

**brownfieldbriefing**

**Strategies for the effective disposal and treatment of  
waste water to minimise contamination**

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# STRATEGIES FOR THE EFFECTIVE DISPOSAL AND TREATMENT OF WASTE WATER TO MINIMISE CONTAMINATION AND OPTIMISE RESOURCES

**DAN PRICE**

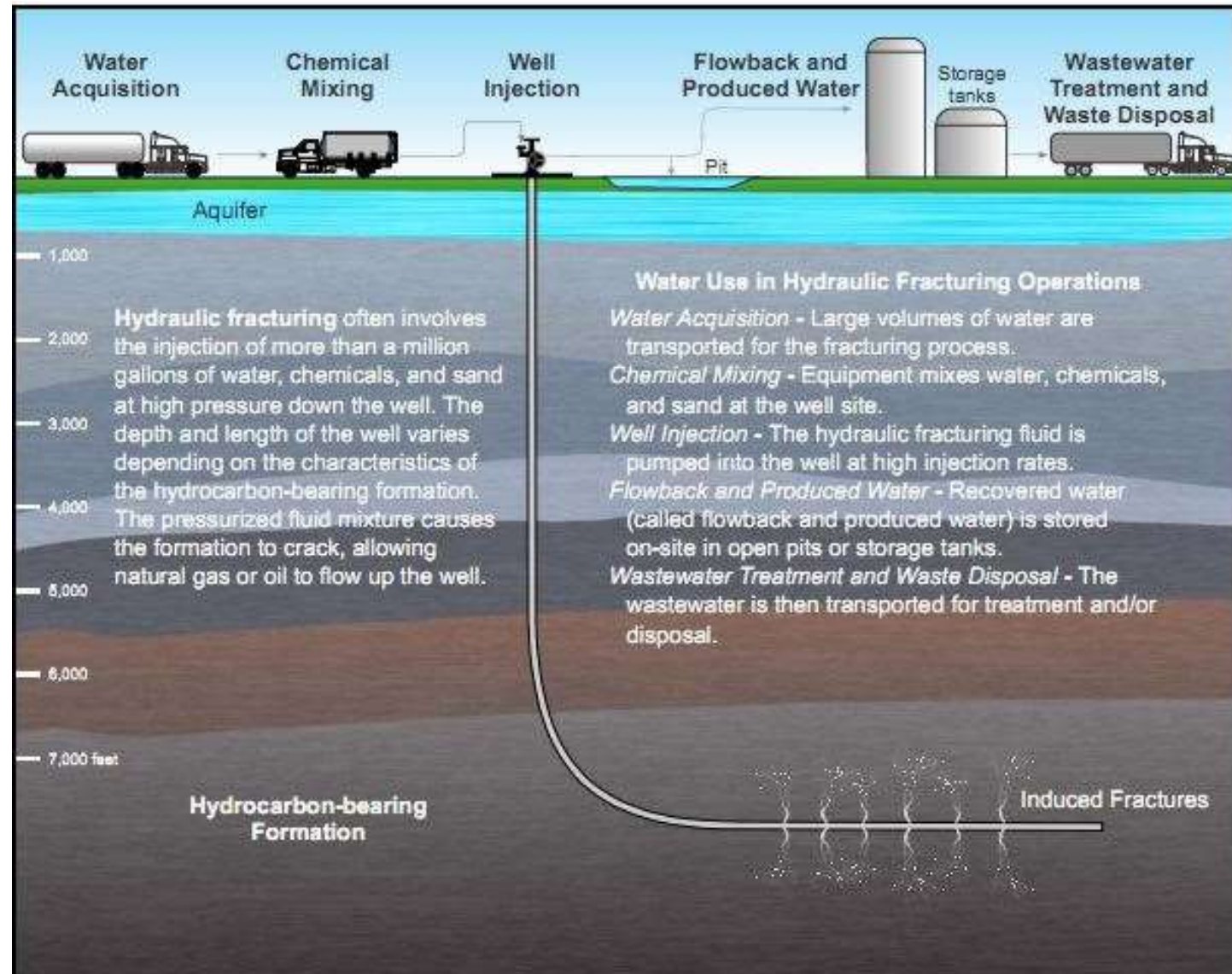
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SENIOR MANAGER



