

Hydraulic Fracturing Water Tracker

RBDMS
Water Tracker

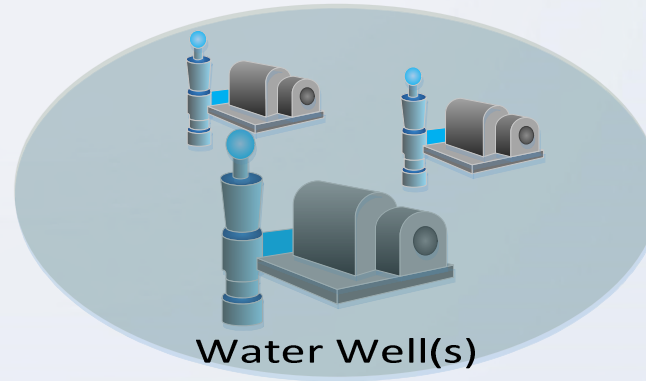




- New well water use
 - Mud systems for cooling, lubrication and pressure control
 - Completion practices use water as carrier fluid for pressure to fracture and move proppant.
- Old fields need water as driver to move oil through the reservoir



Streams & Reservoirs



Water Well(s)

- Access to fresh water is controlled
 - Individual owners
 - State law through regulatory agencies
- Water use is defined as consumptive use
 - Not returned to a water resource system
- Streams may require makeup water
 - Augmentation plan



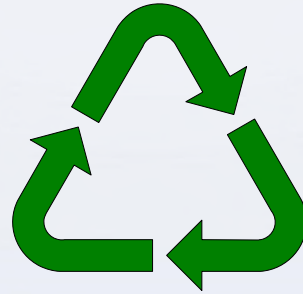
- Mobile storage tanks
- Reserve pit or impoundment on single well site
- Multi-well pit or impoundment on well site
- Centralized pit(s) or impoundment(s) servicing multiple locations

Fluids Returned to Surface

- Considered exploration and production waste
- Regulated by the state
- Strict compliance and handling requirements
- Limited use depending on water quality
- Beneficial use may be regulated by different agency



- Reserve Pit or Impoundment on Single Well Site
- Multi-Well Pit or Impoundment on Location
- Centralized Pit or Impoundment Servicing Multiple Locations



- Fluids Reuse
 - Drilling Fluids
 - Other drilling operations
 - Soil supplement
 - Flowback
 - Sand
 - Depends on the stimulation technology
 - Produced Water
 - Beneficial Reuse
 - New Hydraulic Fracture Treatment Operation

