

DATE: November 5, 2021 CAFO Permit # 0059536-04-01

TO: James Salscheider – CAFO Specialist – NER/Green Bay  
Ben Uvaas – CAFO Enforcement Program Coordinator – NER/Oshkosh  
Tyler Dix – CAFO Permitting Program Coordinator – WT/3

FROM: Ian Anderson – CAFO Hydrogeologist Program Coordinator

SUBJECT: Kinnard Farms Inc. – Offsite Groundwater Monitoring

**Background:**

The Kinnard Farms production site, satellite farm, and many landspreading fields are located in Sections 19, 20 and 30, T25N R24E, Town of Lincoln, Kewaunee County. Many of the fields included in the Kinnard Farms Nutrient Management Plan (NMP), where the facility landspreads manure, are within 5 miles of the production area, which is bordered by fields receiving manure from Kinnard Farms. The remaining fields cover a wide swath of Kewaunee County and some are as far away as northern Manitowoc, Southern Door and southeast brown Counties. All of the Kinnard Farms NMP fields in the Town of Lincoln are located over Silurian bedrock. The Dairy currently houses 7,950 milking and dry cows, and anticipates generating approximately 103 million gallons of manure and process wastewater and 2,045 tons of solid manure.

According to the UW-Stevens Point WI Well Water Quality Viewer, 29% of private wells in section 20 have tested positive for total coliform bacteria. During the Kinnard farms contested case hearing in February, 2014 the Administrative Law Judge heard testimony that up to 50 percent of private wells in the Town of Lincoln were contaminated and that 30 percent of wells tested positive for E. coli bacteria.

Sampling of production area monitoring wells has shown nitrate concentrations greater than 20 mg/L in upgradient and downgradient wells. These concentrations exceed both the 10mg/L state health-based drinking water standard and the 10mg/L groundwater quality enforcement standard (NR 140) for nitrate. All four active monitoring wells have tested positive for Total Coliform bacteria and only MW-1 has not had an E. coli positive sample during the monitoring history. Total coliform bacteria, including E. coli bacteria, has an enforcement standard of 0 in NR 140.

**Site Geology/hydrogeology:**

Water supply well construction reports (WCRs) in the area surrounding the production site show limestone or dolomite bedrock encountered at depths between 7 and 63 feet, and reported depth to groundwater, at the time of construction ranging from 21 to 81 feet. Based on WCRs near the production site and *Hydrogeological Characterization of the town of Lincoln, Kewaunee County, Wisconsin* (Parsen et al., 2017), the Silurian Dolomite forms an unconfined aquifer approximately 400 feet thick that is highly fractured with thin soil cover.

**Potential landspreading site contaminant sources:**

Animal waste is known to contain pathogens such as total coliform bacteria including E. coli and nitrogen in various forms. These contaminants can readily enter an aquifer system in a karst setting and can travel quickly along bedrock fractures (Parsen et al. 2017). According to Bradbury et al. (WOFR 2001-01, 2002), “minimum rates of vertical groundwater movement range from 13 to 115 ft/day following recharge events” in a similar karst setting. Potential sources of the contamination in groundwater in this area include the Kinnard Production area and manure landspreading sites. Several potential contaminant sources can be found at the Kinnard Farms production area, including waste storage, feed storage runoff

and wastewater runoff. Dairy operation animal waste, feed storage leachate and process wastewater are known to contain significant levels of potential nitrogen groundwater contaminants, including nitrate and ammonia. However, groundwater upgradient of the production area in MW-1 and MW-2 exceeds NR 140 enforcement standards, indicating landspreading as a potential source. In addition, the occurrence of groundwater contamination in private wells in the Town of Lincoln suggests landspreading may be the source of contamination. For these reasons offsite groundwater monitoring located at landspreading sites is reasonable to allow the determination of the source of contamination.

