Microbiological water quality of coastal and fresh waters in Dublin area



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Outline of the talk

- Background to the research
- Urban water quality
- Point of source contamination
  - Tolka pollution
  - Canal contamination
- Rural water quality
- North Dublin coastal area
- Conclusions

Background to the research

EPA report

Water Quality in Ireland 2004 - 2006

"Faecal coliforms were detected in more than half of the groundwater locations sampled. This constitutes a risk for those using such untreated waters for drinking water purposes in the absence of disinfection."

Quality of drinking water

Galway Cryptosporidium Outbreak 2007

Contamination of the city water supply was detected after 24 hours, by which 900 households had been affected and 250 people had been hospitalised with GI symptoms.

"The Food Safety Authority has confirmed that a survey in 2007 found that 1% of samples of bottled water had *E. coli* and 6.3 per cent contained coliforms. 7.2 per cent, or one bottle in 16, failed to comply with legal or EU requirements. " The Irish Times, 18 Nov 2008

Background to the research

The main threat - **pathogenic micro-organisms**.

E. coli, a faecal coliform, in water is a strong indicator of faecal contamination and possible occurrence of pathogen (disease-causing) organisms.

E. coli along with **total coliforms** are the obligatory parameters for microbiological water quality assessment according to EC and National legislation.

Cause of contamination:
-overwhelmed treatment plant
-animal waste
-human waste

Bacteriological analysis

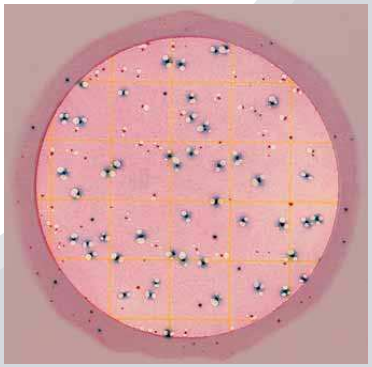
- **Sample collection, storage & transportation to the laboratory**

- **Analytical techniques** – based on cell growth
  - Membrane filtration
  - Most probable number
  - Commercially available sample-ready-culture medium systems

Membrane Filtration

VS

3M Petrifilms



At least 18-24 hours is required for analysis
➢Unacceptable for the cases, where an immediate action is required!
➢Lack of Continuous monitoring (only spot checks).

Monitoring strategy

Water Framework Directive requires the Member States to make sure their waters achieve and maintain at least good water quality status by 2015.

	Parameter [CFU / 100 mL]	Excellent	Good	Sufficient
Inland waters	*Intestinal enterococci*	*200 (*)*	*400 (*)*	*330 (*)*
	E. coli	***500 (*)***	***1000 (*)***	***900 (**)***
Coastal and transitional waters	*Intestinal enterococci*	*100 (*)*	*200 (*)*	*185 (*)*
	E. coli	***250 (*)***	***500 (*)***	***500 (**)***
(*) Based on a 95 – percentile evaluation				
(**) Based on a 90 – percentile evaluation				

