Ohio Environmental Protection Agency

Ohio Administrative Code (OAC) Chapter 3745-9: Water Well Standards

Pumping Test Requirements for New Public Water System Wells – OAC 3745-9-09(B)

Ohio EPA's Division of Drinking and Ground Waters (DDAGW) regulates public water systems (PWSs). This includes establishing requirements for conducting and reporting pumping tests on proposed PWS wells to ensure adequate capacity to meet needs.

The purpose of this Fact Sheet is to provide applicants the information necessary to design, implement, document, and report the results of a pumping test for a new ground water well to meet current regulations. Note: this fact sheet covers the pumping test that is required once a public water system (PWS) well site acceptance/approval has been obtained from Ohio EPA. These procedures may be used, at the discretion of the applicant, for any evaluations of the pumping capacity of a test hole or well prior to well site acceptance/approval, but the pumping test required by OAC 3745-9-09 may not be performed until after the applicant receives the well site acceptance/approval. The PWS well site acceptance application can be found on Ohio EPA's internet site.

Pumping Test Process

Any applicant planning to install a PWS well must first obtain a well site acceptance/approval letter from the director of Ohio EPA. Instructions for completing the PWS well application are available on Ohio EPA's internet site. After the well is constructed, the applicant is required to conduct a pumping test and collect new well chemical samples. OAC Rule 3745-9-09(B) sets forth the requirements for a pumping test which is also known as aquifer test, aquifer performance test and drawdown test. A pumping test involves pumping a well at a controlled rate and observing changes in water level, or drawdown. Water levels can be monitored in the pumping well and in one or more surrounding wells. Data on how water levels respond to pumping are used to evaluate well performance and estimate the hydraulic properties of aquifers. Pumping test data is also used to evaluate the adequacy of the installation and development of the well and any affects the pumping of the well might have on other wells in the area. A pumping test report must be submitted to Ohio EPA for review.

Pumping Test Determination

The first step in designing and implementing an adequate pumping test to meet Ohio EPA's requirements is to determine the classification of the well. The classification is based on the estimated average daily demand (ADD) of the well. The ADD represents how many gallons of ground water the PWS will need per day to meet demand. See table below from OAC Rule 3745-9-09(B)(4):

Pumping Test Classification	Estimated Average Daily Demand of the Well (gallons per day)	Approximate Pump Capacity (gallons per min)
Low Use	0 to 10,000	0 to 7
Medium Use	10,001 to 100,000	7 to 70
High Use	Greater than 100,000	Greater than 70

Once the classification of the well is known, the corresponding pumping test requirements can be identified.

Low/Medium Use

For low or medium use wells, a constant rate pumping test is required. The test must be performed for a time period of at least normal operation of the PWS during peak hourly demand or 1.5 times the anticipated permanent design pumping rate as identified in the well site application. For community water systems, the constant rate pumping test must be performed for a time period of no less than twenty-four hours.

High Use

For high use wells, a step-drawdown pumping test followed by a constant rate test is required. The step-drawdown test must consist of three or more steps of progressively increasing pumping rates where each step is run at a constant pumping rate for

no less than forty-five minutes each. The constant rate test must be conducted for at least twenty-four hours at a pumping rate at least 1.5 times the anticipated permanent design pumping rate. The constant rate test should not be started until the water level has recovered to at least 90% of the drawdown caused by the step-drawdown test or twenty-four hours after the step-drawdown test has ended, whichever comes first.

Ohio EPA has identified several situations where the constant rate test should extend beyond twenty-four hours. The applicant should consult with Ohio EPA prior to implementing the constant rate test to determine this need. For more complicated geologic settings or higher rate pumping tests, Ohio EPA recommends the applicant work with a consulting or engineering firm.

The pumping rate for the constant rate test at low, medium or high use wells may be conducted at rate lower than 1.5 times the anticipated permanent pump design rate if there is a concern that pumping of the well at this rate is excessive, is not possible, or will cause long-term adverse effects on the well's performance or the aquifer. In this case, the constant rate test may be performed at a lower rate, but not less than 1.2 times the pump design rate and must include a demonstration to support the lower pumping rate.

