

An aerial photograph of the York University Keele Campus, showing a mix of green spaces, buildings, and parking lots. The text is overlaid on the image.

Land Use Evolution and Run Off at York University Keele Campus

**Laura Antoniazzi
Katia Canil
Ignazio Giuntoli
Julia Rodrigues Leite
Anne Sabourin**

Nov 27, 2006

CURRENT SITUATION

- The York Keele Campus area : +/- 185 hectares (2006) and
Permeable surface area: +/- 108 ha or 58% (green space)
Impermeable surface area: +/- 77 ha or 42% (buildings,
roads, paths and parking lots);
- 80% of stormwater is conducted in an outlet into Stong Pond
(Black Creek Watershed/Humber River);
- 20% of the water is part of the Dufferin subwatershed (Don
River Watershed);

- Stormwater includes not only the flow from campus, but also water flow from north of Steeles (external development thus impacts stormwater management on campus);
- Stong pond is currently at capacity;
- Tennis Canada wetland treatment facility (generally) at capacity;
- Older facilities cannot be upgraded to manage stormwater in situ, but this is considered for new buildings. For instance, Accolade building has a dry pond.

York University is located in the Humber River Watershed and closely borders the Don River Watershed.

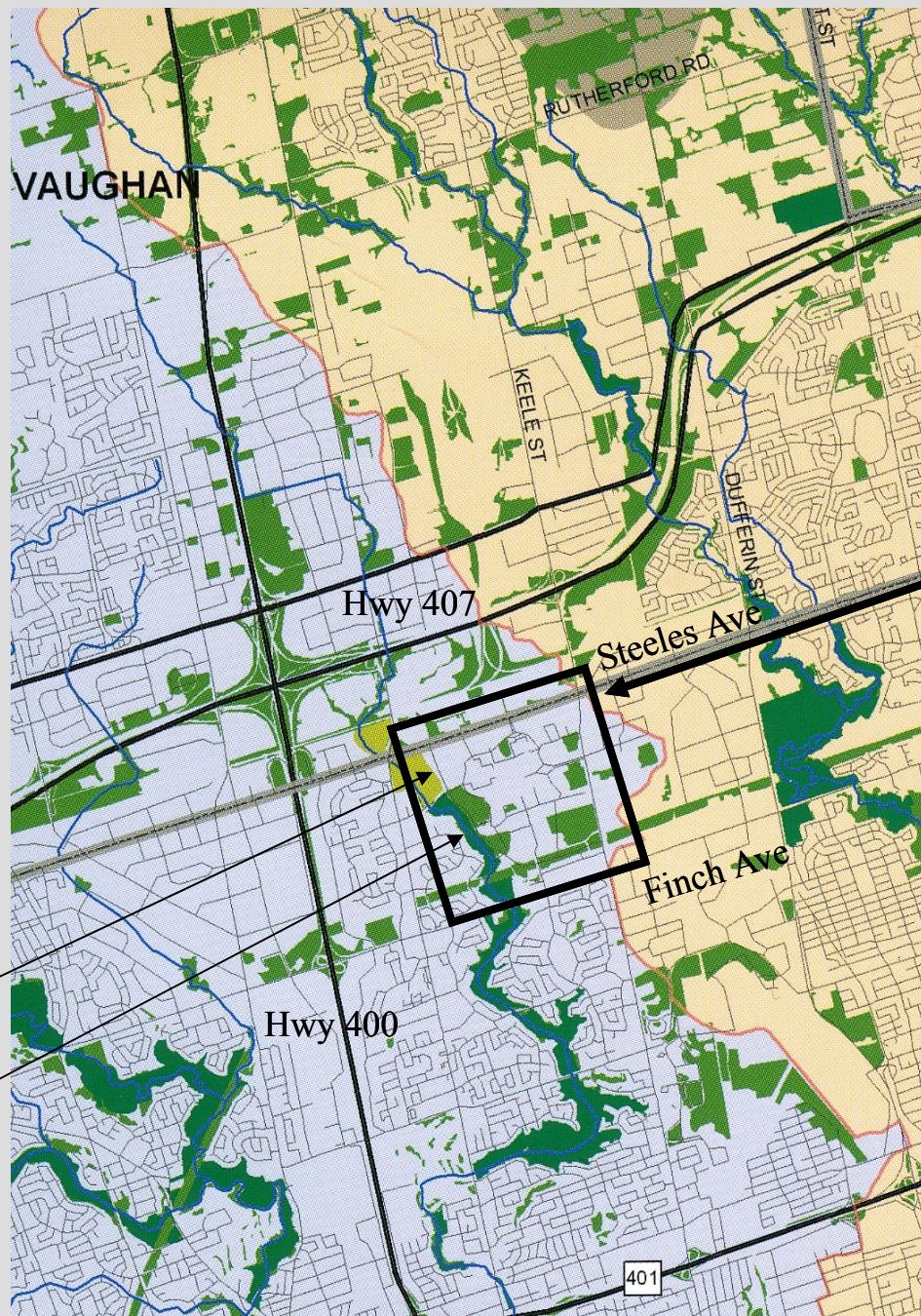
Humber River Watershed



Don River Watershed



**Subject area:
York University**

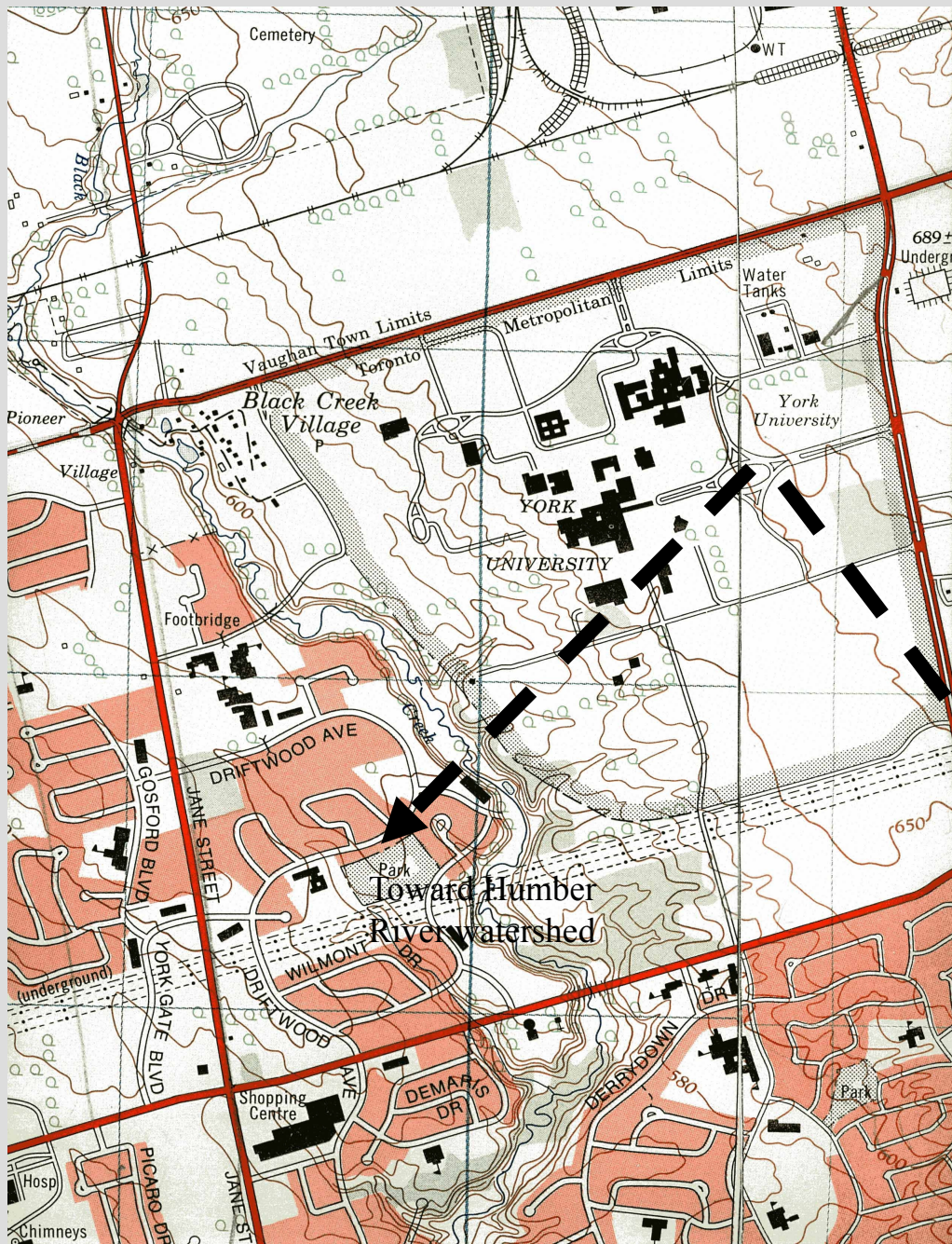


Black Creek Pioneer Village

Black Creek



York Campus, 2006. Source: Facilities Services York University



Water Drainage

This Topographical Map illustrates the landform contours and drainage directions. Primary drainage is to the south-west (Humber River Watershed) for most the campus and partial drainage to the south-east (Don River Watershed)

Toward Don River watershed

York Campus, 2006. Source: Facilities Services York University

GENERAL OBJECTIVES

Analyze the change over time of York campus runoff in the period from 1974 to 2006.

OBJECTIVES

- 1- Analyses of the land use (growth of impermeable areas).
