NEW BRUNSWICK **PETROLEUM ALLIANCE**
ALLIANCE PÉTROLIÈRE DU NOUVEAU-BRUNSWICK

CAPP ACPP
CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS | ASSOCIATION CANADIENNE DES PRODUCTEURS PÉTROLIERS
Canada's Oil and Natural Gas Producers | Les producteurs de pétrole et de gaz naturel du Canada

What New Brunswick Needs to Safely Manage Wastewaters from Oil & Natural Gas Development: Smarter Regulations and Better Communication

Prepared by the

New Brunswick Petroleum Alliance in partnership with the

Canadian Association of Petroleum Producers

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About the New Brunswick Petroleum Alliance and Canadian Association of Petroleum Producers

The New Brunswick Petroleum Alliance (NBPA) is an advocate for the oil and natural gas industry in New Brunswick. Founded in 2011, the NBPA is the provincial organization that represents oil and natural gas companies that are involved in the exploration, development, production, and distribution of petroleum resources in New Brunswick.

As the primary voice of industry and member advocate, NBPA works to facilitate a vibrant and sustainable domestic oil and natural gas industry in the province through education, working groups, lobbying, regulatory activities, and media relations. The NBPA and its members proactively engage with governments, communities, stakeholders, First Nations, and the public to encourage the flow of accurate information concerning the petroleum industry, technical expertise, exploration and development programs, and the economic benefits from these activities for the region.

NBPA works continuously to promote the socially and environmentally responsible development of New Brunswick's petroleum resources, with safety as a priority in all activities and operations conducted. The NBPA is committed to ensuring a strong, safe and responsible domestic oil and natural gas industry in New Brunswick that contributes to well-being of the Province – economically, environmentally and socially.

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce about 90 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a national industry with revenues of about $120 billion a year.

Introduction & Purpose

As an industry, the companies and people working in the oil and gas sector are held to the highest standards of regulatory oversight. To this end, we are committed to, and go to great lengths to, protect and respect the safety of people and the environment. This includes the responsible management of wastes from our operations and activities.

Following the launch of the new *Rules for Industry* (Rules) in February 2013, industry recognized that there would be a need to identify market-appropriate methods to treat and dispose of wastewater fluids from hydraulic fracturing activities. The new *Rules* in New Brunswick require a waste management plan prior to commencing activities that outline options for storage, treatment, re-use and disposal (Section 4.4). Further to this, the Rules indicate that the *disposal of a waste at an existing wastewater treatment facility in New Brunswick is not permitted unless it has been established that the facility is capable of providing*

effective treatment (Section 4.10). However, no facility is currently approved in the Province, negating the possibility for industry projects to move forward.

As a result, industry determined that it needed to identify potential methods for treating and disposing of waste fluids, and their associated costs. In May 2015, a Request for Information (RFI) was issued to companies and experts from across North America already working in the field of wastewater treatment and disposal. The express purpose of the RFI was to have interested participants provide their expert advice and solutions for treatment and disposal specific to New Brunswick's unique situation.

Findings in Depth

We were pleased to receive numerous responses highlighting a variety of innovative and probable solutions. In short, the RFI process provided validation from wastewater experts that wastewater treatment and disposal could be addressed safely in New Brunswick using a variety of options and innovative techniques. However, what became acutely evident was that **the single most significant obstacle to providing any wastewater treatment and disposal solution is the perception that wastewater from hydraulic fracturing processes is unique and cannot be treated** in a similar manner to other industrial wastewaters currently being processed within the Province of New Brunswick.

As an industry poised for growth in the Province, oil and natural gas development and the processes used to extract hydrocarbons have come under a great degree of public scrutiny and there are innumerable myths circulating about industry processes, procedures and oversight – not the least of which is the treatment and disposal of wastewater fluids.

Similar to wastewater fluids resulting from other industrial activities, fluids from hydraulic fracturing activities **can be treated to normal levels of cleanliness for disposal at approved sites or facilities**. In other words, whatever is put into the water can be removed. The water then can be disposed of in an appropriate manner or reused, as can be any of the resulting solid wastes, bi-products (e.g., salt, sludge, oily solids), or saleable co-liquids—depending on the treatment method employed.

To this end, it is the position of the NBPA and CAPP that:

1. clarity is required from the regulator on the precise treatment standards necessary for wastewater fluids to ensure full compliance and public confidence;

2. since wastewater fluids can and will be treated to the required standards set out by the regulator, the licensing of disposal sites and/or facilities should be approved, assuming full compliance, as they are for wastewater fluids from other industrial processes in the Province; and

3. best practices, which have been proven safe, effective and are being used in other jurisdictions (e.g., annular disposal wells), be further reviewed and studied to understand if geological formations are conducive to enable such practices in the future in New Brunswick.

It is important to note, that all solutions provided were either *mobile* or *scalable* to meet the fluid volumes required for current industry activity levels and subsequent industry growth. Many companies are working towards water neutral operations.