Classification of waterways according to EU directive 2006/7/EC

Urban water quality

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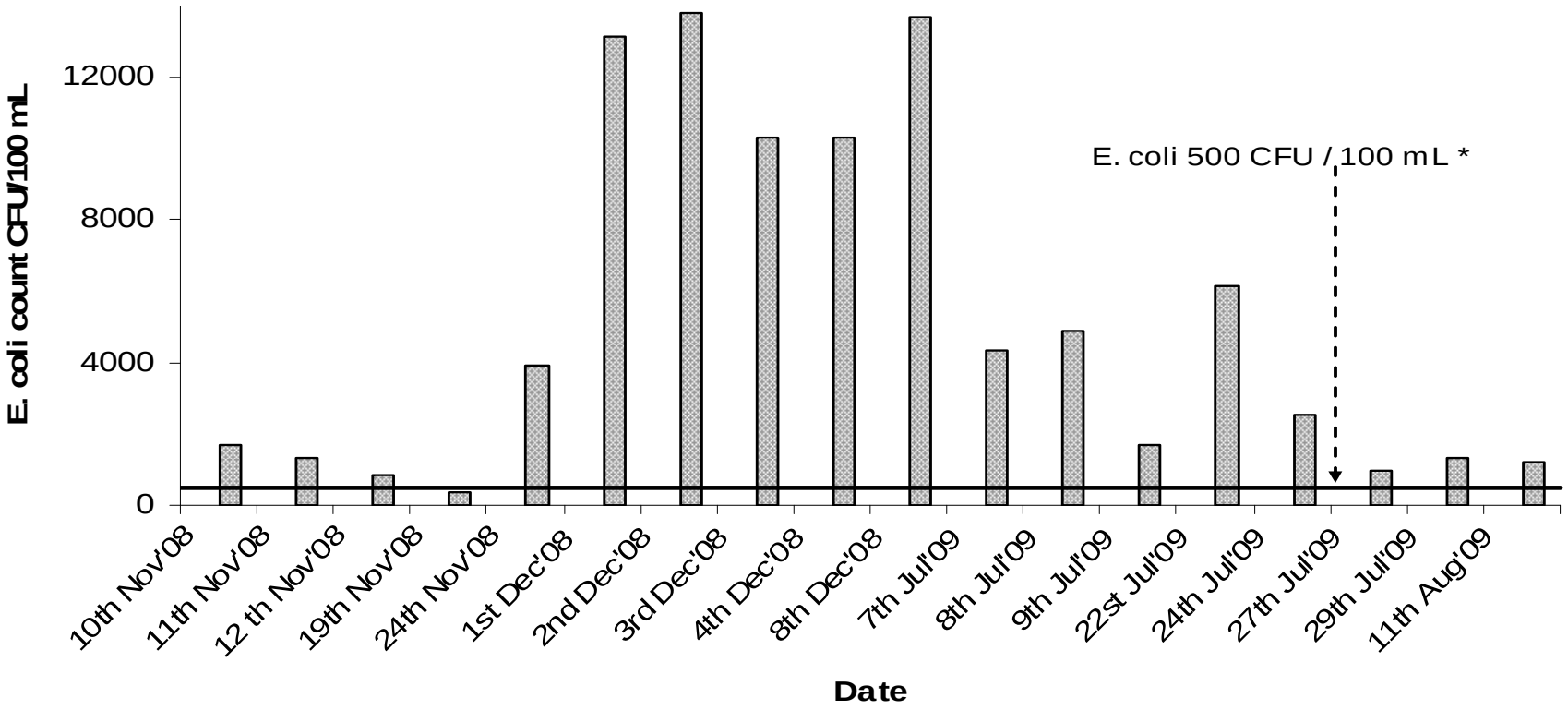
Maps of the investigated area in Dublin

Urban water quality

Average *E. coli* count in the investigated inner city Dublin water bodies

Sampling location	CFU/100 mL	StDev	n
Liffey Tall Bridge	2157	2246	7
Liffey Parliament Bridge	6361	10021	9
Liffey Islandbridge	6467	8746	6
Grand Canal Kilmainham	36	24	7
Royal Canal Phibsboro	14	24	7
Tolka Griffith Park	5137	4869	18

Urban water quality



E. coli **concentration in samples of water from river Tolka taken on different dates at Griffith park. *Corresponds to "excellent" water quality parameters for E. coli according to the Directive 2006/7/EC for bathing water quality.**