- 2- Measures of the runoff.

METHODOLOGY

1- LAND USE TYPOLOGIES:

Permeable:

(VC) Vegetation Coverage

(G) Grass/Open Fields

(W) Ponds

(ES) Exposed Surfaces

Impermeable:

(IA) Institucional Areas

(IS) Impermeable Surfaces

(UA) Urban Areas

(P) Parkings

(R) Roads

2 – IDENTIFICATION OF THE LAND USE TYPOLOGIES

- AERIAL PHOTOS (1974; 1987; 1997; 2002).

3- QUALITATIVE ANALYSES OF THE LAND USE EVOLUTION ON THIS PERIOD OF TIME.

4- RUN OFF

- (1987; 1997; 2006).

Water Runoff

The pertinent meteorological statistics considered were:

$$\theta = 120$$

$$\phi = 0.25 \text{ for permeable land use}$$

$$\phi = 0.9 \text{ for impermeable land use}$$

$$\zeta = 0.20 \text{ mm}^{-1}$$

$$\lambda = 0.30 \text{ h}^{-1}$$

$$\psi = 0.015 \text{ h}^{-1}$$

$$\text{depression storage } S_d = 2 \text{ mm}$$

The formula used to calculate
the average **Annual Volume of Runoff (R)**:

$$R = \theta \frac{\phi}{\zeta} e^{-\zeta S_d}$$

Sources: *Urban Stormwater Management Planning*, B. J. Adams & F. Papa. 2000 Wiley P.