# HYDRAULIC FRACTURING AND THE ROLE OF WATER



Source: EPA

# WASTEWATER GENERATED

To drill and fracture a horizontal shale gas well:\*\*

~7-15 million litres of freshwater<sup>1</sup>

Two major types of wastewater are produced:

**Flowback Water:** Primarily the water which was injected into the well under high pressures for fracturing (includes added chemicals) and is discharged from the well when the pressure is released

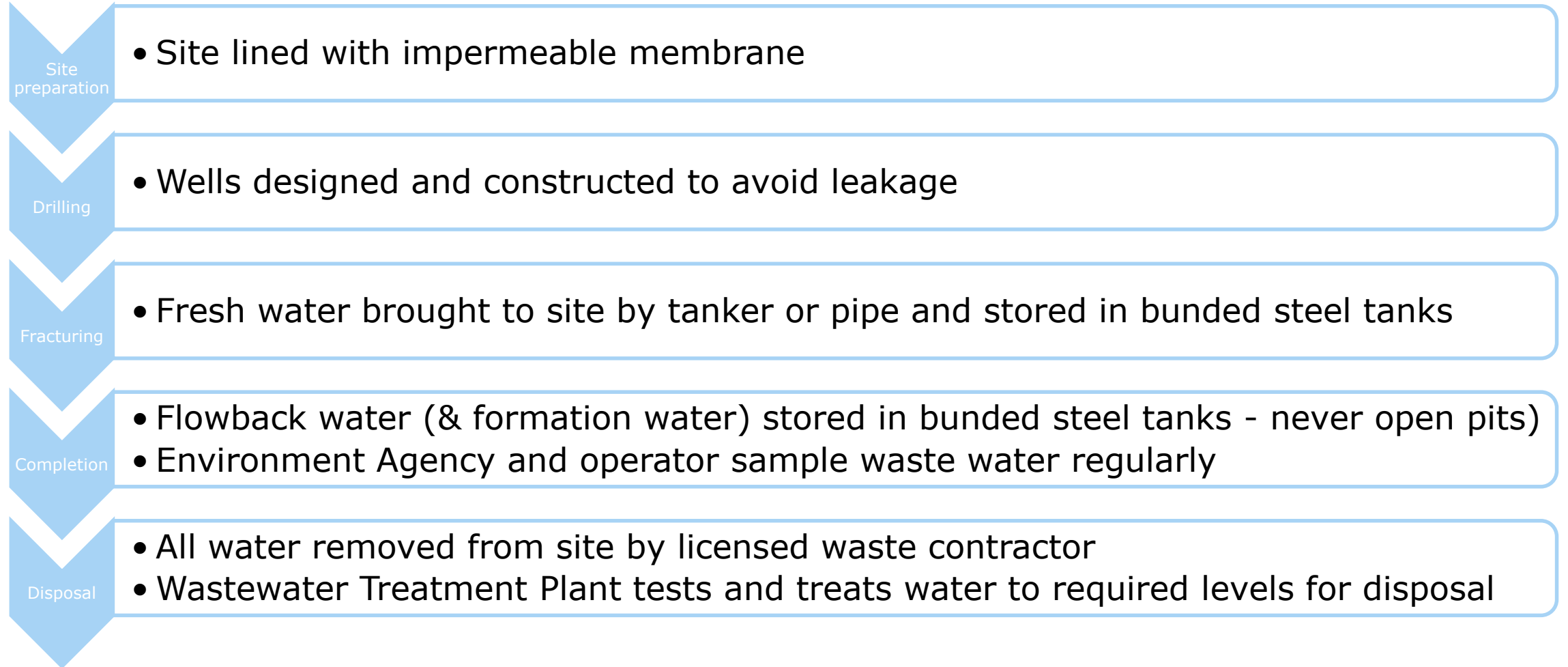
**Produced Water:** That water which was trapped in oil and gas reservoir for millennia and is released along with oil or gas reserves

