SECOND SUPPLEMENTAL EXPERT REPORT
OF
DAVID J. ERICKSON

Community Association for Restoration of the Environment, Inc.
and Center for Food Safety, Inc.
v.
George & Margaret, LLC, George DeRuyter & Son Dairy, LLC, D & A Dairy, and D & A Dairy, LLC.

Docket No. 2:13-cv-3017-TOR

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Community Association for Restoration of the Environment, Inc.
and Center for Food Safety, Inc.
v.
Cow Palace, LLC, The Dolsen Companies, and Three D Properties, LLC

Docket No. 2:13-cv-3016-TOR

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Community Association for Restoration of the Environment, Inc.
and Center for Food Safety, Inc.
v.
Henry Bosma Dairy, Liberty Dairy, LLC, Arizona Acres, LP, Liberty Acres, LLC, and Henry Bosma.

Docket No. 2:13-cv-3019-TOR

Prepared for:

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1. I, David J. Erickson, have been retained by Plaintiffs in the above-captioned matter to provide expert testimony about the manure management and storage practices of the aforementioned Defendants, including whether these activities have caused contamination of soils and groundwater.

2. As with my initial and prior supplemental reports, all opinions expressed herein are to a reasonable degree of scientific certainty, unless specified otherwise. I reserve the right to modify or supplement this report based on information obtained by Plaintiffs after the date of this report.

3. I have reviewed all new data provided to Plaintiffs by Defendants, including productions from January, 2015 forward. The most recent production was provided on April 24, 2015. These documents include recent soil sampling records, 2014Q4 and 2015Q1 groundwater monitoring data, and AOC-related documentation and correspondence from 2015. I also visited the DeRuyter facilities, obtaining Geoprobe samples from that Defendants' composting area on April 9, 2015. Overall, the new information I have reviewed further confirms my opinions outlined in my prior expert reports.

4. Plaintiffs finally received hydrometer and deep soil sampling analysis for the Cow Palace and Bosma facilities. The hydrometer analysis for Cow Palace, dated August 22, 2012 shows that the sampled field and location

(Field 2, 4-5 foot depth) was predominantly silt with 20% sand and 15% clay and had sufficient moisture (25.4%) to be conducive to the downward movement of water in the unsaturated zone and, correspondingly, nitrate deeper into the soil profile well beyond the reach of plant uptake. DAIRIES028837.

5. The same is true for the Bosma sampling, with more silt and only minor concentrations of sand (5%) and clay (12%). The Bosma hydrometer analysis also shows an in-situ moisture content of 28.1%. Both samples indicate that the silt zone is approaching saturated flow conditions. DAIRIES028838.

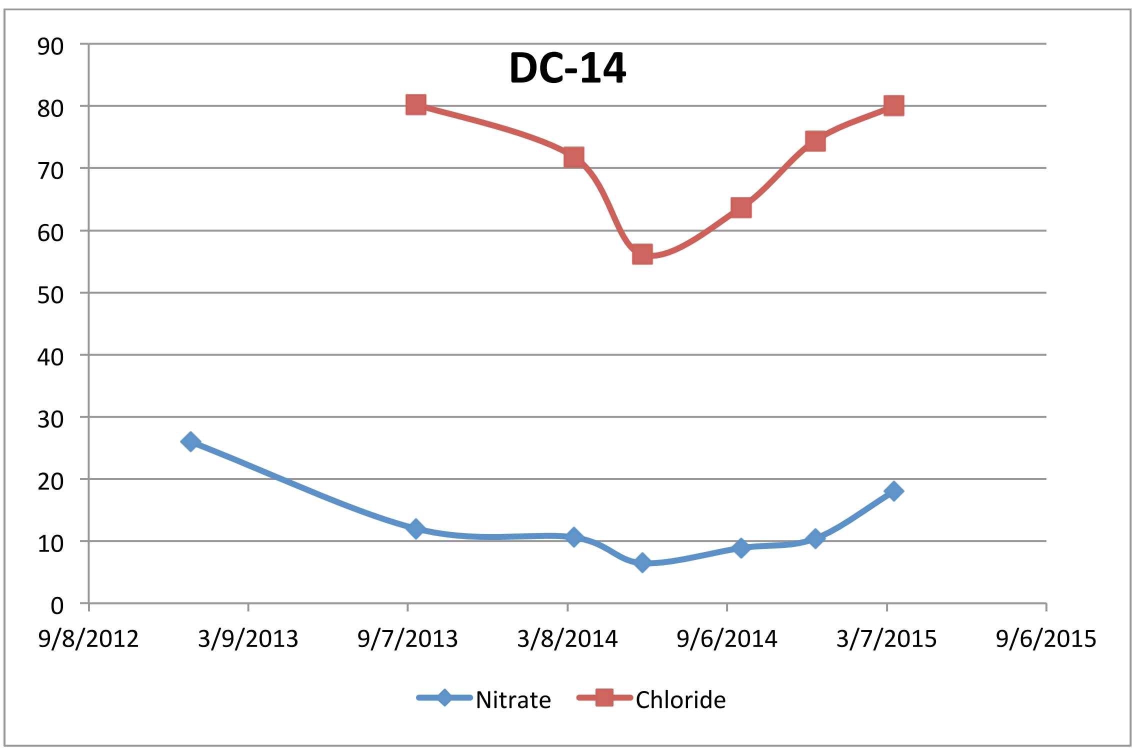
6. The Bosma deep soil samples were collected in August or 2012, DAIRIES028836, and received by the Plaintiffs in April of 2015. The analysis shows high concentrations of nitrate throughout the soil column, but more significantly in the deeper portions of the soil column. For instance, at 15 feet below ground surface, results of 44.1, 130, 161, 87.2, 37, and 143 mg/kg nitrate were recorded in fields 1-6, respectively. In addition, the deep samples indicate the sources are animal waste, per the nitrogen isotope analysis performed by Arcadis. Moisture content was predominantly between 18 and 22%. In my opinion, this further indicates that the Bosma

