

**Report on the
Dutchess County
Comprehensive Countywide Private Well Testing Initiative
Phase I
with Phase II Addendum**

**Original Issue Date: May 28, 2008
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Dutchess County Department of Health
387 Main Street,
Poughkeepsie, NY 12601

The following document contains two parts:

Pages 2 – 22: Report on Phase I of the Dutchess County Comprehensive Countywide Private Well Testing Initiative. This report was originally issued on May 28, 2008. The information contained in the report is unchanged since its release and is provided to offer background context for the methodology, sample selection, and reporting period, which remained the same for the Phase II testing.

Pages 25 – 34: Findings for Phase II of the Dutchess County Comprehensive Countywide Private Well Testing Initiative.

Abstract:

This document reports the findings of Phase I of the Comprehensive Countywide Private Well Testing Initiative announced by County Executive William R. Steinhaus on September 6, 2007. This well water testing program was designed to enhance the current knowledge about the quality of groundwater sources throughout the county. To implement the first phase of this multi-phased initiative, volunteers were recruited over a four week enrollment period using an on-line and mail-in application process. Following the recruitment period, 125 wells that served single-family, owner occupied residences were randomly selected from the pool of applicants, with a minimum of two applicants selected per municipality and a proportional share of applicants accounting for the remaining 85 samples. Water sampling and analysis was performed by a private contract laboratory and samples were analyzed for bacteria, organic, and inorganic chemicals. While sodium was the most common analyte¹ detected, it is not regulated by a maximum contaminant level. There is a recommended guideline, with one established for those on severely restricted sodium diets and one for those on moderately restricted diets. Total coliform, which is regulated by a maximum contaminant level, was the second most common analyte detected, which may suggest that the wells were either poorly constructed, poorly maintained, or under the influence of sewage or surface water. There were no exceedances² above the maximum contaminant levels for principal organic compounds, although there were some minor detects, at or below the detection limit of 0.5 parts per billion.

Introduction:

County Executive William R. Steinhaus launched the Dutchess County Comprehensive Private Well Testing Initiative on September 6, 2007 to expand on information available on groundwater quality. The Dutchess County Department of Health already regularly

¹ Analyte- The sample being analyzed by, in this case, laboratory analysis.

² Exceedance- The amount by which an analyte exceeds a standard or permissible measurement.

monitors over 1800 public water supply wells throughout the County. The goal of this project was to collect information about Dutchess County private well water sources that serve single-family, owner-occupied residences. A targeted private well sampling protocol which allowed for the testing of private wells at randomly selected homes was utilized.

Many people and agencies contributed to the successful implementation of this new initiative, which was led by the Dutchess County Department of Health (DCDOH). The Environmental Health Services (EHS) division of the DCDOH coordinated the project. This first phase of the program was broken into three stages:

- (1) Enrollment and Recruitment
- (2) Sample Selection
- (3) Sampling and Reporting

The Public Health Information, Planning, and Education (PHIPE) division, including their GIS Coordinator, as well as the County's Office of Computer and Information Systems (OCIS), Department of Planning and Development, and the Water and Wastewater Authority all actively contributed to this effort. Through the public bidding process, Smith Laboratory, a lab certified through the Environmental Laboratory Approval Program (ELAP) and located in Hyde Park, New York, was selected to complete the water sampling and analysis.

Methodology:

Enrollment Period

The recruitment period for volunteer enrollment for the county well initiative commenced on Thursday, September 6, 2007 and ended on Friday, October 5, 2007.

The County Executive held a press conference at 22 Market Street in the City of Poughkeepsie on September 6, 2007 to announce the start of the initiative. In addition to this presentation to the media, public interest was generated through a postcard mass mailing to homeowners throughout the county; through radio announcements; and with

the placement of ads in weekly newspapers. Recruitment information was also posted on the Dutchess County website, accessible via www.dutchessny.gov.

Eligibility requirements for participation in the initiative were delineated on the website, on the postcard that was sent to homeowners, as well as on the on-line application.

Criteria that had to be met included:

- 1) The applicant had to be the owner and occupant of a single-family home served by a private well that supplied only their residence.
- 2) The applicant could not be part of an on-going well sampling protocol conducted by the New York State Department of Environmental Conservation.
- 3) The applicant had to provide access to raw, untreated water for sampling.

A copy of the application used for enrollment can be found in Appendix A. It details the full list of eligibility requirements.

During the enrollment period, Health Department staff was prepared to answer general questions that the public could have about the initiative. While many callers were referred to the county website to complete and submit the on-line application, a significant number of applications were mailed to those homeowners who were interested in participating in the initiative but did not have access to the Internet.

Applications submitted via the on-line system were delivered electronically to 'healthinfo', the health department e-mailbox used by the public for general inquiries. The information from the electronic applications was also imported into the Well Test Application SQL³ database. The application data from the SQL database was then imported into an Access database. As completed hard-copy applications were received by mail, staff entered the data into the SQL database, which was then imported into the Access database.

³ SQL (Structured Query Language), is a standard interactive and programming language for querying and modifying data and managing databases.

Throughout the enrollment period, applications were reviewed to check whether applicants met the basic eligibility requirements. Using the County's *ParcelAccess* data system, staff members verified that applicants owned the home that was listed on the application, that the residence was a single-family dwelling, and that the residence was served by a private water supply. Those applicants that did not meet these general requirements were marked "Ineligible" in the Access database. During this process, tax map numbers were also cross-referenced and corrected to ensure that they accurately reflected each applicant's property location.

Sample Selection

During the planning stages, it was determined that 125 wells would be sampled as part of Phase I of the Comprehensive Countywide Private Well Testing Initiative. Of these 125 proposed wells, it was also decided that a minimum of two applicants would be selected per municipality and a proportional share of applicants would account for the remaining 85 samples. This proportional share was based on the estimated number of private wells located within each municipality compared to the estimated total number of private wells located in the entire County. Table 1 shows the breakdown of the estimated number of private wells per municipality and the total number of wells (including the required two) that would be sampled per municipality. For the purposes of this study, villages were incorporated into the town numbers.

Table 1: Breakdown of the estimated number of private wells per municipality and the number of wells to be sampled per municipality.

SWIS Code	Municipality	Estimated # Private Wells	Total # of Wells to be Sampled
132000	Town of Amenia	697	4
132200	Town of Beekman	2144	8
132400	Town of Clinton	1309	6
132600	Town of Dover	1365	6
132800	Town of East Fishkill	5371	17
133089	Town of Fishkill	1077	5
133200	Town of Hyde Park	2781	10
133400	Town of LaGrange	3251	11
133600	Town of Milan	719	4
133889	Town of Northeast	487	3
134089	Town of Pawling	1310	6
134200	Town of Pine Plains	514	3
134400	Town of Pleasant Valley	1931	7
134689	Town of Poughkeepsie	387	3
134889	Town of Red Hook	1078	5
135089	Town of Rhinebeck	1068	5
135200	Town of Stanford	1158	5
135400	Town of Union Vale	1062	5
135689	Town of Wappinger	2084	8
135889	Town of Washington	872	4
Total		30665	125

To facilitate the sample selection process, the updated Access database with corrected tax map numbers and ineligible candidates appropriately marked, was forwarded to the DCDOH GIS Coordinator who georeferenced eligible applicants in the GIS system. This was done by matching applicant address to County Address Point File and Zip Code. After completing the georeferencing of the applicant wells, names and addresses were removed to maintain anonymity during the selection process.

After removing the identifiers, a query was conducted on the GIS system to ascertain how many volunteer wells fell into the following categories:

- a. Located in valley aquifer areas
- b. Located in upland aquifer areas
- c. Located on parcels below sizes recommended by the recent aquifer recharge/septic density study
- d. Located on parcels larger than the aquifer recharge/septic density recommendations

Then using the classification system described above, the GIS Coordinator, a representative from the DCWWA, and other Department of Planning and Development staff members randomly selected the pre-determined number of wells that were to be sampled in each municipality. Wells were selected evenly throughout the municipalities, and consideration was given to maintaining the original countywide ratio of upland versus valley and large versus undersized parcels.

As a precaution, a back-up well was also chosen for every priority well that was selected during the random selection process. This was done in case there was a problem with the first sample location. The back-up well was near the priority well and was also similarly-positioned. Two hundred and fifty wells were selected during this process.

