

**ORC TECHNICAL BULLETIN # 2.2.2.7**

# Oxygen Release Compound, ORC<sup>®</sup>

## ORC Injection Residential Petroleum Remediation in New Jersey

### Introduction

Releases of no. 2 heating oil from residential storage tanks have become an increasing and costly problem in New Jersey. Petroleum releases at residential sites occur from leaks in underground, aboveground and basement storage tanks. Residential tanks are commonly used for the storage of no. 2 heating oil, but may also contain gasoline and kerosene. The use of excavating methods is often impossible or highly disruptive to the household. In addition, the installation of pump-and-treat systems, to remove the petroleum and the impacted ground water, may not be physically possible or not a cost effective remedial alternative. Releases of petroleum from residential tanks may cause severe groundwater contamination sufficiently serious to render residential wells unfit for use as a water supply. Accordingly, the New Jersey Department of Environmental Protection (NJDEP) oversees all residential cleanups to insure that ground-water supplies in these areas remain fit for consumption.

### Case History No. 1

In 1997, a 280-gallon underground storage tank (UST), previously containing leaded gasoline, was excavated and removed from an abandoned farm in Burlington County, New Jersey. Laboratory analytical results from a potable well sample revealed that targeted VOCs detected in the sample included chloroform, benzene, toluene and *o,m,p*-xylenes at concentrations of 2.5 ug/l, 1.5 ug/l, 3.1 ug/l and 3.3 ug/l, respectively. In December 1997, five monitoring wells were installed at the farm. Gasoline odors were detected in two of the boreholes: MW-3 and MW-4. Evidence of petroleum contamination was not present in the remaining boreholes and a product layer was not present in any of the wells.

In January 1998 a series of thirteen borings were completed with a Geoprobe rig. An ORC slurry containing 10 pounds of ORC and 3.5 gallons of water was injected into each boring at a depth interval of 10 to 20 feet bgs. A carbon treatment unit was then installed onto the existing potable well and the treated effluent from the carbon units was discharged into a wooded area behind the farmhouse. Results from a July 1998 sampling, presented in Table 1, revealed a significant reduction in the concentrations of BTEX in the ground water had occurred after the introduction of ORC. VOC concentrations detected in all the wells have decreased to concentrations well below NJDEP criteria. The groundwater sampling data have been submitted to the NJDEP with a request for case closure.

Well	Pre-ORC (7/97) BTEX (ug/l)	Post-ORC (7/98) BTEX (ug/l)
MW-1	ND	ND
MW-2	7	ND
MW-3	164	ND
MW-4	1.6	ND
MW-5	ND	ND
Potable Well	386	0.79

**Table 1**

### Case History No. 2

In 1996, a 550-gallon UST was excavated and removed from a residential site in Middlesex County, New Jersey. The UST was located immediately adjacent to the foundation of the residence and additional excavation beyond the removal of the

UST could not be performed. Petroleum concentrations in excess of 6,000 ug/l were detected in groundwater. Hand auger borings were completed at locations surrounding the residence and it was determined that the plume was localized to the vicinity of the former UST excavation.

In late February 1997, three hand auger borings were completed at locations surrounding the excavation and adjacent to the foundation. A slurry containing 20 pounds of ORC with 10 gallons of water was injected with a pressure grouter into each boring. In July 1997, a temporary monitoring well was installed and groundwater samples collected for analysis of VOCs and B/Ns revealed that neither targeted nor non-targeted contaminants were present (Table 2). A second confirmation sample was collected with the same results. The groundwater sampling data were subsequently forwarded to the NJDEP and the case was closed.

Well	Pre-ORC VOCs (2/97) (ug/l)	Pre-ORC B/Ns (2/97) (ug/l)	Post-ORC VOCs (7/97) (ug/l)	Pre-ORC B/Ns (7/97) (ug/l)
TW-1	191	6,605	ND	ND

**Table 2**

### **Case History No. 3**

In January 1997, a 275-gallon UST was abandoned in place within a condominium complex in Monmouth County, New Jersey. The UST was abandoned and not removed because it was located between a foundation and a retaining wall; its removal would have undermined both structures and would have prevented entrance through the only door to the condominium for an extended period of time. The UST was taken out of service because petroleum product was found to seeping in the basement of the condominium through numerous holes in the base of the UST.

Three borings were completed through the base of the UST and an ORC slurry was injected into the underlying soils. In addition, ORC injections were conducted at 7 additional locations surrounding the abandoned UST. In February 1997, six monitoring wells were installed at locations surrounding the abandoned UST. Since 1997, ORC socks have been placed in the wells to enhance the removal of dissolved petroleum.

Since February 1997, groundwater samples have been collected from the six monitoring wells on four occasions and analyzed for TPHCs (Table 3). Overall TPHC concentrations have decreased significantly. However, beads of petroleum product continue to recharge wells MW-3 and MW-4 and it is apparent that soils underlying the abandoned UST have not been adequately remediated. It is likely that a residual saturation of petroleum is present in the soil beneath the abandoned UST. Additional injections of ORC are proposed for this location and additional monitoring will be conducted.

Well	TPHC (mg/l) 2/2/97	TPHC (mg/l) 8/15/97	TPHC (mg/l) 11/20/97	TPHC (mg/l) 6/16/98
MP-1	106	5	12	1.93
MP-2	122	3	3	7.79
MP-3	442	915	170	5.87
MP-4	304	2	41	4.09
MP-5	NA	NA	NA	1.18
MP-6	NA	5	ND	1.82

**Table 3**

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