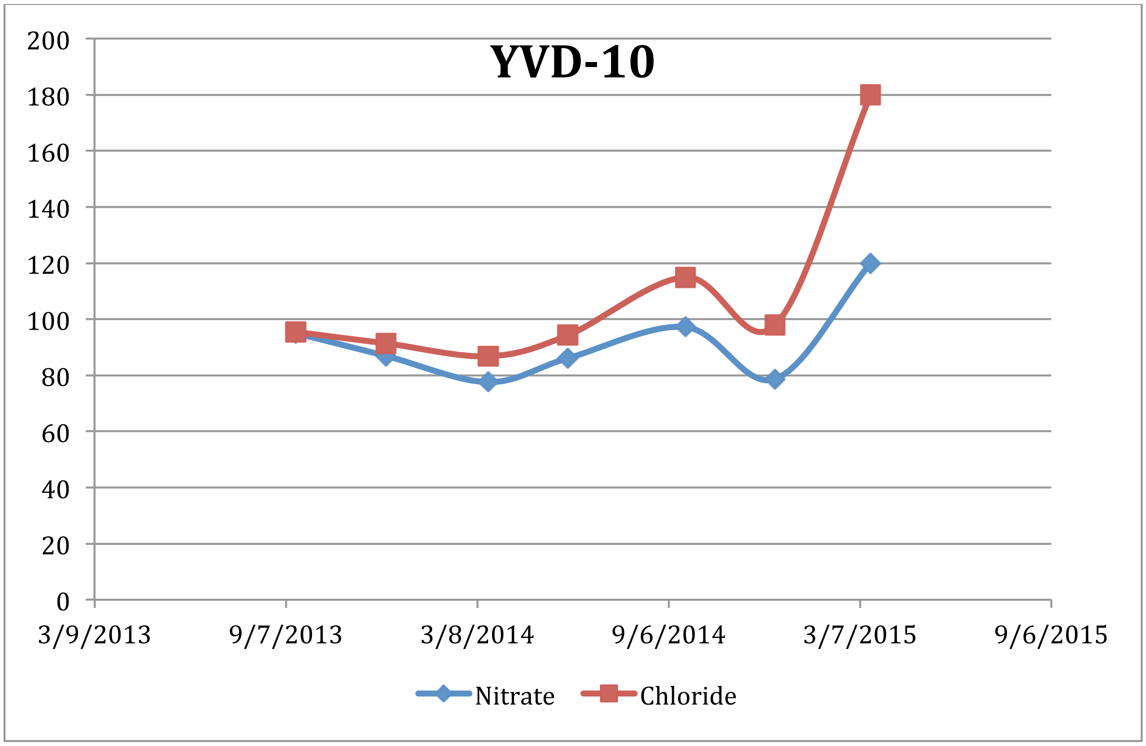
dairies were depositing large amounts of manure onto their fields – far more than crops could uptake as fertilizer.

