



**ENVIRONMENTAL CONSULTING & MANAGEMENT  
ROUX ASSOCIATES INC**

**GREEN TECHNOLOGY: A SUSTAINABLE ALTERNATIVE TO CONVENTIONAL CHALLENGES**

Sustainability has made great strides both in acceptance and technology. Once considered an expensive alternative to conventional engineering challenges, sustainable techniques have come a long way toward reducing a facility's carbon footprint while promoting renewable resources. Roux Associates, Inc. (Roux) has been employing the environment's natural abilities to meet environmental goals for over 25 years. Through the use of Engineered Natural Systems®, or ENS®, Roux has designed and implemented green technologies to treat industrial and sanitary wastewater; stormwater; and environmental remediation eliminating high capital wastewater treatment plants and more importantly reducing operation costs and carbon footprint through energy efficiency and carbon dioxide sequestration.

**STORMWATER MANAGEMENT**

A growing concern for many regulatory agencies is stormwater runoff both in terms of volume and water quality. Urbanization has resulted in substantial areas of paved land increasing runoff to streams and waterways resulting in heavy erosion and flooding. Sensitive receptors such as freshwater fisheries and coastal shellfish beds are susceptible to contamination from rural and urban runoff. Industry recognizes this threat and is taking steps to mitigate these impacts.

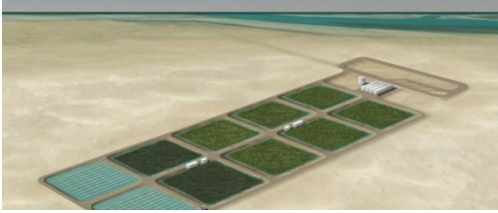
- TEXAS - Roux designed a multi-faceted ENS® to minimize annual maintenance costs for an international ore refining and metals processing company. The company also wanted to achieve zero discharge. The treatment system included an 8-acre constructed treatment wetland, vegetated bioswales, and an additional 8-acre sprayfield to reduce erosion, eliminate flooding, provide treatment, and achieve zero discharge of stormwater.

- ICELAND - At a metal manufacturing site Roux constructed a treatment wetland to meet surface water quality discharge requirements. The stormwater is collected from production areas and pre-treated using vegetated filter strips, swales and engineered soil profiles to provide initial chemical and biological treatment. From the pre-treatment the stormwater is conveyed to a constructed wetland where a forebay removes solids and marshes to remove organic and inorganic contaminants. The wetlands were planted with vegetation indigenous to Iceland obtained from local farmers.



## WASTEWATER TREATMENT

With an aging infrastructure and increased regulatory pressure to achieve lower discharge limits, many existing wastewater treatment plants require replacement or upgrading. Green technologies can be a perfect alternative to expanding conventional treatment technologies or as a polishing step at the end of the treatment train to achieve those lower discharge limits. Incorporating green technologies in new wastewater treatment plant construction can help minimize operating costs while providing a visible, physical demonstration of the corporate commitment to sustainable practices.

- **MIDDLE EAST** - On a 3,000-acre industrial complex, Roux designed a 23-acre ENS® to treat 1.4 million gallons per day (gpd) of process, stormwater and sanitary wastewater without the addition of chemicals or the creation of nuisance odors. The system included 300,000-gallon sedimentation and aerobic treatment tanks to breakdown and separate organic material; a 300,000-gallon oil./water separator, a subsurface wetland that uses vegetation and micro-organisms to remove organics and nitrogen; soil filters for disinfection and phosphorus removal; an ultraviolet disinfection system; a fluoride removal system and infiltration basins to recharge groundwater. Approximately 1 million gallons gpd of finished water is recycled back into the industrial complex saving not only water but over \$7 million a year in water usage.
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- **PENNSYLVANIA** – Roux designed a sustainable, cost effective sanitary wastewater treatment system to replace a failing 30 year old WWTP. Patented enhanced subsurface flow constructed treatment wetland designed to treat 60,000 gpd of sanitary wastewater from a technical campus.

## REMEDICATION

In addition to real time water management and treatment, green technologies are employed to mitigate situations from the past. Often remediation projects are remote and cannot be easily integrated into active operations and as a result can be a drain on physical and monetary resources. For these situations green technologies are ideally suited as they do not require significant labor to operate (most require none), do not require an energy supply and are not an attractive nuisance that might otherwise invite vandalism or other liability issues.

- **RHODE ISLAND** Roux installed a subsurface flow constructed treatment wetlands (CTW) designed to passively intercept and treat BTEX contaminated groundwater from a gasoline station that was discharging to surface water on a golf course. The system's high aesthetic, low visual impact appeal was ideal for its golf course setting. The system requires little to no maintenance (other than removing gold balls)

- NEW JERSEY - Roux installed a hybrid poplar and ash phytoremediation system to replace a conventional pump and treat system at an idle chemical plant. The phytoremediation system is designed to hydraulically control groundwater flow and remediate aromatic organic compounds through consumptive use. The phytoremediation system will eliminate a 100,000 gallon per day treatment system and an air permit for the discharge of vapors.
- VIRGINIA - Roux designed a cost effective alternative landfill cover and leachate treatment system for a multi-national chemical company. Key design elements included a CTW for pH neutralization and metal removal from leachate and a phytotechnology cap in place of the traditional RCRA cap to capture stormwater runoff. The original RCRA remedy planned for the site included a RCRA cap with a leachate treatment system; a costly and labor-intensive remedy. The CTW/phyto alternative had a lower capital cost and a fraction of the operating cost. The system discharges into a high quality water body. The effluent quality discharges at a concentration consistently and considerably less than the permitted discharge limits.
- PERU – Through our Corporate Social Responsibility program, Roux volunteers are working with the Blacksmith Institute to design and install natural remediation systems to mitigate the discharge of contaminated groundwater from abandoned oil wells into local water supplies and ultimately into Lake Titicaca.



## SUMMARY

Green technologies are becoming more mainstream in a variety of applications. As the technology develops, the efficiency and cost improve making what was once an expensive and unproven technique a viable option to conventional engineering challenges. Roux has the expertise and experience to evaluate your needs and develop cost-effective options.

For more information or to discuss possible applications at your site contact Tom Buggey at [tbuggey@rouxinc.com](mailto:tbuggey@rouxinc.com).