Understanding Hydraulic Fracturing & Fluids

Water is a critical component of many modern day industrial activities. But it is also critically important for human life and daily activities. This is why industry goes to such great lengths to respect and protect our environment.

Hydraulic fracturing practices are evolving rapidly, and process technologies have been developed to stimulate wells, treat fluids and recycle water. Industry constantly works towards continuous improvement by employing technologies to reduce freshwater use and reduce fracture fluid additives. As hydraulic fracturing techniques evolved, so too have the regulations which protect the environment and water resources.

Typically a well will require about 20,000 m^3 of water to fracture stimulate. Sand is used in the fluid to hold open the fractures created in the formation. Also, in order to optimize the effectiveness of hydraulically fracturing fluids, usually 3-12 chemical components are added for the purposes of: reducing friction, preventing micro-organism growth, providing viscosity, preventing corrosion of pipes. The fluid composition is approximately 99.5% water and sand, and 0.5% chemical additives.

In the case of additives contained within fracturing fluids, transparency is a critical aspect and **industry supports the full disclosure of fracturing fluid additives and the development of fracturing fluid additives with the least environmental risks.** To this end, The BC Oil & Gas Commission (BCOGC) introduced the FracFocus website to Canada. The www.fracfocus.ca website is intended to provide objective information on hydraulic fracturing, fracturing fluids, groundwater and surface water protection and related oil and gas activities in Canada. Alberta, the Northwest Territories and **New Brunswick** have since adopted the FracFocus system as well, whereby companies must disclose their chemical use for each well.

Treatment Options

It is important to understand that there are two types of wastewater resulting from drilling and completion activities – *Produced* and *Flowback* waters. *Produced water* is natural formation water that is found in the reservoirs or geological formations of drilling zones. It comes to the surface as part of the oil and natural gas production process. *Flowback water* is the water-based solution that returns to the surface following completion of hydraulic fracturing. It contains clays, chemical additives and other Total Dissolved Solids (TDS) such as minerals, salts, and metals.

Any fluids derived from the process of hydraulic fracturing (produced or flowback waters) can be treated by a number of new and existing technologies (or combinations thereof) to treat fluids and produce effluents similar to other industrial discharges, including:

Activated Carbons – a technology that introduces carbon (e.g., granular, pelletized or powder) to the treatment system as a filtration mechanism for removing a wide range of contaminants through adsorption.

Advanced Oxidation – a chemical treatment procedure used to remove organic and inorganic materials in wastewater by modifying the structure of the pollutants to similar, but less harmful, compounds by adding an oxidizing agent (e.g., oxygen, hydrogen peroxide, chlorine).

Bioreactor – a container or continuous system used in the production (e.g., fermentation) or destruction (e.g., sewage, wastewater) of living organisms in substances. The process is conducted in a closed system and under tightly controlled conditions (e.g., temperature, moisture, oxygen, light and other environmental components).

Crystallization – a wastewater technology that changes a solute (a substance dissolved in another substance) in a solution to a solid state (crystals) using a temperature change (heating or cooling), thus separating wastes.

Desalination – there are many desalination systems, but the process simply involves heating the water and turning it into steam. Some evaporates and some is collected as condensate. This process removes salts and minerals thereby producing fresh water.

Dissolved Air Flotation – a process of wastewater filtration that removes suspended matter or solids by dissolving air in the water under pressure, and then releasing the air at atmospheric pressure into a flotation tank or basin. This produces air bubbles that adhere to the suspended matter which causes it to float to the surface, where they can be removed by a skimming device.

Distillation – a commonly used technology for many applications. The process separates the component substances from a liquid mixture using evaporation and condensation.

Evaporation – this technology is used to turn water-based wastes into vapor, leaving the remaining contaminants behind. The vapor can be recovered and recycled as distilled water for reuse or discharge.

Forward Osmosis (FO) – a filtration process that uses a high concentration solution to naturally "draw" water through a semi-permeable membrane from the "feed" solution (lower concentration solution), effectively separating the water from the dissolved solutes.

Gravity Separation – a method of separating two components (of a liquid or dry mixture) by separating the components of different weights using gravity. This is used to further remove Total Dissolved Solids (TDS) from a solution.

Physico-Chemical treatment – includes processes designed to separate colloidal solutions (solutions that have particles from one to 1,000 nanometers in size that are evenly distributed throughout a solution) by adding chemicals called coagulants or flocculants.

Reverse Osmosis (RO) – a filtration process that uses high pressure to "force" water through a semi-permeable membrane to remove molecules that are smaller in size than a water molecule (inorganic solids) from the solution.

Solids drying – dewatering of solids to separate contaminants can be done using filter or screw press or a centrifuge. Drying beds of sand with an under-drainage system may also be used, whereby sludge applied on the sand bed and allowed to dry by evaporation and drainable of excess water.

Water softening – the process of removing of cations and anions in hard water (water containing more minerals than ordinary water, usually calcium and magnesium). Softening is typically achieved by using lime or other ion-exchange resins (to replace calcium or magnesium).

