



SHale gas
Exploration and
Exploitation induced
Risks

*Assessing risk pathway scenarios for
groundwater pollution: the case of
abandoned wellbores*

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Second Annual Meeting

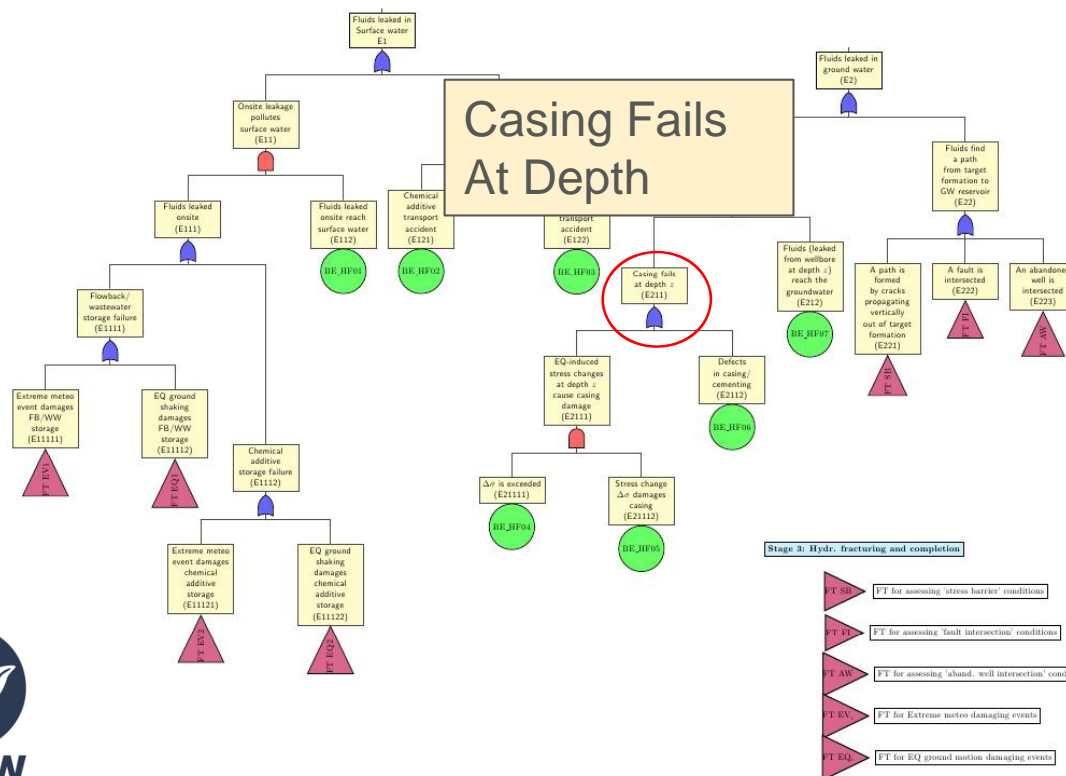
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Multi-hazard risk assessment applied to shale gas operations