**Need to investigate and required response action if source is landspreading practice or activity:**

Chapter NR 140, Wis. Adm. Code, establishes state groundwater quality standards that apply to all facilities, practices and activities which may affect groundwater quality, and which are regulated by the department under chs. 281 and 283, Stats. In accordance with s. NR 243.13(5), Wis. Adm. Code, all permitted large CAFOs are required to comply with state groundwater quality standards. This includes landspreading activities under an approved NMP. Sampling of monitoring wells at the Kinnard Farms production area has identified that groundwater is contaminated with nitrate at concentrations as high as 29.3 mg/L and has identified contamination with total coliform. These results exceed ch. NR 140 groundwater standards. Ch. NR 140 directs the department to assess the cause and significance of contaminants in groundwater above state groundwater quality standards, and to determine appropriate response actions to minimize the concentration of contaminants in groundwater and prevent exceedances of ch. NR 140 Enforcement standards.

**Recommendations:**

Available information shows that the Kinnard Farms production site and landspreading sites are located in an area susceptible to groundwater contamination. Well construction reports, and a hydrogeologic study in the Town of Lincoln indicate karst geology, including documented sinkholes. Groundwater monitoring at the Kinnard production site show persistent exceedances of groundwater quality standards for nitrate and bacteria. Contamination of nearby private wells with bacteria has been reported. Since nitrate and bacteria exceeding NR 140 enforcement standards are found in monitoring wells upgradient from the production site and in private wells, I recommend that a groundwater monitoring system, consisting of at least three monitoring wells located in at least one field that is actively used for landspreading, be installed to evaluate whether landspreading practices or activities may have contaminated groundwater and caused exceedances of nitrate and total coliform groundwater standards at the upgradient monitoring wells or nearby private wells. The pending permit modification resultant from the 2019 settlement agreement should include a requirement that Kinnard submit an offsite groundwater monitoring plan, subject to department approval.

**References:**

*Field Verification of Capture Zones for Municipal Wells at Sturgeon Bay, Wisconsin.* WOFR 2001-01. Bradbury, Rayne & Muldoon. 2002.

*Hydrogeological Characterization of the Town of Lincoln, Kewaunee County, Wisconsin.* WOFR 2017-05. Parsen, Mauel & Streiff. 2017.