Stephenson, 1981 and ASCH, 1992 for the estimate of the runoff coefficient

Evolution of the Water Runoff Volume

1987

Ann Runoff (Imp Area) = 155648 m³
Ann Runoff (Perm Area) = 142778 m³

Total Annual Runoff
298426 m³

1997

Ann Runoff (Imp Area) = 127696 m³
Ann Runoff (Perm Area) = 209944 m³

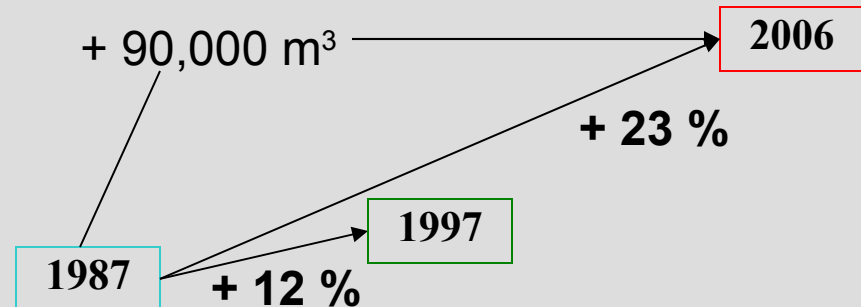
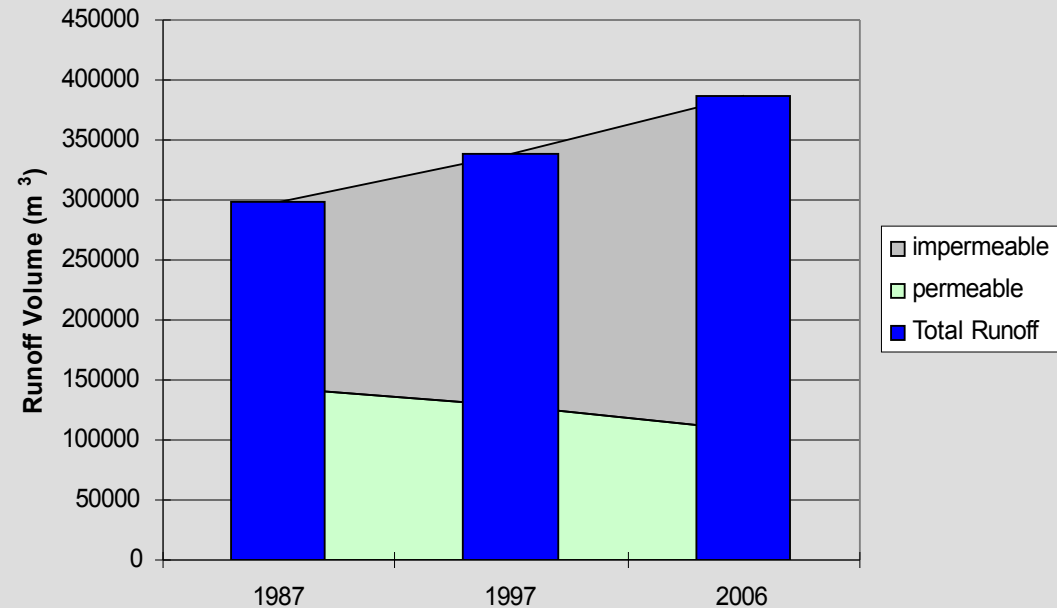
Total Annual Runoff
337640 m³