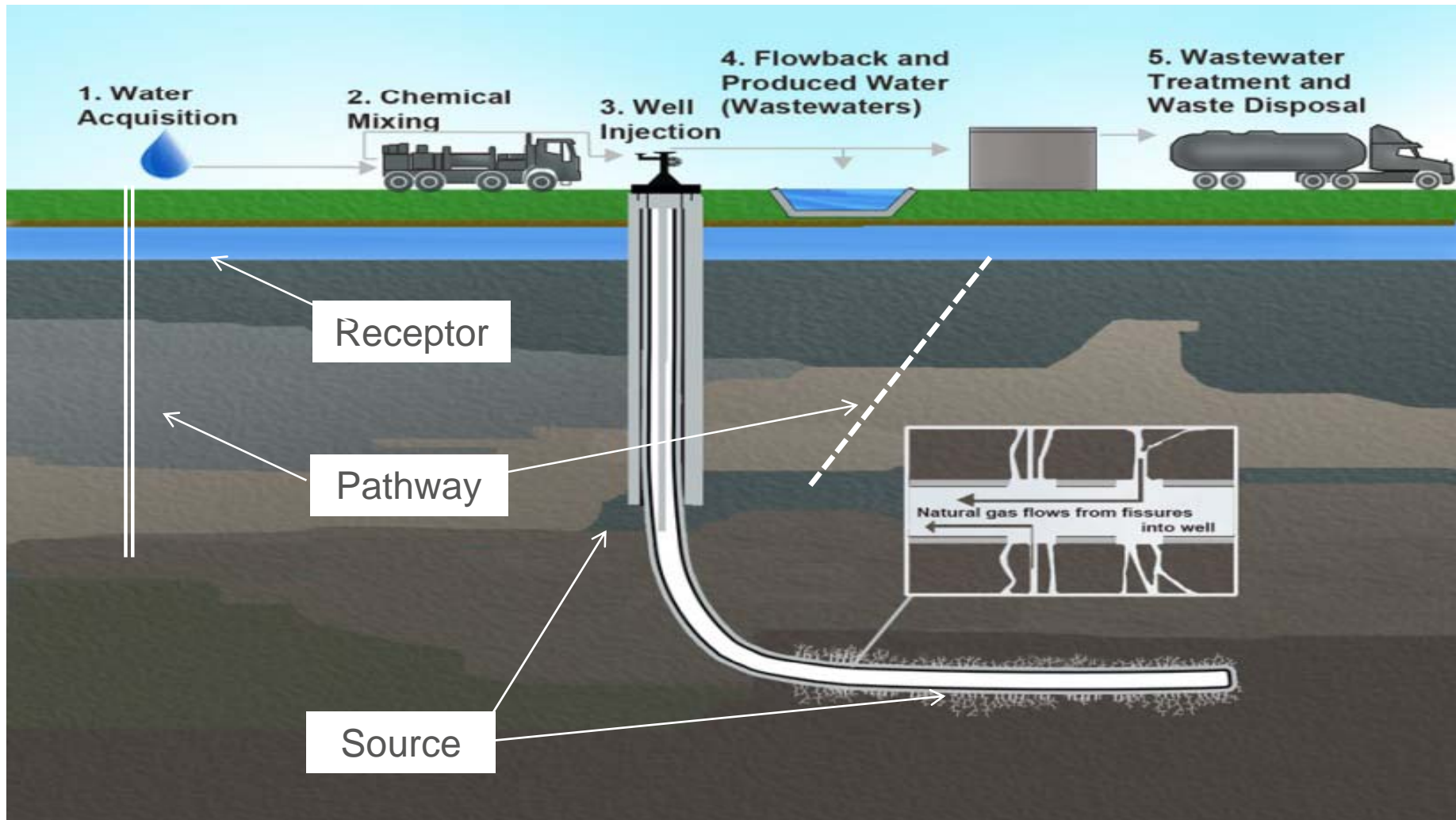
The main objective of a multi-hazard risk assessment applied to shale gas operations is to identify and to assess the rate (or the likelihood) of occurrence of incidents, and their potential impacts on surrounding environment, considering different hazards and their interactions (Garcia-Aristizabal et al., 2016).



Examples of a fault tree structure developed for some scenarios of groundwater and surface water pollution in the hydraulic fracturing stage Garcia-Aristizabal et al., 2016).



