

US Liquids of Louisiana

Optimizing E&P Waste Management

A Contractor's
Perspective

“Innovative treatment, services and disposal technologies are the keys to reducing, reusing and recycling E&P waste. The goal is the lowest total cost of operations with minimum environmental risk and zero operator liability.”

—William F. Werdenberg



Toward zero operator liability

As the generators of 15 to 20 billion barrels per year¹ of produced water, oil- and water-based drilling fluids, cuttings, workover and completion fluids, and production wastes, exploration and production (E&P) operators in the United States spend hundreds of millions on regulatory compliance and waste transportation, treatment and disposal. Operators often find it more cost effective to use commercial contractors to manage their wastes. Under the U.S. Superfund law² enacted in 1980, however, cradle-to-grave responsibility for generated wastes became the standard. Thus, if the contractor improperly transports, treats or disposes of waste, the government may require all companies that generated the waste to share the cost of remediation. Until recently, little progress has been made to cost-effectively minimize or eliminate this liability that comes from drilling and producing oil and gas wells.

Over the last four years, USLL has perfected a number of innovative treatment and disposal methods to reduce, reuse and recycle E&P waste, and for the first time a reliable commercial method has been demonstrated to move the industry much closer to zero operator liability. As a contractor, the challenge in developing zero-operator-liability technologies and services has been to ensure that the total cost of waste management of the new approaches is *lower* than the traditional oilfield practices that historically have been employed by oil and gas companies.

¹American Petroleum Institute, Overview of E&P Waste Volumes and Waste Management Practices in the U.S., May 2000.

²U.S. House of Representatives, U.S. Code–Title 42, The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Onsite burial	Slurry injection in wells	Salt cavern disposal	Land treatment with recycling
<p>Solids buried in pit at the wellsite</p> <ul style="list-style-type: none"> ■ Appropriate only for some drilling fluids ■ Not appropriate with shallow groundwater table ■ Moisture content, contaminant levels and soil type must be carefully considered to avoid costly liabilities 	<p>Wastes slurrified and pumped into injection wells</p> <ul style="list-style-type: none"> ■ Economical for large volumes of waste ■ Solids size and pump pressures must be controlled ■ Risk of leakage to seafloor or surface if pressures exceed fracture gradient 	<p>Wastes disposed in salt domes</p> <ul style="list-style-type: none"> ■ Economical if dome located close to coast ■ Can handle large solids ■ Very low risk of leakage if disposal wells and facility well maintained 	<p>Wastes treated in engineered cells</p> <ul style="list-style-type: none"> ■ Oil recycled, water reused, clean reuse material generated ■ Reuse material blended with other materials to create recycle product ■ Recycle product applied in road paving or levee reconstruction
Long-term operator liability	Long-term operator liability	Minimal long-term operator liability	Zero operator liability

■ Optimizing E&P Waste Management

Achieving the lowest total cost of waste management for the operator comes from four initiatives:

- New patent-pending waste segregation processes and active water evaporation technologies that keep contractor costs down because they improve land treatment efficiency and reduce the required quantity of land and water resources
- More efficient salt cavern disposal services located closer to high-volume drilling and production areas
- Reduced transportation costs resulting from strategically positioned treatment facilities and more cost-efficient docks and marine transfer stations (The cost of transportation contributes significantly to the total E&P waste disposal cost.)
- Economical and fully compliant conversion of E&P waste to beneficial and environmentally friendly roadbase and levee fill reuse material that eliminates E&P operator liability.

