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Human Impacts on Groundwater and Surface Waters

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Introduction

- Over the past sessions we have seen the scope and the significance of the Tellus Data Sets
- Indications of the multitude of uses these data sets may be put to
- In the following few minutes focus on the relevance of the Tellus Project in Assessing Human Impacts on Groundwater and Surface Waters

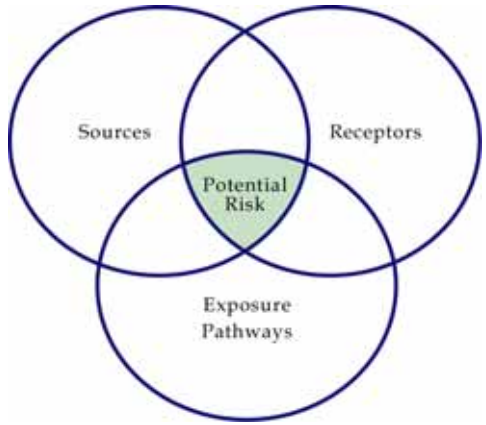
Legislative Drivers for Assessment

- **Legislative Framework for assessing human impacts on Groundwater and Surface Waters include:**
  - **Water Framework Directive / Groundwater Directive**
  - **Environmental Liability Directive**
  - **Habitats Directive & Birds Directive**
  - **Draft Soil Protection Directive**

Conceptual Framework for Assessment

- The general Conceptual Framework for assessing human impacts on groundwater and surface waters
  - Source - Pathway - Receptor Model

- Evaluate presence and significance of linkages
- Leading to more detailed risk assessment of identified linkage



Conceptual Framework and Tellus

- How do the Tellus Data Sets fit into this conceptual Framework ?
  - How can they help assess:
    - Sources
    - Pathways
    - Receptors
    - And relevant linkages

Sources & Tellus Data

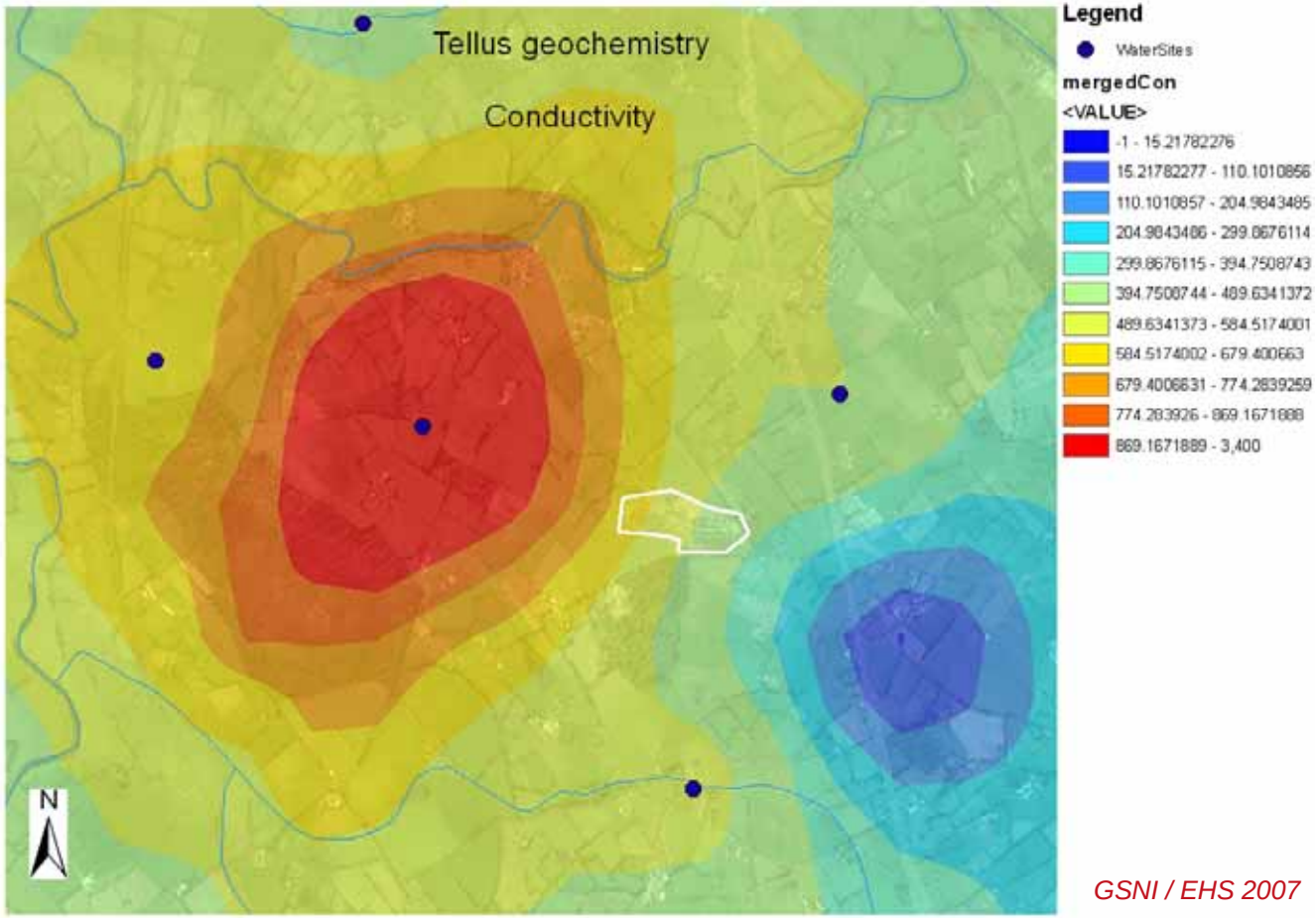
- **Tellus Soil Geochemistry Data (rural/urban)**
  - Provide background information on specific compound concentrations on which the imprint of anthropogenic impacts may be identified
    - diffuse and point sources
    - organic & inorganic compounds
  - geochemistry data may provide additional information on compound speciation and associated mobility / toxicology