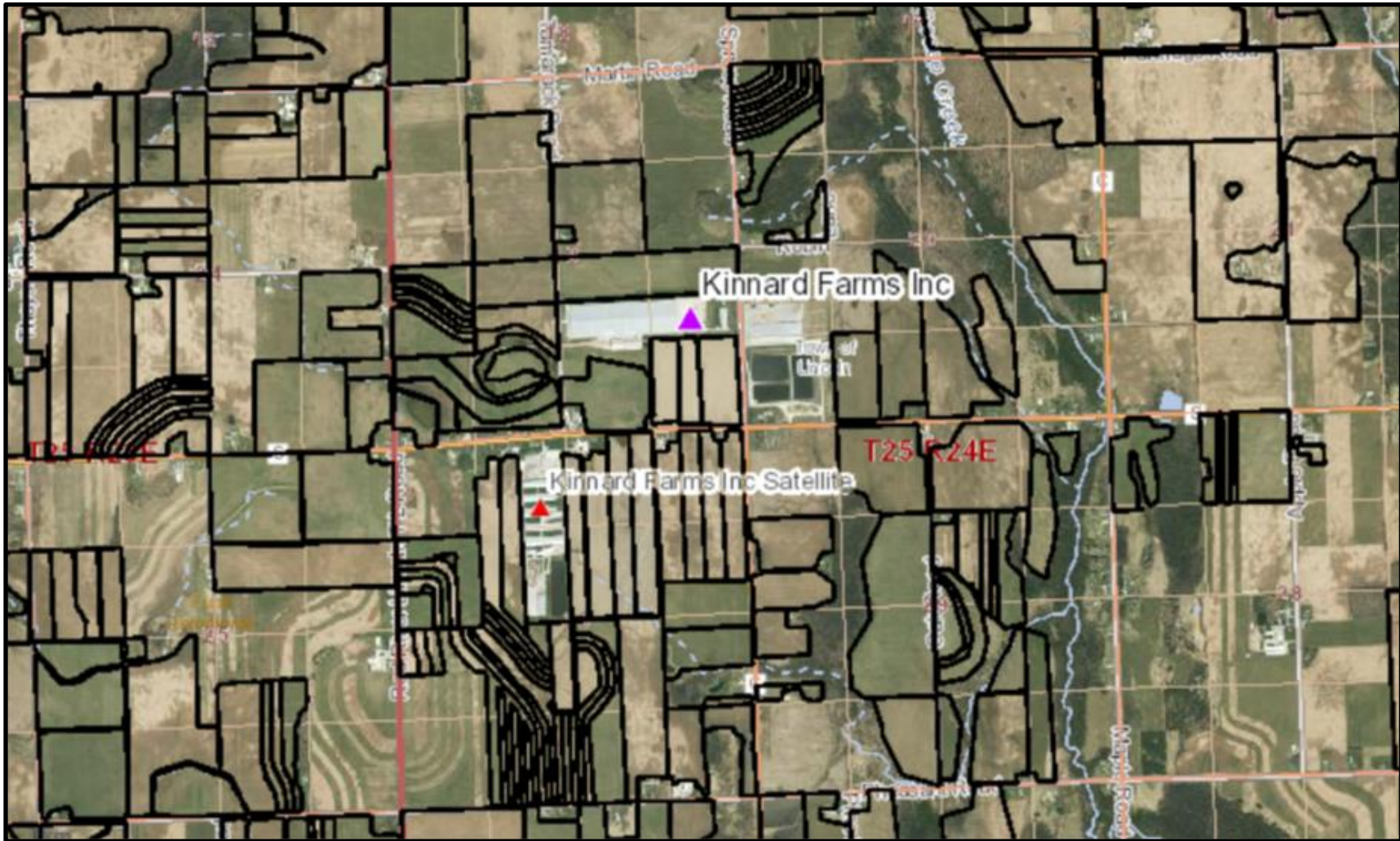
UWSP Well Water Quality Viewer. [https://gissrv3.uwsp.edu/webapps/gwc/pri\\_wells/](https://gissrv3.uwsp.edu/webapps/gwc/pri_wells/)

**Attachments:**

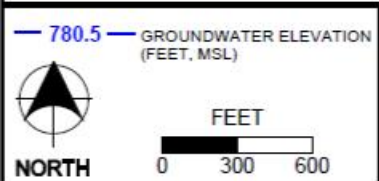
1. Aerial photo of production area
2. Map of Kinnard Farms NMP Fields Near the Production Area
3. Kinnard Farms Production Area with Monitoring Well Locations and Gradient
4. Depth to bedrock and karst features map (Map 3 from WGNHS Town of Lincoln report)



Attachment 1 – Aerial Photo of Kinnard Farms Production Area (Outlined in blue)



Attachment 2 – Kinnard Farms NMP Fields (outlined in black) Near the Production Area

























  
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KINNARD FARMS CASCO, WISCONSIN POTENTIOMETRIC SURFACE 06/15/21		
DRAWN BY	PROJ. No.	DATE
KM	1395	26 Jul 21

