

Date: June 20, 2013

To: Central Valley Regional Water Quality Control Board

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**Re: Submission of Evidence and Policy Statement regarding Hearing on
Administrative Civil Liability Complaint R5-2013-0539**

A. Introduction.

We are James G. Sweeney and Amelia M. Sweeney, doing business as Sweeney Dairy, and are the “Dischargers” named under the Central Valley Regional Water Quality Control Board’s Administrative Civil Liability Complaint R5-2013-0539 (Complaint). Our address is 30712 Road 170, Visalia, CA 93292. Our telephone number is (559) 280-8233 and our email address is japlus3@aol.com. The Central Valley Regional Water Quality Control Board shall hereinafter be referred to as the “Regional Board,” and the State Water Resources Control Board shall hereinafter be referred to as the “State Board.”

B. Statement of Facts/Background.

1. We operate a small dairy at 30712 Road 170, Visalia, CA. We milk around 300 cows on a site where a dairy has continuously been conducted for over eighty years.

2. The Regional Board's Order No. R5-2007-0035 (2007 Order) compelled us, along with all other dairymen, to prepare and file all of the following reports with the Regional Board by July 1, 2009. The Regional Board amended the 2007 Order in 2009 with Order No. R5-2009-0029 (2009 Order) in which the filing date for these reports was extended for one year, to July 1, 2010. The 2009 Order cited financial distress in the dairy industry as the justification for the extension.

The 2009 Annual Report, due on July 1, 2010, consisted of an Annual Dairy Facility Assessment for 2009, and a Waste Management Plan (WMP), consisting of the following reports:

- (a) Retrofitting Plan for needed improvement to storage capacity, flood protection or design of the production area.
- (b) Dairy site and Cropland maps.
- (c) Wastewater lagoon capacity evaluation.
- (d) Flood protection evaluation.
- (e) Dairy and cropland design and construction evaluation.
- (f) Cross-connection assessment report.

The 2010 and 2011 Annual Reports, due on July 1, 2011 and July 1, 2012, respectively, consisted of the following reports:

- (a) Nutrient Monitoring Element:
 - i. Waste Water, amounts and test results
 - ii. Manure, amounts and test results
 - iii. Crop, amounts and test results
- (b) Groundwater Monitoring Element (domestic and ag wells), test results.
- (c) Certification of Nutrient Monitoring Program "retrofitting."
- (d) Certification of storage capacity "retrofitting."
- (e) Certification of flood protection "retrofitting."
- (f) Certification of housing and manure storage area "retrofitting."

The 2007 Order required most of the 2009, 2010 and 2011 reports, technical and otherwise, to be prepared by licensed professionals/engineers and consultants, with all of the sample testing to be done by licensed laboratories, all of which were very expensive.

3. Since 2008, the dairy industry has suffered through a number of periods characterized by a combination of low milk prices and high feed costs that have been unprecedented in recent memory. Virtually all dairies, large and small, have had to borrow substantially in order to remain in business. Most dairymen have not yet financially recovered from these challenges. Indeed, the Regional Board's 2009 Order acknowledged the seriousness of the situation by postponing for a year the filing date for most of the 2009 reports.
4. Environmental groups have often been critical of large dairies, referring to them as "mega dairies" and "factory farms." Larger dairies discharge larger volumes of waste and generally pose a greater potential threat to our groundwater. Yet, in adopting the 2007 Order, the Regional Board imposed very costly monitoring and reporting requirements

that are pretty much the same for all dairies, regardless of size. Because smaller dairies have fewer cows over which to spread these fixed regulatory costs, it is much more burdensome, and puts them at an even greater competitive disadvantage. In some cases it is even fatal, for we know of a number of small dairies who told us that they sold out because they could not afford the costs of complying with the new reporting requirements adopted in the 2007 Order.

5. The Regional Board's staff has supplied us with data (broken down by herd size) that show the number of dairies that filed reports in the Fresno Office in 2010, versus 2007. While there was less than a 1% decline in the number of large dairies (over 700 cows) filing reports between 2007 and 2010, there were 36% fewer medium sized dairies (between 400 and 700 cows), and 46% fewer small dairies (less than 400 cows) that filed reports in 2010 than did in 2007. So the evidence is not just anecdotal; it is quite compelling that it was the smaller dairies that were disappearing in much larger measure during this financially stressful period. There should be no dispute that the Regional Board's costly reporting requirements as set forth in the 2007 Order are a contributing reason why large dairies are growing even larger, and they are taking over the production lost by the small dairies going out of business.
6. As a result of the financial situation in which we found ourselves in 2009 and 2010, we wrote a letter dated March 28, 2010 to the Regional Board's staff – more than three months before the July 1, 2010 filing deadline - in which we asked for a waiver from submitting these reports. We wrote a follow-up letter dated April 7, 2010 to the Regional Board staff in which we requested a one-year suspension of filing the reports. Anticipating that the staff would refuse to grant said relief, we stated in both of these letters that if they were unable to grant our request, to please schedule the matter for a face-to-face hearing before the Regional Board at a future meeting so that we could present our request for relief to the Board.
7. The Regional Board's staff replied to our March 28 and April 7 letters by a letter dated June 15, 2010. They did not agree to our request to a one-year suspension, and they refused to schedule a hearing before the Regional Board, as we had asked. Instead, they advised us that we could address the Board during the "Public Forum" section of their agenda. Such presentations are limited to three (3) minutes.
8. In a letter dated June 27, 2010, we again asked the staff to schedule a hearing before the Regional Board, and it was ignored.
9. In a letter to the Regional Board's staff dated August 22, 2010 we again mentioned our request for a hearing before the Regional Board. The staff continued to ignore our request. We later found out why. At the July 14, 2011 hearing before the Hearing Panel, Mayumi Okamoto, one of the Regional Board's legal counsel, stated that "the decision to place a matter on the agenda remains with the discretion of your [Regional Board's] management in consultation with the Executive Officer as the *gatekeeper*." Regional Board staff member, Clay Rodgers, also testified that "Mr. Sweeney did approach us to ask for an extension. We decided that an extension, as the *gatekeepers* to the Board, that

the extension of the Waste Management Plan had already been granted. ... And we did not feel that the extension of the annual report would be appropriate.”

While the Regional Board may delegate some of its powers and duties, some are not delegable. According to Section 13223 (a) of the California Water Code, the modification of any waste discharge requirement is one of those powers and duties that is not delegable. It is the Regional Board’s nondelegable duty and responsibility to hear and decide, or to refuse to hear and decide, our request for a modification of the waste discharge requirements contained in the 2007 Order. Since Section 13223 (a) grants only the Regional Board the authority to make such determinations, Ms. Okamoto and Mr. Rodgers were both admitting that the staff operated outside their legal authority.

10. On May 10, 2011 an Administrative Civil Liability Complaint, R5-2011-0562, (2011 Complaint) was served on us for failing to file the July 1, 2010 reports, and seeking civil penalties against us in the amount of \$11,400.00. Oddly, the Complaint prejudicially failed to mention our multiple efforts to schedule a hearing before the Regional Board to seek relief.
11. On July 1, 2011, the 2010 Annual Reports became due, but we did not file them as we were still seeking a hearing before the Regional Board to obtain relief from having to file them.
12. On September 21, 2011, we emailed Alex Mayer, one of the Regional Board’s legal counsel, wherein we again asked that a hearing be scheduled before the Regional Board where we could ask the Board for a modification of the reporting requirements of the 2007 Order.
13. We were advised by Mr. Mayer’s email dated September 29, 2011 that he had no authority to schedule the hearing we requested before the Board, but that we could appear before the Board as “a member of the public” and would be allowed only three minutes to speak during their “public forum” section of their agenda.
14. We sent a document to Mr. Mayer, dated October 2, 2011, which included another written request for a hearing before the Regional Board where we could request a modification of the reporting requirements. The document included evidence and arguments in support of the request.
15. We appeared at the hearing on the 2011 Complaint before the Regional Board on October 13, 2011. Mr. Mayer mentioned our October 2 document, but recommended that it not be accepted into the record. Chair Hart, without asking us for our response, immediately ruled that it would not be accepted. She then informed us that we would only be given five minutes and that it would be limited to evidence regarding dairy herd size data (not a particularly significant issue). I began reading a two-page presentation, beginning with an introduction. One minute into the presentation, just as I was about to request a hearing for a modification of the 2007 Order’s reporting requirements, Board legal counsel Okamoto interrupted me and objected to what I was requesting. Chair Hart responded by telling me

the following untrue statement: “We are fully advised what your position is.” She then ordered me to limit my comments to just the herd size data.

