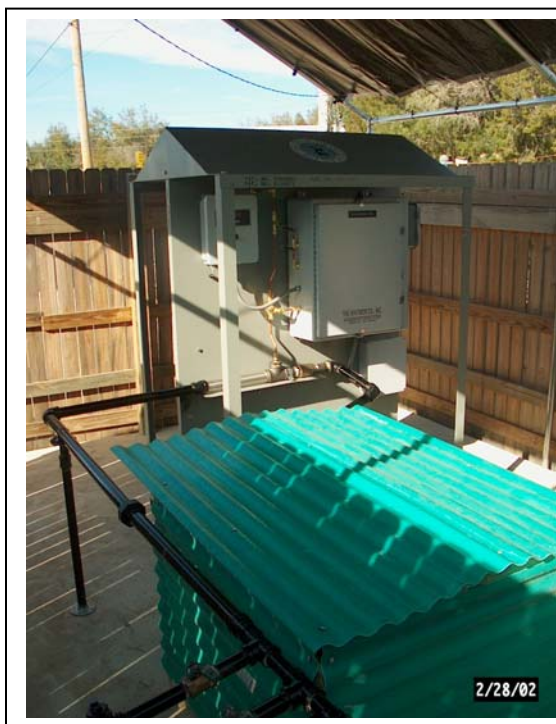




KEYSTONE HEIGHTS/ FLORIDA

In February 2002, GBI implemented *Butane Biostimulation Technologies*TM at the City of Keystone Heights Maintenance Yard to clean up petroleum pollutants. The primary environmental contractor for the Site was Handex Environmental located in Tampa, Florida. The property was contaminated by an underground storage tank (UST) in 1997 that leaked diesel fuel into the Site soil and groundwater. The geology at the Site consists of fine silty sands to approximately 20 feet below the land surface (bls), fine sand with clay from 20 to 35 feet bls, fine sand with clay from 35 to 45 feet bls, hard white sandstone from 45 to 47 feet bls, calcareous sandy clay from 47 to 66 feet bls, and a hardpan of sandstone and gravel from 67 to 70 feet bls. The target contaminants at the Site included benzene, toluene, ethylbenzene, xylenes, and naphthalene, all components of diesel fuel. The *Butane Injector 2000*TM system startup occurred in May 2002. Butane was injected into three *Butane Biosparging*TM wells installed in a clay layer on the one-half acre site. After approximately three months of system operation, Florida Department of Environmental Protection Groundwater Cleanup Target Levels for petroleum products contaminants of concern were achieved. Groundwater sampling data for all of the sampled monitoring wells with initial concentrations exceeding the Cleanup Target Levels are presented in the table below. The *Butane Injector 2000*TM system was shut down on March 4, 2003. The Site is currently undergoing post-remedial monitoring and sampling.

BUTANE BIOSTIMULATION TECHNOLOGIESTM Site Photos



Summary of Groundwater Quality Data
Keystone Heights, Florida
System Startup – May 2002 : System Shut Down – March 2003

Sample Location	Sample Date	Analytical Method	Benzene	Ethylbenzene	MTBE	Naphthalene	Toluene	Xylenes
MW-1A	11/6/2001	8260 VOCs	<1.0	1,170	<1.0	122	2,900	7,090
	7/24/2002	8260 VOCs	<1.0	<1.0	<1.0	1.8	<1.0	<1.0
	10/31/2002	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	1/30/2003	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	5/1/2003	8260 VOCs	<1.0	1.6	<1.0	36	<1.0	8.3
MW-2	11/6/2001	8260 VOCs	3.0	387	4.0	92	83	1,190
	7/24/2002	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	10/31/2002	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	1/30/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	5/1/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-4	11/6/2001	8260 VOCs	<1.0	302	3.0	99	85	999
	7/24/2002	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	10/31/2002	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	1/30/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	5/1/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-5*	11/6/2001	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	7/24/2002	8260 VOCs	<1.0	7.0	<1.0	<1.0	57	47
	10/31/2002	8260 VOCs	<1.0	1.7	<1.0	<2.0	3.0	45
	1/30/2003	8260 VOCs	<1.0	2.7	<1.0	<2.0	2.4	98
	5/1/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	28
MW-8	11/6/2001	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	7/24/2002	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	10/31/2002	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	1/30/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	5/1/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-9	11/6/2001	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	7/24/2002	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	10/31/2002	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	1/30/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	5/1/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
MW-10	11/6/2001	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	7/24/2002	8260 VOCs	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	10/31/2002	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	1/30/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
	5/1/2003	8260 VOCs	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0
Florida Drinking Water Standard			1.0	30	50	20	40	20

NOTES: All concentrations expressed in µg/l (ppb)
Bold values exceed Groundwater Cleanup Target Level
* Monitoring well MW-5 is located in the street (Magnolia Drive) and is upgradient from the Site
Yellow shading indicates pre-treatment concentrations

REFERENCES

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