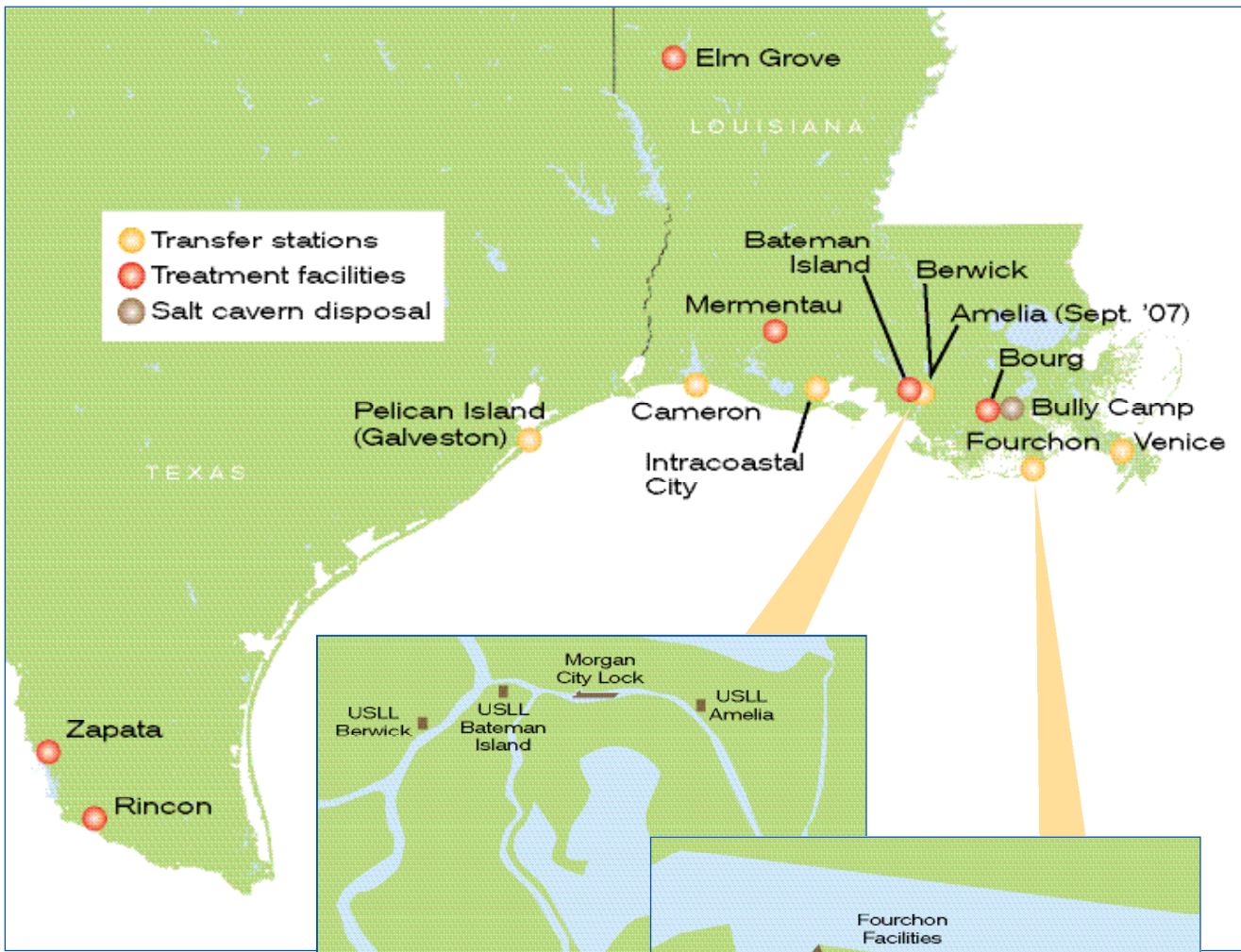
Improving land treatment

Argonne National Laboratory considers land treatment a cost-effective and proven form of both treatment and disposal. The techniques documented by the lab's Drilling Waste Management Information System³ have been perfected by USLL during 25 years of continuous safe operations at its four facilities in Louisiana and its two sites in Texas.

As drilling activity and associated costs increased in recent years, these USLL facilities have focused on continuous safety improvements. Cost efficiency, however, has been the greater challenge. In Louisiana locations, for example, each engineered cell used to wash E&P waste is 3 to 5 acres in size. As waste is received at the facility, all the drilling and production streams are mixed into one cell for treatment. On average it takes 15 to 21 months to complete the treatment activities for each cell, which includes washing to decrease soluble salt content and to recover or degrade the oil. Treatment water, used to wash the cuttings to achieve the regulatory guidelines, is injected into permitted injection wells, and the oil is recovered and recycled. Once the treated solids meet the permit and regulatory criteria, they are stockpiled for future use as roadbase or levee fill. While the process is affordable and low risk, it is labor intensive, requires land and water resources and fuel to operate heavy equipment—all of which are increasing in cost.

³web.ead.anl.gov/dwm/techdesc/land/index.cfm, Drilling Waste Management Information System, Argonne National Laboratory, U.S. Department of Energy (DOE) Natural Gas & Oil Technology Partnership program, National Energy Technology Laboratory.

US Liquids of Louisiana



Unmatched infrastructure in Louisiana and Texas

Facilities positioned to lower transportation costs on inland waterways

1,600 ft of dock to improve barge accessibility

Optimizing E&P Waste Management

Two years ago USLL set out to establish more efficient land treatment operations by developing a proprietary waste segregation technique. In a project conducted at its Mermantau, Louisiana, facility, a 6-acre cell was divided into three smaller cells. The smaller cells received three types of segregated waste streams: low chlorides and low oil, high chlorides and low oil, and high oil concentration wastes. One cell included a freshwater pond. By segregating the waste into these mini-cells, the number of wash cycles and treatment times was reduced significantly, and oil recovery rates dramatically improved.

The second approach pioneered by USLL to improve efficiency is an innovative method of active water evaporation. This new technique, developed in cooperation with the Louisiana Department of Natural Resources (LDNR) and the Louisiana Department of Environmental Quality (LDEQ), has significantly reduced the amount of process water that is pumped down injection wells, while creating a mechanism that recycles this water into the environment through enhanced evaporation.



