

Vermont Water Well Data Summary

Vermont Geological Survey, Department of Environmental Conservation, January 2007

In the 2005-2006, the Vermont Legislature passed Act 144 which directs the Agency of Natural Resources to provide a compilation summary of water well log completion data for the last 15 years. The water well database contains records from 93788 wells completed between 1966 and 2006. The database includes data for 76 different fields, including why the well was drilled (ex. new, replace existing supply, deepen existing), 23 different well use codes (ex. domestic, heating, industrial, agricultural), well statistics such as yield, depth, casing length, and screening, date completed, well type (gravel or bedrock), and location information. The data was derived from well driller reports and the accuracy of the data is varied. The compilation presented here focuses on the data from January 1991 – December 2005, the most recent complete 15 year time interval but includes the 40 year data in 5 year increments to highlight long term trends.

Well Summary

In the past 15 year interval, 41901 wells have been reported and have an average depth of 317 feet and an average yield of 15 gallons per minute (gpm). Of these wells, 1190 or 2.8% were gravel wells and the remainder were drilled in bedrock. Most wells drilled in Vermont in the past 15 years are new wells (96%) for domestic use (95%). The 40 year well data includes records for a total of 91,416 wells. The number of wells, plus depth and yield information is presented in Table 1.

Table 1. 40 Year Well Data in 5 Year Increments

Years	# of Water Wells	Average Depth (ft)	Average Yield (gpm)	Median Depth (ft)	Median Yield (gpm)	gpm/ft
1966-1970	5669	210.15	13.87	177	6	0.07
1971-1975	7475	226.39	15.48	197	6	0.07
1976-1980	8328	240.65	13.36	205	6	0.06
1981-1985	10874	261.19	13.91	225	6	0.05
1986-1990	17169	281.71	13.85	250	6	0.05
1991-1995	13717	294.17	14.30	265	6	0.05
1996-2000	13053	319.19	15.24	298	7	0.05
2001-2005	15131	337.58	16.77	303	8	0.05
Total	91416					
Average	11427	271.38	14.60			

Although the number of wells has increased in the past 15 years, this number has decreased from the high of 17,169 in 1986-1990. 40 year trends for well yield and well depth are shown in Figure 1 and Figure 2. As shown in Table 1 and Figures 1 and 2, the trend is towards a higher average yield, an increase in well depth and a decrease in gpm/ft (average yield divided by average depth).

Figure 1. 40 Year Trends for Well Yield in Gallons per Minute (gpm)

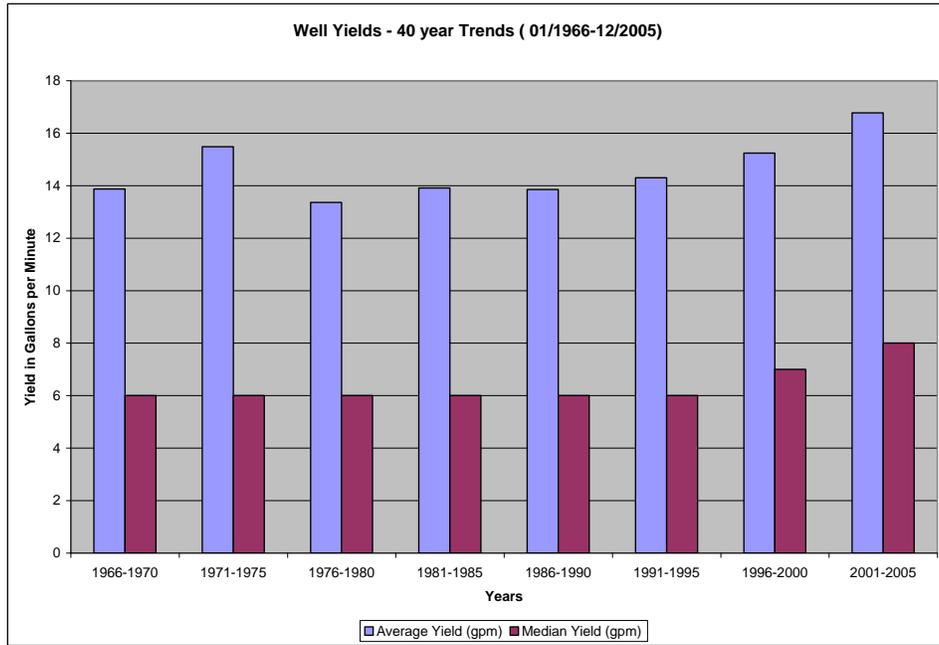
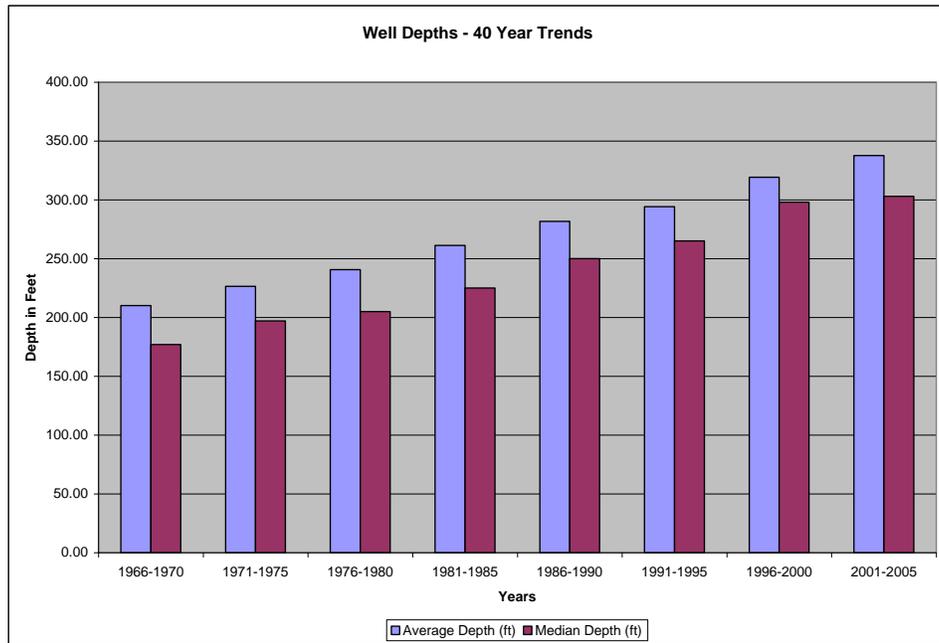