After completing the selection process, the names and addresses were re-matched with the selected wells and placed in an Excel spreadsheet. The primary and back-up sample locations were also depicted on a map.

Using the Excel spreadsheet, staff then checked each of the selected participants again in *ParcelAccess* to confirm that each was eligible to participate. If only one candidate in an applicant pair was deemed ineligible, then another selection was not done. The remaining candidate would be contacted. If both the priority candidate and its back-up were ineligible, a replacement pair would be selected. During this review, one pair was deemed ineligible and was subsequently replaced.

Applications for the selected candidates were gathered and then reviewed by another staff member to determine if any of these locations were part of any on-going sampling protocol from a known spill. None of the applicant sites were identified as such during this review.

Sampling and Reporting Period

Original applications were delivered to Smith Labs in two batches, with applications divided into towns and priority and back-up applications marked accordingly. Photocopies of all applications were maintained at the Health Department. Two GPS units were also loaned to the laboratory so that longitude and latitude coordinates for sampled wells could be taken. A disk containing a reporting spreadsheet and data definitions was also provided to the lab. The spreadsheet was for electronic reporting of well test data for posting on the county website. These reports would be submitted to the County by e-mail.

Sampling began during the first week of January, 2008 and ended on April 9, 2008. The laboratory contacted homeowners by phone and made arrangements to meet the owner for sampling. As a condition of participation, any treatment that was installed on the homeowner's water system had to be bypassed *by* the owner before samples could be taken. If there was a raw sample tap located prior to any treatment, then the sample was drawn from there. At the time of sampling, the Smith Lab representative also reviewed the application with the homeowner, and had the individual sign the bottom of the application, thus attesting that they met the eligibility requirements that were outlined. The Smith Lab representative also took the longitude and latitude coordinates at the well, or if that location was unknown, at the front door of the house.

Smith Lab contacted homeowners throughout the entire sampling period. If both the priority and back-up candidate in a pair were unreachable after at least two attempts to call or if they were no longer interested in participating, then the laboratory representative requested a new pair. With this notification, the GIS Coordinator then forwarded new pairs that most closely met the criteria outlined in the Sample Selection section. New

applicants were checked against *ParcelAccess* and then the original applications were delivered to Smith Lab.

The list of analytes tested for during Phase I is included in Appendix B. The presence/absence test was used for bacteriological analysis, and was completed first for each sample taken. Analysis for organic and inorganic chemicals required a longer time period to complete.

As the bacteriological results became available, Smith Lab reported total coliform positive and *Escherichia coli* (*E. coli*) positive results via fax to Health Department. As these reports were received, homeowners were contacted by Health Department staff, advised of their results, and directed to the district office of jurisdiction for additional follow-up and guidance. A copy of the faxed report from Smith Lab was then sent to the appropriate district office supervisor. Sanitarians contacted homeowners to discuss water sample results and, if warranted, to make arrangements to complete a sanitary survey of the well. These surveys were done to determine if any factors were present that may have contributed to the presence of bacteria in the well. If deemed necessary, a follow-up sample was also taken. A record of these visits and their findings was maintained and copies of the completed reports, with copies of any follow-up water sample reports, were forwarded to the Health Department.

In early March, Smith Laboratory began to provide hard-copy results to the Health Department. Staff reviewed these reports for detects or exceedances above New York State Drinking Water Standards and guidelines for public drinking water supplies. Homeowners with elevated results or detects were contacted by phone and appropriately advised. The lab also began entering data results for each tested well into the reporting spreadsheet, and electronically submitted the individual reports. These reports were reviewed for conformance with the data definitions and were sent back to Smith Lab if changes were necessary.

Results and Findings:

Three thousand three hundred and eighty-six (3,386) applications were received during the volunteer enrollment period and over 1,400 phone calls were fielded by staff.

Approximately 3,336 applicants were eligible to participate.

During the sampling phase, four pairs – one each in the Towns of East Fishkill, Wappinger, Dover, and Lagrange – had to be replaced. One individual from the Town of Wappinger declined participation and the remaining homeowners were unreachable after Smith Lab made a number of attempts to contact them by phone.

Another individual in the Town of East Fishkill had to be replaced with the corresponding back-up candidate because the priority candidate's chlorinator could not be by-passed. For another individual, sample analysis for Principal Organic Compounds (POC) could not be completed because the homeowner had sprayed a chemical on the faucet that could have interfered with testing and possibly harmed the laboratory equipment. Sample analysis for all other analytes was completed for this residence. Both candidates were notified of these respective issues. There was a third supply with an ultraviolet light that could not be by-passed, but it was determined that the light was not working. The sample from this home tested positive for total coliform and *E. coli* bacteria.

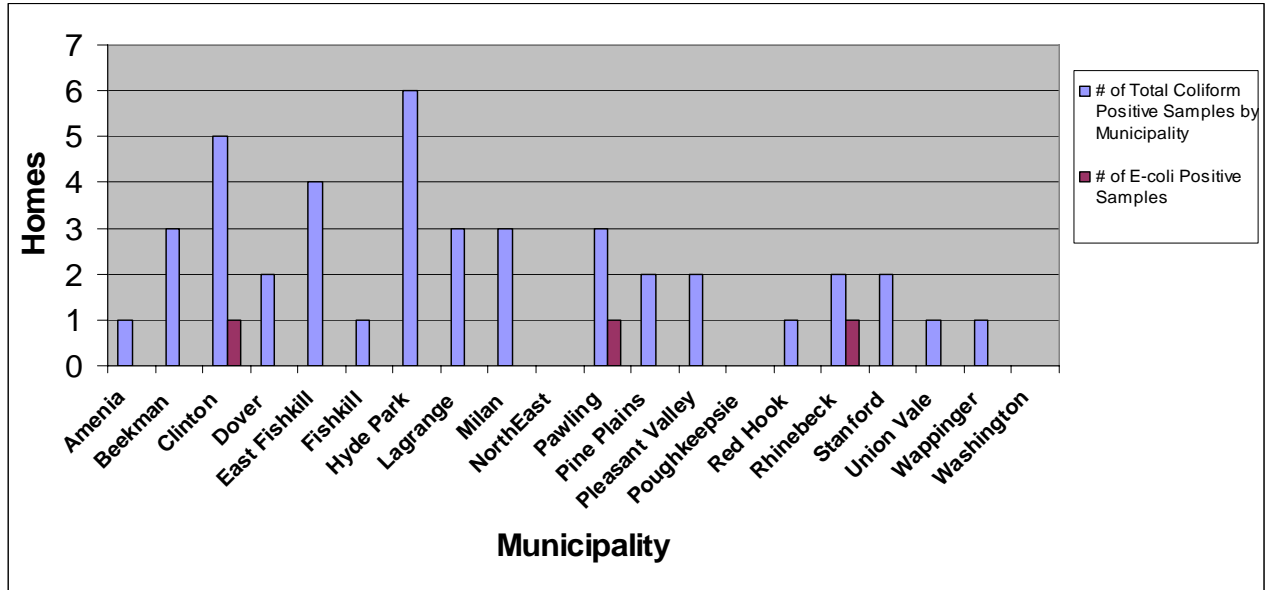
Refer to Appendix D for the map depicting the locations of the 125 final participants that were sampled as part of the initiative.

Bacteria Results

Of the 125 water samples that were taken, 42 samples tested positive for total coliform bacteria and of these, three tested positive for the presence of *E. coli* bacteria. Figure 1 shows the breakdown of total coliform and *E. coli* positive sample results by

municipality. In addition, five samples had turbidity⁴ at a level equal to or above the New York Drinking Water Standard.

Figure 1: Breakdown of total coliform and E. coli positive samples by municipality.



⁴ **Turbidity** is the cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye.