Sources & Tellus Data

- **Tellus Stream Hydrochemistry Data**
  - Provide background information on specific compound concentrations supplementing existing data sets from regulatory monitoring schemes
    - eg. Nitrate levels in surface waters – diffuse impact

Sources & Tellus Data

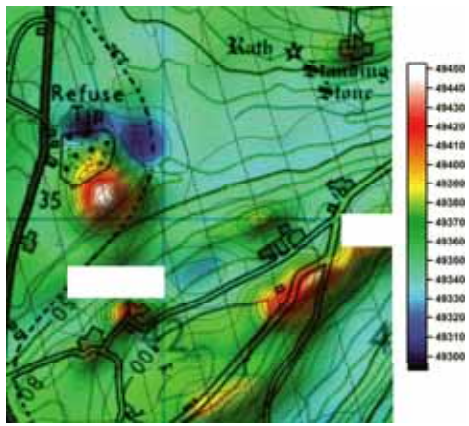
- **Tellus Stream Hydrochemistry Data**

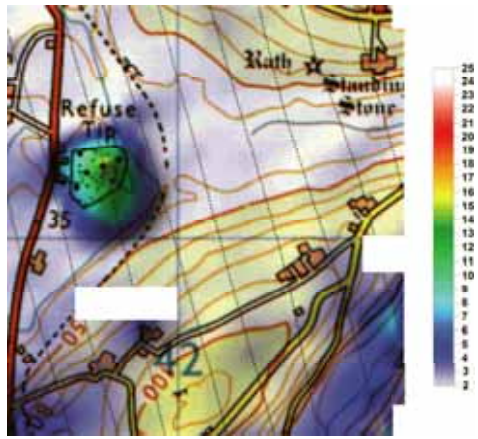


GSNI / EHS 2007

Sources & Tellus Data

- **Tellus Airborne Geophysics**
  - Identification of contaminant plumes in shallow groundwater (EM data)
    - Together with other information highlight areas that may warrant more detailed intrusive SI





