APPENDIX B
Changes to the Draft
Program Environmental Impact Report

2. SUMMARY

SECTION 2
SUMMARY

INTRODUCTION

This section provides a summary of the proposed Revised Draft Dairy Element to the Kings County General Plan (Element) and areas of controversy that have been identified by the public and public agencies in response to the Notice of Preparation. This section also provides a summary of the discretionary actions required to implement the proposed project.

PROPOSED PROJECT

The proposed project evaluated in this Program Environmental Impact Report (PEIR) is the Revised Draft Dairy Element and associated amendments to the Kings County Zoning Ordinance (Appendix A). The Element presents a comprehensive set of goals, objectives, and policies to guide development, expansion, and operation of milk cow (bovine) dairies within the County. The Element is designed to accomplish two equally important major purposes. The first purpose is to ensure that the dairy industry of Kings County continues to grow and contribute to the economic health of the County. The second purpose is to ensure that the standards established in the Element protect public health and safety and the environment. The County has determined that the best way to accomplish these combined goals is to adopt a separate general plan element that establishes development and operational policies for the local dairy industry.

The Element designates areas within the County suitable for the development and expansion of bovine dairy facilities (Dairy Development Overlay Zones, or DDOZs) and areas suitable for application of manure and process water generated at dairy facilities (Nutrient Spreading Overlay Zones, or NSOZs). The locations of the DDOZs are controlled by objectives and policies of the Element which restrict dairy development within and proximal to environmental constraints, including incompatible land uses (e.g., urban residential areas, schools, and the Lemoore Naval Air Station), flood zones, designated wildlife habitat, and areas of excessive slope. The DDOZs encompass approximately 394 square miles of land currently zoned for agricultural uses. Construction of dairy facilities and application of manure and process water would be allowed in the DDOZs.

Manure and process water application as irrigation and fertilizer would be allowed in flood zones as long as precautions are taken to avoid application during periods of expected inundation. The NSOZs encompass an additional ~~646~~ 642 square miles for additional

nutrient application. The combined areas of the DDOZs and NSOZs would total approximately ~~1,040~~ 983 square miles for dairy facilities and nutrient spreading. On the basis of the available land within the DDOZs and NSOZs, the Element has estimated a theoretical capacity for the maximum herd size for the County under the provisions of the Element. The limiting factor for the theoretical herd size was assumed to be the rate of nutrient (nitrogen and salts) application recommended by the Central Valley Regional Water Quality Control Board (RWQCB) to be protective of water quality. The maximum theoretical milk cow herd is estimated to be 381,980 milk cows (534,772 animal units,[1] AU) and 423,998 head of support stock (335,409 AU), after considering the nutrient loading related to other livestock and sewage sludge reuse. Accounting for the estimated dairy herd within the County in 1999 (124,668 milk cows and 138,344 head of support stock) and other existing sources of manure nutrients, the potential available remaining capacity in the County is approximately 257,312 milk cows and 285,654 head of support stock.

Dairies and dairy expansions proposed in the DDOZs, as designated in the Element, would be established by ~~conditional use permit, and could be expanded by either~~ site plan review (SPR) or conditional use permit (CUP), depending on circumstances. SPRs would be exempt from individual environmental review as long as they are consistent with the standards adopted in the Element concerning design, operation, monitoring, and reporting.

The PEIR evaluates the adequacy of the goals, objectives, and policies contained in the Element in reducing or eliminating potential environmental impacts associated with implementation of the Element.

NOTICE OF PREPARATION AND SCOPING SESSIONS

Two Notices of Preparation (NOP) were prepared and distributed to public agencies, community organizations, and other interested parties. The NOPs solicited public response as to the issues that should be included in the EIR. The initial NOP was mailed out on 17 November 2000 and responses were requested within a 30-day period, as required by Section 15082(a) of the CEQA Guidelines. Following amendments to the Element, a second NOP was distributed on 12 April 2001 that described the revised Element.

[1] An animal unit (AU) is a normalizing standard used to define equivalent numbers of animals managed at confined animal facilities. One animal unit is defined as one 1,000-pound mature dairy cow, specifically one Jersey cow. Support stock (e.g., heifers and calves) are smaller than milk cows and are assigned a fraction of an animal unit, depending on maturity (and weight). A mature Holstein cow is equivalent to 1.4 AU; a mature Guernsey cow is equivalent to 1.2 AU. For purposes of this EIR, all dairy cattle are conservatively considered Holstein cattle.

Scoping of the development of the Element and its environmental analysis was performed by the Kings County Planning Agency with assistance from the County's Dairy Review Committee. The Dairy Review Committee was a voluntary committee made up of interested people from the dairy community, allied industries, and others including representative of the general public and an environmental group. No formal membership was required to participate.

The scope of the Element was discussed at two Dairy Review Committee meetings and three subcommittee meetings held between May and November 1999. The subcommittees discussed the following specific issues:

- Manure management
- Design standards for dairy facilities
- Dairy monitoring program

The recommendation of the Dairy Review Committee was split. Both groups were in favor of developing an Element, but split on whether a Program EIR should be prepared. Since an environmental review is required as part of the development of a general plan or its elements, it was determined that a Program EIR would be prepared as part of the Element development and review process.

AREAS OF CONTROVERSY

There were six written responses to the initial NOP. The responses indicated general agreement with the range of issues that have been addressed in this PEIR. Responses were received from five public agencies, including the Central Valley Regional Water Quality Control Board, Native American Heritage Commission, Kings Mosquito Abatement District, Caltrans, and the Kern County Resource Management Agency. Concerns about potential environmental impacts included the following topics:

- Mosquito production
- Land application of manure and process water
- Process water and process water pond management
- Cultural resource preservation
- Cumulative transportation impacts

Following public distribution of the 21 December 2000 PEIR, several letters of comment were received. The comments contained in these letters were considered in the development of the revised Element and this PEIR. The letters included comments provided by the Cities of Hanford and Lemoore, Central Valley Regional Water Quality Control Board, Caltrans, Kings County Fire Department, Kings County Department of Public Health, United States Fish and Wildlife Service, Tulare Basin Wetlands Association,

California Department of Fish and Game, California Office of Governmental and Environmental Relations, Marc Schuil, and Michael LaSalle. These responses included comments on the following topics:

- Manure and process water management and application
- Fire protection
- Land use designations
- Transportation impacts (including cumulative impacts)
- Wetlands protection
- Pathogen migration
- Wildlife protection (including special-status species)

No letters of response were received on the second NOP (distributed on 12 April 2001) by 27 April 2001. Any comment letters received after 27 April 2001 will be considered during the preparation of the Final PEIR.

DISCRETIONARY ACTIONS FOR APPROVAL OF THE ELEMENT

The following approvals or entitlements would be required to allow the project to be implemented:

- Certification of the Program Environmental Impact Report
- Approval and adoption of the Element of the Kings County General Plan;
- Amendment of the Kings County Zoning Ordinance to ensure that dairy development is consistent with State law and implement the policies in the Element.

SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The analysis of potential environmental impacts of implementation of the Element presented in this PEIR reflects the iterative and integrated process under which the Element was prepared. Throughout the process, the technical professionals on the EIR interacted with the staff of the Kings County Planning Agency to develop the goals, objectives, and policies contained in the Element. Initially, the EIR team performed impact analysis on a preliminary draft of the Element. As a result of that analysis, recommended mitigation measures were submitted to the KCPA for consideration. The Element was revised to include all of the recommended mitigation measures. Therefore, the version of the Element presented in Appendix A of this PEIR represents the project as mitigated by the recommendations made to the KCPA.

The impacts and associated mitigation measures of the revised Element are summarized in Table 2-1. The table provides the text of impact statements and the entire mitigation measure that would reduce the impact to a less than significant level, if possible. The table also presents the pertinent policies contained in the Element that mitigate the identified impact. Table 2-1 also indicates those instances where mitigation would not reduce an impact to a less-than-significant level. These significant and unavoidable impacts include:

- Particulate matter (PM_{10}) emissions on a project level
- Particulate matter (PM_{10}) emissions on a cumulative level
- Ozone precursors ~~Reactive organic gas (ROG)~~ emissions on a project level
- Ozone precursors ~~Reactive organic gas (ROG)~~ emissions on a cumulative level
- Hydrogen sulfide emissions on a project level
- Hydrogen sulfide emissions on a cumulative level
- Ammonia emissions on a project level
- Ammonia emissions on a cumulative level
- Methane emissions on a project level
- Methane emissions on a cumulative level
- Odor emission on a project level

ALTERNATIVES

This EIR includes an evaluation of alternatives to the proposed project. A revised location alternative was considered and rejected during the scoping process on the basis that the Element considers the most appropriate locations for new and expanded dairies and that the County cannot control dairy development outside the County. In addition, an alternative to limit the herd size at individual dairies was considered. This alternative was rejected on the basis that the County does not set specific limits on other types of agricultural activities as long as those activities are conducted in accordance with existing laws and regulations. In addition, the alternative was not found to reduce environmental impacts because it would likely result in development of a similar overall size dairy herd in the County to that proposed by the Element.

The alternatives evaluated include the No Project, two Reduced County Herd Size, and Increased Manure Treatment alternatives. The Ten Percent Reduced County Herd Size and Fifty Percent Reduce County Herd Size alternatives were considered to provide a context for the effect of varying maximum theoretical bovine herd size reductions. The Fifty Percent Reduced County Herd alternative is considered the environmentally superior alternative.

Table 2-1: SUMMARY OF IMPACTS AND MITIGATION MEASURES					
Environmental Impact	**Level of Significance before Mitigation**		**Mitigation Measures**	**Level of Significance after Mitigation**	
	LS	**S**		**LS**	**SU**
Geology, Soils, and Seismicity					
4.1-1 Construction of proposed embankments to contain dairy operations process water present the potential for erosion and slope failure and release of contained process water.	●		4.1-1 *None required.* Compliance with the requirements of Policies DE 2.1f, 3.1a, and ~~6.1c~~ 6.2b would ensure that potential adverse geotechnical issues would be evaluated by a qualified professional.	●	
4.1-2 Disturbance of agricultural soils caused by construction of dairy facilities.	●		4.1-2 *None required.*	●	
4.1-3 Potential damage during expected seismic shaking.	●		4.1-3 *None required.* Implementation of Policy DE 2.1f and enforcement of existing building code requirements would reduce the potential impacts related to seismic shaking to a less-than-significant level.	●	
4.1-4 The moderate to high shrink-swell potential and the potential for corrosion of uncoated steel and concrete within soils could present significant maintenance and stability problems for pipelines, foundations, and pavements.	●		4.1-4 *None required* . Implementation of Policy DE 2.1f and compliance with the requirements of the Uniform Building Code will reduce adverse soil condition impacts.	●	
Air Quality					
4.2-1 Construction activities associated with new or expanded dairies would result in a short-term increase in PM_{10} emissions from fugitive dust sources.	●		4.2-1 *None required.* Implementation of Policy 5.1d of the Element would reduce short-term construction-related PM_{10} emissions from fugitive dust to a less-than-significant level.	●	
4.2-2 Construction activities associated with new or expanded dairies would result in short-term exhaust emissions from construction equipment.	●		4.2-2 *None required.* Implementation of the Element would reduce construction related exhaust emissions to a less-than-significant level.	●	
4.2-3 Operation of new or expanded dairies ~~would~~ could increase PM_{10} air pollutant emissions from fugitive dust, exhaust from agricultural and dairy equipment, vehicular traffic exhaust, and formation of secondary $PM_{2.5}$.		●	4.2-3a (Fugitive Emissions from Unpaved Areas) *No additional feasible mitigation measures are available for the control of fugitive dust.* Implementation of Policies DE 5.1e, ~~5.1h~~ 5.1g, ~~5.1i~~ 5.1h, ~~6.1b~~ 6.1a, ~~6.1d~~ 6.2c, and ~~7.1d~~ 6.1b of the Element would reduce and control PM_{10} emissions from fugitive dust at future or expanded dairies.		●

			4.2-3b (Secondary $PM_{2.5}$) *No additional feasible mitigation measures are available.* Implementation of Policies DE 3.1a, 5.1c, 5.1e, 6.1a, 6.2d, 6.3a, and 6.1b would be expected to reduce ammonia generated from dairy facilities and would also reduce other air pollutants generated from cattle manure. 4.2-3c (Equipment Exhaust) *No additional feasible mitigation measures are available.* Implementation of Policy DE 5.1i would reduce the potential for PM_{10} emissions from exhaust sources although the amount of the reduction is unknown.		
~~4.2-4 Operation of new or expanded dairies could increase exhaust emissions from agricultural and dairy equipment.~~	●		~~4.2-4 *None required.*~~ ~~Implementation of Policy DE 5.1j of the Element would reduce exhaust emission impacts to a less-than-significant level.~~	●	
~~4.2-5~~ 4.2-4 Operation of new or expanded dairies could generate adverse odors.		●	~~4.2-5~~ 4.2-4 *No additional feasible mitigation measures are available.* Implementation of Policies DE 1.2g, 1.2h, 1.2i, 3.1a, 3.1b, 3.1c, 5.1b, 5.1c, ~~5.1h~~ 5.1g, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~7.1d~~ 6.1b, and ~~7.2a~~ 6.4a through ~~7.2e~~ 6.4c would significantly reduce odors generated from dairy facilities operated in conformance with the Element.		●
~~4.2-6~~ 4.2-5 Operation of new or expanded dairies would generate ozone precursor (ROG and NOx) emissions from cattle manure and combustion engine exhaust.		●	~~4.2-6~~ 4.2-5 *No additional feasible mitigation measures are available.* Implementation of Policies DE 3.1a, 5.1c, 5.1i, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, and ~~6.2a~~ 6.3a would be expected to reduce ~~ROG~~ ozone precursors and other air pollutants generated from cattle manure and equipment and vehicle exhaust.		●
~~4.2-7~~ 4.2-6 Operation of new or expanded dairies would generate ammonia emissions from cattle manure.		●	~~4.2-7~~ 4.2-6 *No additional feasible mitigation measures are available.* Implementation of Policies DE 3.1a, 5.1c, 5.1e, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.2a~~ 6.3a, and ~~7.1d~~ 6.1b would be expected to reduce ammonia and other air pollutants generated from cattle manure.		●
~~4.2-8~~ 4.2-7 Operation of new or expanded dairies would generate hydrogen sulfide emissions.		●	~~4.2-8~~ 4.2-7 *No additional feasible mitigation measures are available.* Implementation of Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.2a~~ 6.3a, and ~~7.1d~~ 6.1b would be expected to reduce hydrogen sulfide and other air pollutants generated from cattle manure.		●
~~4.2-9~~ 4.2-8 Operation of new or expanded dairies would generate methane emissions from cattle and cattle manure.		●	~~4.2-9~~ 4.2-8 *No additional feasible mitigation measures are available.* Implementation of Policies DE 3.1a, 5.1c, ~~5.1f~~, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.1g~~, ~~6.2a~~ 6.3a, and ~~7.1d~~ 6.1b would reduce methane generated from ruminant livestock and manure.		●

Key: LS = less than significant
S = significant
SU = significant and unavoidable

Table 2-1: SUMMARY OF IMPACTS AND MITIGATION MEASURES (*continued*)					
Environmental Impact	**Level of Significance before Mitigation**		**Mitigation Measures**	**Level of Significance after Mitigation**	
	LS	**S**		**LS**	**SU**
~~4.2-10 Increased localized and regional air pollutant emissions would be generated during operation of new or expanded dairies from vehicular traffic~~.	●		~~4.2-10 *None required.*~~	●	
4.2-9 Increased localized carbon monoxide would be generated from vehicular traffic during operation of new or expanded dairies.	●		4.2-9 *None required.* Implementation of Policy DE 3.1g would reduce the potential for adverse queuing of traffic generated by dairy development and the potential for a significant increase in CO emissions.	●	
~~4.2-11~~ 4.2-10 Implementation of the Element would result in a cumulative increase in PM_{10} emissions.		●	~~4.2-11~~ 4.2-10 *None available.* Although implementation of Policies DE 5.1e, ~~5.1h~~ 5.1g, ~~5.1i~~ 5.1h, ~~6.1b~~ 6.1a, ~~6.1d~~ 6.2c, ~~6.1e~~, and ~~7.1d~~ 6.1b of the Element would reduce PM_{10} emissions from cumulative project operations, PM_{10} emissions could continue to be generated during cumulative operations.		●
~~4.2-12~~ 4.2-11 Implementation of the Element would result in a cumulative increase in ~~ROG~~ ozone precursor emissions.		●	~~4.2-12~~ 4.2-11 *None available.* Although implementation of Policies DE 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, and ~~6.2a~~ 6.3a would reduce or prevent the release of ~~ROG~~ ozone precursor emissions into the environment from manure storage or collection systems, ~~ROG~~ ozone precursor emissions would continue to be generated from existing, new, or expanded dairies in the County (i.e., exhaust emissions, manure stockpile, initial deposition of manure).		●
~~4.12-13~~ 4.2-12 Implementation of the Element would result in a cumulative increase in methane emissions.		●	~~4.2-13~~ 4.12-12 *None available.* Implementation of Policies DE 3.1a, 5.1c, ~~5.1f~~, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.1g~~, ~~6.2a~~ 6.3a, and ~~7.1d~~ 6.1b of the Element would reduce but not eliminate methane emissions from cumulative projects in the San Joaquin Valley air basin.		●
~~4.2-14~~ 4.2-13 Implementation of the Element would result in a cumulative increase in hydrogen sulfide emissions.		●	~~4.2-14~~ 4.2-13 *None available.* Implementation of Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.2a~~ 6.3a, and ~~7.1d~~ 6.1b of the Element would reduce but not eliminate hydrogen sulfide emissions from cumulative projects in the San Joaquin Valley air basin.		●
~~4.2-15~~ 4.2-14 Implementation of the Element would result in a cumulative increase in ammonia emissions.		●	~~4.2-15~~ 4.2-14 *None available.* Implementation of Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.2a~~ 6.3a, and ~~7.1d~~ 6.1b of the Element would reduce but not eliminate ammonia emissions from cumulative projects in the San Joaquin Valley air basin.		●

Water Resources					
4.3-1 Construction activities associated with new or remodeled dairies could result in degradation of water quality in receiving waters by reducing the quality of storm water runoff.	●		4.3-1 *None required.* Implementation of existing National Pollutant Discharge Elimination System regulations (including the construction period SWPPP) would reduce this potential impact to a less-than-significant level.	●	
4.3-2 Projects implemented under the Element could modify surface water drainage patterns, potentially causing localized off-site migration of runoff, erosion, and/or flooding.	●		4.3-2 *None required.* Conformance with State Confined Animal Facility regulations and implementation of Policies DE 1.2c, 1.2f, 3.2c, 3.2d, 4.1b, and 4.1c would reduce impacts associated with runoff from dairy facilities to a less-than-significant level.	●	
4.3-3 Implementation of the proposed project would result in an increase in impervious surfaces, potentially increasing runoff volumes and velocities.	●		4.3-3 *None required.* Compliance with existing State Confined Animal Facility regulations and programs would reduce the impact to a less-than-significant level without additional mitigation.	●	
4.3-4 Dairies located in flood-prone areas could be damaged or rendered temporarily inoperable during a flood event. In addition, flood waters could inundate dairy facilities (manured areas and/or process water storage facilities) and fields where wet or dry manure had been recently applied causing impacts to surface water quality.	●		4.3-4 *None required.* Implementation of the pollution prevention actions required by the Element, including Policies DE 1.2c, 3.2d, and 3.2g, would minimize the potential for degradation of water quality during flood events and reduce the impact to a less-than-significant level.	●	
4.3-5 Operation of existing and new dairies could result in releases of pollutants (including nutrients such as nitrogen and phosphorus), impacting the quality of surface waters.	●		4.3-5 *None required.* Compliance with existing regulations and programs and Policies DE 1.2f, 3.1a, 4.1a, 4.1b, 4.1c, and 4.1d proposed by the Element would reduce potential impacts to surface water quality to a less-than-significant level without additional mitigation.	●	
4.3-6 Implementation of the proposed project could result in depletion of water resources.	●		4.3-6 *None required.* Implementation of Policy DE 3.2h would reduce the impact of depletion of water resources to a less-than-significant level.	●	
4.3-7 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.	●		4.3-7 *None required.* Implementation of Policies DE 1.2c, 1.2d, 1.2f, 3.1a, 3.2a, 3.2b, 3.2c, 3.2h, 3.2i, 4.1a.A, 4.1a.B, 4.1b, 4.1c, ~~6.1h~~ 6.2f, and ~~7.2d~~ 6.4d would reduce localized and regional groundwater quality impacts to a less-than-significant level.	●	

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Table 2-1: SUMMARY OF IMPACTS AND MITIGATION MEASURES (*continued*)					
Environmental Impact	**Level of Significance before Mitigation**		**Mitigation Measures**	**Level of Significance after Mitigation**	
	LS	**S**		**LS**	**SU**
4.3-8 Existing water supply wells may represent preferred pathways for pollutant migration to the subsurface.	●		4.3-8 *None required.* Implementation of Policies DE 3.2c and 3.2i would reduce the impacts associated with potential direct migration of pollutants into wells to a less-than-significant level.	●	
4.3-9 Implementation of the proposed Element could result in cumulative impacts to water quality.	●		4.3-9 *None required.* Implementation of Policies DE 1.2c, 1.2d, 1.2f, 3.1a, 3.2a, 3.2b, 3.2c, 3.2g, 3.2h, 4.1a, 4.1b, 4.1c, 4.4a, ~~6.1h~~ 6.2f, and ~~7.2d~~ 6.4d would reduce the cumulative impact to groundwater quality to a less-than-significant level.	●	
Biological Resources					
4.4-1 Dairy development could result in conversion of existing vegetative cover and associated wildlife habitat, including habitat for special-status species or sensitive natural communities.	●		4.4-1 *None required.* Implementation of Policies DE 1.2e and 3.3a would reduce the biological resource impacts to a less-than-significant level.	●	
4.4-2 Loss and modification of wetlands.	●		4.4-2 *None required.* Implementation of Policies DE 1.2e and 3.3a would reduce the biological resource impacts to a less-than-significant level.	●	
Noise					
4.5-1 Construction activities associated with new or expanded dairies would result in short-term noise increases.	●		4.5-1 *None required.* Compliance with Policies 40a and 40b of the General Plan would reduce this potential impact to a less than-significant-level without additional mitigation.	●	
4.5-2 Operation of a new or expanded dairy could increase noise levels generated by additional vehicular traffic.	●		4.5-2 *None required.*	●	
4.5-3 New or expanded dairies could be exposed to adverse existing noise sources.	●		4.5-3 *None required.* Compliance with Policy 40c of the General Plan and Policy DE 1.2b of the Element would reduce construction-related noise impacts to a less-than-significant level without additional mitigation.	●	
4.5-4 Noise levels generated by project operations.	●		4.5-4 *None required.* Implementation of Policies DE ~~7.2a~~ 6.4a through ~~7.2e~~ 6.4c of the Element and compliance with Policies 40a and 40b of the General Plan would reduce noise impacts related to dairy operations to a less-than-significant level.	●	

Visual Resources					
4.6-1 The general height, scale, lighting, and design of typical dairy facilities that would be allowed under the Element would be consistent with other farming operations in the agricultural zones of Kings County.	●		4.6-1 *None required.*	●	
4.6-2 There is a potential for outdoor lighting and glare associated with dairies allowed under the Element to affect nearby rural residences.	●		4.6-2 *None required.* Implementation of Policies DE 1.2i, 3.1a, 3.1b, 3.1c, 3.1h, and ~~7.2a~~ 6.4a through ~~7.2e~~ 6.4c would reduce the potential for light and glare impacts to a less-than-significant level.	●	
Land Use and Policies					
4.7-1 Since the Element goals, policies, and programs would be consistent with applicable policies of the Kings County General Plan, there are no significant impacts.	●		4.7-1 *A new goal, new objective, and two new policies shall be added to the Kings County Land Use Element under "III. Policies for Rural Areas," which cross-references the Element, to direct readers to the additional policies in the adopted Element. The proposed new Land Use Element goal and policies recommended to be added are as follows:* "Goal ~~DE~~ 9A: Restrict the locations where dairies may be located to those areas of the County where they are most compatible with surrounding uses and activities and environmental constraints as ~~required by DE~~ presented in the *Dairy Element*. "Objective ~~DE~~ 9A.1: Use specific ~~criteria~~ standards to avoid potential land use conflicts through the site plan review (SPR) streamlined review process when approving new dairies and expansion of existing dairies. ~~"Policy DE 9A.1a: Prohibit new dairy facilities in designated wetlands and undisturbed wildlife habitat areas; and in proximity to cities, rural communities, Lemoore Naval Air Station, schools, and other dairies.~~ "Policy ~~DE~~ 9A.1~~b~~ a: Proposed new dairies and expansions of existing dairies, and associated dairy stock replacement facilities, ~~and substantial expansions,~~ may be approved through the ~~site plan review~~ SPR process if they meet all of the ~~criteria~~ standards in the *Dairy Element* concerning siting, design, operation, monitoring and reporting."	●	
4.7-2 Since some of the Element policies and programs supercede and are more restrictive than dairy regulations in the Kings County Zoning Ordinance, there are no significant impacts.	●		4.7-2 *New text shall be added to the Kings County Zoning Ordinance, Section 2102, Site plan review application and fee, as follows:* "Applications for proposed new bovine dairy facilities, and ~~substantial~~ expansions of existing facilities exceeding the baseline capacity, shall be approved through the site plan review process if the applications meet all of the specified criteria of the Element ~~(Section IV and Appendix C)~~."	●	

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S = significant
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Table 2-1: SUMMARY OF IMPACTS AND MITIGATION MEASURES (*continued*)					
Environmental Impact	**Level of Significance before Mitigation**		**Mitigation Measures**	**Level of Significance after Mitigation**	
	LS	**S**		**LS**	**SU**
			Section 1908(F) of the Kings County Zoning Ordinance shall be deleted in its entirety and replaced with the following text: "Applications for proposed new bovine dairy facilities, and substantial expansions of existing facilities, shall be approved through the site plan review process if the applications meet all of the specified criteria of the Element ~~(Section IV and Appendix C)~~. A site plan review may be approved by the zoning administrator for a new or expanded bovine dairy facility if the dairy is in ~~substantial~~ compliance with the design criteria contained in the Element."		
4.7-3 New and expanded dairy facilities allowed under the Element could cause impacts to natural resources and sensitive land uses.	●		4.7-3 *None required.* Implementation of the policies of the Element would reduce the potential adverse impacts to biological and natural resources to a less-than-significant level.	●	
4.7-4 Implementation of the Element will prevent or minimize impacts to residentially zoned lands within the four cities, rural communities, and other sensitive uses.	●		4.7-4 *None required.* Implementation of Policies DE 1.2a, 1.2b, 1.2g, 1.2i, and 1.2j of the Element would reduce the potential noise, lighting, and odor impacts of dairy facility operations and process water irrigation on new subdivision residents within the three cities.	●	
4.7-5 New and expanded dairy facilities allowed under the Element could cause impacts to adjacent individual rural residences in the agricultural areas.	●		4.7-5 *None required.* Implementation of the policies of the Element would reduce the potential noise, traffic, lighting, and odor impacts of dairy facility operations and process water irrigation on nearby residences to a less-than-significant level.	●	
Human Health/Risk of Upset					
4.8-1 Workers could be exposed to hazardous materials during dairy operation, resulting in adverse health impacts.	●		4.8-1 *None required.* Implementation of Policy DE 4.3a and conformance with hazardous materials laws and regulations would reduce this impact to a less-than-significant level.	●	
4.8-2 Potential exposure to residual agricultural chemicals during construction of the dairy facilities, resulting in adverse health impacts.	●		4.8-2 *None required.*	●	
4.8-3 Operation of the dairies could result in increased vector activity, potentially creating adverse human health impacts.	●		4.8-3 *None required.* Implementation of Policies DE 4.3b and 4.3c would reduce impacts related to vector activity to a less-than-significant level.	●	

4.8-4 Operation of the dairy facilities could expose people to dairy manure pathogens, potentially causing adverse human health impacts.	●		4.8-4 *None required.* Implementation of Policies DE 1.2c, 1.2d, 1.2f, 3.1a, 3.2b, 3.2c, 4.1a, 4.1b, 4.1c, ~~6.1h~~ 6.2f, and ~~7.2a~~ 6.4a through ~~7.2c~~ 6.4c would reduce the impact of exposure to pathogens to a less-than-significant level.	●	
4.8-5 Residual manure remaining at dairy facilities following cessation of manure management facilities operation could expose people to elevated methane and nitrate levels, potentially causing adverse human health impacts.	●		4.8-5 *None required.* Implementation of Policy DE ~~5.1k~~ 5.1j will reduce the impacts associated with residual manure to a less-than-significant level.	●	
4.8-6 Construction of dairy facility structures over or near improperly abandoned oil or gas wells could result in accumulation of natural gas within the structures, presenting the potential for fire and explosion. This is a less-than-significant impact.	●		4.8-6 *None required.* Implementation of Policies DE 3.5a and 3.5b of the Element will reduce impacts associated with abandoned oil or gas wells to a less-than-significant level.	●	
Transportation					
4.9-1 Truck and other traffic from new dairy development would be added to County roadways.		●	4.9-1 *The following policy shall be included in the Element:* "Policy DE 3.1g: The Technical Report for new and expanded dairies shall include a Traffic Impact Study (see Component 8 of Appendix J) prepared by a qualified traffic engineer in conformance with guidelines provided by the California Department of Transportation, which demonstrates that the project will not result in degradation of the level of service of adjacent roadways to below Level of Service (LOS) D on County roadways or LOS C on State highways. Additionally, the Traffic Impact Study shall demonstrate that the proposed dairy project will not result in significant safety hazards. Where the Traffic Impact Study determines that the LOS will be degraded to a LOS E or lower on adjacent roadways, a conditional use permit and additional environmental review focused on traffic related environmental issues will be required before any new dairy development or expansion of an existing dairy may occur."	●	
Public Services and Utilities					
4.10-1 Increases in water consumption.	●		4.10-1 *None required.*	●	
4.10-2 Increase in the amount of storm water runoff.	●		4.10-2 *None required.* Implementation of Policy DE 4.1a and conformance with State Confined Animal Facility regulations would reduce impacts related to runoff to a less-than-significant level.	●	

Key: LS = less than significant
S = significant
SU = significant and unavoidable

Table 2-1: SUMMARY OF IMPACTS AND MITIGATION MEASURES (*continued*)					
Environmental Impact	**Level of Significance before Mitigation**		**Mitigation Measures**	**Level of Significance after Mitigation**	
	LS	**S**		**LS**	**SU**
4.10-3 Increases in the demand for police and fire protection, emergency medical response, solid waste collection and disposal services, school facilities, and recreation facilities.	●		4.10-3 *None required.* Implementation of ~~Policies~~ Policy DE 3.6a ~~and 3.6b~~ would reduce the potential for impacts to public services to a less-than-significant level.	●	
Cultural Resources					
4.11-1 Disturbance or destruction of cultural (historical and archaeological) resources. This would be a significant impact if archaeological resources were to be identified at dairy development sites.	●		4.11-1 *None required.* Implementation of Policies DE 3.1d and 3.1e would reduce the potential for disturbance or destruction of cultural resources to a less-than-significant level.	●	

3. PROJECT DESCRIPTION

SECTION 3
PROJECT DESCRIPTION

The proposed project, the **Draft Dairy Element of the Kings County General Plan** (developed by the Kings County Planning Agency), presents a comprehensive set of goals, objectives, and policies to guide development, expansion, and operation of milk cow (bovine) dairies within the County. The Draft Dairy Element and associated applicable zoning ordinance amendments (hereafter collectively referred to as the Element) is designed to accomplish two equally important major purposes. The first purpose is to ensure that the dairy industry of Kings County continues to grow and contribute to the economic health of the County. The second purpose is to ensure that the standards established in the Element protect public health and safety and the environment.