Figure 2. 40 Year Trends for Well Depth



Well Type

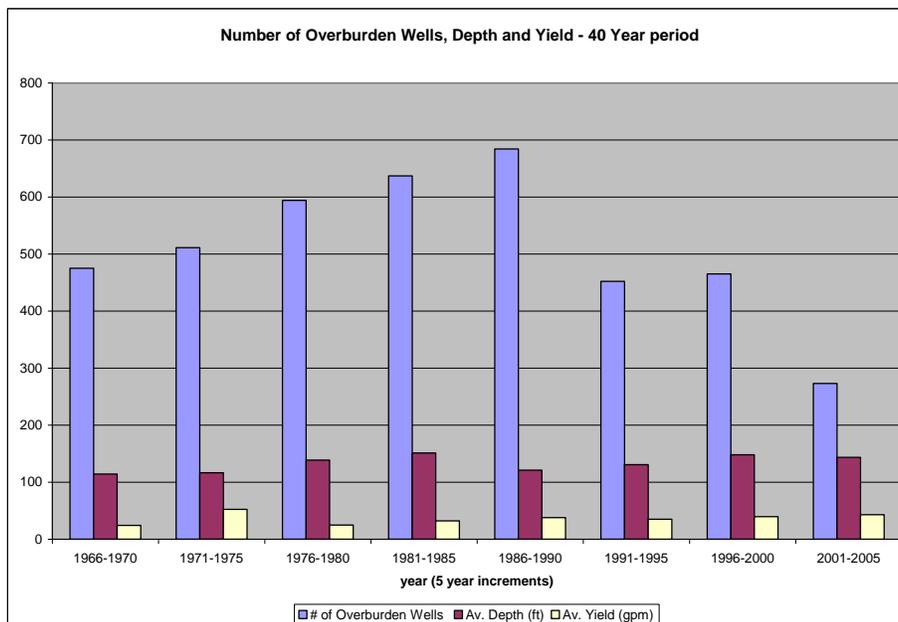
The majority (87,300) or 95.5% of wells are completed in bedrock. 4.5% of wells are completed in overburden. The percent of overburden wells has decreased from 8.3% to 1.8% since 1966. Statistics for the overburden wells are in Table 2 and Figure 3.

- Gpm/ft for overburden wells averages 0.27 gpm/ft compared to 0.05 gpm/ft for bedrock wells.
- The average depth for overburden wells is 133 feet compared to 271 ft for all wells and 290 ft for bedrock wells.
- The average yield is 36 gpm for overburden wells compared to 14 gpm for bedrock wells.
- In general, overburden wells are shallower and have a higher yield than bedrock wells.

