



Land Treatment Success

Frontera completed the clean closure of its Tarbaini Waste Management Area land treatment operations according to International cleanup/closure criteria in 2009. The utilization of bioremediation as a technology to treat oily sludge and other oily materials from locations in the Taribani Field proved successful. This is the first successful demonstration of bioremediation in Georgia. Frontera has clearly demonstrated its expertise in the design, construction, operations, and monitoring of land treatment operations. This process is cost effective and is globally recognized as an environmental best practice.

The Technology

Land treatment is a technology that utilizes microorganisms in the soil to reduce hydrocarbon concentrations via the bioremediation process. Microorganisms use hydrocarbon as a food source for cell metabolism. The hydrocarbons are converted into additional biological mass, water, and carbon dioxide. Bioremediation has shown reductions of 60% to 90% of hydrocarbon concentrations in approximately one year or less under the proper application and operational procedures. Our experience confirmed that by reaching clean closure concentrations in nine months.



Plowing operations at the Taribani Waste Management Area.

The Permit

Frontera received permits from Georgia's Ministry of Environment and National Agency for Regulation of Oil and Gas in fall 2006 for permission to construct and operate centralized waste management areas for Block XII. The permit application and subsequent permit contained commitments for operational practices, monitoring, recordkeeping, and criteria for clean closure. The principal component of interest for closure criteria was total petroleum hydrocarbons. Initial application concentrations of 5% to 10% were reduced via the biodegradation process to less than 2%. The internationally recognized U.S. State of Louisiana 29B regulation recognizes 3% as the maximum acceptable total petroleum hydrocarbon concentration.



November 2008: Taribani Waste Management Area.

The Operations

Approximately one acre of land was plowed in preparation for application of oily material for remediation. The oily material was then applied and mixed into the soil by additional plowing. Nutrients (nitrogen and phosphorous), pH, and soil moisture were monitored and necessary adjustments were made by adding nutrients, water, and lime so that the optimum biodegradation conditions remained stable. Biodegradation is soil temperature dependent, with best results occurring when soil temperatures are above 21C.

Frontera applied approximately 275 cubic meters of oily materials removed from the closure of old pits and the cleanup of old contaminated soil locations to the land treatment area. The oily materials were applied to the land surface from July 25, 2008 to August 4, 2008.

The Monitoring

Frontera employed an independent environmental consultant to perform the necessary sampling and analyses. Indicator parameters (pH, nutrients, soil moisture) were monitored routinely to ensure optimum biodegradation conditions. Baseline and progress samplings were performed for about fifteen constituents (heavy metals, total petroleum hydrocarbons, etc.) by the independent environmental consultant from August 2008 through June 2009. The June 2009 results showed that hydrocarbon concentrations had been reduced below the closure criteria contained within the permit from the National Agency for Regulation of Oil and Gas. A Waste Management Report sent to the Agency documenting the land treatment operations at the Taribani Field confirms that the closure criteria contained in the permit have been achieved. Just to reconfirm closure criteria were met an additional sampling and analysis campaign was conducted in 2010. Results were confirmed.



August 2009: Taribani Waste Management Area following completion of successful land treatment process.

Summary

The first ever successful demonstration of bioremediation in Georgia is a significant achievement. Frontera is extremely proud of the culture that has been created around its Health, Safety, Environment and Community policy which is a priority in every facet of Frontera's daily work and operations. This recent land treatment success is yet another testimony to the strong commitment Frontera has made in ensuring the health and safety of its employees, responsible stewardship of the natural environment and the importance of the communities in which it operates.