

# Water Quality Monitoring

By Bill Shirk, CGCS, Queenstown Harbor Golf Links

A brief history of Queenstown Harbor Golf Links starts at its location which is situated on the mouth of the Chester River and Little Queenstown Creek which is located less than a mile from the Chesapeake Bay. Queenstown Harbor Golf Links is located just east of the Chesapeake Bay Bridge. Queenstown Harbor Golf Links was built on 750 acres of farmland, hardwood forest, non-tidal wetlands, and tidal wetlands. The property has been owned and operated as a farm until 1990 by Washington Brick & Terra Cotta Company for 25 years. After 7-1/2 years of permitting process and 43 public hearings, Washington Brick and Terra Cotta finally broke ground on August 1, 1990, on their newest project, a 27 hole upscale public golf course.

During one of the many public hearings, which seemed to be constantly changing as to the law and interpretation of what a wetland was and how it is to be protected and preserved, the Critical Area Commission and Washington Brick and Terra Cotta Company agreed to have 13 ground water monitoring locations on the property and to be tested by an independent lab. This

testing would be done four times per year. A report from each testing would have to be sent to the Critical Area Commission, Queens Anne's County Planning Department, Washington Brick and Terra Cotta Company and to Bill Shirk CGCS, Golf Course Manager. These reports were to be used to help me with our integrated pest management program and to provide information to the Critical Area Commission to help them decide whether golf courses could be located in the critical area zone of the Chesapeake Bay and its tributaries. The critical area zone is the area within 1,000 feet of the Chesapeake Bay and its tributaries.

The water monitoring is done by Apogee Research Inc. from Bethesda, Maryland. Steve Roy is in charge of this project and with whom I work closely to make adjustments to fertilizer programs according to the monitoring results.

The 13 monitoring wells were installed using a drilling rig with hollow stem augers on July 6, 1990. Notice this was done prior to construction in hopes of getting some data prior to golf course usage.

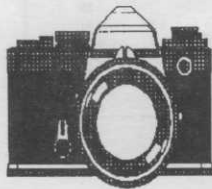
On November 15, 1990, nine wells were tested. Several wells were damaged during construction and three new wells were added in 1994 as part of construction for a new nine, B-14, B-15, and B-16. We now have close to five years of data. I will highlight the first report and the last report and let the charts show the rest.

## November 9th Testing Results

The drinking water standard for nitrate-nitrogen is 10 MOIL. Two samples, well B-7 and well B-8 revealed elevated nitrates. Nitrates in well B-7 were 14 MG/L and well B-8 was measured at 19 MG/L. These wells are located at a ground water discharge point to the Chester River and demonstrate significant impacts from the previous agricultural operation. Well B-4 which is located in the practice fairway also showed elevated nitrates at 6.1 MG/L. This area was in agriculture operations.

The average concentration of nitrate-nitrogen for all the wells was 5.34 MG/L. Well B-1 is considered representative of background undisturbed water quality as it moves onto the site.

**Continued on page 7**



## Aerial Photography



**Aerial photographs of your golf course--oblique, vertical, and single-hole shots. Find out if your fairways and greens need improvement. Have an aerial view to help in the planning of future landscaping and development.**

**Makes a great score card cover and photo for the Club House.**

*Prices start at \$475.00.*

E&R Aerial Photography, 9210 Gold Dust Court  
Laruel MD 20723 Phone/Fax (301) 369-0550