Named the R3SM treatment process, USLL is continuing to experiment with these new patent-pending waste segregation and active water evaporation processes to ensure that land treatment remains a low-cost alternative for E&P operators. As the new technologies and processes are implemented on a wider scale, USLL expects to handle three times the volume of E&P waste without increasing the footprint of its present facilities.

Frequent independent tests, onsite audits by E&P operators and strict regulatory monitoring of USLL operations confirm groundwater and soil are not adversely impacted by this proprietary land treatment process. The process is quite different from the practices used by operators who have their drilling contractor bury and dispose of E&P waste at the wellsite. Comparative cost and risk analysis studies have shown that commercial land treatment is often more competitive than wellsite burial. E&P operators who use a professional land treatment process avoid the liability costs of groundwater contamination and landowner lawsuits from improper wellsite burial of contaminated wastes. A significant added benefit is that professional land treatment results in an environmentally friendly, regulatory compliant reusable material for road construction and levee fill.

R3 is a service mark of US Liquids of Louisiana, LP.

Salt cavern disposal

Salt cavern disposal is a viable alternative for E&P waste whenever the cost of hauling is not prohibitive. At Bully Camp, one of only a few salt domes located close to the Louisiana coast suitable for E&P waste disposal, a work program is being conducted to meet Louisiana cavern disposal regulations set in May 2003. New techniques are being tested to document the efficiency and compliance of blending E&P waste with water or brine to form slurry. Slurry injection into caverns is ideal for some drill cuttings, tank bottoms and other wastes because there are fewer restrictions on the size of solids than pumping waste slurries into injection wells where controlling solids size and maintaining pump-down pressure below the fracture gradient can be challenging. And unlike slurry injection in wells, no leaks or releases have been observed from the limited number of caverns used for disposal.⁴

Lower transportation costs

Transportation costs contribute significantly to E&P operators' total cost of waste management. In recent years activity increases have strained barge capacity and driven rates up. At some facilities there are long wait times to offload waste. An extensive USLL network of transfer facilities in Berwick/Morgan City/Amelia, Cameron, Fourchon, Intracoastal City and Venice in Louisiana benefit Gulf Coast operators with lower-cost, one-stop disposal, cleaning services and washout bays. In addition, a significant upgrade program is being completed to improve barge utilization and lower transportation costs:

- A new Pelican Island Transfer Station in Galveston, Texas, opened in March 2007.
- A second transfer station was added to the Port Fourchon infrastructure to provide 1,600 ft of water frontage to improve barge turnaround time.
- A new transfer station, located on the east side of the Morgan City lock, is being developed in Amelia, Louisiana, to provide much-improved efficiency to E&P operators working in the shallow waters in this area.

The investments made to upgrade transfer station capabilities translate into significant savings to E&P operators who rely on inland barges to transport waste to USLL's network of land treatment and salt cavern disposal facilities.

⁴web.ead.anl.gov/dwm/techdesc/land/index.cfm, Drilling Waste Management Information System, Argonne National Laboratory, U.S. Department of Energy (DOE) Natural Gas & Oil Technology Partnership program, National Energy Technology Laboratory.

Roadbase and levee fill from reuse material



R3 road base has higher compressive strength than asphalt.



Asphalt sample

USLL has worked for years with state regulators in Louisiana and Texas to sponsor new regulations, develop new processes and demonstrate that its land treatment process results in clean reuse material that can be blended with other materials to become a legitimate commercial recyclable product.

With the patent-pending R3 recycling process, E&P waste is cleaned and blended with other feedstock to produce high-performance roadbase and paving reuse materials. Once the reuse materials meet engineering and environmental specifications, they are no longer classified as wastes and are legally considered to be recyclable products. Independent lab tests have proved that the material is cleaner and more affordable than comparable roadbase materials and that it has higher compressive strength.



An oil and gas industry first, E&P waste was converted to environmentally friendly, regulatory compliant roadbase material to construct a road in Starr County in south Texas. Approved by the Texas Department of Transportation (TxDOT) and the Texas Railroad Commission (RRC), USLL's R3 recycled roadbase and paving materials virtually eliminate E&P operator liability because the waste is converted to a commercially viable recycled product and applied in an approved construction project.



Given the enormous volume of roadbase consumed every year in areas surrounding USLL facilities, all the existing and newly created stockpile from drilling operations can easily be reused in road repair and construction—a benefit to both the environment and to E&P operators. Besides road-building applications, levee reconstruction projects in Louisiana require many times the volume of material than is currently stockpiled at all USLL facilities.



R3 roadbase applied on Delmita Road in Starr County, Texas.

Thanks to the cooperation of government agencies plus the sponsorship and support of E&P operators, the goal of moving toward E&P waste management with zero operator liability can be achieved as future road-building and levee reconstruction projects safely recycle treated E&P waste once thought to carry cradle-to-grave risks.



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