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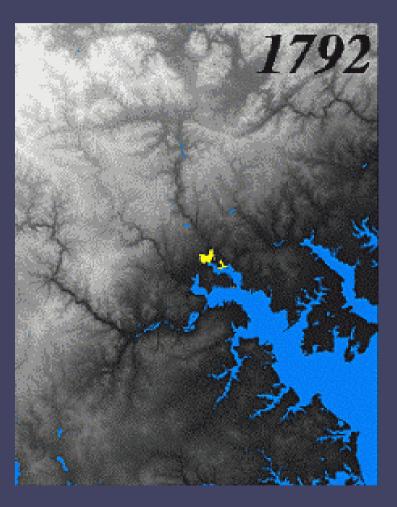








Introduction



Baltimore

- 50% of the global population live in urban centres (UN, 2007)
- Water and sediment quality is key for regeneration, quality of life, and biodiversity.
- However, details on the mineralogical and geomicrobiological controls on contaminant cycling are lacking.



Significant hydrological and chemical modification



and legacy...

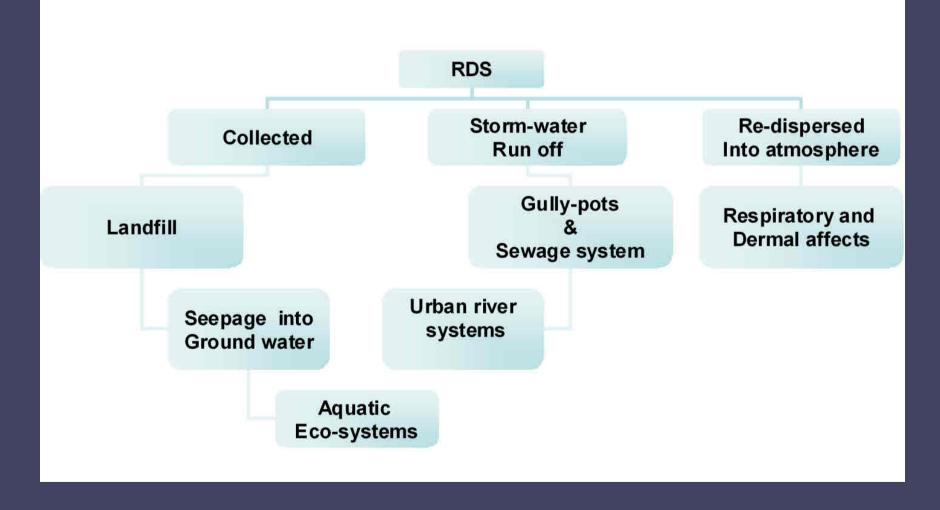


L.S. Lowry

Mersey Basin Catchment Manchester Hollingworth River Inwell **River Roch** Ogden Reservoir United Kingdom Rochdale Heywood Bolt Reservoir Canal Show River Croal **River Roch** River Heaton Park Reservoirs Oldha **River Inwell** River Proutwich Walkden River Huddersfield Canal Medlock ackley Map designed by Aidan O'Rourke @1998 River Bridgewater Canal Ashton Canal River Manchester Medlock Audenshaw Ship Canal Gorton **River** Tame Fallowfield River Choriton Sale Park Water River **River** Withington River Goyt Park River D debury Mersey River Mersey strincham Wythenshawe Hazel Grove headle Hale Bridgewater Canal Airport River Peak Forest Canal Bollin Rostherne Mere Macclesfield Tatton **River Dean River Bollin** Canal Mere Crown copyright and Licence number MC 027251

- 4680 square km.
- Ca. 2000 km watercourse.
- Over 5 million people live in the area.
- Over 200 years of industrial pollution.
- Major feature = Manchester Ship Canal.

Urban Sediment Pollution Cascade



What is road-deposited sediment?