Principal Organic Compounds

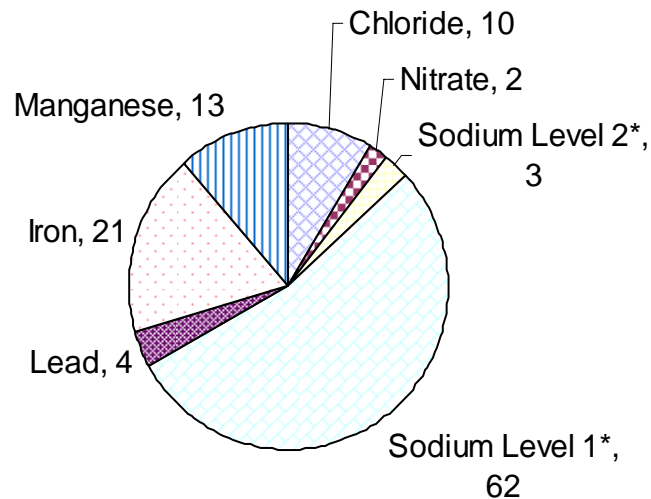
Of the 125 samples that were taken, there were no water samples that had POCs detected above the maximum contaminant level established for the respective analytes by New York State Drinking Water Standards. While below the maximum contaminant level(s), POC results were reported for eleven samples. However, of these eleven, only two of these samples had results that were detected above the laboratory's detection limit of 0.5 parts per billion (ppb⁵). Both of these samples had MTBE detected at 0.6ppb (MCL 10ppb). These two homes were located in the Towns of Dover and Lagrange. There was one residence in East Fishkill where MTBE was detected at a level equal to the laboratory's detection limit of 0.5ppb. For the remaining eight samples, Smith Laboratory analysts interpreted results through a visual inspection of the gas chromatograph printout and estimated that certain POC analytes were present *below* the laboratory's normal detection limit of 0.5ppb. These estimates were indicated on the report with the letter "J" - a code unique to Smith laboratory in these cases. The presence of trichloroethene, tetrachloroethene, toluene, and benzene were estimated in this manner, with five homes showing an estimated level of toluene, one home with an estimated level of tetrachloroethene, two homes with estimated benzene, and one home with estimated trichloroethene (note, one home had both benzene and toluene). Where POCs were detected above the detection limit or estimated below the detection limit (0.5ppb), homeowners were advised and encouraged to resample within three months.

Inorganic Compounds

Figure 2 shows the breakdown of results for inorganic chemicals. Note that these numbers do not add up to 125 because some homes had one or more inorganic chemicals detected while other homes did not have any detected.

⁵ One part per billion, also reported as 1 microgram/Liter, is approximately equivalent to 1 second in 32 years.

Number of Residences with an Inorganic Chemical Detected equal to or above the New York State Drinking Water Standard or Guideline



* **Level 1** represents the recommended guideline (greater than 20 mg/L but less than 270 mg/L) established for those on severely restricted sodium diets. **Level 2** represents the recommended guideline (greater than 270 mg/L), established for those on moderately restricted sodium diets.

Figure 2: Breakdown of inorganic chemical results from Phase I of the Comprehensive Countywide Private Well Testing Initiative.

Discussion:

Results from Phase I of the Comprehensive Countywide Private Well Testing Initiative indicate that sodium was the most common analyte detected, found at levels above the New York State recommended guideline for those on severely restricted sodium diets. One sodium guideline has been established for those individuals who are on severely restricted sodium diets and one has been established for those who are on moderately restricted sodium diets. Common sources of sodium are water softener backwash and road salt.

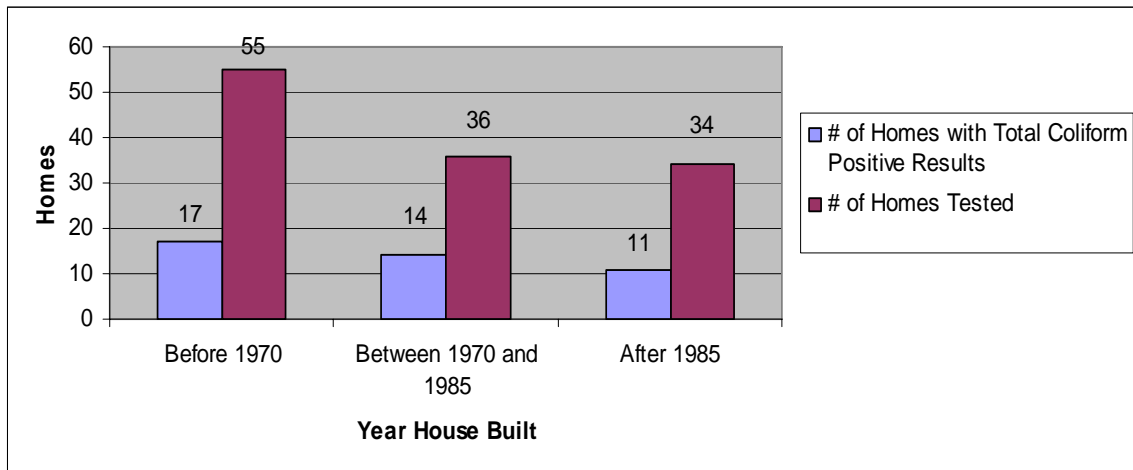
Total coliform was the second most common analyte detected in the 125 water samples that were taken during this phase. The presence of total coliform, an indicator organism, suggests that the impacted well is either poorly constructed, poorly maintained, or under the influence of sewage or surface water. While total coliform may have little if any effect on healthy adults, other organisms could be present that may cause gastrointestinal illness, including diarrhea.

These two findings are in-line with information that has been gathered historically on private wells in Dutchess County and consistent with USGS⁶ surveys of drainage basins throughout New York State. Homeowners frequently contact the Dutchess County Department of Health seeking guidance for treating their drinking water that is total coliform positive and for elevated sodium levels.

⁶ United States Geological Survey. Groundwater quality data from Mohawk, Chemung, and upper Susquehanna River Basins in New York are available on-line at the USGS website.

To clarify whether the presence of coliform bacteria could be linked to the age of the well, the number of homes testing positive for total coliform is depicted graphically in Figure 3 compared to the year the home was built. For perspective, Figure 3 also shows the total number of homes that were built within the same time period and that were also sampled as part of this initiative. With 31% of the homes built before 1970 testing positive for total coliform, 39% of the homes built between 1970 and 1985 testing positive for total coliform, and 32% of homes built after 1985 testing positive for total coliform, **there does not appear to be a significant relationship between the age of the home and the presence of bacteria in the drinking water supply.**

Figure 3: Relationship between samples testing positive for total coliform compared to the year* that the houses were built.



* Information was obtained from *ParcelAccess*

Five of six samples collected from the Town of Clinton had unsatisfactory bacteriological results and one also tested positive for the presence of *E. coli*. A review of *ParcelAccess* revealed that each of these homes was served by an individual sewage disposal system, and the lot sizes for these properties ranged from 0.53 acres to 13.3 acres. The well that tested positive for *E. coli* was located on the smallest lot, which may indicate a relationship between parcel size and bacteriological contamination in this specific case.

Sanitary survey results provided some information about the proximity of wells to the on-site septic systems, as well as other potential hazards that may have contributed to

unsatisfactory total coliform results. Sanitary surveys are still being conducted by Sanitarian field staff and survey data is therefore not available for all wells that tested positive for total coliform.

A survey that was conducted at one home revealed that the home was served by a shallow, dug well, located approximately 50 feet from the on-site sewage disposal system, 75 feet from a cornfield and 115 feet from a pond. Another sanitary survey conducted by a Sanitarian revealed that well work had been done prior to the initial sampling by Smith Lab and that the well had not been disinfected after this work was completed. Notably, the conditions observed during the former and the latter surveys could have impacted the quality of the initial water sample.

It is worth pointing out that, to date, of the 28 re-samples that were taken by staff during this follow-up period, 11 re-samples tested positive for total coliform. Four of the remaining 17 homes with *satisfactory* results were re-sampled after the water treatment system and four of the re-samples were taken after the homeowner had disinfected their well. The fact that water treatment systems were already present on a number of these water supplies suggests that homeowners were previously aware of unsatisfactory water quality. By staff re-sampling after treatment, however, there was assurance that homeowners were *drinking* potable water. Several homeowners also chose to install treatment after being notified of unsatisfactory results from initial and follow-up samples.

Finally, with no exceedances above the maximum contaminant levels for any of the principal organic compounds, and only some minor detects at or below the detection limit of 0.5 parts per billion, the POC results in private wells mirror the data that is maintained for Dutchess County public water supplies, which are served by approximately 1800 wells. Refer to Appendix E for the Dutchess County Public Water Supplies with Final Participants in Phase I map. POCs are man-made or manufactured chemicals that may be found in petroleum products. They occur in those wells that may be contaminated by leaking underground fuel tanks, gas stations, or industrial processes.