Table 2. 40 Year Summary of Overburden Wells in 5 Year Increments

Years	# of Gravel Wells	Average Depth (ft)	Average Yield (gpm)	Median Depth (ft)	Median Yield (gpm)	Maximum Depth (ft)	Maximum Yield (gpm)
1966-1970	475	114.25	24.14	88	14	697	500
1971-1975	511	116.6	52.14	98	20	545	2030
1976-1980	594	138.61	24.82	107	15	810	400
1981-1985	637	151.22	31.98	117	20	1330	1200
1986-1990	684	120.95	37.75	105	20	980	1080
1991-1995	452	130.55	34.88	110	25	1235	300
1996-2000	465	148.04	39.35	119	20	700	1200
2001-2005	273	143.33	42.85	120	30	925	1000
Total	4091						

Figure 3. Summary of Overburden Well Data



Well Use

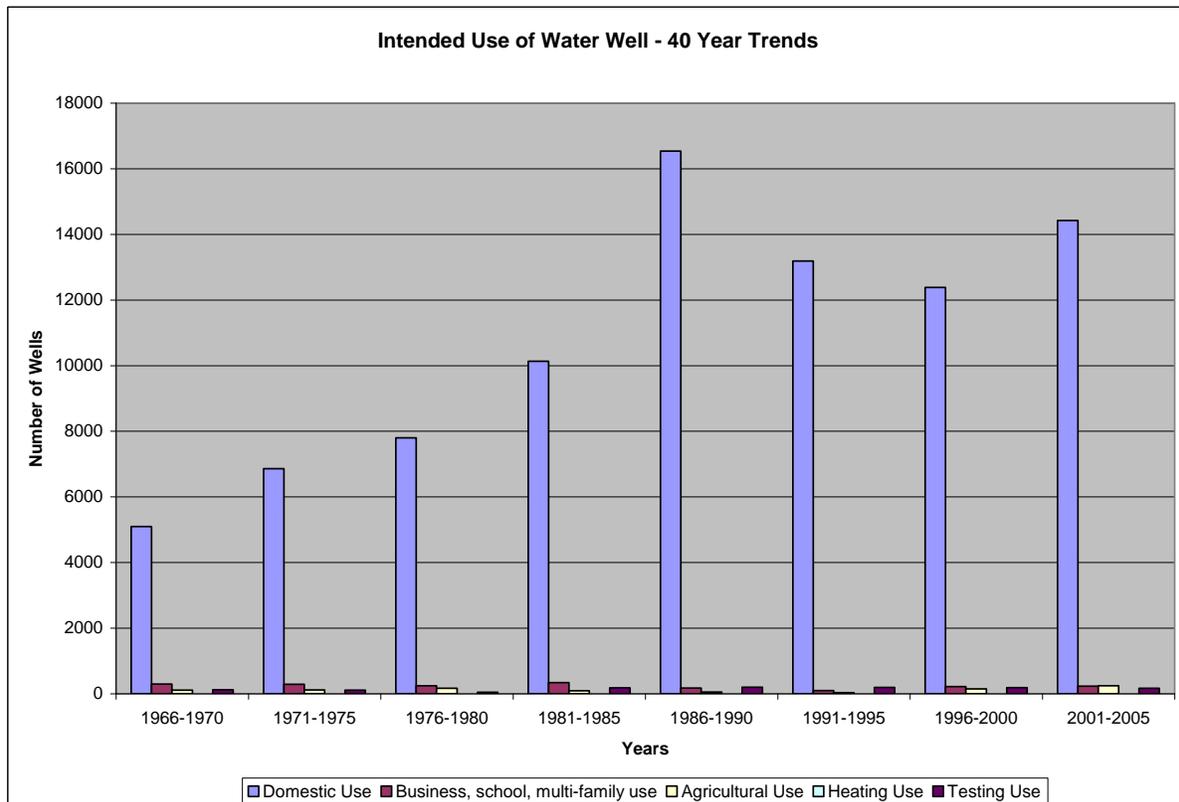
The water well database contains 23 codes used to describe the intended use of a well.

Table 3. Well Use Codes

1 Domestic	8 Hospital/ Clinic	16 Other
2 Abandoned	9 Hotel/ Motel/ Lodge	17 Recharge
3 Agriculture	10 Housing Development	18 Recreation Facility
4 Apartments	11 Injection	19 Restaurant
5 Business Establishment	12 Industrial	20 School
6 Condominiums	13 Monitoring	21 Test
7 Heating	14 Municipal	22 Trailer Park
	15 Nursing/ Retirement Home	23 Public

For the purpose of this summary, well use codes were grouped as follows: Domestic (1), Business (4,5,6,8,9,10,12,13,14,15,18,19,20,22,23), Agricultural (3), Heating (7,11), and Testing and Other (16,21). The number of wells in each category and the 40 year trend in 5 year increments is presented in Figure 4. The large majority of wells (94%) are for domestic use over the 40 year period.

Figure 4: Summary of Intended Use of Water Well



Although domestic wells are clearly the largest number of wells drilled, the average gallon per minute for wells by use in Figure 5 shows that average yield for agriculture and business wells both exceed the average yield for domestic wells. The number likely reflects the need for higher yield to support a business/school/condominium etc. and agriculture. However, when considering the total number of wells in each category and the total gpm, yield for domestic use is the highest as shown in Figure 6. These numbers report the well driller yield and *do not record actual water usage/withdrawal*.