The County has determined that the best way to accomplish these combined goals is to adopt a separate General Plan element that establishes development and operational policies for the local dairy industry. The element and associated zoning ordinance amendments will replace existing regulations pertaining to dairy development presented in the current County General Plan and the Kings County Zoning Ordinance. The purpose of this Program Environmental Impact Report (PEIR) is the evaluation of the potential environmental impacts associated with implementation of the proposed Element.

SETTING

Kings County is located in the southern San Joaquin Valley (Figure 3-1). The County is comprised of 1,391 square miles (890,513 acres) of land, predominantly dedicated to agricultural production. The central and eastern portions of the County occupy the relatively flat valley floor; the southwestern portion is characterized by the low hills and intervening valleys of the Kettleman Hills. The 2000 census identified 129,461 people in all of Kings County. In the cities of Avenal, Corcoran, Hanford, and Lemoore, there were approximately 96,907 people, including the 17,874 inmates at the Avenal and Corcoran State Prisons. Another 14,024 people live in the rural communities of Armona, Home Garden, Kettleman City, Lemoore NAS, Santa Rosa Rancheria, and Stratford. The remaining 18,530 people live in the agricultural areas. Irrigated agricultural crop production is the dominant land use on the valley floor and grazing and dry farming predominate in the southwest portion. Kings County is ranked as the 12th leading agricultural county in California (25th in the nation), and is in the top 15 milk producing counties in the nation. Kings County shares boundaries with the top four agricultural counties in the state, Fresno, Tulare, Monterey, and Kern.

PROJECT LOCATION Figure 3-1

Approximate
0 80 Miles

Source: Kings County Planning Agency, 2000.

BASELINE

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Milk production has become a major agricultural industry in Kings County. According to the *1999 Kings County Agricultural Commissioner's Annual Report*, dairy production has been the largest cash crop in Kings County in recent years. Milk represents about 31.8 percent of the gross value of agricultural commodities produced in Kings County. In 1999, there were 149 commercial dairies in the County supporting 124,668 milk cows (Appendix A, Table 3).[1] Under current conditions, a large portion of the milk produced within the County is exported to out-of-County processing facilities. However, the recently proposed expansion of the Leprino Foods cheese processing facility in Lemoore will provide additional local marketing options for the County's dairy operators.

As the producer of the leading cash crop, the dairy industry is very important to Kings County's economy. Expansion of the dairy industry within Kings County and the southern San Joaquin Valley is expected. Large dairy operations in southern California, primarily in the Chino Basin, are in the process of relocating their facilities, largely due to land use conflicts with urban uses. Kings County is an attractive option for relocation of these facilities due to the availability of large areas of land in agricultural settings and proximity to the large southern California milk market. Since 1988, an average of four new dairies has been approved by the Kings County Planning Agency on an annual basis. During that period, the yearly average increase in the number of dairy cows has been 4,573 milking cows per year.

Large tracts of agricultural cropland are necessary to implement "rural recycling"[2] of manure generated at the dairy facilities. Under this dairy management concept, manure and process water generated at the dairies are collected and used as fertilizer and soil amendment for production of feed crops to be used at the dairies. The process water also provides supplemental irrigation supply.

Despite these benefits, the generation and reuse of these materials can result in adverse effects on the environment. Volatile components of manure, including reactive organic gases (precursors to ozone formation), ammonia, methane, and hydrogen sulfide, can be released to the atmosphere. In addition, cattle movement in unpaved corrals generates particulate matter. The San Joaquin Valley Air Basin is currently in non-attainment of Federal and State air quality standards for ozone and PM_{10} (particulate matter less than 10 microns in diameter). In addition to potential air quality impacts, overuse of nutrients contained in manure can result in migration of nitrate and salts into surface and subsurface

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[1] Following completion of the analysis presented in this PEIR, the University of California Cooperative Extension released updated information on dairies in Kings County. In January 2000, the number of dairies was reduced to 147 and the milk cow herd increased to 130,443 cows (Appendix G).

[2] The reuse of manure generated at a dairy as a fertilizer and soil amendment for crop production and dairy process water as fertilizer and irrigation for crops is commonly referred to as "rural recycling."

waters. In recognition of these important issues, the Element of the *Kings County General Plan* was prepared to establish specific development and operational standards to ensure that the dairy industry can continue to grow while minimizing the potential adverse environmental impacts.

REGULATORY ENVIRONMENT

Water Quality

The design, construction, and operation of bovine dairies are controlled by local, State, and Federal laws and regulations. Confined animal facilities (CAFs), including dairies confining more than 1,000 animal units, must comply with specific provisions of the Federal Clean Water Act, including the requirement that such facilities prepare and implement a Clean Water Action Plan. Such facilities are also required to comply with the State regulations for confined animal facilities, which are codified in Title 27, Division 2, Chapter 7, Subchapter 2, Article 1 ("Confined Animals Facilities") of the California Code of Regulations commencing with Section 22560. These regulations were promulgated by the State Water Resources Control Board in 1984 and are enforced by the Central Valley Regional Water Quality Control Board (RWQCB). The regulations specify that certain minimum standards shall either be implemented in the Waste Discharge Requirements (WDRs) for a particular CAF or made a condition to the waiver of such requirements. In an effort to address the need to permit numerous dairies throughout the Central Valley, the RWQCB adopted General Waste Discharge Requirements for Milk Cow Dairies (Order No. 96-270), which established the specifications for dairy manure and process water management and an application process for dairy operations intending to comply with the requirements of the Clean Water Act. At its discretion, the RWQCB can issue site-specific WDRs for individual dairy operations.

In addition, runoff water quality is also regulated by the Federal National Pollutant Discharge Elimination System (NPDES) Nonpoint Source Program (established through the Clean Water Act); the NPDES Nonpoint Source Program objective is to control and reduce pollutants to water bodies from nonpoint discharges. The Program is administered in California by the California Regional Water Quality Control Boards. Commercial dairies are required to comply with the State NPDES General Construction Permit for discharges of storm water associated with construction activity and with the General Industrial Permit during operation.

Air Quality

The California Air Resources Board (CARB) is responsible for enforcing the federally-required State Implementation Plan (SIP) in an effort to achieve and maintain the national ambient air quality standards. In addition, CARB has established State Ambient Air Quality Standards (SAAQS) for the criteria pollutants as well as for other pollutants for

which there are no corresponding Federal standards. The SAAQS for the criteria pollutants are equal to or more stringent than the Federal standards. CARB is responsible for assigning air basin attainment and nonattainment designations in California.

Analogous to the Federal Clean Air Act (CAA) and its amendments, the 1988 California Clean Air Act (CCAA) requires areas within the State to be designated as attainment or nonattainment with the SAAQS. The CCAA similarly requires that plans be prepared for nonattainment areas describing strategies to achieve the SAAQS. The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) was formed in 1991 and has jurisdiction over air quality issues in the San Joaquin Valley Air Basin, which includes Kings County. The SJVUAPCD and CARB have joint responsibility for attaining and maintaining the State and Federal ambient air quality standards in the San Joaquin Valley Air Basin. The San Joaquin Valley Air Basin is currently in nonattainment for the Federal and State PM_{10} standards.

Agricultural and livestock operations are generally exempt from rules and regulations of the SJVUAPCD that pertain to stationary sources of air pollutant emissions. Therefore, dairies are not required to obtain permits for construction or operation. However, the SJVUAPCD enforces prohibitions for fugitive PM_{10} emissions (Regulation VIII) from outdoor sources, including some aspects of agricultural operations. The SJVUAPCD is in the process of revising Regulation VIII in response to U.S. EPA requirements for approval of the SIP. Draft amendments to Regulation VIII have been developed by the district. The amendments include a new rule (Rule 8081) that addresses PM_{10} emissions from off-field agricultural sources. Rule 8081 presents Best Available Control Measures (BACM), which would apply to dairy operations.

Dairy Design and Operation

The California Food and Agriculture Code (Sections 33481 through 33486) requires the development and enforcement of sanitary requirements and standards for the construction of dairy facilities. The California Code of Regulations (Title 3, Division 2, Chapter 1, Article 22) sets the required standards for dairy design and construction. The standards present specific design requirements for dairy buildings and corrals. Prior to construction, all dairy facilities are required to submit plans and specifications to the California Department of Food and Agriculture for review and approval. The Food and Agriculture Code also requires inspection of dairy farms by a certified milk inspection service. In Kings County, dairy farms are inspected by the Tulare County Environmental Health Services Division.

PROJECT COMPONENTS

DAIRY SITING

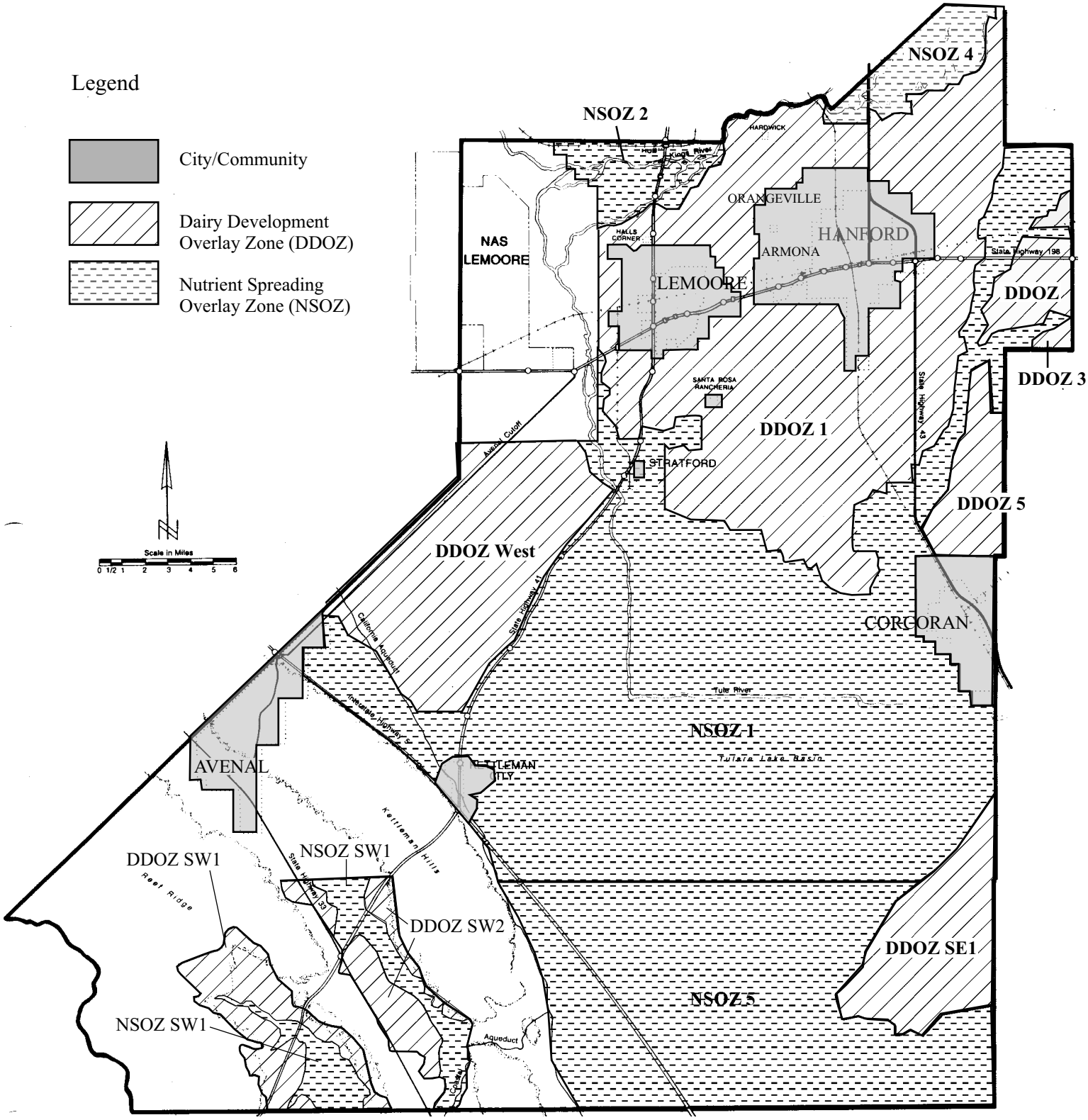
The Element designates areas (Figure 3-2) within the County suitable for the development and expansion of bovine dairy facilities (Dairy Development Overlay Zones, or DDOZs) and areas suitable for application of manure and process water generated at dairy facilities (Nutrient Spreading Overlay Zones, or NSOZs). The locations of the DDOZs are controlled by objectives and policies of the Element, which would restrict dairy development within and proximal to environmental constraints, including incompatible land uses (e.g., urban residential areas, schools, and the Lemoore Naval Air Station), flood zones, designated wildlife habitat, and areas of excessive slope. The DDOZs encompass approximately ~~394~~ 341 square miles (~~251,930~~ 217,657 acres) of land currently zoned for agricultural uses. Construction of dairy facilities and application of manure and process water would be allowed in the DDOZs.

The NSOZs encompass an additional ~~646~~ 642 square miles (~~413,693~~ 411,055 acres) for nutrient application. The combined areas of the DDOZs and NSOZs would total approximately ~~1,040~~ 983 square miles (~~665,623~~ 628,712 acres) for dairy facilities and nutrient spreading. On the basis of the available land within the DDOZs and NSOZs, the Element has estimated a theoretical capacity for the maximum herd size for the County under the provisions of the Element. The limiting factor for the theoretical herd size was assumed to be the rate of nutrient (nitrogen and salts) application recommended by the Central Valley Regional Water Quality Control Board (RWQCB) to be protective of water quality. The maximum theoretical milk cow herd is estimated to be 381,980 milk cows (534,772 animal units,[3] AU) and 423,998 head of support stock (335,409 AU), after considering the nutrient loading related to other livestock and biosolids reuse. Accounting for the estimated current dairy herd within the County (124,668 milk cows and approximately 138,344 head of support stock) and other existing sources of manure nutrients, the potential available remaining capacity in the County is approximately 257,312 milk cows and 285,654 head of support stock.

[3] An animal unit (AU) is a normalizing standard used to define equivalent numbers of animals managed at confined animal facilities. One animal unit is defined as one 1,000-pound mature dairy cow, specifically one Jersey cow. Support stock (e.g., heifers and calves) are smaller than milk cows and are assigned a fraction of an animal unit, depending on maturity (and weight). A mature Holstein cow is equivalent to 1.4 AU; a mature Guernsey cow is equivalent to 1.2 AU. For purposes of this EIR, all dairy cattle are conservatively considered Holstein cattle.

PROPOSED DAIRY DEVELOPMENT AREAS

Figure 3-2



BASELINE

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ENVIRONMENTAL REVIEW

Currently, new and expanding dairies are required by the Kings County Zoning Ordinance to obtain a Conditional Use Permit (CUP). Granting a CUP is a discretionary action that requires project-specific environmental review to comply with the California Environmental Quality Act. Under the proposed Element, new dairies and existing dairy expansions proposed within the DDOZs would be approved following the ministerial site plan review (SPR) process. An SPR is conducted by the administrator in conformance with the requirements of Article 21 of the Zoning Ordinance.

An SPR would be approved only after the application for a proposed (new or expanded) dairy project is found to comply with all of the requirements contained in the goals, policies, and objectives of the Element. Those requirements include specific siting and design criteria, operational standards, and monitoring and reporting guidelines that are proposed as mitigation of potential adverse environmental impacts. Dairy projects that meet all of the requirements of the Element would be considered allowable and conforming land uses within the DDOZs. If the zoning administrator determines that a dairy application does not meet the requirements of the Element, the proposed dairy project would be subject to the CUP process, including additional project-specific environmental review under CEQA. In addition, proposed dairy expansion projects within the limited agricultural (AL-10) zones would also be required to obtain a CUP.

The purpose of this change in the zoning process is to meet one of the primary goals of the Element, streamlining of the dairy project approval process. Approval of SPRs for conforming dairy projects would be ministerial actions taken by the zoning administrator. Under the revised dairy approval process, all dairy applications would be forwarded to responsible agencies to ensure that any required permitting beyond the SPR approval by the County would be considered by State and local regulatory agencies. Additional site-specific environmental review under CEQA for individual conforming dairy projects would not be necessary. The appropriateness of allowing new and expanded dairies to be approved under the SPR process depends on the strength of the environmental controls imposed on all projects under the Element. Review of the adequacy of the goals, objectives, and policies in reducing or eliminating adverse environmental effects of dairy construction and operation is the subject of this PEIR.

DAIRY APPROVALS

New Dairies

Dairy operators seeking to construct a new dairy would be required to file an application, which contains all information required by the goals, objectives, and policies of the adopted Element, with the zoning administrator. The level of permitting for expansion projects would depend on the scale of the proposed expansion and, more specifically, on the

capacity of the land under the control of the dairy operator to effectively reuse manure and process water generated by the proposed dairy herd. The zoning administrator would be responsible for calculating the area of land required to apply manure and process water generated by the management of the proposed dairy herd in a manner that would not result in application of excess nutrients that could be released to the environment. The "calculated capacity" of the proposed dairy site[4] would be determined by the zoning administrator in accordance with the methodology developed by the Central Valley Regional Water Quality Control Board for appropriate nutrient (nitrogen and salts) loading to reduce the potential for degradation of surface or subsurface water quality. The "calculated capacity" would define the size of the dairy herd that would be allowed at the proposed dairy site.

Existing Dairies

Under the Element, an SPR would be required for the expansion of any existing dairy if the expansion would include construction of new dairy facilities[5] and/or proposes expansion of the existing dairy site. If the proposed expansion does not include the construction of additional dairy facilities or expansion of the dairy site, the need for SPR approval would depend on the size of the proposed increase in the dairy herd and the amount of land available at the dairy site for application of manure and process water. For dairies that existed prior to January 1, 1979, the zoning administrator would determine the "calculated capacity" for the dairy site (in accordance with RWQCB criteria) on the basis of the amount of land owned or controlled by the dairy operator prior to July 1, 1998. For existing dairies that began operation on or after January 1, 1979, the zoning administrator would set the herd expansion limit at the dairy cattle herd approved for the dairy's existing zoning permit. If the proposed herd increase for an existing dairy does not exceed the "calculated capacity" or herd expansion limit, an SPR approval would not be required. Expansion of a dairy herd to above the "calculated capacity" for a dairy site would require a Conditional Use Permit.

ELEMENT OVERVIEW

The Element is organized into seven major sections. The initial section of the element describes the purpose and objectives of the element. The specific goals, objectives, and policies developed for control of dairy siting, design, and operation are presented in the

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[4] The Element defines a dairy site as all of the land used for a dairy, including the dairy facility and associated agricultural land.

[5] The Element defines a dairy facility as that portion of a dairy site that includes corrals, barns, feed storage, milk barn, lagoons, and other manure handling facilities, but not including the associated agricultural land.

subsequent sections. The following description summarizes the organization and content of the Element:

Section I provides an introduction describing the purpose, objectives, and organization of the Element. Section II explains the rationale, assumptions, and methodology for estimating the theoretical capacity for the maximum herd size for the County.

Section III of the Element presents limitations on the siting of dairy facilities, which includes prohibition of dairies within sensitive areas and setbacks from sensitive uses. In addition, Section III establishes the SPR process for new and expanded dairies.

The requirements for the design, construction and operation of new and expanded dairies is presented in Section IV. The policies of Section IV set forth the required technical analysis to be presented in dairy development applications and considered in the application review process. These requirements include submittal of site-specific technical analysis of surface and subsurface water resources, cultural resources, geotechnical conditions, and biological resources. In addition, the policies of Section IV require the development and implementation of operational plans, including plans for ~~comprehensive~~ manure nutrient management, dead animal management, process water ~~disposal~~ management, odor management, and manure treatment~~, and livestock management~~.

Section V of the Element establishes the Dairy Monitoring Office (DMO) within the Kings County Planning Agency and its responsibilities for implementing the requirements of the Dairy Monitoring Program. Requirements are also set for monitoring of dairy conditions by dairy operators, including reporting of annual inspections and documentation of quality assurance/control for required management plans. The policies of Section V also establish a program to be maintained by the DMO to track and evaluate compliance with the Element. Policies are included that provide funding for the DMO, establish a formal public complaint process, and ensure implementation of water quality monitoring at dairies. Section VI of the Element establishes the County policy to encourage certification of dairies under the California Dairy Quality Assurance Program.

~~Conformance of existing dairies with the goals, objectives, and policies of the Element is addressed in Section VI. The policies establish a Dairy Conformance Program under which legally existing dairies, not subject to existing or proposed permitting requirements, can voluntarily participate in evaluation and certification of conformance. A policy is also included that commits the County to working with the~~

~~Legislature, industry programs, and individual dairy operators to develop programs and funding to assist dairies in meeting current and future operating standards.~~

Section VII presents the results of an analysis of economic impact and job creation potential of the dairy industry. The economic analysis considers the consequences of the development of the maximum theoretical bovine herd established in Section II.

CONTACT PERSONS

The lead agency for the preparation of this PEIR is Kings County, which is also the project applicant. The environmental consultant for this PEIR is BASELINE Environmental Consulting. The key contact persons are as follows:

Lead Agency and Applicant:	Kings County Planning Department Mr. Bill Zumwalt, Director Government Center 1400 W. Lacey Blvd. Hanford, CA 93230 (559) 582-3211, Ext. 2686 or 2675
EIR Consultant:	BASELINE Environmental Consulting Mr. Kevin O'Dea, Vice President 101 H Street, Suite L Petaluma, CA 94952 (707) 762-5233

COUNTY OBJECTIVES

California Code of Regulations (CCR), Title 14, Chapter 3, Article 9, Section 15124 requires in part, that the project description includes "A statement of the objectives sought by the proposed project." ~~The introduction of the Element presents three stated objectives:~~ The following six stated objectives are presented in the Element:

- To evaluate the overall ability/capacity of Kings County to host dairies from the standpoint of the environment;
- To provide standards, including mitigation of impacts and monitoring and reporting of the mitigation measures applicable to the establishment of new and expanded dairies in Kings County;

- To streamline the dairy approval process, facilitating the orderly and efficient expansion of the dairy-based economy of the County;

- To maintain the viability of valued existing dairy operations within the County;

- To ensure that dairies approved in Kings County are competitive in the dairy industry;

- ~~To develop and adopt a voluntary, phased program to encourage existing dairies within Kings County to comply with these dairy standards within 5 years.~~ To support the dairy quality assurance program.

The first of these objectives recognizes the importance of the dairy industry to the current and future economy of Kings County and the need to promote controlled growth of the County's most economically productive agricultural industry. The second objective acknowledges that appropriate siting, design, and operational standards are necessary to reduce or eliminate potential environmental impacts associated with dairy development. The fifth objective addresses the importance of improving the operation of existing dairies within a realistic period of time.

REQUIRED ACTIONS FOR APPROVAL OF ELEMENT

Implementation of the proposed Element would result in significant changes in the local regulation of dairies within Kings County. Its implementation would require modification or replacement of existing regulations. The specific required actions and approvals for the proposed project are:

1. Planning Commission - Recommend to the Board of Supervisors that it:
    - Certify the Program Environmental Impact Report and Mitigation Monitoring Program;
    - Approve and adopt the Element of the Kings County General Plan;
    - Amend the Kings County Zoning Ordinance with the changes shown in Appendix E of the Element to implement the policies in the Element.

2. Kings County Board of Supervisors:
    - Certify the Program Environmental Impact Report;
    - Approve and adopt the Element of the Kings County General Plan;

- Amend the Kings County Zoning Ordinance to ensure that dairy development is consistent with State law and implement the policies in the Element.

In addition, there are several other public agencies that could review and comment on various aspects of the proposed project. These include Kings County Health Department, Division of Environmental Health Services; Kings County Agricultural Commissioner; Kings County Public Works Department; California Department of Food and Agriculture; Kings County Mosquito Abatement District; San Joaquin Valley Unified Air Pollution Control District; Kings County/Tulare County Dairy Inspector (Tulare County Health Department); California Department of Water Resources, Division of Safety of Dams; and the California Department of Fish and Game, California Department of Conservation Division of Oil, Gas and Geothermal Resources; and the United States Fish and Wildlife Service.

4. ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES

SECTION 4
ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES

This section of the EIR addresses specific topics required by the California Environmental Quality Act (CEQA). The Setting section for each topic (i.e., land use, geology) includes a description of existing conditions for the proposed project. The Impacts and Mitigation Measures section for each topic addresses impacts specifically related to the project. The impact analysis includes a discussion of all goals, objectives, and policies included in the Kings County Revised Draft Dairy Element (Element) that serve to mitigate the identified impact. In many cases, implementation of the policies of the Element is found to mitigate the identified impact to a less-than-significant level.

Unless otherwise noted, all identified impacts are considered potentially significant impacts. The corresponding mitigation measures, unless otherwise noted, would be sufficient to reduce impacts to a less-than-significant level. When more than one mitigation measure is recommended for a specific impact, all the measures would be required to reduce the impact to a level of insignificance unless the word "or" or "alternatively" appears in the list of mitigation measures. Although not required by CEQA, several less-than-significant impacts have also been discussed because they are issues of local concern. No mitigation is required by CEQA for less-than-significant impacts. However, all policies of the Element that mitigate the impact are identified for less-than-significant impacts. Mitigation measures are provided for all significant impacts.

Each impact is summarized, numbered, and shown in bold lettering. Text then follows each summarized impact statement to provide more detailed discussion and analysis. At the end of the impacts discussion, mitigation measures are listed and numbered to correspond to the numbered impact. The summary table in Section 2 of this EIR includes the same text shown in bold lettering and the mitigation measure(s).

DETERMINATION OF SIGNIFICANCE

Under CEQA, a significant impact is defined as a substantial, or potentially substantial, adverse change in the environment (Public Resources Code 21068). The guidelines implementing CEQA direct that this determination be based on scientific and factual data. The specific criteria for determining significance of a particular impact are identified prior

to the impact discussion in each topical section, and are consistent with significance criteria set forth in the recently revised guidelines implementing Appendix G of the CEQA Guidelines, and those used locally, where available.

4.1 GEOLOGY, SOILS, AND SEISMICITY

4.1 GEOLOGY, SOILS, AND SEISMICITY

This section presents a description of the geologic, soils, and seismic conditions within Kings County and expected impacts associated with implementation of the proposed project. The description of these conditions is based on published and unpublished reports and maps prepared by the U.S. Geological Survey, the Soil Conservation Service (now known as the Natural Resource Conservation Service), the California Division of Mines and Geology, and the Kings County Planning Agency. Mitigation measures are presented for each identified impact.