I began commenting on the herd size data. However, during that time, the Chair, Mr. Landau and both legal counsel interrupted me, debated the herd size issue, and ended up taking up much of my five minutes. Then Chair Hart stopped me and said “Thank you Mr. Sweeney and your time is up.” The Regional Board then went ahead and adopted the proposed order for civil liability against us in the amount of \$11,400.00.

16. We were sent an email on October 25, 2011 by Ken Landau, Assistant Executive Officer of the Regional Board in which he listed the documents that had been “made available to the Board members for their consideration at the 13 October hearing.” Our document of October 2 was not on that list. Therefore, the record seems clear that our request for a modification hearing was not read or considered by the Regional Board in connection with the actions it took at the October 13 hearing.
17. On November 9, 2011, we appealed all of the Regional Board’s decisions at its October 13, 2011 hearing by filing a Petition for Review with the State Water Resources Control Board (A-2190). Said petition/appeal is still pending decision before the State Board.
18. On May 9, 2012 an Administrative Civil Liability Complaint, R5-2012-0542 (2012 Complaint), was mailed to us for failing to file the July 1, 2011 reports. The Complaint sought civil penalties against us in the amount of \$7,650.00. The Complaint failed to mention our efforts to secure a hearing before the Regional Board to obtain relief from these reporting requirements. It also failed to note that the Regional Board failed to grant us such a hearing, and that this failure was under appeal by us to the State Water Resources Control Board.
19. On May 4, 2012, the Regional Board mailed us a “Groundwater Monitoring Directive,” ordering us to install either (a) an individual groundwater monitoring system at our dairy, or (b) join a representative monitoring program (RMP) that will monitor groundwater at a set of representative facilities.
20. On May 30, 2012, we filed a Petition for Review with the State Board appealing the Regional Board’s adoption of the foregoing Directive. Said petition/appeal is still pending decision by the State Board.
21. The Regional Board held their hearing on the 2012 Administrative Civil Liability Complaint on August 2, 2012. During my oral presentation at the August 2 hearing, I asked the Board if it would grant us a hearing in the future wherein we could fully present all of our evidence and arguments in support of modifying the 2007 Order’s reporting requirements as it applied to us. Without giving me an opportunity to further explain why the granting of such a hearing would be justified, and without discussing it with the other board members, or having the board vote on it, Chair Longley simply declared “My answer to that would be no,” and then he moved on. In preventing us from presenting our evidence and arguments for the appropriateness of giving us such a

hearing in the future, and in not allowing the Board members to participate and vote on the issue, the Chair issued a unilateral, arbitrary and capricious edict, one that clearly violated Water Code section 13223 (a) and deprived us of due process.

22. In addition, our request for a modification hearing was contained in our Written Testimony dated July 20, 2012, which we sent to counsel Alex Mayer with our request to submit it to the Regional Board members before the hearing. Our review of the documents submitted to the Board prior to the hearing did not include this document – another instance where our evidence and arguments were suppressed by the Board’s staff and kept from the attention and review of the Board members.
23. At the end of the August 2, 2012 hearing, the Regional Board voted to adopt Order no. R5-2012-0070, imposing an administrative civil liability penalty of \$7,650.00 on us for failing to file the Annual Reports due July 1, 2011.
24. Had the Regional Board granted us a full hearing prior to the issuance of the 2010, 2011 and 2012 Complaints, as we had requested over and over, there is the possibility that the Board could have granted us relief from some or all of those reporting requirements due by July 1, 2010, July 1, 2011, and July 1, 2012, respectively, in which case, we would not be in violation of these reporting requirements.
25. On August 26, 2012, we appealed all of the Regional Board’s decisions at its October 13, 2011 hearing, including its order no. R5-2012-0070, by filing a Petition for Review with the State Water Resources Control Board. Said petition/appeal is still pending decision before the State Board.
26. The Regional Board cannot contend that we have violated the 2007 Order’s reporting requirements due on July 1, 2010, July 1, 2011, and July 1, 2012 until such time as the Regional Board members have heard our arguments for the appropriateness of a modification of the 2007 reporting requirements, and have voted to deny the same, and until we have exhausted our appeal and all other legal remedies afforded us under the Water Code with regard to this issue (Water Code Sections 13320, 13325, and 13330). Hence, the filing and serving on us of this 2013 Complaint at this time and under these circumstances is premature and constitutes a violation of due process and our rights as clearly set forth in the Water Code.

C. Documents/Evidence.

We are required to identify and provide all documents and other evidence that we intend to use or rely upon at the hearing. At the present time we intend to use or rely upon the following, which we submit by reference because they are believed to already be in the files or otherwise in the possession of the Regional Board:

1. Regional Board Report of Compliance Inspection for Sweeney Dairy, dated December 31, 1998.
2. Regional Board Inspection Report letter for Sweeney Dairy, dated April 7, 2003.
3. Letter from the Regional Board to us, dated October 15, 2003, regarding our groundwater supply well test results:

Irrigation Well #1 Nitrate (NO ₃)	2.0	mg/L
Domestic Well “ “	3.2	mg/L
4. Certificate of Analysis from BSK Laboratories to us, dated November 6, 2007, regarding our groundwater supply well test results:

Irrigation Well #1 Nitrate (NO ₃)	1.1	mg/L
Irrigation Well #2 “ “	1.2	mg/L
Domestic Well “ “	3.2	mg/L
5. Reports from FGL Environmental to us, dated July 14, 2010, regarding our groundwater supply well test results:

Irrigation Well #1 Nitrate (NO ₃)	1.1	mg/L
Irrigation Well #2 “ “	.2	mg/L
Domestic Well “ “	1.4	mg/L
6. Letter from Farm Credit West to us dated September 30, 2009.
7. Dairy Inventory Worksheet, dated December 12, 2009, prepared by us for Farm Credit West.
8. Jim Sweeney letter to the Regional Board dated March 28, 2010.
9. Jim Sweeney letter to the Regional Board dated April 7, 2010.
10. Regional Board letter to the Sweeneys dated June 15, 2010.
11. Jim Sweeney letter to the Regional Board dated June 27, 2010.
12. Regional Board Notice of Violation sent to the Sweeneys on August 16, 2010.
13. Jim Sweeney letter to the Regional Board dated August 22, 2010.

14. Regional Board letter to Sweeneys from Clay Rodgers dated May 5, 2011 re Administrative Civil Liability Complaint R5-2011-0562.
15. Administrative Civil Liability Complaint, R5-20011-0562, (2012 Complaint) against James G. and Amelia M. Sweeney, dated May 5, 2011(together with all attachments, including the Hearing Procedures).
16. Jim Sweeney letter to the Regional Board dated May 15, 2011.
17. Jim Sweeney letter to the Regional Board dated May 31, 2011.
18. Sweeneys' Written Testimony and Arguments to the Regional Board, dated July 8, 2011, regarding 2011 Complaint.
19. Transcript of July 14, 2011 hearing before the Hearing Panel regarding 2011 Complaint.
20. Jim Sweeney letter to Alex Mayer dated September 5, 2011.
21. Email from Alex Mayer (Regional Board legal counsel) to Jim Sweeney dated September 20, 2011.
22. Jim Sweeney letter to Alex Mayer dated September 21, 2011.
23. Email from Alex Mayer to Jim Sweeney dated September 29, 2011
24. Second email from Alex Mayer to Jim Sweeney dated September 29, 2011.
25. Jim Sweeney letter to Alex Mayer dated September 30, 2011.
26. Sweeneys' Written Testimony and Arguments to the Regional Board, dated October 2, 2011.
27. Transcript of hearing held on October 13, 2011 before Regional Board regarding the 2011 Complaint.
28. Email from Ken Landau to Jim Sweeney dated October 25, 2011.
29. Sweeneys' Petition for Review to the State Board regarding the Regional Board's decisions at the October 13, 2011 hearing on the 2011 Complaint.

