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August 25, 2017

VIA EMAIL: JANE.LANDRETTI@WISCONSIN.GOV
AND U.S. MAIL

Jane R. Landretti
Staff Attorney
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

Re: Central Sands Dairy, LLC ("CSD") – WPDES Permit No. WI-0063533-02-1

Dear Ms. Landretti:

Pursuant to Paragraphs 8 and 9 of the Settlement Agreement effective July 27, 2017, enclosed is an ammonia source investigation plan prepared on behalf of CSD by RJN Environmental Services, LLC. Pursuant to Paragraph 10 of the Settlement Agreement, we look forward to the Department's review of the enclosed.

Very truly yours,

MICHAEL BEST & FRIEDRICH LLP

David A. Crass

Enclosure

cc w/enc.: James E. Wysocki, Central Sands Dairy, LLC
Robert J. Nauta, RJN Environmental Services, LLC
Cameron F. Field, Esq., Michael Best & Friedrich LLP

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RJN Environmental Services, LLC
Surface Water Studies
Groundwater Studies
Site Investigations

August 25, 2017

Central Sands Dairy, LLC
c/o Mr. James E. Wysocki
8550 Central Sands Road
Bancroft, Wisconsin 54921

RE: Ammonia Concentrations in CSD-1D – Source Investigation Plan
Central Sands Dairy
Juneau County, Wisconsin

Dear Mr. Wysocki:

On behalf of Central Sands Dairy, LLC (CSD), RJN Environmental Services, LLC (RJN) prepared this plan to investigate or otherwise address the source of ammonia in monitoring well CSD-1D, and to a lesser extent CSD-1S at the Central Sands Dairy (CSD) facility.

Background

Ammonia has been present in samples collected from CSD-1D since the start of sampling, in December 2014. Concentrations have ranged from as low as 1.8 mg/L (November and December 2016) to as high as 17 mg/L in June 2017. Figure 1 shows the wells that are adjacent to or downgradient from the waste storage facility (WSF). Wells CSD-6, CSD-7 and CSD-9 have never yielded ammonia concentrations in exceedance of the preventive action limit (PAL). Early in the monitoring process, well CSD-5 yielded concentrations in exceedance of the PAL; however, there have been no exceedances since November 2016.

Figure 2 shows the ammonia concentrations in samples from CSD-1S and CSD-1D, since the start of monitoring in 2014. It is only since January 2017 that the concentrations have been increasing in CSD-1D. As the figure shows, although the concentrations are elevated, the trend lines are actually downward. Additionally, with the June 2017 sampling, the concentrations appear to be leveling off. Consequently, it is possible that a slug of ammonia has been passing through the CSD-1 area.

Flow Conditions

Figure 3 shows the water table and groundwater flow at CSD on July 17, 2017. The aquifer matrix at the site was observed to be fine- to medium-grained sand. Using the range of hydraulic conductivity for clean sands tabulated in *Groundwater* (Freeze and Cherry, 1979), of 10^{-3} cm/sec to 10^{-2} cm/sec, the average linear velocity was calculated using the equation:

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Phone: 608.576.3001

$v = (K*I)/n$

Where:

v = average linear velocity
K = hydraulic conductivity
I = flow gradient (measured on Figure 3)
n = porosity

For purposes of the calculation, a porosity of 25 percent was assumed (also from *Groundwater*). This gives a linear travel velocity of groundwater at the site of 0.24 feet per day to 2.4 feet per day, with a geometric mean velocity of 0.76 feet per day.

Figure 4 shows the distances from several features to CSD-1, including the nearest and farthest boundaries of the WSF, and the nearest and farthest boundaries of an area that was paved in November 2013. The WSF was inspected in August 2014, and found to be structurally sound. If a release of ammonia had occurred at the WSF prior to inspection, it would have traveled a minimum of 265 to 2630 feet, with a geometric average of 835 feet. Although no slug tests have been conducted at the site, RJN has observed the groundwater to be virtually instant in its recovery from pumping, suggesting that the true permeability at the site is very high. Because we know that the structure was found to be sound in August 2014, it is unlikely that a release has occurred since that time. We therefore do not believe that the WSF is the source of the ammonia at the CSD-1 nest.