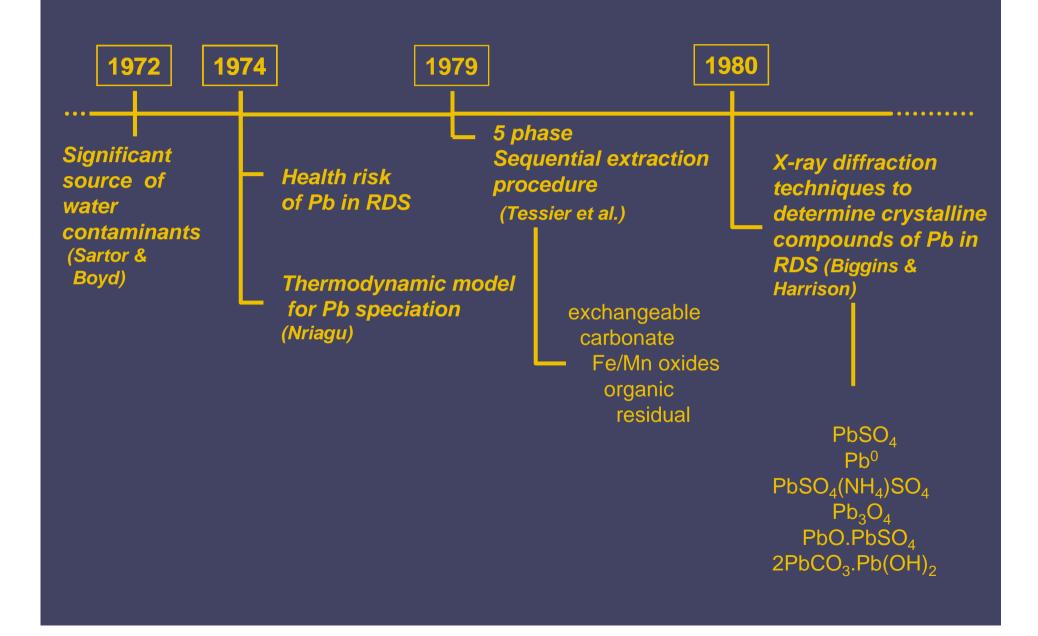


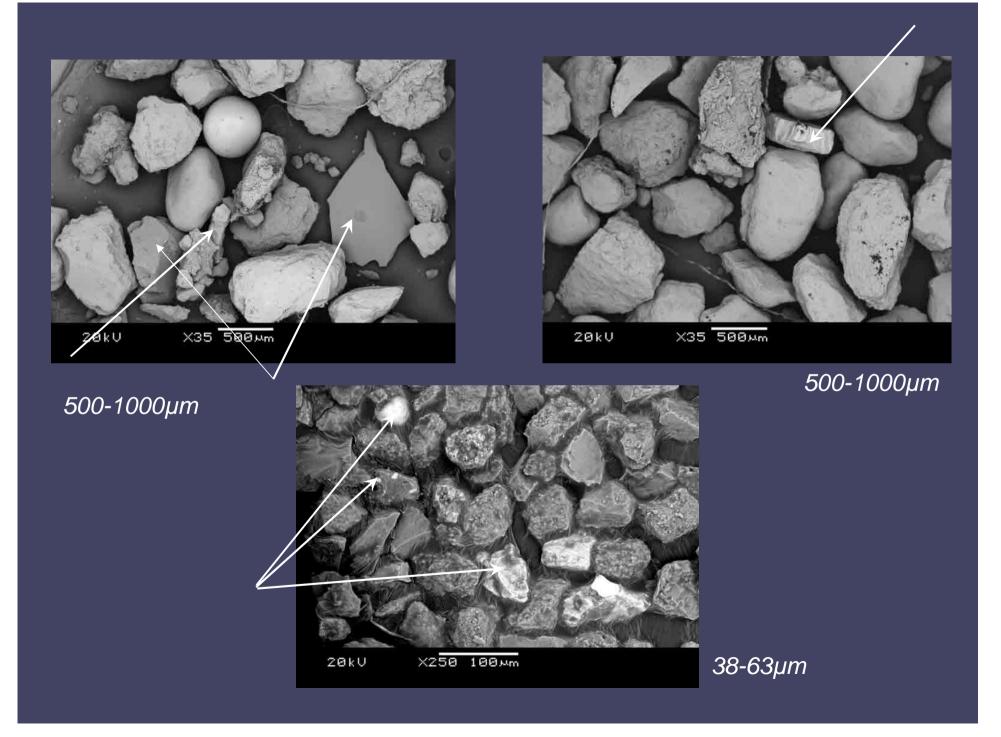
Complex

Mobile

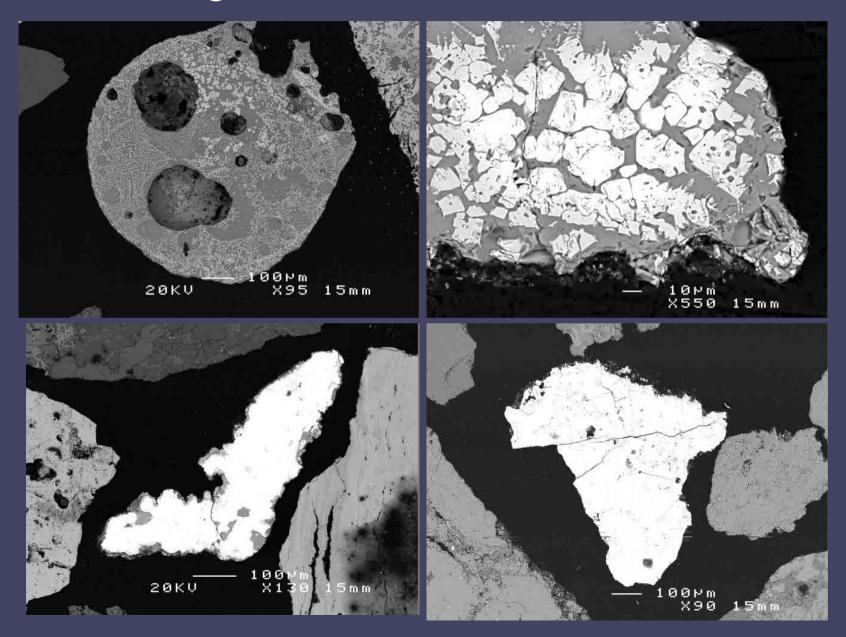
Location specific

Interactive



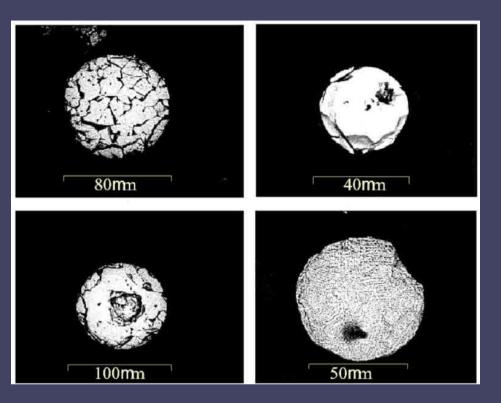


Metal-rich grains