For those with minor detects, staff interviewed homeowners to determine if the homeowner was aware of any contributing factors to explain the slight POC detects. Especially for those with *estimated* levels of toluene (that is below the lab's normal detection limit of 0.5ppb), several homeowners were asked whether they had had recent plumbing work done on their wells; plumbing tape used during this process has been linked to leaching of this chemical into water supplies. While one individual indicated that they had had some work done in the past, further discussion revealed that this work was done over a year prior. As such, a definitive assessment cannot be made regarding whether this was a factor contributing to the presence of trace levels of toluene in the drinking water sample.

Conclusion:

The goal of the Comprehensive Countywide Private Well Testing Initiative, a multi-phased program that was announced by County Executive Steinhaus on September 6, 2007, was to gain a better understanding of the quality of groundwater sources throughout Dutchess County. Volunteers were recruited over a four week period and from this pool of applicants, 125 single family, owner-occupied residences were randomly selected to participate in the first phase of the program. The sampling period ran from the first part of January through the beginning of April, with water sample analysis occurring concurrently. Results from this phase indicated that sodium, which is not regulated by a maximum contaminant level, and total coliform, which is regulated by a maximum contaminant level, were the most common analytes detected. There were no maximum contaminant level exceedances for principal organic compounds during this phase, although there were some minor detects, at or below the detection limit of 0.5 parts per billion. To date, these findings mirror historical information that the Dutchess County Department of Health has gathered from public water supplies regarding the presence of principal organic compounds in drinking water, as well as the information that the agency has gathered from private supplies regarding inorganic and bacteriological analytes, which are more common. These findings are consistent with USGS surveys of drainage basins throughout New York State and they reinforce the Dutchess County Department of Health's recommendations for private homeowners to

regularly test their water supplies.

Appendix A: Application

<p>Dutchess County Application for the Private Well Testing Initiative</p> <p style="text-align: right;">Office Use Only</p> <p style="text-align: right;">Log # _____</p>
--

First Name _____ Last Name _____

Physical Address _____

Town/Village/City _____ Zip Code _____

Mailing Address (if different from physical address) _____

Town/Village/City _____ Zip Code _____

Daytime Phone Number (____) ____ - _____

Tax Map Number _____ - _____ - _____ [Link to Parcel Access](#)

- By submitting this application to the Dutchess County Department of Health, I understand and attest that:
- 1) Although I am volunteering for inclusion in this initiative, I may not be selected as one of the final participants in the pilot private well testing program.
 - 2) I own a single family dwelling and have a private well that serves only my residence.
 - 3) My residence is not part of an on-going sampling program related to a known contamination problem.
 - 4) I must be home when water samples are collected and must provide access to raw, untreated water for sampling.
 - 5) I am not a County or municipal elected official and/or employee and no one in my immediate family or within my household is a County or municipal elected official and/or employee.
 - 6) Sample results will be released for public review. Individual names will be removed, but test locations may be identified by tax map number, address, street name, or other appropriate identifiers.
 - 7) Results indicating principal organic contamination above allowable limits will be reported to the New York State Department of Conservation for investigation and follow-up.
 - 8) Only homeowners may submit this application on their own behalf.
 - 9) By offering this initiative, the County of Dutchess is not assuming a duty to clean any contamination discovered; to expand testing areas; or to provide county-wide infrastructure to facilitate provision of municipal water. Furthermore, I hereby release, discharge and agree to hold harmless the County of Dutchess from any liability stemming from my involvement with this initiative, including, but not limited to, inaccurate test results.

Submit Clear

Office Use Only – to be completed on date of sampling.

Longitude/Latitude or GPS		

Signature of Owner	Date	Signature of Sampler
_____	_____	_____

Appendix B: List of analytes and their maximum contaminant levels.

Analyte	CAS Number	MCLValue	Units
benzene	71-43-2	5	ug/L
bromobenzene	108-86-1	5	ug/L
bromochloromethane	74-97-5	5	ug/L
bromomethane	74-83-9	5	ug/L
n-butylbenzene	104-51-8	5	ug/L
sec-butylbenzene	135-98-8	5	ug/L
tert-butylbenzene	98-06-6	5	ug/L
carbon tetrachloride	56-23-5	5	ug/L
chlorobenzene	108-90-7	5	ug/L
chloroethane	75-00-3	5	ug/L
chloromethane	74-87-3	5	ug/L
2-chlorotoluene	95-49-8	5	ug/L
4-chlorotoluene	106-43-4	5	ug/L
dibromomethane	74-95-3	5	ug/L
1,2-dichlorobenzene	95-50-1	5	ug/L
1,3-dichlorobenzene	541-73-1	5	ug/L
1,4-dichlorobenzene	106-46-7	5	ug/L
dichlorodifluoromethane	75-71-8	5	ug/L
1,1-dichloroethane	75-34-3	5	ug/L
1,2-dichloroethane	107-06-2	5	ug/L
1,1-dichloroethene	75-35-4	5	ug/L
cis-1,2-dichloroethene	156-59-2	5	ug/L
trans-1,2-dichloroethene	156-60-5	5	ug/L
1,2-dichloropropane	78-87-5	5	ug/L
1,3-dichloropropane	142-28-9	5	ug/L
2,2-dichloropropane	564-20-7	5	ug/L
1,1-dichloropropene	563-58-6	5	ug/L
cis-1,3-dichloropropene	10061-01-5	5	ug/L
trans-1,3-dichloropropene	10061-02-6	5	ug/L
ethylbenzene	100-41-4	5	ug/L
hexachlorobutadiene	87-68-3	5	ug/L
isopropylbenzene	98-82-8	5	ug/L
p-isopropyltoluene	99-87-6	5	ug/L
methylene chloride	75-09-2	5	ug/L
n-propylbenzene	103-65-1	5	ug/L
styrene	100-42-5	5	ug/L
1,1,1,2-tetrachloroethane	630-20-6	5	ug/L
1,1,2,2-tetrachloroethane	79-34-5	5	ug/L
tetrachloroethene	127-18-4	5	ug/L
toluene	108-88-3	5	ug/L
1,2,3-trichlorobenzene	87-61-6	5	ug/L
1,2,4-trichlorobenzene	120-82-1	5	ug/L
1,1,1-trichloroethane	71-55-6	5	ug/L

Analyte	CAS Number	MCLValue	Units
1,1,2-trichloroethane	79-00-5	5	ug/L
trichloroethene	79-01-6	5	ug/L
trichlorofluoromethane	75-69-4	5	ug/L
1,2,3-trichloropropane	96-18-4	5	ug/L
1,2,4-trimethylbenzene	95-63-6	5	ug/L
1,3,5-trimethylbenzene	108-67-8	5	ug/L
o-xylene	95-47-6	5	ug/L
m,p-xylene	108-38-3;106-42-3	5	ug/L
methyl-tertiary-butyl-ether	1634-04-4	10	ug/L
vinyl chloride	75-01-4	2	ug/L
alkalinity			mg/L
antimony		0.006	mg/L
arsenic		0.01	mg/L
barium		2	mg/L
beryllium		0.004	mg/L
cadmium		0.005	mg/L
chloride		250	mg/L
chromium		0.1	mg/L
cyanide		0.2	mg/L
hardness			mg/L
iron		0.3	mg/L
lead		0.015	mg/L
manganese		0.3	mg/L
mercury		0.002	mg/L
nickel			mg/L
nitrate		10	mg/L
nitrite		1	mg/L
pH			unitless
selenium		0.05	mg/L
sodium			mg/L
sulfate		250	mg/L
thallium		0.002	mg/L
turbidity		5	NTU
total coliform		0	colonies/100ml
Escherichia coli		0	colonies/100ml

Appendix C

Principal organic compounds (benzene through vinyl chloride on the above-referenced chart) are man-made or manufactured chemicals that may be found in petroleum products. They occur in those wells that may be contaminated by leaking underground fuel tanks, gas stations, or industrial processes. Typically, POCs are reported in parts per billion or micrograms/Liter.

