



## low impact development demonstration project

NORTH HUMBER EXTENSION NEIGHBOURHOOD - KLEINBURG

TRIECA Conference 2012 | March 27 and 28 | The International Centre Mississauga

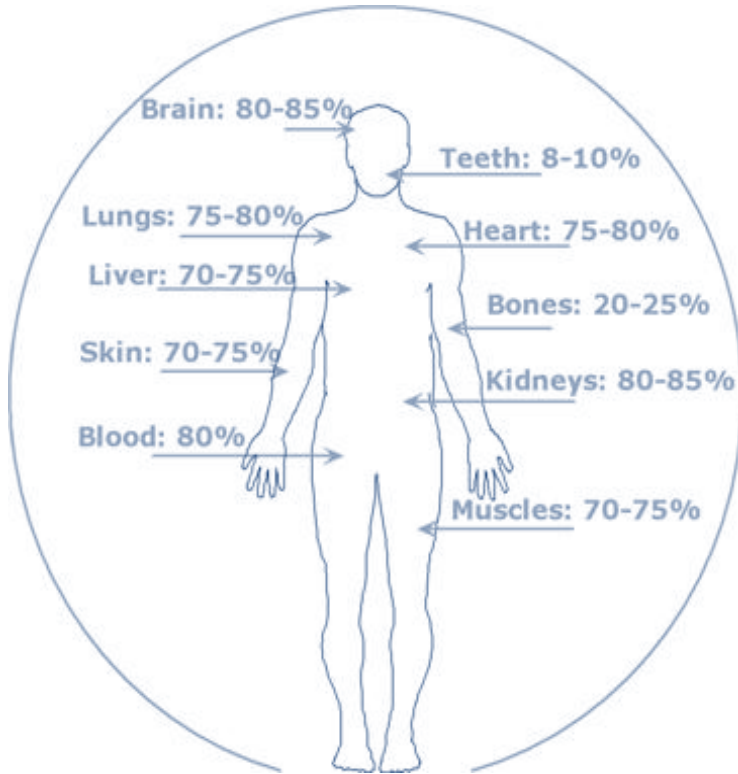


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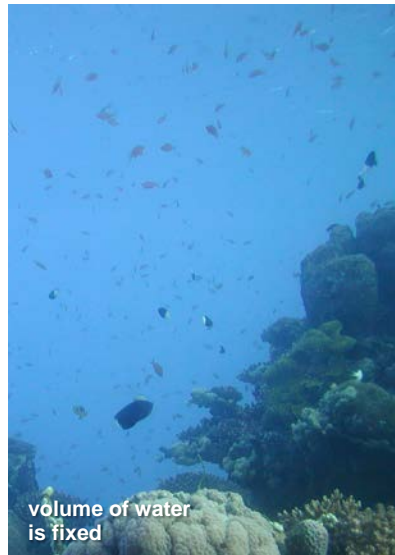
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905 738 5700 [www.tmig.ca](http://www.tmig.ca)

1. Water resources and stormwater management
2. Low impact development – a return to first principles
3. Opportunities
4. Challenges
5. Case study + other examples

# water



# water





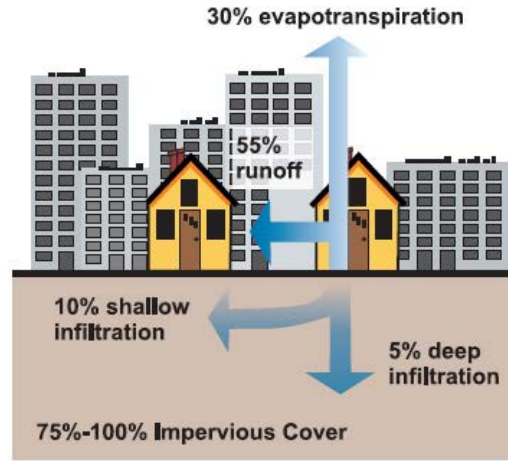
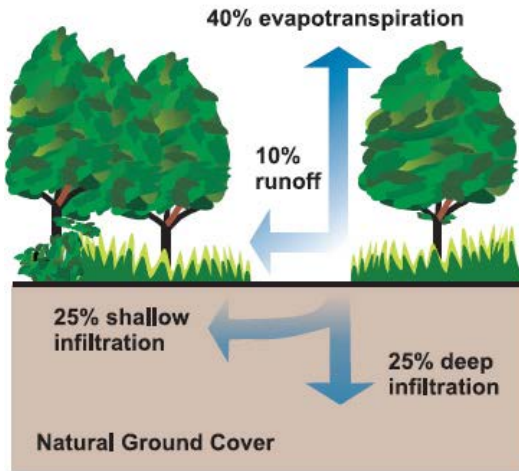
# stormwater management

pollution

*managing our  
impact on the  
water cycle, and  
the water cycle's  
impact on us*



# stormwater management



impervious surfaces increase the volume of stormwater runoff

human activity creates pollution

---

**stormwater management:**  
managing the quantity and quality of stormwater runoff

# stormwater management





# today's challenges

*“the ecological integrity of river ecosystems depends on their natural dynamic character”*