<b>Figure</b> <b>1</b>
FILE
WTR 061521

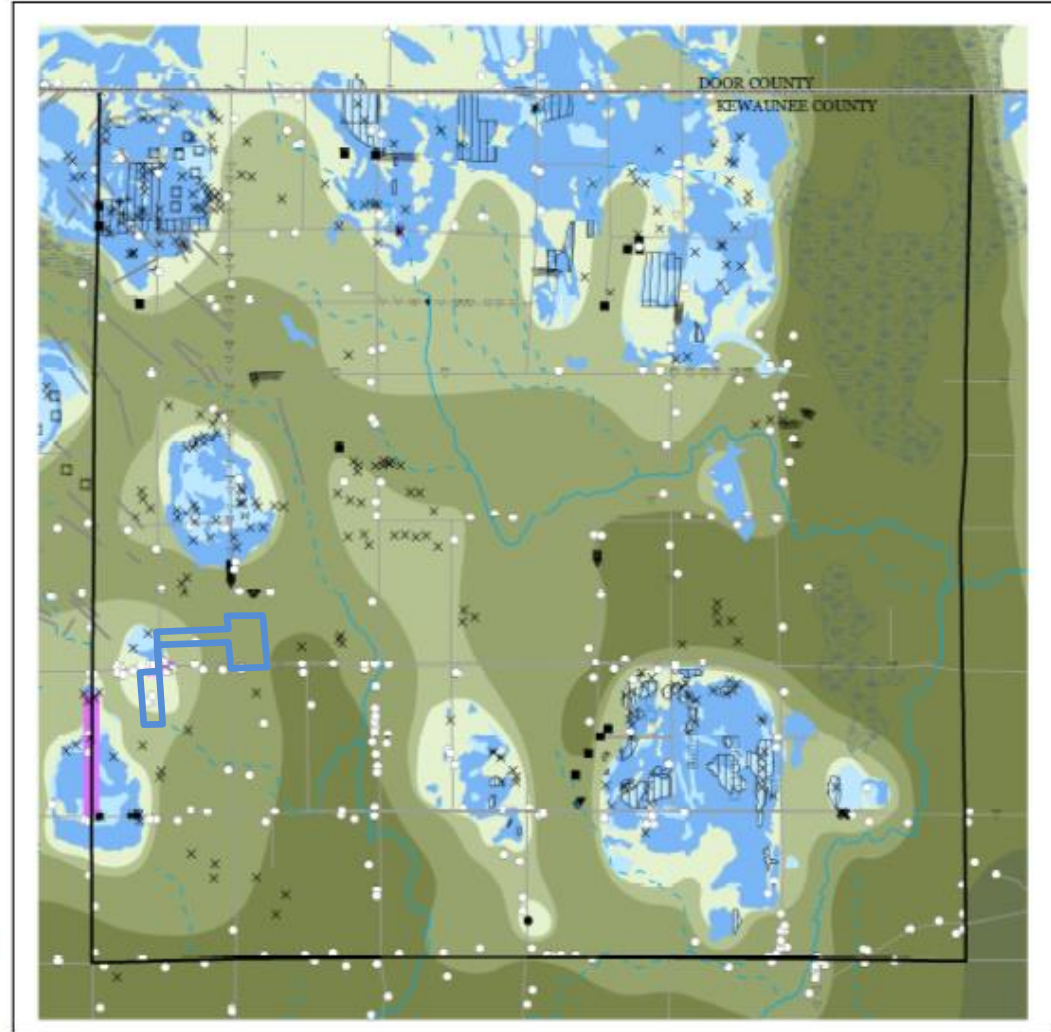
Attachment 3 – Kinnard Farms Production Area Monitoring Well Locations and Water Table Gradient (from SSPA 2<sup>nd</sup> Quarter Groundwater Monitoring Report dated August 9, 2021)

### Legend

-  County Boundary
-  Town Boundary
-  Roads
-  Wetland areas
-  Perennial streams
-  Intermittent streams
-  Well construction reports
-  Fracture traces
-  Sinkholes
-  Geologic log
-  Borings (WGNHS)
-  Borings (wind turbine)
-  Hand auger and push-probe points
-  Surface geophysics measurements
-  Bedrock outcrop observations
-  Utility trenches
-  0 - 24 inches to bedrock (mapped by farmers)
- NRCS soil thickness, depth to bedrock (inches)**
  -  0 - 20
  -  20 - 40
- Depth to bedrock (feet)**
  - < 10 feet symbol" data-bbox="95 635 108 648"/> < 10
  -  10 - 20
  -  20 - 50
  -  50 - 100
  - > 100 feet symbol" data-bbox="95 727 108 740"/> > 100

0 0.5 1 Miles

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Attachment 4 – Depth to Bedrock Map with Input Datasets (Modified from WOFR 2017-05). Note approximate location of Kinnard Farms Production area outlined in blue