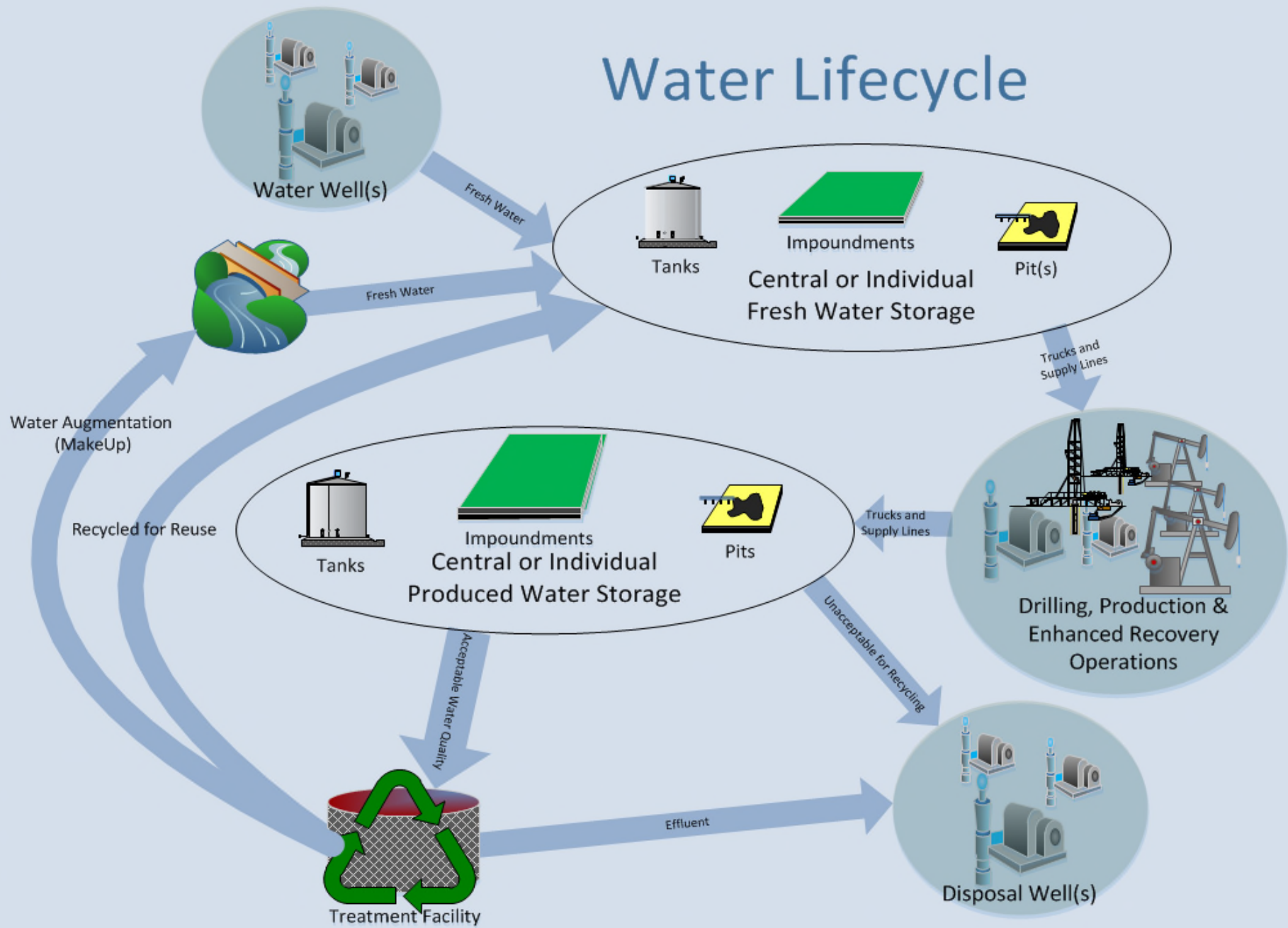


- Not all fluids can be recycled
- Proper effluent disposal from facility
- TDS exists throughout system and if totally eliminated creates negative impact on usability of output fluid – too clean
- Proper disposal of solid waste