7. I have also reviewed records showing that Cow Palace Dairy had an off site manure spill on to the Butler property in January, 2015. DAIRIES029864. No soil samples were taken from the field to which manure was applied. DAIRIES029867. That Cow Palace is still incapable of applying manure in compliance with its DNMP and with the AOC shows just how important it is that the recommendations of Dr. Shaw for future field management are adopted with enforceable capabilities.

8. The most recent soil sampling from Defendants show that nutrient levels are still very high – in many instances, much higher than the AOC's 45 mg/kg (aka ppm) nitrate level of concern. For Liberty/Bosma, a summary table at DAIRES031078 shows that Fields 2, 6, 7, and 8 have very high residual nitrate concentrations, with Fields 7 and 8 both exceeding 100 mg/kg nitrate. Cow Palace Field 6 exceeded the AOC 45 ppm nitrate level of concern. DAIRES033022. The fields at the DeRuyter facilities remain the highest in terms of residual nitrate concentrations, with GDS-SU4 and GDS-SU5 being very high (GDS-SU5 had results in excess of 200 mg/kg nitrate). Many fields remain in violation of the AOC's 45 ppm level of concern. DAIRIES032050.

9. Additional groundwater monitoring results obtained pursuant to the AOC show that the dairies are still the major contributor to the nitrate contamination observed in the wells. In the data usability reports from 4Q2014 and 1Q2015, nitrate levels continue to remain high in downgradient wells, with results fluctuating between one sampling event to the next. This provides further additional support that surface activities are influencing groundwater on a relatively short timeframe. The histograms below show the temporal nitrate and chloride results from monitoring wells along the centerline of the contaminant plume emanating from Dairy operations.

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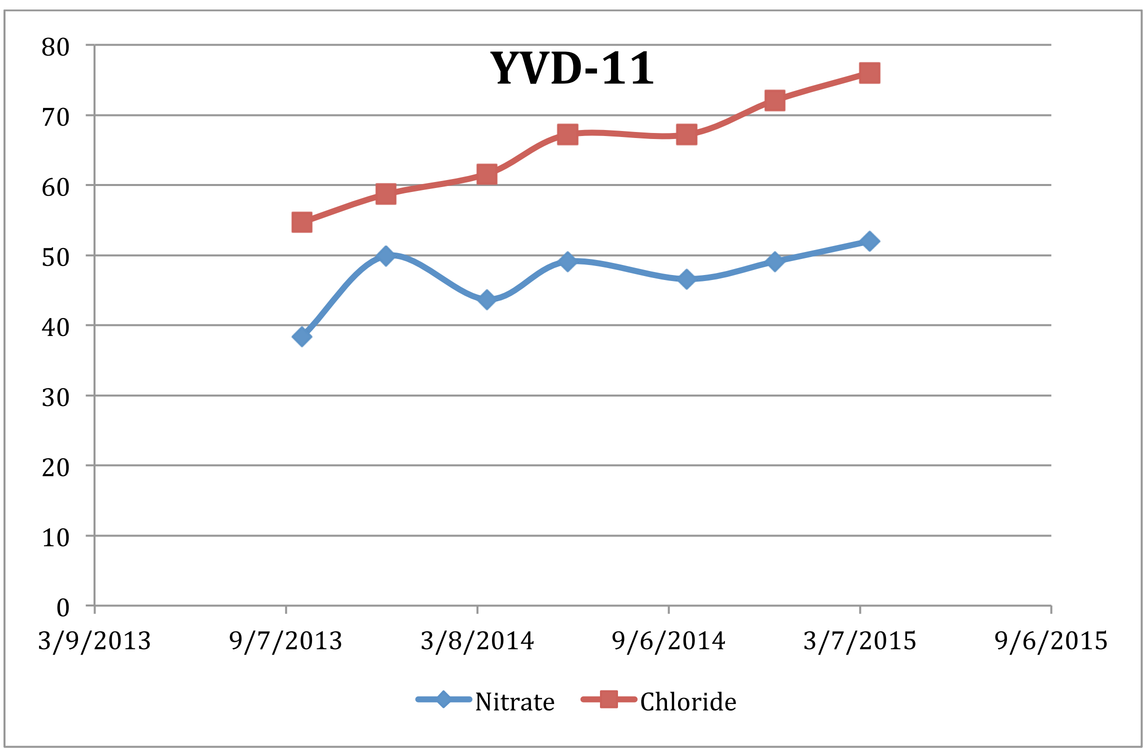
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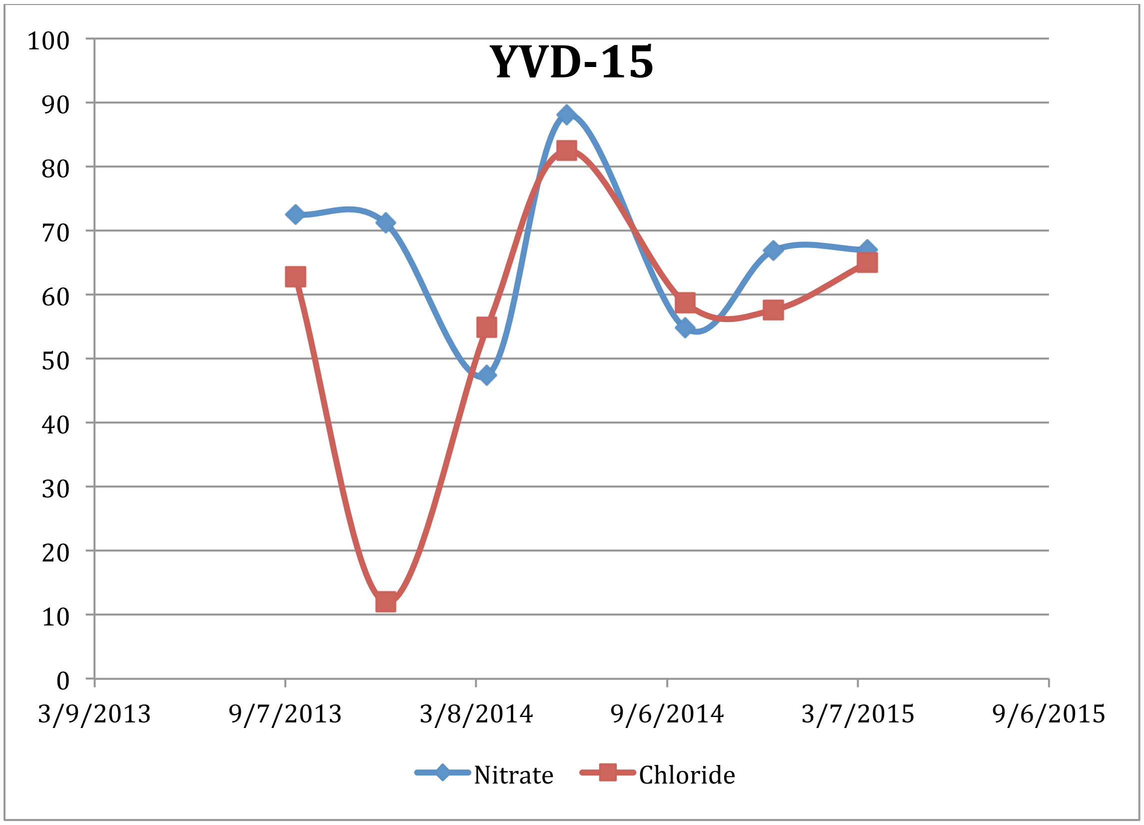