SETTING

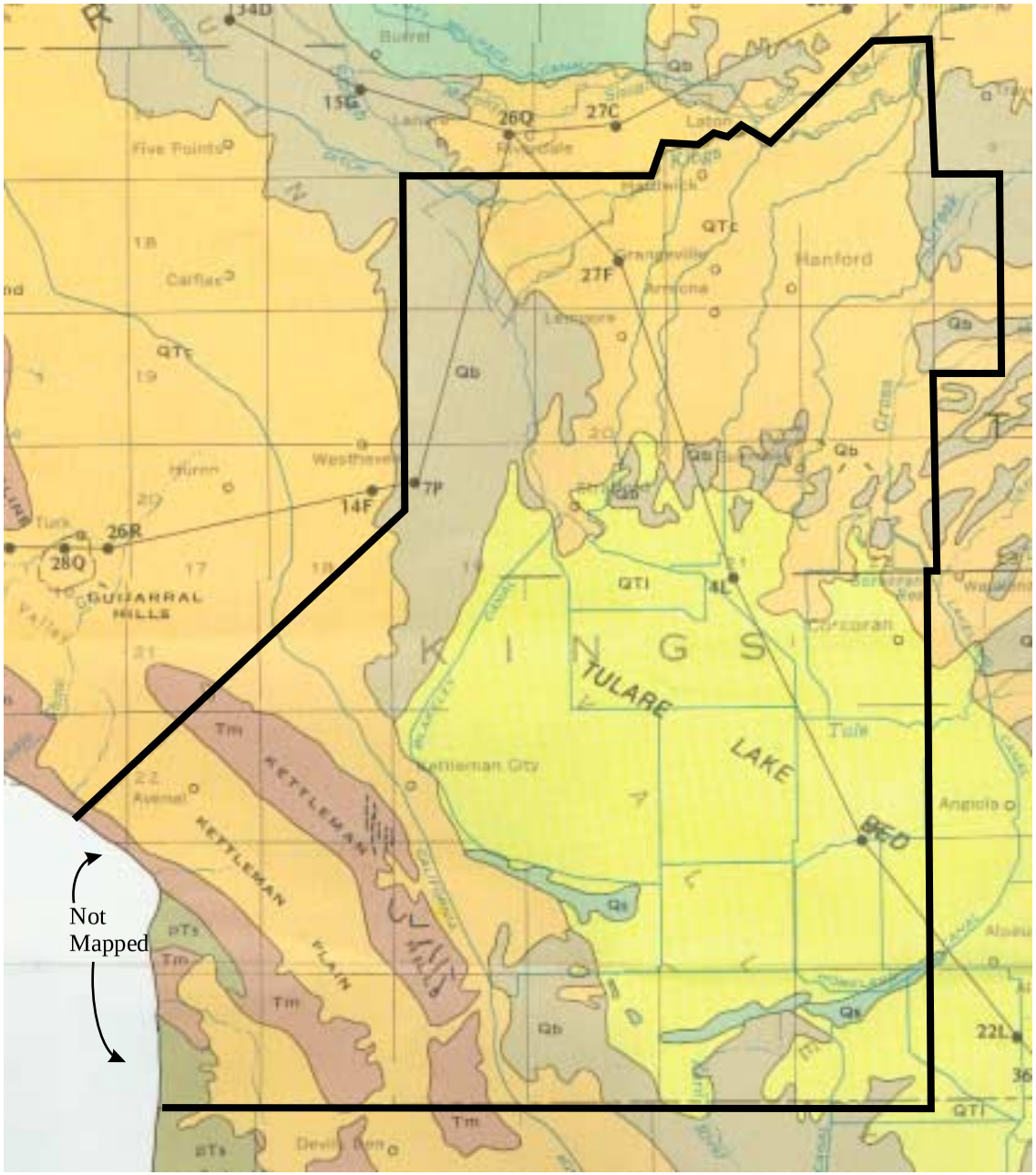
REGIONAL GEOLOGY

Kings County is located in the west-central portion of the San Joaquin Valley, the southern section of the Great Valley Geomorphic Province of California. The Great Valley (also referred to as the Central Valley) is a large, asymmetrical, northwestwardly-trending, structural trough formed between the uplands of the California Coast Ranges to the west and the Sierra Nevada to the east (Figure 4.1-1). The Great Valley is over 400 miles long and approximately 50 to 60 miles wide in the project area. The Valley is subdivided into the Sacramento Valley (north of the Sacramento-San Joaquin Delta) and the San Joaquin Valley (south of the Delta). The southern part of the Valley (including most of Kings County) is internally draining, with the distributaries of the Kings, Tule, and Kaweah rivers and Cross Creek flowing into the Tulare Lake Bed. North of the Kings River, runoff is directed into the San Joaquin River, which flows northward.

The southern San Joaquin Valley is bounded by the low mountains of the Coast Ranges to the west, the San Emiggdio and Tehachapi Ranges to the south, and the foothills of the Sierra Nevada to the east. The valley is filled with up to six vertical miles of sediment (Norris and Webb, 1990). The sediments include marine, alluvial, and lacustrine (lake) deposits. The valley is asymmetric with its axis located to the west of the geographic center of the valley. In general, the rivers lie along the axis and the thickest accumulation of sediments is also located along the axis. The geologic structure in the subsurface produced by folding and faulting and the presence of significant petroleum source rocks and suitable reservoir rocks has resulted in the development of numerous oil and gas fields within the southern San Joaquin Valley (including the Kettleman Hills, west of the project site). This sedimentary sequence is underlain in the west by granitic and metamorphic rocks of the Sierran structural block and by mafic and ultramafic bedrock in the east.

GEOLOGIC MAP

Figure 4.1-1



Legend

Qs	Sand dunes (Holocene)
Qb	Flood-basin deposits
Qr	River deposits (Holocene)
QTl	Lacustrine and marsh deposits (Pliocene to Holocene)
QTc	Continental rocks and deposits (Miocene to Holocene)
Tm	Marine rocks and deposits (Eocene, Oligocene, Miocene, and Pliocene)
pTs	Marine rocks (Pre-Tertiary)
———	Contact approximately located
— — —	Fault dashed where approximately located, dotted where concealed
D — D′	Line of geologic section
● 34A	Well and number

0 8 Miles

BASELINE

Source: Page, 1986.

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The alluvial sediments include relatively coarse-grained deposits along river channels and alluvial fans on the margin of the valley. These sediments include the Tulare and San Joaquin Formations, which outcrop along the western margin of the valley and dip toward the center of the valley. These formations are relatively resistant to erosion and form low hills, including the Kettleman Hills in southwestern Kings County.

During the wetter climatic periods of the Pleistocene Epoch (1.8 million to 11,000 years ago), a series of lakes formed in the western, lowest portions of the valley floor. These lakes included, from north to south, Tulare, Buena Vista, and Kern lakes. During the relatively warmer and drier climatic conditions of the Holocene Epoch (the last 11,000 years), the water levels in the lakes receded and the lakes became seasonal lakes or playas. Fine-grained lake deposits are enduring evidence of the presence of the lakes. In historic times, much of the area of the lakes has been drained and put into agricultural production. The central portion of Kings County (Figure 4.1-1) occupies a portion of Tulare Lake, the largest of the Pleistocene lakes. The Kings, Kaweah (Cross Creek), and Tule rivers, as well as other distributaries, terminate within the former Tulare Lake Bed, which partially and temporarily fills during periods of high runoff.

Finer-grained lacustrine and flood basin deposits related to the Pleistocene lakes are found in the central portion of the valley (Page, 1986). The Tulare, Kern, and Buena Vista Lake Beds were sediment deposition centers located within structural depressions on the valley floor. Tectonic subsidence of the surface is caused by down-warping of the earth's crust. The fine-grained sediments underlying the Tulare Lake Bed are more than 3,600 feet thick. These deposits include the E clay, a diatomaceous clay deposited over a very large area of the San Joaquin Valley. The E clay is considered equivalent to the Corcoran Clay Member of the Tulare Formation. Within Kings County the top of the E-clay occurs at depths of approximately 250 to 900 feet and the layer is up to 160 feet thick.

In addition to the E clay, other younger, less extensive but similar clay deposits have been recognized. These deposits are found along the topographic axis of the valley, including the area of the project site. The C clay is mapped from near the town of Mendota in northern Fresno County to the Kern Lake Bed. This unit ranges in depth from about 100 to 330 feet below the ground surface and is 5 to 45 feet thick. The A clay is the youngest of the clay deposits and is also found underlying the axis of the valley. This unit is typically encountered at depths of less than 10 to 70 feet and is generally 5 to 70 feet thick. The presence of the A clay usually results in perching of groundwater at shallow depths.

GEOMORPHOLOGY AND TOPOGRAPHY

The most prominent topographic feature in Kings County is the Tulare Lake Bed. The lake bed is a broad, shallow depression covering the central and southern portions of the County. The land surface within the basin is nearly flat but has been modified significantly

by agricultural grading. The average elevation of the lake bed is approximately 175 and 192 feet NGVD. The northern portion of the County is typified by alluvial fan surfaces formed along the Kings and Tule rivers and Cross Creek. The alluvial fan surface slopes gently toward the Tulare Lake Bed.

The Kettleman Hills region, located in the southwestern portion of the County, forms a distinct geomorphic setting. The region of the County is characterized by northwest-southeast trending ridges (i.e., Kettleman Hills, Pyramid Hills, Keryenhagen Hills, and Avenal Ridge) and intervening valleys (i.e., Kettleman Plains and Sunflower Valley). The topography is developed on folded and faulted Pleistocene and Pliocene sedimentary rocks. The ridges rise to a maximum elevation of 3,473 feet NGVD at Table Mountain at the western boundary of Kings County. The slopes are moderately steep to steep.

County Soils

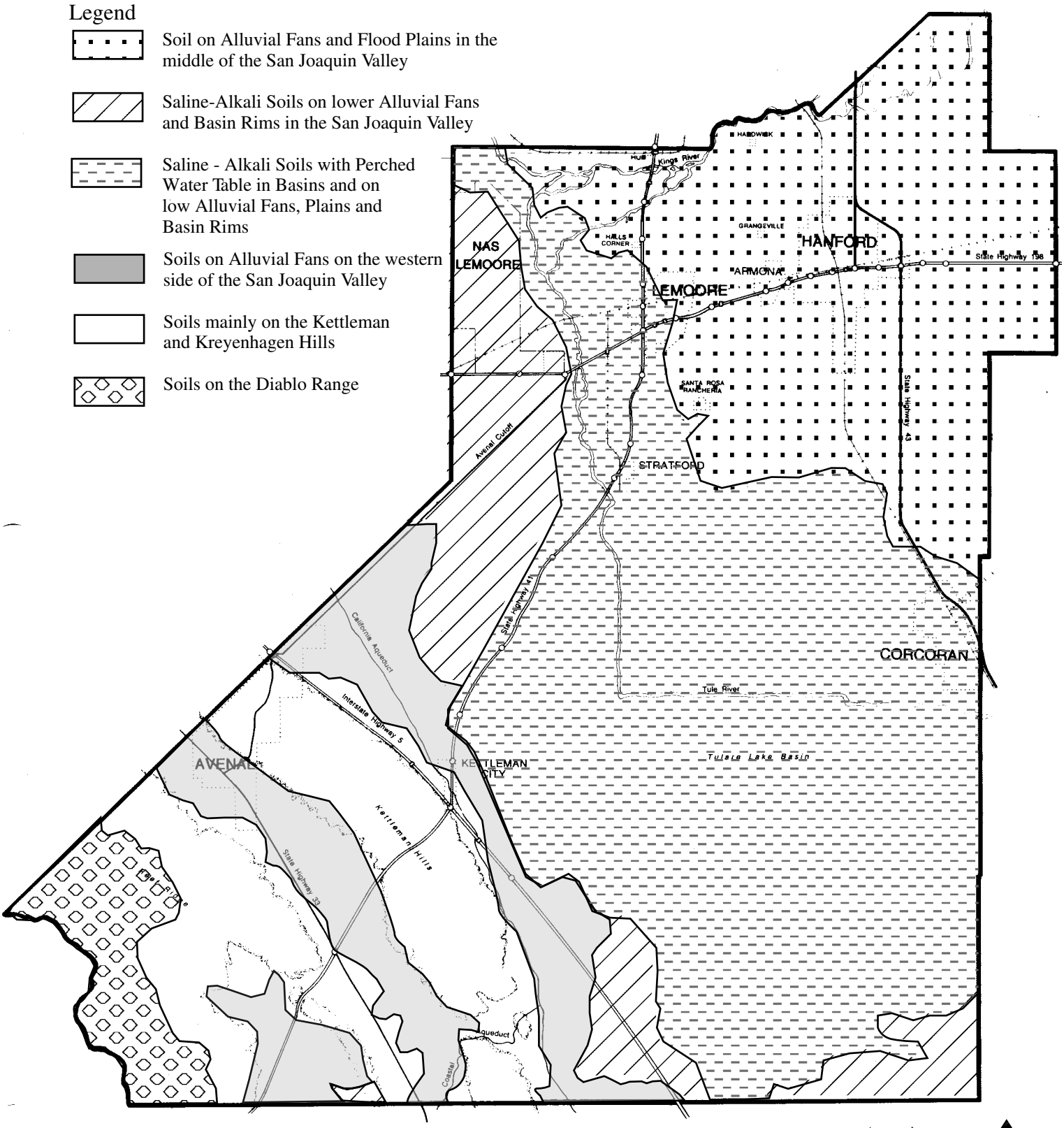
Soil is generally defined as the unconsolidated mixture of mineral grains and organic material that mantles the land surfaces of the earth. Soils can develop on unconsolidated sediments and weathered bedrock. The characteristics of soil reflect the five major influences on their development topography, climate, biological activity, parent (source) material, and time. The surface soils throughout Kings County have been mapped (Figure 4.1-2) by the U.S. Soil Conservation Service (USDA, 1986), an agency now known as the Natural Resource Conservation Service (NRCS). In general, there are six general types of soil (called associations) within the County. The soil associations are comprised of similar specific soil types (called mapping units), which have developed on similar geologic materials and topography.

Northeast Alluvial Fans

The alluvial fan surfaces in the northeastern portion of the County are mantled with very deep, well-drained, saline-alkali soils. These soils include three soil associations. The Nord association soils are located in the northeast corner of the County, in the higher portions of the Cross Creek alluvial fan. The Kimberlina-Garces association mantles the lower portions of this alluvial fan. The soils developed on the alluvial fan along the Kings River are mapped as Remnoy-Melga-Youd association. The soils of the Kimberlina-Garces and Remnoy-Melga-Youd associations are very deep, nearly level saline-alkali soils. The surface horizons are sandy loams and fine sandy loams. The Remnoy-Melga-Youd association soils have a prominent hardpan. The permeability is moderately slow to very slow. Runoff is usually very slow and the erosion potential is slight. The Nord soils are similar although typically less saline and alkaline.

GENERALIZED SOILS MAP

Figure 4.1-2



Approximate

0 7 Miles

Source: USDA, 1986

BASELINE

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The agricultural Capability Class ranges from I to III and the predominant land use on these soils is primarily for row and field crop production. The soils of the Kimberlina-Garces and Remnoy-Melga-Youd associations are best suited for salt- and alkali-tolerant, drought-resistant crops. Generally, soils in this group present only slight restrictions to building site development.

Low Alluvial Fans and Basin Rim

The lower portions of alluvial fans that border the northeastern and southeastern margins of the Tulare Lake Basin are transitional in character relative to the upper portions of the alluvial fans and the lake basin. The Lethent, Lethent-Garces-Panoche, and Lethent-Excelsior soil associations are found in these areas. Soils of these associations typically have loam, clay loam, or sandy clay loam surface soils and clay, clay loam, or silt loam subsurface soils. Most of the horizons are alkaline and saline and have high corrosivity for steel and concrete. Some mapping units within this group of soils are calcareous. The permeability is moderate to very slow and runoff is slow or very slow.

The soils are used primarily for irrigated row and field crop production. The soils are best suited for salt- and alkali-tolerant, drought-resistant crops. Most of the soils are Capability Class I through III. The primary limitation, when present, is the droughty nature of these soils. Building site limitations are primarily high shrink-swell potential and high corrosivity.

Tulare Lake Basin and Basin Rim

The soils within and at the margins of the Tulare Lake Basin saline-alkali soils developed in areas of perched shallow groundwater. These soils characterize most of the central portion of the County. Three soil associations are represented, Gepford-Westcamp-Houser, Tulare, and Armona-Lakeside-Grangeville. These soils are very deeply developed on nearly flat alluvial deposits and are typically somewhat poorly drained to poorly drained. The nearly level topography results in slow runoff and negligible erosion potential. The surface horizon is typically fine-grained, ranging from fine sandy loam to clay. Subsurface horizons are also fine-grained. The permeability is slow to very slow and shrink-swell potential is high. The saline-alkali soils cause high corrosivity to concrete and steel.

The soils are used primarily for irrigated row and field crop production. The soils are best suited for salt- and alkali-tolerant, drought-resistant crops. Most of the soils are Capability Class III with the primary limitation being shallow groundwater.

Southwestern Valleys

The Kettleman Plain, Sunflower Valley, and the western margin of the Kettleman Hills contain some of the best quality agricultural soils in Kings County. Although the texture

and chemistry of the soils are well suited for agriculture, the availability of water limits agricultural productivity. The soil associations that occur in these areas are Avenal-Panoche, Panoche-Wasco, and Wasco-Panoche-Westhaven. These soils are deeply developed on alluvium and are well drained to moderately well drained. The surface soils are typically loam and sandy loam. The permeability is moderately slow to moderately rapid. Runoff is moderate and the erosion hazard is moderate. The shrink-swell potential is moderate to high, presenting a limitation to building development.

As indicated above, the areas mapped as these associations are not typically irrigated and are used primarily for non-irrigated crop production and grazing. Assuming that these soils are not irrigated, the Capability Class is VII. If irrigated, the Capability Class is upgraded to II, with the primary limitation being the erosion hazard and arid climate.

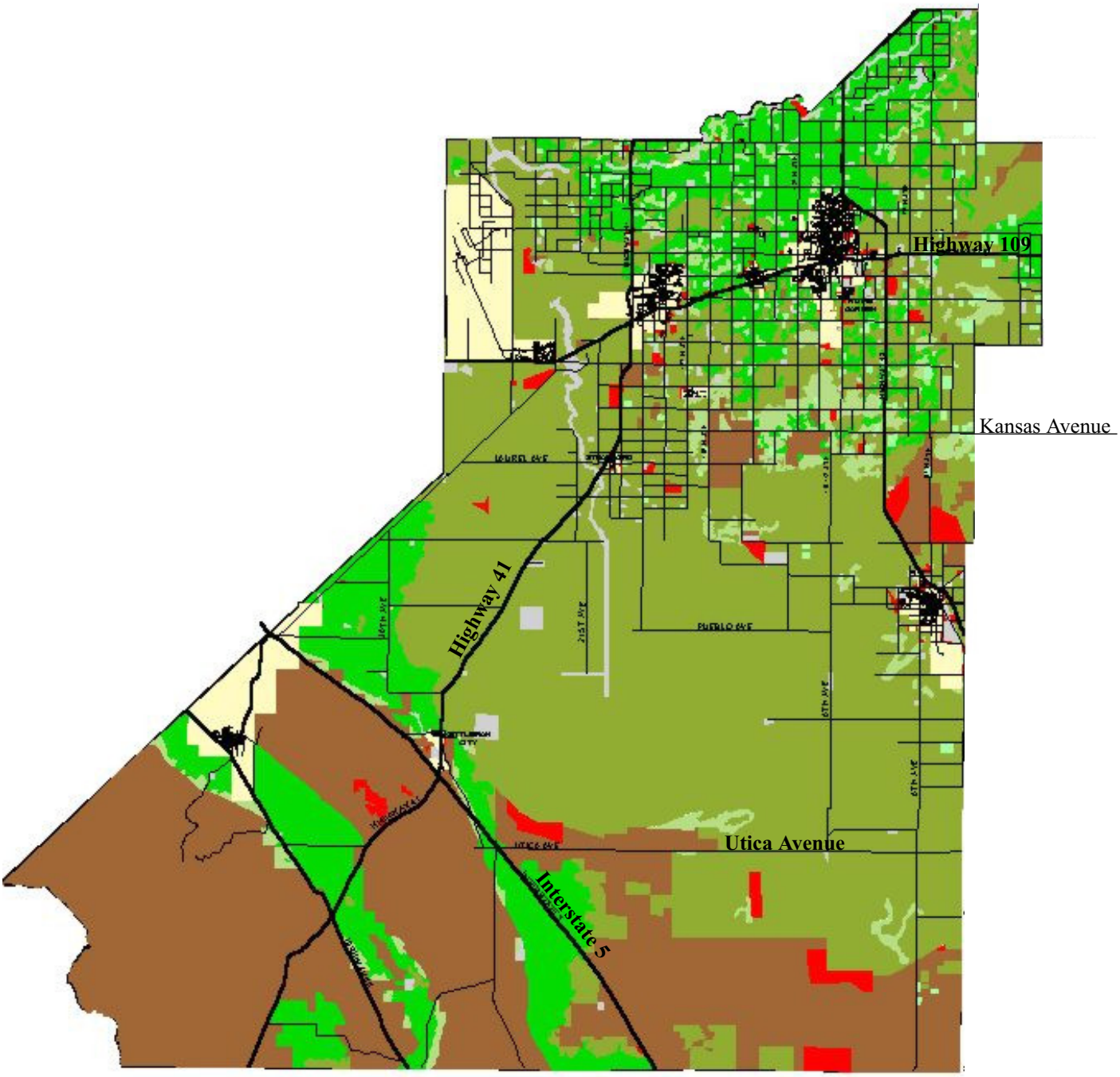
Southwestern Uplands

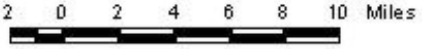
The soils of the uplands of the southwestern portion of the County, including the Kettleman Hills, Pyramid Hills, Keryenhagen Hills, and the Diablo Range, have severe limitations for agriculture and building development. The soils are developed within colluvium on sedimentary bedrock and are shallow and well-drained to excessively well-drained. The erosion hazard is high. The soil associations within the upland area include the Henneke-Wasesprings-Millsholm and Graviota-Vaquero-Altamont associations in the foothills of the Diablo Range, and the Kettleman-Cantuan-Mercey, Delgado-Kettleman, and Delgado-Carollo associations in the Kettleman and Kreyenhagen Hills. Severe limitations for agriculture include low rainfall, high erosion hazard, shallow depth to bedrock, and excessive shrink-swell potential. The areas are used primarily for rangeland and wildlife habitat. Grazing is generally restricted to winter and spring by low rainfall.

FARMLAND CLASSIFICATION

The Department of Conservation Farmland Mapping and Monitoring Program has classified farmlands throughout Kings County (CDC, 1998). The purpose of the program is to provide data to decision makers for use in planning for the present and future use of California's agricultural land resources. The program produces maps showing areas defined as meeting the characteristics of seven general agricultural land use categories. Land with the best combination of physical and chemical features to sustain long-term production of agricultural crops is classified as "prime farmland." The soil quality, growing season, and available moisture supply in areas classified as "prime farmland" are the best in the state for crop production. The most recent mapping of the County (Figure 4.1-3) by FMMP identifies three general areas of "prime farmland," the north-central portion of the County, the western valley margin, much of the Kettleman Plain, and the southern portion of Sunflower Valley. In 1998, 142,528 acres of the County were classified as "prime farmland."

IMPORTANT FARMLAND MAP 1998 Figure 4.1-3





LEGEND

Important Farmland Classifications:

- Grazing Land
- Farmland - Local Imp.
- Prime Farmland
- Farmland - State Imp.
- Unique Farmland
- Urban/Developed
- Water
- Other Land

Source: California Department of Conservation.

The mapping indicates that the majority (429,172 acres in 1998) of the valley floor (including the Tulare Lake Bed) is classified as "farmland of statewide importance." Lands in this classification are considered to have a good combination of physical and chemical features for the production of agricultural crops but have minor limitations relative to "prime farmland." Other farming areas (24,496 acres) are identified as"unique farmland." Although lands within this category do not meet the standards of "prime farmland" or "farmland of statewide importance," these lands have been used for the production of high value crops. Dairy sites within the County that existed at the time of FMMP are classified as "farmland of local importance." The upland areas (244,174 acres) of the southwestern portion of the County are classified as "grazing land" and are not typically suitable for crop production.

In addition to mapping and classifying farmlands statewide, the FMMP monitors conversion of agricultural land to nonagricultural use. Between 1996 and 1998, a net loss of 50 acres of prime farmland and 4,715 acres of "farmland of statewide importance" occurred in Kings County. The farmland conversion data indicate that 597 acres of prime farmland, 816 acres of "farmland of statewide importance," and 100 acres of "unique farmland" were converted to "farmland of local importance." These changes reflect, in part, the conversion of cropland to dairy facilities.

SEISMICITY

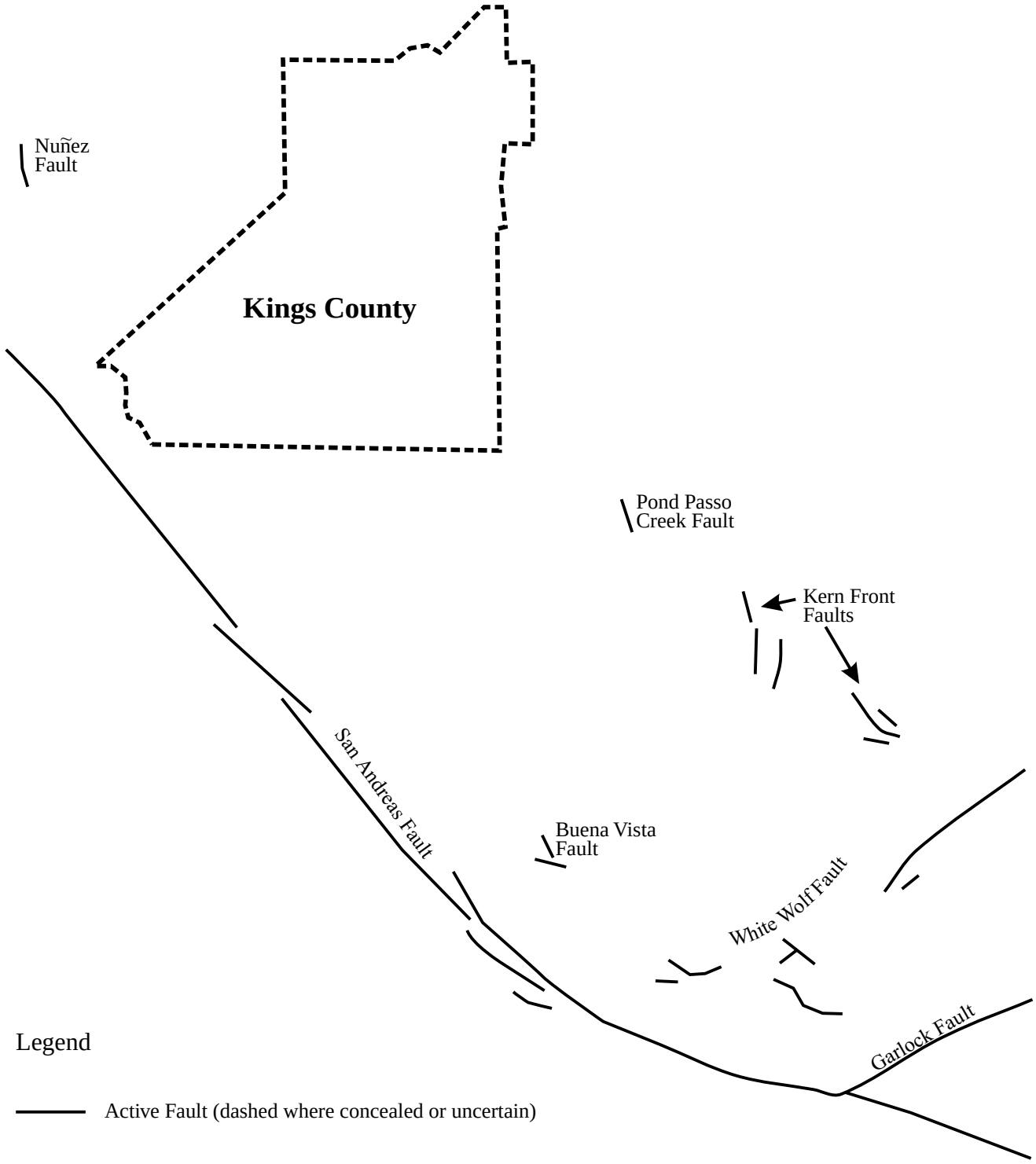
Kings County is located in a seismically active region and, therefore, designated seismic Zone 4 in the Uniform Building Code and Kings County Code of Building Regulations. Expected earthquakes on several active regional faults, including the San Andreas, White Wolf, Garlock, and Kern Front Faults, could cause moderate to strong seismic ground shaking within the County. Faults recognized as active[1] in the vicinity of the County are shown on Figure 4.1-4. No evidence of active earthquake faults has been identified in the County. The lack of evidence of active faulting at the site indicates that the potential for fault rupture is negligible.

The closest active fault identified by the Alquist-Priolo Earthquake Fault Mapping Program, the Nunez Fault, is located approximately 40 miles to the northwest. Surface rupture occurred along this fault during the 1983 Coalinga earthquakes. The main shock of these earthquakes, occurring on 2 May 1983, had a magnitude of 6.7. The surface rupture along the Nunez Fault was not considered to generate the main shock, rather, the earthquake was caused by movement along a "blind thrust" fault that is concealed at depth within a complex fold and thrust belt at the western margin of the San Joaquin Valley. This

[1] A fault is considered active under the California Alquist-Priolo Earthquake Faults Zoning Act if geologic or seismic evidence indicates that displacement along the fault has caused surface rupture in the last 11,000 years.

REGIONAL ACTIVE FAULTS

Figure 4.1-4



Source: Jennings, 1994.

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deformational zone extends along the entire western margin of the Great Valley and is termed the Coast Range-Sierran Block Boundary Zone (CRSBBZ). In addition to the 1983 earthquakes, a magnitude 6.0 earthquake occurred on 4 August 1985 with its epicenter located approximately 10.5 miles east of Coalinga.

Proximity to the CRSBBZ controls the expected ground shaking. Therefore, the western portion of Kings County is predicted by the California Division of Mines and Geology to experience more ground shaking than the eastern portion of the County. The estimated peak horizontal ground acceleration (a standard measure of seismic shaking) that is expected to occur in the western portion of the County over the next 50 years would be 0.3 to 0.6 g. This level of shaking would be comparable to Modified Mercalli Intensity (MMI) VIII to IX (Table 4.1-1); similar to intensities experienced in the area during the 1983 Coalinga earthquake. The ground in the eastern portion of the County is expected to be 0.1 to 0.3 g or MMI VII to VIII. This level of shaking would be similar to intensities experienced in the area during the 1952 White Wolf magnitude 7.2 earthquake. By comparison, the area of the project site was subjected to MMI V (eastern portion) to VI (western portion) during the 1983 Coalinga earthquake (Rymer and Ellsworth, 1990).