30. Groundwater Monitoring Directive from the Regional Board to Sweeneys, dated May 4, 2012.
31. Letter from Douglas Patten to Sweeneys, dated May 23, 2012.
32. Email from Clay Rodgers to Jim Sweeney, dated May 27, 2012.
33. Sweeneys' Petition for Review to the State Board, dated May 30, 2012, regarding the Groundwater Monitoring Directive.
34. Sweeneys' Written Testimony and Arguments to the Regional Board, dated July 20, 2012, regarding the 2012 Complaint.
35. Transcript of hearing held on August 2, 2012 before the Regional Board regarding the 2012 Complaint.
36. Sweeneys' Petition for Review to State Board, dated August 26, 2012, regarding the Regional Board's decision at the August 2, 2012 hearing on the 2012 Complaint.
37. Order No. R5-2007-0035, "Waste Discharge Requirements General Order for Existing Milk Cow Dairies."
38. The Administrative Record of all Public Hearings and Public Input, upon which Order R5-2007-0035 was based and adopted.
39. Water Quality Control Plan for the Tulare Lake Basin (2nd ed., 1995) and subsequent amendments thereto.
40. State Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California."
41. Final Report of Brown, Vence & Associates, "Review of Animal Waste Management Regulations – Task 4 Report (November, 2004)." While we believe that your Agency is in possession of a copy, please advise if you do not.
42. Study Findings, Recommendations, and Technical Report (Parts I & II) of the University of California Extension, entitled "Manure Waste Ponding and Field Application Rates (March, 1973). Please advise if your agency does not have a copy.

43. NRCS Guidelines for Water Treatment Lagoons, Natural Resources Conservation Service Conservation Practice Standards, Code 359 (July, 2000). Please advise if your agency does not have a copy.
44. “Impact of Dairy Operations on Groundwater Quality,” a research project conducted and a report prepared by the Lawrence Livermore National Laboratory in cooperation with the State Water Resources Control Board. The report was submitted to the State Board in August, 2009. We believe this report is in the possession of the Regional Board, and if it is not, please advise.
45. “Fate and Transport of Waste Water Indicators: Results from Ambient Groundwater and from Groundwater Directly Influenced by Wastewater,” a report prepared by the Lawrence Livermore National Laboratory in connection with the State Water Resources Control Board. We believe this report is in the possession of the Regional Board, and if it is not, it is available at the State Board’s website:
<http://www.swrcb.ca.gov/gamadocs.shtml>.

46. Jorge Bacca’s (Regional Board) reporting data by herd size for both 2007 and 2010.

[The documents listed as 47 through 51 below were attached as exhibits to our Submission of Evidence and Policy Statement submitted to the Regional Board on June 19, 2012 in connection with ACLC R5-2012-0542]

47. California Dairy Herd Improvement Association (DHIA) dairy herd size and numbers, Central Valley, 2011. (As Exhibit 1)
48. San Francisco Bay Regional Water Quality Control Board Resolution No. R2-2003-0094. (As Exhibit 2)
49. San Francisco Bay Regional Water Quality Control Board, Annual Certification Reporting Form, Dairy Waiver Compliance Documentation (As Exhibit 3)
50. North Coast Regional Water Quality Control Board Order No. R1-2012-0002. (As Exhibit 4).
51. North Coast Regional Water Quality Control Board Order No. R1-2012-0003. (As Exhibit 5)

[The documents listed as 52 through 67 below were attached as exhibits to our Petition for Review to the State Water Resources Control Board, dated May 30, 2012. A copy of same was mailed to the CVRWQCB on the same date.]

52. Letter to us from Dale Essary, dated August 22, 2011 (As Exhibit 1).
53. Letter from us to Dale Essary, dated September 30, 2011 (As Exhibit 2).
54. Letter to us from Douglas Patteson, dated November 9, 2011 (As Exhibit 3).
55. Letter from us to Dale Essary, Douglas Patteson, and Clay Rodgers, dated November 29, 2011 (As Exhibit 4).
56. Letter to us from Douglas Patteson, dated December 7, 2011 (As Exhibit 5).
57. Letter from us to Douglas Patteson, Dale Essary, and Clay Rodgers, dated January 17, 2012 (As Exhibit 6).
58. Certified letter to us from Regional Board (Groundwater Monitoring Directive) (Pamela C. Creedon) dated May 4, 2012 (As Exhibit 7).
59. Letter from us to Clay Rodgers, dated May 11, 2012 (As Exhibit 8).
60. Letter to us from Douglas Patteson, dated May 23, 2012 (As Exhibit 9).
61. Email from Clay Rodgers to us, dated May 27, 2012 (As Exhibit 10).
62. Webpage of Dairy Cares Central Valley Dairy Representative Monitoring Program and Fact Sheet (<http://www.dairycares.com/CVDRMP>) (As Exhibit 11).
63. Letter from us to Douglas Patteson and Dale Essary, dated May 29, 2012 (As Exhibit 12).
64. Email to us from J. P. Cativiela of the Central Valley Dairy Representative Monitoring Program, dated May 29, 2012 (As Exhibit 13).
65. Letter to us from Dale Essary, dated July 19, 2012.
66. Letter from us to Regional Board, dated March 26, 2013.
67. Letter to us from Regional Board, dated April 19, 2013.

At the present time we also intend to use the following document at the hearing, which we attach to this submission as Exhibit A:

68. A peer-reviewed paper entitled, “When Does Nitrate Become a Risk for Humans?,” authored by David S. Powlson, Tom M. Addicott, Nigel Benjamin, Kenneth G. Cassman, Theo M. de Kok, Hans van Grinsvin, Jean-Louis L’hirondel, Alex A. Avery and Chris Van Kessel, and published in the *Journal of Environmental Quality* 37:291-295 (2008).

D. Witnesses.

1. Jim Sweeney. His testimony and arguments are set forth herein. He will take 30 minutes.
2. Clay L. Rodgers.
3. Dale E. Essary.
4. Douglas K. Patteson.

Either Mr. Rodgers, Essary or Patteson need to be prepared to identify the location of the representative groundwater monitoring wells administered by Dairy CARES’ Central Valley Dairy Representative Monitoring Program (CVDRMP) that are nearest to our dairy, and to explain why the results of those wells are meaningful to the Sweeney dairy site. Together, the examination of these witnesses should take 10 minutes.

We also reserve our right to use other evidence and witnesses not listed above if any come to light during the course of continuing to develop our case. We will notify you when such evidence or witnesses become known.

E. Legal Arguments and Analysis.

1. The Administrative Civil Liability Complaint (R5-2012-0542) is legally defective because it is premature and is the result of us being deprived of due process.

- (a) The 2007 Order declares that it “serves as general waste discharge requirements of waste from existing milk cow dairies ... of all sizes.” (2007 Order, p.1) The Order describes the procedures where a Discharger makes a request for a modification of the Order or of any of its general waste discharge requirements. (2007 Order, SPRR-2) The reporting requirements, including the filing deadlines for annual and technical reports, are part of the Order’s general waste discharge requirements for which someone like us may seek modification, exemption or other similar relief.
- (b) Addressing waste discharge requirements, Section 13263 (e) provides that “(e) Upon application by any affected person, or on its own motion, the regional board may review and revise requirements ...” Therefore, we, as affected persons, have the right to apply to the Regional Board for a *modification* or *revision* of the general waste

discharge requirements, including the reporting requirements contained in the 2007 Order.

- (c) Section 13269 (a) (1) and (2) of the Water Code goes on to say that a regional board may *waive* waste discharge requirements (dealt with in section 13263) as they apply to the performance of an individual, such as ourselves.
- (d) Section 13223 (a) of the Water Code specifies that the regional board may not delegate modification of waste discharge requirements. It is the regional board's undelegable duty and responsibility to hear and decide our request for relief from these waste discharge requirements. The staff cannot appoint itself as the "gatekeepers" in these matters, and the board is prohibited under section 13223 (a) and other applicable law to appoint the staff as "gatekeepers." We have a right to appear before the Regional Board to ask for a modification or waiver from any of the Order's general waste discharge requirements. Even a decision to not hear our request for relief would have to be made by the Regional Board - not by its staff. The evidence in the record is that our requests for such a hearing were never communicated to the Board by the staff and there is no evidence in the record that the Board deliberated and voted on whether to grant us such a hearing. Even if the Board had, they did not give us the opportunity to argue before them why such a hearing should be granted. In preventing our request for such a hearing from being heard and decided by the Board, the staff acted unlawfully and beyond their statutory authority. They deprived us of due process and violated our civil rights.
- (e) Had the Regional Board's staff scheduled such a hearing before the Board, as we had requested over and over, there is the possibility that the Board would have granted us relief from some or all of those reporting requirements, including the July 1, 2011 deadline, in which case, we would not be in violation of the reporting requirements. The Regional Board cannot contend that we have violated the 2007 Order's reporting requirements due on July 1, 2011 until such time as the Regional Board has heard and denied our request and after we have exhausted our appeal and all other legal remedies afforded us under the Water Code. (Water Code Sections 13320, 13325, and 13330) Thus, the filing and serving of the 2012 Complaint is premature.

