

Water Use Report Requirements for Swine Operations

Two recent water use laws were passed in Michigan (P.A. 177 & P.A. 148) that will require reporting to the State by many farm operations and allow State response form small well user complaints against large well users. These public acts reflect change to the Natural Resources & Environmental Protection Act (NREPA) and fall under the enforcement provisions there it contains.

A copy of the complete acts may be found at <http://www.michiganlegislature.org> .

Both acts use the like definitions for a “large capacity well”. Large capacity wells are those with the **capacity** to withdraw 100,000 gallons per day (70 gallons per minute) average in any consecutive 30-day period. The combined capacity of more than one well at a site, which is 100,000 gallons, or greater capacity per day (70 gallons per minute), also meets the large capacity well definition. Water use reporting will also include surface water withdraws with single or combined capacity of 100,000 gallons per day (70 gallons per minute) average in any consecutive 30-day period. All agricultural water uses (Irrigation, cooling, animal, watering, etc.) will apply to these laws.

Act PA 148 will establish Statewide Groundwater Mapping and Water Use Reporting This law will create a groundwater resource map of the state and establish a groundwater advisory committee to direct groundwater protection efforts in the future. Large capacity well user can report to MDEQ or to MDA if the water use is agriculture related. For more information see <http://www.michigan.gov/mda> or <http://www.msue.msu.edu/waterqual/gwprojects.html>

The MDA will assemble township-based reports annually and forward to the MDEQ. If a producer has a site that exceeds the 70-gallon/minute threshold, then he must start filing annual water use reporting forms in January 2005.

Large capacity water users will be required to report the following:

- (a) The amount and rate of water withdrawn on an annual/monthly basis in either gallons or acre-inches
- (b) The type of crop irrigated, if applicable
- (c) The acreage of each irrigated crop, if applicable
- (d) The source or sources of the water supply
- (e) If the water withdrawn is not used entirely for irrigation, the use or uses of the water being withdrawn
- (f) If the source of water withdrawn is groundwater, the static water level of the aquifer or aquifers needs to be identified
- (g) Applicable water conservation practices and an implementation plan for those practices

Estimating the producers water use could be accomplished by several methods:

- **Pump capacity multiplied by run time:** or fuel/power use per hour
- **Flow meter:** meters actual flow, note maintenance and calibration concerns
- **Water application multiplied by # of applications,** plus estimate of additional water use

- **Industry average numbers** (Mid West Plan Service or ASAE) with appropriate adjustments (Not appropriate for high variable water uses such as irrigation.)

Conducted correctly any combination of these systems could produce estimates that meet the needs of the law. Producers need to evaluate their water use and devise a simple, low cost, low time input method, to accomplish the goal of the legislation that may improve the management of the operation. Most farm supply houses, green house supply houses and irrigation supply houses carry flow meters and run time timers.

SEE ATTACHED WORKSHEETS

Estimating Water Used by Swine Farms in Michigan

Swine farms use well water for watering animals, cleaning facilities, animal cooling and in some instances for moving manure from the barn to the storage structure. Most pigs are raised in an all-in/all-out environments where one group of pigs, at the same stage of production, is moved into a location and stays there until that group is ready to move to the next location or on to slaughter. Between groups the facility is thoroughly cleaned by pre-soaking and/or pressure washing. In the summer, during periods of extreme heat, pigs may be cooled by using drippers which emit small drops of water periodically on the animals back, or by misters giving off a small mist of water intermittently to cool the room. Some farms use well water to flush manure from the barn to the manure storage structure, but this practice is not very widespread in Michigan and therefore that water was not considered in these calculations.

Table 1 provides the estimated daily water consumption by pigs of various sizes. The range in daily water consumption within each stage of production is dependant on temperature and water conservation practices on the farm. For this example the average of the range will be used to estimate daily water use.

Table 1: Water requirements of pigs¹

Animal type	Gal/head/day	Animal type	Gal/head/day
Sow and litter	2.5 - 7	Finishing pig (100 – 250 [#] BW)	3 - 5
Nursery pig (up to 60 [#] BW)	.7	Gestating sow	3 - 6
Growing pig (60 – 100 [#] BW)	2 - 3	Boar	8
		Replacement Gilt	3

¹Swine Care Handbook

Michigan's average daily and annual water consumption for pigs at various stages of production is provided in Table 2. The Hog & Pig inventory information is from the 2002-2003 *Michigan Agriculture Statistics* (NASS). Hog and pig inventories fluctuate from Quarter to Quarter, therefore the 2002 April 1, June 1, September 1, and December 1 inventories were averaged to report the 2002 numbers. The gallon per head per day is the average of the figures provided in Table 1.