BioScience, 1997





# today's challenges

roads & communities

*climate  
variability*



# today's challenges

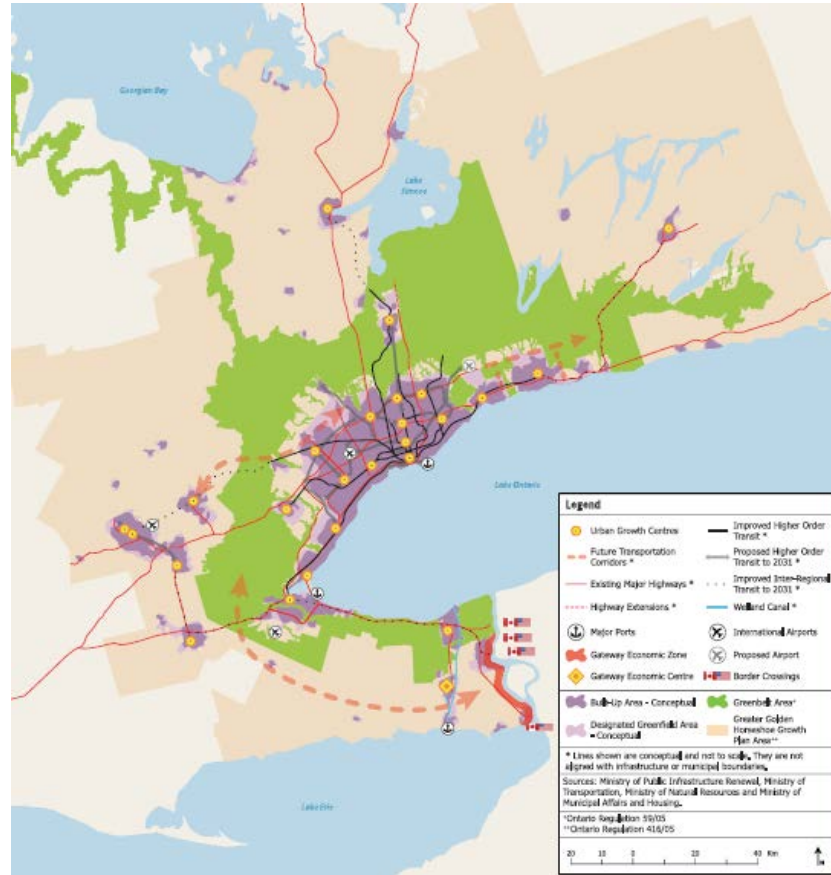
## *infrastructure deficits*

*(\$200 Billion Nationally, \$2 Trillion Globally)*



# today's challenges

*intensification*





# returning to first principles: low impact development



# other opportunities





# new challenges





# general approach



maximize infiltration (need to know soil conditions and depth to water table)



maximize evapotranspiration (lots of plants, surface storage)

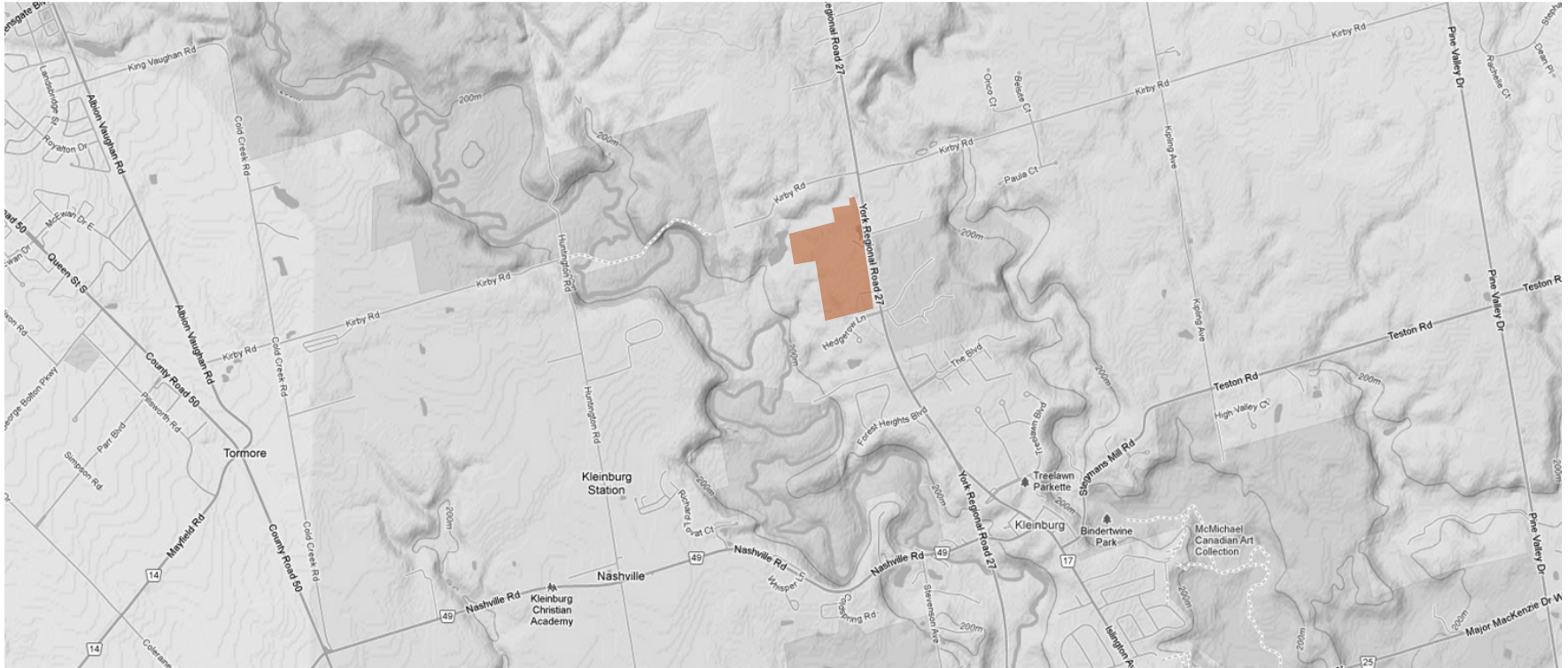


maximize reuse (for irrigation or other human uses)



minimize impervious cover (avoid hard surfaces)