2. Order R5-2007-0035 is unlawful and unenforceable against us because it fails to comply with applicable law, including provisions of the Water Code and Government Code.

(a) The need for the 2007 Order is not supported by substantial evidence.

No rule or regulation of a state agency is valid and enforceable unless the administrative record shows that it is supported by substantial evidence. We have reviewed all 34,000 pages of the administrative record of the hearings held in

connection with the adoption of the 2007 Order, and we found no substantial evidence – in fact, no evidence whatsoever – that supports the need to replace the former reporting requirements with the new reporting requirements adopted in the 2007 Order. We have encountered no evidence in the record that the data, reports and information that the Regional Board staff obtained from or about dairies prior to the 2007 Order were inadequate, insufficient, unreliable or otherwise flawed. And we have encountered no evidence in the record that claimed or demonstrated that the new reporting requirements were necessary or needed to replace the former. We made this argument to the Regional Board in connection with the 2011 and 2012 Complaints. In both instances, and the Regional Board staff failed to prove otherwise.

(b) The Regional Board has not shown the need for the reports specified in the 2007 Order and has not justified their burden.

The “Monitoring and Reporting Program” of the 2007 Order recites that it is issued pursuant to Water Code Section 13267. (2007 Order, p. MRP-1) Section 13267 (b) (1) states that “the regional board may require that any person who ... discharges ... waste within its region ... shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires.”

But Section 13267 (b) (1) goes on to say that “The burden, including costs, of the reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring these reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.”

The Regional Board failed to comply with Section 13267 in that the 2007 Order does not contain “a written explanation with regard for the need for the reports,” and it fails to “identify the evidence that supports requiring [us] to provide the reports.” In addition, the Regional Board never provided us with “a written explanation with regard for the need for the reports,” and it did not “identify the evidence that supports requiring [us] to provide the reports.”

Over the years, the Regional Board’s staff visited our dairy site to inspect and obtain information about it. For example, staff member Ken Jones visited our dairy in 2003 and spent one day gathering information. He measured and calculated the storage capacity of our three waste water lagoons and concluded that our storage capacity exceeded what the Regional Board required. In fact, it was 128% of what was required. He also concluded that we had sufficient cropland for application of waste water. We have his letter dated April 17, 2003, confirming that our dairy was in full compliance with all Regional Board requirements. We are prepared to submit evidence that our dairy has essentially the same number of animals, the same lagoon capacity and even more cropland now than we had in 2003.

A dairy has been continuously operating on our site for over eighty years. We have submitted to the Regional Board staff test results from water samples taken from each of our supply wells in 2003, 2007 and 2010. The results have ranged between .2 and 3.4 mg/L, all incredibly low levels. All well results were and are substantially below the state's maximum contaminant levels (MCL); in fact, they are incredibly low.

We have argued to the Regional Board staff that these test results that we have submitted to them in the past are compelling evidence that our operation was and is not adversely impacting ground water, and therefore the cost of filing these reports due July 1, 2011 did not and do not, in the words of Section 13267, "bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports." But the Regional Board recently brushed off these results by telling us that "Groundwater supply wells are typically screened in deeper aquifer zones ... groundwater quality data collected from the Dairy's on-site supply wells do not necessarily represent the quality of first encountered groundwater beneath the Dairy."

(c) The Regional Board has failed to show us the value of or need for joining a Representative Groundwater Monitoring Program.

1. The Regional Board's staff first informed us by letter dated August 22, 2011 that we would need to either install our own individual groundwater monitoring system at our dairy, or we would have to join a representative monitoring program (RMP) that would monitor groundwater at a set of representative facilities. In a letter we sent to the staff on September 30, 2011, we pointed out that Water Code section 13267 obligates a regional board to "provide a person with a written explanation with regard to the need for the reports," and that "these reports shall bear a reasonable relationship to the need for the reports." In order to determine the "need" for these groundwater monitoring well test reports, we wanted to ascertain how meaningful they needed to be in order for them to be acceptable. This is why we asked, "Where are their [Central Valley Representative Monitoring Program] monitoring wells located that would serve as the basis of information for our site?"

2. The Board's staff responded to our letter by letter dated November 9, 2011, but the letter never answered our question about the locations of the CVRMP groundwater wells. We had to ask again in a letter we sent Mr. Essary on November 29, 2011 as to the location of these CVRMP wells. Yet, the responding letter to us dated December 7, 2011 again failed to answer this very specific and direct question. We sent Clay Rodgers a letter dated May 11, 2012, which again called to his attention the obligations imposed by section 13267. Yet, we were sent another letter, this one dated May 23, 2012, that again failed to provide us with the locations of the CVRMP groundwater wells.

3. On May 4, 2012, the Regional Board issued a Directive, ordering us to implement groundwater monitoring at our dairy. The Directive claimed that it had the authority under section 13267 of the Water Code and under the 2007 Dairy Order (R5-2007-0035) to require us to do so. This Directive was communicated to us by letter dated May 23, 2012. One of the allegations of this Complaint is that we have violated this Directive and the 2007 Dairy Order by failing to install a groundwater monitoring system.

The relevant language of section 13267 of the Water Code reads: “the regional board may require that any person ... who ... discharges ... within its region ... shall furnish ... monitoring program reports which the regional board requires. The burden, including costs, shall bear a reasonable relationship for the need for the report and the benefits to be obtained from the reports. In requiring these reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring the person to provide the reports.”

The Regional Board also cited the following language found on page MRP-16 of the 2007 Order: “Pursuant to Section 13267, the Executive Officer will order Dischargers to install monitoring wells to comply with Monitoring and Reporting Program Order No. R5-2007-0035 based on an evaluation of the threat to water quality *at each dairy*. It is anticipated that this will occur in phases of 100 to 200 dairies per year.”

Both provisions indicate that the determination of whether to require a given dairy to provide monitoring well reports is to be made on a dairy-by-dairy, individual basis. Before a dairy can be required to implement a monitoring well program, the Regional Board must be aware of specific and compelling evidence that there is a need for such a costly program, and it must inform the dairyman of what specific evidence regarding his/her dairy supports the requiring of such reports.

Despite the foregoing, the Regional Board expressed the position in its May 23, 2012 letter that the foregoing language in the 2007 Order gave it the right to require *all dairies*, in phases of “100 to 200 dairies,” to install monitoring well systems. Indeed, the letter states that the Regional Board has issued directives to 260 dairymen to implement monitoring well programs, and that 1000 dairies have already joined “Representative Monitoring Programs.” This statement implies that *all dairies* in the Central Valley region either already participate or are being ordered to do so, without any effort being made by the Regional Board to evaluate each dairy individually. Thus, it appears that the Regional Board has engaged in a direct violation of the plain language of section 13267 and the 2007 Order, and has flagrantly violated its duties and obligations under the applicable laws.

Section 13263 of the Water Code provides that a Regional Board may prescribe requirements for dischargers, which it did in adopting the 2007 Order. However, section 13269 states that the Regional Board can waive any of these requirements,

including the monitoring requirements, as it applies to “an individual” by considering “relevant factors.”

We have consistently called to the staff’s attention that our dairy has continuously been the site of a dairy for over 80 years. We have pointed out to the Regional Board’s staff that the nitrate-nitrogen test results from our domestic and agricultural supply wells, which we began submitting in 2003. The results have ranged between .2 and 3.4 mg/L, all incredibly low levels. Yet, the Regional Board have brushed off these results by stating that “Groundwater supply wells are typically screened in deeper aquifer zones ... groundwater quality data collected from the Dairy’s on-site supply wells do not necessarily represent the quality of first encountered groundwater beneath the Dairy.”

The Regional Board had the audacity to say this after demanding for ten years that we test our supply wells and send them the results. Indeed, their 2007 Order, at page MRP-7, actually orders dairymen to “sample each domestic and agricultural supply well,” and submit the laboratory analysis for nitrate-nitrogen to it on an annual basis. For ten years they have been demanding these costly reports and now tell us that they are meaningless. Absolutely outrageous!