The potential for seismically-induced ground failure in the County is low to moderate. The valley floor portions of the County are relatively flat and the potential for slope failure is negligible. Liquefaction[2] of saturated, loose, granular sediments is unlikely, as the near-surface sediments are predominantly fine-grained lacustrine deposits. The fine texture and cohesiveness of these sediments would generally inhibit the potential for liquefaction. However, sandy layers may occur within the sediments underlying portions of the County. These layers may be subject to liquefaction. The Safety Element of the Kings County General Plan identifies the central portion of the County as being a zone of secondary liquefaction hazard, including all DDOZ west and DDOZ southeast, and the western portion of DDOZ 1.

MINERAL RESOURCES

According to the Resource Conservation section of the Kings County General Plan, there are currently no mineral extraction activities occurring within the County. The California Division of Mines and Geology has not identified any significant mineral resources within the County. Oil and gas resources have been identified in and extracted from portions of the County. Oil and gas production began in Kings County in the early 1900s. The

[2] During moderate to strong ground shaking, saturated sediments can undergo a type of failure referred to as liquefaction. During liquefaction, elevated pore water pressures cause a complete and sudden loss of strength and the sediments are transformed from a solid to liquid state. In a liquid state, the sediments have no bearing capacity and can flow. The results of flow can include collapse or settlement of the ground surface. Significant damage or collapse of structures built in areas affected by liquefaction can occur.

TABLE 4.1-1: **Modified Mercalli Scale**[1]

	Intensity	Effects	v,2 cm/s	g3
M4	I.	Not felt. Marginal and long-period effects of large earthquakes.		
3	II.	Felt by persons at rest, on upper floors, or favorably placed.		
	III.	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.		0.0035-0.007
4	IV.	Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV wooden walls and frame creak.		0.007-0.015
	V.	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.	1-3	0.015-0.035
5	VI.	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle - CFR).	3-7	0.035-0.07
6	VII.	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments - CFR). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.	7-20	0.07-0.15
	VIII.	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.	20-60	0.15-0.35
7	IX.	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations - CFR.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas sand and mud ejected, earthquake foundations, sand craters.	60-200	0.35-0.7
8	X.	Most masonry and frame structures destroyed with their foundations. some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.	200-500	0.7-1.2
	XI.	Rails bent greatly. Underground pipelines completely out of service.		>1.2
	XII.	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.		

Note:

Masonry A, B, C, D. To avoid ambiguity of language, the quality of masonry, brick or otherwise, is specified by the following lettering (which has no connection with the conventional Class A, B, C construction).

Masonry A: A Good workmanship, mortar, and design, reinforced, especially laterally, and bound together by using steel, concrete, etc; designed to resist lateral forces.
Masonry B: Good workmanship and mortar, reinforced, but not designed to resist lateral forces.
Masonry C: Ordinary workmanship and mortar; no extreme weaknesses such as non-tied-in corners, but masonry is neither reinforced nor designed against horizontal forces.
Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

[1] From Richter (1958).
[2] Average peak ground velocity, cm/s.
[3] Average peak acceleration (away from source).
[4] Richter magnitude correlation.

petroleum reserves are located within Tertiary sedimentary rocks of the San Joaquin, Temblor, and Kreyenhagen formations. The principal active petroleum resource fields include the Pyramid Hills, Kettleman Middle and North Dome, and Tulare Lake oil fields, and the Harvester gas field. The Dudley Ridge and Northwest Trico gas fields have been abandoned. The active and abandoned fields contain numerous active, idle, and abandoned oil and gas wells and abandoned non-producing ("dry") exploratory wells. In addition, numerous abandoned dry wells are located outside the boundaries of the fields. The California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR) maintains records of the location and details of construction and abandonment of all oil and gas wells. Although significant volumes of oil and gas have been produced, production has been in decline within the County for the last 30 years.

SUBSIDENCE

Land surface subsidence is a phenomenon under which the land surface is measurably but gradually lowered over time. The subsidence of the land surface can be caused by a wide range of natural and human-induced factors. Natural subsidence is generally caused by deformation of the earth's crust or tectonics. As indicated earlier, tectonic subsidence of the axis of the San Joaquin Valley caused by down-warping of the crust along the San Joaquin Valley syncline resulted in the formation of Pleistocene lakes and lacustrine sediment deposition. The rate of tectonic subsidence is very slow and measurable only by very precise surveying. However, the observation of tectonic subsidence is very difficult in areas affected by subsidence caused by human factors. The primary cause of human-induced subsidence is the extraction of fluids from the subsurface (including groundwater and oil or gas). When fluids are removed from voids within sediment and rock by pumping, the structure of these materials can partially collapse, resulting in compression or consolidation. When this occurs, a loss of volume results, potentially causing settlement at the surface. Within the San Joaquin Valley, historically intensive groundwater extraction has resulted in significant land subsidence within some areas of the valley.

Kings County is located within a broad area of the southern San Joaquin Valley where groundwater withdrawal resulted in significant subsidence (Bertoldi, et al., 1991). However, most of the subsidence occurred following the period of intensive groundwater withdrawal during the 1940s through the 1960s. The rate of groundwater withdrawal declined sharply in the late 1960s when surface water supplies became available. In addition, proactive management of groundwater resources, including large groundwater recharge projects, promoted the recovery of depressed groundwater levels. By 1983, land subsidence in the San Joaquin Valley had either slowed considerably or stopped (Ireland, 1986).

The Kings County General Plan identifies two areas of "secondary hazard" related to subsidence. One area is located southeast of Corcoran; the second area is along the western margin of the County.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

The Kings County Draft Dairy Element (Appendix A) includes several components that address geologic resources and seismic hazards. Specifically, **Goal DE 1** proposes to restrict dairy development to areas where dairies would be most compatible with surrounding land uses and environmental constraints (including adverse geologic, pedologic, and seismic conditions). **Objective DE 1.2** promotes using specific ~~criteria~~ standards to avoid potential land use conflicts, which could include conflicts with potential adverse conditions. Policies that implement **Objective DE 1.2** include **Policy DE 1.2f**, which prohibits dairy development within areas of excessive slope in the southwestern portion of the County. **Policy DE 1.2d** limits dairy development in areas of high groundwater, reducing potential impacts associated with liquefaction of saturated sediments. **Policy DE 2.1f** requires that a site-specific geotechnical report be prepared and submitted as part of applications for all new dairy facilities. **Goal DE 3** requires development of policies for evaluation of the potential environmental effects during review of proposals for new dairies. **Objective DE 3.1** supports this goal and establishes the requirement for assessment of soil characteristics **(Policy DE ~~3.2b~~ 3.1a.B)** ~~and loss of agricultural land (Policy DE 3.1a(G))~~. **Policy DE ~~6.1c~~ 6.2b** requires annual inspection of slopes surrounding manure separation pits and process water ponds to ensure timely recognition of erosion and slope stability problems.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

Unstable geologic environments can potentially result in significant damage to structures and/or cause injuries or death to persons exposed to those hazards. For purposes of impact analysis for this EIR, a potentially significant impact would result if the project would result in or expose people or structures to any of the following:

- Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
- Strong seismic ground shaking;
- Seismic-related ground failure, including liquefaction;

- Landslides;
- Substantial soil erosion or the loss of topsoil;
- Geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on-site or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- Expansive soil, as defined in Table 18-1-B of the Uniform Building Code (~~1994~~ 1997), creating substantial risks to life or property;
- Soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

In addition to the analysis of unstable geologic condition, this section of the EIR evaluates potential impacts of the proposed Element on soils as an agricultural resource. Therefore, the following significance criteria are also considered:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;
- Conflict with existing zoning for agricultural use or a Williamson Act contract;
- Involve other changes in the existing environment that, due to their location or nature, could result in conversion of farmland to non-agricultural uses.

Impact 4.1-1

Construction of proposed embankments to contain dairy operations process water present the potential for erosion and slope failure and release of contained process water. This is a less-than-significant impact.

Under existing conditions, the topography within the Dairy Development Overlay Zones (DDOZs) is primarily flat (with slopes less than one percent) and the potential for slope failure is negligible. The only exception are the slopes along existing irrigation canals and agricultural ditches. The potential for slope failure along the canals is minimized by the low height (generally less than ten feet) and maintenance activities under which the slopes are regraded periodically, providing uniform slope surfaces. Under the proposed project, manure separation pits and process water ponds at some potential dairy sites would be constructed above the existing ground surface by the emplacement of earthen embankments. Generally, the embankments would be constructed with available surface soils at the dairy site and would not require the importation of fill materials from off-site locations.

The properties of the shallow surface soils in portions of the County could present problems for appropriate embankment construction. The surface soils of the soil mapping units within the DDOZs are predominantly loams and silty loams, some of which are alkali and have high salt content. These soils generally have low compressive strength that can present slope stability problems if not properly treated and compacted. These soils are also potentially subject to a phenomenon known as hydrocompressibility.

In addition, the soils have a high potential for erosion when exposed on a steep slope such as those proposed for the embankments. Although the potential for water erosion by runoff would be limited due to low precipitation amounts and slow runoff, the potential for erosion by wave action could result in minor slope failures along the interior margin of constructed embankments.

The site-specific potential for slope failures and erosion of the embankment slopes at new or expanded dairies is addressed in the Element. **Policy DE 3.1a** requires that soil characteristics, slope stability, and erodibility be considered in siting of new and expanded dairies. **Policy DE 2.1f** requires that all applications for new dairies include a Geotechnical Report prepared by a licensed geotechnical engineer or certified civil engineer. Appendix J of the Element presents specific requirements for information to be presented in the Geotechnical Report. The report shall, at minimum, present the results of sufficient subsurface sampling and testing to classify and characterize the soils and groundwater conditions in areas of proposed dairy facility structures and process water storage facilities. The report shall include recommendations for foundation design, cut and fill slope design, and site grading. The recommendations shall specifically address:

- Soil consolidation and compression
- Shrink-swell potential
- Soil corrosivity
- Cut and fill slope stability under static and pseudo-static conditions
- Erosion potential
- Liquefaction potential

Additionally, a post-construction report, certifying that lagoons and embankments have been constructed in conformance with design requirements, is required.

Under **Policy DE ~~6.1c~~ 6.2b**, the dairy operators are responsible for conducting an annual inspection of the interior and exterior slopes surrounding the manure separation pits and process water ponds following the rainy season of each year during the first three years of operation. The inspections are required to document the occurrence of any significant erosion (e.g., formation of rills or gullies longer than ten feet and/or deeper than one foot) or any significant slope failures (e.g., soil slips greater than 100 square feet in area). A

report of the inspections, including recommendations and schedule for completing any necessary corrective action, must be submitted to the Kings County Dairy Monitoring Office. This policy ensures that long-term stability of the slopes if maintained.

Compliance with the requirements of **Policies DE 2.1f**, **3.1a**, and ~~**6.1c**~~ **6.2b** would ensure that potential adverse geotechnical issues would be evaluated by a qualified professional. Conformance with professional recommendations would reduce the impact to a less-than-significant level.

Mitigation Measure 4.1-1

None required.

Impact 4.1-2

Disturbance of agricultural soils caused by construction of dairy facilities. This is a less-than-significant impact.

The development of new or expanded dairies would require construction of dairy barn and associated structures and manure separation pits and process water pond. Construction of these improvements would likely require extensive grading to meet requirements for uniform and positive drainage in corrals and the excavation of ponds, or construction of pond embankments. The grading would presumably result in disturbance of the naturally developed soil horizons. Such disturbance could adversely affect the capability of these soils for agricultural crop production.

The Element would allow construction of dairy facilities within five distinct Dairy Development Overlay Zones. The Element estimates that, at buildout, approximately 42,693 acres of land would be required for dairy facilities. Within each of the DDOZs, large areas of land are classified by the FMMP as "prime farmland" or "farmland of statewide importance." Conversion of these areas to dairy facilities would result in reclassification of these areas by FMMP to "farmlands of local importance."

However, the proposed project would not result in the conversion of farmland to non-agricultural use. The Kings County General Plan specifically permits "animal concentrations" on lands designated General Agricultural, confirming animal husbandry as an agricultural use. Development of dairy facilities on cropland would not be considered conversion to nonagricultural use. The construction and operation of dairies within General Agricultural areas are permitted under the County Zoning Ordinance. Such developments are also consistent with provisions of the Williamson Act, as enforced in the County (i.e., the *Uniform Rules for Agricultural Preserves in Kings County*). Therefore, the disturbance of agricultural soil would be a less-than-significant impact.

Mitigation Measure 4.1-2

None required.

Impact 4.1-3

Potential damage during expected seismic shaking. This is a less-than-significant impact.

Moderate to strong seismic shaking could occur throughout the County during expected earthquakes on regional active faults. The agricultural buildings and residences at the dairy facilities permitted under the proposed project would be required to be designed and constructed in accordance with the requirements of the current building code for seismic design. These requirements would minimize the potential for building collapse during earthquakes. Although structural and nonstructural damage could occur, these potential impacts would be similar to those that could occur throughout the region. The potential for damage and possibly related human injuries is acknowledged as an acceptable risk through the adoption of building codes that do not preclude this risk. Therefore, damage to proposed structures and other improvements caused by seismic shaking is a less-than-significant impact.

The process water ponds, manure separation pits, and associated dairy runoff conveyance systems could be constructed completely or partially above the existing ground surface. Possible damage to these facilities caused by seismic shaking could occur but is addressed in the requirements of **Policy DE 2.1f**.

The potential for liquefaction or other related seismically-induced ground failure is low to moderate due to the gentle topography and the low potential for saturated near-surface granular sediments. Investigation of the effects of the 1983 Coalinga earthquakes indicated that the occurrence of liquefaction-related ground failure was limited to isolated areas in recent deposits along active stream channels (Rymer and Ellsworth, 1990). In addition, significant ground failure associated with liquefaction typically occurs in areas where liquefied sediments can flow to a "free face," which extends below the liquefied layer, such as a stream bank or artificial cut. Under the Element, excavations expected at proposed dairy facilities would not extend below the groundwater table and this condition would not occur.

One other potential liquefaction hazard could be presented by dairy development under the proposed project. The fill materials used for embankments around proposed manure separation pits and ponds could include granular materials that could be locally saturated. However, **Policy DE 2.1f** requires that a site-specific Geotechnical Report for proposed dairies evaluate the liquefaction potential at project sites. In addition, **Policy DE 4.1a.B.2.c**

requires that the soils lining the pits and ponds have low hydraulic conductivity, reducing the potential for saturation of underlying granular sediments. Therefore, the potential for liquefaction is considered low.

Implementation of **Policy DE 2.1f** and enforcement of existing building code requirements would reduce the potential impacts related to seismic shaking to a less-than-significant level.

Mitigation Measure 4.1-3

None required.

Impact 4.1-4

The moderate to high shrink-swell potential and the potential for corrosion of uncoated steel and concrete within soils could present significant maintenance and stability problems for pipelines, foundations, and pavements. This is a less-than-significant impact.

The soils throughout the seven DDOZs proposed by the Element present a moderate to high potential for corrosion of untreated steel and concrete and moderate to high shrink-swell potential. Utility pipelines would be required to cross areas containing corrosive soils. Corrosion of the pipelines or other buried steel structures could result in failure of the lines. Concrete footings and pavement could also be subject to corrosion. Repair or replacement of the pipelines and concrete could result in interruption of service. Modern dairy designs for the southern San Joaquin Valley typically propose that a process water collection system would be constructed of plastic pipe and would not be significantly affected by the high corrosivity of the soils. The Uniform Building Code has specific design requirements for design specifications for steel and concrete exposed to corrosive soils and requirements for construction in expansive soils. In addition, **Policy DE 2.1f** specifically requires that the site-specific geotechnical report prepared for each proposed dairy development evaluate the potential adverse effects of soil corrosivity and present professional recommendations to reduce these effects. Implementation of **Policy DE 2.1f** and compliance with the requirements of the Uniform Building Code will reduce this impact to a less-than-significant level.

Mitigation Measure 4.1-4

None required.

4.2 AIR QUALITY

4.2 AIR QUALITY

Clean air is a vital resource to public health and welfare, to the local agricultural economy, and to the quality of life. Air pollution adversely affects public health, diminishes the production and quality of agricultural crops, reduces visibility, degrades materials, and damages native vegetation. This section discusses regional air quality in the San Joaquin Valley Air Basin and sources and quantities of air emissions expected from new or expanded dairies allowed under the Kings County Revised Draft Dairy Element (Element).

SETTING

CLIMATIC CONDITIONS

Kings County is located in the San Joaquin Valley Air Basin, which is defined by the Sierra Nevada to the east, the Coast Ranges to the west, and the Tehachapi mountains to the south. The surrounding topographic features restrict air movement through and out of the basin and, as a result, impede the dispersion of pollutants from the basin. Inversion layers are formed in the San Joaquin Valley Air Basin throughout the summer and winter; an inversion layer is created when a mass of warm dry air sits over cooler air near the ground, preventing vertical dispersion of pollutants from the air mass below. During the summer, the San Joaquin Valley experiences daytime temperature inversions at elevations from 2,000 to 2,500 feet above the valley floor; during the winter months, inversions occur from 500 to 1,000 feet above the valley floor (SJVUAPCD, 1998).

The average summer high temperature in Kings County is in the upper 90° F (degrees Fahrenheit) range; during the summer, wind rose data for the valley indicate that the wind usually originates from the north end of the San Joaquin Valley and flows in a southeasterly direction. During winter months, the average temperature in the County is in the low 50° F; wind flows from the south end of the San Joaquin Valley toward the north. Low wind speeds and low inversion layers during the winter result in high carbon monoxide and particulate matter concentrations (National Climatic Data Center, undated).

AIR QUALITY STANDARDS AND LEGISLATION

Federal

National Ambient Air Quality Standards

National ambient air quality standards (NAAQS) for six criteria pollutants (carbon monoxide, ozone, particulate matter, nitrogen dioxide, sulfur dioxide, and lead) have been established by the Administrator of the U.S. Environmental Protection Agency (EPA) according to the mandate of the 1970 Federal Clean Air Act (CAA) (Table 4.2-1). In July 1997, EPA promulgated new NAAQS for ozone and particulate matter with a diameter less

than or equal to 2.5 microns ($PM_{2.5}$) (Table 4.2-1). The existing 1-hour ozone standard (0.12 ppm) will eventually be phased out and replaced with an 8-hour standard of 0.08 ppm.[1] The new $PM_{2.5}$ standard has been established for both an annual average and 8-hour periods.

TABLE 4.2-1: **National and State Ambient Air Quality Standards**

Pollutant	Averaging Period	California Standards	Federal Standards
Ozone	8 hours	--	0.08 ppm
	1 hour	0.09 ppm	0.12 ppm
Carbon monoxide	8 hours	9.0 ppm	9.0 ppm
	1 hour	20.0 ppm	35.0 ppm
Nitrogen dioxide	Annual	--	0.053 ppm
	1 hour	0.25 ppm	--
Sulfur dioxide	Annual	--	0.03 ppm
	24 hours	0.04 ppm	0.14 ppm
	1 hour	0.25 ppm	--
Suspended particulate matter; diameter $\leq$ 10 microns (PM_{10})	Annual arithmetic mean	--	50.0 $\mu g/m^3$
	Annual geometric mean	30.0 $\mu g/m^3$	--
	24 hours	50.0 $\mu g/m^3$	150.0 $\mu g/m^3$
Suspended particulate matter; diameter $\leq$ 2.5 microns ($PM_{2.5}$)	Annual	--	15.0 $\mu g/m^3$
	24 hours	--	65.0 $\mu g/m^3$
Hydrogen sulfide	1 hour	0.03 ppm	--
Lead	Calendar quarter	--	1.5 $\mu g/m^3$
	30-day	1.5 $\mu g/m^3$	--

Source: SJVUAPCD, 1998.

Notes: ppm = parts per million.
$\mu g/m^3$ = micrograms per cubic meter.
-- = Not available

The CAA and subsequent Federal Clean Air Act Amendments of 1977 and 1990 require geographical areas to be designated as in attainment or nonattainment with the national

[1] In February 2001, the U.S. Supreme Court unanimously overturned a lower court opinion voiding the revised NAAQS for ozone and $PM_{2.5}$. However, the case must first go back to the U.S. Court of Appeals for resolution of other issues not decided by the Supreme Court. In addition, the Supreme Court is requiring EPA to develop a new implementation plan for ozone (California Environmental Insider, 2001).

ambient air quality standards. A geographical area is considered to be in attainment if the air pollutant level for that area meets the corresponding national standard; geographical areas for which an air pollutant exceeds the corresponding national standard are classified as nonattainment areas. State Implementation Plans (SIP) must be developed for nonattainment areas to identify strategies for achieving attainment of the national standard.

The San Joaquin Valley is currently in nonattainment for the Federal standards for ozone and particulate matter with an aerodynamic diameter less than or equal to ten microns (PM_{10}). The air basin is designated as a "serious" nonattainment area for PM_{10} and a "severe" nonattainment area for ozone. As a result, the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) has prepared PM_{10} and ozone attainment demonstration plans; these plans identify the regulatory framework necessary to bring the San Joaquin Valley into compliance with the Federal ozone and PM_{10} standards.

The PM_{10} attainment demonstration plan was approved by the California Air Resources Board (CARB) on 26 June 1997 and constitutes the PM_{10} SIP for the San Joaquin Valley. In September 1999, the EPA proposed simultaneous limited approval and limited disapproval of Regulation VIII rules in the PM_{10} SIP for the San Joaquin Valley. EPA proposed a limited disapproval because several of the rules were considered to be deficient in complying with the control measure requirements of the Federal Clean Air Act. Among other deficiencies, EPA indicated that control measures need to be revised to include control and test methods that are practical and effective to demonstrate that the emission control techniques selected by SJVUAPCD will actually provide sufficient reduction in PM_{10} emissions. The discussion of Regulation VIII rule deficiencies are contained in EPA's Technical Support Document dated 31August 1999. In response to EPA's disapproval, SJVUAPCD prepared a draft report proposing amendments to Regulation VIII.

The ozone attainment demonstration plan was incorporated into CARB's 1994 ozone SIP; CARB's ozone SIP also includes attainment demonstration plans for nonattainment areas other than the San Joaquin Valley and statewide measures intended to attain the Federal ozone standard. The 1994 ozone SIP was approved by EPA on 25 September 1996.

Methane

Regulatory requirements for the reduction or control of methane emissions have not been established on the Federal, State, or local levels. However, EPA prepares methane emission source inventories on an ongoing basis, as required by the CAA amendments. The five major anthropogenic sources of methane in the United States have been identified to be (in order of contribution) landfills, domesticated livestock, natural gas and oil production, coal mining, and livestock manure (U.S. EPA, 1999). Methane has been determined to be the second most significant greenhouse gas (following carbon dioxide) that contributes to

global warming. The effects of greenhouse gases have been recognized as a worldwide problem and international efforts are being made to reduce the emission of these gases.

In 1988, the United Nations established the Intergovernmental Panel on Climate Change to evaluate the impacts of global warming and to develop strategies that nations could implement to curtail global climate change. In 1992, the United States joined with other countries around the world in signing the United Nations' Framework Convention on Climate Change agreement; the goal of the agreement was to control greenhouse gas emissions, including methane.[2]

As a result, the Climate Change Action Plan was developed to address the reduction of greenhouse gases in the United States. The plan consists of more than 50 voluntary programs, including the Ruminant[3] Livestock Efficiency Program (RLEP) and AgSTAR Program. The RLEP, developed by EPA in coordination with the U.S. Department of Agriculture (USDA), provides a series of improved livestock production practices that could readily be implemented to reduce methane emissions from ruminant animals. The AgSTAR Program, developed by EPA, USDA, and U.S. Department of Energy, encourages the use of methane recovery technologies at confined animal feeding operations that manage manure as liquids or slurries to reduce methane emissions (U.S. EPA, 1997).

California

The California Air Resources Board (CARB) is responsible for enforcing the Federally-required SIP in an effort to achieve and maintain the national ambient air quality standards. In addition, CARB has established State Ambient Air Quality Standards (SAAQS) for the criteria pollutants (Table 4.2-1) as well as for other pollutants for which there are no corresponding Federal standards. The SAAQS for the criteria pollutants are equal to or more stringent than the Federal standards. CARB is responsible for assigning air basin attainment and nonattainment designations in California.

Analogous to the CAA and its amendments, the 1988 California Clean Air Act (CCAA) requires areas within the State to be designated as attainment or nonattainment with the SAAQS. The CCAA similarly requires that plans be prepared for nonattainment areas describing strategies to achieve the SAAQS.

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[2] The agreement was ratified by the U.S. Senate in October 1992 (Breidenich, 1999).

[3] Ruminant animals have a four-chamber digestive system that converts otherwise unusable plant materials into nutritious food and fiber as well as methane; ruminant animals include cattle, sheep, buffalo, and goats.

The San Joaquin Valley is currently in nonattainment for the State ozone and PM_{10} standards; the urban area of Fresno located in the San Joaquin Valley is also in nonattainment for the State carbon monoxide standard (SJVUAPCD, 1998). In 1991, the SJVUAPCD prepared an air quality attainment plan for the San Joaquin Valley to establish the regulatory framework necessary to bring the San Joaquin Valley into compliance with the State ozone and carbon monoxide standards; this plan was last updated in 1994.[4] As previously mentioned, the EPA proposed a simultaneous limited approval and limited disapproval of Regulation VIII rules in the PM_{10} SIP for the San Joaquin Valley in September 1999. In response, SJVUAPCD prepared a draft report proposing amendments to Regulation VIII (SJVUAPCD, 2000).

In addition, CARB is required to prepare a statewide emission inventory under Section 39607(b) of the California Health and Safety Code. The most recent emission inventory was conducted for 2000 and includes stationary sources, areawide sources, and mobile sources and included inventories for various pollutants, including reactive organic gases (ROG) and PM_{10}. Table 4.2-2 provides the emissions inventory prepared for Kings County. The CARB emissions inventory does not include emissions generated from specific sources. For example, PM_{10} emissions from fugitive dust at unpaved dairy corrals are not included as a specific source.

Approximately 27.8 tons per day (10,151 tons per year) of ROG and 37 tons per day (13,520 tons per year) of PM_{10} were emitted from the stationary, area, and mobile sources in 2000, according to the inventory. Of this amount, 3.59 tons per day (1,310 tons per year) of ROG and 2.06 tons per day (752 tons per year) of PM_{10} are from stationary sources, 13.3 tons per day (4,855 tons per year) of ROG and 34.19 tons per day (12,479 tons per year) of PM_{10} are from areawide sources, and 10.9 tons per day (3,986 tons per year) of ROG and 0.79 ton per day (288 tons per year) of PM_{10} are from mobile sources.

TABLE 4.2-2: **2000 Estimated Average Emissions Inventory, Kings County**

Category	ROG		PM_{10}	
	tpd	tpy	tpd	tpy
Stationary Sources				
Fuel Combustion[1]	0.23	84	0.47	172
Waste Disposal	1.07	391	–	–
Cleaning and Surface Coatings[2]	0.67	245	–	–
Petroleum Production and Marketing[3]	0.56	204	–	–
Industrial Processes[4]	1.06	387	1.59	580
Subtotal	3.59	1,310	2.06	752

[4] Although the San Joaquin Valley is currently in nonattainment for the State PM_{10} standard, the SJVUAPCD is currently not required to prepare a State Implementation Plan to attain the PM_{10} State standard.

Table 4.2-2 - *continued*

Category	ROG		PM_{10}	
	tpd	tpy	tpd	tpy
Areawide Sources				
Solvent Evaporation[5]	3.86	1,409	–	–
Residential Fuel Combustion (miscellaneous)	0.14	51	0.28	102
Farming Operations (miscellaneous)[6]	7.51	2,741	12.66	4,621
Construction and Demolition (miscellaneous)	–	–	0.91	332
Paved Road Dust (miscellaneous)	–	–	2.02	737
Unpaved Road Dust (miscellaneous)	–	–	7.51	2,741
Fugitive Windblown Dust (miscellaneous)	–	–	7.91	2,887
Fires	–	–	0.01	4
Waste Burning and Disposal (miscellaneous)	1.77	646	2.84	1,037
Cooking	0.02	7	0.05	18
Subtotal	13.3	4,855	34.19	12,479
Mobile Sources				
On-road Motor Vehicles	6.62	2,416	0.30	110
Aircraft	3.42	1,248	0.21	77
Trains	0.01	4	–	–
Recreational Boats	0.05	18	–	–
Off-Road Recreational Vehicles	0.06	22	–	–
Off-Road Equipment	0.29	106	0.06	22
Farm Equipment[7]	0.47	172	0.22	80
Subtotal	10.9	3,986	0.79	288
TOTAL	**27.8**	**10,151**	**37.0**	**13,520**

Source: CARB, ~~1998~~ 2000

Notes: tpd = tons per day
tpy = tons per year
– = not available or less than 0.05 ton per day.
ROG = reactive organic gases
PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less.

1 Stationary fuel combustion sources include manufacturing and industrial and food and agricultural processing.
2 Includes degreasing, coatings and related process solvents, and other (cleaning and surface coatings).
3 Includes oil and gas production and petroleum marketing.
4 Includes chemical, food and agriculture, and mineral processes.
5 Includes consumer products, architectural coatings and related process solvent, and pesticides/fertilizers.
6 Farming operations generate particulate matter during land preparation, harvest operations, growing season operations, cattle feedlots, and other farming-related activities; ROG emissions are from livestock waste decomposition. However, according to CARB, the ROG emissions included in this inventory may not reflect accurate conditions due to the difficulty in obtaining accurate livestock population data for the County (Shimp, 2000).
7 The source of PM_{10} and ROG emissions is from light and heavy duty equipment used in farming-related activities; in addition farm equipment also generates approximately 767 tons per year of nitrogen oxide.