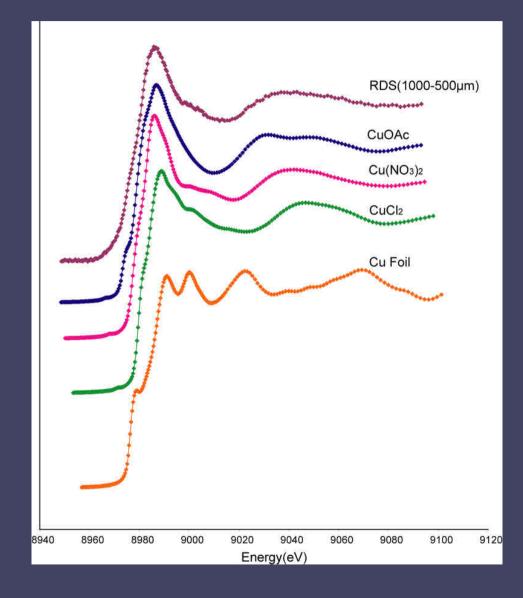
Metal-rich grains

Anthropogenic grains are major hosts for metals



Element	Iron oxide concentrations (μg/g⁻¹)	Iron rich glass concentrations (μg/g ⁻¹)
Pb	247 - 1,554	214 - 696
Cu	387 - 1,460	274 - 3,252
Zn	406 - 9,597	216 - 5,341