Multi-hazard risk assessment applied to shale gas operations

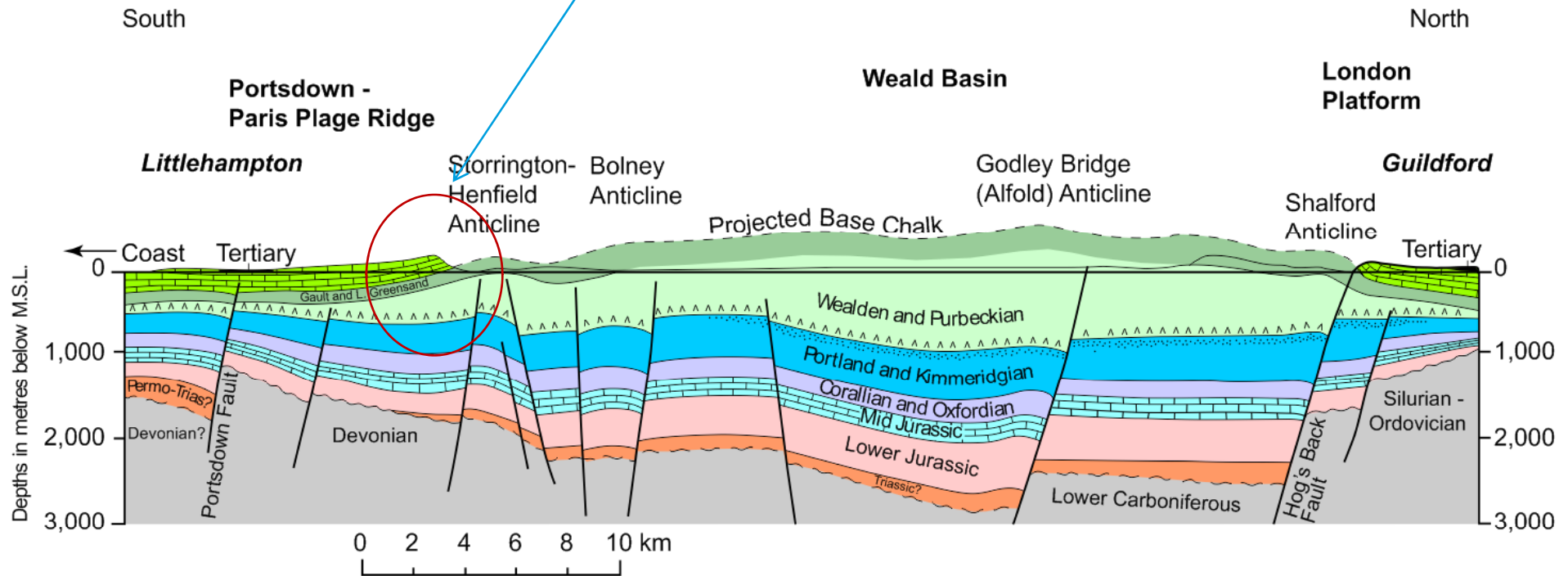


Multi-hazard risk assessment applied to shale gas operations

Two areas of risk to investigate:

- Connection between the frac zone and surface via anthropogenic features
 - Adjacent wells/boreholes
 - Abandoned wells
 - Mining activity
 - Connection via High Permeability zones eg faults
- The timeline over which shale oil and gas production takes place
 - Well integrity over that production period

Investigate 2 Scenarios in Weald Basin



Andrews, I.J. 2014. *The Jurassic shales of the Weald Basin: geology and shale oil and shale gas resource estimation*. British Geological Survey for Department of Energy and Climate Change, London, UK.

Abandoned wells?

- What should the safe 'stand-off' distance between an a frac well and a drinking water well
- How can one estimate this?
- Can the RW approach provide a means of providing a safe stand-off distance – use the Weald Basin to test this