Magnetic Total Intensity and 3k apparent conductivity (mS/m) on 50k OS map. Flight lines shown Beamish (2007)

Conceptual Framework and Tellus

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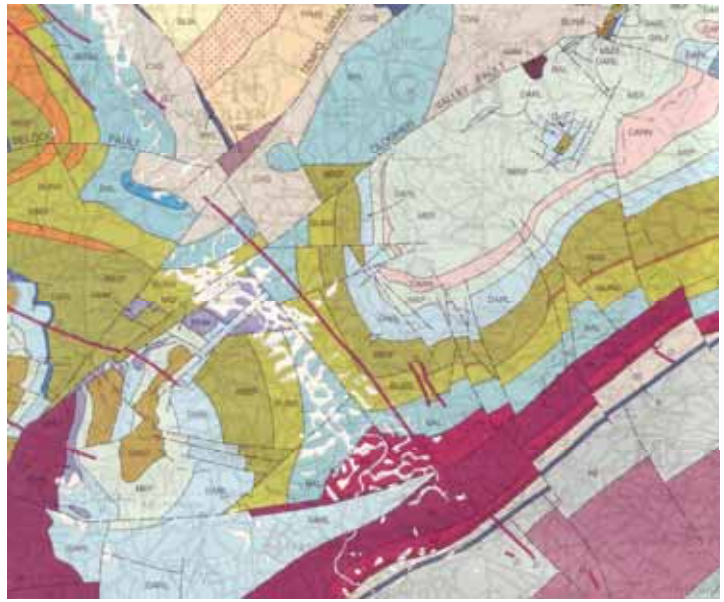
    - ✓ Sources
    - Pathways
    - Receptors

Pathways & Tellus Data

- **Tellus Soil Geochemistry & Stream Hydrochemistry Data**
  - The correlation of geochemical and hydrochemical data may highlight pathway linkages and provide information on compound speciation / mobility
    - Rural data resolution - diffuse pollution
    - Urban setting – even point source impacts ?

Pathways & Tellus Data

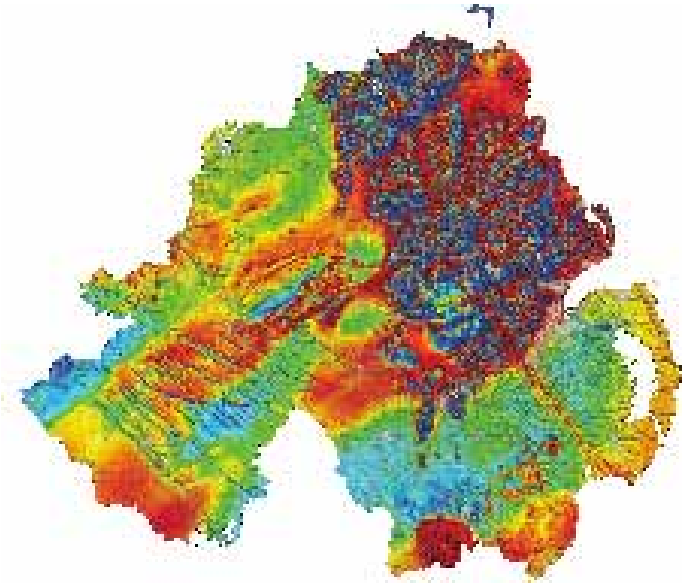
- **Tellus Airborne Geophysics**
  - Constrain geological mapping / geometry of bedrock units
  - Relevant information to choose appropriate conceptual models including key processes / properties governing Groundwater flow