\*\*Very dependent on well, shale characteristics and fluid recipe

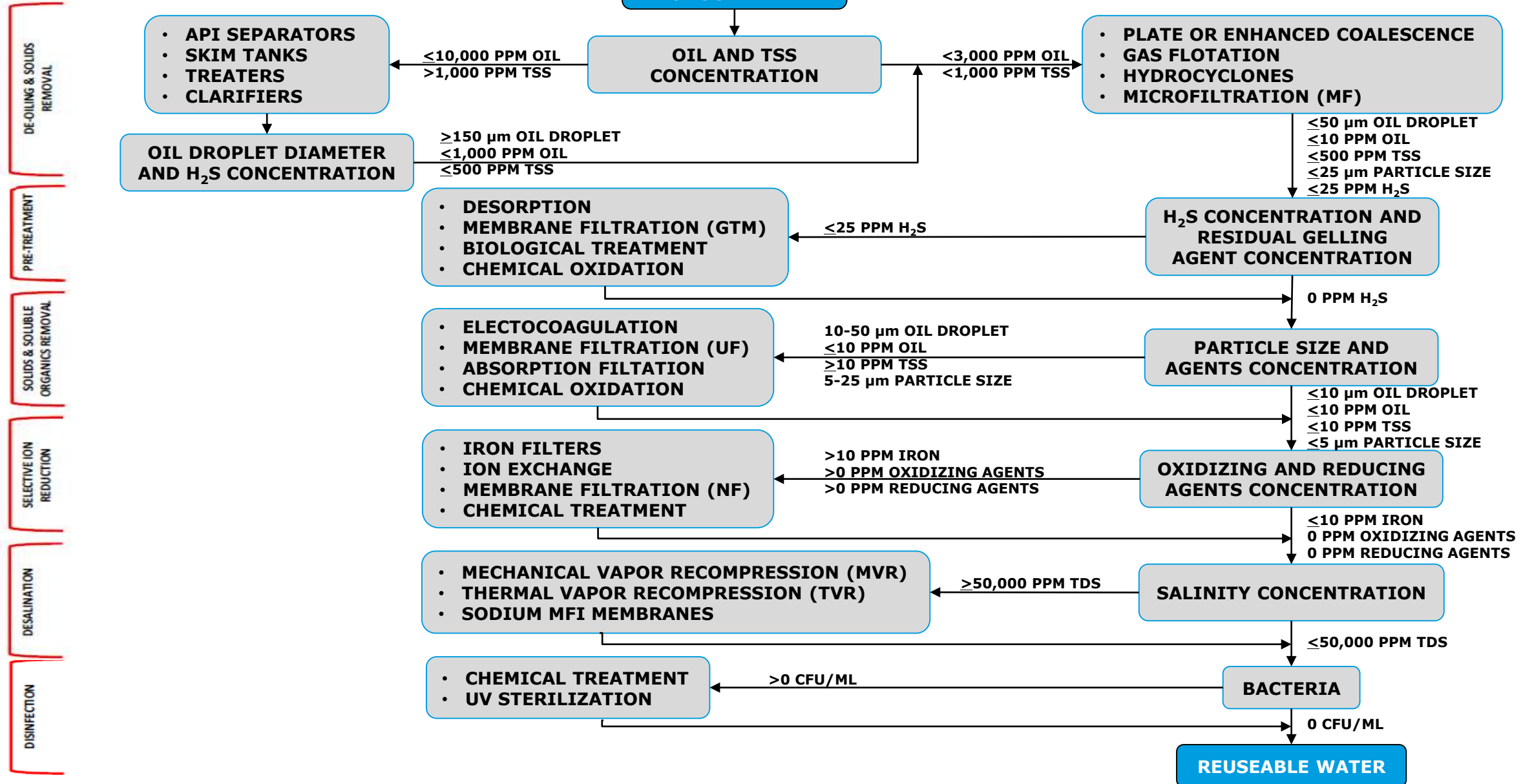
<sup>1</sup>Modern Shale Gas Development in the United States: A Primer 2009