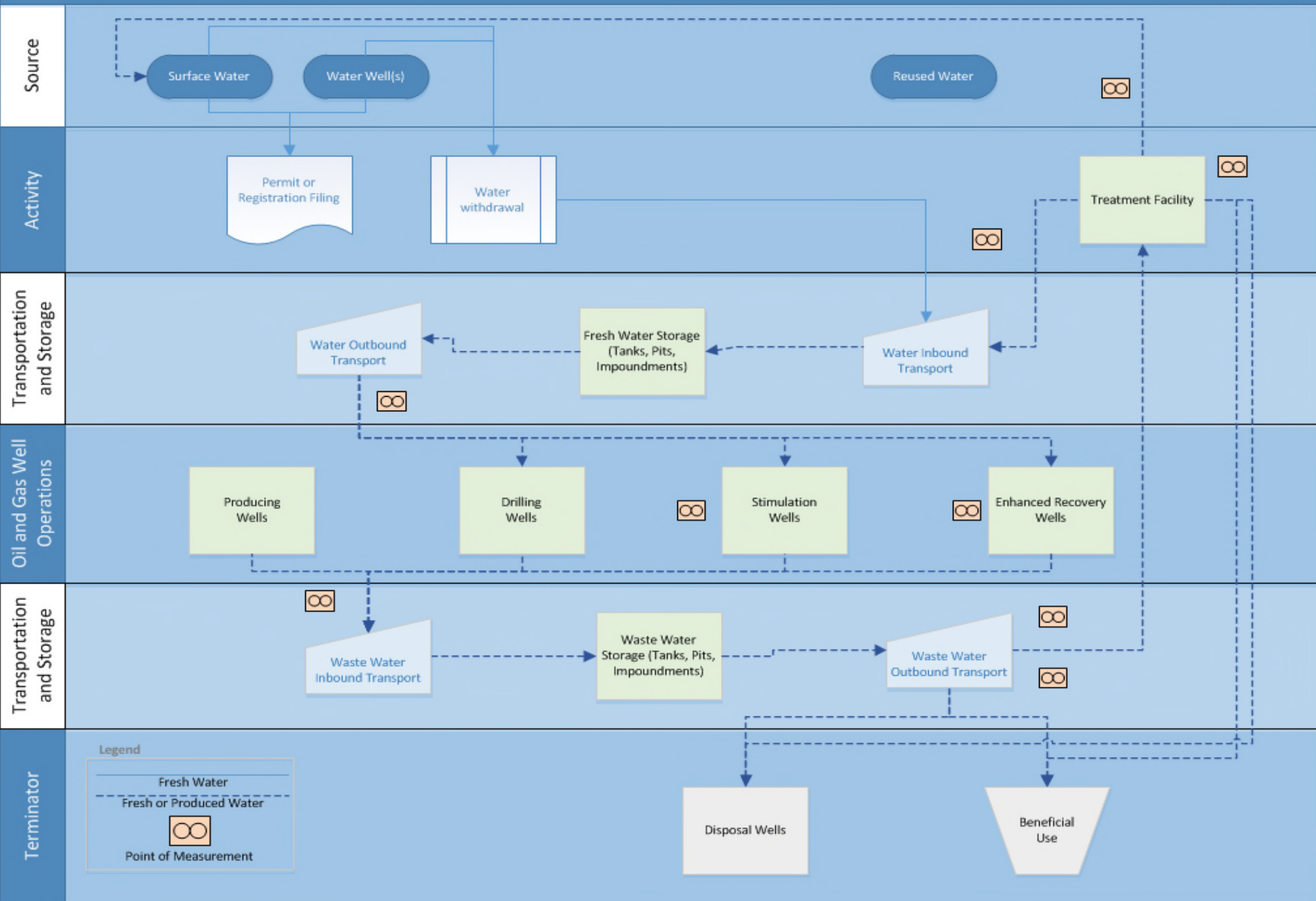
- Recycled - Reuse
 - Industry reuse
 - Public Water supply
 - Makeup Water – Augmentation

Water Lifecycle



Water Lifecycle Tracking

Water Movement



Points of Measurement

- Transfer point is the inlet or outlet of storage or source, such as sales or regulatory control point.
- Critical volume measurement such as the hydraulic stimulation.
- Accuracy and methods of measurement are very disparate.

Example Oil & Gas Regulatory Requirement

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Page ___ of ___

Form
5A
Rev 6/12

State of Colorado Oil and Gas Conservation Commission



For COGCC Use Only

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COMPLETED INTERVAL REPORT

Formation: _____		Status: _____	
Date of First Production for this formation: _____		This formation is commingled with another formation <input type="checkbox"/>	
Tubing Size: _____	Tubing Setting Depth: _____	Tbg Setting Date: _____	Packer Depth: _____
Formation Treatment		Treatment Type: _____	
Perforations Top: _____ Bottom: _____		No. Holes: _____	Hole Size: _____ Open Hole: <input type="checkbox"/>
Provide a brief summary of the formation treatment:		Treatment Dates: Start: _____	End: _____
Total fluid used in treatment (bbl): _____		Max pressure during treatment (psi): _____	
Total gas used in treatment (mcf): _____		Fluid density at initial fracture (lbs/gal) _____	
Type of gas used in treatment: _____		Min frac gradient (psi/ft): _____	
Total acid used in treatment (bbl): _____		Number of staged intervals: _____	
Recycled water used in treatment (bbl): _____		Flowback volume recovered (bbl): _____	
Fresh water used in treatment (bbl): _____		Disposition method for flowback: _____	
Total proppant used (lbs): _____		Rule 805 green completion techniques were utilized: <input type="checkbox"/>	
Fracture stimulations must be reported on FracFocus.org		Reason why green completion not utilized: _____	

Conclusions

- Measurement of water use is complicated
- Recycling makes a difference but is complicated
- It makes sense to reuse and recycle oil and gas waste water
- Jurisdictional issues abound
- Things are changing



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- Thanks to Coordinate Solutions, Inc.:
 - Dave Lowther
 - Dottie Virden