


British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Applied geoscience for our changing Earth

Rural Flooding

from hydrology to hydrogeology




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Why Flood Science Matters ?

Public / government want effective solutions
Flood defences - effectiveness, cost...



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...and Natural Flood Management

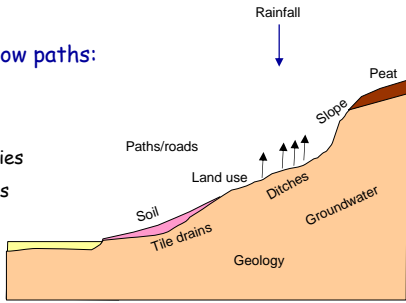
" holistic approach to reducing flood risk by restoring and enhancing natural processes which slow down the generation and conveyance of runoff through the catchment system, and deliver environmental and wider socioeconomic benefits "

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What affects how a hillslope responds to rainfall ?

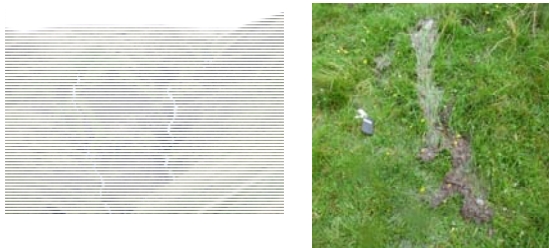
Different flow paths:

- Soil
- Overland flow
- Small tributaries
- Drains, Ditches
- Groundwater




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Examples from the Tweed 20/8/09



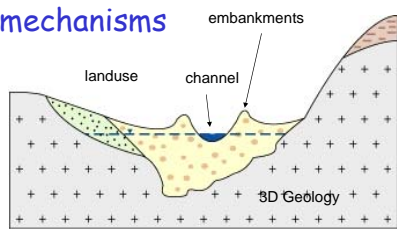
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Examples from the Tweed 20/8/09



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Flood Plain mechanisms



Examples from Tweed



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Looking deeper

Groundwater in the flood plain

Characterising hydrogeology of upland catchments



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Groundwater and the River Findhorn



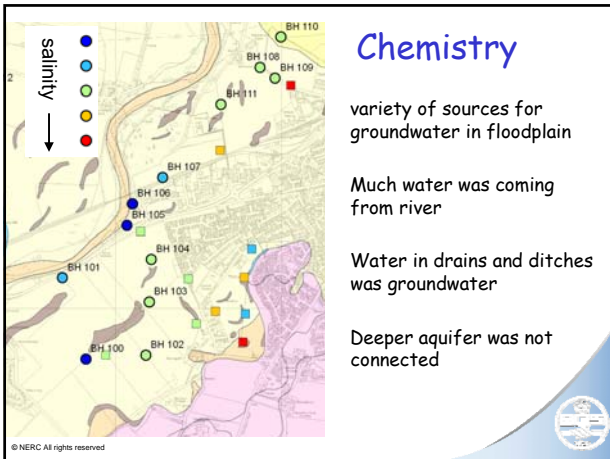
Large part of the town flooded 1997, 2001
Muckle Spate of 1829
New flood alleviation schemes

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Chemistry

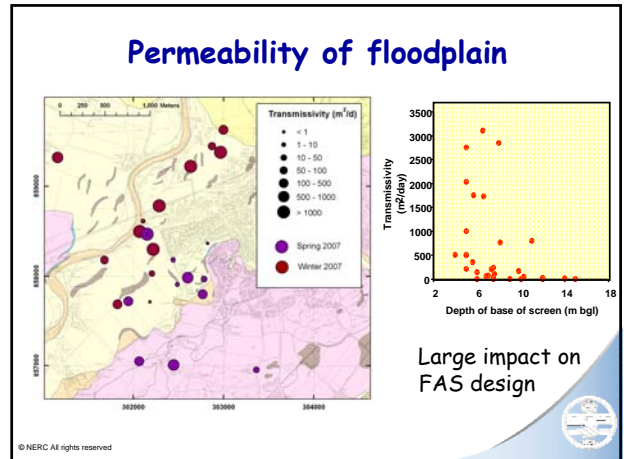
variety of sources for groundwater in floodplain