The histograms above provide concentrations versus time for the wells referenced. The concentration trends show increasing, decreasing and stable trends; consistent with contamination from multiple sources or source terms impacting an alluvial aquifer.

10. I have also reviewed the new lagoon work plans submitted by Defendants to EPA. The double lined system proposed is consistent with what has been recommended in my earlier reports, as long as some additional issues are properly addressed. In those documents, Defendants propose lining their lagoons with a hybrid double lined system with one glaring shortfall; if construction quality control is not excellent, there is a

good chance the lagoon will have a leak with no means of detecting the location or magnitude of the leak. By incorporating leak detection into the liner system, the Dairies can remove future leak concerns. Given the liner system proposed, leak detection should be required and could easily be added to the construction drawings.

11. Additionally, in the work plans the Defendants' representative states that gas venting will be required because of deposited organic material in the soil underlying the lagoons. Despite repeated denials, this is a further statement from Defendants indicating their knowledge that the existing lagoons as designed leak.

12. With respect to the DeRuyter facilities, on April 9, 2015, I oversaw the use of the Geoprobe sampler at both of DeRuyter's composting facilities. One composting facility is located at the D&A Dairy site, and I understand from conversations with Mr. DeRuyter during the inspection that it has been in operation for more than 15 years. The other composting operation is located northeast of the George DeRuyter & Son Dairy, above the Roza Canal. I understand this composting facility to be relatively newer, with our sampling location in an area that has had a composting operation for about three years.