In November 2000, CARB prepared a report to the legislature that provided emission estimates of select pollutants for all the counties in the San Joaquin Valley air basin. The report included emission estimates for ammonia, PM_{10}, ROG, NOx, CO, and methane. The emission estimates were classified by the following sources: dairy operations; other livestock; other agriculture; stationary; areawide; motor vehicles, and natural. The estimated emissions for dairy operations in Kings County were: 7,600 tons per year of ammonia, 90 tons per year of PM_{10}, 2,600 tons per year of ROG, and 8,300 tons per year of methane (CARB, 2001).

Ammonia emissions for dairy operations were based on an emission factor (74 pounds per head per year) developed from a 1997 field study in the San Joaquin Valley by Terry James, et al. (James, et al., 1997). The dairy cattle population used for the ammonia emission estimates was based on the 1997 calendar year.

PM_{10} emissions for dairy operations exclusively represented potential releases from windblown dust at dairy pasture land. The emissions did not include PM_{10} emissions that would be generated from movement of dairy cattle at unpaved corrals.[5] The PM_{10} emissions were based on: 1) a rough assumption on the fraction of pasture land occupied by dairy cattle; and 2) the 1998 calendar year dairy cattle population data generated by the SJVUAPCD (Benjamin, 2001a). The data are routinely submitted to CARB for inclusion in the California Emission Inventory Database.

ROG and methane emissions for dairy operations were based on the 1998 calendar year data generated by the SJVUAPCD and emission factors established in CARB's Emission Inventory Procedural Manual, Methods for Assessing Area Source Emissions.[6] However, CARB's estimates for ROG and methane emissions from livestock waste include emissions generated from other livestock sources (e.g., swine, horses, poultry), and not exclusively from dairy animals (Benjamin, 2001b). In addition, the CARB study did not estimate methane emissions generated from the cattle digestion process.

The report concluded that dairy operations accounted for 91 percent of the methane emissions generated in Kings County. The report also indicated dairy operations contribute 58, 25, and 1 percent of the total ammonia, ROG, and PM_{10} generated in Kings County (CARB, 2001). The estimated percentages would be expected to be modified when all sources of emissions can be quantified.

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[5] According to CARB, PM_{10} emission estimates were based solely on what was reported in their California Emission Inventory Database, which is limited to windblown dust from pasture land. CARB indicated that PM_{10} emissions from dairy corrals were not estimated since corresponding PM_{10} emission factors were not reported in the California Emission Inventory Database (Benjamin, 2001a).

[6] A discussion of this methodology is provided in the Existing Conditions subsection of this analysis.

San Joaquin Valley Unified Air Pollution Control District

The San Joaquin Valley Air Basin includes all of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare counties, and a portion of Kern County (SJVUAPCD, 1998). The SJVUAPCD was formed in 1992 and has jurisdiction over air quality issues in the San Joaquin Valley Air Basin. Agricultural and livestock operations are exempt by State law from permitting requirements but are responsible for following prohibitory rules. The SVJUAPCD and CARB have joint responsibility for attaining and maintaining the State and Federal ambient air quality standards in the San Joaquin Valley Air Basin.

In March 2000, the SJVUAPCD prepared a draft staff report identifying Best Available Control Measures (BACM) Amendments to SJVUAPCD's Regulation VIII, Fugitive PM_{10} Prohibitions. The purposes of the amendments were to address the deficiencies in the current Regulation VIII identified by the U.S. EPA and to fulfill the district's commitment to upgrade Regulation VIII from Reasonably Available Control Measures (RACM) to BACM. The SJVUAPCD proposes to "sunset" the existing Regulation VIII rules and replace them with amended rules described in the draft staff report. The SJVUAPCD has not specified a "sunset" date.

The amendments include eight ~~proposed~~ adopted rules to be incorporated into Regulation VIII. The ~~proposed~~ rules address administrative requirements (rule 8011), construction, demolition, excavation, extraction, landfill, and other earth moving activities (rule 8021), bulk materials (rule 8031), carryout and trackout (rule 8041), open areas and vacant lots (rule 8051), paved and unpaved roads (rule 8061), unpaved vehicle and equipment traffic areas (rule 8071), and off-site agricultural sources[7,8] (rule 8081). The report indicated that the SJVUAPCD has not yet completed its research projects to determine appropriate regulatory control strategies for on-field agricultural sources[9] (e.g., tilling, land preparation, and harvesting) and strongly encouraged owners/operators of on-field agricultural sources

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[7] ~~Proposed~~ Rule 8011 defines an agricultural source as any activity or portion of land associated with the commercial growing of crops or the raising of fowl or animals.

[8] According to ~~proposed~~ rule 8011, an off-field agricultural source is defined as any agricultural source that also meets the definition of: construction; excavation; outdoor handling, storage and transport of bulk material; paved road; unpaved road; or unpaved vehicle or traffic equipment area; open areas and vacant lots; or generates carryout or trackout.

[9] According to ~~proposed~~ rule 8011, on-field agricultural source is defined as any agricultural source that is not an off-field agricultural source, including: activities conducted solely for the purpose of preparing land for the growing of crops or the raising of fowl or animals, such as brush or timber clearing, grubbing, scraping, ground excavation, land leveling, grading, turning under stalks, disking, or tilling; drying or pre-cleaning of agricultural crop material on the field where it was harvested; handling or storage of agricultural crop material that is baled, cubed, pelletized, or long-stemmed on the field where it was harvested; and disturbances of cultivated land as a result of planting, fertilizing, or harvesting.

to apply voluntary best management practices outlined by the district and the Natural Resource Conservation Service. The SJVUAPCD ~~recently revised the March 2000 report, which will be available for public review sometime in spring~~ adopted the amendments in November 2001.

The SJVUAPCD is also currently working with CARB and other parties (i.e., industry) on the development of the California Regional $PM_{10}/PM_{2.5}$ Air Quality Study (CRPAQS), a comprehensive program of monitoring, emissions inventory development, data analysis, and modeling of particulate matter, specifically PM_{10} and $PM_{2.5}$. The purpose of the study is intended to provide an improved understanding of PM_{10} and $PM_{2.5}$, establish a strong scientific foundation for informed decision making, and to prepare efficient and cost-effective emission control strategies to achieve the PM_{10} and $PM_{2.5}$ standards in central California. The study includes particulate matter associated with agricultural and livestock operations, including dairy facilities. The study is expected to be completed in 2003.

In addition, the SJVUAPCD is currently working with CARB on the development of the Central California Ozone Study (CCOS); the study area extends from Redding in the north to the Mojave Desert in the south, and from the Pacific Ocean in the west to the Sierra Nevada in the east. The primary objective of this study is to obtain a suitable database for grid-based, photochemical modeling. The California Air Resources Board (CARB) and air pollution control districts will use this database to apply photochemical models to examine the effects of emissions on ozone concentrations and to prepare the demonstration of attainment for the ozone standard for nonattainment areas in central California. Data were collected between December 1999 and February 2001. Over the next two years, the data will be evaluated and eventually included in the database system.

Kings County

The Kings County Right to Farm Ordinance (Kings County Code of Ordinances, Chapter 14, Article III, Section 14-38) indicates that it is the County's policy to "*protect agricultural land, operations, and facilities from conflicting uses due to the encroachment of incompatible, non-agricultural uses of the land in agricultural areas of the county*," and to "*advise developers, owners, and subsequent purchasers of property in the County of the inherent potential inconveniences and discomforts often associated with agricultural activities and operations, including, but not limited to, equipment and animal noise; farming activities conducted on a 24-hour a day, 7-day a week basis; odors from manure, fertilizers, pesticides, chemicals, or other sources; the aerial and ground application of chemicals and seeds; dust; flies and other insects; and smoke from agricultural operations.*"

The ordinance also indicates that no lawful agricultural activity, operation, or facility "*conducted for commercial agricultural purposes in a manner consistent with proper and accepted customs and standards as established and followed by similar agricultural operations in the same*

locality, shall be or become a nuisance, private or public, due to any changed condition in or about the locality, including, but not limited to, the encroachment of non-agricultural uses such as rural residences." The ordinance requires that all approvals for rezonings, land divisions, zoning permits, and residential building permits in the County shall include a condition that notice and disclosure of this policy be given to subsequent owners and occupants of the property, and that transfers of property also include the notice.

AMBIENT AIR QUALITY

The San Joaquin Valley Air Basin is approximately 250 miles long and averages 35 miles in width. The width of the Valley in the area of the project averages about 50 to 60 miles. It is the second largest air basin in California and has some of the most severe air pollution problems in the State. The following is a description of the sources, physical and health effects, and the air basin's attainment status, where appropriate, for air pollutants.

Permanent air quality monitoring stations currently operating in the County are the Van Dorsten station in Corcoran, Patterson station in Corcoran, and South Irwin Street station in Hanford. The Patterson station was opened in 1996 to replace the Van Dorsten station; the criteria pollutant monitored at the two stations is PM_{10}. The criteria pollutants monitored at the Hanford station are PM_{10}, ozone, and nitrogen dioxide. The air quality data for the last three available years (1998 to 2000) are summarized in Table 4.2-3.

Ozone (O_3), also known as smog, is not emitted directly into the environment. Ozone is generated from complex chemical reactions that occur in the presence of sunlight. One of the primary components of the chemical reactions is nitrogen oxide (NOx), which is referred to as an ozone precursor. NOx generators in the San Joaquin Valley include mobile sources, solvents, and fuel combustion. Ozone exposure causes eye irritation and damage to lung tissue in humans. Ozone also harms vegetation, reduces crop yields, and accelerates deterioration of paints, finishes, rubber products, plastics, and fabrics. The San Joaquin Valley Air Basin is currently in nonattainment for the Federal and State standards for ozone.

Unlike ozone, **carbon monoxide** (CO) is released directly into the atmosphere by stationary and mobile sources. CO is an odorless, colorless gas formed by the incomplete combustion of fuels. CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood when inhaled at high concentrations. ~~Only the urban area of Fresno is currently in nonattainment for the State CO standard. In 1998, the urbanized areas of Fresno, Stockton, Modesto, and Bakersfield were reclassified from nonattainment to~~

~~attainment status for the Federal CO standard.~~[10] The San Joaquin Valley Air Basin is currently in attainment for both State and Federal CO standards.

TABLE 4.2-3: **Summary of Air Quality Data, 1998 - 2000**

Pollutant	Standard		1998	1999	2000
Van Dorsten and Patterson Stations (in Corcoran)					
PM_{10}	State 24-hours (50 µg/m^3)	Days over standard	6/13	NA/43	NA/13
	Federal 24-hours (150 µg/m^3)	Days over standard	0/0	NA/2	NA/0
	State annual geometric mean (30 µg/m^3)	Annual geometric mean concentration (µg/m^3)	24.0/ 32.8	NA/ 41.3	NA/ 35.4
	Federal annual arithmetic mean (50 µg/m^3)	Annual arithmetic mean concentration (µg/m^3)	29.5/ 41.9	NA/ 53.2	NA/ 41.5
South Irwin Street Station (in Hanford)					
PM_{10}	State 24-hours (50 µg/m^3)	Days over standard	15	17	7
	Federal 24-hours (150 µg/m^3)	Days over standard	0	0	0
	State annual geometric mean (30 µg/m^3)	Annual geometric mean concentration (µg/m^3)	29.8	41.6	36.4
	Federal annual mean (50 µg/m^3)	Annual mean concentration (µg/m^3)	39.2	53.4	39.8
Ozone	State 1-hour (0.09 ppm)	Days over standard	27	28	43
	Federal 1-hour (0.12 ppm)	Days over standard	3	2	0
		Highest 1-hour concentration (ppm)	0.14	0.14	0.124
Ozone	Federal 8-hour (0.08 ppm)	Days over standard	31	25	48
		Highest 8-hour concentration (ppm)	0.11	0.11	0.11
Nitrogen dioxide	State 1-hour (0.09 ppm)	Days over standard	0	0	0
	Federal 1-hour (0.12 ppm)	Days over standard	0	0	0
		Highest 1-hour concentration (ppm)	0.09	0.09	0.06

Source: CARB, 1998 and undated(a)

Notes: µg/m^3 = micrograms per cubic meter.
xx/yy = Van Dorsten Avenue data/Patterson data.
na = Not available.
Values in parentheses indicate corresponding standard.

[10] ~~Based on personal communication between Mr. Joe O'Bannon, San Joaquin Valley Unified Air Pollution Control District, and Ms. Rhodora Del Rosario, BASELINE Environmental Consulting, on 10 March 1999.~~

PM_{10} is released directly into the atmosphere by stationary and mobile sources. PM_{10} consists of a wide range of solid and liquid particles, including smoke, dust, aerosols, and metallic oxides. PM_{10} consists of coarse and fine particulates. The coarse fraction contains particulates greater than 2.5 microns and less than or equal to 10 microns; the fine fraction contains particulates less than or equal to 2.5 microns and is known as $PM_{2.5}$. Exposure to coarse fraction particulates can aggravate respiratory conditions, such as asthma. Major sources of PM_{10} include vehicles, power generation, industrial processing, wood burning, road dust, construction/farming activities, and fugitive windblown dust. The 2000 PM_{10} emission inventory for the San Joaquin Valley Air Basin indicated that fugitive windblown dust from undeveloped areas, farming operations, and unpaved road dust were the three leading sources of PM_{10} (SJVUAPCD, 2000). The San Joaquin Valley Air Basin is currently in nonattainment for the Federal and State PM_{10} standards.

$PM_{2.5}$, the fine fraction of PM_{10}, is generated by combustion processes and by chemical reactions taking place in the air. Fine fraction particulates can penetrate the deepest part of the lungs. Exposure to fine particulates has been linked to health problems, including asthma, bronchitis, acute and chronic respiratory symptoms (e.g., shortness of breath and painful breathing), and premature deaths. The elderly, individuals with cardiopulmonary disease, and children appear to be at greatest risk (U.S. EPA, 1998a and 2000). None of the air basins has been designated as attainment or nonattainment for the $PM_{2.5}$ standard due to the current lack of $PM_{2.5}$ data and the recent adoption of the $PM_{2.5}$ standard. As of the preparation of this EIR, the U.S. Court of Appeals for the District of Columbia Circuit has ruled that the new $PM_{2.5}$ standard was improperly adopted; the district is in the process of determining the course of action for $PM_{2.5}$.

$PM_{2.5}$ is classified as either primary or secondary particulates. Both primary and secondary $PM_{2.5}$ can travel over large distances. Primary $PM_{2.5}$ is considered either carbonaceous or geological (crustal). Primary $PM_{2.5}$ predominantly consists of carbonaceous $PM_{2.5}$, which is generated from combustion of fossil fuels or biomass. Carbonaceous $PM_{2.5}$ combustion sources include gasoline and diesel exhaust, wood stoves and fireplaces, land clearing, prescribed burning of wild land, and wild fires. Geological (crustal) $PM_{2.5}$ makes up a minor amount of primary $PM_{2.5}$. Geological (crustal) $PM_{2.5}$ is generated from fugitive emission sources, including paved and unpaved roads, dust, crustal material from construction activities, agricultural tilling, wind erosion, and other crustal sources.

Secondary $PM_{2.5}$ is created through atmospheric heterogeneous (gas to particle) reactions of gaseous SOx and NOx precursor emissions. The reactions involve chemical and physical interactions with the precursor emissions in the atmosphere. Data collected in the San Joaquin Valley indicate that agricultural sources of ammonia react with nitric acid to form ammonium nitrate particles, which are in the $PM_{2.5}$ range (EIIP, 1999). A study conducted in the San Joaquin Valley in 1998 indicated that the formation of ammonium nitrate is

sensitive to the availability of nitric acid in the environment (Atmospheric and Environmental Research, Inc., 1998).[11] Nitric acid is a secondary component that is formed in the atmosphere via one of two pathways. One pathway involves reaction with hydroxyl radicals and the other involves reaction with NOx. Studies are currently being conducted to better understand the chemical reactions associated with these two pathways.

The average phase partition of ammonia has been observed to be 43 percent in $PM_{2.5}$, according to the conceptual model of a particulate matter pollution study conducted in the San Joaquin Valley in 1998. The formation of ammonium nitrate is influenced by meteorology, chemical reaction, and deposition. Warm temperatures aloft curtail vertical mixing, resulting in stagnant conditions, which are considered a major cause of high particulate matter. Fog causes a net removal of particulate matter by wet deposition, between 40 to 50 percent of ammonia by mass may be removed due to fog episodes. Dry deposition may also be a removal pathway of particulate matter precursors.

On July 18, 1997, the EPA promulgated new National Ambient Air Quality Standards for $PM_{2.5}$.[12] At that time, a national $PM_{2.5}$ monitoring network had not yet been established, although there were existing PM_{10} monitors nationwide. CARB staff worked closely with the U.S. EPA to expeditiously assemble $PM_{2.5}$ monitors throughout California. There are currently 82 $PM_{2.5}$ monitoring sites in California (CARB, 2001). On June 30, 1998, CARB and local air pollution control and air quality management districts (air districts) first submitted the *1998 California Particulate Matter Monitoring Network Description* to U.S. EPA. Three annual updates, the *1999 California Particulate Matter Monitoring Network Description*, the *2000 California Particulate Matter Monitoring Network Description*, and the *2001 California $PM_{2.5}$ Monitoring Network Description* have been submitted to U.S. EPA.

The goal of the $PM_{2.5}$ monitoring program in California is to provide ambient data that support the State's air quality programs, including mass measurements and speciation data, pursuant to Title 40 of the Code of Federal Regulations. Data from the $PM_{2.5}$ monitoring program will be used to identify nonattainment areas, develop and track implementation plans, assess regional haze, assist in health effects studies, and support other ambient aerosol research activities. Three years of monitoring data are necessary to designate attainment status for a particular area. The National Ambient Air Quality

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[11] The observation was based on a January 1996 episode.

[12] The U.S. Court of Appeals for the District of Columbia circuit initially ruled that: 1) the revised ozone and new $PM_{2.5}$ standards were improperly adopted; 2) U.S. EPA is prohibited from enforcing the revised ozone standard; and 3) it is in the process of determining the course of action for $PM_{2.5}$. In February 2001, the U.S. Supreme Court unanimously overturned a lower court opinion voiding the revised NAAQS for ozone and $PM_{2.5}$. However, the case must first go back to the U.S. Court of Appeals for resolution of other issues not decided by the Supreme Court. In addition, the Supreme Court is requiring EPA to develop a new implementation plan for ozone (California Environmental Insider, 2001).

Standards (NAAQS) $PM_{2.5}$ attainment status for the air basins in California, including the San Joaquin Valley, has not yet been designated due to the current lack of complete $PM_{2.5}$ data. $PM_{2.5}$ attainment designation is expected in 2003 at the earliest (CARB, 2001).

Based on the 1999 data and preliminary 2000 data collected from the monitoring program, the highest 24-hour and annual average $PM_{2.5}$ concentrations are at the monitoring stations in the San Joaquin Valley and South Coast air basins (CARB, 2001). $PM_{2.5}$ monitoring data have shown that the $PM_{2.5}$ fraction of PM_{10} concentrations is generally greater during the winter months. In the San Joaquin Valley, up to 80 to 90 percent of PM_{10} concentrations consist of the $PM_{2.5}$ fraction and accounts for 80 to 90 percent of the total PM_{10} concentrations during winter. During the remainder of the year, the $PM_{2.5}$ fraction of PM_{10} concentrations is lower due to the increased coarse fraction (particulate matter between $PM_{2.5}$ and PM_{10}) generated from geological sources (i.e., fugitive dust emissions). The monitoring data indicate that the predominant sources of $PM_{2.5}$ are carbonaceous (i.e., combustion) as well as secondary particulate sources (i.e., reaction).

Ammonia and **hydrogen sulfide** are toxic gases generated during manure decomposition. Ammonia is also generated from rapid volatilization of nitrogen excreted by cattle in the form of urea manure in urine through hydrolysis. Ammonia generation depends on various conditions, including the animal type, feed type provided to the animal, environmental conditions (i.e., temperature, humidity), pH of the manure surface, geography, and level of biological activity. Ammonia reacts with nitrates and sulfates in the air to form ammonium nitrate, which is a particulate less than or equal to 2.5 microns.

Ammonia can generally be detected by the human nose at concentrations between 5 and 50 parts per million (ppm). Ammonia is an irritant that inflames wet body tissues (e.g., eyes and lungs) even at low concentrations. Mucous surface irritation results when exposed to between 100 and 500 ppm of ammonia. Immediate irritation of the eyes, nose, and throat occurs at exposure levels between 400 and 700 ppm. Exposure to levels between 2,000 and 3,000 ppm can cause severe eye irritation, coughing, and frothing at the mouth, which could be fatal. Exposure to concentrations of about 5,000 ppm, respiratory spasm, and rapid asphyxia can occur. Exposure to 10,000 ppm is fatal (Harmon, et al., 1994). Ammonia does not have Federal or State standards but is a precursor of $PM_{2.5}$.

Hydrogen sulfide has a rotten egg odor; it may be detected at 0.01 to 0.7 ppm. An offensive odor is detected at three to five ppm. Eye irritation results from exposure to ten ppm. Exposure to 20 ppm of hydrogen sulfide could cause irritation of the mucous membranes and lungs. Olfactory-nerve paralysis occurs from exposure to 150 ppm. Headaches, dizziness, and nervous system depression could set in from exposure to 200 ppm and nausea, excitement, insomnia, and death may occur after 30 minutes of exposure at 500 to 600 ppm of hydrogen sulfide. Fatality could occur when exposed to 700 to 2,000 ppm

(Harmon, et al., 1994). A State standard exists for hydrogen sulfide but the San Joaquin Valley is unclassified in attainment status.

Methane is an odorless greenhouse gas that absorbs and reflects terrestrial radiation back to the earth, potentially causing the earth surface temperature to gradually increase. It is classified as a simple asphyxiant and affects the human body by excluding oxygen from the lungs. When the asphyxiant mixture reaches a concentration of 50 percent air and gas, marked symptoms can be produced, such as rapid respiration and air hunger. A concentration of 75 percent gas in air results in fatality (Sax, 1984).[13]

Methane is emitted into the environment from various sources, including ruminant livestock and manure decomposition.[14] Methane released from domesticated ruminant livestock accounts for about 20 percent (about 80 million metric tons per year) of the anthropogenic methane generated in the United States (Agricultural Education, University of Missouri, et al., 1998; U.S. EPA, 1998a).

Of the ruminant livestock, dairy cattle generate about 1.5 million metric tons of methane per year, or about two percent of the total ruminant livestock methane generated and only about 0.4 percent of the total anthropogenic methane generated in the United States (U.S. EPA, 1998b). Ruminant animals produce methane emissions as part of their special digestive process. A portion of the feed material is converted into energy needed to support the maintenance and production (e.g., body tissue growth, milk, reproduction) of the animal. Feed that is not transformed into maintenance and production energy is converted into methane as a by-product. Methane generation from dairy cattle is influenced by feed quality, essential nutrients in the feed, feeding level and schedule, and animal health. Methane is released through the animal's mouth and nostrils.

Methane is also generated from anaerobic decomposition of livestock manure. Approximately 26 million metric tons per year of methane are generated from livestock manure in the United States, about seven percent of the total anthropogenic methane generated in the United States (Agricultural Education, University of Missouri, et al., 1998). The remaining major anthropogenic methane sources, producing 73 percent of methane emissions, are rice farming, natural gas/petroleum use, coal mining, biomass burning, landfills, and publicly owned wastewater treatment systems.

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[13] A "simple asphyxiant" is an inert gas that displaces the oxygen necessary for breathing, and dilutes the oxygen concentration below the level that is useful for the human body.

[14] Other anthropogenic sources of methane include landfills, natural gas and petroleum systems, rice cultivation, agricultural residue burning, coal mining, and fossil fuel production (U.S. EPA, 1998b).

Reactive organic gases (ROG) are also generated during decomposition of manure. ROG compounds commonly associated with animal manure decomposition include volatile fatty acids, aldehydes, alcohols, amines, mercaptans, indoles, and skatol. These compounds contribute to the odor exhibited by decomposing manure (Westerman and Zhang, 1996). ROG consist of hydrocarbons that undergo photochemical reactions to form ozone and are considered ozone precursors. Although there are no specific health effects for ROG, some compounds that make up ROG are carcinogenic. The San Joaquin Valley is in nonattainment for both Federal and State ozone standards.

AVAILABLE MANURE TREATMENT TECHNOLOGIES

Animal manure will naturally undergo aerobic[15] and anaerobic decomposition (Westerman and Zhang, 1996).[16] A wide variety of gaseous compounds are created and released into the environment at various stages of the anaerobic decomposition process, including reactive organic gases, methane, carbon dioxide, ammonia, and hydrogen sulfide, most of which are odorous (i.e., ammonia, hydrogen sulfide, and reactive organic gases).

One of the main focuses of air quality research on animal manure has been to address odorous gases generated from manure decomposition. Various technologies have been established to control odors generated from manure decomposition. These technologies include biological additives, chemical additives, permeable and impermeable covers, natural crust formed cover, composting, aerobic treatment systems, and anaerobic digestion.[17] Some of these treatment systems (i.e., impermeable covers, aerobic treatment systems, and anaerobic digestion) also address the generation of methane in addition to odorous gases.

The effectiveness of odor treatment systems is typically measured by detecting whether odors from treated manure are present. This is commonly performed using a human nose, olfactometer, or other similar measuring device. These devices can subjectively determine whether odor is still present, but cannot identify which individual odorous gases have been reduced or by how much.

Treatment effectiveness currently cannot be measured by quantifying the reduction rate of the individual odorous gas compounds because of the lack of available scientific

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[15] Aerobic decomposition occurs in the presence of oxygen.

[16] Raw dairy manure solids consist of volatile organics, such as fats, carbohydrates, proteins, and nutrients. The volatile solids of the manure provide the food and energy source for bacteria to grow and reproduce. Because oxygen is quickly consumed, manure undergoes natural anaerobic decomposition.

[17] It should be noted that the technologies described in this air quality analysis are summaries of the most common technologies that address some of the gases generated by manure decomposition.

methods to do so. Research on this issue is only now emerging. The USDA Agriculture Research Service (ARS) is currently in the final stages of completing an analytical methodology to measure concentrations of individual odorous gases (USDA, 1998; Zahn, 2001).[18] 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.

Biological Waste Supplements

Biological waste supplements may be applied to a manure collection area in an attempt to reduce **hydrogen sulfide** and **ammonia** gas generation. The supplements are intended to enhance bacteria growth, including sulfur-reducing bacteria. However, this technology has been identified to be questionable (MPCA, 1999). This technology also does not address the reduction of methane or reactive organic gases generated from natural anaerobic decomposition of the manure.

Chemical Additives

The primary purpose of chemical additives is to mask and counteract **odors** generated from anaerobic decomposition. Additives such as lime may be added to increase the pH of the manure and reduce **hydrogen sulfide** emissions. However, the rate of ammonia gas generation increases with elevated pH levels. This technology does not address the reduction of other gases generated from natural anaerobic decomposition of the manure.

Permeable and Impermeable Covers

Several types of impermeable and permeable covers have been developed for placement over manure storage systems, such as holding ponds; covers act as a physical barrier between liquid manure and the air. **Permeable** covers (known as biocovers) typically consist of an 8- to 12-inch wheat or barley straw layer (or other type of organic layer) lined with geotextile fabric; this type of cover acts as a biofilter and reduces the odor-related emissions, such as **ammonia** and **hydrogen sulfide** (Jacobson, et al., 1998; MPCA, 1999). However, this type of permeable cover would not prevent emission of other gases (i.e., methane, ROG) generated from the anaerobically decomposing manure contained in the waste storage system (Sullivan, 1999).

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[18] Based on the research conducted to date, USDA ARS has identified more than 200 volatile organic compounds (i.e., ROG compounds), including the commonly known ammonia and hydrogen sulfide, in livestock manure.

Impermeable covers have been used to retain gases generated from manure storage systems. However, gases generated (**methane, reactive organic compounds, ammonia, hydrogen sulfide**) from natural anaerobic decomposition of the stored manure must be treated to remove air pollutants before being emitted into the environment. Treatment may include a biofilter and/or flare; therefore, the impermeable covers would need to be equipped with a gas collection system, similar to a covered pond anaerobic digester.

Biofilters would capture and reduce odor-related compounds (e.g., **ammonia** and **hydrogen sulfide**) but are not expected to reduce methane emissions (MPCA, 1999; Sullivan, 1999). Burning gases (collected from the covers by flaring) generate combustion gases; as a result, ozone precursor gases and carbon monoxide would be generated.

Natural Crust Formed Cover

Stored dairy manure can form a natural crust layer cover, depending on factors such as solids content, holding storage surface area, feed type, and weather conditions (Sullivan, 1999; Jacobson, et al., 1998). For instance, the tendency for a crust layer to form is reduced with increasing storage surface area and decreasing solids content. At least two to three years of operation are typically required before a crust layer can form (Sullivan, 1999). Minimal agitation, which is typically inevitable, of a crust layer would release gases formed within the system; in addition, nonodorous gases, such as methane, may escape through the crust layer. Furthermore, the Kings Mosquito Abatement District (undated material) prohibits the formation of natural crusts on dairy process water ponds to reduce development of mosquito habitat.

Composting

Manure composting is a biological treatment process ideally conducted under aerobic conditions (Clanton, 1997). Composting is commonly used for manure with solids content of at least 25 to 30 percent (Bicudo, 1999); raw dairy manure typically contains 14 to 16 percent solids (U.S. EPA, 1999). However, carbon sources (e.g., straw) may be added to raw manure to increase the solids content of the manure. Composting of flushed manure, common at dairy facilities, would not be appropriate due to the low solids content.