To make matters worse, the Regional Board has been advising dairymen, including us, that as an alternative, we can join a “Representative Monitoring Program,” and the results from monitoring wells that are not even close to a dairy can be submitted and they will be treated as satisfying the monitoring well requirement. Indeed, I wrote Douglas Patteson on May 27, 2012, and asked him what representative monitoring program the Regional Board would accept for my dairy. Clay Rodgers emailed me the same day and advised me that the Central Valley Dairy Representative Monitoring Program (CVDRMP), administered by Dairy CARES in Sacramento, covered Tulare County and that it would be an acceptable RMP for my dairy. I checked with Dairy CARS/CVDRMP and was advised by email dated May 29, 2012 that it would accept my application to join the program. I also discovered that the nearest CVDRMP monitoring wells were about 45 miles from my dairy. This will be treated by the Regional Board as meaningful information?

4. Section 648 (a) of Title 23 of the California Code of Regulations defines an “adjudicative proceeding” as a proceeding by which facts are determined pursuant to which a regional board issues a decision. Clearly, the Regional Board’s May 4, 2012 Directive to us was such a decision, and the deliberation leading up to the decision to issue the Directive comes under the purview of these adjudicative proceedings requirements. However, the Regional Board never afforded us the procedural rights to which we were entitled. We were not provided with an opportunity to confront or cross-examine any witnesses, allegations and evidence, and we were not allowed to present direct or rebuttal evidence or argument during its deliberations.

Even if it is determined that the proceedings are not considered “adjudicative proceedings” under these regulations, the Regional Board’s conduct in connection

with reaching its decision to issue this Directive violated fundamental constitutional principles of due process.

5. Mr. Essary sent us a letter dated July 19, 2012 reminding us of our need to install groundwater monitoring wells on our dairy or join an RMP. He threatened us with action if we did not comply, and he completely ignored our previous request for the locations of the RMP wells. We responded with a letter dated March, 26, 2013, in which we again asked for the location of the CVRMP groundwater wells. He sent us a letter dated April 19, 2013, which completely ignored our question, but warned us that the Regional Board would issue a Complaint against us if we did not install a monitoring well system on our dairy or join an RMP.

6. To put it bluntly: For quite a long time – for two years – the Regional Board’s staff has been very much aware of our request for this RMP information. The degree to which they have continuously dodged answering our requests would make anyone suspicious as to why. The reason they refuse to answer our questions about the location of the CVRMP groundwater wells, it seems transparently clear, is because they would be admitting that its Representative Monitoring Program with Dairy CARES is a reprehensible fraud, joke, and sham.

7. We are looking forward to examining your Board members at the upcoming hearing on this Complaint about this RMP option and how over 1000 dairies are enrolled in it. We intend to ask them how this program will provide meaningful information regarding what is going on at our dairy, or for that matter, at most individual dairies. We will also ask them who was responsible for developing this plan and whether the Board has been fully and accurately informed about it.

(d) The 2007 Order fails to implement the most modern and meaningful scientific findings and technologies.

Section 13263 (e) of the Water Code provides that “any affected person may apply to the regional board to review and revise its waste discharge requirements. All requirements shall be reviewed periodically.” If new and more cost effective ways can accomplish the same purpose, we contend that the above section imposes on the Regional Board a legal duty to review such issues and revise its requirements accordingly. New and old research and advanced technologies presently exist which may provide less expensive means for evaluating groundwater contamination risk, of determining non-contamination of groundwater, and of using less expensive practices that can still prevent such contamination.

For example, Lawrence Livermore National Laboratory published two papers in *Environmental Science Technology*, (2007) 41, 753-765. (The State Board has copies)

in which they stated that they discovered that soil bacteria break down and eliminate nitrates in dairy waste water in a substantial if not complete degree. They have also ascertained that there are certain compounds and gasses in manure water that can be used to determine whether water from dairy lagoons or from waste applied in irrigation water has infiltrated into first encountered groundwater. There are also simple and inexpensive ways to show the amount of highly compacted clay layers sitting beneath a dairy site and whether they constitute an impervious barrier between the dairy and the groundwater. Yet, the 2007 Order contains a “one-size-fits-all” approach, and generally requires reports that provide little to no meaningful information. Indeed, some of these reports are ludicrous and unnecessary. One example is that we are required to provide monthly photos of our lagoons to show that the water level was not too high during the month. This is as absurd as requiring us to photograph our speedometer to prove we didn’t drive over the speed limit during the month.

We have read all 34,000 pages of the administrative record leading up to the adoption of the 2007 Order. We have found no evidence in the record that supports or justifies the need to regulate nitrates, considering the levels found in the groundwaters of the Central Valley. Indeed, a peer-reviewed paper entitled “When Does Nitrate Become a Risk for Humans?”, co-authored by nine scientists from the U.S., the UK, France, Germany and the Netherlands, and published in 2008 in the *Journal of Environmental Quality*, have evaluated all the old studies done about the health impacts of nitrates on humans and it suggests that nitrates at the levels found in groundwater are not the health threat once believed. The paper further suggests that perhaps the current nitrate limits should be significantly raised because the health risks may be overstated.

In short, it would appear that the Order’s reporting requirements are excessive, unnecessary, overly burdensome, primitive, antiquated, obsolete, and provide nothing of real value, except for lining the pockets of engineers, consultants and laboratories. The Regional Board has not sufficiently examined and considered recent research results and advanced testing technologies, and it has not modified its Order accordingly. We made these arguments to the Regional Board during the hearings on the 2011 Complaint and on the 2012 Complaint. In both instances, these arguments were never challenged, rebutted or disputed by the Regional Board staff or their counsel.

(e) The 2007 Order fails to take into account economic considerations.

The 2007 Order’s waste discharge requirements as they relate to water quality objectives must take into account economic considerations. (Water Code Sections 13241 and 13263 (a)) The 2007 Order does not do so. It specifically fails to set or implement water quality objectives that are within the economic means of smaller dairies – operations that have to deal with disproportionately higher per cow reporting costs. Indeed, the Order fails to address the special economic circumstances of smaller dairies in any way whatsoever.

The administrative record (AR) of the 2007 Order consists of 34,000 pages of documents and testimony. A great deal of testimony was presented concerning how expensive the new reporting requirements would be, and how especially unbearable it would be for smaller dairies:

(1) There was testimony that the cost would be “as high as \$89,000.00 initially and \$58,000.00 annually per dairy.” (AR 002089) Mr. Souza testified that “some dairies will be out of business as a result of this waste discharge requirement ... (AR 000384).”

(2) Ms Asgill, an agricultural economist, testified that because of these regulations, “we are probably looking at the smaller dairies going under. Probably those dairies that we [are] usually fond of protecting – dairies under 500 milking cows - will be going out.” (AR 000444)

(3) A letter from the State Department of Food and Agriculture Board mentioned that Governor Schwarzenegger “made a commitment to reject new regulations that unfairly impact small business. ... It is expected that new and existing regulations will be reviewed for economic impact to small business. ... we encourage the RWQCB to review your proposal ... propose alternatives that are less burdensome.” (AR 007297)

(4) The Federal government presented input: The EPA’s Small Business Advocacy Panel submitted its recommendation to streamline the reporting requirements and that operations under 1000 animal units should be exempted from certain requirements. (AR 02397)

(5) The State Water Board expressed concern in its submission during the hearings that the proposed requirements “may have significant adverse economic impact on small business.” The State Board went on to recommend “different compliance or reporting requirements ... which would take into account the resources available to small business ... [and] exemption or partial exemption from regulatory requirements for small business.” (AR 019632)

(6) Even Regional Board member Dr. Longley expressed concern: “Whereas larger dairies, a 10,000 cow dairy, would be able to absorb the costs, a 100 cow dairy is going to be faced with possible disaster.” (AR 002163)

(7) In response to a written question submitted by Baywatch, Sierra Club, California Sportfishing Protection Alliance and Waterkeeper Alliance, the Regional Board staff gave them assurances that “the Board has the option of limiting the application of this order based on the *size of herd*,” and that “waste discharge requirements or a *waiver* of waste discharge requirements would be adopted for facilities that are not covered by the order.” (AR 000583)

(8) No economic analysis or evidence was presented into the record that disputed the testimony that the proposed 2007 Order would be harmful, even fatal, to smaller dairies.

Small dairies are under much greater economic stress than larger, more efficient dairies and, therefore, are less able to handle the high costs of complying with the 2007 Order’s reporting requirements.