13. Samples were collected in the DeRuyter compost areas to determine subsurface soil types, moisture content, and nutrient concentrations. In addition, continuous core samples were collected to allow analysis on 1 foot intervals. This detailed analysis was performed to allow precise characterization of subsurface migration pathways and a detailed description of chemical processes in the subsurface. The yellow highlighted columns in the following table (see below) summarizes all the data collected during this investigation. The brown shading highlights soil intervals with concentrations greater than 100 mg/kg with darker brown representing concentrations greater than 200 mg/kg.

Photo. Geoprobe in D&A Compost Area

14. Given the nitrate concentrations in the subsurface and the laboratory moisture content, nitrate concentrations in the soil moisture (pore water) can be calculated using a reference partitioning coefficient for the nitrate contaminant.[1] The last column in the table provides the nitrate concentration in pore water migrating down to ground water. With pore water concentrations as high as 3,000 mg/l, it is readily apparent that ground water

[1] Cantrell K.J., R.J. Serne and G.V. Last, 2003, Hanford Contaminant Distribution Coefficient Database and Users Guide, PNNL-13895 Rev. 1.

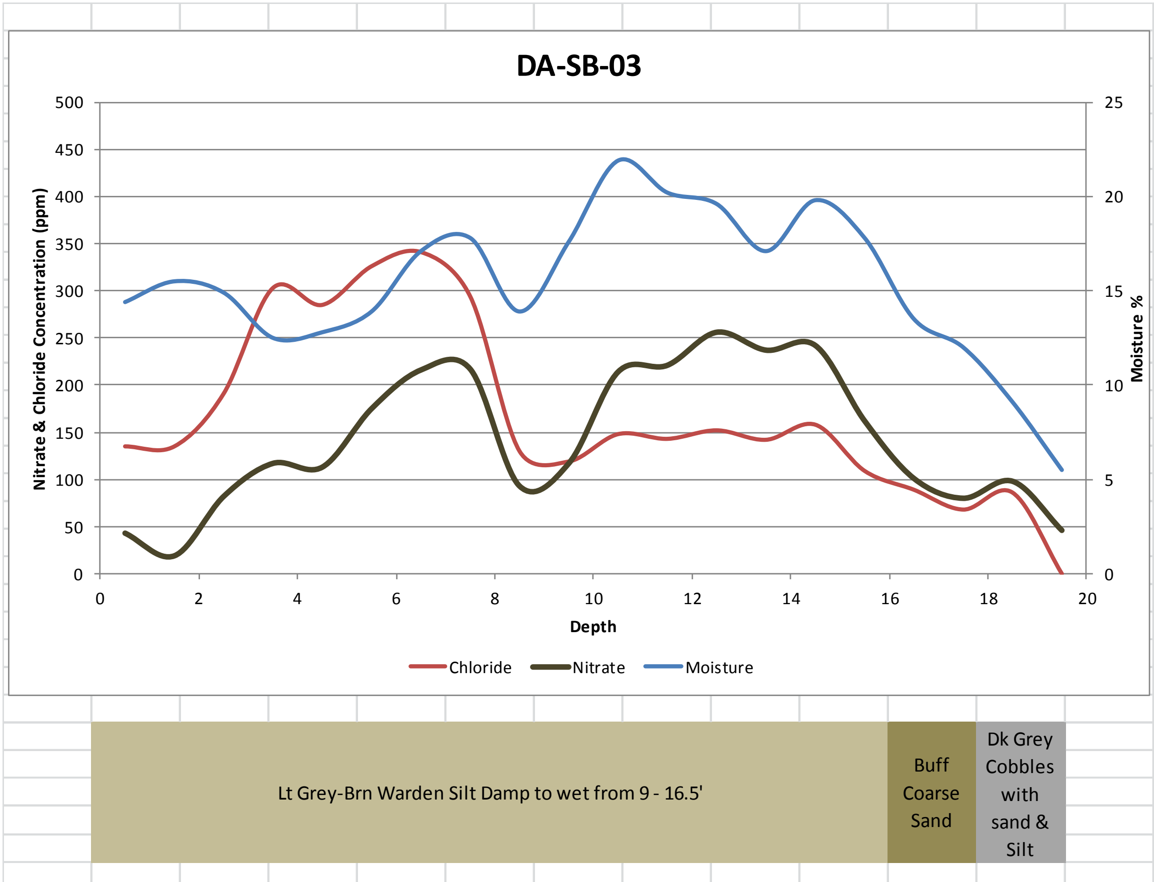
concentrations in the 200 mg/l range could originate from the composting operation. Also, under unsaturated flow conditions, the decreasing soil concentrations do not represent the lack of migration, but rather the decrease in soil moisture typical with coarser grained soils.