Composting requires the continuous aeration of the system for the aerobic process to continue; otherwise, waste could undergo anaerobic decomposition, generating methane and other gases (Richard, 1996). Aeration can be promoted by forced aeration mechanical systems or passive aerated systems, which depend on diffusion and natural convection to aerate the waste. Land availability is a major limitation for composting. For instance, passive aerated windrows typically are 3 to 9 feet high and 6 to 18 feet wide (double the height). For forced aeration systems, the ideal windrow size will depend on the characteristics of the manure being composted; typically, the maximum height of a compost

pile is 6 to 9 feet. Therefore, both systems require large areas to feasibly and appropriately handle manure; this technology would likely be inappropriate for dairies generating large volumes of scraped manure on a daily basis.

The composting process will result in the elimination or reduction of **methane**, **hydrogen sulfide,** and **reactive organic gases** compared to natural anaerobic decomposition of manure; however, ammonia emissions would be released into the environment. Equipment operations needed for the composting process would generate exhaust emissions. In addition, composting requires pretreatment of the manure, such as sorting, mixing, grinding, temporary storage, and amendment addition (Clanton, 1999); these operations may cause air pollutants (e.g., methane, reactive organic gases, ammonia, hydrogen sulfide) to be released into the environment if anaerobic decomposition of the manure were to occur while the manure was being stored.

Aerobic Treatment Systems

Aerobic treatment is a process that enhances the decomposition of livestock manure slurries by aerobic bacteria with the addition of oxygen, thus preventing anaerobic decomposition. Various aerobic treatment systems have been used for managing livestock manure slurries, including activated sludge reactors, aerated ponds, and oxidation ditches (Westerman and Zhang, 1996). Depending on the system, mechanical aerators may be used to enhance oxygen transfer to the waste liquid or diffused air may be introduced into the treatment volume. Various mechanical aerators include compressed air aerator, mechanical surface aerator, mechanical subsurface aerator, combined compressed air/mechanical aerator, and pumped liquid aerator.

Aerobic treatment systems would reduce or prevent the generation of **methane, hydrogen sulfide**, and **reactive organic gases**. End products from aerobic systems are carbon dioxide, water, sulfates, ammonium ions, nitrite, and nitrate; however, ammonia emissions would continue to be emitted into the environment, depending on the chemical environment and oxygen availability (Zandergheynst, 1999; Brady, 1990; Zhang, undated).

The oxidation process of an aerobic treatment depends on the amount of oxygen provided and the reaction period. Under aerobic conditions, heterotrophic bacteria convert nitrogenous compounds in the manure into ammonium ions. The ammonium ions may be converted into nitrite then nitrate by nitrification bacteria, depending on the conditions of the treatment system (i.e., chemical environment and oxygen availability). Organic carbon is oxidized into carbon dioxide and sulfur compounds are converted into elemental sulfur and sulfate, as opposed to odor-causing sulfides (e.g., hydrogen sulfide) (Zhang, undated).

The liquid and solid effluent may be applied to land provided that the manure is completely stabilized; otherwise, anaerobic decomposition could occur during effluent storage and result in the generation and release of various gases, including hydrogen sulfide, reactive organic gases, and methane. The main disadvantage of aerobic treatment is the high energy cost required to continuously aerate the treatment volume sufficiently (Westerman and Zhang, 1996).

Aerobic treatment systems have recently been used at two dairy facilities in the San Joaquin Valley, one in Kings County and the other in Kern County. The aerobic treatment system in Kings County was developed as a six-month pilot study conducted at the Longfellow Dairy in Hanford; the study was conducted by Rain for Rent, Mazzei Injector Corporation, University of California at Davis, and the University of California Cooperative Extension Service. The treatment system was designed to handle approximately 5,000 gallons per day of flushed manure. The system consisted of a solids separator, two treatment tanks equipped with aerators (two stage treatment), and an effluent storage basin. Activated sludge is also added to the system to enhance waste treatment. Flushed manure was effectively treated to eliminate the potential generation of ammonia gas by implementing a two-stage process, where the organic loading was reduced in the first stage and the conversion of nitrogen to nitrate was accomplished by nitrification in the second stage.[19] However, although the treatment would reduce the total suspended solids of the manure, periodic cleaning of the system would be needed to remove eventual solids accumulation in the tanks (Grundvig, 1999).[20]

The aerobic treatment system in Kern County was constructed in May 1999 and is currently being operated to treat flushed dairy manure. The system was installed at the Visser Dairy located in McFarland, which houses approximately 3,000 milking cows. The system requires continuous maintenance and consists of two treatment ponds equipped with aerators and agitators and a storage pond. Microbes are also added to the treatment ponds to aid in the aerobic digestion of the manure. Similar to the pilot study performed in Kings County, the process water was effectively treated to eliminate the potential generation of ammonia gas. The generation of ammonia gas was prevented through controlling the system's pH level. Treated effluent in the form of a liquid slurry is currently applied on agricultural fields (Lubin, 1999).[21]

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[19] The study discovered that high organic loading of dairy manure prevented the bacteria that converts ammonia to nitrate from being active.

[20] The system was not monitored to evaluate the releases of hydrogen sulfide, reactive organic gases, or methane. However, these gases are not typically generated under aerobic conditions.

[21] The system was also not monitored to evaluate the releases of hydrogen sulfide, reactive organic gases, or methane. However, these gases are not typically generated under aerobic conditions.

Controlled Anaerobic Digester Systems

Air pollutant emissions from naturally decomposing manure can be significantly reduced by implementation of an anaerobic digester treatment system. Controlled anaerobic digestion is an enclosed and controlled biological waste treatment process that is conducted in the absence of oxygen. The process includes capturing biogases generated from anaerobic digestion (**methane**, **carbon dioxide**, and trace gases, such as **hydrogen sulfide** and **ammonia**) to minimize or prevent release into the environment. **Reactive organic gases** would also be minimized since the organic compounds would remain in liquid phase (due to the limited head space in the fully enclosed system) and eventually be converted into the biogases (Zhang, 1999).

Manure placed into an anaerobic digester undergoes controlled anaerobic decomposition in a totally enclosed and air-tight system. During the waste digestion process, hydrolytic and fermentic bacteria inherent in the manure break down complex organic waste compounds into short chain fatty acids, hydrogen gases, and carbon dioxide. The fatty acids are then converted into acetic acid by syntrophic bacteria in the manure. At this stage, additional carbon dioxide and hydrogen gases are formed within the enclosed system. Afterwards, methanogenic bacteria creates end biogases from the acetic acid and hydrogen and carbon dioxide gases within the system. The end biogases are a mixture of approximately 50 to 60 percent methane, 40 to 50 percent carbon dioxide, and less than one percent other compounds including hydrogen sulfide. All generated biogases are trapped within the digester.

The three basic types of anaerobic digesters operated in the United States are covered ponds, plug flow digesters, and complete mix digesters.[22] A covered pond is a fully enclosed pond, which typically is designed to have a retention time of 50 to 60 days; the pond design is similar to that of a dairy holding pond, but on a smaller scale (Sharp, 1999). Complete mix and plug flow digesters are designed and operated to enhance anaerobic decomposition and typically require less land area than pond systems. Selection of the appropriate digester system would depend on numerous factors, such as, but not limited to, climate, manure solids content, solids characteristics, and land availability.

Generated biogases require proper management to prevent air pollutants from releasing into the environment. Management must include transporting the biogases from the digester to their end use. Biogases may be used in various ways. The biogases generated from anaerobic digester systems may be converted into electricity for on-site use or resale. Biogases may also be used directly as a fuel for a boiler to produce steam for facility operations.

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[22] Other anaerobic treatment systems or combined systems exist, such as ozonated anaerobic lagoons and combined aerobic and anaerobic lagoons.

In addition to end biogases (methane, carbon dioxide, and trace gases), effluent, which is stable and rich in nutrients (ammonia, phosphorus, and potassium), is generated from the digester process; the effluent is typically stored in a separate storage pond and may be used for crop irrigation. In addition, the effluent is an excellent soil conditioner when dried (U.S. DOE, undated). However, effluent would have the potential to release ammonia during storage and application.[23] In addition, operation of the anaerobic digester treatment system would generate exhaust emissions from fuel-operated equipment and from burning of the biogas.

The AgSTAR Program promotes the development and operation of biogas systems (e.g., anaerobic digester treatment systems) at commercial farms (e.g., dairy, swine, and poultry) in the United States to reduce air pollutant emissions. However, installation of a biogas system at dairy facilities has not been considered in the past to be a practical solution to reducing the methane and organic gases generated from dairy manure because of the cost to design and construct the system as well as the labor required to maintain and operate it.[24]

A survey conducted in 1995 (Morse, et al., 1995) identified six dairy producers in California who had operated anaerobic digester systems as part of their dairy manure management systems. The installation costs for the digesters ranged from $100,000 to $950,000, generally increasing with the size of the dairy herd, which ranged from 200 to 1,500 cows. Of those dairies, only one continued to operate the digester. Three had discontinued use of the digester system, and the other two no longer operated their dairies. Producers who discontinued use of the digesters indicated that operational problems and maintenance costs were significant problems. In addition, the differential between the price dairy producers paid electrical companies for electricity and the price electrical companies paid for electricity generated at the dairies from biogas fueled turbines created additional economic problems. The results of the survey indicated that the economical feasibility of operating digesters in California was marginal in 1995, but that correction of operational problems and establishment of a trained service industry for operating digesters could promote their use as a viable component of dairy manure management systems.

In September 1999, a heated-plug flow anaerobic digester was installed at Haubenschild Farms, a 500-cow freestall dairy, in Princeton, Minnesota. The collected biogas is converted into electricity and is reused on-site and also sold to a local electric cooperative (AgSTAR,

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[23] During decomposition of the manure, organic nitrogen of the manure is converted to ammoniacal nitrogen. Ammoniacal nitrogen can volatilize into the environment and is not a result of bacterial decomposition of the ammoniacal nitrogen (USDA, 1992).

[24] Shultz, 1999.

2000). By January 2000, the dairy produced almost twice as much electricity as was needed to supply the electric needs on the farm, approximately 5.5 kilowatt-hours per cow per day.

Haubenschild Farms is projected to yield $66,200 of total annual revenue in 2000 from generated electricity, based on the digester performance between January and June 2000. The projected annual revenue is expected to increase in 2001 as the herd size will be expanded to 1,000 cows (Nelson and Lamb, 2000). The cost to construct the 1,000-cow capacity digester was $355,000 ($355 per cow). Costs included construction of the manure collection, digester, and energy conversion. Therefore, construction and implementation of an anaerobic digester system at a dairy facility is considered to be beneficial, considering the increasing cost of electricity in California and the apparent correction of past operational problems with digesters.

Efficiency of Anaerobic and Aerobic Treatment Systems

All manure contains volatile solids (VS), which constitute the organic portion of the total solids. VS is defined as the organic fraction of total solids that will oxidize and convert into gas at 600 degrees Celsius. VS provides the food and energy source for certain bacteria to grow and reproduce, causing manure to decompose.[25] A wide variety of gaseous compounds are created and released into the environment at various stages of the decomposition process. When ~~100 percent of~~ the VS from the manure is completely removed, ~~no~~ the potential for additional gaseous compounds ~~are~~ released is reduced since the food and energy sources for the bacteria have been depleted. ~~At this point~~ When all of the volatile solids are removed, manure is considered completely stabilized (i.e., complete decomposition).[26] At this point, the potential release of methane, reactive organic gases, hydrogen sulfide, and ammonia and ammonium compounds generated by anaerobic bacteria is minimized. Therefore, the emission of these gases would be significantly reduced if the treatment of manure results in complete oxidation of manure and process water (i.e., aerobic treatment) or if the gases generated during anaerobic decomposition are collected and combusted (i.e., controlled anaerobic digestion).

All VS are completely biodegradable, although a portion is classified as readily biodegradable (consumed by bacteria quickly) and the rest is considered to biodegrade slowly. The fraction of readily biodegradable VS depends on such factors as manure quality and digestion method.

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[25] Volatile solids can be consumed by bacteria under both aerobic and anaerobic conditions (Metcalf & Eddy, Inc, 1972).

[26] It should be noted that volatile solids reduction can also be achieved through solids settling.

Both anaerobic and aerobic treatment systems use the VS concentration in manure as a parameter for treatment design and effectiveness. The design of these systems is based on the VS loading that can be handled by the systems. The effectiveness of these systems is measured by the amount of VS that has been removed from the effluent; the VS removal efficiency is typically expressed as a percent reduction.

Standard testing methods for quantifying the reduction of air pollutant gases from treated manure (anaerobically or aerobically) is currently not readily available. However, the VS removal efficiency level of a treatment system may be considered an appropriate indicator for determining the remaining potential for treated manure to emit air pollutants (including ROG and methane) to the atmosphere.

A discussion of the potential VS removal efficiencies for anaerobic and aerobic treatment systems is provided below. The VS removal efficiency of an anaerobic treatment system (50 to 70 percent) may be lower compared to the efficiency of an aerobic treatment system (70 percent). However, a substantial benefit of an anaerobic treatment system is the capability of recovering biogases for conversion into electricity.

Anaerobic Treatment System

The VS removal efficiency of a livestock manure anaerobic treatment system is highly dependent on several factors, including manure quality, livestock, and digestion treatment method. For example, the removal efficiency increases with increasing readily biodegradable VS in the manure. The level of readily biodegradable VS present in manure depends on the animal's diet. A diet high in sugars generally results in higher readily biodegradable VS in the manure and a diet high in fiber generally results in lower readily biodegradable VS (Martin, 2001; Roos, 2001).

The VS removal efficiency depends on the type of livestock manure. Generally, the VS removal efficiency for treating swine manure is expected to be higher than that for dairy manure because of the amount of readily biodegradable VS in swine manure (Martin, 2001; Roos, 2001) .

The type of anaerobic digester unit also affects the VS removal efficiency. A covered anaerobic lagoon digester system generally exhibits greater VS removal efficiency compared to other types of digester systems (i.e., plug flow, complete mix) primarily because lagoons also allow for the partitioning and settling of VS contained in the manure. Therefore, the level of VS in manure treated in anaerobic lagoons is reduced by two processes: bacteria consumption and partitioning and settling (Martin, 2001; Roos, 2001).

An industry standard VS removal efficiency value for dairy manure anaerobic treatment systems has not been established because of the wide variability of the above-mentioned

factors. In addition, limited published studies evaluating VS removal efficiencies of anaerobic treatment systems are currently available to provide a generally accepted efficiency value. Two studies were conducted to evaluate the energy recovery of swine waste from lagoon systems, which were funded by U.S. EPA under the AgSTAR program.

One study compared the performance of two swine waste treatment systems (a covered anaerobic lagoon with a storage pond and an ozonated anaerobic lagoon[27]) with a traditional anaerobic lagoon (not considered an anaerobic treatment system).[28] This study was conducted from 1998 through 1999.[29] The study reported a VS removal efficiency of 92 percent for the covered anaerobic lagoon treatment system, 90 percent for the ozonated anaerobic lagoon, and 89 percent for the traditional anaerobic lagoon (Cheng, et al., undated). The second study evaluated the performance of a swine waste covered anaerobic lagoon treatment system. The study was conducted in the late 1990s at Barnham farm, located in North Carolina, which is a swine farm with 4,000 sows in six houses. The study reported that the covered anaerobic lagoon provided a VS removal efficiency of 88 percent (Cheng, et al., 1999).

Both studies indicate that the VS removal efficiencies of swine waste anaerobic lagoons are in the upper 80 percent range. It should be noted, however, that the VS removal efficiency for swine waste would be expected to be greater than for dairy manure because of the increased readily biodegradable VS typically present in swine waste (Martin, 2001). In addition, the VS removal efficiency for anaerobic lagoons is generally higher compared to other digester systems because of the VS settling potential.

AgSTAR, in coordination with the University of Delaware, is currently in the process of researching the performance of dairy manure anaerobic treatment systems. The research will focus on evaluating the VS removal efficiencies of these systems. The results of the study are expected to be completed before the end of 2001. AgSTAR and University of Delaware staff involved in the research indicate that the VS removal efficiencies are expected to be lower than those observed for swine waste systems, at a range possibly between 60 to 70 percent. Staff indicated that the VS removal efficiency range may be

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[27] The ozonated anaerobic lagoon consisted of a standard anaerobic lagoon equipped with a surface aerator that allowed for the injection of an ozone and air mixture into the lagoon.

[28] A traditional anaerobic lagoon is not considered an anaerobic treatment system since the lagoon is not constructed with a cover or other mechanism to capture gases generated during anaerobic decomposition of the waste.

[29] The covered anaerobic lagoon was installed at a farrow-to-wean swine farm with 4,000 sows in six houses. The ozonated anaerobic lagoon was installed at a finishing swine farm with 5,400 hogs in six houses. The traditional lagoon was installed at a finishing swine farm with 8,100 hogs in nine houses.

optimistic for the plug flow and complete mix digesters, and could possibly be approximately 50 percent (Martin, 2001; Roos, 2001).

Although no regulatory requirements currently exist for specifying a VS removal efficiency for dairy manure treatment systems, Colorado has developed a VS limit for swine wastes to control odor. The Colorado Air Quality Control Commission Odor Emission Regulations (No. 2) Section IX.A.4.e (1) require that all swine process water that is land applied and not injected shall be pretreated to "...achieve sixty percent removal of total volatile solids" (Colorado Air Quality Control Commission, 1999).

Aerobic Treatment System

Similar to anaerobic treatment systems, the VS removal efficiency of livestock manure aerobic treatment systems would be expected to depend on various factors (manure quality, livestock, treatment type). Limited studies have been conducted to evaluate the VS removal efficiency of livestock manure aerobic treatment systems. The recent six-month pilot study conducted at the Longfellow Dairy in Hanford included evaluation of the VS removal efficiency of the treatment system. The study indicated that the treatment system achieved a median VS removal efficiency of 74 percent if only a one-stage system was implemented. A median VS removal efficiency of 83 percent was achieved by the system if a two-stage system were used. The primary purpose of the two-stage system was to eliminate the potential generation of ammonia gas.

As with anaerobic treatment systems, an industry standard VS removal efficiency value for dairy manure aerobic treatment systems has not been established. However, a 50 percent VS removal efficiency (lower efficiency rate for anaerobic treatment system) could possibly be achieved based on the pilot study conducted in Hanford.

CURRENT USDA AGRICULTURAL RESEARCH SERVICE ACTIVITIES

As mentioned previously, available scientific methods for quantifying the release of gaseous compounds from livestock manure is now only being conducted by USDA ARS. USDA ARS acknowledges that a complete understanding of emission and dispersion of gases generated from animal production systems is currently lacking and that greater knowledge is needed about the mechanisms responsible for air pollutant emissions, composition, emission rates, and dispersion from livestock operations to provide effective solutions. During the late 1990s, USDA ARS established various national programs, including the Air Quality and Manure and Byproduct Utilization programs, to develop a systems research approach to evaluate and develop solutions related to air quality

problems from livestock operations (USDA ARS, undated).[30] The research is being conducted by USDA ARS and other specialists (i.e., universities, industry).

The Air Quality National Program is designed to meet the research needs of those parties involved in controlling, assessing, and regulating air quality associated with agriculture. USDA ARS anticipates that the research results of the Air Quality National Program will provide farmers with cost-effective technology to significantly decrease harmful pollutant emissions and provide a methodology to monitor and evaluate rates and amounts of emissions from agriculture. The Manure and Byproduct Utilization National Program focuses on nutrient management, atmospheric emissions, and pathogens from livestock operations (USDA ARS, undated).

There are currently 33 research projects being performed under the Air Quality National Program and 71 research projects being performed under the Manure and Byproduct Utilization National Program. The research projects are generally expected to be completed by 2005. The following provides a summary of some of the research projects (USDA ARS, undated):

- Nutrient conservation and odor reduction in swine and cattle confinement facilities; this project focuses on understanding and developing methods to inhibit microbial activities that produce offensive gaseous and volatile organic compounds (i.e., ROG) and development of biofilters/biocovers that efficiently metabolize offensive odors to non-odorous compounds (USDA ARS, undated). To date, USDA has identified that the addition of low levels of essential plant oils to livestock manure inhibited odor emissions although field tests are needed to determine the economics and usefulness of these agents in livestock facilities.

- Anaerobic microbiological processes in animal waste management; the purpose of this research is to uncover the underlying microbiological basis for odor and devise strategies to intervene in the production of odor causing chemicals generated during anaerobic decomposition of animal wastes, primarily from swine facilities.

- Developing anaerobic microbiological processes for swine waste management; project objectives include development of fundamental knowledge concerning the microbial population of swine waste and the swine intestinal tract to understand the relationship between microbial population and production of odorous compounds. Also, the project aims to develop improved methods to quantify changes in fecal and stored waste bacterial populations and correlate these with emissions generated.

[30] These programs, as well as other USDA ARS national programs, also deal with other agriculture issues.

- Manure treatments and uses to protect soil-water air quality, food safety, and improve manure value; project objectives include development of methods to improve handling and treatment of animal manure to reduce impact on air and water quality and quantification of odor emissions and bioaerosols to evaluate management practice effects on air quality.

- Influence of soil amendments on gaseous emission of nitrogen, carbon, and sulfur from feedlots; project objectives include: 1) evaluating the effects of adding chemical amendments to beef cattle feedlot surfaces; and 2) chemically characterizing the gaseous emissions from the feedlot surfaces using a laboratory-scale system.

- Holding project for animal manure management research; project objectives include the development of management practices on all phases of livestock operations (animal nutrition, manure handling treatment and storage and field application) for effective use of manure in cropping systems while protecting environmental quality and human health. Management practices and treatment technologies will be developed to control emissions, conserve nutrients, and reduce or eliminate pathogens.

- Conservation of manure nutrients and odor reduction in swine and cattle confinement facilities; project objectives include developing methods to inhibit microbial activities that produce offensive gaseous and volatile organic compounds (i.e., ROG); and developing microbially enriched biofilters and biocovers to efficiently metabolize offensive odors to non-odorous compounds.

- Integrated management regimens that minimize the environmental impact of livestock manure; project objectives include measuring the effects of different diets and feeding regimes on ruminant nutrient excretion and emissions of ammonia, odors, and particulates.

- Improved animal manure treatment methods for enhanced water quality; the purpose of this project is to develop improved treatment technologies and systems to manage animal waste from swine production to protect water and air quality. No corresponding study is currently being conducted for dairy facilities.

- Comprehensive systems for managing nutrient flows and gaseous emissions in relation to dairy manure; project objectives include developing manure treatment, handling, and use practices that reduce release of nutrients, ammonia, odors, bioaerosols, and dust particles to air and water.

- Nutritional, microbial, and land application regimens for use of feedlot wastes; project objectives include developing nutritional and management regimens that reduce

nitrogen and phosphorus content of feedlot wastes without adversely affecting animal production efficiency and developing microbial methods to improve nutrient use by feedlot cattle to decrease the quantity of animal waste and improve quality of waste for land application. A study published in June 1999 indicated that application of chemicals, such as aluminum sulfate, calcium chloride, and a urease inhibitor, decreased ammonia production at the feedlot surface by 40 to 70 percent.[31] However, according to USDA ARS, additional research is currently being conducted to evaluate the application of other chemicals, safety of chemical application, and appropriate application rate (Cole, 2001)

The understanding of livestock operation-related air quality issues is limited, as evidenced from the current research projects being performed by USDA ARS. Therefore, the effectiveness of available manure treatment systems to control air pollutant emissions cannot be completely determined until a complete scientific understanding of air pollutant emissions generated from livestock manure can be made. 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.

EXISTING CONDITIONS

The areas within Kings County covered under the Element are currently being used for agricultural purposes, of which approximately 245,300 acres are used as cropland, 4,756 acres are occupied by dairy facilities, and the remaining areas are used for nondairy livestock operations (i.e., beef cows, hogs, pigs, and poultry) and agricultural cropland.[32] Current cropland and livestock operations are also capable of generating air pollutant emissions.

Air pollutant emissions from cropland activities include PM_{10} emissions from fugitive dust due to land preparation, crop harvesting, and fugitive windblown dust; and exhaust emissions (ROG, NOx, and PM_{10}) from agricultural equipment. Air pollutant emissions from dairy operations include: 1) PM_{10} emissions from fugitive dust due to cattle movement at unpaved corrals, unpaved roadways, and other unpaved areas; 2) ROG,

[31] The study was based on laboratory experiments although some field studies have been conducted.

[32] It is assumed that new or expanded dairies would be built on cropland and not on existing nondairy livestock operations; therefore, emissions generated from nondairy livestock operations were not estimated since they would not affect net emissions from new or expanded dairies subject to the Element.

hydrogen sulfide, ammonia, and methane from manure decomposition; 3) methane from cattle; and 4) exhaust emissions (ROG, NOx, and PM_{10}) from dairy equipment.

Cropland Emissions

PM_{10} Emissions from Fugitive Dust

PM_{10} emissions from fugitive dust are released into the atmosphere during land preparation for planting and post-harvest activities. Typical land preparation operations include stubble disking, finish disking, mulching, and other mechanical disturbances. Soil preparation activities are dependent on the crop type being grown. Based on the crop types harvested in 1999 countywide, crops grown in the County include alfalfa, alfalfa seed, hay, barley, corn (silage), cotton (lint, all varieties), cotton (seed), pasture (fescue), safflower, sugar beets, wheat, and wheat (seed).[33]

PM_{10} emissions from land preparation activities were estimated using a PM_{10} emission factor published in the August 1997 CARB Emission Inventory Procedural Manual, Volume III, Section 7.4, Agricultural Land Preparation. Land preparation activities from current cropland could generate up to 1,241 tons per year of PM_{10} emissions (Table 4.2-5a). In addition, crop harvesting activities would also generate PM_{10} emissions. PM_{10} emission factors for all the crop types were not available and, therefore, PM_{10} emissions from crop harvesting could not be estimated accurately. However, according to CARB's 2000 Emission Inventory, approximately 12.66 tons per day (or 4,621 tons per year) of PM_{10} emissions were emitted from farming operations throughout Kings County in 2000 (Table 4.2-2). Farming operations generate particulate matter during land preparation, harvest operations, growing season operations, cattle feedlots, and any other activities (CARB, 1998).

Windblown dust across agricultural fields also releases PM_{10} emissions to the environment. Up to 1,577 tons per year of PM_{10} emissions could be released due to windblown dust throughout the existing cropland; the estimated emissions were based on the current cropland size, a PM_{10} emission factor published in the August 1997 CARB Emission Inventory Procedural Manual, Volume III, Section 7.12, Wind Blown Dust, Agricultural Land (Table 4.2-5a). According to CARB's 2000 Emission Inventory, an average of 7.91 tons per day (2,887 tons per year) of PM_{10} emissions from fugitive windblown dust attributed to agricultural lands, pasture lands, and unpaved areas were emitted from Kings County in 2000 (Table 4.2-2) (CARB, 1998).

[33] The crop types are included in the Theoretical Capacity Model.

Exhaust (ROG, NOx, and PM_{10}) Emissions from Agricultural Equipment

Air pollutant emissions from agricultural equipment exhaust include ozone precursors (i.e., ROG and NOx) and PM_{10}. ROG, NOx, and PM_{10} emissions would be dependent on the types of equipment used (e.g., diesel-fueled equipment, such as stalk cutters, cultivators, discing equipment, seeder, dressing- and mulch-related equipment, tractors, trucks, and miscellaneous equipment), equipment use duration, equipment horsepower, crop areas, annual operating hours for each equipment, emission factors, and load factors. Since this information varies throughout the County, and is site-specific, estimations of ROG, NOx, and PM_{10} emissions under current conditions could not be estimated. However, according to CARB's 2000 Emission Inventory, an average of 172, 1,267, and 80 tons per year of ROG, NOx, and PM_{10}, respectively, are generated annually from farm equipment in Kings County (Table 4.2-2) (CARB, 1998). Farm equipment included light and heavy duty equipment used in farming.

Dairy Facility Emissions

Air pollutant emissions from dairy facility operations include PM_{10}, ROG, NOX, ammonia, hydrogen sulfide, and methane. PM_{10} emissions are primarily from fugitive dust releases at unpaved corrals and unpaved roadways/areas. Windblown dust across pasture land would also generate very minimal PM_{10} emissions.[34] ROG, ammonia, hydrogen sulfide, and methane emissions result from decomposition of animal waste. Methane emissions are also generated from the digestive process of the dairy animals. In addition, dairy farm equipment exhaust releases ROG and PM_{10} emissions as well as NOx emissions.

PM_{10} Emissions from Fugitive Dust during Cattle Movement in Unpaved Corrals

The generation of fugitive dust at dairies is primarily from cattle movement in unpaved corrals; fugitive dust would also be generated during maintenance activities (e.g., regrading) at the unpaved corrals.[35] Under existing conditions, dry cows, bred heifers, heifers (one year to bred ages), calves, and baby calves are assumed to be housed in unpaved corrals and milk cows in freestall barns.[36]

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[34] Approximately three tons per year of PM_{10} could be emitted from dairy pasture land under existing conditions, conservatively assuming that all of the dairy areas are exclusively for pasture.

[35] Air pollutant emissions from existing dairies were based on the assumptions that: 1) existing dairies handle Holstein-type cows; 2) the ratio of support stock to milk cows is similar to that estimated under Table 5 (Theoretical Dairy Capacity of Kings County); 3) existing dairies house milk cows in freestall barns and support stock in unpaved corrals; and 4) manure is currently not being treated to reduce air pollutant emissions.

[36] Little to no fugitive dust would be expected to be generated from the freestall barns as these facilities are typically paved with concrete.