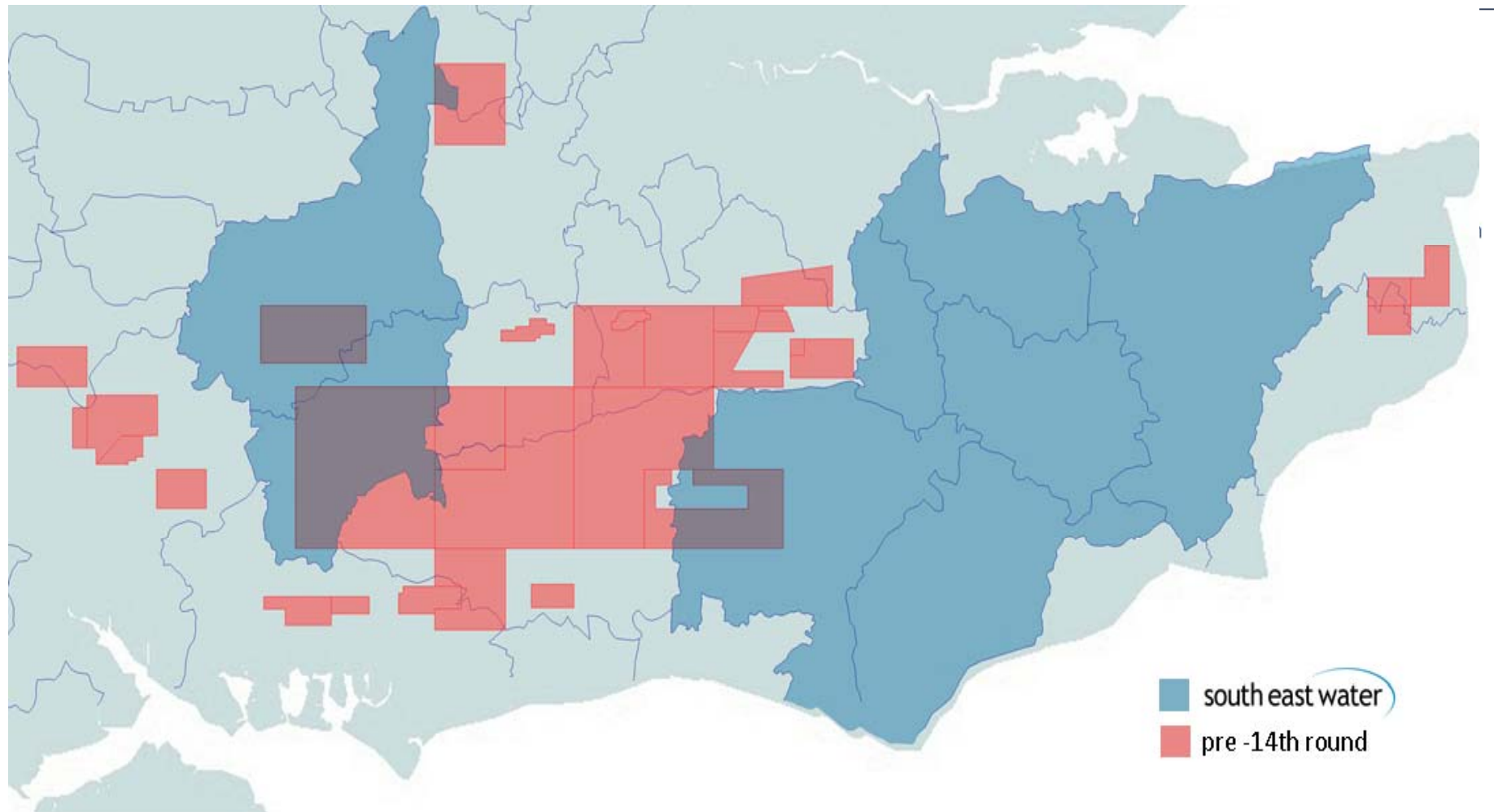
- a number of abstraction wells are deeper than 250mbgl
- two reach 460 mbgl

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- proximity to potential shale horizons within the Jurassic and Kimmeridge