15. Data from the table are presented in the following graphs. The correlation between soil moisture and nitrate is a direct indication that the soil moisture is transporting the nitrate into the subsurface. While the soil descriptions show that the silt is retaining moisture to saturated or near saturated conditions, until the liquid breaks through the coarser grained material, most likely under finger flow conditions.

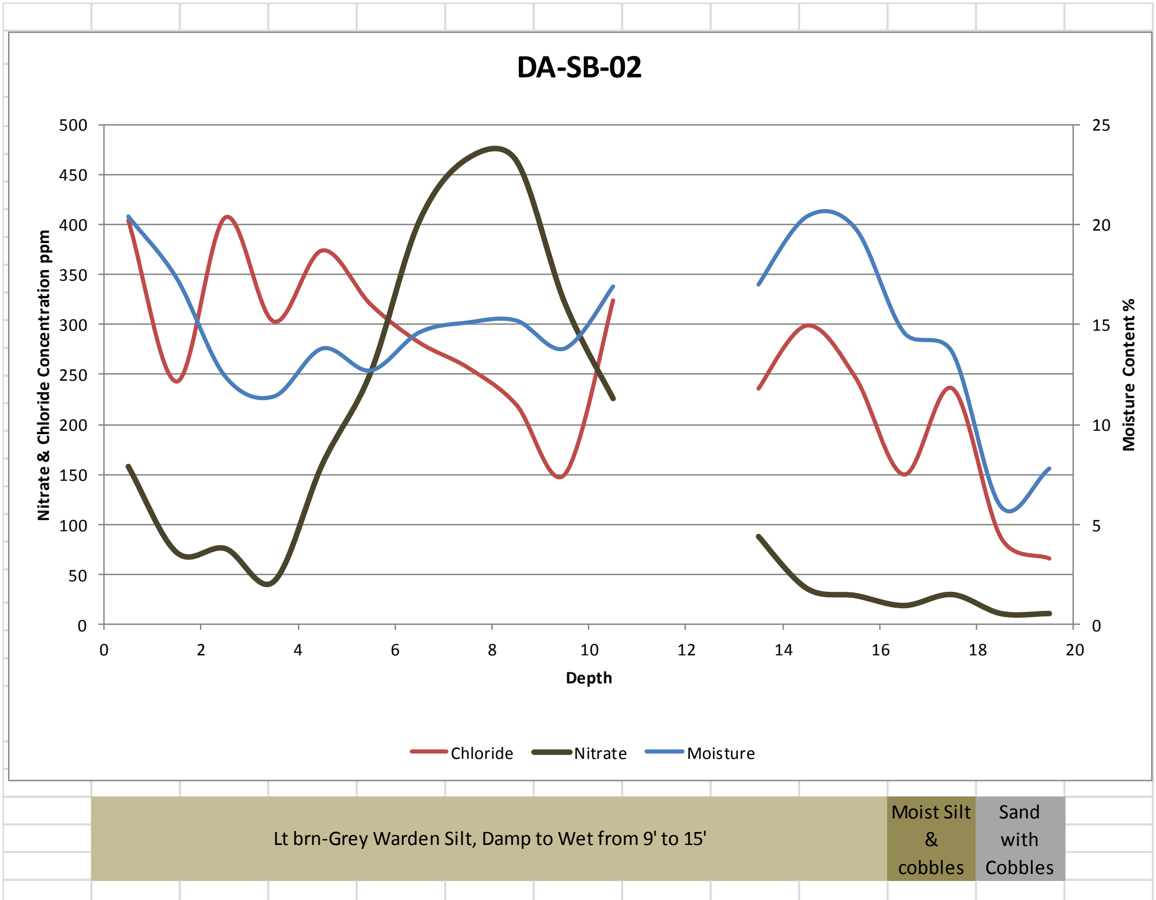
Photo Wet Silt. Note free water on soil core liner

Photo. Wet Silt on top of Gravel. DS-SB-03 @ 15’