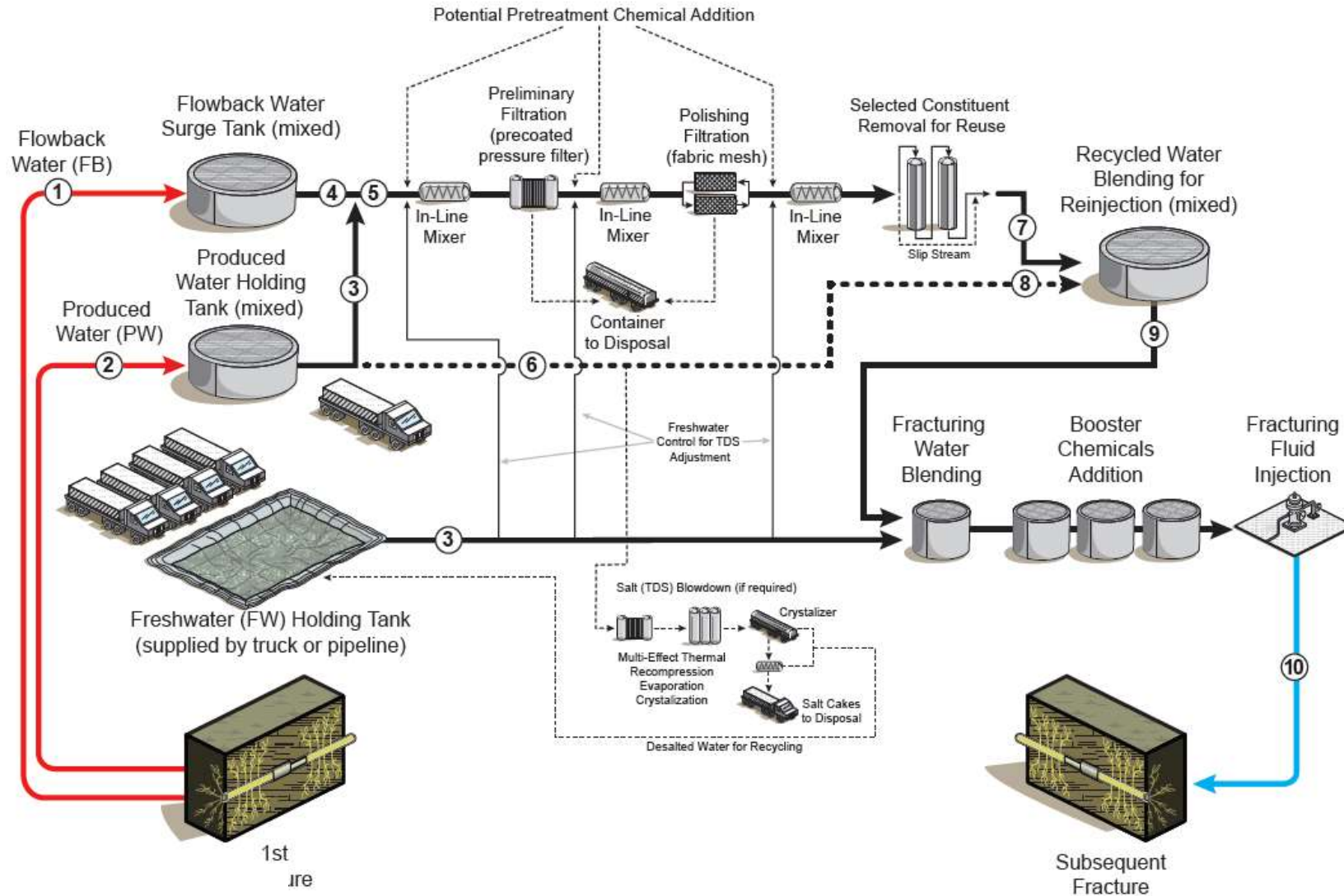
# EXAMPLE WASTEWATER TREATMENT PATH



# FLOWBACK AND PRODUCED WATER TREATMENT DECISION TREE



# ZERO DISCHARGE (CLOSED LOOP) TREATMENT SYSTEM



# DISPOSITION





# WATER REUSE

Other opportunities for beneficial reuse  
(as allowed under law):

- Surface water augmentation
- Habitat (salt marshes)
- Agricultural
- Watershed improvement projects
- Wetlands
- Recreational



# CURRENT UK GUIDANCE – DISPOSAL OF WASTEWATER

EA/ SEPA role to:

- Protect water resources, including groundwater (aquifers)
- Ensure appropriate treatment of and disposal of mining waste
- Ensure suitable treatment and management of any naturally occurring radioactive materials (NORM)

Wastewater disposal informed by EU Regulation – e.g. Water Framework Directive, Groundwater Directive, Mining Waste Directive

- Flowback water, wastewater and drilling muds are considered a waste
- Must characterise waste and ensure proper management – e.g. no open pits
- Demonstrate methods used to reduce waste
- Disposal by injection into formations - “Environment Agency will generally not permit the re-injection of flowback fluid for disposal into any formation”