Figure 5. Average Well Yield (gpm) by Use Category – 15 Year Period

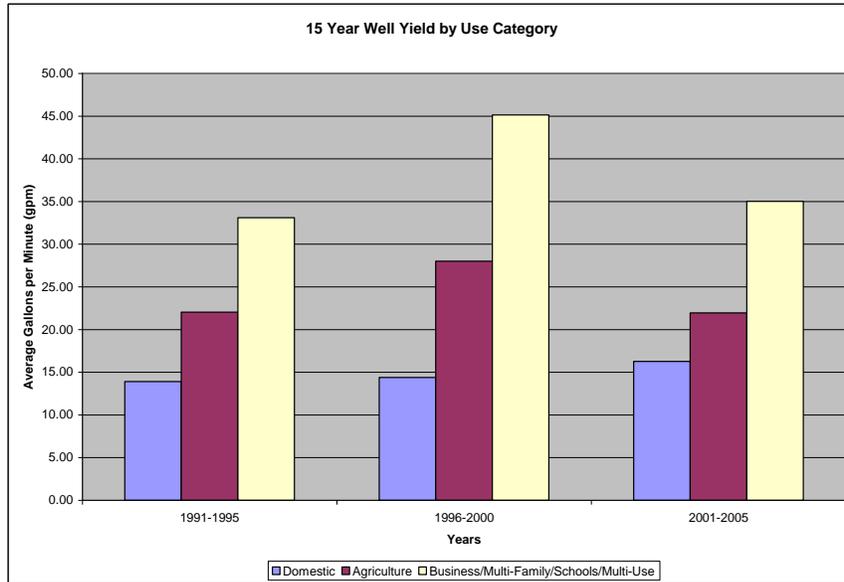
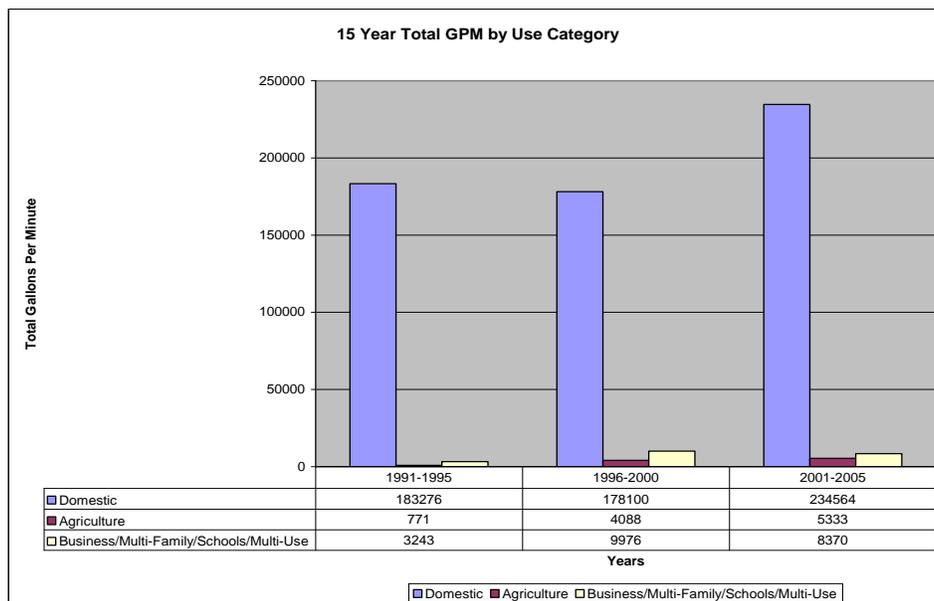


Figure 6. Total Yield (gpm) by Use Category – 15 Year period



Identifying High and Low Yield

A reported yield of 1 gpm was selected as the high value for low yielding wells. 1 gpm is 1440 gallons per 24 hours and the average person uses a minimum of 150 gallons per day. This equates to 600 gallons/day for a family of 4. We assumed that the actual well yield in gpm may be half of the value in the well driller report. Therefore, a value of less than or equal to 1gpm was used to identify a low yield well. In Vermont, the average percent of low yield wells to total wells over the 40 year period is 14%. 28% of the wells are in the high yield category over the 40 year period. The Vermont Geological Survey is evaluating the low and high yield wells in GIS on a generalized basis to determine if there are geologic and geographic correlations.

Figure 7. 40 Year Trend for Low and High Yield Wells: The figure shows the total number of wells and the wells with yield less than or equal to 1 gpm or greater than or equal to 20 gpm.