Data Collection

Regardless of the classification of the well or the pumping test being performed, the applicant is required to collect enough information to generate a report detailing the results, interpretations, and conclusions of the pumping test in accordance with OAC Rule 3745-9-09(B)(5) and (6). For all well classifications, the pump test report must include the following information: person(s) conducting the test, date(s)/time(s) of the pumping test, data tables with drawdown and recovery water level measurements to the nearest 0.1 foot with corresponding times after the pump test has started, a measurement of the height of the water level reference point, the pumping rate and pump depth for each test, and the anticipated permanent pump depth. A calculation of the well's specific capacity at the pump test rate(s) and the anticipated permanent design pumping rate are also required.

For high use wells, the pumping test report must also contain a map with a legend/scale showing the location of the well and other wells used to observe drawdown, and graphs (arithmetic and semi-logarithmic) showing drawdown and recovery water level measurements during and after each pump test.

A form has been developed by Ohio EPA to assist in the collection of pumping test data. An example of a completed form is attached to this Fact Sheet. The form is also contained in the Division of Drinking and Ground Waters' *Guidelines for Design of Small Public Ground Water Systems*, Third Edition, Appendix H, available on Ohio EPA's internet site.

Data Submittal

The applicant is required to submit a pumping test report which includes all the information listed above. Ohio EPA recommends that the applicant include a copy of the well log filed with the Ohio Department of Natural Resources (ODNR) with the pumping test report.

The pumping test report should be submitted to the Ohio EPA district office. The applicant may also be required to submit a copy of the pumping test report electronically to Ohio EPA. The pumping test report will be reviewed by Ohio EPA staff to determine compliance with OAC Rule 3745-9-09(B). If the report does not meet the requirements, the applicant will be contacted by Ohio EPA to provide additional information to resolve any outstanding deficiencies.

Common Deficiencies

Common deficiencies in pumping test reports identified by Ohio EPA include incorrect pumping test used, inadequate length of test, missing water level measurements, lack of precision in collecting water level measurements and missing specific capacity determinations. The above information is necessary to determine in part, an appropriate permanent pumping rate, if the aquifer can provide safe and adequate supplies of water at the permanent pumping rate, and to evaluate any effects the pumping of the well might have on other wells owned by the applicant or on wells not owned by the applicant.

Chapter 3745-9: Water Well Standards 3745-9-09(B) - Pumping Test Requirements

Contact

For more information, contact Ohio EPA's Division of Drinking and Ground Waters at 614-644-2752, or email ***DDAGW@epa.ohio.gov***.

References

OAC Rule 3745-9-09 (Well development and pumping test) is available in its entirety on Ohio EPA's internet site.

Information about designing and implementing pumping tests can be found in Chapter 4 of Ohio EPA's *Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring* (TGM) available on Ohio EPA's internet site.

Chapter 3745-9: Water Well Standards 3745-9-09(B) - Pumping Test Requirements

24-HOUR PUMPING TEST REPORT

NAME OF ENTITY: Anywhere Restaurant

COUNTY: Henry PWS-ID: OH1234567 WELL NUMBER: #1

ODNR WELL LOG #: 2233444

NAME OF PERSON PREPARING REPORT: John Driller – John's Drilling Company

WELL LOCATION: 1234 Somewhere Highway, Rudolph, OH 43532

LATITUDE: 41° 18' 53.19" NORTH

LONGITUDE: 83° 40' 12.76" WEST

PUMP SETTING DEPTH: 100' FEET

STATIC LEVEL (So): 41.6' FEET

The distance from the ground to the surface of the water column in the well measured after at least 12 hours without pumping to ensure a constant static level.

DISCHARGE RATE: 20 GALLONS PER MINUTE

The test is to be run at the peak hourly demand or at least 1.5 times the design pumping rate if the well cannot sustain peak hourly flow.

DEPTH TO WATER(S): (ATTACH)

The distance from the ground to the water surface at various times during the test. Levels shall be recorded in accordance with the following table.