PM_{10} emission factors from fugitive dust generated at unpaved dairy corrals have not yet been developed by U.S. EPA or CARB (Gaffney, 1999). However, a wide range of particulate emission factors have been published for cattle feedlots. The September 1985 U.S. EPA A.P. 42 Manual publishes a total particulate matter emission factor from fugitive dust at cattle feedlots (U.S. EPA, 1985). Based on this factor, CARB developed a PM_{10} emission factor, which is provided in the Emission Inventory Procedural Manual, Methods for Assessing Area Source Emissions (CARB, 1989a). CARB's PM_{10} emission factor of 134.4 pounds per 1,000 head per day assumes that 48 percent of the total particulate emission factor constitutes PM_{10}.[37]

In 1999, the Department of Agricultural Engineering at Texas A&M University completed a PM_{10} emission inventory study for cattle feedlots in Texas. As part of the study, the AP-42 total particulate emission factor was reexamined and a revised PM_{10} emission factor of 15 pounds per 1,000 head per day from fugitive dust at cattle feedlots was estimated. The revised PM_{10} emission factor was based on sampling, back-calculating the emission factor using the ISC3 air model, and annualizing the estimated emission factor. The revised PM_{10} emissions factor for feedlots was considered in a recent report by the Confined Livestock Air Quality Committee (CLAQC) of the USDA Agriculture Air Quality Task Force (CLAQC, 2000). CLAQC indicated that the PM_{10} emission factor for dairy cattle may be less than 20 percent of the cattle feedlot PM_{10} emission factor developed by Texas A&M (15 pounds per 1,000 head per day), according to personal communication between Mr. Jim Sweeten (Texas A&M University professor) and the Confined Livestock Air Quality Committee of the USDA Agricultural Air Quality Task Force (2000).

Potential PM_{10} emissions from existing unpaved dairy corrals in Kings County were estimated using PM_{10} emission factors published by CARB as well as the Department of Agricultural Engineering at Texas A&M University for cattle feedlots (Table 4.2-5a). However, actual PM_{10} emissions generated could be less than the estimated emissions since cattle feedlots are known to generate more PM_{10} emissions than dairy corrals constructed to current California Department of Food and Agriculture standards.[38] The number of existing support stock (dry cows, heifers, and calves) considered in calculating PM_{10} emissions were estimated using the ratio of milk cow to individual support stock and the number of milk cows currently housed in existing dairies in Kings County provided in Table 5 of the Element (Theoretical Dairy Capacity of Kings County).

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[37] As indicated previously, an average of 4,621 tons per year of PM_{10} emissions from farming operations, which included cattle feedlots (but not dairies), was emitted from the entire County in 2000.

[38] PM_{10} emissions from a cattle feedlot are mainly due to the disturbance of the manure pack present in the feedlot. However, manure in unpaved dairy corrals is not common and typically removed frequently. In addition, the spacing of cows in unpaved dairy corrals is typically greater than in cattle feedlots.

CARB's PM_{10} emission factor is based on dry season conditions and where dust control measures are not regularly employed. In addition, the emission factor appears to be based on adult steers and heifers that are placed in feedlots and calves (weighing 320 to 700 pounds) that are placed in feedlots during part of their growth period (Monsanto, 1977). Therefore, CARB's PM_{10} emission factor would not be expected to account for PM_{10} emissions generated from new born calves and only partially considers PM_{10} emissions generated from calves weighing between 320 to 700 pounds.[39]

PM_{10} emissions using CARB's emission factor were estimated under the following two scenarios to account for PM_{10} emission reduction from the wet season (rainfall effects) and for potential additional PM_{10} emissions generated from new born calves and calves between 320 to 700 pounds:

- Scenario 1: Exclude all calves in PM_{10} emission estimate and account for potential PM_{10} emission reduction during wet season;[40] and

- Scenario 2: Conservatively include all calves in PM_{10} emission estimate (assuming that PM_{10} emission rates for calves are equivalent to those for the heavier and larger dry cattle and heifers),[41] and ignore potential PM_{10} emission reduction during wet season.

The PM_{10} emission factor developed by the Department of Agricultural Engineering at Texas A&M University is an annualized value that accounts for rainfall effects observed in Texas. However, the PM_{10} emissions for existing conditions used a non-annualized emission factor of 20 pounds per 1,000 head per day since the rainfall effects observed in Texas would not be applicable to California. The PM_{10} emission factor was assumed not to account for calves in the cattle feedlots. Therefore, PM_{10} emissions using the University's emission factor were estimated under the following two scenarios:

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[39] PM_{10} emissions from cattle movement vary depending on the cattle type, as movement from dry cattle and heifers would likely generate more PM_{10} emissions from fugitive dust compared to calves because of weight and hoof size differences between the older (dry cattle and heifers) and younger (calves) cattle.

[40] PM_{10} emission reductions from rainfall were based on guidance from CARB (Gaffney, 1999).

[41] The emission factor used to estimate PM_{10} emissions was based on beef cattle feedlots. Production of beef calves usually consists of raising calves to weaning weights of 480 pounds as part of a range-pasture program; calves from weaning to weights between 550 to 700 pounds are typically grazed on pastures and also maintained in cattle feedlots. Therefore, the emission factor would not be expected to account for PM_{10} emissions generated from baby calves or from partial raising of calves from weaning to weights of 550 to 700 pounds.

- Scenario 3: Exclude all calves in PM_{10} emission estimate and account for potential PM_{10} emission reduction during wet season using approach consistent with Scenario 1;[42] and

- Scenario 4: Conservatively include all calves in PM_{10} emission estimate, and ignore potential PM_{10} emission reduction during wet season.

The PM_{10} emissions for the four scenarios were estimated to be 1,681, 3,394, 251, and 505 tons per year for Scenarios 1, 2, 3, and 4, respectively (Tables 4.2-5a). CARB's November 2000 study indicated that 90 tons per year of PM_{10} were generated from dairy operations in Kings County. However, CARB's estimate only reflects PM_{10} emissions released from windblown dust along dairy pasture land. In addition, CARB's study was based on a rough assumption on the fraction of pasture land occupied by dairy cattle (Benjamin, 2001a). If the entire 4,756 acres that are currently occupied by dairies in Kings County were conservatively assumed to constitute all pasture land, the estimated PM_{10} emissions generated from windblown dust on the pasture land would be approximately three tons per year, which is a relatively insignificant amount compared to PM_{10} emissions expected to be released from unpaved dairy corrals.[43]

PM_{10} Emissions from Fugitive Dust during Vehicular Use along Unpaved/Gravel Paved Roadways and Other Unpaved Areas

PM_{10} emissions are also generated from fugitive dust during vehicular use along unpaved or gravel paved roadways and from other unpaved areas within a dairy facility. The amount of PM_{10} emissions that could be generated from vehicular use along roadways at existing dairies would be dependent on various factors including the road type, vehicle miles traveled along the roadway, number of vehicular trips, vehicle type (number or wheels and weight), travel speed, silt content of the roadway, and vehicle weight. Similarly, the amount of PM_{10} emissions that could be generated from unpaved areas throughout a dairy facility would be dependent on several factors including area size and silt content of the area.

Since these factors vary widely with each dairy, PM_{10} emissions from vehicular use along unpaved or gravel paved roadways were not estimated. In addition, PM_{10} emissions from vehicular use are generally minimal, compared to PM_{10} emissions generated from unpaved corrals (Kings County, 1999). However, according to CARB's 2000 Emission Inventory, an estimated 7.51 tons per day (2,741 tons per year) of PM_{10} were emitted in 2000 from

[42] PM_{10} emission reductions from rainfall were based on guidance from CARB (Gaffney, 1999).

[43] This estimate is based on an the actual acreage currently occupied by dairies within the County and an emission factor for pasture land in Kings County, which is published in the August 1997 CARB Emission Inventory Manual, Volume III, Section 7.12, Wind Blown Dust, Agricultural Land.

unpaved roads within the county (CARB, 1998). The emission reflects particulate matter stirred up by vehicles traveling along dirt and gravel roads including city and county roads, and farm roads.

Fine Particulate Fraction of PM_{10} Emissions

$PM_{2.5}$, known as fine particulate matter, comprises a fraction of PM_{10}. Primary and secondary $PM_{2.5}$ emissions could be generated from existing dairy operations. Primary sources include equipment exhaust, fugitive dust from unpaved dairy corrals, agricultural land preparation, and windblown dust. A discussion of the potential PM_{10} emissions associated with these primary sources is presented earlier in this section and summarized in Table 4.2-5a. The potential $PM_{2.5}$ emissions from these sources make up a fraction of the estimated potential PM_{10} emissions. Based on recent studies conducted by CARB, approximately 92 percent of PM_{10} emissions from exhaust (combustion) is expected to be in the $PM_{2.5}$ range. In addition to exhaust sources, fugitive dust from the unpaved dairy corrals, unpaved roadways, agricultural land preparation, and windblown dust from the proposed project would also generate primary $PM_{2.5}$ emissions. Based on recent studies conducted by CARB, the percentages of PM_{10} emissions that are in the $PM_{2.5}$ range are approximately 12 percent for cattle feedlots and 22 percent for windblown dust, agricultural tilling, and unpaved roadways (CARB, undated, Speciation Profiles and Size Fractions). Table 4.2-5a currently provides the potential PM_{10} emissions that could result from the above-mentioned sources.

Secondary sources of $PM_{2.5}$ would result mainly from the formation of ammonium nitrate from the reaction between ammonia and nitrates. Ammonium nitrate emissions in the $PM_{2.5}$ range result from reactions between ammonia emissions and nitrates available in the environment. For dairy operations, ammonia emissions are generated as the organic nitrogen contained in cattle fecal manure decomposes and when the urea manure hydrolyzes.

Limited information about $PM_{2.5}$ secondary particulate emissions from ammonia reactions is currently available. In the San Joaquin Valley, ammonia is believed to be more abundant than nitrates, indicating that the generation of ammonium nitrate is dependent on the availability of nitrates in the environment rather than the availability of ammonia (Gaffney, 2001). The SJVUAPCD is currently working with CARB and other parties (i.e., industry) on the development of the California Regional $PM_{10}/PM_{2.5}$ Air Quality Study (CRPAQS), a comprehensive program of monitoring, emissions inventory development, data analysis, and modeling of particulate matter, specifically PM_{10} and $PM_{2.5}$. The purposes of the study are to provide an improved understanding of PM_{10} and $PM_{2.5}$, establish a strong scientific foundation for informed decision making, and prepare efficient and cost-effective emission control strategies to achieve the PM_{10} and $PM_{2.5}$ standards in central California. The study is also expected to provide some scientific basis for determining ammonia's effect on $PM_{2.5}$.

The study includes particulate matter associated with agricultural and livestock operations, including dairy facilities. The study is expected to be completed in 2003.

Estimation of the amount of ammonia that is converted into ammonium nitrate and the expected contribution to existing $PM_{2.5}$ concentrations cannot be accurately made at this time. Estimation of the $PM_{2.5}$ emissions from this single source would require development of a regionwide photochemical model. Considering the lack of available techniques to estimate $PM_{2.5}$ emissions from secondary sources, particularly from ammonia reactions, development of such a complex regional model is outside the scope of this PEIR. However, it is acknowledged by this document that ammonia emissions from existing dairies could be a major contributor to the formation of secondary $PM_{2.5}$.

ROG Emissions from Manure Decomposition

Cattle manure will naturally undergo anaerobic decomposition once it is excreted from the animal (Zhang and Westerman, 1996). A wide variety of gaseous compounds are emitted during various stages of the decomposition process, such as ROG. Specific ROG that would be generated during the intermediate manure decomposition stage include ethyl amine, trimethyl amine, propyl acetate, isopropyl alcohol, and ethyl alcohol (Radian, 1988).

ROG emissions may be generated from cattle manure at any location where cattle manure is present, provided the manure is undergoing natural anaerobic decomposition. These locations could include the freestall drive lanes, storage ponds, unpaved corrals, manure stockpiles, and areas where manure waste is applied. Limited data for estimating ROG emissions from cattle manure are currently available. CARB's Emission Inventory Procedural Manual, Methods for Assessing Area Source Emissions includes an emission factor for total organic gases; the emission factor is based on the Evaluation of Emissions from Selected Uninventoried Sources in the State of California, prepared for the CARB in April 1988 by Radian Corporation. Approximately eight percent of the total organic gases emission factor was considered ROG, based on the compounds identified as total organic gases (Radian, 1988). It should be noted that the emission factor used to estimate ROG emissions was developed more than ten years ago and was based on limited available data.

ROG emissions were estimated for existing conditions, assuming that none of the dairy facilities are currently treating generated manure to reduce ROG emissions. The number of milk cows currently housed in existing dairies in Kings County was obtained from Table 5 of the Element (Theoretical Dairy Capacity of Kings County). Similarly, the number of support stock (dry cows, heifers, and calves) was determined using the ratio of milk cow to individual support stock and existing milk cow data provided in Table 5 of the Element (Theoretical Dairy Capacity of Kings County). Potentially 1,694 tons per year of ROG could

be generated from natural decomposition of the manure produced from existing dairies (Table 4.2-5a).[44]

CARB's November 2000 study indicated that 2,600 tons per year of ROG were generated from dairy operations in Kings County. As previously indicated however, CARB's estimate is artificially inflated since the estimate also accounts for ROG emissions generated from other livestock sources, and not exclusively from dairy animals.

Ammonia Emissions from Manure Decomposition

Ammonia is an odorous compound that is generated from cattle manure. The nitrogen excreted by cattle in the form of urea manure in urine is volatilized into ammonia rapidly through hydrolysis. Ammonia is also generated during decomposition of organic nitrogen contained in the fecal manure. Ammonia generation is dependent on various conditions including the animal type, feed type provided to the animal, environmental conditions (i.e., temperature, humidity), pH of the manure surface, geography, and level of biological activity.

Several studies have been prepared to estimate ammonia emissions from dairy cattle in recent years. Ammonia emission studies conducted during the 1980s and 1990s have reported ammonia emission factors ranging from 11 pounds per head per year to 130 pounds per head per year (Confined Livestock Air Quality Committee of the USDA Agricultural Air Quality Task Force, 2000; CARB, 1999). In 1997, Terry James, et al. conducted field estimates of ammonia volatilization from cattle production facilities in the San Joaquin Valley. The field study estimated an ammonia emission factor of 74 pounds per head per year (James, et al., 1997).[45] According to the July 2000 Air Quality Research and Technology Transfer Programs for Concentrated Animal Feeding Operations Air Quality Research and Technology Transfer White Paper and Recommendations for Concentrated Animal Feeding Operations, field studies were conducted in 1998 in the San Joaquin Valley to estimate upwind and downwind ammonia concentrations and calculate an ammonia emission factor, based on the emission rate and number of animals at the dairy studied. The calculated ammonia emission factors, which accounted for temporal effects, ranged from 24 pounds per head per year during the evening to 227 pounds per head per year in the late morning (Confined Livestock Air Quality Committee of the USDA Agricultural Air Quality Task Force, 2000). More recently in 1999, Ashbaugh and others conducted an additional study that also reports ammonia emissions factors based on field

[44] CARB's 1996 Emission Inventory estimated that an average of eight tons per day (2,738 tons per year) of ROG were emitted from livestock waste in King County in 1996 (CARB, 1998).

[45] Note that this emission factor is not specific to the cattle type (e.g., cow, heifer, calves) and reflects the emission factor from a combination of the different cattle typically housed at a dairy facility.

studies; however, this study has not yet been published but is expected to be released in 2000. According to CARB, the ammonia emission factors reported in this study are similar to previously reported emission factors (Benjamin, 2000).

In 1999, CARB prepared a preliminary ammonia emission inventory for dairies and beef cattle in California. Because ammonia is a precursor to $PM_{2.5}$, the inventory was conducted as a result of the promulgation of the $PM_{2.5}$ Federal standard in 1997.[46] The emission factors for dairy cattle used in this inventory were from the 1994 Development and Selection of Ammonia Emission Factors, developed for the U.S. EPA (Battye, et al., 1994). The 1994 report provides a compilation of published emission factors for various animals. The emission factors used in the CARB inventory were based on the 1992 Asman emission factors referenced in the 1994 report (Battye, et al., 1994).[47] However, CARB plans on revising the ammonia emission inventory to reflect the recent ammonia emission factor developed by Ashbaugh and others (Shimp, 2000).

Additional ammonia studies are currently being conducted. The South Coast Air Quality Management District is in the process of developing a comprehensive ammonia emission inventory for dairies in Southern California.

A range of potential ammonia emissions from cattle manure were estimated using the emission factors published in the 1994 Development and Selection of Ammonia Emission Factors, developed by Battye, et al. for the U.S. EPA (Battye, et al., 1994) (Scenario One) as well as the factor from James and others (1997) (Scenario Two). The emissions were estimated assuming that manure treatment to reduce ammonia emissions is currently not being implemented by the dairies.

Potentially, between 2,395 and 9,733 tons per year of ammonia could be generated under existing conditions (Tables 4.2-5a). The lower range reflects the emission factors developed in 1994 and is based on the current number of animals throughout the existing dairies, animal type (applicable only for the 1994 emission factor), and specific emission factors for decomposition of newly generated manure at the animal housing unit and decomposition of stored manure. The number of milk cows at existing dairies was obtained from Table 5 of the Element (Theoretical Dairy Capacity of Kings County) and the number of support stock (dry cows, heifers, and calves) was determined using the ratio of milk cow to individual support stock and existing milk cow data provided in Table 5 of the Element.

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[46] Ammonia gas can react in the atmosphere to produce particulate matter, such as ammonium nitrate or ammonium sulfate.

[47] The Asman study, conducted in 1992, summarized literature in the Netherlands through 1990.

The higher end of the range reflects the emission factor developed by James and others (74 pounds per head per year) and is based on the current number of animals throughout the existing dairies. This emission factor reflects the emission factor from a combination of the different cattle typically housed at a dairy facility and is not specific to the cattle type (e.g., cow, heifer, calves).

Actual ammonia emissions that could be generated are highly variable and are dependent on site-specific factors as discussed above. CARB's November 2000 study indicates that 7,600 tons per year of ammonia were generated from dairy operations in Kings County. As previously indicated, the estimate is based on the 1998 dairy cattle population data and an emission factor of 74 pounds per head per year (the same emission factor used for Scenario 2).

It should be noted that additional ammonia may also be released into the environment if process water and stockpiled manure from the existing dairies are applied onto agricultural fields. However, ammonia emissions would also be expected with the use of nitrogen-rich manufactured fertilizer that would be necessary if locally generated manure were not used as fertilizer.

Hydrogen Sulfide Emissions from Manure Decomposition

Hydrogen sulfide is an odorous compound that is generated during decomposition of cattle manure. However, emission factors for hydrogen sulfide production from manure decomposition are not currently available and therefore, hydrogen sulfide emissions from existing dairies could not be accurately estimated. However, a sampling of 58 dairies in Minnesota by the Minnesota Pollution Control Agency (MPCA) in 1998 indicated that the median concentration of hydrogen sulfide at or near the facility boundary was typically less than 0.02 ppm. Due to significant differences in climatic conditions in the southern San Joaquin Valley, the MPCA data may not be directly applicable to this EIR. By comparison, the permissible exposure limit (PEL) established in Title 8 of the California Code of Regulations Section 5155 for the protection of human health is 10 ppm.

Methane Emissions from Cattle and Manure Decomposition

Methane emissions are generated from cattle and manure management. Methane generated during the cattle's digestive process is released through the animal's mouth and nostrils. Cattle throughout the existing dairies could potentially generate on the order of 23,173 tons per year of methane (Table 4.2-5a). The emissions were estimated based on EPA-developed emission factors for dairy cattle in the western United States (U.S. EPA,

1998c) and the total number and types of cows at the existing dairies.[48] However, the actual amount of methane generated by cattle depends on the feed quality, feeding level and schedule, and animal health.

Cattle manure generated throughout the existing dairies also release methane during the decomposition process. The amount of methane that could be released from decomposing manure by existing dairies could be on the order of 14,804 tons per year, assuming that none of the dairies currently implement manure treatment to reduce methane emissions (Table 4.2-5a). The estimate was based on the number of cows at the existing dairies and emission factors for natural manure decomposition available from the Emission Inventory Procedural Manual, Methods for Assessing Area Source Emissions developed by the California Air Resources Board (CARB, 1989b; Radian, 1988).

CARB's November 2000 study did not estimate methane emissions from the cattle's digestive process. The study indicated 8,300 tons per year of methane were generated from dairy livestock waste in Kings County. As previously indicated, CARB's estimate includes emissions generated from other livestock sources, and does not exclusively provide emissions from dairy animals. However, it is unknown why CARB's emissions estimate (8,300 tons per year) is considerably less than the emissions estimated for current conditions (15,983 tons per year).

Exhaust (ROG, NOx, and PM_{10}) Emissions from Dairy Farm Equipment

Air pollutant emissions from dairy farm equipment exhaust include ozone precursors (i.e., ROG and NOx) and PM_{10}. Similar to exhaust generated from agricultural equipment, ROG, NOx, and PM_{10} emissions generated from dairy farm equipment would be dependent on the types of equipment used (e.g., diesel-fueled equipment such as tractors, trucks, and miscellaneous equipment), equipment use duration, equipment horsepower, crop areas, annual operating hours for each equipment, emission factors, and load factors. ~~Since this information varies throughout the County, and is site-specific, estimations of ROG, NOx, and PM_{10} emissions under current conditions could not be estimated.~~

RECEPTORS

Receptors are generally regarded to be people exposed to air emissions generated by development construction and operation. The SJVUAPCD defines a "sensitive receptor" as a location where human populations, especially children, seniors, and sick persons are present, and where there is a reasonable expectation of continuous human exposure to pollutants, according to the averaging period for the ambient air quality standards, such

[48] The emission factors were based on a mechanistic model outlined in the 1993 U.S. EPA Report to Congress entitled "Anthropogenic Methane Emissions in the United States: Estimates for 1990."

as 24 hour, 8 hour, or 1 hour. Examples of receptors include residences, hospitals, and schools (SJVUAPCD, 1998). Although the SJVUAPCD definition of receptors includes residences, it is generally interpreted to include areas designated by the General Plan for residential use. Future dairy sites under the Element would be located in areas designated General Agricultural. Receptors in such agricultural areas are subject to the Right to Farm Ordinance and are expected to be subject to discomfort and inconveniences caused by air emissions associated with existing standard agricultural operations or practices.

CONSISTENCY WITH EXISTING PLANS AND POLICIES

The Air Quality section of the Resources Conservation Element of the Kings County General Plan does not contain specific goals, objectives, or policies related to air quality pollutants that would be relevant to the proposed project. The main goal of the General Plan is to protect human health and preserve the environment by achieving good air quality.

> *Goal 13: Protect human health and preserve the environment by achieving good air quality.*
>
> *Objective 13.1: Implement air quality standards that protect human health and prevent crop, plant, and property damage.*
>
> *Policy 13b: Require that commercial and industrial development minimize air pollution emissions by using Best Available Control Technology (BACT).*
>
> *Policy 13c: Refer development projects to the San Joaquin Valley Unified Air Pollution Control District as appropriate for their review and comment. Consider their suggestions and requirements as conditions of approval.*

Although Policy 13c indicates that development projects should be referred to the SJVUAPCD as appropriate for their review and comment, agricultural and livestock operations, such as the proposed project, are exempt from the permitting requirements of SJVUAPCD. Air pollutants generated from new or expanded dairies under the Element may be released into the environment at levels that would exceed significance thresholds for permitted sources established by the SJVUAPCD, as discussed in the impacts discussions below.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

The following goals, objectives, and policies of the Kings County Draft Dairy Element address air quality issues:

Dairy Siting Goals, Objectives, and Policies

Goal DE 1 restricts the locations where dairies may be located to those areas of the County where they are most compatible with surrounding uses and activities, and environmental constraints. **Objective DE 1.2** requires ~~that~~ specific ~~criteria~~ standards to minimize potential land use conflicts when approving new dairies and expansion of existing dairies. Such conflicts could include nuisance odors at residences near existing or proposed dairies, which are addressed in Impact ~~4.2-5~~ 4.2-4 of this EIR.

Policy DE 1.2g provides a buffer zone between dairy facilities and schools. The policy indicates that dairies (including manure and dairy process water storage areas) are prohibited from locating within a one-half mile buffer zone around any existing public or private school site. The policy allows manure used as fertilizer and dairy process water used to irrigate cropland to be transported to and used within the school buffer zone, but must be scheduled during weekends or summer vacation when the schools are closed.

Policy DE 1.2h provides a buffer zone between dairy facilities. The policy indicates that the minimum distance between dairy facilities and other dairies and confined animal feeding operations shall be one-quarter mile. This restriction includes only the actual dairy facilities, i.e., corrals, milk barns, feed storage areas, manure storage areas, etc., but not cropland used to spread dairy process water and manure.

Policy DE 1.2i requires a one-half mile buffer zone between any residential zone and a dairy facility, including corrals, barns, feed and manure storage areas, and ponds. **Policy DE 1.2j** addresses "compatibility zone" boundaries. The policy indicates that the "compatibility zone" boundaries around the cities of Hanford, Lemoore, and Corcoran shall be updated periodically to ensure that changes are reflected in the boundaries.

Theoretical Herd Capacity Goals, Objectives, and Policies

Goal DE 3 requires the development of a countywide policy for the evaluation and distribution of dairies and dairy stock replacement location and operation. **Objective DE 3.1** requires consideration of potential environmental effects of dairies when reviewing and evaluating proposals for new or expanded dairies.

Policy DE 3.1a requires the consideration of the following criteria for both the general dairy siting criteria and site specific dairy projects: 1) Ground and surface water quality and quantity; 2) Soil characteristics; 3) Air quality, including dust control (construction and operation) and odors; 4) Traffic and road conditions; 5) Dead animal disposal management; 6) Insect, i.e., fly and mosquito control and rodent control; ~~7) Loss of agricultural land~~; ~~8~~ 7) Light and glare and noise; ~~9) Cumulative effects;~~ ~~10~~ 8) Biological resources; ~~11~~ 9) Cultural and archeological resources; ~~and 12) Other potential health, safety, and/or nuisance~~

~~problems that may be identified on a case by case basis~~ 10) Slope stability and potential for erosion; 11) Proximity to the nearest residences; and 12) Irrigation management.

Goal DE 5 recommends control of potential adverse air emissions at dairies to promote protection of air quality in the San Joaquin Valley. **Objective DE 5.1** requires that emerging air emissions control practices and technologies be implemented at dairies to reduce the potential for degradation of air quality and odor generation.

Policy DE 5.1a requires ~~the participation in~~ monitoring of the efforts of the SJVUAPCD in developing air emissions control guidelines for agricultural uses, including dairy operations. **Policy DE 5.1b** requires that an Odor Management Plan (OMP) be prepared as part of the technical information submitted with each application to either establish a new dairy or expand an existing dairy. The Plan is to specifically address standard operating practices for livestock handling, and manure collection, treatment, storage, and land application.

Policy DE 5.1c requires that a Manure Treatment Management Plan (MTMP) be prepared as part of the technical report submitted with each application to either establish a new dairy or expand an existing dairy. The policy requires that the technical report also present an estimate of the anticipated increase in ROG, ammonia, and methane emissions generated by manure and process water management proposed by the dairy development project.

The MTMP would provide treatment of all manure to reduce ROG, nitrous oxides, ammonia, methane, hydrogen sulfide, and odor emissions. The MTMP would describe general housekeeping practices, feed management, solid manure moisture management, the purpose and procedures for the use of additives or adsorbents, and land application methodologies that effectively minimize air pollutant emissions. The policy further requires that the MTMP include an advanced treatment technology to reduce ROG emissions for all new dairies and dairy expansions that include construction of new dairy facilities. Effective advanced treatment technologies provided in the policy include: 1) controlled anaerobic digestion; 2) aerobic treatment; and 3) combined controlled aerobic/anaerobic treatment.

The MTMP would include a quality assurance/quality control protocol to monitor the implementation and effectiveness of the manure treatment system. An estimate of the volatile solids removal efficiency of the proposed treatment system would be presented in the MTMP. The MTMP would demonstrate that the proposed advanced treatment system shall meet or exceed the goal of 50 percent reduction in volatile solids in the treated manure and dairy process water. The MTMP would be revised as necessary, based on the results of the monitoring program, to ensure that the selected treatment technology is being

implemented in a manner that will reduce or control air emissions and odor from dairy operations.

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.

Policy DE 5.1d requires that SJVUAPCD Regulation VIII~~, Rule 8020~~ rules be implemented during construction activities to reduce PM_{10} emissions and control fugitive dust emissions.

Policy DE 5.1e requires that fugitive dust emissions from cattle movement and maintenance activities at the unpaved corrals, perimeter roadways, and other unpaved areas throughout dairy ~~sites~~ facilities be effectively stabilized by the use of water or chemical stabilizer/suppressant that is safe for the environment and cattle. Stabilization shall be conducted in a manner that will not result in the potential for breeding of mosquitoes and other vectors. The policy requires the owner/operator to also ensure that manure generated in the corrals is removed periodically to prevent the manure from becoming a PM_{10} source and further requires that removal activities be conducted in a manner that will minimize dust emissions.

~~**Policy DE 5.1f** requires that a Livestock Management Plan (LMP) be prepared as part of the technical report submitted with each application to either establish a new dairy or expand an existing dairy. The LMP is required to identify practices to reduce methane emissions from ruminant livestock and must be consistent with the voluntary practices incorporated in EPA's Ruminant Livestock Efficiency Program.~~

Policy DE ~~5.1g~~ 5.1f requires the owner/operator of a proposed dairy development or ~~redevelopment~~ expansion to ensure that ~~specific~~ measures are implemented to control exhaust emissions generated from heavy-duty construction equipment.

Policy DE ~~5.1h~~ 5.1g requires the calculation of anticipated PM_{10} emissions from cattle movement and maintenance activities at the unpaved corrals, perimeter roadways, and other unpaved areas throughout the dairy site. In addition, the policy requires that a Fugitive Dust Emissions Control Plan (FDECP) be submitted with all applications for proposed dairies and all dairy expansions. The Plan shall describe and demonstrate conformance with SJVUAPCD fugitive dust emissions control requirements.