Inorganic chemicals (alkalinity through thallium on the above-referenced chart) may be naturally-occurring and attributable to groundwater characteristics, or issues with the plumbing system. Certain analytes, like iron and manganese, may affect the color, taste or odor of drinking water, while the presence of other analytes, such as lead and sodium, may have health effects. Two recommended guidelines for sodium have been established. One for those who are on severely restricted sodium diets and one for those who are on moderately restricted sodium diets. Typically inorganic chemicals are reported in parts per million⁷ or milligrams/Liter.

Coliform bacteria occur in wells that are either poorly constructed, poorly maintained, or under the influence of sewage or surface water. If a water sample taken from a well tests positive for coliform bacteria it may indicate that more harmful organisms that cause gastrointestinal illness may also be present.

⁷ One part per million, also reported as 1 milligram/Liter, is approximately equivalent to 1 second in 10 days.

Addendum:

Phase II

Dutchess County Comprehensive Countywide Private

Well Testing Initiative

July 17, 2009

Overview:

Phase II of the Dutchess County Comprehensive Countywide Private Well Testing Initiative was carried out in a similar manner as Phase I. One hundred and twenty-five wells serving single-family, owner-occupied residences were selected for testing; raw (untreated) drinking water samples were taken and analyzed by Smith Laboratory personnel; results of the laboratory analysis were then submitted to the Dutchess County Department of Health (DCDOH) for review and follow-up.

Individuals selected to participate in the second phase of the multi-phased initiative were drawn from the original pool of applicants used for Phase I (for details about the initial enrollment and recruitment process, refer to the Methodology section of the main report). To ensure that those who participated in Phase I were not selected again, the enrollment database was updated, marking those who participated in Phase I as “Ineligible” for Phase II. Furthermore, in an effort to maximize our reach into those areas not previously sampled, Phase I back-ups (or “B” candidates, who were generally located in close proximity to the selected homes) were also marked as “Ineligible” to participate in Phase II.

Following these adjustments, the updated enrollment database was provided to the DCDOH GIS coordinator who, employing the same criteria and methods used to select the participants in Phase I, randomly selected 125 primary (“A”) and 125 back-up (“B”) sample locations for Phase II. The number of sample sites selected per town for the current phase was in accordance with the pre-determined number of wells established for each municipality during Phase I. For a complete description of the sample selection process, refer to the Methodology section of the main report.

After selecting the set number of candidates, the DCDOH GIS coordinator replaced all identifiers, and forwarded the list of 250 prospective participants back to the Environmental Health Services (EHS) division. Using *ParcelAccess*, EHS staff then verified that the selected sample sites were single family residences and were served by a private well. Acceptable applications were ultimately delivered to Smith Laboratory in

Hyde Park at the end of September, 2008. Well sampling commenced the following month and ended during the first part of April, 2009.

During the sampling period, Smith Laboratory requested three replacement pairs – one each from the towns of Red Hook, Pawling, and Dover. These substitutions were necessary for one of three reasons -- the homeowners could not be reached after Smith Lab personnel made several attempts to contact them by phone (2-3 calls); the telephone number given during the application process was no longer in service; or the homeowner no longer wished to participate in the initiative.

Upon request, replacement pairs were identified by the DCDOH GIS coordinator for both the Pawling and Dover areas. Only an “A” candidate was chosen, however, to replace the original Red Hook pair, since no other candidates from that town met the selection criteria outlined in the Methodology section of the main report (i.e. located in valley aquifer area; located in upland aquifer areas; located on parcels below sizes recommended by the recent aquifer recharge/septic density study; located on parcels larger than the aquifer recharge/septic density recommendations).

The analytical period occurred at the same time as the sampling period. Bacteriological, organic, and inorganic laboratory analysis was done for all 125 wells sampled during Phase II. The presence/absence test was used for bacteriological analysis and was completed first for each sample taken. Analysis for organic and inorganic chemicals required a longer time period to complete. The complete list of analytes tested for during Phase II is included in Appendix B of the main report.

As analysis was completed, Smith Laboratory personnel entered results for each sampled well into the Excel spreadsheet reporting form. These reports were then forwarded, via electronic mail, to the DCDOH for review and subsequent posting on the county website. Hard copies of these water reports were also delivered to the Department of Health by Smith Lab personnel.

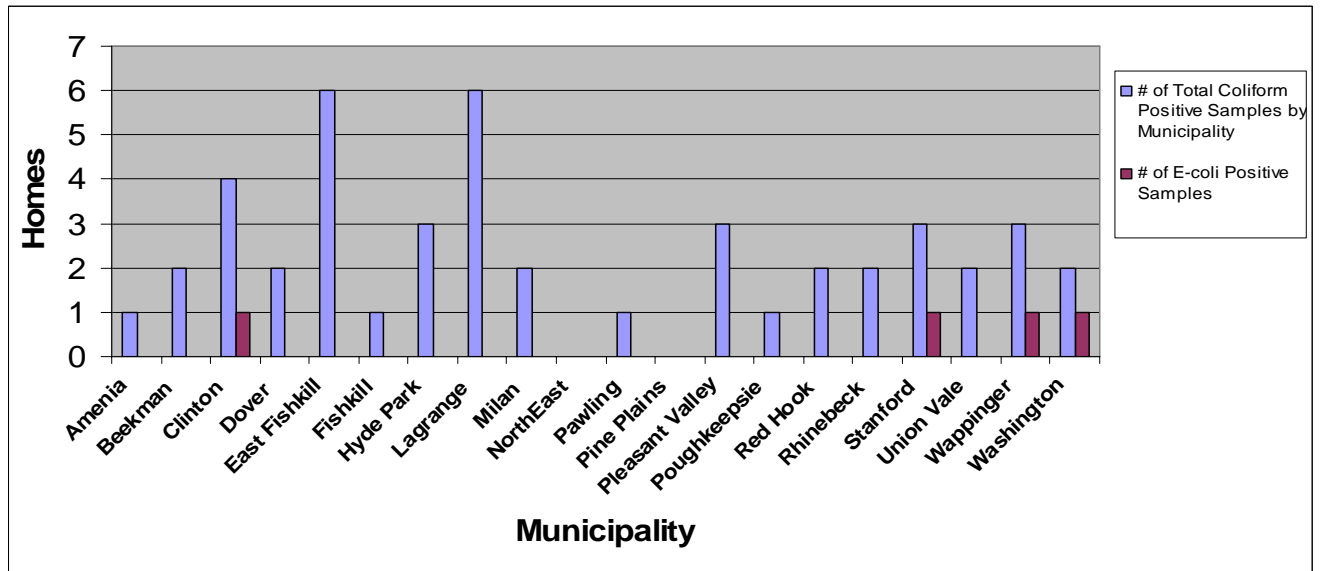
Results and Findings

A map entitled “Final Participants in Phase 2” is included with this addendum and shows the locations of the final 125 participants in the second phase of the initiative.

Bacteria Results

Of the 125 water samples that were taken during Phase II, 46 samples tested positive for total coliform bacteria and of these, four tested positive for the presence of *E. coli* bacteria. Figure 1-A shows the breakdown of total coliform and *E. coli* positive sample results by municipality. In addition, ten samples had turbidity^{1A} at a level equal to or above the New York State Drinking Water Standard.

Figure 1-A: Breakdown of total coliform and *E. coli* positive samples by municipality for Phase II.



^{1A} **Turbidity** is the cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye.

Principal Organic Compounds (POC)

Of the 125 wells that were sampled for Phase II, there were no water samples that had POCs detected above the maximum contaminant level established for the respective analytes by New York State Drinking Water Standards. While below their respective maximum contaminant levels, POC results were reported for thirteen samples. Of these thirteen, however, only one of the samples had a result that was detected above the laboratory's detection limit of 0.5 parts per billion (ppb^{2A}). The analyte that was detected above the detection limit was methylene chloride, reported at 0.6ppb (MCL 5ppb), and was taken from a home located in the Town of Hyde Park.