Time After Pump Test Started (minute)	Time Interval Between Measurements (minute)
0-15	1
16-60	5
61-120	10
121-180	20
181-300	30
301-1,440	60

DURATION OF PUMPING: 8 hours

Pumping shall continue for at least 24 hours, unless the daily usage is less than 10,000 gallons (low usage). For low usage facilities, the pump test must be as long as the normal operating hours of the proposed entity.

RECOVERY LEVELS AT VARIOUS TIME INTERVALS (ATTACH)

The distance from the ground to the water surface in the well after pumping has ceased. Levels should be recorded every 5 minutes for the first hour and every ½ hour thereafter until essentially there is no change in the water level.

Chapter 3745-9: Water Well Standards 3745-9-09(B) - Pumping Test Requirements

Pumping Test

Date (start of pump test): 11/16/2020; 0750

Time (Military)	Time since pumping started	Depth to Water (S)	Change in Water Level (S-So)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
0750	0	46.62	0	0	Cloudy, 36° NE wind 15mph
0750	1	46.62	0	20	
0751	2	46.3	-.32		
0752	3	53.99	-.76		
0753	4	56.02	-2.03		
0754	5	55.05	+0.97		
0755	6	58.88	-3.83		
0756	7	57.66	+1.22		
0757	8	58.07	-0.41		
0758	9	59.16	-1.09		Light rain
0759	10	59.14	+0.02		
0800	11	56.13	+3.01		
0801	12	55.29	+0.84		
0802	13	55.52	-0.23		
0803	14	55.11	+0.41		
0804	15	55.22	-0.11		
0809	20	55.15	+0.07		
0814	25	55.11	+0.04		
0819	30	55.00	+0.11		
0824	35	55.57	-0.57		
0829	40	62.27	-6.70		
0834	45	55.44	+6.83		
0839	50	54.31	+1.13		
0844	55	59.58	-5.27		
0849	60 (1hr)	55.59	+3.99		
0859	70	58.37	-2.78		
0909	80	58.17	+0.20		
0919	90	62.28	-4.11		
0929	100	57.74	+4.54		
0939	110	62.85	-5.11		
0949	120 (2hr)	63.56	-0.71		
1009	140	63.99	-0.43		
1029	160	62.56	+1.43		flurries
1049	180 (3hr)	65.99	-3.43		
1119	210	66.18	-0.19		
1149	240 (4hr)	66.78	-0.60		
1219	270	65.80	+0.98		

Chapter 3745-9: Water Well Standards 3745-9-09(B) - Pumping Test Requirements

Time (Military)	Time since pumping started	Depth to Water (S)	Change in Water Level (S-So)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
1249	300 (5hr)	63.37	+2.43	20	
1349	360 (6hr)	64.75	-1.38		
1449	420 (7hr)	64.10	+0.65		
1549	480 (8hr)	65.40	-0.70		
	540 (9hr)				Water samples taken
	600 (10hr)				
	660 (11hr)				
	720 (12hr)				
	780 (13hr)				
	840 (14hr)				
	900 (15hr)				
	960 (16hr)				
	1020 (17hr)				
	1080 (18hr)				
	1140 (19hr)				
	1200 (20hr)				
	1260 (21hr)				
	1320 (22hr)				
	1380 (23hr)				
	1440 (24hr)				

Date (end of pump test): 11/16/2020; 1549

Recovery

Time (Military)	Time since pumping started	Depth to Water (S)	Change in Water Level (S-So)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
1655	0	65.10	0	0	
1700	5	54.02	+11.08		
1705	10	50.45	+3.57		
1710	15	49.12	+1.33		
1715	20	47.81	+1.31		
1720	25	47.60	+0.21		
1725	30	47.47	+0.23		
1730	35	47.35	+0.12		
1735	40	47.24	+0.11		
1740	45	47.20	+0.04		
1745	50	47.19	+0.01		
1750	55	47.18	+0.01		
1755	60 (1hr)	47.10	+0.09		

Chapter 3745-9: Water Well Standards 3745-9-09(B) - Pumping Test Requirements

Time (Military)	Time since pumping started	Depth to Water (S)	Change in Water Level (S-So)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
	90				
	120 (2hr)				
	150				
	180 (3hr)				
	210				
	240 (4hr)				
	270				
	300 (5hr)				