TECHCON, INC.
TECHNICAL CONSULTANTS

July 19, 2001

Mr. Aaron Isherwood
Sierra Club Environmental Law Program
85 Second Street, Second Floor
San Francisco, CA 94105-3441

Re: Review of Revised Draft Dairy Element of the Kings County General Plan

Dear Mr. Isherwood:

I have reviewed the Program Environmental Impact Report and Revised Draft Dairy Element of the Kings County General Plan (*Revised Draft Element*) dated May 7, 2001, and have the following comments:

Review of TechCon's February, 2001 Comments (attached):

1. Policy DE 3.2h - this policy should be revised to include a provision for impermeable membrane liners should a qualified Certified Hydrogeologist or Professional Engineer determine that natural conditions do not provide an adequate hydrogeological barrier to pollutant transport.

2. Revise Policy DE 4.1a, (B)(2)(c) to prohibit the discharge of process water through the soils lining the pits and lagoons to below 1×10^{-7} cm/s, to protect groundwater supplies. Assuming 0.45 lbs/day/animal unit of nitrogen produced by lactating dairy cows (at 1.4 animal units each), freestall dairies, no solids removal prior to the waste reaching the lagoons, and a wastewater production of 144 lbs/day/cow, the less restrictive NRCS standard of 1×10^{-5} cm/s would allow 230 lbs per day (43 tons per year) of nitrogen alone to infiltrate to groundwater, based on the projected maximum herd size in the *Revised Draft Element*. The more restrictive standard would reduce that to 2.3 lbs per day and

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Dairy Waste Pollution Reduction

Introduction

This report examines the current status of dairy wastewater treatment, and advocates a "total systems" approach to dairy design that is practical and protective of air and water quality. A "total systems" approach means that the entire dairy is designed not only to efficiently increase milk production but also to optimize waste and nutrient management. Key components of the total system design include the type of housing used for the animals, the waste collection approach, waste treatment, and utilization of the treated waste as a nutrient source. The total systems approach is advocated based on what is currently working in the dairy industry to provide milk produced in an environmentally protective manner.

Throughout this report, the two predominant types of dairy management will be contrasted: corral-style[1] dairies and freestall[2] dairies. The animal housing, waste collection, waste treatment and waste utilization all follow from the selection of one type of dairy management or the other.

Though the transition from family-owned and operated agriculture to ever-more centralized production has been occurring for some time in all types of agriculture, it has been especially acute in the dairy industry in the past decade (U.S. EPA, 2001). According to statistics reported by the U.S. Census Bureau, the average dairy farm increased in size from 32.75 cows per farm to 77.82 cows per farm between 1978 and 1997 (U.S.D.A., 1997). Between 1992 and 1997, the number of dairy operations with

0.43 tons per year, which would be negligible across the county. Salts associated with dairy waste may be even more damaging to groundwater quality, as described in section 4.3 of the *Revised Draft Element*. The impact of lagoon water nitrogen and salts would be over and above the impacts associated with existing agricultural practices.

3. Policy DE 5.1c: My concerns regarding specificity of air quality criteria have been partially met in the current Draft. However, the stated goal of 50 percent reduction in volatile solids within the treated manure and dairy process water is not protective enough. This goal should be raised to 60 percent reduction in volatile solids within the treated manure and dairy process water, a goal that can be met according to the sources cited in the *Revised Draft Element* as outlined further in this letter. In addition, standards for emitted gases are not included in this policy. If specific performance standards for emitted gases are included, then air quality is much more likely to be protected.

New Comments:

1. The *Revised Draft Element* states on page 4.2-3, "The San Joaquin Valley is currently in non-attainment for the Federal standards for ozone and particulate matter with an aerodynamic diameter less than or equal to ten microns (PM_{10})". Table 4.2-5b of the *Revised Draft Element* shows estimated PM_{10} emissions from cattle movement in unpaved corrals. Under the most optimistic projection of future conditions, 203 tons per year more PM_{10} will be emitted by cattle movement in unpaved, but stabilized corrals, than is currently emitted (under Policy DE 5.1e).

