



Hydraulic Fracturing – Development and Produced Wastewater

Hydraulic Fracturing

Hydraulic fracturing is the propagation of fractures in a rock layer by a pressurized fluid. Some fractures form naturally, creating conduits along which gas and petroleum from source rocks may migrate to reservoir rocks. Induced hydraulic fracturing or hydrofracturing, commonly known as fracing, or fracking, is a technique used to artificially create conduits for release of petroleum and natural gas

(including shale gas, tight gas, and coal seam gas). This type of fracturing creates fractures from a wellbore drilled into reservoir rock formations. Water-based hydraulic fracturing, commonly referred to as slick water fracing, is the typical process used by Oil and Gas Developers in most shale gas & oil basins throughout the continental United States.

Development Wastewater

Development wastewater can be segregated into the following sources:

- **TOP HOLE WATER** – Top hole water is the fresh water that enters a bore hole within the first few hundred feet of the drilling process. It is essentially clean groundwater.
- **PIT WATER** – Pit water is water that accumulates in containment areas associated with drilling operations. It is typically a combination of rainwater and minor amounts of drilling fluids.
- **DRILLING MUDS** – Drilling mud, also known as drilling fluid, is a product used in the drilling process. The mud is an integral part of the drilling process, serving a number of functions, including providing hydrostatic pressure to prevent formation fluids from entering the wellbore, keeping the drill bit cool and clean during drilling, and carrying any drill cuttings to surface for removal. One of the most critical roles of this mud is as a lubricant. Drilling gen-

erates tremendous friction, which can damage the drill bit or the formation being drilled. Drilling mud cuts down on the friction, lowering the heat of drilling and reducing the risk of friction-related complications.

- **FRAC OR FLOWBACK WATER** – Frac or Flowback waters consist of spent frac fluids that typically contain dissolved constituents such as minerals and brine waters as well as small amounts of chemical additives and proppants (sand or other materials used to help keep the fractures open). In the Marcellus Shale Play, frac or flowback water typically accounts for about 10 to 15% of the original fluid volume used to fracture the well, however, the amount can vary greatly depending on the geological conditions between shale plays.

O&G DEVELOPMENT & PRODUCED WASTEWATERS CONSTITUENTS OF INTEREST

- **Top Hole Water (TSS)**
- **Pit Water – Drilling Fluids/Formation Water (TSS, Chemical Additives)**
- **Flowback (Chemical Additives, TDS, Metals, NORM)**
- **Formation Water (TDS, Metals, NORM)**
- **Compressor Station Wastewaters (Condensate/Waste Oil) (Oil, BTEX)**
- **Drilling Muds (TDS, NORM, TSS, Chemical Additives, Oil)**



ABILITY • RESPONSIBILITY • STEWARDSHIP

Produced Wastewater

Produced wastewater is a term used in the oil & gas industry to describe water that is produced when oil and gas are extracted from the ground. We have segregated produced wastewater into the following sources:

- **FORMATION WATER** – Oil and gas shale play reservoirs have a natural water content. Oil reservoirs frequently contain large volumes of water, while gas reservoirs tend to have smaller quantities. Formation water is typically brought to the surface along with oil or gas. Because the water has been in contact with the hydrocarbon-bearing formation for centuries, it contains some of the chemical characteristics of the formation and the hydrocarbon itself. It may include water from the reservoir, water injected into the formation, and any chemicals added during the production and treatment processes. Produced water is also called “brine.”
- **COMPRESSOR STATION CONDENSATE WATER** – Natural gas compressor stations move gas along a pipeline. In addition to compressors, compressor stations often include equipment to



Compressor Station

remove and store water vapor, condensate and other remaining impurities. Condensate water typically contains small amounts of compressor station oil and other antifreeze agents.

FREQUENTLY ASKED QUESTIONS:

Q *What is in development and produced wastewaters?*

A The physical and chemical properties of development and produced wastewaters vary considerably depending on the geographic location of the field, the geological host formation, and the type of hydrocarbon product being produced. Produced wastewater properties and volume can even vary throughout the lifetime of a well. The major constituents of interest in development and produced wastewaters are suspended solids, salt content (salinity, total dissolved solids, conductivity), low levels of naturally occurring organics and trace levels of drilling mud and fracing additives.

Q *How much development and produced wastewater is generated?*

A Development and produced wastewaters are by far the largest volume byproduct or waste stream associated with oil and gas exploration and production. As with chemical

composition, the quantity of development and produced wastewaters generated vary with geography, geology and drilling/fracking methods. Of the approximately 29 million barrels of development and produced wastewater generated in the Marcellus Play in 2012, approximately 4 million barrels required treatment/disposal – the rest was recycled.

Q *Are development and produced wastewaters radioactive?*

A Eureka Resources has been treating Marcellus Shale Play related development and produced wastewaters at our Williamsport facility since 2008. Eureka routinely monitors radiation levels throughout the Williamsport facility in accordance with a plan required by the Pennsylvania Department of Environmental Protection (PADEP). While the influent wastewaters do contain low levels of Naturally Occurring Radioactive Material (NORM), the routine monitoring has determined that the NORM levels stay below action levels and the wastewater is not radioactive.



GAS WELL WASTEWATER TREATMENT

TYPE OF FACILITIES/WASTEWATERS: Oil & Gas Wastewater Treatment & Storage Facilities that accept/treat/manage development (top hole waters, pit waters, drilling muds, flowback) & produced (formation waters & compressor station condensate waters).

LOCATIONS OF FACILITIES:

- 419 Second Street, Williamsport, PA 17701
- Off Route 6 near Towanda, Standing Stone Township, Bradford County, PA
- Reach Road, Williamsport, PA 17701

ADDRESS: Eureka Resources, LLC, 454 Pine Street, Williamsport, PA, 17701
Please Contact Us at **570-651-9972** for More Information.

Visit us on our Website: www.eureka-resources.com