As an example of how the 2007 Order adversely affects smaller dairies, Dairy Cares of Sacramento estimated the average cost for a dairy to install their own individual monitoring well system to be \$42,000.00, and thousands of dollars each year thereafter for ongoing sampling, testing and reporting. The cost of monitoring well programs, both the installation and the periodic reporting costs, are for the most part the same for large dairies as they are for small dairies. This means that the costs, on a per cow basis, are dramatically higher for small dairies, and contribute to small dairies being at a competitive disadvantage. Section 13241 of the Water Code requires the Regional Boards to take into account “economic considerations” in connection with its water quality objectives.

We requested data from the Regional Board staff that would reveal the report filing compliance rate of dairies, broken down by herd size. In response to our request, Jorge Baca, from the Regional Board, provided us with data concerning the dairies dealt with by its Fresno office. But the compliance rate is not what is most meaningful in this data. Rather it is the rate of loss of dairies, by herd size, since the adoption of the 2007 Order. This data shows the following with respect to the dairies that provided reports to the Fresno office:

Herd Size	2007	2010	Attrition
Less than 400 cows	56	30	-26 = 46% attrition
400 to 700 cows	92	62	-30 = 32% attrition
Over 700 cows	485	455	-30 = .6% attrition
Total	633	547	-86 = 13% overall attrition

In other words, only about half the number of smaller dairies filed reports in 2010 as compared to the number of smaller dairies that filed reports in 2007.

Not only are small dairies less able to deal with the high regulatory costs, they pose a dramatically smaller threat to the groundwater. California DHIA data shows that DHIA dairies in the San Joaquin Valley of our size or smaller represent less than 1/10 of 1% (.09%) of all DHIA cows in the San Joaquin Valley.

Other agencies recognize these facts. Both the North Coast Regional Water Quality Control Board and the San Francisco Bay Regional Water Quality Control Board have recognized how smaller dairies have a much smaller impact on groundwater,

and how they are less able to bear the same regulatory expenses and burdens that larger dairies can. These Regional Boards saw fit to adopt special performance and reporting relief for dairies under 700 cows (See Orders R1-2012-003 and R2-2003-0094, respectively).

In the case of the North Coast Region's Order R1-2012-0003, it declares that "this Order applies to dairies that pose a low or insignificant risk to surface water or groundwater." The Order goes on to say that "economics were considered, *as required by law*, during the development of these objectives," and "that a waiver of WDRs [waste discharge requirements] for a specific type of discharge is in the public best interest."

In the case of the San Francisco Bay Region, it requires smaller dairies to complete and file a two-page "Reporting Form" which does not require the involvement of expensive engineers.

In addition, the SJ Valley Air Pollution Control District exempts smaller dairies from many of its requirements.

Despite all of the foregoing, the Regional Board has refused to adopt any waivers, or make any special provisions for, or grant any reporting relief to smaller dairies, and none appear in its 2007 Order. Its refusal not only violates the law, but it puts smaller dairies in the Central Valley region at a greater competitive disadvantage with larger dairies in the Central Valley, and at a competitive disadvantage with small dairies in the North Coast and San Francisco Bay regions. Even Dr. Longley, who had earlier expressed concern with the adverse impact on smaller dairies, went ahead and voted to adopt the Order without it containing any such provisions.

(f) The 2007 Order is subject to the requirements of the California Administrative Procedure Act (APA).

The California Administrative Procedure Act (Chapter 3.5 of the California Government Code, Section 11340 et seq) is intended to keep the regulations of state agencies from becoming unreasonably costly and otherwise burdensome. Section 11340 of APA recites that the legislature found that "the complexity and lack of clarity in many regulations put small businesses, which do not have the resources to hire experts to assist them, at a distinct disadvantage." APA created the Office of Administrative Law to administer the Act. Section 11340.1 declares that it is the legislature's intent under APA for state agencies to "actively seek to reduce the unnecessary regulatory burden on private individuals." It is undisputed that the regional water boards are state agencies.

While Section 11340.9 (i) of APA states that this chapter does not apply to a number of matters, including a regulation that "does not apply generally throughout the state," it does apply however, under Section 11353, to "any policy, plan or guideline" that

(1) the State Water Resources Control Board has adopted after June 1, 1992, or (2) that a court determines is subject to this part. In other words, Section 11353 is a specific exception to the more general exception under 11340.9 (i). Section 11353 goes on to say that the policies, plans and guidelines adopted by the SWRCB are not effective until their regulatory provisions are approved by the Office of Administrative Law.

The Tulare Lake Basin Water Quality Control Plan of 1995 and its subsequent amendments are covered by APA because it is a “plan” adopted by the State Board in 1995. The Office of Administrative Law (OAL) has reviewed and approved this Plan and its amendments. The 2007 Order recites that its waste discharge requirements are an “implementation” of the Tulare Lake Basin Plan. Therefore, we contend that the 2007 Order and its WDRs should be considered a part of and an extension of said Plan. If the law requires a regional plan such as the Tulare Lake Basin Plan to be reviewed and approved by State Board and the OAL, then logic tells us that the waste discharge requirements adopted to implement the Plan should also be reviewed and approved by the OAL. Thus, it is our contention that the 2007 Order should have been reviewed and approved by the OAL.

The Government Code provides that if any regulation or order that should be reviewed and approved by the OAL is not, then the same is invalid and unenforceable. Because the 2007 Order was not reviewed and approved by the OAL, we contend that it is invalid and unenforceable.

Under Government Code sections 11350 and 11353, we have the right to file an action for declaratory relief with the superior court, under which we can ask the court whether this Order is a “regulation” that should be subject to the requirements of APA. Given the significant adverse impact that the Order has on small dairies, we are inclined to think a court would see fit to declare that the 2007 Order is subject to APA requirements, and that it is invalid and unenforceable because it did not follow its requirements.

F. Regional Board’s Attorneys.

We are aware that the attorney for the Advisory Team and the attorneys acting as part of and on behalf of the Prosecuting Team are all employees of the same employer - the State Water Resources Control Board. Moreover, the State Board is the agency to which we must appeal any adverse ruling by the Regional Board. Such a situation constitutes a clear conflict of interest, and we object to it. It is tantamount to attorneys from the same law firm representing the plaintiff, advising the judge and advising the appellate court to which the case is appealed. This is a situation that the State Bar vigilantly strives to prevent, and it has a robust history of imposing discipline on offending attorneys.

Respectfully submitted,

James G. Sweeney

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Exhibit A

1-1-2008

When Does Nitrate Become a Risk for Humans?

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<http://digitalcommons.unl.edu/agronomyfacpub/102>

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When Does Nitrate Become a Risk for Humans?

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Is nitrate harmful to humans? Are the current limits for nitrate concentration in drinking water justified by science? There is substantial disagreement among scientists over the interpretation of evidence on the issue. There are two main health issues: the linkage between nitrate and (i) infant methaemoglobinaemia, also known as blue baby syndrome, and (ii) cancers of the digestive tract. The evidence for nitrate as a cause of these serious diseases remains controversial. On one hand there is evidence that shows there is no clear association between nitrate in drinking water and the two main health issues with which it has been linked, and there is even evidence emerging of a possible benefit of nitrate in cardiovascular health. There is also evidence of nitrate intake giving protection against infections such as gastroenteritis. Some scientists suggest that there is sufficient evidence for increasing the permitted concentration of nitrate in drinking water without increasing risks to human health. However, subgroups within a population may be more susceptible than others to the adverse health effects of nitrate. Moreover, individuals with increased rates of endogenous formation of carcinogenic N-nitroso compounds are likely to be susceptible to the development of cancers in the digestive system. Given the lack of consensus, there is an urgent need for a comprehensive, independent study to determine whether the current nitrate limit for drinking water is scientifically justified or whether it could safely be raised.

Is nitrate harmful to humans? Are the current limits for nitrate concentration in drinking water justified by science? These questions were addressed at a symposium on “The Nitrogen Cycle and Human Health” held at the annual meeting of the Soil Science Society of America (SSSA). Although they sound like old questions, it became clear there is still substantial disagreement among scientists over the interpretation of evidence on the issue—disagreement that has lasted for more than 50 years.

This article is based on the discussion at the SSSA meeting and subsequent email exchanges between some of the participants. It does not present a consensus view because some of the authors hold strongly divergent views, drawing different conclusions from the same data. Instead, it is an attempt to summarize, to a wider audience, some of the main published information and to highlight current thinking and the points of contention. The article concludes with some proposals for research and action. Because of the divergent views among the authors, each author does not necessarily agree with every statement in the article.