   None of the policies cited as mitigating measures under the PM_{10} impact discussions, Impact 4.2-3 on page 4.2-53 (new or expanded dairies) and Impact 4.2-11 on page 4.2-78 (Implementation of the Element), are noted to be sufficient to reduce PM_{10} emissions to below a significant increase. The conclusion within the *Revised Draft Element* is that "the impact would constitute a significant and unavoidable adverse cumulative impact". However, there is an available mitigation measure that is not included in the *Revised Draft Element*. In *Dairy Waste Pollution Reduction*, I have proposed the adoption of enclosed freestall dairies. "Enclosed freestall dairies have the additional advantage of eliminating dust generation from unpaved corrals due to wind-blown dust and cattle movement. This source of fine particulate matter (PM10)

is shown by Kings County data to contribute between 14 and 37 percent of all the PM10 generated annually in Kings County (Kings County, 2001). Eliminating dairy operations as a major source of PM10 would significantly affect air quality in the San Joaquin Valley." (Gay, 2001) In addition, dust control stabilizer can and should be required for use in existing dairies as well as expanded dairy facilities. By implementing these policies, PM_{10} emissions might be held within SJVUAPCD limits.

2. In discussing available manure treatment technologies on pages 4.2-14 and 4.2-15, the authors of the *Revised Draft Element* state, "Treatment effectiveness currently cannot be measured by quantifying the reduction rate of the individual odorous gas compounds because of the lack of available scientific methods to do so. Therefore, a conclusive determination of whether residual air pollutants are emitted from treated manure is not possible until sufficient information and data are available to quantify the concentration of individual odorous gases (i.e. ammonia, hydrogen sulfide, ROG) in treated manure. In addition, best available control measures or technologies have not been developed by regulatory agencies (e.g., CARB, EPA) to address reducing potential adverse air quality effects from livestock manure emissions."

   There are definitely scientific methods available to quantify organic gases originating from treated manure. In *Standard Methods for the Examination of Water and Wastewater, 20th Edition* (APHA/AWWA/WEF, 1998), the following methods are available to quantify gasses emitted from anaerobic sludge (2720 C), and odor threshold (2150 B). Ambient air samples can be obtained using a portable sampling pump to fill "Tedlar" gas sample bags. It is also possible to obtain field measurements of ammonia and hydrogen sulfide using pre-calibrated, substance-specific reagent chips accurate for concentrations between 2 and 50 ppm for both substances, or detector tubes are available accurate between 2 and 1000 ppm for ammonia and 0.2 and 4000 ppm for hydrogen sulfide (Lab Safety Supply, 1998). Actually, quantification is not necessary to determine whether residual air pollutants are emitted from treated manure, particularly odorous gases. To a person familiar with wastewater treatment chemistry and experienced with dairies, it is relatively easy to detect and distinguish trace amounts of ammonia, hydrogen sulfide, and ROG. The odor threshold of ammonia is 50 ppm, which corresponds to

the OSHA limit for exposure (Agency for Toxic Substances and Disease Registry, Occupational Safety and Health Administration [OSHA]), and for hydrogen sulfide the odor threshold is 0.13 ppm, with an exposure limit of 20 ppm (OSHA).

Though regulatory agencies such as CARB and EPA do not have official best available control measures or technologies in place for controlling residual air pollutants from treated manure, there are common best management practices in place in dairies that are available for odor control of treated manure. Some proven odor control techniques include:

A) Waste nutrients only applied during periods of low wind speeds, such that aerosols and odors are minimized from drifting onto neighboring areas
B) Minimize spreading or agitating manure or waste nutrients when the wind is blowing toward populated areas
C) Apply treated manure during periods of low humidity
D) Windbreaks planted to enhance a "chimney" effect so that odors rise and dissipate before reaching residential areas
E) Apply treated manure to fields at agronomic rates

3. The best information available on plug flow digester performance at a dairy is provided in a paper on the 360 to 400 cow Langerwerf Dairy, (Moser and Langerwerf, 2000) based on 16 years of digester operation. This dairy treatment system was the subject of a profile in *Dairy Waste Pollution Reduction* (Gay, 2001). From solids sales records, the amount of accumulated solids left in the digester, and conservative estimates of the solids removal from the cow yard (80%); retention of digested solids at the dairy(50%); and digested solids total solid content (13%); the estimated volatile solids reduction experienced at the Langerwerf Dairy over 16 years was 64%. With the benefit of a larger volume plug flow digester and more frequent cleaning (every 5 - 10 years instead of after 16 years), it is likely that a higher volatile solids reduction would result. Therefore, using 60% as a target for VS removal is realistic and more environmentally protective than the 50% advocated in the *Revised Draft Element* on page 4.2-24 and included in Policy DE 5.1c on page DE-35.