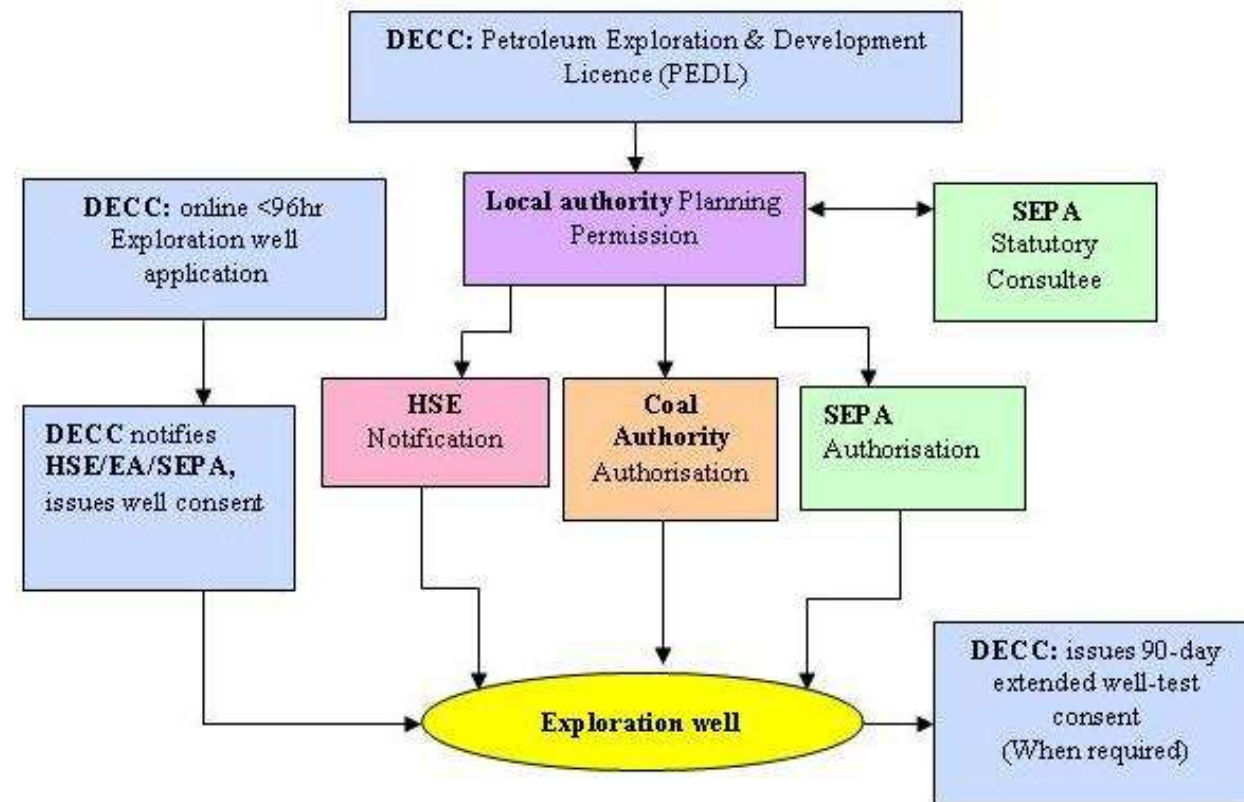
# CURRENT UK GUIDANCE - USE OF CHEMICALS

Shale gas extraction in UK regulated by:

- Oil & Gas Authority (OGA – executive agency of DECC)
- Minerals Planning Authority/ Local Authority
- Environment Agency (EA)/ Scottish Environment Protection Agency (SEPA)
- Health & Safety Executive (HSE)