Present Regulatory Situation

In many countries there are strict limits on the permissible concentration of nitrate in drinking water and in many surface waters. The limit is 50 mg of nitrate L⁻¹ in the EU and 44 mg L⁻¹ in the USA (equivalent to 11.3 and 10 mg of nitrate-N L⁻¹, respectively). These limits are in accord with WHO recommendations established in 1970 and recently reviewed and reconfirmed (WHO, 2004). The limits were originally set on the basis of human health considerations, although environmental concerns, such as nutrient enrichment and eutrophication of surface waters, are now seen as being similarly relevant. It is the health

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Published in *J. Environ. Qual.* 37:291–295 (2008).

doi:10.2134/jeq2007.0177

Received 10 Apr. 2007.

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issues that are the main cause of disagreement; the contrasting views are set out in the following two sections.

Nitrate and Health

There are two main health issues: the linkage between nitrate and (i) infant methaemoglobinaemia, also known as blue baby syndrome, and (ii) cancers of the digestive tract. The evidence for nitrate as a cause of these serious diseases remains controversial and is considered below.

An Over-Stated Problem?

The link between nitrate and the occurrence of methaemoglobinaemia was based on studies conducted in the 1940s in the midwest of the USA. In part, these studies related the incidence of methaemoglobinaemia in babies to nitrate concentrations in rural well water used for making up formula milk replacement. Comly (1945), who first investigated what he called "well-water methaemoglobinaemia," found that the wells that provided water for bottle feeding infants contained bacteria as well as nitrate. He also noted that "In every one of the instances in which cyanosis (the clinical symptom of methaemoglobinaemia) developed in infants, the wells were situated near barnyards and pit privies." There was an absence of methaemoglobinaemia when formula milk replacements were made with tap water. Re-evaluation of these original studies indicate that cases of methaemoglobinaemia always occurred when wells were contaminated with human or animal excrement and that the well water contained appreciable numbers of bacteria and high concentrations of nitrate (Avery, 1999). This strongly suggests that methaemoglobinaemia, induced by well water, resulted from the presence of bacteria in the water rather than nitrate per se. A recent interpretation of these early studies is that gastroenteritis resulting from bacteria in the well water stimulated nitric oxide production in the gut and that this reacted with oxyhaemoglobin in blood, converting it into methaemoglobin (Addiscott, 2005).

The nearest equivalent to a present-day toxicological test of nitrate on infants was made by Cornblath and Hartmann (1948). These authors administered oral doses of 175 to 700 mg of nitrate per day to infants and older people. None of the doses to infants caused the proportion of haemoglobin converted to methaemoglobin to exceed 7.5%, strongly suggesting that nitrate alone did not cause methaemoglobinaemia. Furthermore, Hegesh and Shiloah (1982) reported another common cause of infant methaemoglobinaemia: an increase in the endogenous production of nitric oxide due to infective enteritis. This strongly suggests that many early cases of infant methaemoglobinaemia attributed at that time to nitrate in well water were in fact caused by gastroenteritis. Many scientists now interpret the available data as evidence that the condition is caused by the presence of bacteria rather than nitrate (Addiscott, 2005; L'hirondel and L'hirondel, 2002). The report of the American Public Health Association (APHA, 1950) formed the main basis of the current recommended 50 mg L⁻¹ nitrate limit, but even the authors of the report

recognized that it was compromised by unsatisfactory data and methodological bias. For example, in many cases, samples of water from wells were only taken for nitrate analysis many months after the occurrence of infant methaemoglobinaemia.

About 50 epidemiological studies have been made since 1973 testing the link between nitrate and stomach cancer incidence and mortality in humans, including Forman et al. (1985) and National Academy of Sciences (1981). The Chief Medical Officer in Britain (Acheson, 1985), the Scientific Committee for Food in Europe (European Union, 1995), and the Subcommittee on Nitrate and Nitrite in Drinking Water in the USA (NRC, 1995) all concluded that no convincing link between nitrate and stomach cancer incidence and mortality had been established.

A study reported by Al-Dabbagh et al. (1986) compared incidence of cancers between workers in a factory manufacturing nitrate fertilizer (and exposed to a high intake of nitrate through dust) and workers in the locality with comparable jobs but without the exposure to nitrate. There was no significant difference in cancer incidence between the two groups.

Based on the above findings showing no clear association between nitrate in drinking water and the two main health issues with which it has been linked, some scientists suggest that there is now sufficient evidence for increasing the permitted concentration of nitrate in drinking water without increasing risks to human health (L'hirondel et al., 2006; Addiscott, 2005).

Space does not permit here to discuss other concerns expressed about dietary nitrate, such as risk to mother and fetus, genotoxicity, congenital malfunction, enlarged thyroid gland, early onset of hypertension, altered neurophysiological function, and increased incidence of diabetes. For differing views of other possible health concerns, see L'hirondel and L'hirondel (2002) and Ward et al. (2006).

Nitrate is made in the human body (Green et al., 1981), the rate of production being influenced by factors such as exercise (Allen et al., 2005). In recent years it has been shown that body cells produce nitric oxide from the amino acid L-arginine and that this production is vital to maintain normal blood circulation (Richardson et al., 2002) and protection from infection (Benjamin, 2000). Nitric oxide is rapidly oxidized to form nitrate, which is conserved by the kidneys and concentrated in the saliva. Nitrate can also be chemically reduced to nitric oxide in the stomach, where it can aid in the destruction of swallowed pathogens that can cause gastroenteritis.

Evidence is emerging of a possible benefit of nitrate in cardiovascular health. For example, the coronaries of rats provided water for 18 mo that contained sodium nitrate became thinner and more dilated than the coronaries of the rats in the control group (Shuval and Gruener, 1977). Nitrate levels in water showed a negative correlation coefficient with the standardized mortality ratio for all cardiovascular diseases (Pocock et al., 1980). In healthy young volunteers, a short-term increase in dietary nitrate reduced diastolic blood pressure (Larsen et al., 2006). Based on these data, one could hypothesize that nitrate might also play a role in the cardiovascular health benefit of vegetable consumption (many vegetables contain high concentrations of nitrate) (Lundberg et al., 2004).

The Need for Caution

Although there is little doubt that normal physiological levels of nitric oxide play a functional role in vascular endothelial function and the defense against infections (Dykhuizen et al., 1996), chronic exposure to nitric oxide as a result of chronic inflammation has also been implicated, though not unequivocally identified, as a critical factor to explain the association between inflammation and cancer (Sawa and Oshima, 2006; Dincer et al., 2007; Kawanishi et al., 2006). Nitric oxide and NO-synthase are known to be involved in cancer-related events (angiogenesis, apoptosis, cell cycle, invasion, and metastasis) and are linked to increased oxidative stress and DNA damage (Ying and Hofseth, 2007). Rather than nitrate, the presence of numerous classes of antioxidants is generally accepted as the explanation for the beneficial health effects of vegetable consumption (Nishino et al., 2005; Potter and Steinmetz, 1996).

A recent review of the literature suggests that certain subgroups within a population may be more susceptible than others to the adverse health effects of nitrate (Ward et al., 2005). Although there is evidence showing the carcinogenicity of N-nitroso compounds in animals, data obtained from studies that were focused on humans are not definitive, with the exception of the tobacco-specific nitrosamines (Grosse et al., 2006). The formation of N-nitroso compounds in the stomach has been connected with drinking water nitrate, and excretion of N-nitroso compounds by humans has been associated with nitrate intake at the acceptable daily intake level through drinking water (Vermeer et al., 1998). The metabolism of nitrate and nitrite, the formation of N-nitroso compounds, and the development of cancers in the digestive system are complex processes mediated by several factors. Individuals with increased rates of endogenous formation of carcinogenic N-nitroso compounds are likely to be susceptible. Known factors altering susceptibility to the development of cancers in the digestive system are inflammatory bowel diseases, high red meat consumption, amine-rich diets, smoking, and dietary intake of inhibitors of endogenous nitrosation (e.g., polyphenols and vitamin C) (de Kok et al., 2005; De Roos et al., 2003; Vermeer et al., 1998). In 1995, when the Subcommittee on Nitrate and Nitrate in Drinking Water reported that the evidence to link nitrate to gastric cancer was rather weak (NRC, 1995), the stomach was still thought to be the most relevant site for endogenous nitrosation. Previous studies, such as those reviewed in the NRC (1995) report, which found no link between nitrate and stomach cancer, concentrated on the formation of nitrosamines in the stomach. Recent work indicates that larger amounts of N-nitroso compounds can be formed in the large intestine (Cross et al., 2003; De Kok et al., 2005).