Table 2: Direct water use - Drinking

Stage	Michigan hog and pig inventory ²	Gal/hd/day	Gallons daily use	Gallons annual use
Pigs under 60 [#]	305,000	0.7	213,500	77,927,500
60 – 119 [#]	202,000	2.5	505,000	184,325,000
120 – 179 [#]	156,000	4	624,000	227,760,000
Over 180 [#]	143,000	4	572,000	208,780,000
Gilts	6,500	3	19,500	7,117,500
Boars	3,000	8	24,000	8,760,000
Sow and Litter	12,800	5	64,000	23,360,000
Gestating Sow	94,200	4	376,800	137,532,000
Total Annual Water for Animal Drinking			2,206,650	875,562,000

²NASS

It was more difficult to estimate the indirect water use on swine farms. There is no reported information on which farms use which practice and the amount of water consumed by each practice. Table 3 Indirect Water Use – Cleaning and Table 4 Indirect Water Use - Cooling were developed using estimates from individuals working in the field. It was estimated that about two thirds of the pigs reared in Michigan reside on farms that regularly clean the farms facilities, the remainder of the pigs may reside in pasture or bedded situations where cleaning facilities with water is impractical. Therefore the number of head or litters was multiplied by 67% in determining total water use.

Table 3: Indirect water use - Cleaning

			% of	Head	Total water
Operation	Approx. run time	Gal/hr.	pigs	or litters	used
Wash Farrowing	20 hours / 100 litters	180	67%	184,000	4,438,080
Wash Nursery	4 hrs. / 1000 hd	180	67%	1,736,000	837,446
Wash Finish	15 hrs. / 1000 hd	180	67%	1,915,000	3,464,235
Pre soak Farr	1.25 hours / 100 litters	600	67%	184,000	924,600
Pre soak Nursery	.5 hours / 1000 hd	240	67%	1,736,000	139,574
Pre soak Finish	2 hrs per 1,000 hd	600	67%	184,000	147,936
Total water for cleaning					9,951,872

Table 4: Indirect water use - Cooling

		Days	Gal/hr/	% of	Head	Total water
Operation	Approx. run time	> 80° F	animal	pigs	or litters	used
Cool Farrowing	8 hrs/sow/day	70	2	67%	12,800	9,605,120
Cool Breeding	8 hrs/sow/day	70	2	4%	94,200	4,220,160
Cool Finishing	8 hrs/1,000 hd/day	70	2	10%	501,000	56,112
Total water for cooling						13,881,392

In Michigan larger swine farms may have up 2,500 sows at one location, or up to 4,000 finishing animals at one location. Michigan has farms that control more animals but the 2,500 sows and 4,000 finishing animals threshold represents the upper ranges of animals at one location being provided water from one water system. Using the figures in Tables 2, 3, and 4 one may estimate that a location with 2,500 sows will use 4.84 million gallons of water annually (13,262 gallons per day), and a 4,000 head finishing location would use 5.13 million gallons of water annually (14,055 gallons per day).

Because of the swine industry structure, where large farms contract with other farms for growing pigs, it is estimated that there are no swine farms in Michigan that individually consume more than 100,000 gallons of water per day.

In Michigan, the estimated annual water used by swine farms is 899.39 million gallons. The water used for cooling is at low rates, on hot days when buildings are being well ventilated, therefore all of the cooling water should be considered as evaporative (consumptive). Very little of the water used for cleaning evaporates, therefore all of the cleaning water should be considered as non-consumptive.

Michigan does not have a large hog processor in the state therefore most of the market hogs produced in the state are shipped out of state for processing. There is a large cull sow processor in the state and most cull sows stay in Michigan for processing.

Market hogs are approximately 50% water (Tri-State Swine Nutrition Guide). The 2000 PigChamp Benchmarking publication reports that in year 2000 Michigan's sow herd had a 47% replacement rate (sows that are sold and replaced with younger gilts) (PigChamp). Michigan Agriculture Statistical Services (NASS) shows that in 2002 Michigan marketed 2.03 million head of hogs with a total weight of 522.9 million pounds. Using the PigChamp culling rate and the 2002 sow inventory, one may calculate that in 2002 there were 50,000 sows culled weighing approximately 17.60 million pounds and containing 1.1 million gallons water. Subtracting the cull sow sales from the total 2002 hogs sales indicates that Michigan's hog producers sold 1.98 million market hogs weighing approximately 505.3 million pounds 2002 (31.58 million gallons water). Table 5 provides the total consumptive/non-consumptive water use in Michigan.

Table 5: Consumptive water use

Water use	Consumptive ³	Non-consumptive ³	Totals ³
Raising Market Hogs	31.58	667.21	698.79
Maintaining Breeding Herd		176.77	176.77
Cooling Facilities	13.88		13.88
Cleaning Facilities		9.95	9.95
Totals	45.46	853.93	899.39

³ Million Gallons

Bibliography:

National Agriculture Statistic Service (NASS) "Michigan Agriculture Statistics 2002-2003" available on line at: <http://www.nass.usda.gov/mi/stats03/statstext.html>

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Swine Care Handbook: National Pork Board, Des Moines, IA, 2002,

Tri-State Swine Nutrition Guide: Published by: Ohio State University, in cooperation with Purdue University Extension, Ohio State University Extension, and Michigan State University Extension, 1998