For the remaining twelve samples, Smith Laboratory analysts interpreted results through a visual inspection of the gas chromatograph printout and estimated that certain POC analytes were present *below* the laboratory's normal detection limit of 0.5ppb. These estimates were represented by the letter "J" - a code unique to Smith Laboratory in these cases -- on the report. The presence of benzene, toluene, and methyl tert-butyl ether (MTBE) were estimated in this manner, with one home showing an estimated level of benzene, three homes with an estimated level of toluene, and eight homes with an estimated level of MTBE. Where POCs were detected above the detection limit or estimated below the detection limit (0.5ppb), homeowners were advised and encouraged to resample within three months.

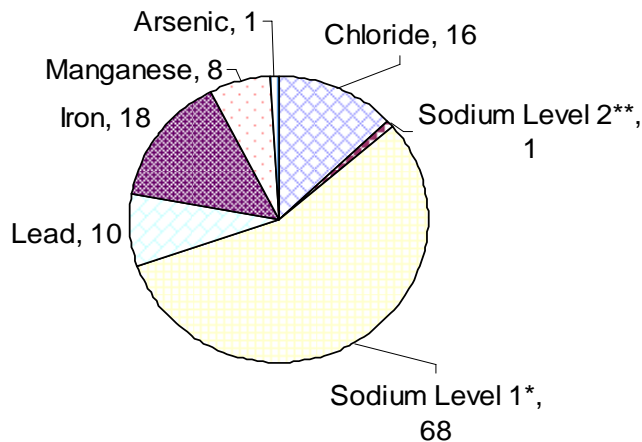
Inorganic Chemicals

Figure 2-A shows the breakdown of results from the inorganic chemical analysis. Note that these numbers do not add up to 125 since some homes had one or more inorganic chemicals detected in their drinking water samples, while other homes did not have any inorganic chemicals detected.

^{2A} One part per billion, also reported as 1 microgram/Liter, is approximately equivalent to 1 second in 32 years.

Figure 2-A: Breakdown of inorganic chemical results from Phase II of the Comprehensive Countywide Private Well Testing Initiative.

Number of Residences with an Inorganic Chemical Detected Equal To or Above the New York State Drinking Water Standard or Guideline



***Level 1** represents the recommended guideline (greater than 20 mg/L but less than 270 mg/L) established for those on severely restricted sodium diets.

****Level 2** represents the recommended guideline (greater than 270 mg/L) established for those on moderately restricted sodium diets.

Discussion

Similar to the findings from the first phase of the Comprehensive Countywide Private Well Testing Initiative, sodium -- an inorganic chemical which does not have a maximum contaminant level but rather a recommended guideline -- was the most commonly detected analyte identified during Phase II sample analysis. Sixty-eight of the 125 water samples taken during this phase had sodium reported at a level greater than 20 mg/L (the recommended guideline which should not be exceeded by individuals on a severely restricted sodium diet) and one sample had sodium detected in excess of 270 mg/L (the recommended guideline which should not be exceeded by those on moderately restricted sodium diets). Homeowners with elevated levels of this analyte were contacted by phone

and advised of the potential health effects associated with consuming water with more than 20 mg/L of sodium.

Sodium is a naturally occurring mineral in rock that may also be introduced into drinking water supplies through road salting activities or through backwash from water softening systems. Fifteen homes with elevated levels of sodium did have water softeners installed on their water systems.

Also similar to the findings from Phase I, total coliform was the second most common analyte detected in Phase II drinking water samples. The presence of total coliform suggests that the impacted well is either poorly constructed, poorly maintained, or under the influence of sewage or surface water. While total coliform, an indicator organism, may have little if any effect on healthy adults, other organisms could be present that may cause gastrointestinal illness, including diarrhea.

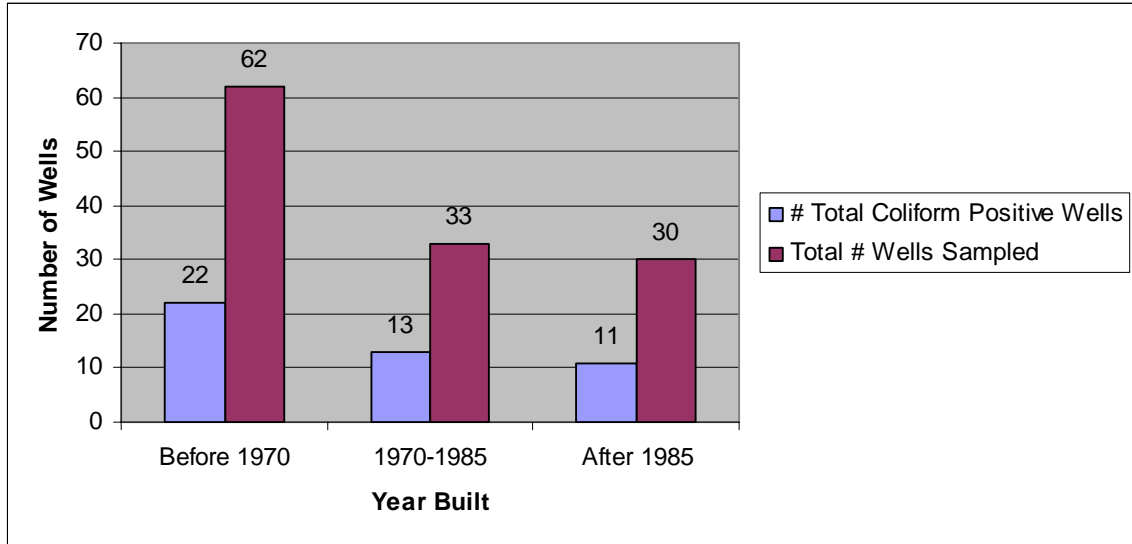
As these results were forwarded to the Health Department, referrals were made to the DCDOH district offices for follow-up on samples that tested positive for total coliform. Based on information that has been collected to date during these follow-ups, three of these impacted wells already had disinfection equipment installed (an ultraviolet light or chlorinator), which is a strong indicator that past samples were also of unsatisfactory sanitary quality. In these instances, attempts were made to grab finished water samples (post-disinfection) to determine whether the treatment system was working properly and to ascertain whether the water that was actually being consumed was potable.

Of the seventeen resamples that have been taken by DCDOH staff to date, nine have tested positive for total coliform for a second time and one, which was previously negative for it, also tested positive for *E.coli*. While some of these homeowners did not request additional assistance, several homes were resampled multiple times, due to recurring issues with unsatisfactory results. After some remediation, which included well disinfection and/or replacement of the ultraviolet bulb, satisfactory bacteriological water sample results were achieved from these wells. For others with unsatisfactory resamples,

Health Department staff offered the homeowners general advice about the steps that they should take to address the issue with coliform.

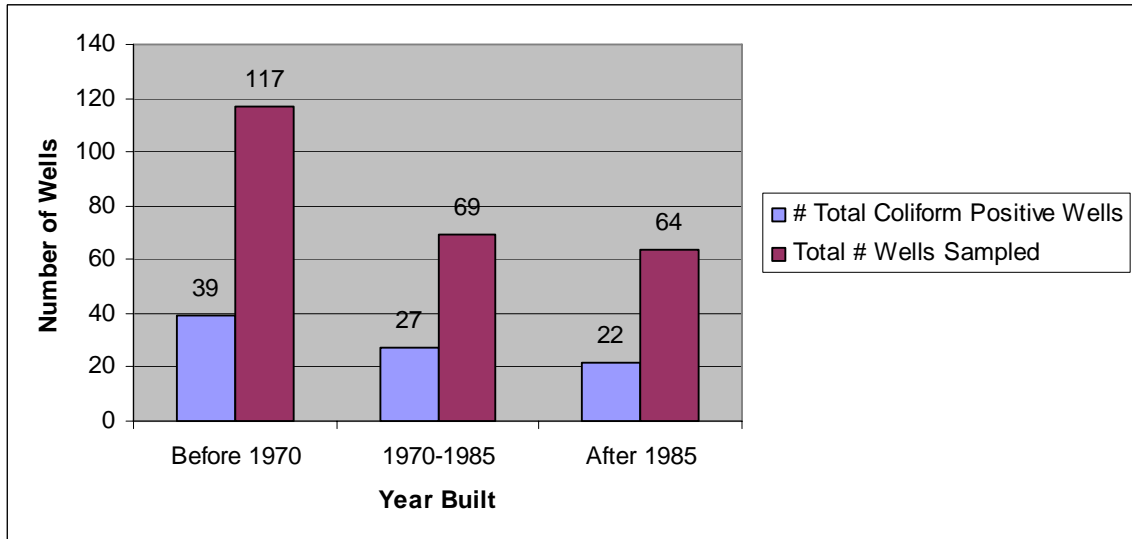
In an effort to examine the correlation between the age of the home and the occurrence of total coliform in wells, the number of homes testing positive for total coliform during Phase II compared to the year the house was built is depicted graphically in Figure 3-A. The *total* number of homes that were sampled as part of Phase II and built during the respective periods is also shown on this graph. It is noted that 35% of the total homes built before 1970 tested positive for total coliform; 39% of the total homes built between 1970 and 1985 tested positive for total coliform; and 37% of the homes built after 1985 tested positive for total coliform. When considering the collective data from Phases I and II, which is depicted in Figure 4-A, the percentages of homes built during the aforementioned time periods and testing positive for total coliform are 33%, 39%, and 34%, respectively.