Another feature shown on Figure 4 is a heavily used area that was paved in November 2013. This is adjacent to the feed and sand pad, and also the area immediately outside the east end of the barns. The travel time from the leading edge of this area to CSD-1 ranges from 416 to 4167 days, with a geometric average of 1315 days (3.6 years). Observe on Figure 2 that the ammonia concentrations in CSD-1D were fairly stable until January 2017, with an average concentration of just under 5 mg/L. In January, the concentrations started to rise; however, with the June 2017 results, it appears that the concentrations are beginning to stabilize. This has the appearance of the concentration trend of a slug passing through. The January 2017 start of an increase in concentrations of ammonia is approximately 1130 days after the paving was done. This falls well within the potential range of travel times from the paved area to CSD-1. It is our opinion that prior to paving, the area was a low to moderate source of ammonia, but that the disturbance caused by re-grading the area for paving likely mobilized contaminants that are now being observed in CSD-1D.

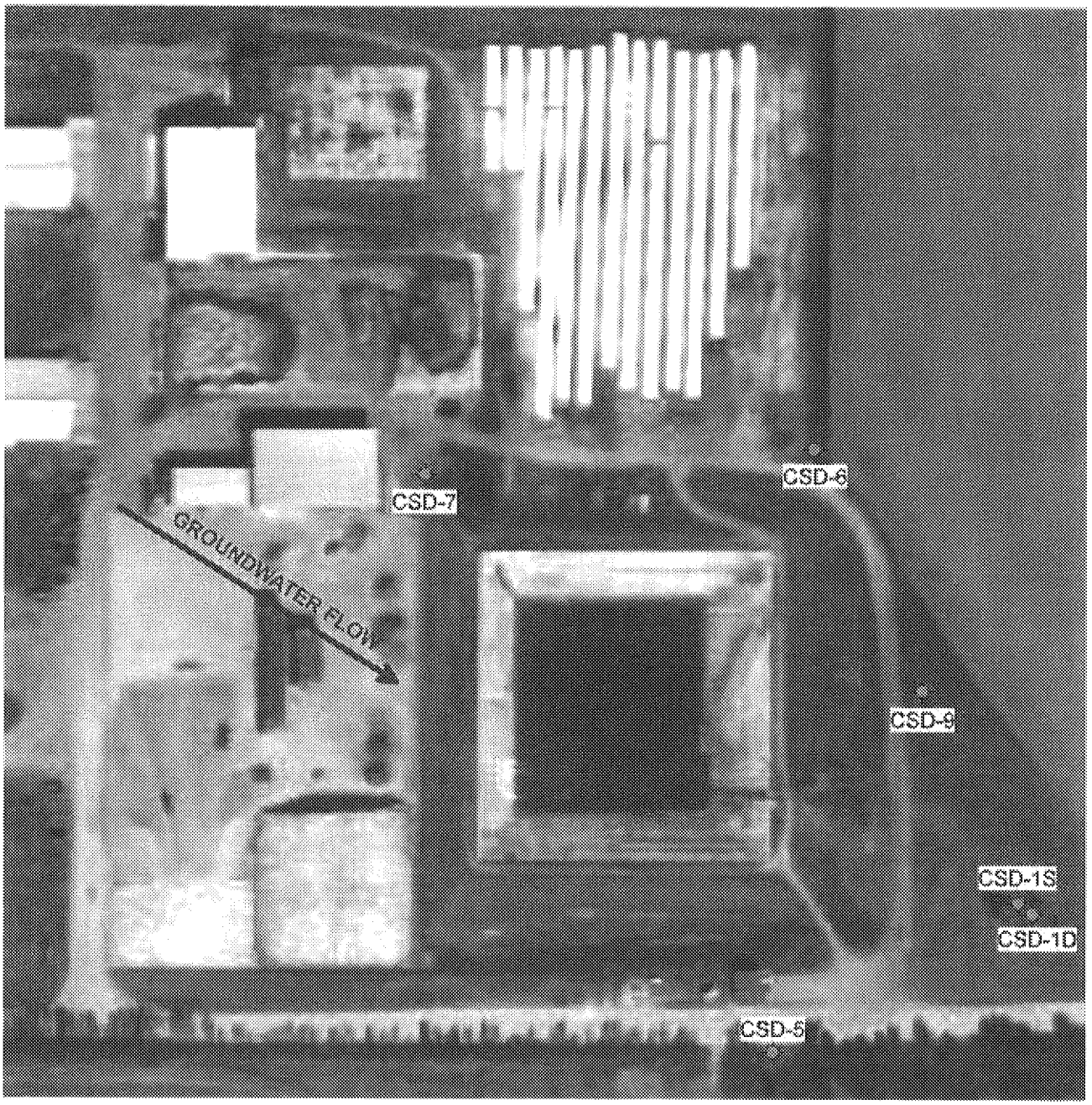
This is also supported by the depth of groundwater impacts. Ammonia concentrations are significantly higher in CSD-1D than in the adjacent shallow well, CSD-1S. Because there is very little vertical groundwater gradient at the site, the source would need to be distant for the contaminant to migrate vertically in the aquifer.