# case study - kleinburg

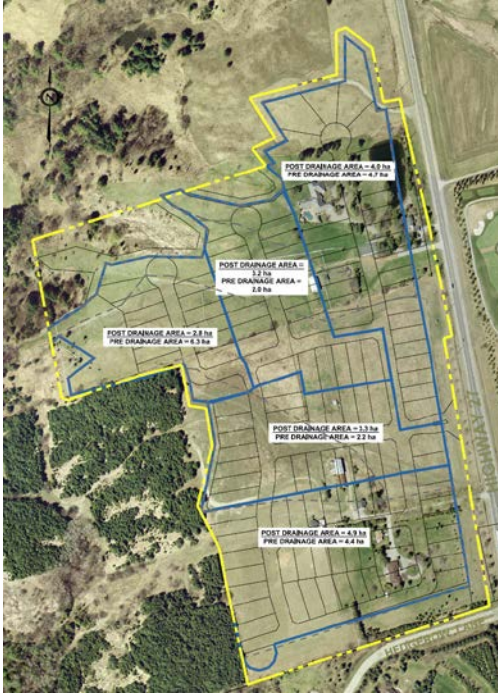


# case study - kleinburg





# case study - kleinburg



# case study - kleinburg

Distributed outlets

Not within Oak Ridges Moraine area

Proximity to the valley

Percolation rate range: 20-60 mm/hr

Size of site

Contemplated form of development

- 26% imperviousness
- Large estate lots

No flood control requirement

Groundwater level greater than 4m below ground

Groundwater flow in north-west direction toward Humber River

Beyond 25 year capture zone for municipal wells



City of Vaughan  
**North Humber Extension  
Neighbourhood**  
Low Impact Development  
Evaluation  
Draft • March 2009 • File 09100



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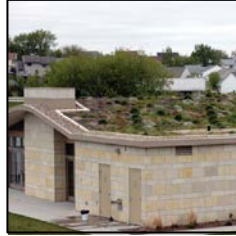


PREPARED FOR:  
Environment Canada  
Toronto Region Conservation  
Authority

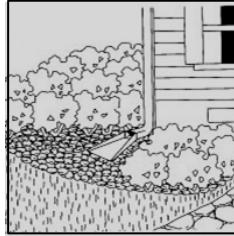
# case study - kleinburg



rainwater harvesting  
(barrels or cisterns)



green roofs



downspout  
disconnects /  
increased topsoil



soakaway pits



bioretention gardens/  
stormwater tree clusters



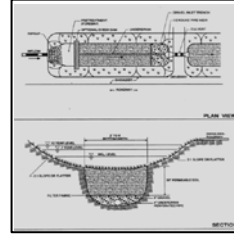
permeable pavement



vegetated filter strips



soil amendments



dry swales



grass swales

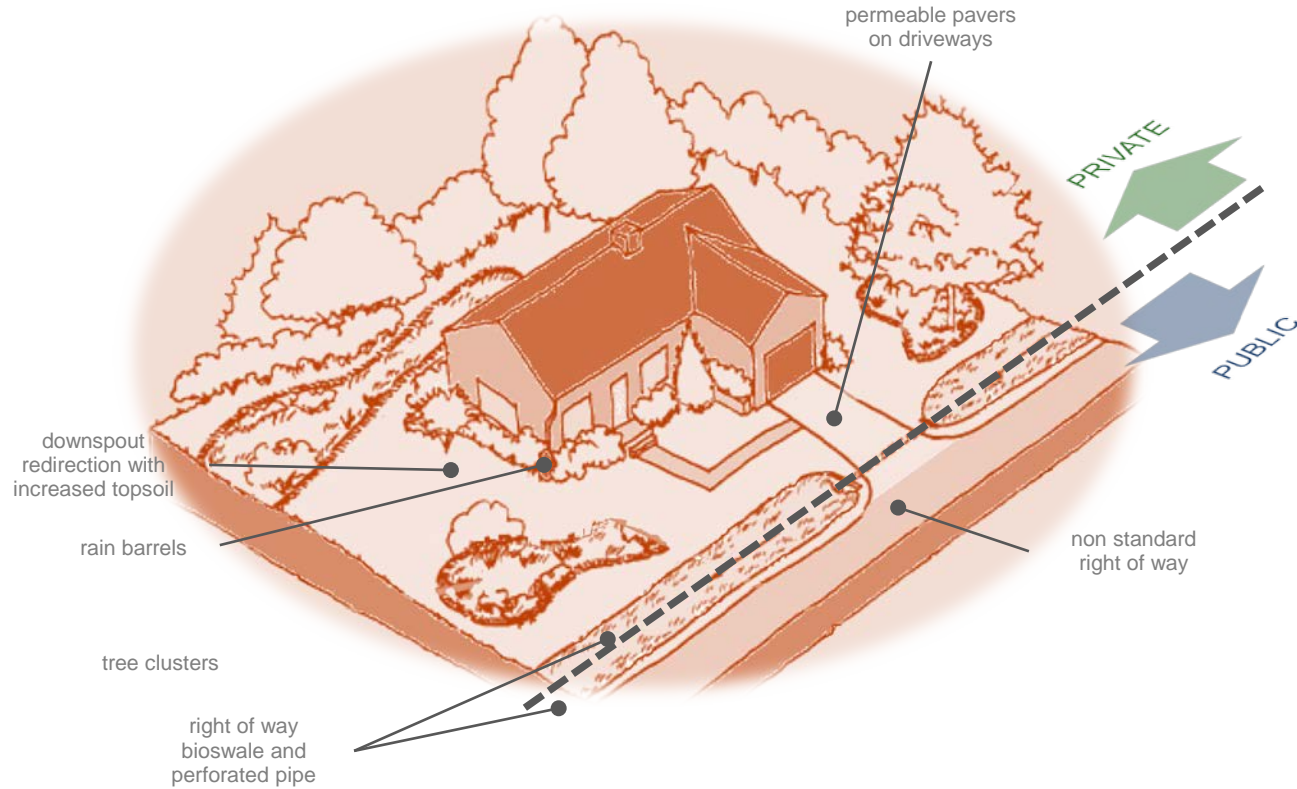


modified cross section

screening via **lid matrix**  
to identify measures applicable to site  
characteristics