Figure 3-A: Relationship between samples testing positive for total coliform during Phase II compared to the year* that the houses were built.



* Information obtained from *ParcelAccess*

Figure 4-A: Relationship between samples testing positive for total coliform during Phases I and II compared to the year* that the houses were built.



- Information obtained from *ParcelAccess*

POCs (principal organic compounds) which are man-made or manufactured chemicals that may be found in petroleum products, can occur in those wells that may be contaminated by leaking underground fuel tanks, gas stations, or industrial processes. **Finally, with no exceedances above the maximum contaminant levels for any of the principal organic compounds, and only some detects at or below the detection limit of 0.5 parts per billion, the POC results in these sampled private wells mirror the data that is maintained for Dutchess County public water supplies, which are served by approximately 1800 wells.** This data also closely resembles the results from the first phase of the initiative.

Conclusion

The goal of the Comprehensive Countywide Private Well Testing Initiative, a multi-phased program that was announced by County Executive Steinhaus on September 6, 2007, was to gain a better understanding of the quality of groundwater sources throughout Dutchess County. For Phase II of this initiative, 125 single family, owner-occupied residences were randomly selected to participate in the program. The sampling period for the second phase ran from October, 2008 through the beginning of April, 2009, with water sample analysis occurring concurrently. Results from this phase indicated that sodium, which is not regulated by a maximum contaminant limit, and total coliform, which is regulated by a maximum contaminant limit, were the most common analytes detected. There were no maximum contaminant level exceedances for principal organic compounds during this phase, although there were some detects, at a below the detection limit of 0.5 parts per billion. To date, these findings mirror historical information that the Dutchess County Department of Health has gathered from public water supplies regarding the presence of principal organic compounds in drinking water, as well as the information that the agency has gathered from private supplies regarding inorganic and bacteriological analytes, which are more common. These findings are consistent with USGS surveys of drainage basins throughout New York State and they reinforce the Dutchess County Department of Health's recommendation for private homeowners to regularly test their water supplies.

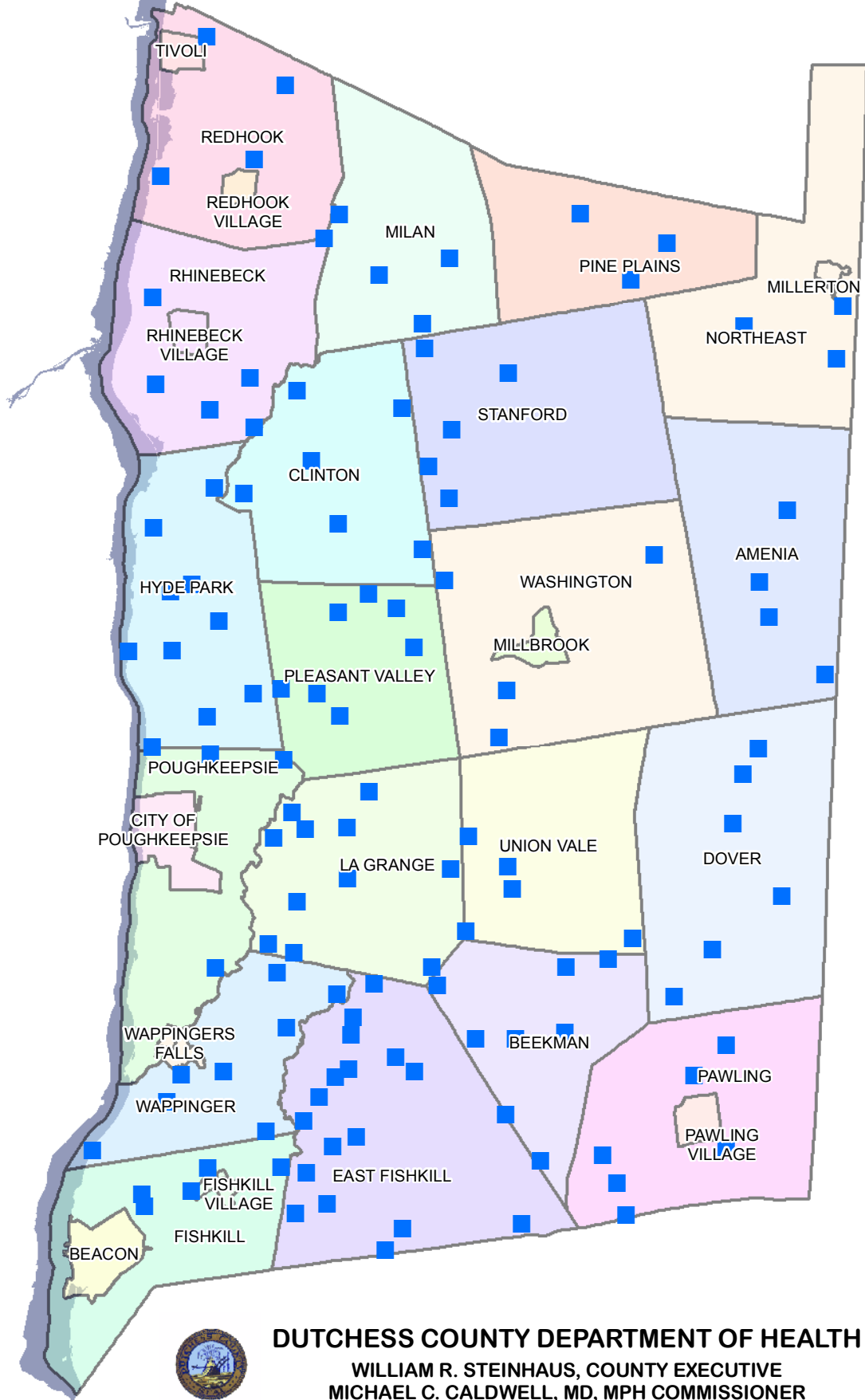
Phase I and Phase II Conclusion

To date, a total of 250 wells serving single-family, owner-occupied residences have been sampled and analyzed as part of the Dutchess County Comprehensive Countywide Private Well Testing Initiative. The final sample locations for both phases are shown on the map entitled “Final Participants in Phase 2 and Phase 1.” This map, as well as a depiction of the final sample locations for both phases and their proximity to public water supplies, is also included with this addendum.

The laboratory results of bacteriological, organic, and inorganic analytes has yielded similar results for both phases of the initiative, with sodium and total coliform bacteria detected in the greatest number of wells sampled during Phase I and Phase II. As stated in regard to the conclusion of Phase 1, these findings are consistent with USGS surveys of drainage basins throughout New York State and they reinforce the Dutchess County Department of Health’s recommendation for private homeowners to regularly test their water supplies.