We have evaluated the known potential sources of ammonia upgradient from the CSD-1 nest. These include the WSF and the previously unpaved area around the feed and sand pad. Both the historical concentrations of ammonia at CSD-1D and the depth in the aquifer of the highest concentrations of ammonia indicate a source that would be consistent with the unpaved area. Because the trend of ammonia concentrations in samples from CSD-1D are consistent with a slug passing through, we recommend the continued monitoring of CSD-1D pursuant to the conditions of the WPDES permit and no further action at this time until the results of this further monitoring are evaluated as against our conceptual site model of the ammonia source as stated herein.

Sincerely,

RJN ENVIRONMENTAL SERVICES, LLC

Robert J. Nauta
Hydrogeologist



SCALE IN FEET

0 100 200 300 400

NORTH

MONITORING WELL

AERIAL PHOTO: GOOGLE MAPS

RJN Environmental Services, LLC

Surface Water Studies
Groundwater Studies
Site Investigations

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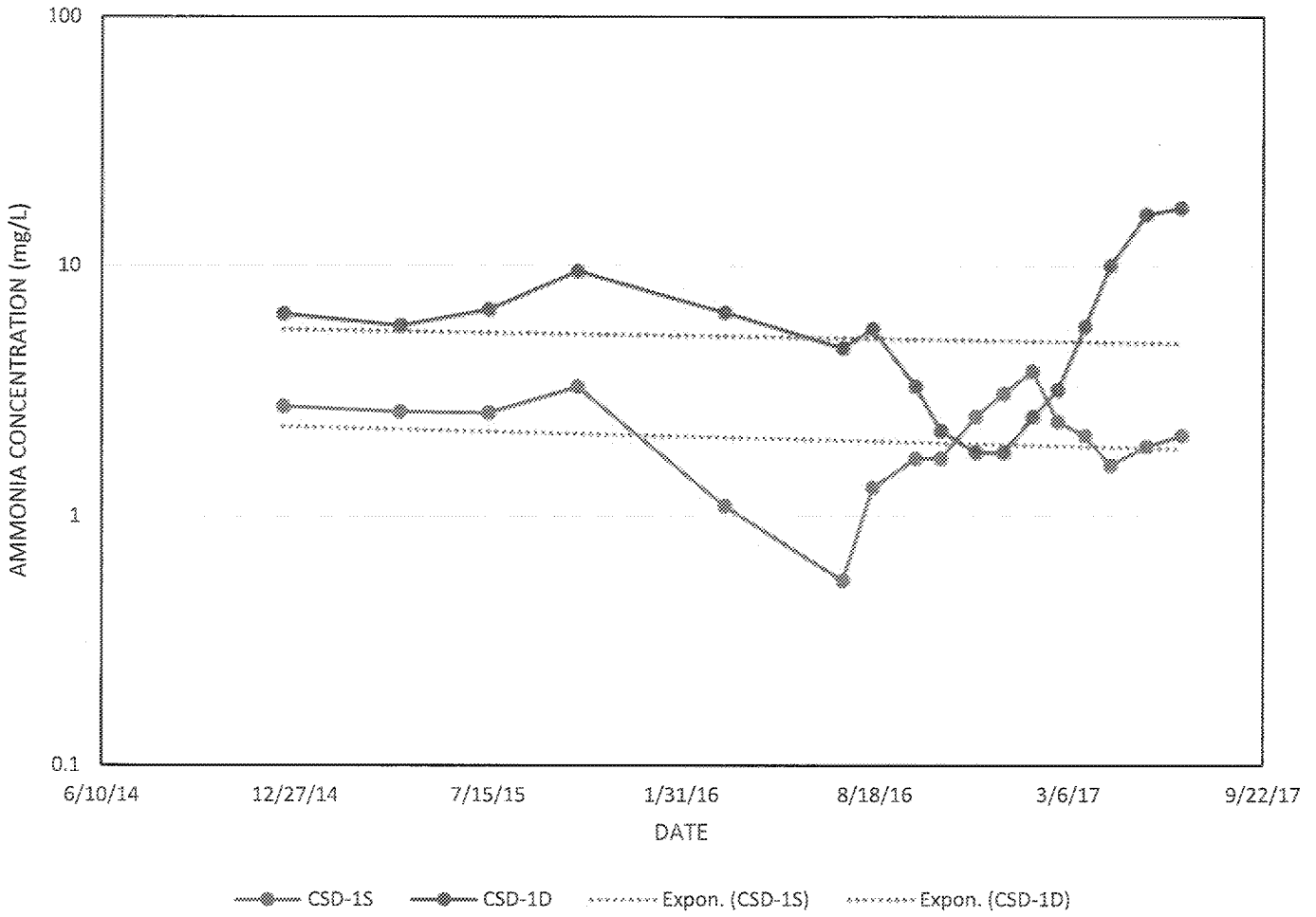
CENTRAL SANDS DAIRY, LLC
TOWN OF ARMENIA, WISCONSIN
MONITORING WELL LOCATIONS