4. The authors of the *Revised Draft Element* thoroughly point out that not enough is known to require specific comprehensive treatment guidelines. On page 4.2-27, "The understanding of livestock operation-related air quality issues is limited, as evidenced from the current research projects being performed by USDA ARS.... In addition, current research is not specifically addressing all of the issues being faced in the southern San Joaquin Valley. In particular, emission of ROG and other ozone precursors is not currently being studied. Similarly, research directed at estimating or measuring PM_{10} emissions from dairy corrals has not been identified by ARS as a research topic." Since treatment requirements for wastewater and air quality are to protect water and air quality at the specific location of each dairy, as well as protect the overall Kings County environment, review of the treatment efficacy of a proposed dairy waste management system must be site specific. Kings County Planning is proposing to implement a site plan review (SPR) requirement: "Site Plan Review (SPR) application approval by the Zoning Administrator (ZA) is a ministerial action requiring the ZA to insure all regulations, policies, mitigation requirements, standards, etc., in the *Zoning Ordinance, Dairy Element,* and *Dairy Element Program EIR* are met in the design of the facility." While this will implement an administrative level of review of proposed and expanding dairies, it does not allow for public review of the process unless the planning commission decides that the dairy is in violation of SPR provisions and requires a conditional use permit (CUP) process, during which the public is notified and given the opportunity to "report any violations of the regulations they may observe." There is no specific mention of a public comment process for either the SPR or CUP processes.

5. On page 4.2-40, the description of Policy DE 5.1c concludes with, "The policy indicates that the requirement for implementation of advanced treatment technologies would be waived for proposed existing dairy expansion projects that do not include proposed construction of new dairy facilities and for which the expanded dairy herd would not exceed the calculated capacity and would not result in ROG emissions that would exceed the SJVUAPCD threshold limits set for a stationary source." It is not clear why ROG is the only emission included in the potential limit to herd size expansion at existing dairies without implementation of advanced treatment technologies. As noted above, PM_{10} can be controlled by requiring enclosed freestall housing of dairy cows, and methane, ammonia and hydrogen sulfide emissions can be reduced by using anaerobic digestion coupled with cogeneration and stack emission control.

Otherwise, the cost-effective approach for the dairy industry is to simply expand existing dairy herds to the maximum capacity of the available land and milk parlor facilities without regard to the cumulative impacts of increased herd size on existing waste treatment and disposal systems.

6. An additional advantage of anaerobic digestion over non-treatment or aerobic treatment is power generation, which I discussed in *Dairy Waste Pollution Reduction* (Gay, 2001). "In cold and/or temperate climates with relatively high density development and associated high land costs, a plug-flow anaerobic digester coupled with an enclosed freestall dairy appears to offer significant benefits in low operation costs, energy efficiency and cogeneration, and a relatively small land use requirement. Recent experience with such digesters indicates that their operation has low maintenance requirements with the added benefits of gas collection, excellent odor control, and marketable, easily handled digested solids suitable for use as a fertilizer (Moser, et al, 1998)." By generating power from anaerobic digestion of manure, there is not only an economic benefit to the dairy, there are also avoided air emissions and/or other environmental impacts associated with more conventional power generation. In addition, basic stack emission control systems can be added to cogeneration facilities to reduce emissions. Conversely, aerobic treatment is a net power user. Therefore, power generation from a off-site energy source and the associated environmental costs are required to achieve the marginally better volatile solids reductions associated with aerobic treatment of dairy waste. None of these advantages of anaerobic digestion were discussed in the *Revised Draft Element.*

7. Projected air emissions of PM_{10}, methane and ammonia are shown to be significant in the *Revised Draft Element.* Emissions of these gases should be classified as a limiting factor for new and expanded dairies in Kings County.

8. Impact 4.3-7 in the *Revised Draft Element* states: "Activities associated with dairy facilities and support cropland could result in an increase in the rate of salt and nitrogen loading, and the release of pathogens in the basin, degrading groundwater quality. This is a less-than-significant impact." The *Revised Draft Element* then proceeds to discuss the potential impacts for 15 pages, before concluding that no mitigation measures are required. However, the proposed policies listed in the discussion of this impact in the *Revised Draft Element* are expressly designed to protect water quality, thus attempting to mitigate the

impacts of the preferred alternative. However, as stated in my second comment from February, 2001, simply requiring impermeable membrane liners instead of allowing the standard NRCS permeability will considerably reduce impacts to groundwater from impounded liquid manure wastewater. Specifically, salt loading from stored wastewater would be cut 99%.