FINAL PARTICIPANTS IN PHASE 2

JULY 2009



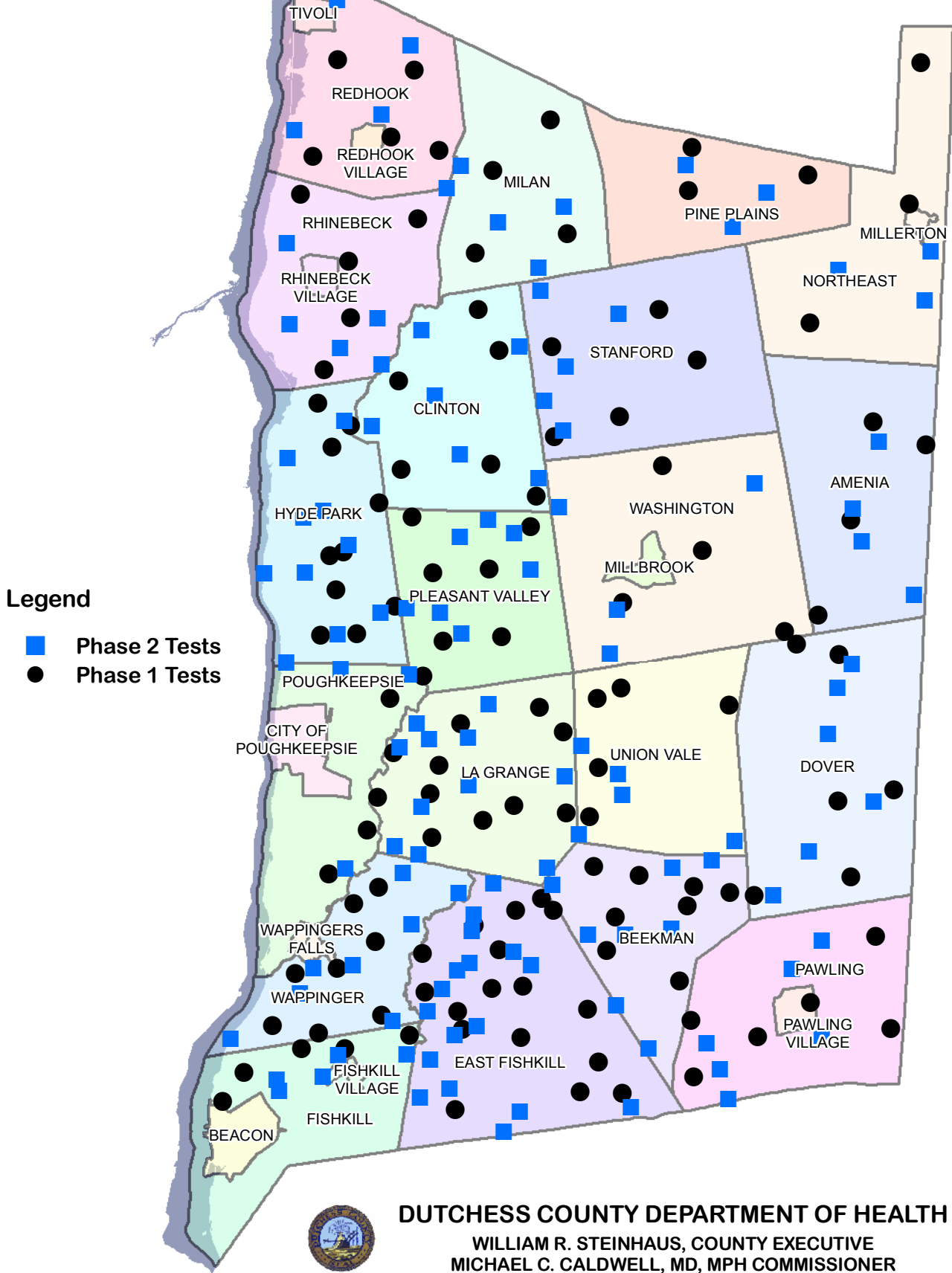
DUTCHESS COUNTY DEPARTMENT OF HEALTH

WILLIAM R. STEINHAUS, COUNTY EXECUTIVE
MICHAEL C. CALDWELL, MD, MPH COMMISSIONER



FINAL PARTICIPANTS IN PHASE 2 AND PHASE 1

JULY 2009



Legend

- Phase 2 Tests
- Phase 1 Tests



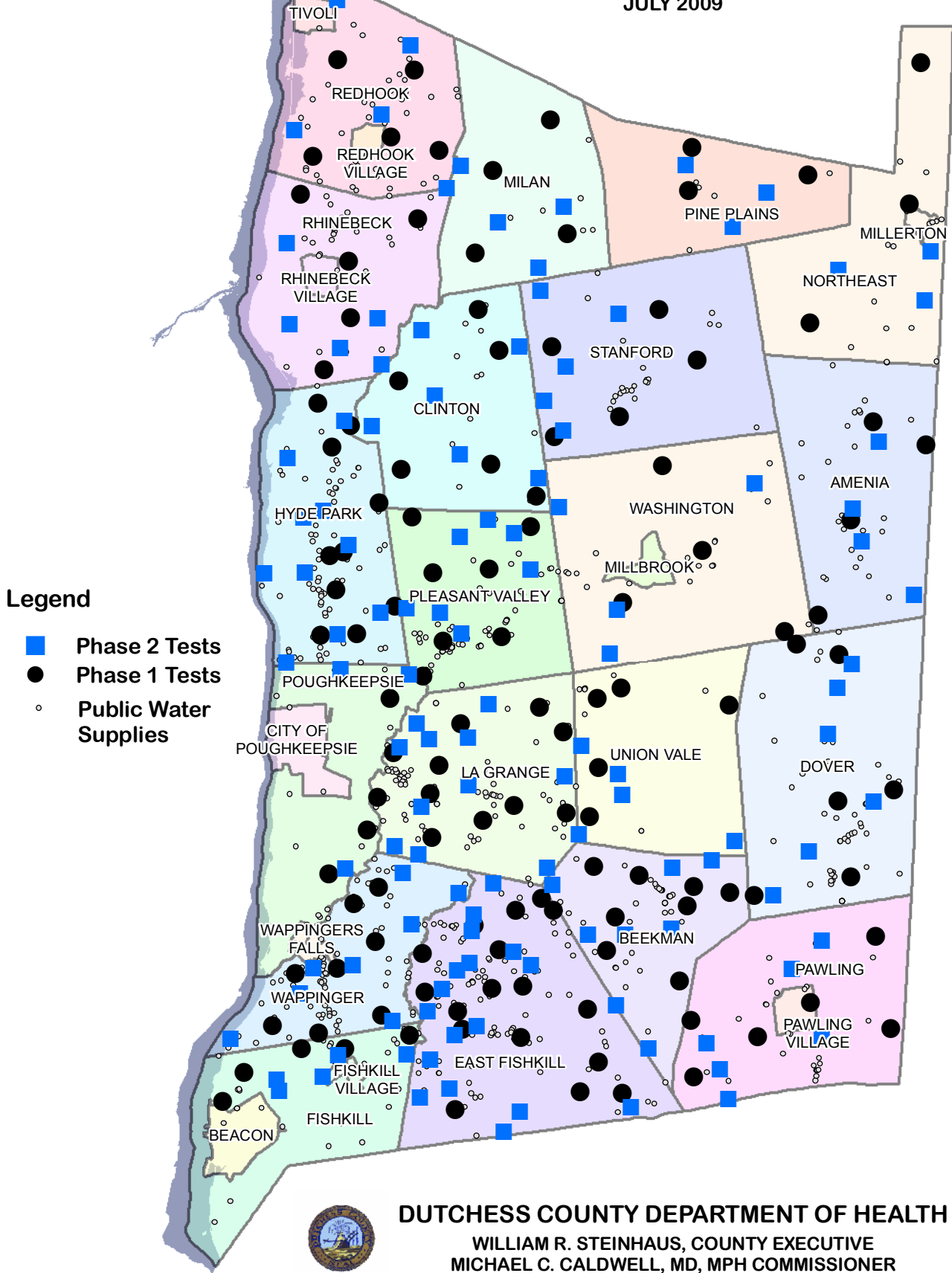
DUTCHESS COUNTY DEPARTMENT OF HEALTH
WILLIAM R. STEINHAUS, COUNTY EXECUTIVE
MICHAEL C. CALDWELL, MD, MPH COMMISSIONER



FINAL PARTICIPANTS IN PHASE 2 AND PHASE 1

WITH DUTCHESS COUNTY PUBLIC WATER SUPPLIES

JULY 2009



Legend

- Phase 2 Tests
- Phase 1 Tests
- Public Water Supplies



DUTCHESS COUNTY DEPARTMENT OF HEALTH

WILLIAM R. STEINHAUS, COUNTY EXECUTIVE
MICHAEL C. CALDWELL, MD, MPH COMMISSIONER