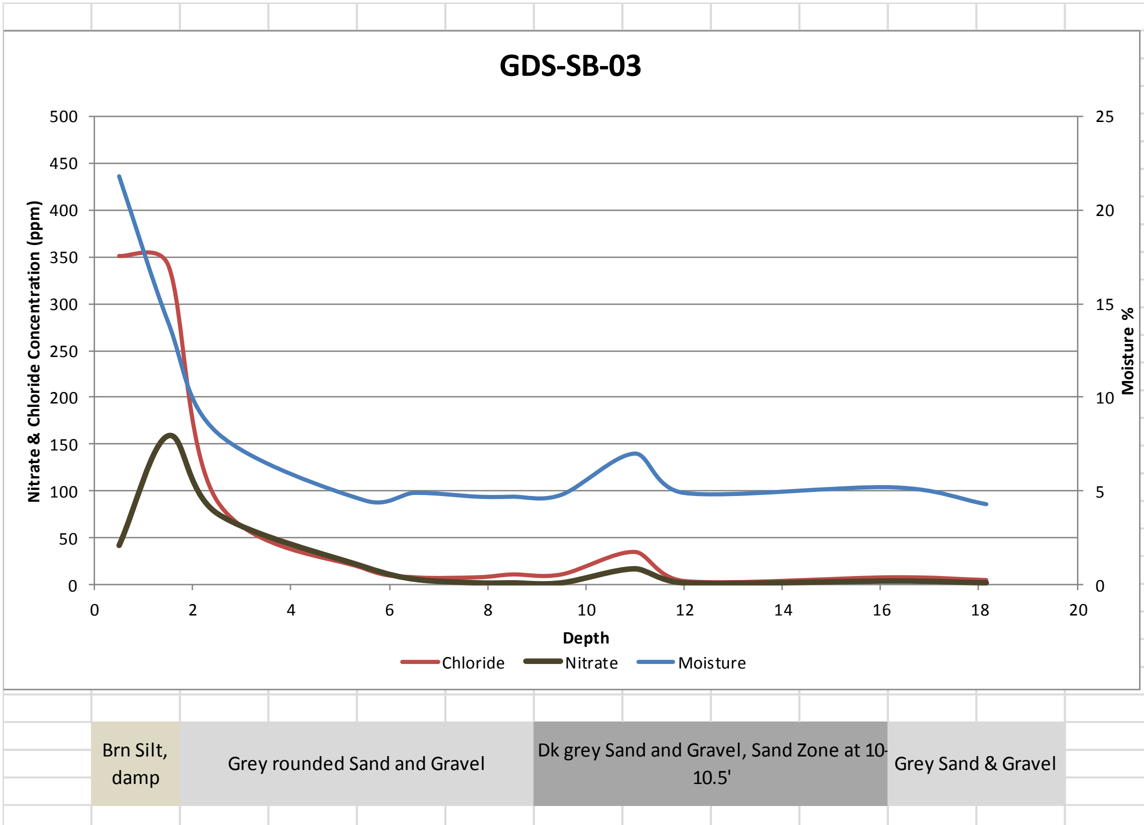
Boring ID		Soil							Pore water Concentration (C_w)
		Moisture content		Concentration (C_t)					
	Interval (ft)	Weight (%)	θ_w (-)	Chloride (mg/kg)	Phos (mg/kg)	Ammonia (mg/kg)	Nitrate (mg/kg)	TKN (mg/kg)	Nitrate (mg/L)
DA-SB-02	0-1	20.4	0.388	404	95	12	158	896	775
	1-2	17.3	0.329	243	58	21	72	560	416
	2-3	12.4	0.236	407	14	13	76	448	613
	3-4	11.4	0.217	303	4	8	43	280	377
	4-5	13.8	0.262	374	4	11	160	224	1,159
	5-6	12.7	0.241	320	2	9	252	56	1,984
	6-7	14.6	0.277	282	3	104	403	112	2,760
	7-8	15.1	0.287	257	4	6	466	112	3,086
	8-9	15.2	0.289	220	3	5	464	112	3,053
	9-10	13.8	0.262	150	3	5	322	112	2,333
	10-11	16.9	0.321	324	47	8	226	672	1,337
	13-14	17	0.323	236	3	5	88	224	518
	14-15	20.4	0.388	299	4	4	36	168	176
	15-16	19.8	0.376	247	4	5	29	168	146
	16-17	14.6	0.277	150	8	5	19	336	130
	17-18	13.6	0.258	236	14	5	30	336	221
	18-19	5.9	0.112	87	3	4	11	112	186
	19-20	7.8	0.148	66	2	4	11	168	141
DA-SB-03	0-1	14.4	0.274	135	97	8	43	168	299
	1-2	15.5	0.295	135	31	4	19	560	123
	2-3	14.9	0.283	191	21	4	82	336	550
	3-4	12.5	0.238	303	34	3	117	504	936
	4-5	12.8	0.243	285	2	3	113	224	883
	5-6	13.9	0.264	326	8	3	175	224	1,259
	6-7	17.1	0.325	341	7	4	216	224	1,263
	7-8	17.8	0.338	294	15	4	217	280	1,219
	8-9	13.9	0.264	130	5	4	93	224	669
	9-10	17.6	0.334	119	3	5	117	672	665
	10-11	21.9	0.416	148	4	5	214	168	977
	11-12	20.2	0.384	143	4	2	221	168	1,094
	12-13	19.6	0.372	152	3	4	256	168	1,306
	13-14	17.1	0.325	142	3	7	237	168	1,386
	14-15	19.8	0.376	158	3	5	242	168	1,222
	15-16	17.8	0.338	109	4	4	162	112	910
	16-17	13.5	0.257	89	4	4	101	112	748
	17-18	12	0.228	68	11	5	80	224	667
	18-19	9.1	0.173	86	7	5	98	224	1,077
	19-20	5.5	0.105	0	2	5	46	112	836
GDS-SB-02	0-1	13	0.247	1580	79	9	288	896	2,215
	1-2	12.3	0.234	1040	13	5	210	672	1,707
	2-3	6.2	0.118	174	8	5	49	336	790
GDS-SB-03	0-1	21.8	0.414	351	510	18	42	3530	193
	1-2	14	0.266	341	120	4	159	728	1,136
	2-3	8.1	0.154	89	23	5	76	336	938
	5-6	4.5	0.086	17	26	4	19	168	422
	6-7	4.9	0.093	8	5	5	6	56	122
	7-8	4.7	0.089	8	4	4	2	56	43
	8-9	4.7	0.089	11	4	4	2	0	43
	9-10	4.8	0.091	11	3	4	2	0	42
	10-12	7	0.133	35	150	6	17	616	243
	13-15	4.9	0.093	4	4	2	2	56	41
	15-17.5	5.2	0.099	8	33	3	4	112	77
	17.5-18.8	4.3	0.082	5	3	3	2	0	47