# Water Quality Monitoring Tables

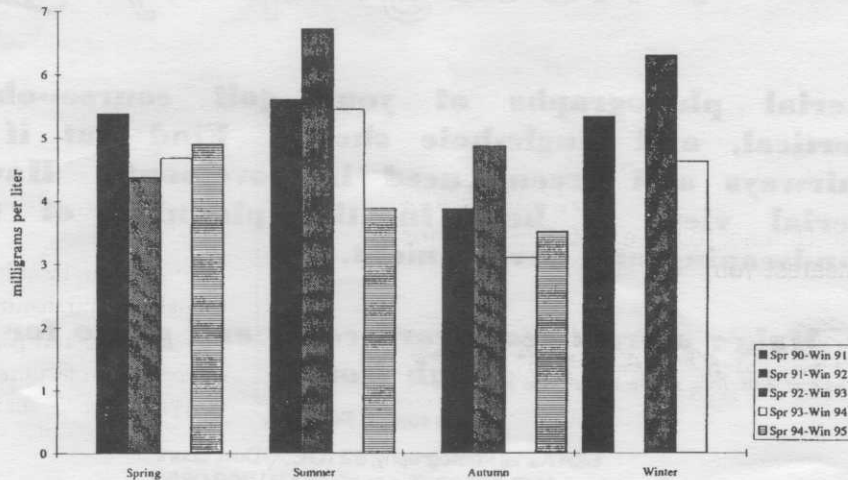
Table 1

WASHINGTON BRICK AND TERRA COTIA												
Queenstown Golf course - Water Quality Laboratory Report												
Sampling date: 11/15/90												
Sample ID	chemical: (mg/l)	Nitrate Nitrogen	Ammonia Nitrogen	Kjeldahl Nitrogen	Phosphorus (total)	Orthophosphate Phosphorus	Carbofuran (ppb)	Carbazyl (ppb)	Flowl (ppb)	Chlorothalonil (ppb)	Iprodione (ppb)	Atrazine (ppb)
B-1		0.02	0.90	9.80	0.88	4.10	< 2.00	< 2.00	< 2.00	< 0.05	< 0.10	< 2.00
B-2		0.13	1.10	12.00	0.05	< 0.01						
B-4		6.10	0.29	18.00	0.24	< 0.01						
B-7		14.00	0.60	0.60	0.52	< 0.01	< 2.00	< 2.00	< 2.00	< 0.05	< 0.10	< 2.00
B-8		0.02	< 0.10	< 0.1	0.20	< 0.01						
B-8		19.00	< 0.10	9.10	0.05	< 0.01						
B-9		2.60	0.10	3.70	0.02	< 0.01						
B-10		0.83	< 0.10	1.80	0.02	< 0.01	< 2.00	< 2.00	< 2.00	< 0.05	< 0.10	< 2.00
LOC-1(Little Queenstown Crk)		0.44										
CR-B-7 (Chester River)		0.39										
Performed by Martel Laboratory Services and Hazelton Wisconsin.												
(ft):	Depth to Bottom	Tape to water	Water level on tape	Depth to water	Top Casing	Water Level						
B-1	17.00	7.00	1.09	5.91	17.28	11.27						
B-2	16.50	11.50	0.98	10.51	21.41	10.90						
B-4	16.00	13.00	0.94	12.06	20.30	8.24						
B-6	14.00	12.20	1.54	10.66	19.90	9.24						
B-7	16.00	9.00	1.38	7.62	8.69	1.07						
B-8	20.00	14.50	0.95	13.55	19.94	6.39						
B-9	20.00	10.50	0.45	10.05	21.53	11.48						
B-10	22.00	16.00	0.96	15.04	24.31	9.27						
B-12	16.50	11.00	0.58	10.42	22.85	12.43						

Table 3: Nitrate-Nitrogen Sampling Results

Queenstown Harbor Golf Links														
DATE	B-1	B-2	B-4	B-6	B-7	B-8	B-9	B-10	B-12	B-13	B-14	B-15	B-16	All Wells Average
11/15/90	0.02	0.13	6.10	0.02	14.00	19.00	2.60	0.83	no samp.	no samp.				5.34
03/20/91	0.03	1.60	8.51	0.04	8.18	17.40	4.36	8.24	no samp.	0.05				5.38
06/20/91	0.03	2.90	7.90	0.04	7.50	15.00	6.50	8.90	6.80	0.52				5.61
09/30/91	0.02	0.02	no samp.	0.05	8.62	19.00	4.81	1.83	0.41	0.08				3.87
04/06/92	0.33	1.80	7.60	0.05	4.20	10.00	8.30	11.00	0.40	0.05				4.37
06/23/92	0.23	2.90	8.10	0.03	8.40	23.00	8.30	16.00	0.15	0.06				6.72
10/05/92	0.35	1.70	7.70	0.01	7.70	21.00	7.10	3.00	0.10	0.03				4.87
01/12/93	0.03	1.40	11.00	0.13	9.60	21.00	10.20	9.20	0.51	0.02				6.31
03/31/93	0.15	2.10	1.90	0.09	5.30	18.30	6.30	12.10	0.20	0.30				4.67
06/23/93	0.08	2.00	3.40	0.05	7.90	12.70	3.50	23.00	0.05	1.80				5.45
10/06/93	0.07	1.70	5.00	0.86	7.30	8.30	2.40	4.00	0.05	1.30				3.10
01/17/94	0.05	1.40	4.30	0.05	3.30	16.40	1.90	12.50	0.19	2.10	6.50	10.00	1.50	4.63
04/05/94	0.10	1.60	3.50	0.10	1.90	12.50	1.30	5.20	no samp.	0.80	18.30	9.50	4.00	4.90
06/20/94	0.30	2.10	4.50	0.40	2.90	11.20	1.20	5.40	0.40	0.80	10.70	7.20	3.20	3.87
10/06/94	0.40	1.40	4.90	0.20	2.00	14.90	0.70	6.10	0.30	1.30	6.60	4.40	2.40	3.51
Average	0.15	1.65	6.03	0.14	6.59	15.98	4.63	8.49	0.80	0.66	10.53	7.78	2.78	4.84