Cu-K edge for X-ray absorption near edge spectroscopy (XANES)



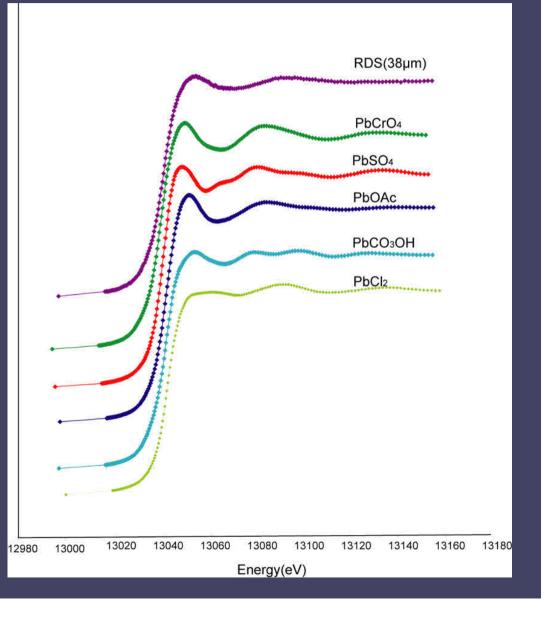


Best Fit Daresbury 43% Copper Acetate 32% Copper Nitrate 16% Copper Metal 9% Copper Chloride

Pb-LIII edge for X-ray absorption near edge spectroscopy (XANES)