2007

Ann Runoff (Imp Area) = 108592 m³
Ann Runoff (Perm Area) = 278719 m³

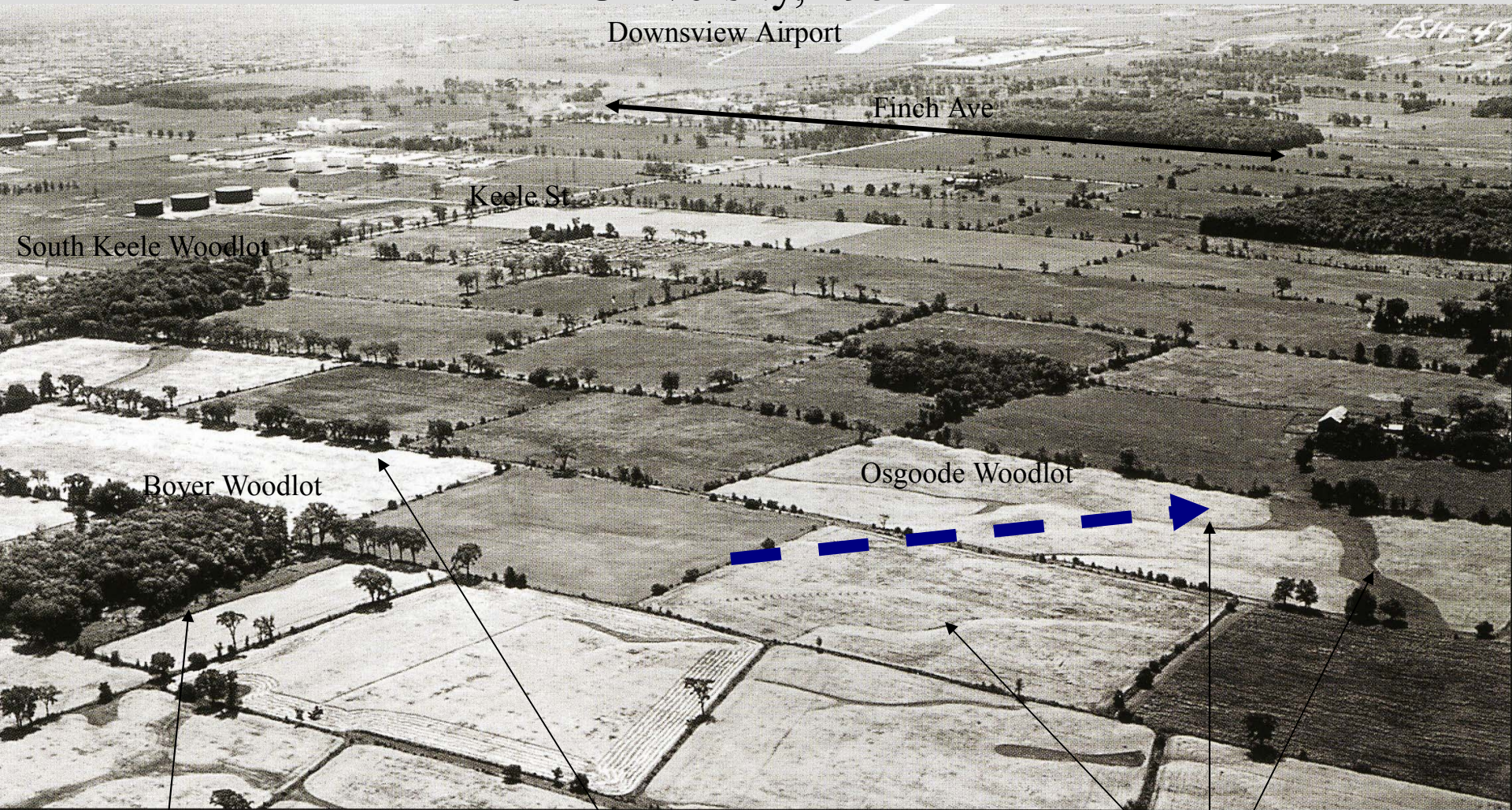
Total Annual Runoff
387311 m³

Annual Water Runoff Evolution



York University, 1958

Downsview Airport



ES11-47

Finch Ave

Keele St

South Keele Woodlot

Boyer Woodlot

Osgoode Woodlot

Remnant Patch (Stepping Stones)

Hedgerows

Surface runoff towards Black Creek

Typologies of Land Use



Photo Source: Toronto: Then and Now (Mike Filey, 2000)



Voyez comme je suis vert.

STOP

100

Unused open green space would be an excellent candidate for naturalization and reforestation

Stong Pond





Natural Greenways already exist
and could be expanded and disconnects addressed

DISCUSSION

From YORK UNIVERSITY LANDSCAPE PLAN (Draft, 2006)

- Environmental Guideline for watershed impermeability
- Practices

Stong Pond ; Tennis Court Pond

Peak flow water management (near Winters Rd. and Vari Hall)

Central Square

Bio Swales

Green Roofs (Computer Science and Engineering Building)

TO CONSIDER...

- York is taking steps to improve the quality of water in the Humber watershed
- What other measures are being taken outside of campus to control runoff?
 - How does York University compare?
 - Is York University leading by example?
 - Is there room for improvement?
- What is York's relative impact within the watershed?