FIGURE 1

DRAWN BY	PROJ. No.	DATE	FILE
RN	14-203	14 AUG 17	MON WELLS



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CENTRAL SANDS DAIRY, LLC
TOWN OF ARMENIA, WISCONSIN
AMMONIA TRENDS

FIGURE 2

DRAWN BY	PROJ. No.	DATE	FILE
RN	14-203	14 AUG 17	AMMONIA

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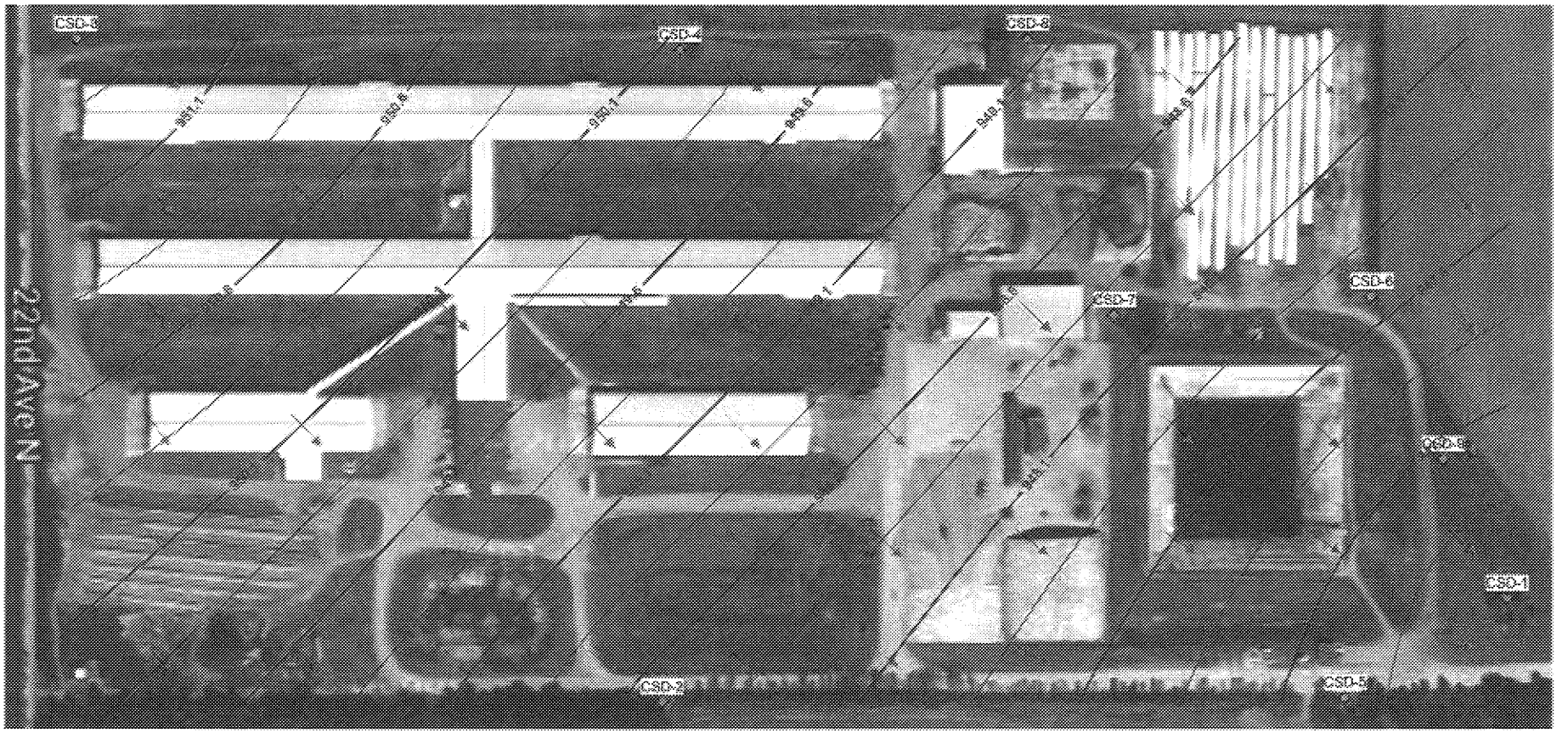

WATER TABLE MONITORING WELL

946 GROUNDWATER ELEVATION (FT, MSL)

GROUNDWATER FLOW DIRECTION

SCALE IN FEET

0 100 200 300 400

NORTH

AERIAL PHOTO: GOOGLE MAPS

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CENTRAL SANDS DAIRY, LLC
TOWN OF ARMENIA, WISCONSIN
WATER TABLE - 07/17/17