Best Fit

49% Lead sorbed to goethite41% Lead Chloride11% Lead Chromate



Salford Quays

Manchester Ship Canal



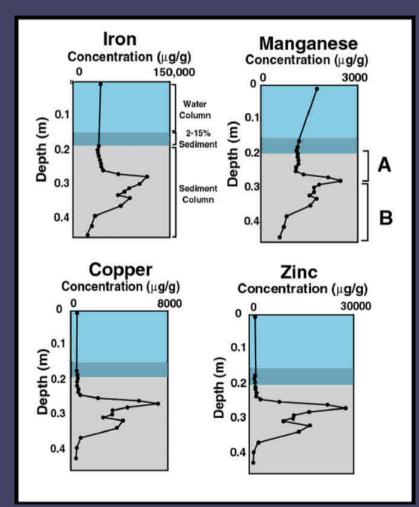
River Irwell

Salford Quays

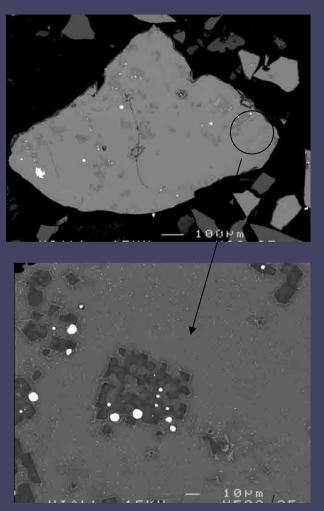
1 km

Sediments: *Stored Pollution*

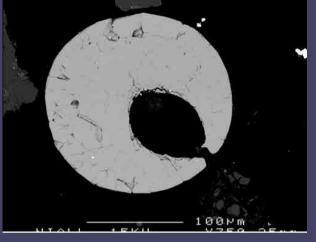




Anthropogenic material



Anthropogenic furnace-derived glass grains abundant

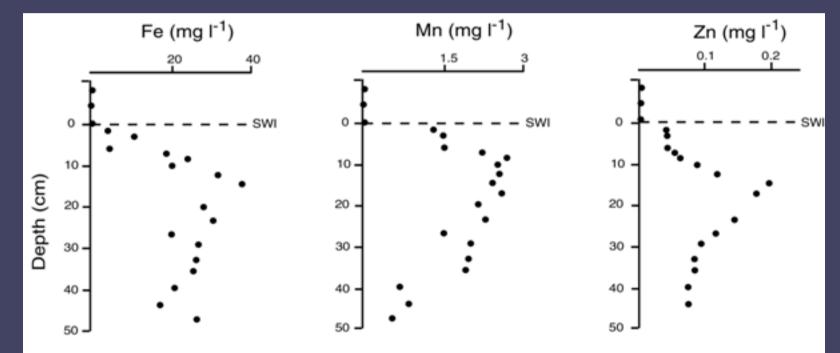




From: Taylor et al. (2003) Hydrological Processes.

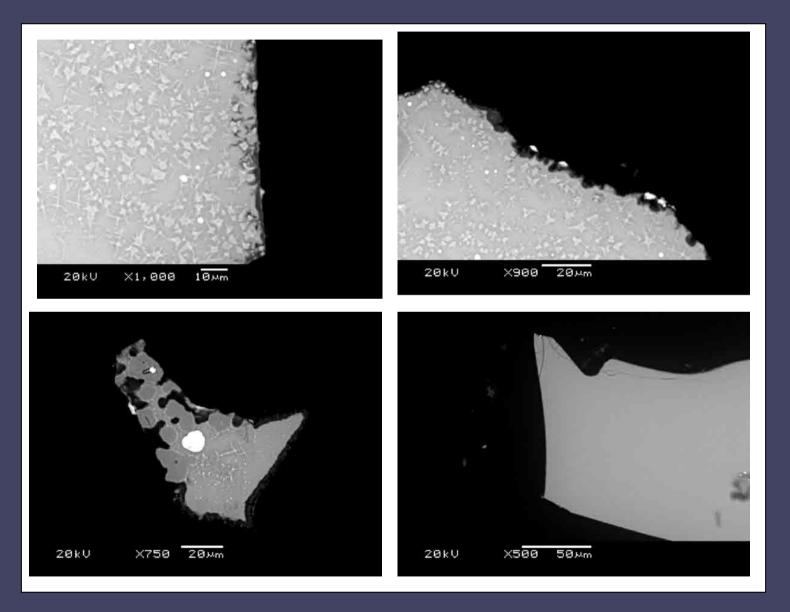
Sediment-Water Interactions

Early diagenesis results in contaminant release into river basins.