Tolka pollution

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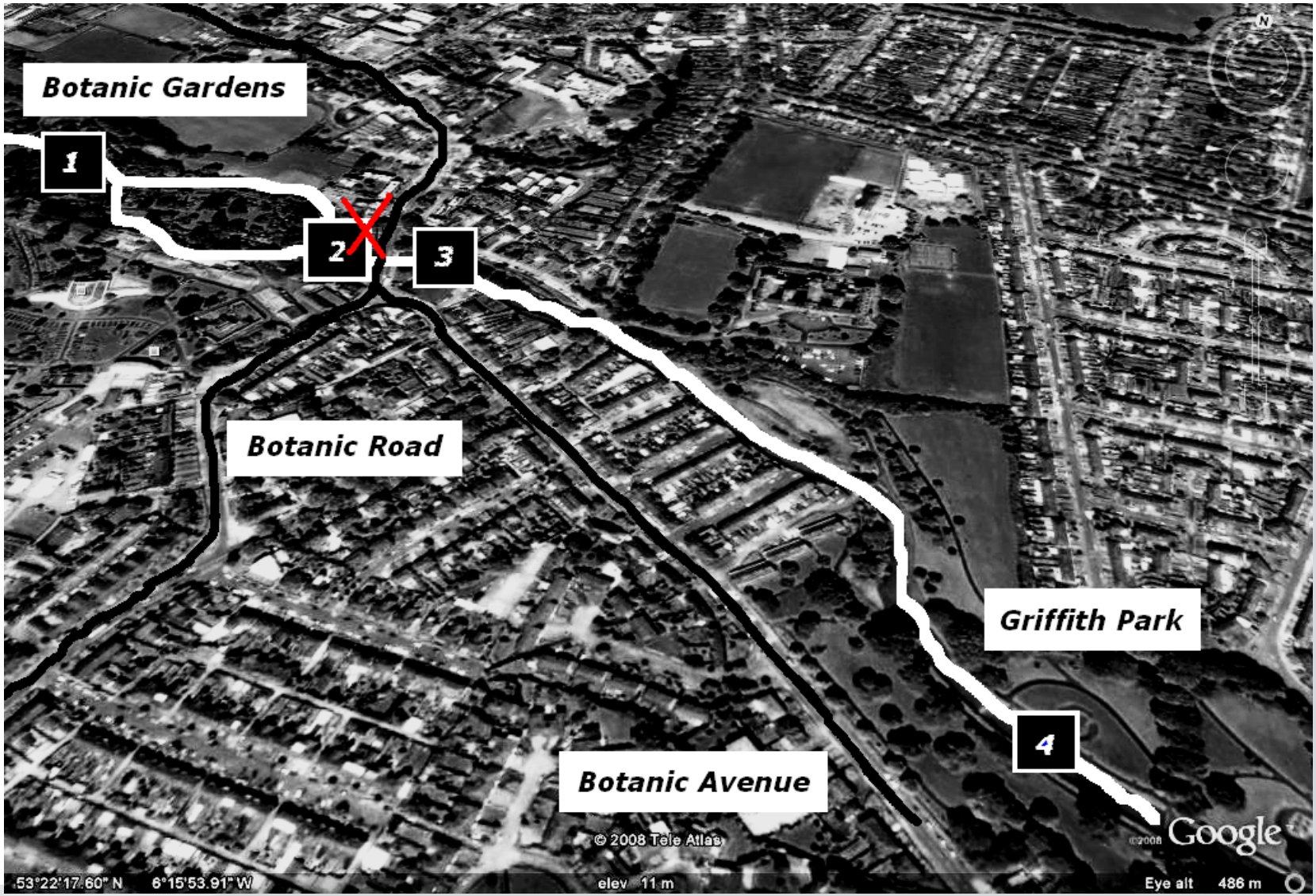
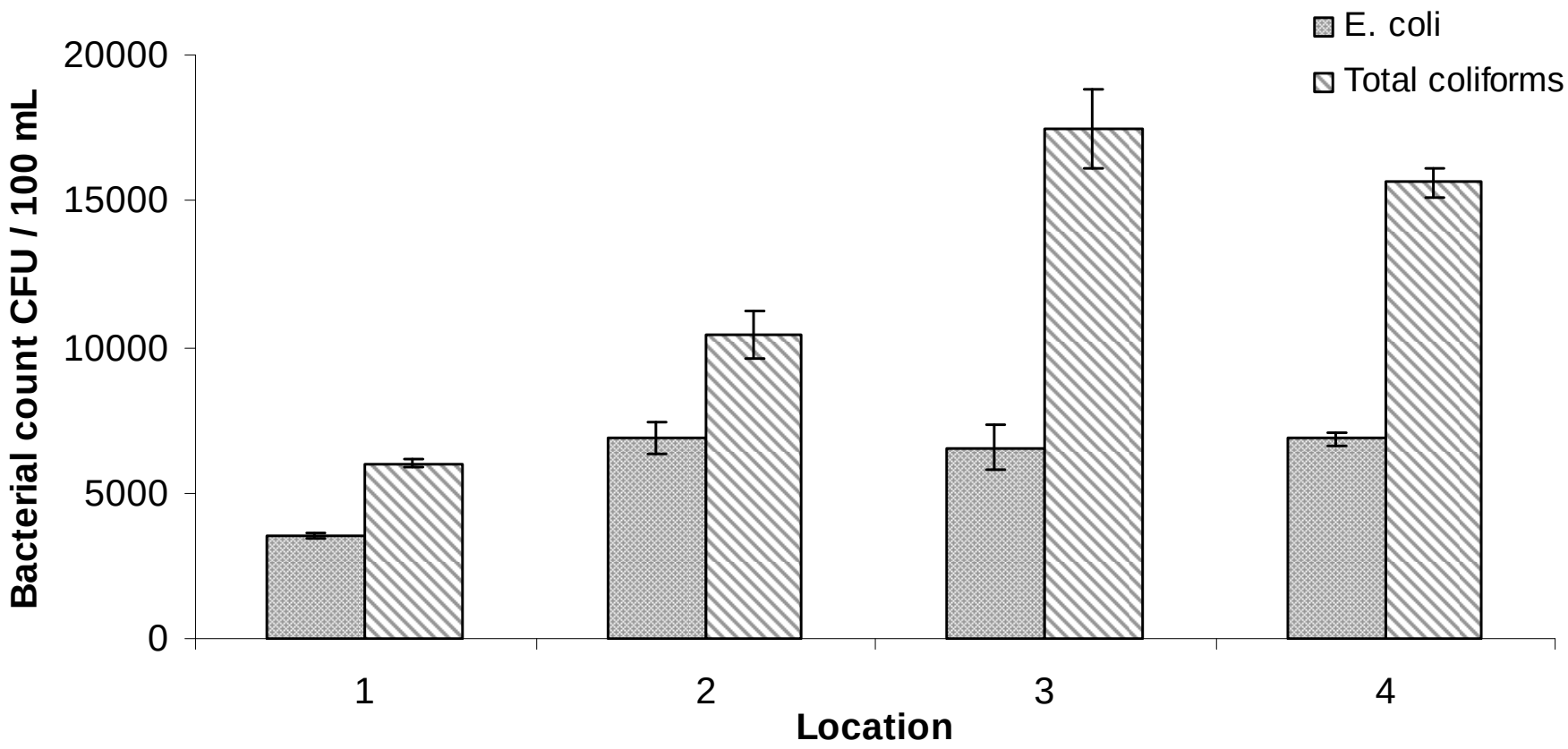