Some scientists argue that there are plausible explanations for the apparent contradictory absence of adverse health effects of nitrate from dietary sources (Van Grinsven et al., 2006; Ward et al., 2006). Individuals with increased rates of endogenous formation of carcinogenic N-nitroso compounds are more likely to be at risk, and such susceptible subpopulations should be taken into account when trying to make a risk-benefit analysis for the intake of nitrate. In view of these complex dose-response mechanisms, it can be argued that it is not surprising that ecological and cohort

studies (e.g., Van Loon et al., 1998) in general do not provide statistically significant evidence for an association between nitrate intake and gastric, colon, or rectum cancers. The experimental design of most of these studies may not have been adequate to allow for the determination of such a relationship.

Population studies have the problem that factors influencing health tend to be confounded with each other. This necessitates molecular epidemiological studies aimed at improving methods for assessing exposure in susceptible subgroups. This approach requires the development of biomarkers that enable the quantification of individual levels of endogenous nitrosation and N-nitroso compounds exposure and methods for accurate quantification of exposure-mediating factors.

Nitrate, Food Security, and the Environment

It is beyond dispute that levels of nitrate and other N-containing species have increased in many parts of the ecosystem due to increased use of fertilizers and combustion of fossil fuels. At present, 2 to 3% of the population in USA and the EU are potentially exposed to public or private drinking water exceeding the present WHO (and USA and EU) standard for nitrate in drinking water. The proportion of the exposed population in the emerging and developing economies is probably larger and increasing (Van Grinsven et al., 2006).

The environmental impacts of reactive N compounds are serious, and continued research on agricultural systems is essential to devise management practices that decrease losses and improve the utilization efficiency of N throughout the food chain. At the same time, the central role of N in world agriculture must be considered. Agriculture without N fertilizer is not an option if the 6.5 billion people currently in the world and the 9 billion expected by 2050 are to be fed (Cassman et al., 2003). Losses of reactive N compounds to the environment are not restricted to fertilizers: losses from manures and the residues from legumes can also be large (Ad-discott, 2005). Research indicates that simply mandating a reduction in N fertilizer application rates does not automatically reduce N losses because there is typically a poor relationship between the amount of N fertilizer applied by farmers and the N uptake efficiency by the crops (Cassman et al., 2002; Goulding et al., 2000). Instead, an integrated systems management approach is needed to better match the amount and timing of N fertilizer application to the actual crop N demand in time and space. Such an approach would lead to decreased losses of reactive N to the environment without decreasing crop yields. Many of the potential conflicts between the agricultural need for N and the environmental problems caused by too much in the wrong place are being studied within the International Nitrogen Initiative (INI; <http://initrogen.org/>), a networking activity sponsored by several international bodies.

The adverse environmental impact of reactive N species (i.e., all N-containing molecules other than the relatively inert N₂ gas that comprises 78% of the atmosphere) deserves attention. Some of these molecules, such as nitrogen oxides, come from combustion of fossil fuels in automobiles and power plants. Agriculture, however, is the dominant source through the cultivation of N₂-fixing crops and the manufacture and use of N fertilizers (Turner and Rabalais, 2003). Both have increased greatly over the

last few decades, and the trend is set to continue (Galloway et al., 2003; 2004). The subsequent N enrichment causes changes to terrestrial and aquatic ecosystems and to the environmental services they provide. Examples include nitrate runoff to rivers causing excessive growth of algae and associated anoxia in coastal and estuarine waters (James et al., 2005; Rabalais et al., 2001) and deposition of N-containing species from the atmosphere causing acidification of soils and waters and N enrichment to forests and grassland savannahs (Goulding et al., 1998). All of these impacts can radically change the diversity and numbers of plant and animal species in these ecosystems. Other impacts almost certainly have indirect health effects, such as nitrous oxide production, which contributes to the greenhouse effect and the destruction of the ozone layer, thereby allowing additional UV radiation to penetrate to ground level with the associated implications for the prevalence of skin cancers.

Losses of nitrate to drinking water resources are also associated with leaky sewage systems. Leaky sewage systems need to be improved for general hygiene considerations. This need is especially important in developing countries and poor rural areas that do not have well developed sewage and waste disposal infrastructure.

Returning Question

In considering the management of nitrogen in agriculture and its fate in the wider environment, the debate keeps returning to the original question: "Is nitrate in drinking water really a threat to health?" Interpretations of the evidence remain very different (L'hirondel et al., 2006; Ward et al., 2006). The answer has a significant economic impact. The current limits established for ground and surface waters require considerable changes in practice by water suppliers and farmers in many parts of the world, and these changes have associated costs. If nitrate in drinking water is not a hazard to health, could the current limit be relaxed, perhaps to 100 mg L⁻¹? The relaxation could be restricted to situations where the predominant drainage is to groundwater. Such a change would allow environmental considerations to take precedence in the case of surface waters where eutrophication is the main risk, and N limits could be set to avoid damage to ecosystem structure and function. Phosphate is often the main factor limiting algal growth and eutrophication in rivers and freshwater lakes, so a change in the nitrate limit would focus attention on phosphate and its management—correctly so in the view of many environmental scientists (Sharpley et al., 1994). It is possible that a limitation on phosphate might lead to even lower nitrate limits in some freshwater aquatic environments to restore the diversity of submerged plant life (James et al., 2005). It could be argued that setting different limits, determined by health or environmental considerations as appropriate, is a logical response to the scientific evidence.

Given the criticisms of the scientific foundation of present drinking water standards and the associated cost-benefits of prevention or removal of nitrate in drinking water, we propose the need to consider the following issues in discussing an adjustment of the nitrate standards for drinking water:

- Nitrogen intake by humans has increased via drinking water and eating food such as vegetables.

- There is circumstantial and often indirect evidence of the enhanced risk of cancers of the digestive system after an increase in the concentration of nitrate in drinking water. There is an urgent need to synthesize existing data and understanding, or to carry out additional research if necessary, to reach clear and widely accepted conclusions on the magnitude of the risk. This will require greater collaboration between scientists who hold opposing views over the interpretation of currently available data. The possibility that subgroups within the population respond differently requires quantification and critical examination.
- Nitrogen oxides have a functional role in normal human physiology, but they are also involved in the induction of oxidative stress and DNA damage. The challenge is to quantify and evaluate these risks and benefits of nitric oxide exposure in relation to the intake of nitrate in drinking water. If humans have a mechanism to combat infectious disease with nitric oxide, produced from nitrate consumed in drinking water and food, what are the long-term effects of the nitric oxide benefits compared with the potential negative health effects from higher intake of nitrate?
- If the evaluation of potential adverse health effects from chronic exposure to nitrate levels in drinking water above 50 mg L⁻¹ demonstrates that these adverse effects can be considered minor compared with other issues of health loss associated with air pollution or life style, would the removal of nitrate from drinking water to meet the current allowable concentration standards be cost-efficient relative to other potential investments in health improvement?

Although science may not provide society with unequivocal conclusions about the relationship between drinking water nitrate and health over the short term, there are good reasons to further explore the issue (Ward et al., 2005). Unfortunately, it remains difficult to predict the health risks associated with chronic nitrate consumption from water that exceeds the current WHO drinking water standard. One complication is the endogenous production of nitrate, which makes it more difficult than previously realized to relate health to nitrate intake in water or food.

Practical management strategies to overcome inefficient use of nitrogen by crops and to minimize losses of nitrate and other N-containing compounds to the environment have to be developed for agricultural systems worldwide.

Given the lack of consensus, there is an urgent need for a comprehensive, independent study to determine whether the current nitrate limit for drinking water is scientifically justified or whether it could safely be raised. Meta-analyses are valuable tools for generating conclusions about specific chronic health effects (e.g., stomach cancer, colon cancer, bladder cancer, specific reproductive outcomes). Unfortunately, the number of suitable studies for any particular health effect is likely too small to be detected by meta-analyses (Van Grinsven et al., 2006). Empirical studies focused on susceptible subgroups, development of biomarkers for demonstration of endogenous nitrosation, and methods for

accurate quantification of mediating factors may provide part of the answers. Moreover, there is also a separate need for determining water quality standards for environmental integrity of aquatic ecosystems. It is time to end 50 yr of uncertainty and move forward in a timely fashion toward science-based standards.

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