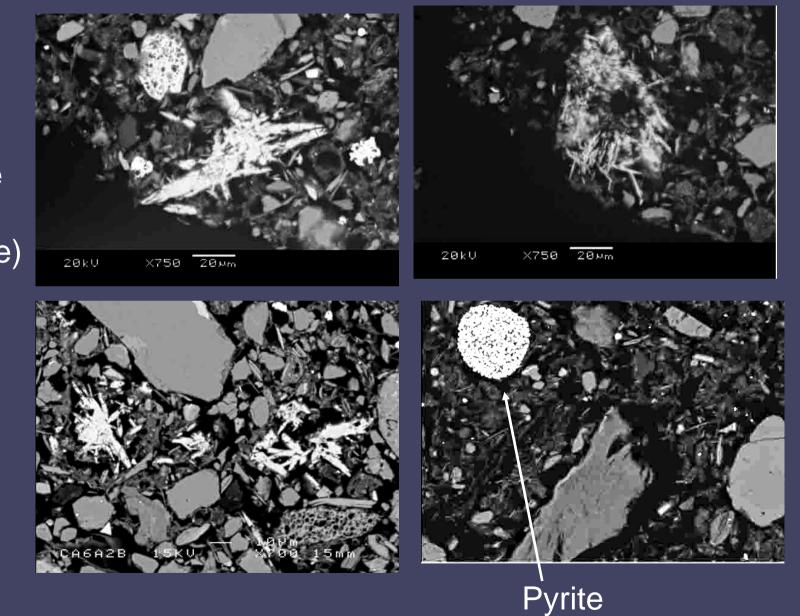
Porewaters

Glass Dissolution

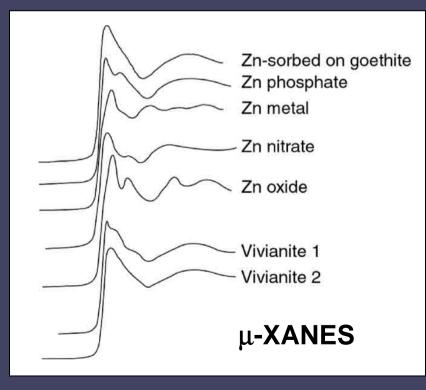


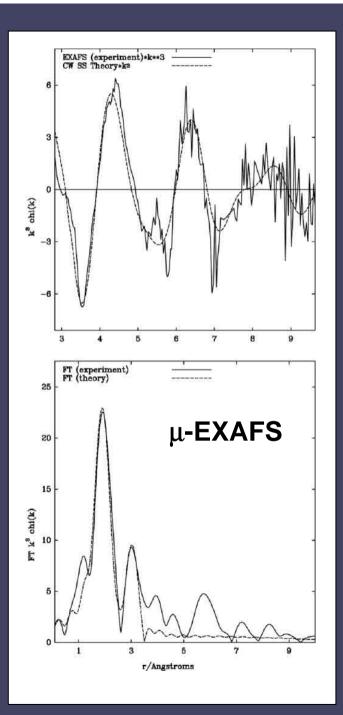
Diagenetic Minerals

Vivianite (Fe^{II} phosphate)



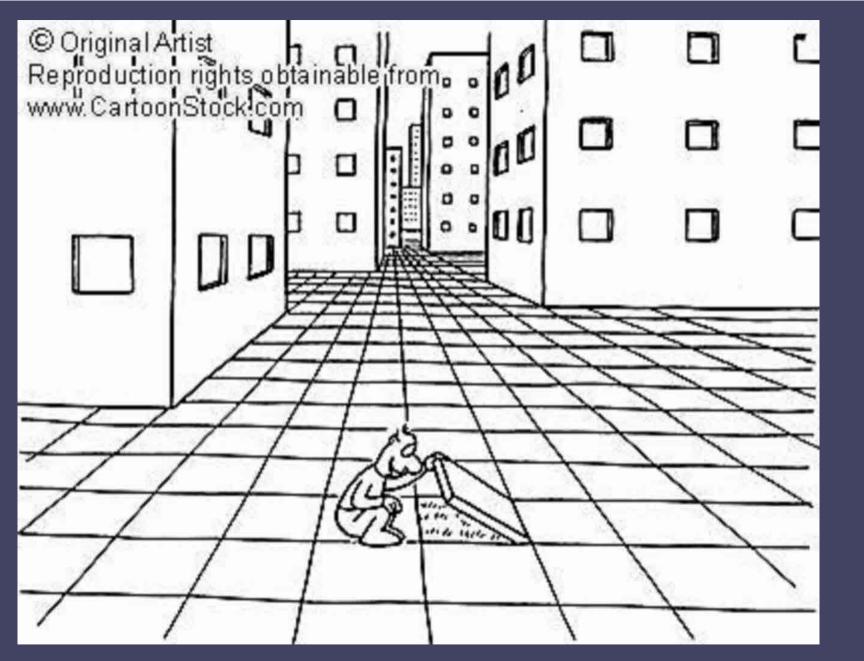






What Next?

- Scale. How do we scale these processes up to the meaningful management scale?
- Transfers. What are the extents and rates of the transfers of these sediments between compartments?
- Geomicrobiology. What role do bacteria play in likely contaminant cycling in urban systems?



Thanks