River Tolka (Dublin, Ireland) map and the location of the sampling points

Tolka pollution

Tolka pollution



Microbiological count in water according to different sampling locations on the river.

Canal water

Sampling location	CFU/100 mL	StDev	n
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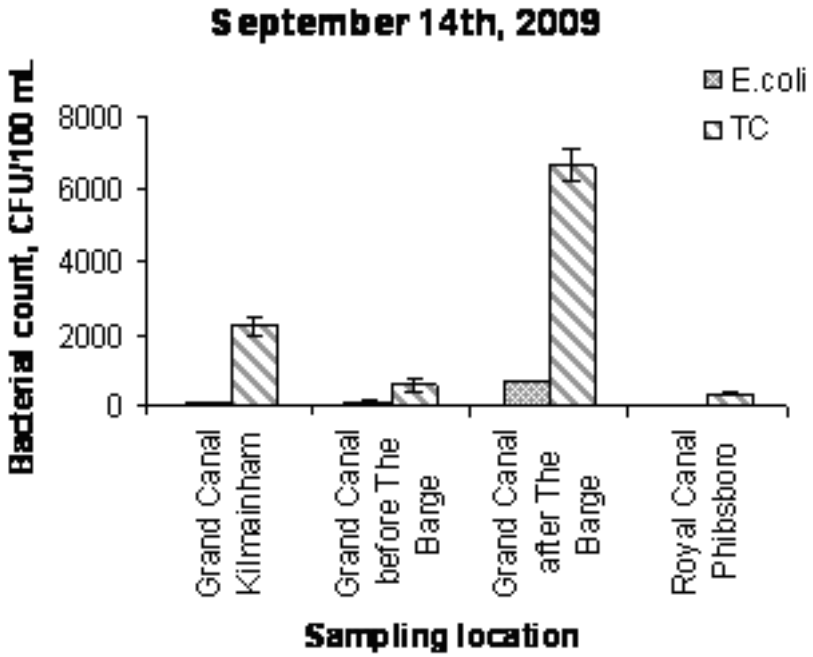
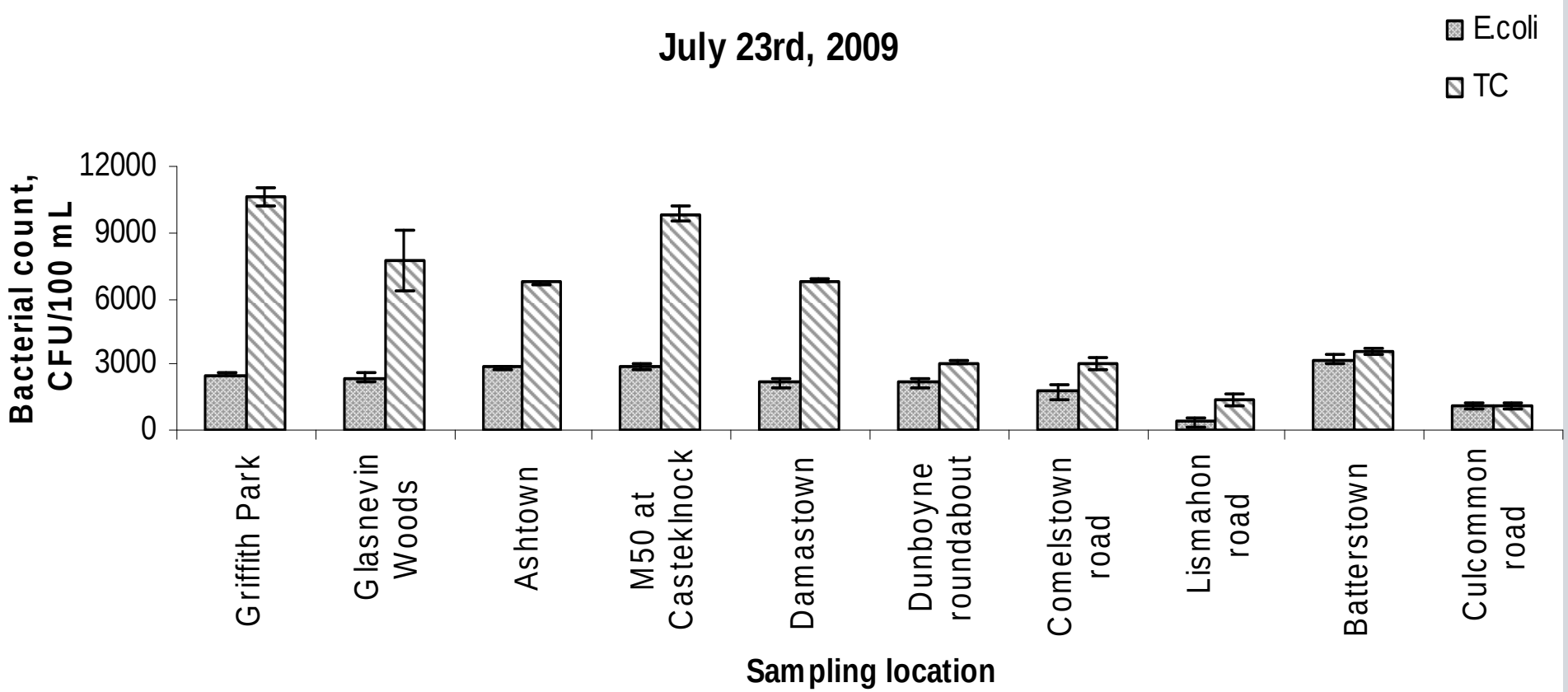