Much water was coming from river

Water in drains and ditches was groundwater

Deeper aquifer was not connected

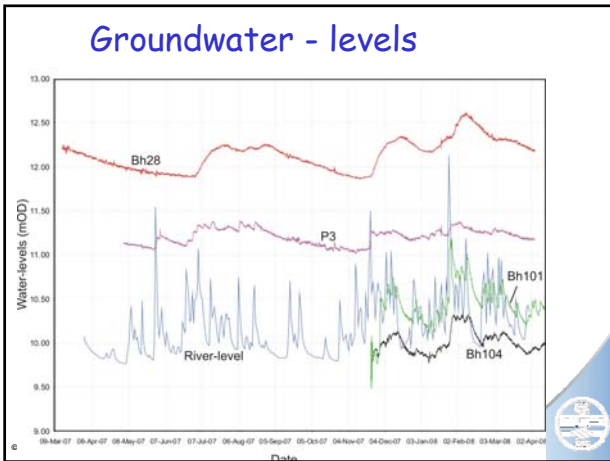
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Permeability of floodplain

Large impact on FAS design

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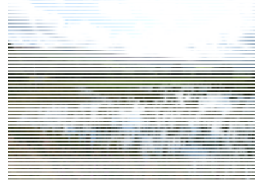


Groundwater - levels

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Summary: groundwater in the floodplain


- Significant surface water - groundwater interaction
- Large volume of storage - regularly used
- Different timescale of response
- Complex geology giving large changes in permeability



Groundwater integral to functioning of floodplain


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Characterising the permeability of superficial deposits in upland areas



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Interdisciplinary studies in Moray



- Geologist - tell us exactly what unit we are in, build models
- Engineers- do standard tests and descriptions
- Hydrogeologists - test permeability

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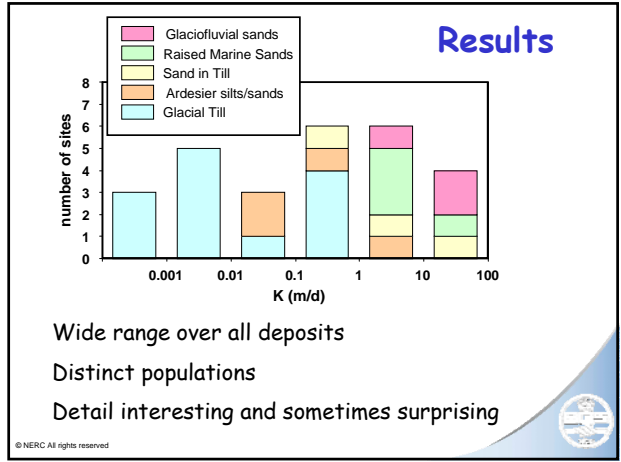


Measuring permeability

Guelph permeameter

Calibrated by comparing with 20 pumping tests in known deposits

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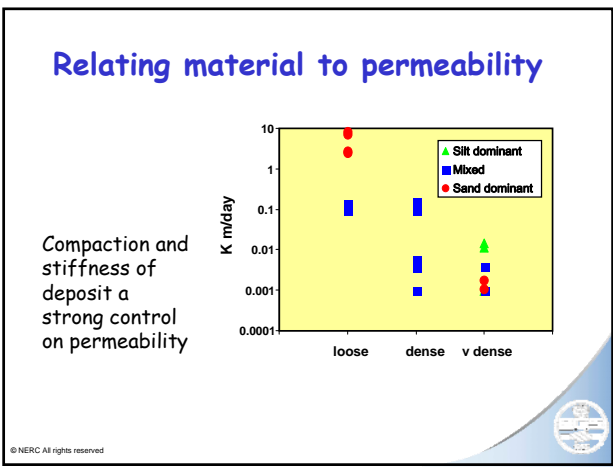


Wide range over all deposits

Distinct populations


Detail interesting and sometimes surprising

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Compaction and stiffness of deposit a strong control on permeability

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Summary - groundwater in uplands

1. Groundwater more significant in upland hydrology than conventionally thought
2. Very early days of understanding groundwater
3. Developing appropriate investigatory tools and models

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Conclusion

1. Flooding is highly complex and requires interdisciplinary thinking
2. Catchment solutions to flooding require a deeper understanding of processes
3. There is no substitute for instrumenting catchments and carrying out observational science
4. Don't forget groundwater