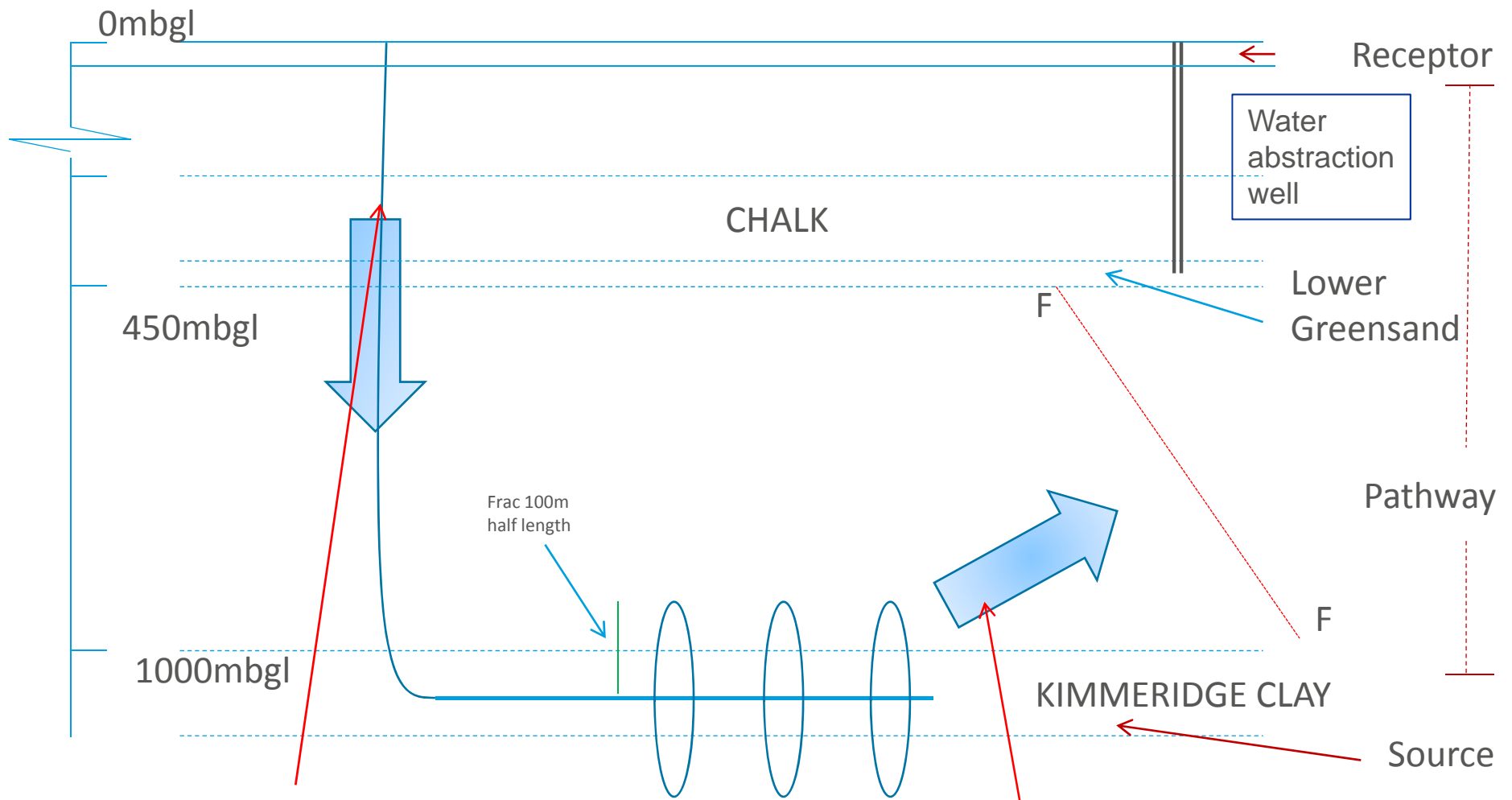
Well 1 and 2 (460mbgl) extract water from the Lower Greensand where the Kimmeridge clay is approximately 1000mbgl.

Abandoned wells?



10km





Scenario 1 – a failure in the well casing in the chalk horizon causing a head of water to build in the well – long t after frac

Scenario 2 – instantaneous increase in pressure associated with frac's cause frac fluid to travel along zones of high K – short time after frac



An application for the RW Model?

- Provide guidelines for a safe stand-off between a frac well and an adjacent well
- In the risk assessment process – provide a sphere within which to focus a search check for abandoned wells as part of the site characterization process
- Work in Progress

Assessing risk pathway scenarios for groundwater pollution: the case of abandoned wellbores

Thanks

Any Questions