Rural contamination

Rural contamination



Rural contamination

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North Dublin coastal area

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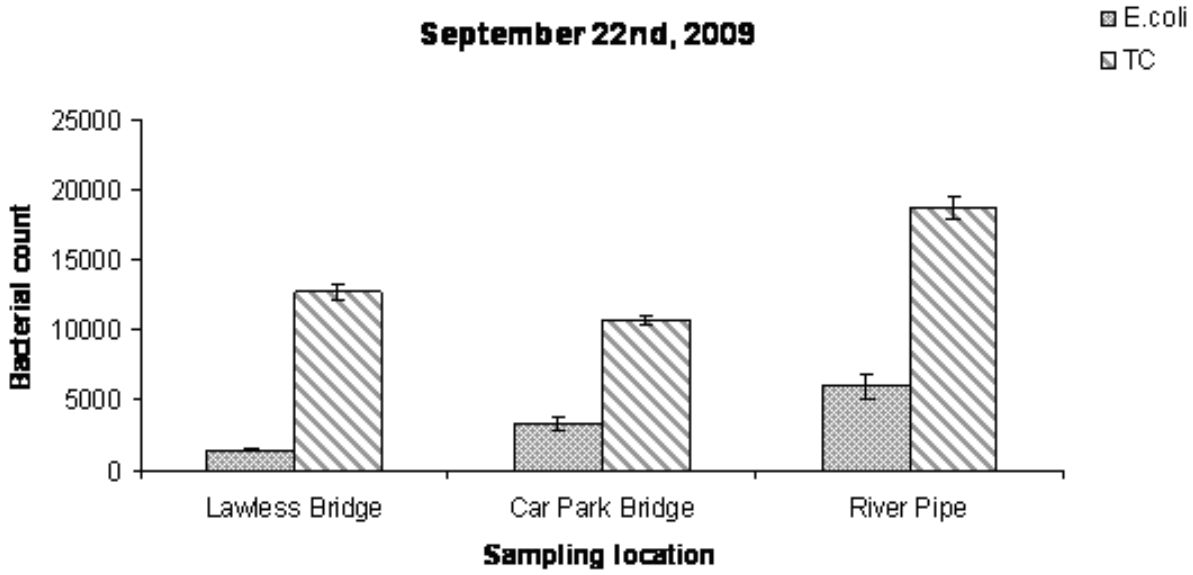
Balbriggan