# case study - kleinburg



# case study - kleinburg

## *permeable pavement*

Reduces runoff coefficient from 0.90 to 0.40

Spans the public and private spaces



# case study - kleinburg

## *downspouts directed to rain barrels and landscaped areas with increased topsoil*

Quantified by adjusting the runoff coefficient for different storm events, based on 21mm capture:

$$C_{25\text{mm}} = 0.05$$

$$C_5 = 0.44$$

$$C_{100} = 0.63$$



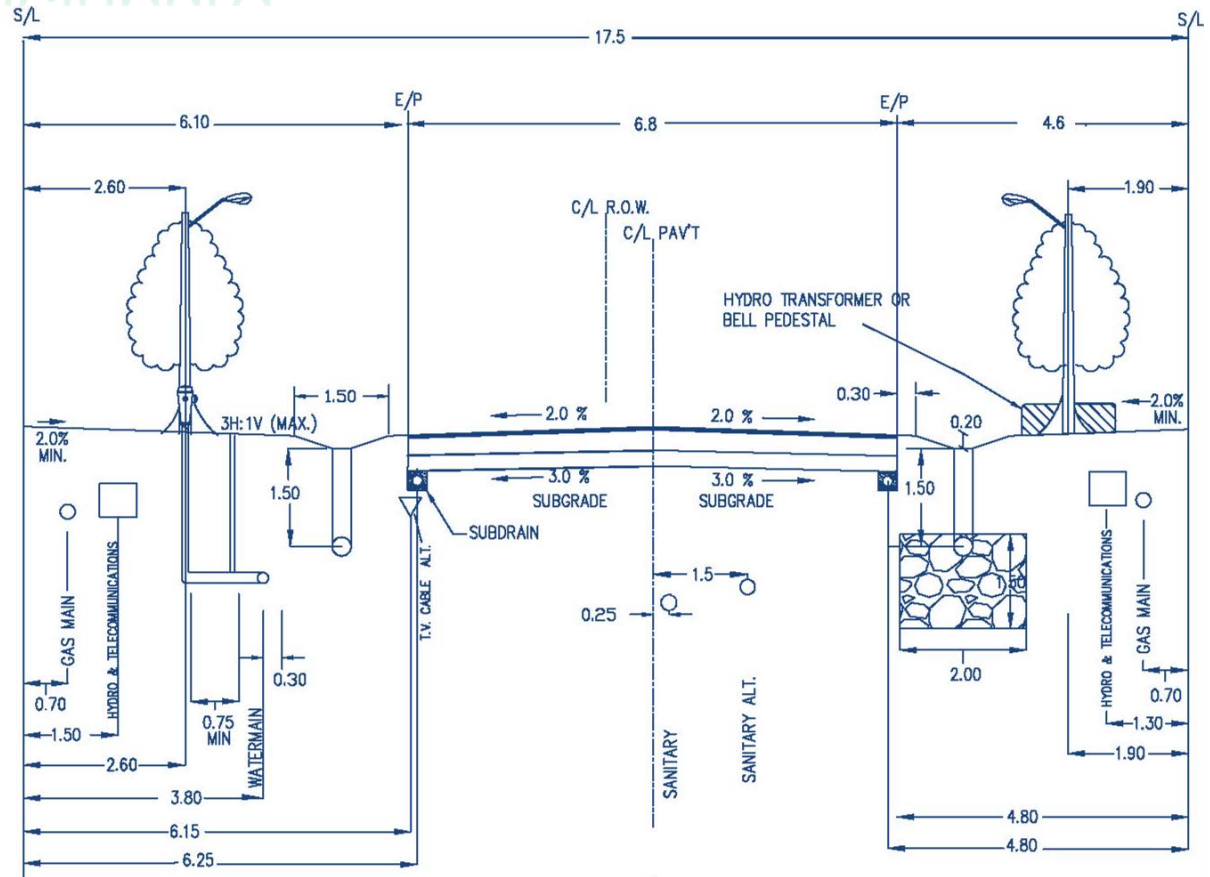


# case study - kleinburg

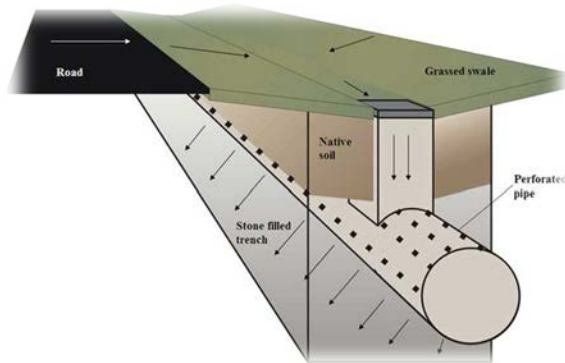
## enhanced dry grassed swale and infiltration trench system

Conveyance capacity

Storage and infiltration sized to  
address erosion and quality  
requirements



# case study - kleinburg



## SUMMARY OF FINDINGS

### Flow Monitoring

- GSPP system peak flows up to 53% of conventional
- Volumes up to 27% of conventional

### Water Quality

- 81 – 95% TSS Removal

### Video Inspection

- Pipes generally clean with very little sediment build-up

## 20 YEAR PERFORMANCE EVALUATION OF GRASS SWALE AND PERFORATED PIPE DRAINAGE SYSTEMS



Project No. 524 (02)



Submitted to:  
Infrastructure Management Division  
City of Ottawa

Prepared by:  
J.F. Sabourin and Associates Inc.