Today, industry uses some of the most technically sound biological, physical, chemical and mechanical treatment techniques available; and consequently, public health and water quality are better protected. In fact, modern wastewater treatment is continuously evolving and improving. This is particularly true as industry seeks to further improve its ability to identify new sources of water, as well as recycle and reuse water for its operations. The challenge of wastewater management will breed creative new solutions and collaboration, as innovative new methods and combinations of new and existing technologies are trialed and introduced to market.

Treatment of wastewater fluids from hydraulic fracturing can be accomplished efficaciously employing modern technologies.

Disposal and Discharge Options

There have been great advances made in the recycling and reuse of waters for drilling and completion of oil and natural gas wells. However, when water can no longer be recycled for practical reasons, it must be disposed of safely and responsibly, as it is for any industrial activity. Wastewater from oil and gas development typically contains salts, hydrocarbons, trace metals and other elements. The most commonly approved disposal method is to inject it deep underground using dedicated wells designed for the purpose of deep well injection. This is the practice that is used in mature producing regions elsewhere in Canada. Industry seeks to study and better understand if geological formations in New Brunswick are conducive for such a practice, and revisit the viability of deep well injection as a future option for wastewater disposal in New Brunswick.

In addition to deep well injection, other disposal methods are available. As mentioned above, fluids from hydraulic fracturing can be treated to any required standards for disposal or discharge. Once treated, waters could potentially be disposed of in municipal treatment facilities, used in land applications, or discharged to surface waters. Of course each option requires regulatory approval and permitting, but **the important factor to note is that the water is treated to the required level of cleanliness and meets all regulatory approvals for disposal or discharge—similar to wastewaters from any other industrial processes.**

Cost Considerations

This issue of wastewater treatment and disposal has the potential to immobilize oil and natural gas development and cause potential industry or investment partners to seek more cost-effective projects elsewhere. It is imperative when reviewing options, that the need for competitiveness within the industry, the technical challenges, and the inherent costs for the development of oil and natural gas resources be considered.

We have outlined numerous methods and options that can effectively treat wastewaters from hydraulic fracturing operations and that are used in other jurisdictions. However, the single most important variable in selecting any of these potential methods is the associated cost. Some treatment methods are

more appropriate for more mature producing regions where volumes and quantities are more substantial and economies of scale can be realized, whereas others may be more suitable for newer regions that are attempting to build capacity.

What industry knows for sure is that at the current scale of operations in New Brunswick—and appreciating what can reasonably be expected over the next five to 10 years for activity—transporting wastewaters to other jurisdictions, hundreds of miles away, is not a financially feasible solution. Wastewater management has been mitigated in other jurisdictions to ensure industry growth, and working together, we know that wastewaters can be managed safely and effectively in New Brunswick – just as it has been done for the management of wastewaters from other industrial activities. For without support in the management of wastewater, industry activity will effectively be halted in New Brunswick.

Conclusion

As a potentially meaningful industry in the Province, oil and natural gas businesses and the processes used to extract hydrocarbons have come under a great degree of public scrutiny. There are innumerable myths and misunderstandings circulating about industry processes, procedures and oversight – not the least of which is the treatment and disposal of wastewater fluids. The lack of means to treat and dispose of water is the single largest impediment to industry progression in New Brunswick. Industry has been working with government departments, wastewater professionals and academia to identify appropriate solutions specific to New Brunswick's situation.

The Request for Information (RFI) process provided validation from experts that wastewater treatment and disposal of wastewater fluids from oil and natural gas activities could be addressed in New Brunswick using a variety of options and innovative techniques. However, **the single most significant obstacle to providing any wastewater treatment and disposal solution is the erroneous perception that wastewater from hydraulic fracturing processes is unique and cannot be treated** similar to other industrial activities.

Similar to wastewater fluids resulting from other industrial activities, fluids from hydraulic fracturing activities **can be treated to appropriate levels of cleanliness for disposal at approved sites or facilities using any of (or combinations of) the modern treatment technologies available**. In other words, whatever is added to water can be safely removed. The water then can be disposed of in an appropriate manner and/or reused by industry, as can be any of the resulting solid wastes, bi-products (e.g., salt, sludge, oily solids), or saleable co-liquids—depending on the treatment method employed.

To this end, it is the position of the NBPA and CAPP that:

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3. best practices which have been proven safe, effective and are being used in other jurisdictions (e.g., annular disposal wells), be further reviewed and studied to understand if geological formations are conducive to enable such practices in the future in New Brunswick.

As regulators and industry look to the future, the necessary regulations, infrastructure and support mechanisms must be put into place to help the onshore oil and natural gas industry flourish in New Brunswick. With a longstanding history of expertise, innovation and success in Canada, best practices from more mature producing jurisdictions can be leveraged to provide industry with a means to safely and responsibly treat and dispose of fluids from hydraulic fracturing operations.