Portrane

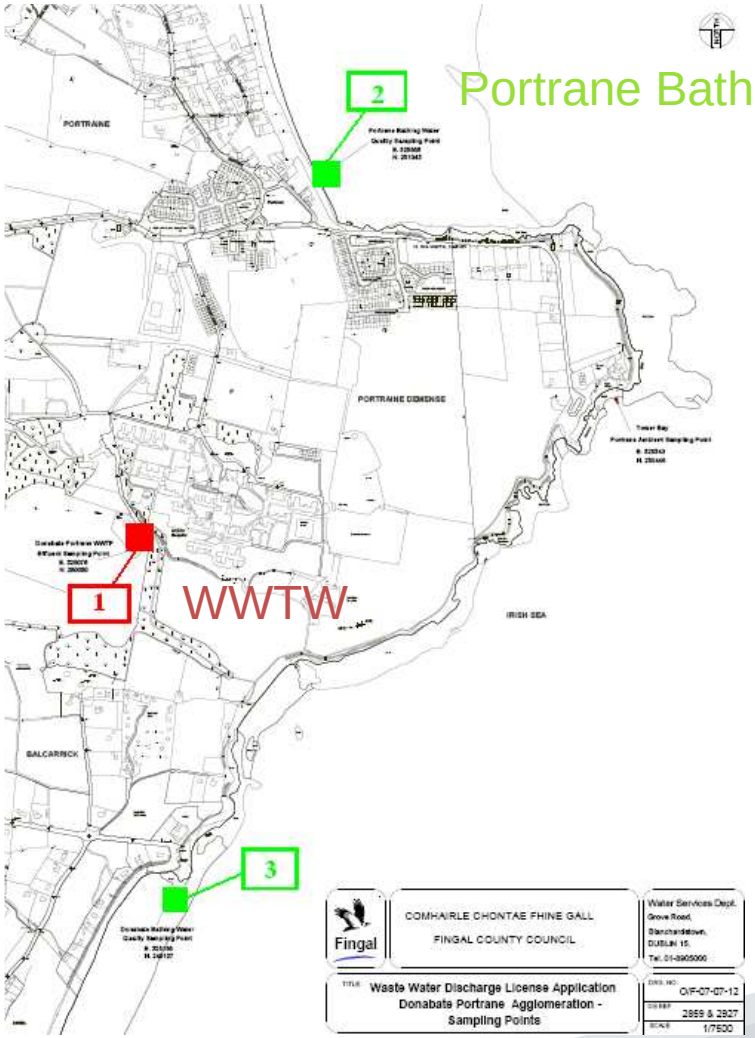
Balbriggan Harbour

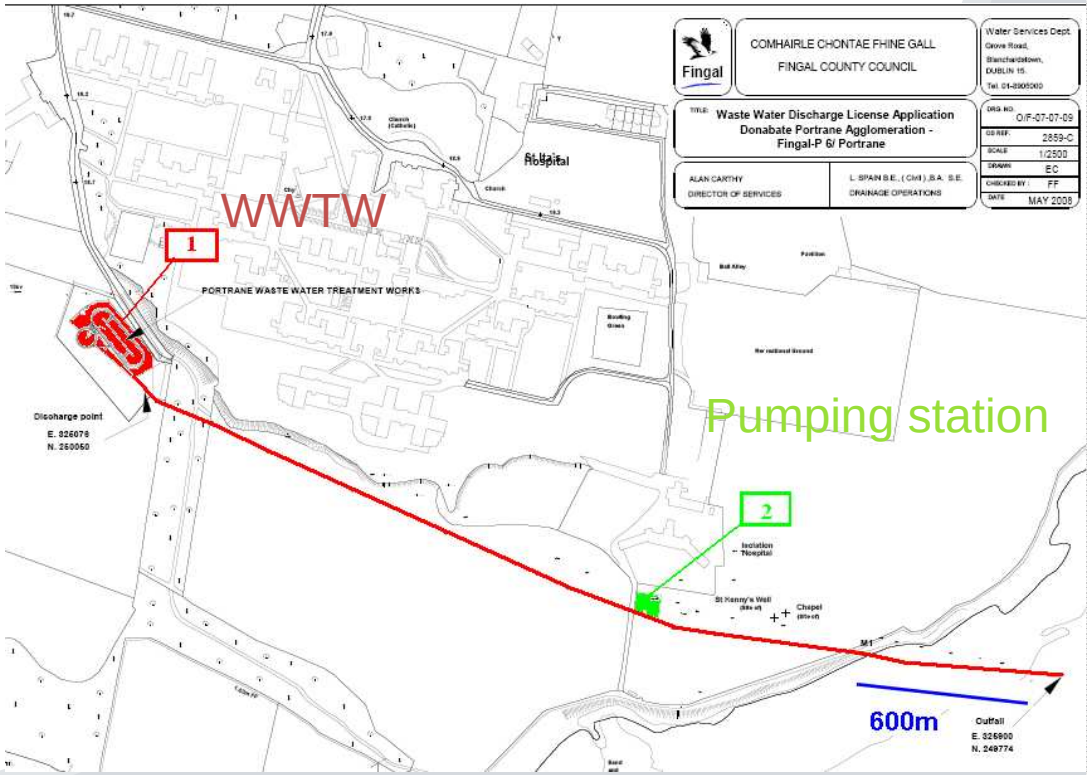
Balbriggan Harbour showing path of River Bracken at low tide and high tide.

Balbriggan Harbour



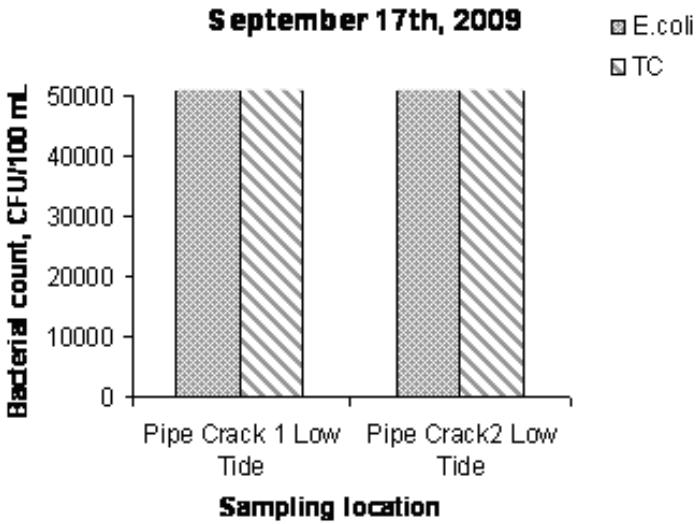
Portrane WWTW





Donabate Bathing Water Quality Point

Portrane WWTW



Conclusions

Poor quality of the rivers in Dublin city is strongly related to human activity

The water quality of the canals in the Dublin area was found to be excellent

In the rural areas human sewage contributes to a lesser extend when compared to the farming activities in the area

The extremely high faecal coliform counts in several water sources in the North County Dublin - potential contribution to the contamination of coastal waters at Balbriggan and Portrane

High levels of microbiological pollution in water require efficient monitoring

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