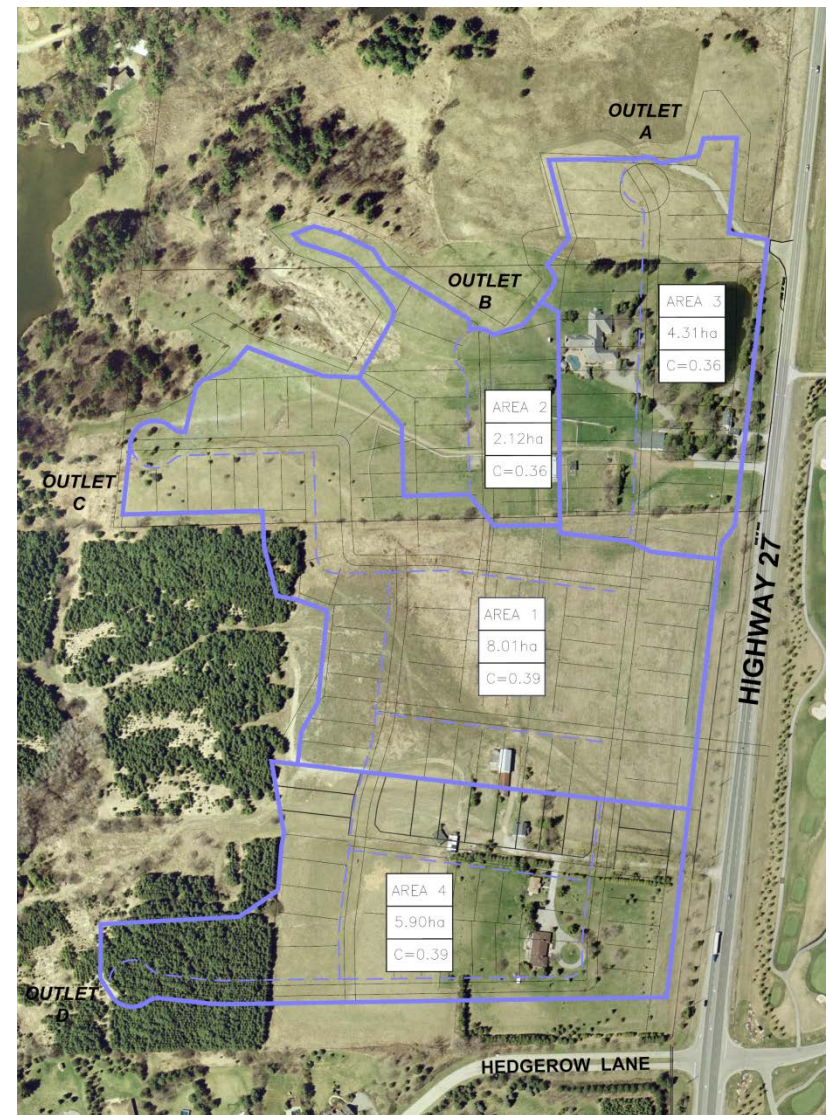
# case study - kleinburg

## Water Quality

	Area 1 (7.62ha)	Area 2 (1.46ha)	Area 3 (2.83ha)	Area 4 (4.26ha)
SWMP Type	Infiltration	Infiltration	Infiltration	Infiltration
Level of Protection	Enhanced	Enhanced	Enhanced	Enhanced
Drainage Area	7.62 ha	1.46 ha	2.83 ha	4.26 ha
Weighted Imperviousness	25 %	22 %	22 %	25 %
Water Quality Storage Volume Requirement	22.5 m <sup>3</sup> /ha	21.67 m <sup>3</sup> /ha	21.75 m <sup>3</sup> /ha	22.50 m <sup>3</sup> /ha
Required Water Quality Storage Volume	171 m <sup>3</sup>	32 m <sup>3</sup>	62 m <sup>3</sup>	96 m <sup>3</sup>
Provided Water Quality Storage Volume	650 m <sup>3</sup>	58 m <sup>3</sup>	181 m <sup>3</sup>	360 m <sup>3</sup>

## Erosion

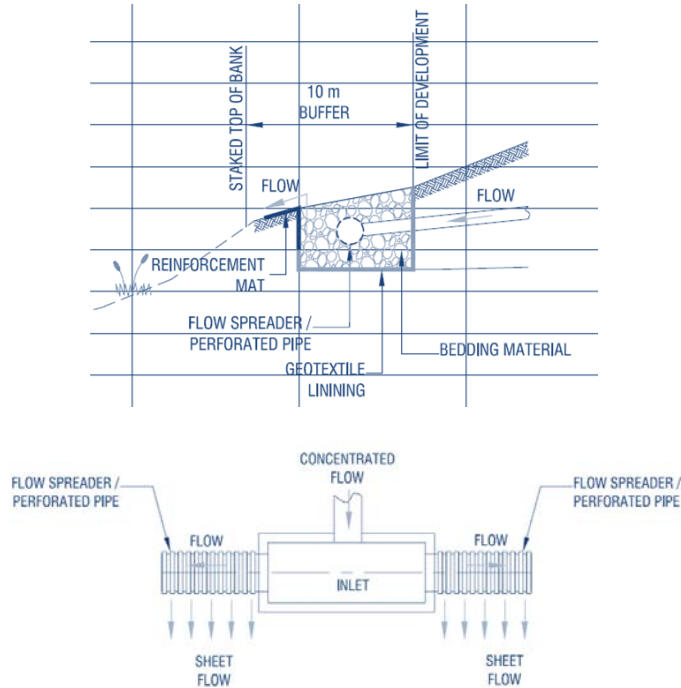
Required Storage (m <sup>3</sup> )	Provided Storage (public, m <sup>3</sup> )	Provided Storage (private, m <sup>3</sup> )	Provided Storage (total, m <sup>3</sup> )
2,394	3,237	5,148	8,385