While requiring a groundwater monitoring program in Policy DE6.1h, the *Revised Draft Element* does not designate specific standards to limit water quality degradation. For example, safeguards and waste treatment should be required if salinity is projected to increase significantly as a result of a proposed or existing project; for baseline salinity between 250 and 500 ppm, a projected or actual salinity increase of 10% or more would trigger a reduction in salt loading by curtailing irrigation, limiting herd size, or removing a percentage of salts in commercial or manure fertilizer. Similar restrictions would apply for baseline salinity over 500 ppm; a salinity increase of 50 ppm would be the trigger. Safeguards for limiting nitrate and pathogen contamination would follow a similar pattern as those for salinity.

In summary, the *Revised Draft Element* still does not include the key information noted above to control air and water emissions from dairies. By advocating an administrative approach that ignores public input until administrators decide that a given dairy project is not being handled in compliance with that approach, the public loses the opportunity to provide non-technical input to the development of specific dairy projects. Such input might include anecdotal information about odor, and local experience with a given dairy's discharges and management practices that otherwise might not be available to a Zone Administrator's staff or other regulatory personnel. Unless such information is actively sought as part of a written procedure, it will most likely not become available until environmental damage is already done as a result of expansion or construction of new dairy facilities.

Sincerely,

Alan E. Gay, P.E.
Project Manager

REVIEW of DRAFT DAIRY ELEMENT of the KINGS COUNTY GENERAL PLAN
21 December, 2000

prepared by Alan E. Gay, P.E.
TechCon, Inc.
February 6, 2001

1. Revise policy DE 3.2h to include a provision that should the Hydrogeologic Sensitivity Assessment conclude that there are inadequate hydrogeologic barriers to pathogen or contaminant migration toward groundwater as defined in EPA's proposed Groundwater Rule (or current version) FEDERAL REGISTER: MAY 10, 2000 PART 2. 40 CFR PARTS 141 AND 142. NATIONAL PRIMARY DRINKING WATER REGULATIONS, then an impermeable membrane liner shall be installed in accordance with California Environmental Protection Agency standards for lining wastewater lagoons.

2. Revise Policy DE 4.1a, (B)(2)(c) to prohibit the discharge of process water through the soils lining the pits and lagoons to below 1×10^{-7} cm/s, to protect groundwater supplies. Assuming 0.45 lbs/day/animal unit of nitrogen produced by lactating dairy cows (at 1.4 animal units each), freestall dairies, no solids removal prior to the waste reaching the lagoons, and a wastewater production of 144 lbs/day/cow, the less restrictive NRCS standard of 1×10^{-5} cm/s would allow 230 lbs per day (43 tons per year) of nitrogen alone to infiltrate to groundwater, based on the projected maximum herd size in the Draft Element. The more restrictive standard would reduce that to 2.3 lbs per day and 0.43 tons per year, which would be negligible across the county. Salts associated with dairy waste may be even more damaging to groundwater quality, as described in section 4.3 of the Draft Element. The impact of lagoon water nitrogen and salts would be over and above the impacts associated with existing agricultural practices.

3. The text of section 4.2 of the Draft Element on page 4.2-54 states, "...Policy DE 3.1a specifically addresses ammonia emissions in the development of countywide policy (no such specificity was found – TechCon), Policy DE 5.1c requires the preparation of an MTMP (Manure Treatment Management Plan - TechCon) that would be implemented to reduce air pollution emissions from the manure, including ammonia." Policy DE 5.1c's criteria for developing an MTMP are vague, and lack specific limits or goals for concentrations of emitted gases or reference to any particular objective standard. With regard to specifying treatment the criteria state, "The appropriate treatment technology, or combination of technologies, shall be selected on the basis of expected manure volumes and site-specific management strategies. The selected treatment system shall be designed to minimize, to the extent economically feasible, the release of air emissions into the environment." (page DE-34 of the Draft Element) Policy DE 5.1c continues, "The MTMP shall include quality assurance/quality control protocol to monitor the implementation and effectiveness of the manure treatment system. The MTMP shall be revised as necessary, based on the results of the monitoring program, to ensure that selected treatment technology is being implemented in a manner that will reduce or control odor from dairy operations." While it is important to reduce and control odor from dairy operations, it is also important to control relatively odorless emissions, such as methane and NO_x. Also, by nature odor control efforts are difficult to objectively quantify. The specific gasses listed earlier in Policy DE 5.1c are quantifiable, but are not specifically addressed in evaluating the effectiveness of the proposed MTMPs. I suggest that Policy DE 5.1c be strengthened such that MTMPs must include a provision that dairies demonstrate compliance with current CARB (California Air Resources Board) standards and goals for concentrations of atmospheric gases to the extent possible using BPT (best practicable control technology currently available).