16. DA-SB-03 was completed in the older compost area on D&A Dairy. The nitrate had infiltrated the complete sample depth at concentrations as high as 1300 mg/l in the pore water and 256 mg/kg in the soil. The nitrate occurs in the soil moisture below any root depth, although there are no plants at the surface to uptake the nutrients. As a result, this contamination will continue to migrate down to the ground water under the force of gravity along preferential flow paths.



17. DA-SB-02 was completed in the D&A Dairy compost area. Nitrate concentrations in the soil are as high as 466 mg/kg and over 3,000 mg/l in the pore water. These data indicate that the compost areas are a major source of nitrate contamination, even more so than previous data from Cow Palace and Bosma indicated.



18. Two additional borings were done at the George DeRuyter & Sons facility, one encountered refusal at 5 feet and the second was completed to 18.8 feet. The area of the second boring had been used for composting operations for about 3 years. These data are significant because they show a good correlation with moisture, but more importantly, show nitrate infiltration to 5 feet with an increase in concentration in a sand zone at 10' below ground surface. Again, this data indicates nitrate impacts from the composting operation are present, migrate in soil moisture and occur relatively quickly.

19. The different lengths of time that DeRuyter has composted at the D&A and GDS facilities indicate the cumulative effect of leaching from compost facilities that are on permeable surfaces will cause or contribute to groundwater contamination. It is just a matter of time before the cumulative nitrate migrates to preferential flowpaths. The D&A facility has been used long enough to show the serious cumulative effects of the nitrogen loading, while the GDS compost area shows that the area will continue to be a contributing source.

20. The high concentrations released from compost operations dictate the need for corrective measures. All compost operations should be completed on impermeable surfaces, as I have indicated in my past expert reports. In addition to those measures, Defendants could also use vacuum pipes in their compost piles, and by controlling the moisture, the composting process could be shortened and the odor controlled with biofilters. All leachate and liquid from the manure piles would need to be contained and applied to the compost piles, as needed.

21. In conclusion, the newest information and data I have seen provides further support for the opinions expressed in my earlier expert reports. The mass of nutrients discharged to the ground by the lagoons, application fields compost operations, and animal pens reinforces the need for corrective

measures at the facilities. Unfortunately, source control may not be sufficient to decrease the ground water impacts in a reasonable time frame, given the mass of contaminants in the soil column. Additional active ground water remediation, such as hydraulic control of the plume and removal of nitrates from the water table, may be required to decrease the extent or magnitude of the plume within a time frame that would benefit the residences that rely on the aquifer for drinking water.

Dated: April 30, 2015

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