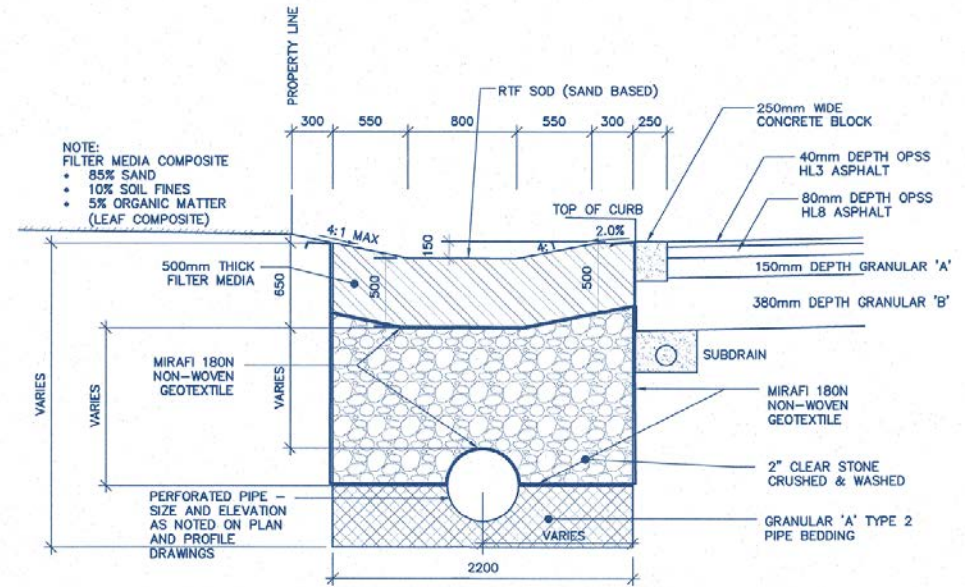


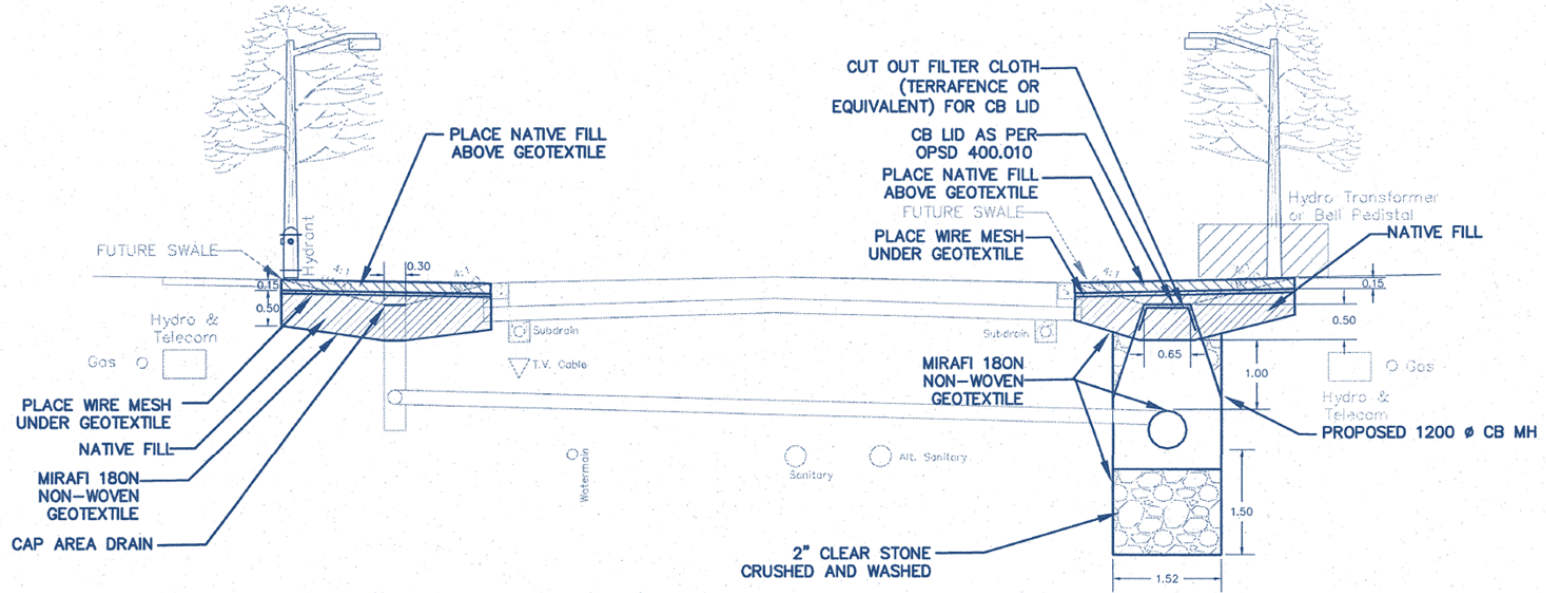
# case study - kleinburg

Outlet details



Enhanced swale detail (Walnut Road)





## case study - kleinburg

*overall project  
estimated as 30%  
less than  
conventional design*





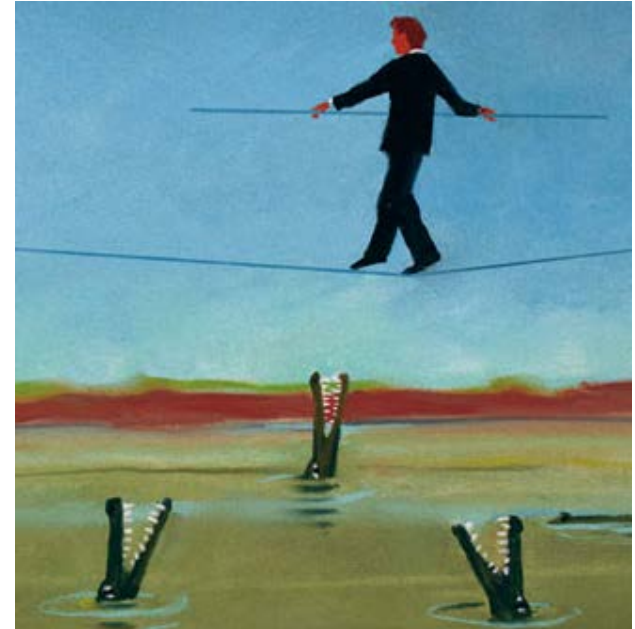
# going forward

*Early and frequent engagement / collaboration needed to understand and meet the intent of existing criteria*

*The era of designing by checklist is over – real engineering and technical excellence are required for innovation*