GSNI 1997

Pathways & Tellus Data

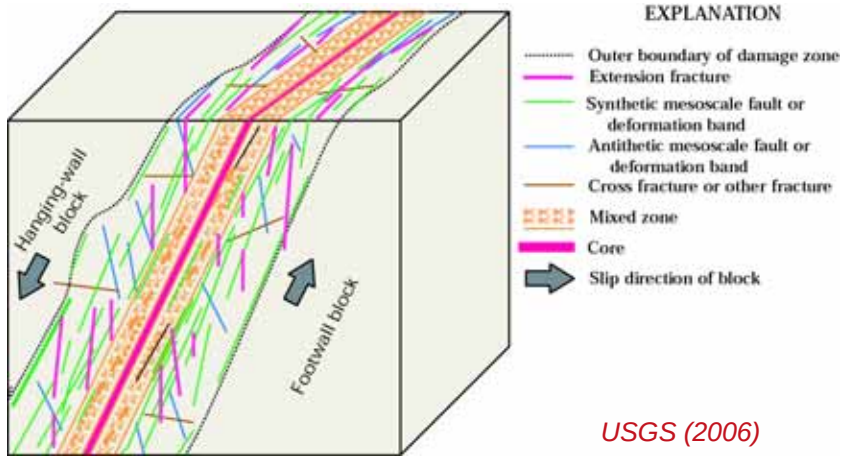
- **Tellus Airborne Geophysics**
  - Provides information on presence and geometry of structural subsurface features
    - Dykes
    - Fault zone



Airborne magnetic field image of Northern Ireland. Note that many of the lineaments may play a strong role in influencing bedrock hydrogeology. GSNI (BGS) 2007

Pathways & Tellus Data

- **Tellus Airborne Geophysics**
  - Provides information on presence and geometry of structural subsurface features
  - Features may act as:
    - Preferential flow paths
    - Barriers to subsurface flow / Compartmentalisation



USGS (2006)

Pathways & Tellus Data

- **Tellus Airborne Geophysics**
  - Provides information on presence and geometry of structural subsurface features
    - May govern / dominate groundwater flow regime
    - May govern associated attenuation processes for specific contaminants

Conceptual Framework and Tellus

- How do the Tellus Data Sets fit into this conceptual Framework ?
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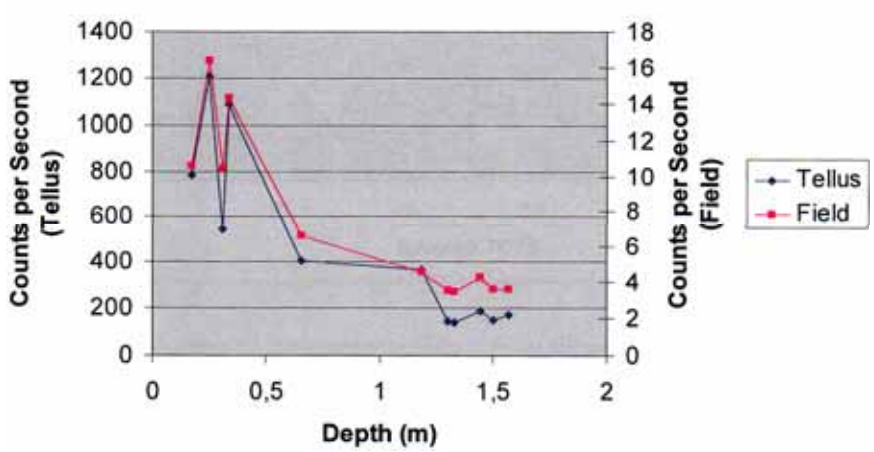
    - Receptors

Receptors & Tellus Data

- **<u>Tellus Stream Hydrochemistry</u>**
  - Provides supplemental base line data for quality status of surface waters (Aquatic Environment as receptor)
  - informs the development of threshold values for RBD‘s cognisant of background levels and targeted at good quality status to be achieved

Receptors & Pathways

- **Tellus Airborne Geophysics**
  - Provide data for assessment of wetlands / GWDTE
  - Baseline assessment of (residual) peat thickness



Correlation of Tellus Airborne γ-ray count rate and field survey γ-ray count rate with field depth measurements (after Coyle 2006)

Conceptual Framework and Tellus

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Conclusion

- **Combination of Tellus Data Sets provide a multitude of applications in assessing human impacts on Groundwater and Surface Waters**
- **Tellus provides:**
  - **important data for baseline assessment of environmental quality**
  - **comprehensive datasets for better characterisation of the geological environment in which these impacts are taking place**