FIGURE 3

DRAWN BY	PROJ. No.	DATE	FILE
RN	14-203	11 AUG 17	WTR TBL 0717

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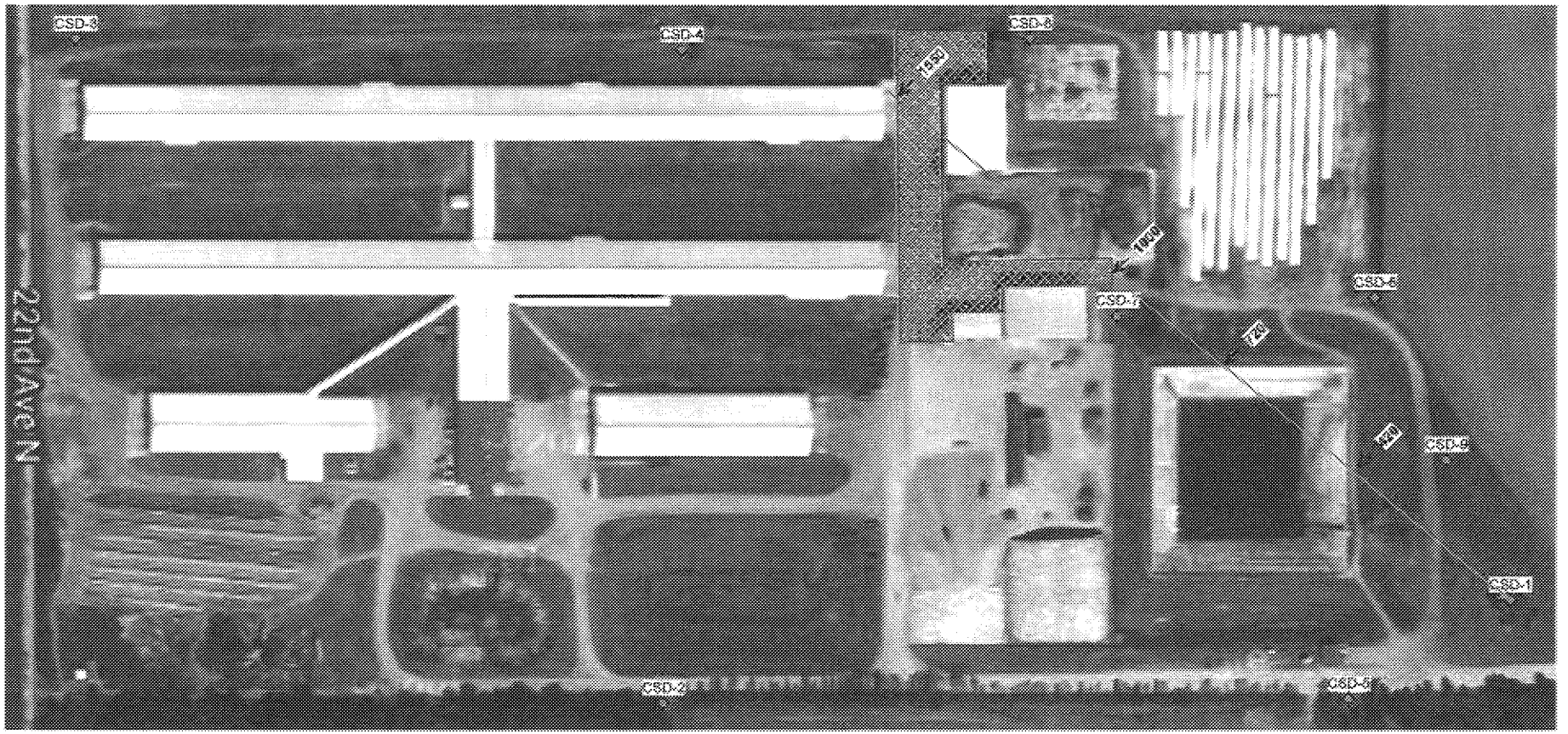

WATER TABLE MONITORING WELL

AREA PAVED IN 2014

420 DISTANCE TO CSD-1 (FEET)

AERIAL PHOTO: GOOGLE MAPS

SCALE IN FEET

0 100 200 300 400

NORTH

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CENTRAL SANDS DAIRY, LLC
TOWN OF ARMENIA, WISCONSIN
TRAVEL DISTANCES TO CSD-1 NEST

FIGURE 4

DRAWN BY	PROJ. No.	DATE	FILE
RN	14-203	21 AUG 17	GW TRAVEL

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