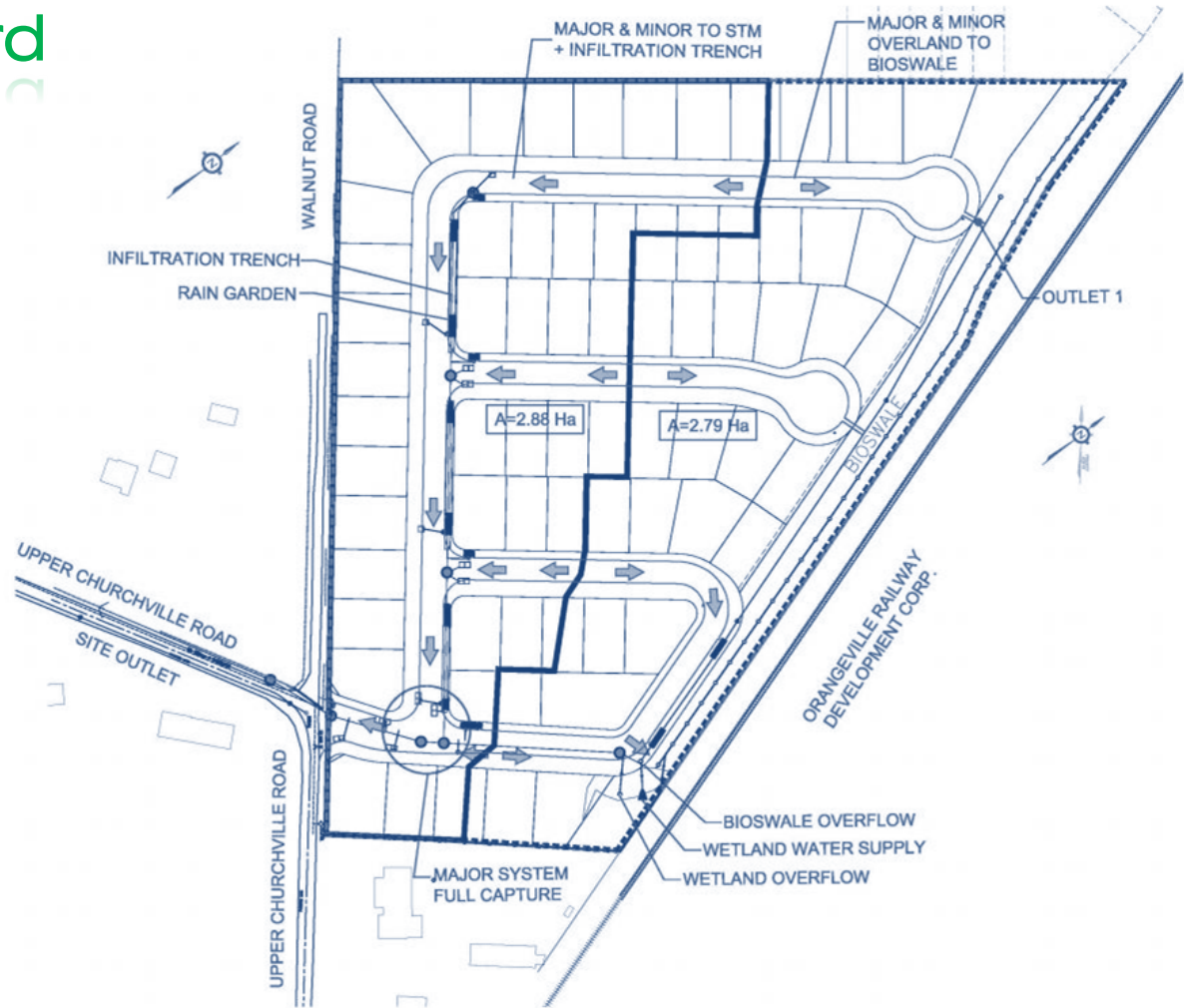
*Monitoring is necessary to confirm and refine design assumptions*

