

## Emissions from two Lower Yakima Valley Dairy Barns

In 2010 WA State University (WSU) published the results of research on a Lower Yakima Valley dairy to estimate emissions of air contaminants from two free stall dairy barns. This was part of a larger study, the National Air Emissions Monitoring Study (NAEMS), designed to quantify emissions from concentrated animal feeding operations (CAFOs) for the Environmental Protection Agency (EPA). The Washington Report is available at [ASAE Journal | US EPA ARCHIVE DOCUMENT](#)

In a free stall operation cows spend about 20 hours per day in the barn and exercise lot and about 4 hours a day in the milk parlor. WSU researchers measured emissions of ammonia, hydrogen sulfide, particulate matter and twenty volatile organic compounds from the barns. Results are:

		Emissions in kg/day	Emissions in kg/day/cow	
Barn 2				
NH3		29.10	0.056615	514 cows
H2S		0.56	0.001082	
PM10		3.59	0.006984	
PM 2.5		2.72	0.005292	
TSP		18.80	0.036576	
VOC		52.00	0.101167	
Barn 4				
NH3		54.70	0.056802	963 cows
H2S		1.13	0.001173	
PM10		10.00	0.010384	
PM 2.5		1.86	0.001931	
TSP		46.90	0.048702	
VOC		102.00	0.105919	

To estimate emissions for large herds, we averaged emissions per cows from the two barns and converted to tons per year. The results are:

	1,000 milk cows	2,000 milk cows	5,000 milk cows	100,000 milk cows
NH3	22.77 tons	45.54 tons	113.85 tons	2,277 tons
H2S	0.45 tons	0.9 tons	2.25 tons	45 tons
PM 10	3.49 tons	6.98 tons	17.45 tons	349 tons
PM 2.5	1.45 tons	2.9 tons	7.25 tons	145 tons
TSP	17.12 tons	34.24 tons	85.6 tons	1,712 tons
VOC	41.45 tons	82.9 tons	207.25 tons	4,145 tons

## Relevant Washington Laws

1. WAC 173-400-030, General Regulations for Air Pollution Sources Definitions, says

An “Emission threshold” means an emission of a listed air contaminant at or above . . .

- Hydrogen sulfide (H<sub>2</sub>S) - 10 tons per year
- Fine particulate matter (PM 2.5) – 10 tons per year
- Coarse particulate matter (PM 10) – 15 tons per year
- Volatile organic compounds (VOCs) – 40 tons per year

2. WAC 173-400-110(b) provides exemption from New Source Review for some emissions:

- PM 10 exempt for < 0.75 tons per year
- PM 2.5 exempt for < 0.50 tons per year
- VOCs exempt for < 2 tons per year

3. WAC 173-460, Controls for New Sources of Toxic Air Pollutants, states in WAC 173-460-020(7):

"Small quantity emission rate (SQER)" means a level of emissions below which dispersion modeling is not required to demonstrate compliance with acceptable source impact levels. SQERs are listed in WAC 173-460-150.

WAC 173-460-150 provides the following SQER's:

- Ammonia – 37 lbs./day or 13,500 lbs./year or 6.75 tons/yr
- Hydrogen sulfide - .15 lbs./day or 54.75 lbs./yr or .027 tons/yr

4. WAC 173-441, Reporting of Greenhouse Gasses, states in WAC 173-441-120 Calculation methods incorporated by reference from 40 CFR Part 98 for facilities in section 2(e)vii:

“40 C.F.R. § 98.362(a), 40 C.F.R. § 98.363 through 40 C.F.R. § 98.368, Equations JJ-2 through JJ-15, and Tables JJ-2 through JJ-7 as adopted by September 1, 2016, remain unchanged unless otherwise modified in this chapter.”

Table JJ-1 to Subpart JJ of Part 98 - Animal Population Threshold Level Below Which Facilities Are Not Required To Report Emissions Under Subpart JJ requires reporting of greenhouse gas emissions for dairies with >3,200 head of milk cows.

5. WAC 173-441-050(3) requires reporting of

- Biogenic CO<sub>2</sub>

- CO<sub>2</sub>
- CH<sub>4</sub>
- N<sub>2</sub>O
- Numerous specified VOCs

Large dairies in Yakima County should be reporting air emissions under WAC 173-400, WAC 173-460, and WAC 173-441.

### Relevant Ecology Reports

In Ecology's 2011 County Emissions Inventory, the agency estimated ammonia emissions from animal agriculture in Yakima County at 8,053 tons (27% of the state ammonia emissions for livestock). In 2017, using a different model, Ecology estimated ammonia emissions from animal agriculture at 5,194 tons (25% of the state ammonia emissions for livestock)

If we assume emissions from cows in dry-lot operations are similar to emissions from free-stall barns (the type of operation in the WSU study) and that there are 100,000 milk cows in the LYV, then dairy cows in this area emit about 2,277 tons of ammonia per year from their living quarters. The remainder of the ammonia in Ecology's Emissions Inventory comes from milk parlors, manure lagoons, composting operations, and field applications.

Ecology does not estimate VOC emissions for animal agriculture. Using the WSU study number as a base, milk cows likely emit over 4,145 tons of VOCs per year (100,000 cows). Perhaps VOC estimates should be required.