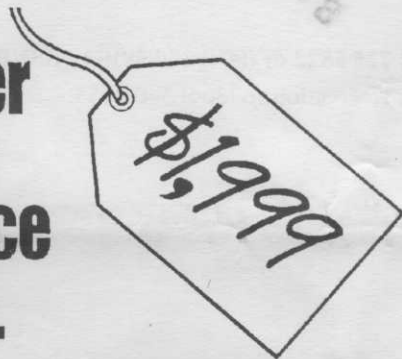
Figure 4: Queenstown Harbor Golf Links - Seasonal Comparison for All Wells Average



## Meeting Site's for 1995

April - Fall Road Golf Course, Potomac, MD  
May - Superintendent/PRO Tournament, Surburban Club, Baltimore, MD  
June - Forest Park Golf Course, Baltimore, MD  
July - Springfield Country Club, Springfield, VA  
August - Bretton Woods Golf Club, Potomac, MD  
September - Cripple Creek Country Club, Bethany Beach, DE  
October - Rolling Road Country Club, Baltimore, MD.  
November - Chevy Chase Club, Chevy Chase, MD  
December - Turf Valley Hotel & Country Club, Ellicott City, MD

# The Mower You Need. At the Price You Want.



Now you can buy a full-featured EagleStar® 36-inch walk-behind commercial mower for as little as \$1,999.\*



Our mid-sized mowers feature:

- 5 speeds plus reverse
- Kawasaki engines
- New deep V drive belt design

\*for 36-in. cutting deck  
48-in. models also available.

Call the EagleStar Hotline, toll-free, 800-929-1948 for name of dealer nearest you.

 **EagleStar**  
Made in USA

## Water Quality Continued from page 5

Nitrate levels at this well were measured at .02 MOIL. Phosphorus levels (.88 MOIL total phosphorus and 4.10 MG/L orthophosphate) were quite high.

Three wells were tested for pesticides B- 1, B-7, and B- 10. All samples provided results at levels below analytical detection levels. The chemicals tested for were Carbofuran, Carbaryl, Pendimethalin, Atrazine, Chlorothalonil, and Iprodione. Please see Table 1 for November 15, 1990, test results.

The results for the last testing to date was October 6, 1994.

After nearly five years of testing nitrate-nitrogen, (NO<sub>3</sub>) is the primary constituent of concern at the golf course. All other testing has become analytical undetectable. Ground water samples are analyzed for nitrate-nitrogen primarily because of two reasons: the concerns of nitrogen additions to the Chesapeake Bay and its usefulness as an indicator of ground water quality conditions and movement.

The average nitrate-nitrogen concentration at the site decreased from the previous sampling event. The average concentration from all wells decreased to 3.5 MG/L in October, 1994, from 3.9 MG/L in June, 1994. Only one well, B-8, had nitrate-nitrogen concentrations above the drinking water standard. The other well which had previously been above 10.0 MG/L, B-14, dropped to 6.6 MG/L in this sampling event. B-8 has always been high. Our conclusion is that this well is located next to an active agricultural use, corn, soybean, and wheat production, since testing has started. Also, B-14, B-15, and B-16 are located in the same agricultural use until fall of 1993. This area has now been developed in an additional 9 holes of golf. We believe that test results for these wells will show a decline in the near future.

The results for the October 6, 1994, sampling and each of the past sampling results are on Table 3. Also on Figure 4 is a seasonal comparison for all wells' average.

In conclusion, I would like to point out that even though the nitrate-nitrogen testing has shown valleys and peaks, of which hopefully we can refine our fertilizer applications to level these valleys and peaks, that Queenstown Harbor Golf Links has dropped the nitrate-nitrogen levels from 5.34 MG/L in November, 1990, to October, 1994's, results of 3.51 MG/L.