*Doing things differently inherently increases risk due to uncertainty*



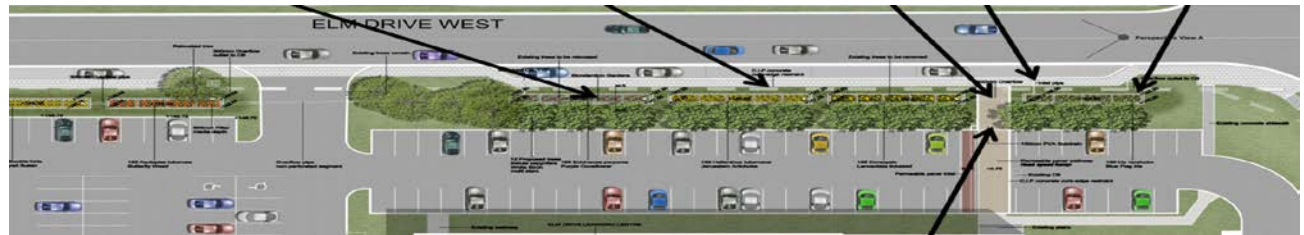
going forward

## Walnut Road, Brampton



# going forward

## *Elm Drive ROW Retrofit, Mississauga*





going forward

# Mississauga Valley Community Centre, Mississauga

Rendering by  
Schollen & Company



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going forward

# *Tower Renewal SWM Feasibility Study, Toronto*

Rendering by  
Schollen & Company

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# going forward

*Lake Wilcox  
(Richmond Hill)  
and Black Creek  
(Toronto)  
SNAP's*



Figures by DTAH



going forward

*East  
Bayfront,  
Toronto*



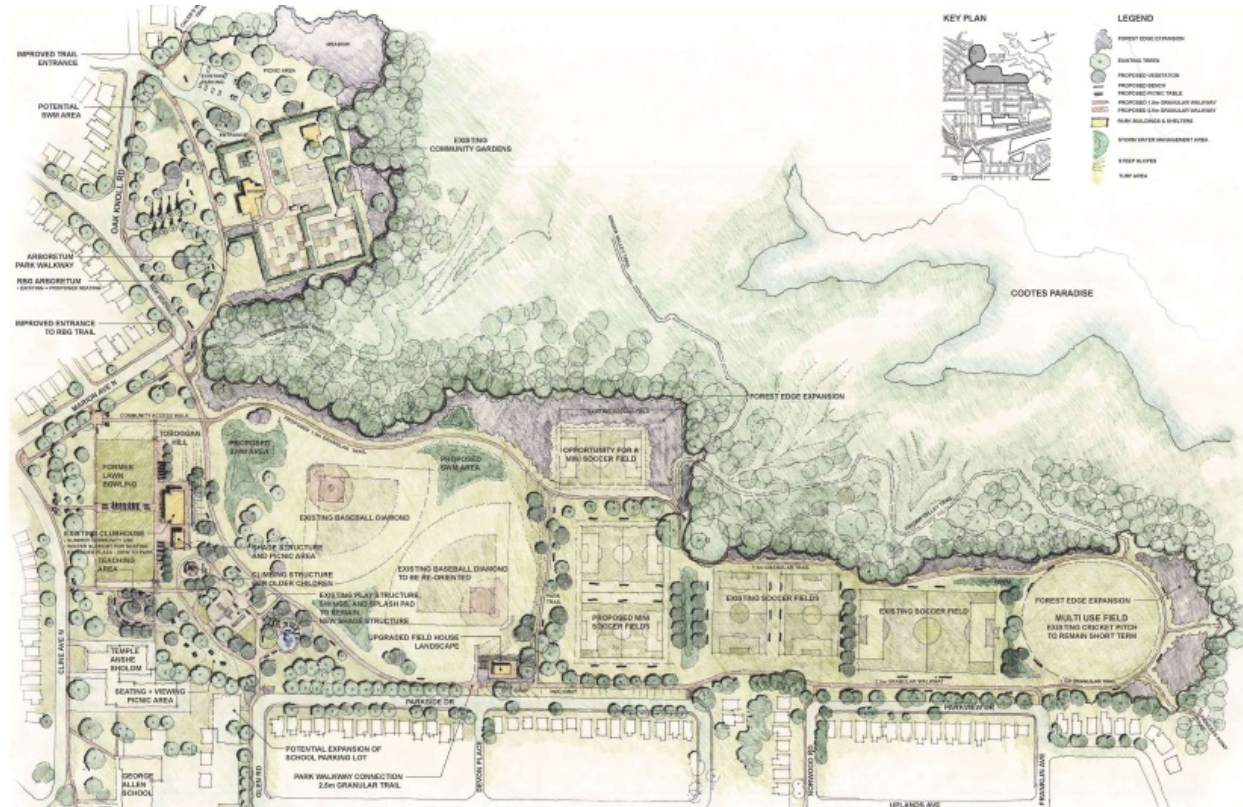
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going forward

# Churchill Park, Hamilton

Rendering by  
Dillon Consulting





going forward

# Vaughan Metro Centre, Vaughan

Rendering by  
Urban Strategies

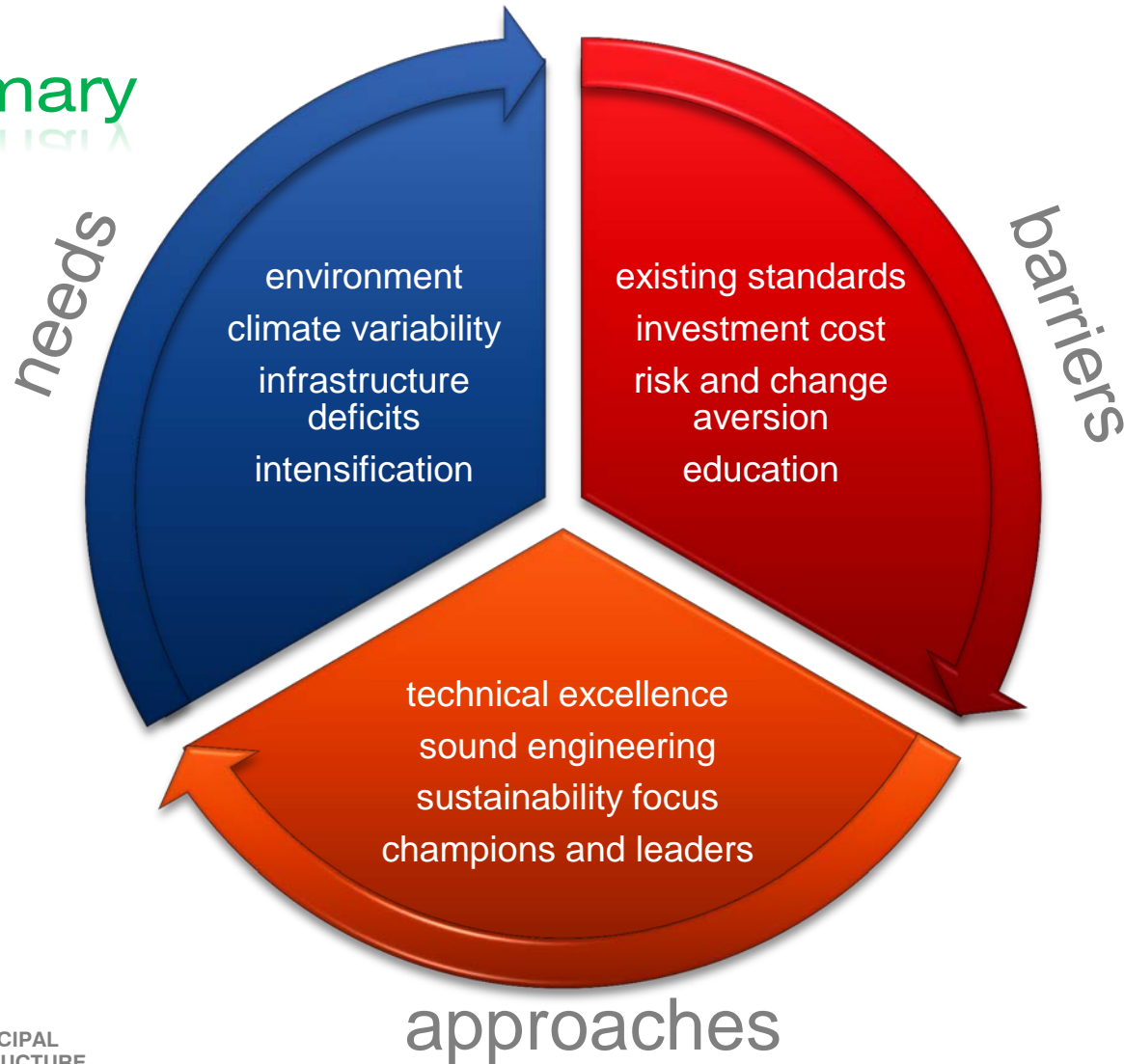


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# summary





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