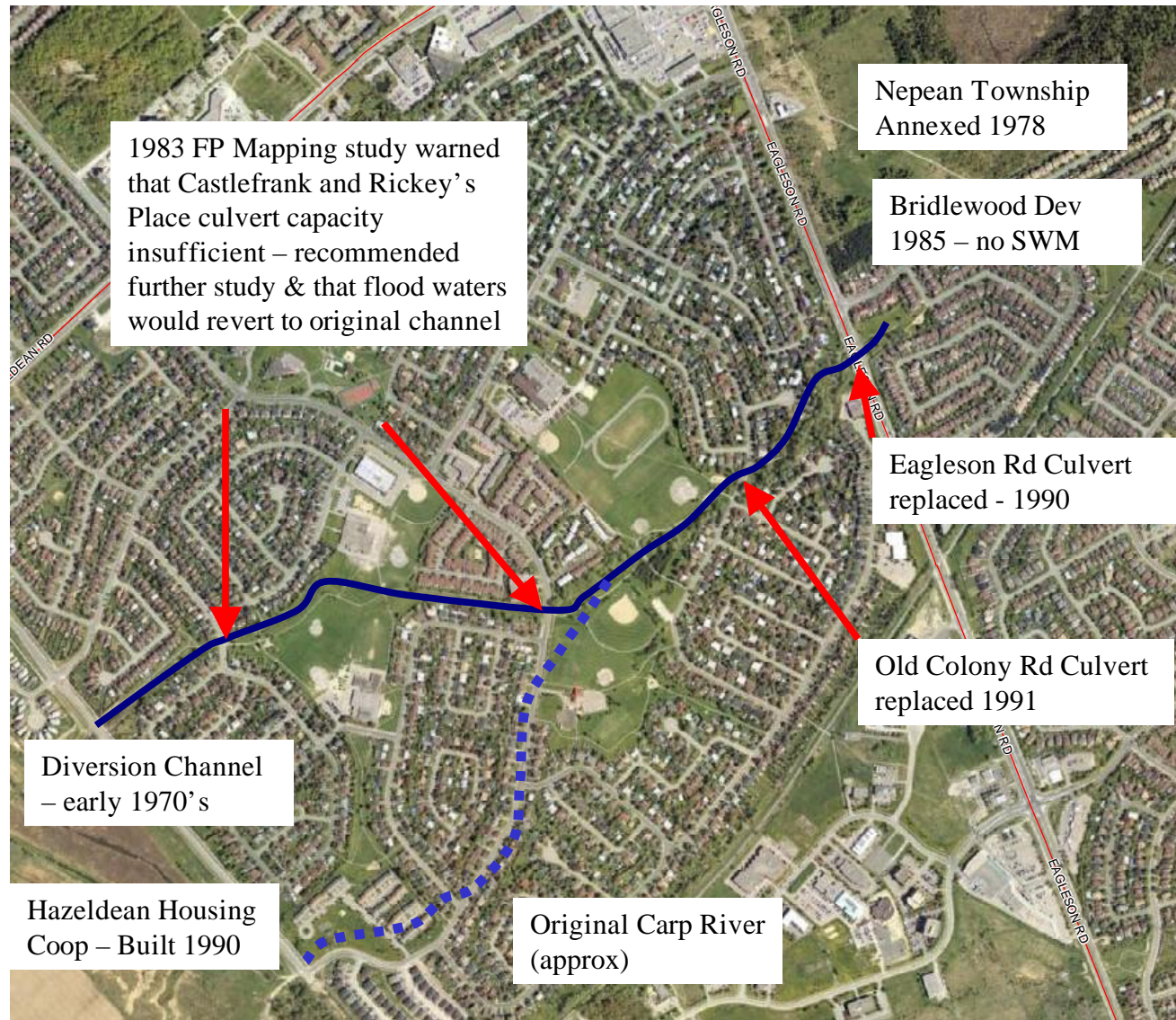
Spring Freshet 2004 – Looking Downstream



# Hydrographs



# Glen Cairn Floodplain Development and Carp River Channelization



## What Happened?

1991 – Hazeldean Housing Coop flooded twice, 1/3 of Units flooded for 3 months; \$500,000 in structural damage due to poor geotechnical conditions

1996 and 2002 – Flood waters exceeded capacity of Castlefrank and Rickey's Place culverts and flood flows reverted to original drainage corridor – dozens of homes flooded

2003-2004 After \$Millions in flood damage and clean-up, City Taxpayers Pay for \$7 Million Flood Remediation – civil lawsuits settled out of court with no disclosure of settlement costs

2005 – Subwatershed Plan Approved recommending more FP Development. 1996 and 2002 Flooding incidents mentioned once on page 137 of report. No mention of 1991 flood event.

# What is to be learned from Glen Cairn?

- è make sure when you are undertaking a channelization project the design accounts for all urban runoff from known upstream development areas;
- è projects involving risks to public health and safety and risks to property should not rely on adaptive management because recommendations in reports are forgotten about in large bureaucracies;
- è natural hazards to be concerned about along the Carp River include geotechnical conditions;
- è if you're completing a channelization project don't allow too much development to encroach into stream corridors otherwise you limit your options in the future should your design prove to be deficient;
- è be wary of potential downstream problems when little or no quantity controls are used, and capacity of bridges are enlarged;
- è no weight should be given to the fact MVC, MNR or other Provincial Ministries had signed-off on the project – instead Third Party review must confirm compliance with requirements of Technical Guidelines
- è public agencies have a responsibility to direct development away from hazardous areas and to apply the precautionary principle because they bear all risks;