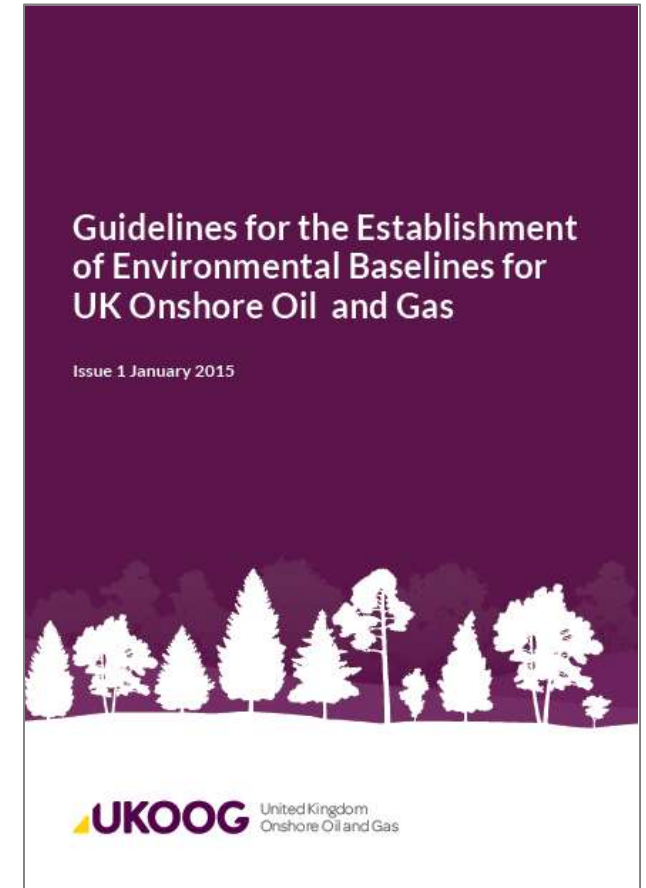
All have regard for correct chemical use.

EA/SEPA remit includes assessing and approving the use of chemicals which form part of the hydraulic fracturing fluid. Only “non-hazardous” fracturing fluids would be permitted.



# CURRENT UK GUIDANCE – BASELINE MONITORING

- Baseline monitoring must be site-specific
- Based on findings of CSM – monitor potential receptors, understand prevailing environmental conditions and natural variability ahead of any operations – e.g. high CH<sub>4</sub> in confined groundwaters
- Baseline monitoring for e.g. soil, air, seismicity, noise...
- For surface water & groundwater
  - Groundwater recharges surface water?
  - Both can act as Source, Pathway and Receptor
  - Importance of establishing what to measure, how frequently, from where...
  - Address cumulative sites, potential for faulted geology etc.
  - Monitoring protocols well established for other industries - landfill, quarries, residential development





# SUMMARY

- Risks to the environment that need to be managed - surface releases, faulty well construction, and inadequate treatment and subsequent disposal of wastewaters
- Wastewater treatment technologies should be designed for the intended end use of that water
- UK limitations on disposal options - water arising from hydraulic fracturing activities is considered a waste and must be treated as any waste
- Environmental regulator will only grant relevant permits where full details of chemicals are provided, along with evidence that these will not harm groundwater or surface water. Currently additives proposed, in the quantities proposed, have resulted in the fracturing fluid being classified as non-hazardous by the Environment Agency (EA)
- UKOOG have produced guidelines for variety of baseline monitoring including soil, air, seismicity; however, nothing is unique to unconventional gas
- Overall maximum radioactivity levels in the flowback fluid would not result in increased radioactivity to a level greater than annual exposure limit set by the EA

**THANK YOU**











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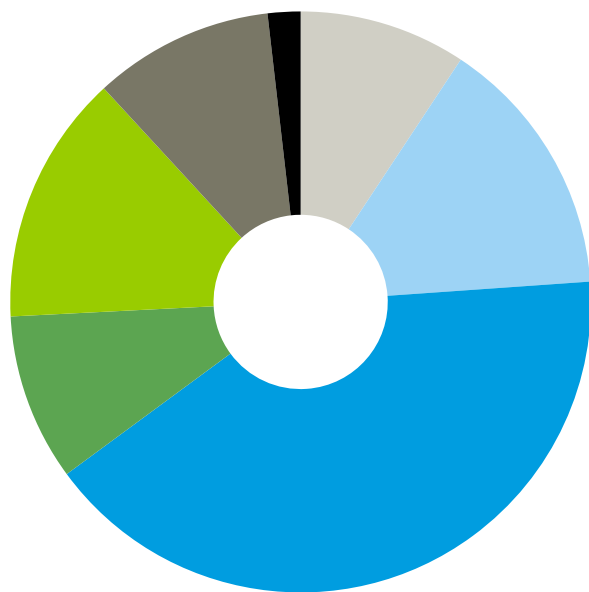
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