Policy DE ~~5.1i~~ 5.1h requires that all dairies comply with the ~~Best Available Control Measures (BACM)~~ control measures for fugitive dust emissions from agricultural sources

established by the most recently adopted SJVUAPCD Regulation VIII. The FDECP required by **Policy DE ~~5.1h~~ 5.1g** shall specify the ~~BACMs~~ control measures to be implemented during dairy operations.

Policy DE ~~5.1j~~ 5.1i requires the estimation of the anticipated net increase in ROG, NOx, and PM_{10} emissions generated from anticipated dairy operation equipment as part of the technical report that is to be submitted with the new dairy or expanded dairy application. The policy requires demonstration that the net increase in emissions will not exceed SJVUAPCD threshold limits for ROG, NOx, and PM_{10}.

Policy DE ~~5.1k~~ 5.1j requires that the operator/owner of a dairy facility that will be converted to other land uses submit documentation to the Dairy Monitoring Office that demonstrates that all residual manure and process water has been removed ~~and~~ or managed in accordance with the facility's CDPW~~D~~AP and MTMP.

Draft Dairy Element Monitoring and Enforcement Goals, Objectives, and Policies

Goal DE 6 requires the implementation of a monitoring program that both demonstrates the Element's effectiveness in protecting the environment, and the effectiveness of the mitigation measures required for each operating dairy facility in Kings County. **Objective DE ~~6.1~~ 6.2** requires the protection of the environment through monitoring of the individual dairy's ~~industry's~~ operational activities so that adjustments in the operation can be made when necessary. **Policies DE ~~6.1a~~ 6.2a** through **~~6.1c~~ 6.2g** provide a mechanism for: determining the current baseline environmental conditions for comparison with future monitoring results; continuous monitoring of individual dairy operations subject to the Element; and the establishment of the dairy system monitoring program and its elements.

Objective DE ~~6.2~~ 6.3 requires the implementation of a continuous monitoring program for each ~~operating~~ dairy regulated by these policies. **Policy DE ~~6.2a~~ 6.3a** requires that each new or expanded dairy submit an annual report demonstrating that the facility is operating under approved conditions and, if conditions are violated, would be subject to modification of the operation.

Policies DE ~~6.1d~~ 6.2c through **~~6.1g~~ 6.2e** provide minimum standards for the monitoring of dust control, OMP, and MTMP~~, and LMP~~ implementation at dairy facilities. Standards include inspections, performance of quality assurance/quality control on the implementation of plans, and documentation.

Goal DE ~~7~~ 6 requires the establishment of a Dairy Monitoring Program in the Dairy Monitoring Office housed in the Kings County Planning Agency. **Objective DE ~~7.1~~ 6.1** would establish a Dairy Monitoring Program in the Kings County Planning Agency. **Policies DE ~~7.1a~~ 6.1a.A** through **~~7.1c~~ 6.1a.C** establish procedures and requirements for

dairy data tracking, problem resolution, and reporting to the Planning Commission. Importantly, the Element also includes **Objective DE ~~7.2~~ 6.4**, which establishes a formal response system for complaints made by the public concerning dairy operations. The objective is supported by **Policies DE ~~7.2a~~ 6.4a** through **~~7.2c~~ 6.4d**, which detail the requirements of the complaint system.

Existing Dairy Voluntary Conformance ~~Goals, Objectives, and~~ Policies

~~**Goal DE 8** would bring all existing dairies in Kings County into voluntary conformance with the provisions of the Element by the end of 2006. **Objective DE 8.1** requires the development of a program by which an existing dairy operations can earn a certificate certifying that it is being operated in compliance with the policies of the Element. **Policies DE 8.1a** and **8.1b** require: the implementation of a Dairy Conformance Program for existing dairies and coordination with the Legislature, industry programs, and individual dairy operators to develop programs and funding to assist dairies meet current operating standards.~~ **Policy DE ~~8.1c~~ 3.7a** indicates that nothing in the Element ~~guarantees that a dairy that does not meet the specified standards will be able to come into conformance, and that out of conformance dairies may be required to modify or cease their operations.~~ "... shall be construed as a guarantee that any existing dairy that does not meet the standards and regulations for the operation of dairies will be able to make the changes necessary for future expansion. Any dairy that is improperly located, or has other specific characteristics that conflict with the standards of this Element or other regulatory requirements, may not be able to expand. Such dairies, with or without expansion, may become nuisances and may be required to take specific corrective action which may include, but not limited to, reducing herd size, increasing cropland application area, or ceasing operation."

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA[49]

Based on the environmental checklist in the CEQA Guidelines, a project could have a potentially significant air quality impact on the environment if it would:

- conflict with or obstruct implementation of air quality plan;
- violate ambient air quality standards or contribute substantially to an existing or projected air quality violation;
- result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under Federal or State standards;

[49] As noted earlier, agricultural and livestock operations are exempt from SJVUAPCD permitting requirements. However, the threshold levels established by SJVUAPCD are used in this air quality analysis as criteria for determining significant environmental impacts.

- expose receptors to substantial pollutant concentrations; or
- create objectionable odors affecting a substantial number of people. An impact resulting from construction activities would also be considered significant if feasible construction control mitigation measures identified in SJVUAPCD's Guide for Assessing and Mitigating Air Quality Impacts (guidelines) were not implemented.

According to SJVUAPCD guidelines, a project could also have a significant air quality impact on the environment if project operations have the potential to frequently expose members of the public to objectionable odors; the SJVUAPCD has indicated that dairies located within 1.0 mile of a sensitive receptor could generate odors that may be significant (SJVUAPCD, 1998).

The SJVUAPCD has established thresholds for certain criteria pollutants for determining whether a project's operation would have a significant air quality impact (Table 4.2-4). In general, if any of the estimated ROG, NOx, and CO emissions generated from a project exceeds the thresholds, the project would be considered to have a significant air quality impact. The thresholds established by the SJVUAPCD are used in this air quality analysis as criteria for determining significant environmental impacts.

TABLE: 4.2-4: **SJVUAPCD Significance Thresholds for Projects**

Pollutant	Threshold of Significance[1]
ROG	10 tons per year
NOx	10 tons per year
CO	9 ppm (8-hour average) 20 ppm (1-hour average)
PM_{10}	15 tons per year[2]

Notes: ROG = Reactive organic gas
NOx = Oxides of nitrogen
PM_{10} = Particulate matter with a diameter less than or equal to ten microns
ppm = parts per million
SJVUAPCD = San Joaquin Valley Unified Air Pollution Control District

1 Refer to text for discussion of the applicability of these thresholds to emissions from the proposed project.

2 The PM_{10} emission threshold level (15 tons per year or 80 pounds per day) is the designated "offset" value specified in the SJVUAPCD permit conditions. An offset value is the maximum allowed pollutant emission rate an owner/operator of a source can release into the environment. If an owner/operator intends to release PM_{10} emissions at a rate greater than the offset value, the owner/operator must identify how the excess emissions would be offset, which is typically done by "purchasing" emission credits from a former PM_{10} emission source. Although SJVUAPCD has not included a significance threshold value for PM_{10} in their guidelines, the offset value of 15 tons per year has been defined as a significance criterion for this air quality analysis.

Local air emissions can have cumulative global impacts. For example, worldwide halocarbon (a class of compounds containing chlorine and/or fluorine) emissions have been linked to ozone depletion in the upper atmosphere. Similarly, worldwide greenhouse gas emissions have also been linked to the gradual increase in near-surface temperatures. Methane is the

second most significant gas causing increases in greenhouse gases.[50] Therefore, emissions that contribute to a global adverse environmental condition are also considered to be a significant impact in this air quality analysis.

IMPACTS ANALYSIS APPROACH

Construction and operation of new or expanded dairies under the Element would generate construction-related and operation-related emissions. Construction-related emissions would include PM_{10} emissions from fugitive dust generated during soil movement activities; and exhaust emissions (e.g., ROG, NOx, and PM_{10}) from construction equipment. Construction-related impacts are addressed in Impacts 4.2-1 and 4.2-2. Dairy operations would also generate air pollutant emissions, including ROG, NOx, PM_{10}, ammonia, hydrogen sulfide, carbon monoxide, and methane; impacts associated with these air pollutants are discussed in Impacts 4.2-3, ~~4.2-4,~~ and ~~4.2-6~~ 4.2-5 through ~~4.2-10~~ 4.2-9. The following is a list of the air pollutant emissions and the corresponding sources generated from project operations:

- PM_{10} emissions from fugitive dust generated during agricultural activities (e.g., land preparation and windblown dust) and dairy operations;
- Exhaust emissions (ROG, NOx, PM_{10}) from dairy and agricultural equipment;
- ROG, hydrogen sulfide, ammonia, and methane emissions from manure decomposition;
- Methane emissions from cattle digestion; and
- Localized (CO) and regional emissions (ROG, NOx, PM_{10}) from vehicular traffic associated with new or expanded dairies.

The air emissions for existing conditions and those resulting from implementation of the Element were estimated by applying currently available emission rates applicable to dairy operations. The air emission calculations are presented in Appendix D of this EIR and are summarized in Tables 4.2-5a and 4.2-5b. To provide a perspective on the air quality implications associated with implementation of the Element, two conditions were considered: 1) air emissions from management of the proposed maximum theoretical dairy herd without implementation of the air emissions controls required under the Element (Table 4.2-5a), and 2) emissions from management of the theoretical herd with the controls presented in the Element (Table 4.2-5b). For each condition, four scenarios are examined

[50] According to U.S. EPA, methane's overall contribution to global warming is significant because it is estimated to be 21 times more effective at trapping heat in the atmosphere than carbon dioxide, the most significant greenhouse-causing gas (EPA, 1999). Sources of carbon dioxide include fossil fuel combustion, natural gas flaring, biomass combustion, industrial processes (e.g., cement, lime, limestone and dolomite, soda ash, and carbon dioxide manufacturing), and changes in forest carbon stocks. Dairy-related operations are not a major source of carbon dioxide emissions.

for PM_{10} emissions from corrals. The scenarios are consistent with the methodology previously described for estimating PM_{10} emissions and represent a range of assumptions regarding emission rates, moisture conditions, and livestock management. The ROG, NOx, and PM_{10} emissions related to exhaust were estimated by assuming that buildout of dairy development would occur by the operation of 52 dairies each with a herd size of 5,000 milk cows (see Impacts 4.2-3 and 4.2-5 for further explanation).

TABLE 4.2-5a: **Estimated Total Emissions from Project Operations under Existing and Uncontrolled Future Conditions**

Activity	ROG	PM_{10}	Ammonia	Methane	NOx
	(tons per year)				
EXISTING CONDITIONS (1999)					
Fugitive Dust (*Impact 4.2-3*)					
Land Preparation	- -	1,241	- -	- -	- -
Windblown Dust	- -	1,577	- -	- -	- -
Cattle Movement at Unpaved Corral[1]					
Scenario 1	- -	1,686	- -	- -	- -
Scenario 2	- -	3,394	- -	- -	- -
Scenario 3	- -	251	- -	- -	- -
Scenario 4	- -	505	- -	- -	- -
Manure Decomposition[2] (*Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8*)	1,694	- -	- -	14,804	- -
Scenario 1	- -	- -	2,395	- -	- -
Scenario 2	- -	- -	9,733	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8*)	- -	- -	- -	23,173	- -
Vehicle Exhaust and Equipment Exhaust	unknown	unknown	- -	- -	unknown
TOTAL UNCONTROLLED FUTURE CONDITIONS (complete buildout of theoretical herd capacity)					
Fugitive Dust (*Impact 4.2-3*)					
Land Preparation	- -	1,191	- -	- -	- -
Windblown Dust	- -	1,514	- -	- -	- -
Cattle Movement at Unpaved Corral[1]					
Scenario 1	- -	5,165	- -	- -	- -
Scenario 2	- -	10,400	- -	- -	- -
Scenario 3	- -	769	- -	- -	- -
Scenario 4	- -	1,548	- -	- -	- -
Manure Decomposition[2] (*Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8*)	5,191	- -	- -	45,360	- -
Scenario 1	- -	- -	7,338	- -	- -
Scenario 2	- -	- -	29,821	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8*)	- -	- -	- -	71,000	- -
Vehicle Traffic Exhaust (new dairies only)[3]	2.74	0.79	- -	- -	26.27
Dairy Equipment Exhaust[3]	22	14	- -	- -	258
TOTAL NET INCREASE IN EMISSIONS	**~~3,497~~ 3,522**	**~~405 to 3,371~~ 419 to 3,386**	**4,943 to 20,088**	**73,384**	**284**

Table 4.2-5a - *continued*

Notes: ROG = Reactive organic gases
PM_{10} = Particulate matter with an aerodynamic diameter of less than or equal to ten microns
-- = Not applicable
See Appendix D for air quality calculations.
NOx = Oxides of nitrogen.

[1] PM_{10} emission factors for dust at unpaved dairy corrals are currently unavailable from U.S. EPA or CARB. The PM_{10} emission factors for dust at cattle feedlots published by CARB (Scenarios 1 and 2) and CLAQC (USDA AAQTF) (Scenarios 3 and 4) were selected to conservatively estimate PM_{10} emissions at unpaved corrals as these factors are currently the most applicable ones available. Scenario 1 uses the CARB feedlot emission factor, excludes calves, and accounts for potential PM_{10} reduction during the wet season. Scenario 2 uses CARB's emission factor, includes calves, and is independent of rainfall effects. Scenario 3 uses the USDA's emission factor, excludes calves, and accounts for potential PM_{10} reduction during the wet season. Scenario 4 uses the USDA's emission factor, includes calves, and is independent of rainfall effects.

[2] Scenario 1 assumes the emission factor developed in the 1994 Development and Selection of Ammonia Emission Factors (Battye et al.); Scenario 2 assumes the emission factor developed by the University of California at Davis in 1998.

[3] Emissions based on operation of 52 5,000-milk cow dairies.

A comparison of air emissions generated under existing (1999) conditions with potential uncontrolled emissions from buildout of the theoretical herd is shown in Table 4.2-5a. A potential net increase (above existing conditions) in ROG [~~3,497~~ 3,522 tons per year (tons/year)], NOx (284 tons/year), PM_{10} (~~405~~ 419 to ~~3,371~~ 3,386 tons/year), ammonia (4,943 to 20,088 tons/year), and methane (73,384 tons/year) would be expected under uncontrolled conditions.

Air emissions controls required by the Element would significantly reduce the potential air emissions generated by management of the theoretical bovine herd. The controls include stabilization of unpaved areas (including roads and cattle corrals) to reduce PM_{10} emissions and advanced manure treatment technologies for the control of ROG, methane, hydrogen sulfide, and ammonia emissions. A comparison of the expected emissions of PM_{10}, ROG, and methane under existing conditions and under the provisions of the Element are presented in Table 4.2-5b. Calculation of the emissions estimated under the Element assumes that the control measures would reduce PM_{10} by 50 percent at the dairy facilities, but no reduction would be expected for emissions from cropland management. The calculations also assume that ROG and methane emissions from manure decomposition would be expected to be reduced by 50 percent at dairies required to implement advanced manure treatment technologies. Although the Element includes provisions to minimize methane generated from dairy cows (i.e., formed during enteric fermentation), the effectiveness of these controls cannot be quantified at this time. Similarly, advanced manure treatment would be expected to reduce ammonia and hydrogen sulfide but the effectiveness is not known.

Relative to emission estimates for the uncontrolled condition (Table 4.2-5a), implementation of the Element (Table 4.2-5b) would reduce the potential net increase in ROG by approximately 45 percent and PM_{10} by 40 to 50 percent. Although the overall reduction in the net increase of methane is approximately 12 percent, the net increase in emissions generated by manure decomposition would be reduced by 30 percent.

TABLE 4.2-5b: **Estimated Total Net Increase in Emissions from Project Operations for Future Conditions under the Element**

Activity	ROG	PM_{10}	Methane	NOx
	(tons per year)			
EXISTING CONDITIONS (1999)				
Fugitive Dust (*Impact 4.2-3*)				
Land Preparation	- -	1,241	- -	- -
Windblown Dust	- -	1,577	- -	- -
Cattle Movement at Unpaved Corral[1]				
Scenario 1	- -	1,686	- -	- -
Scenario 2	- -	3,394	- -	- -
Scenario 3	- -	251	- -	- -
Scenario 4	- -	505	- -	- -
Manure Decomposition[2] *(Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8)*	1,694	- -	14,804	- -
Scenario 1[3]	- -	- -	- -	- -
Scenario 2[3]	- -	- -	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8)*	- -	- -	23,171	- -
Vehicle Exhaust and Equipment Exhaust	unknown	unknown	--	unknown
TOTAL FUTURE CONDITIONS UNDER DAIRY ELEMENT (complete buildout of theoretical herd capacity)[3]				
Fugitive Dust (*Impact 4.2-3*)				
Land Preparation	- -	1,191	- -	- -
Windblown Dust	- -	1,514	- -	- -
Cattle Movement at Unpaved Corral[1]				
Scenario 1	- -	3,808	- -	- -
Scenario 2	- -	6,897	- -	- -
Scenario 3	- -	567	- -	- -
Scenario 4	- -	1,026	- -	- -
Manure Decomposition[2] *(Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8)*	~~3,627~~ 3,609	- -	~~31,693~~ 31,541	- -
Scenario 1[3]	- -	- -	- -	- -
Scenario 2[3]	- -	- -	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8)*	- -	- -	71,000	- -
Vehicle Traffic Exhaust (new dairies only)[4]	2.74	0.79	--	26.27
Dairy Equipment Exhaust[4]	22	14	--	258
TOTAL NET INCREASE IN EMISSIONS UNDER DAIRY ELEMENT	**~~1,933~~ 1,940**	**~~203 to 2,009~~ 218 to 2,024**	**~~64,718~~ 64,566**	**284**

[1] PM_{10} emission factors for dust at unpaved dairy corrals are currently unavailable from U.S. EPA or CARB. The PM_{10} emission factors for dust at cattle feedlots published by CARB (Scenarios 1 and 2) and CLAQC (USDA AAQTF) (Scenarios 3 and 4) were selected to conservatively estimate PM_{10} emissions at unpaved corrals as these factors are currently the most applicable ones available. Scenario 1 uses the CARB feedlot emission factor, excludes calves, and accounts for potential PM_{10} reduction during the wet season. Scenario 2 uses CARB's emission factor, includes calves, and is independent of rainfall effects. Scenario 3 uses the USDA's emission factor, excludes calves, and accounts for potential PM_{10} reduction during the wet season. Scenario 4 uses the USDA's emission factor, includes calves, and is independent of rainfall effects.

Table 4.2-5b - ***continued***

[2] Scenario 1 assumes the emission factor developed in the 1994 Development and Selection of Ammonia Emission Factors (Battye et al.); Scenario 2 assumes the emission factor developed by the University of California at Davis in 1998.

[3] Total future conditions under the Element reflect the implementation of Policies DE 5.1c and 5.1e. Policy DE 5.1c requires 50% reduction in VS in treated manure and process water. The values shown here reflect a corresponding 50% reduction in ROG and methane released to the environment from further decomposition of treated manure and process water. Policy DE 8.1e requires the stabilization of unpaved corrals and other unpaved areas by use of water (expected efficiency of 50%) or chemical stabilizer/suppressant (expected efficiency of 75%). The values shown reflect a minimum stabilization of 50% in unpaved corrals.

[4] Emissions based on operation of 52 5,000-milk cow dairies.

TABLE 4.2-5c: **Total Uncontrolled Emissions from Operations at a Typical 500-, ~~735-~~ 705-, 2,000-, and 5,000-Milk Cow Dairy**

Activity	ROG	PM_{10}	Ammonia	Methane	NOx
	(tons per year)				
500-MILK COW DAIRY					
Fugitive Dust from Cattle Movement at Unpaved Corral (*Impact 4.2-3*)[1]					
Scenario 1	- -	7	- -	- -	- -
Scenario 2	- -	14	- -	- -	- -
Scenario 3	- -	1	- -	- -	- -
Scenario 4	- -	2	- -	- -	- -
Manure Decomposition[2] (*Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8*)	7	- -	- -	59	- -
Scenario 1	- -	- -	10	- -	- -
Scenario 2	- -	- -	39	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8*)	- -	- -	- -	93	- -
Vehicle Traffic Exhaust	0.01	0	- -	- -	0.05
Dairy Equipment Exhaust	0.4	0.3	- -	- -	5.0
~~735-~~ 705-MILK COW DAIRY					
Fugitive Dust from Cattle Movement at Unpaved Corral (*Impact 4.2-3*)[1]					
Scenario 1	- -	10	- -	- -	- -
Scenario 2	- -	~~20~~ 19	- -	- -	- -
Scenario 3	- -	1	- -	- -	- -
Scenario 4	- -	3	- -	- -	- -
Manure Decomposition[2] (*Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8*)	10	- -	- -	~~87~~ 84	- -
Scenario 1	- -	- -	14	- -	- -
Scenario 2	- -	- -	~~57~~ 55	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8*)	- -	- -	- -	~~137~~ 131	- -
Vehicle Traffic Exhaust	0.01	0	- -	- -	0.07
Dairy Equipment Exhaust	0.4	0.3	- -	- -	5.0

Table 4.2-5c - *continued*

Activity	ROG	PM_{10}	Ammonia	Methane	NOx
	(tons per year)				
2,000-MILK COW DAIRY					
Fugitive Dust from Cattle Movement at Unpaved Corral (*Impact 4.2-3*)[1]					
Scenario 1	- -	27	- -	- -	- -
Scenario 2	- -	54	- -	- -	- -
Scenario 3	- -	4	- -	- -	- -
Scenario 4	- -	8	- -	- -	- -
Manure Decomposition[2] (*Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8*)	27	- -	- -	238	- -
Scenario 1	- -	- -	38	- -	- -
Scenario 2	- -	- -	156	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8*)	- -	- -	- -	372	- -
Vehicle Traffic Exhaust	0.02	0.01	- -	- -	0.2
Dairy Equipment Exhaust	0.4	0.3	- -	- -	5.0
5,000-MILK COW DAIRY					
Fugitive Dust from Cattle Movement at Unpaved Corral (*Impact 4.2-3*)[1]					
Scenario 1	- -	68	- -	- -	- -
Scenario 2	- -	136	- -	- -	- -
Scenario 3	- -	10	- -	- -	- -
Scenario 4	- -	20	- -	- -	- -
Manure Decomposition[2] (*Impacts ~~4.2-6, 7, 9~~ 4.2-5, 6, 8*)	68	- -	- -	594	- -
Scenario 1	- -	- -	96	- -	- -
Scenario 2	- -	- -	390	- -	- -
Cattle Digestion (*Impact ~~4.2-9~~ 4.2-8*)	- -	- -	- -	929	- -
Vehicle Traffic Exhaust	0.05	0.02	- -	- -	0.5
Dairy Equipment Exhaust	0.4	0.3	- -	- -	5.0
Project Significance Threshold	**10**	**15**	**- -**	**- -**	**10**

[1] PM_{10} emission factors for dust at unpaved dairy corrals are currently unavailable from U.S. EPA or CARB. The PM_{10} emission factors for dust at cattle feedlots published by CARB (Scenarios 1 and 2) and CLAQC (USDA AAQTF) (Scenarios 3 and 4) were selected to conservatively estimate PM_{10} emissions at unpaved corrals as these factors are currently the most applicable ones available. Scenario 1 uses the CARB feedlot emission factor, excludes calves, and accounts for potential PM_{10} reduction during the wet season. Scenario 2 uses CARB's emission factor, includes calves, and is independent of rainfall effects. Scenario 3 uses the USDA's emission factor, excludes calves, and accounts for potential PM_{10} reduction during the wet season. Scenario 4 uses the USDA's emission factor, includes calves, and is independent of rainfall effects.

[2] Scenario 1 assumes the emission factor developed in the 1994 Development and Selection of Ammonia Emission Factors (Battye et al.); Scenario 2 assumes the emission factor developed by the University of California at Davis in 1998.

To characterize the expected air emissions from dairies of various sizes, Table 4.2-5c presents the estimated emissions of PM_{10}, ROG, NOx, ammonia, and methane from typical (i.e., flushed freestall barns for milk cows, unpaved corrals for support stock, anaerobic lagoons for manure treatment) dairies managing 500, ~~735~~ 705, ~~1,000~~ 2000, and 5,000 milking cows and associated support stock. Estimates of emissions related to exhaust from dairy operational equipment and vehicular traffic generated by the dairies are also presented. The ~~735~~ 705-milk cow dairy was included because that size dairy would be expected to generate ROG emissions (including estimated emissions from dairy equipment and vehicular traffic generated from dairy operations) of 10 tons/year, the SJVUAPCD threshold for ROG emissions from a stationary source. The emission estimates presented in Table 4.2-5c assume that no controls on emissions are implemented at "typical" dairies.

Impact 4.2-1

Construction activities associated with new or expanded dairies would result in a short-term increase in PM_{10} emissions from fugitive dust sources. This is a less-than-significant impact.

Construction activities associated with development of a new or expanded dairy could include site preparation, soil excavation, grading, equipment traffic on paved and possibly unpaved roads, and construction of buildings (i.e., milking parlor, freestall barns). Soils exposed during excavation and grading would be subject to wind erosion. These activities would result in a substantial short-term increase in localized PM_{10} emissions from fugitive dust emissions.

The level of PM_{10} emissions that could be generated from construction activities would be dependent on the surface area being disturbed, grading rate, construction duration, and weather conditions. The highest potential for PM_{10} emissions from fugitive dust would occur when the exposed soils are dry, during late spring, summer, and early fall.

The San Joaquin Valley Air Basin is currently in nonattainment for the Federal and State PM_{10} standards. The SJVUAPCD considers PM_{10} emissions to be the pollutant of greatest concern from construction activities and has established comprehensive control measures for construction-related activities to control these emissions. The control measures are divided into the following three components: 1) control measures from the SJVUAPCD Regulation VIII - Fugitive PM_{10} Prohibitions, Rule 8020, 2) enhanced control measures, and 3) additional control measures. These control measures are included in the SJVUAPCD's Guide for Assessing and Mitigating Air Quality Impacts, dated 20 August 1998.

Regulation VIII control measures are required for all construction projects and aim to reduce the amount of PM_{10} emissions generated from fugitive dust sources. As discussed earlier, the SJVUAPCD ~~is currently in the process of establishing~~ has recently adopted

amendments to the ~~current~~ Regulation VIII, in response to the deficiencies identified by the EPA on the corresponding rules. The amendments include replacing former rule 8020 with rule 8021. ~~Proposed~~ Rule 8021 generally includes the requirements from rule 8020 and also contains additional requirements for disturbed and undisturbed surface areas, wind-driven/blown fugitive dust. In addition, ~~proposed~~ rule 8081 would now address emissions from off-field agricultural sources, including construction-related activities associated for agricultural land uses, except when the activities are for the purpose of preparing land for the growing of crops or the raising of fowl or animals (SJVUAPCD, 2000).

Enhanced and additional control measures provide a greater degree of PM_{10} reduction compared to Regulation VIII. According to SJVUAPCD, enhanced control measures are applicable to construction projects that would be expected to generate large PM_{10} emissions and additional control measures are applicable for projects with large construction sites, located near receptors, or that for other reasons warrant additional emissions reductions.[51]

Policy DE 5.1d of the Element requires compliance with the SJVUAPCD Regulation VIII, ~~Rule 8020~~ rules during construction of a dairy facility to control PM_{10} emissions from fugitive dust. To further ensure control of dust emissions during construction, this policy requires the implementation of enhanced and additional control measures specified by SJVUAPCD.

The owners/operators of a proposed new dairy development/~~redevelopment~~ or expansion are required to implement the ~~following~~ most recently adopted Regulation VIII rules established by SJVUAPCD for construction activities. ~~enhanced and additional control measures as deemed necessary by the Kings County Planning Agency with consultation, if needed, from the SJVUAPCD:~~

- ~~Limit traffic speeds on unpaved roads to 15 miles per hour;~~
- ~~Install sandbags or other erosion control measures to prevent silt runoff to public roadways from sites with a slope greater than one percent;~~
- ~~Install wheel washers for all exiting trucks, or wash off all trucks and equipment leaving the site;~~
- ~~Install temporary wind breaks at windward side(s) of the construction areas;~~

[51] Based on the Guide for Assessing and Mitigating Air Quality Impacts established by the San Joaquin Valley Unified Air Pollution Control District; the Guide does not provide a quantitative threshold that would trigger the implementation of enhanced and additional control measures. The need for enhanced and additional control measures would be determined on a case-by-case basis.

- ~~Suspend excavation and grading activity when winds exceed 20 miles per hour; and~~

- ~~Limit the areal extent of land subject to excavation, grading, and other construction activity at any one time.~~

Implementation of **Policy DE 5.1d** of the Element would reduce short-term construction-related PM_{10} emissions from fugitive dust to a less-than-significant level.

Mitigation Measure 4.2-1

None required.

Impact 4.2-2

Construction activities associated with new or expanded dairies would result in short-term exhaust emissions from construction equipment. This is a less-than-significant impact.

Heavy-duty construction equipment such as scrapers, graders, trenchers, and earth movers that would be used during the development of a new or expanded dairy would release short-term exhaust emissions. The primary pollutants associated with exhaust emissions from construction-related equipment consist of ozone precursors (ROG and NOx) and PM_{10}.

The amount of daily exhaust emissions that could result from construction equipment would be dependent on the construction duration, work period, selected construction equipment, and construction activities. Short-term exhaust emissions (ROG, NOx, and PM_{10}) generated during construction-related activities could expose any nearby residents and other sensitive receptors located downwind to temporary substantial pollutant concentrations. The Element addresses the short-term impact of exhaust emissions by including **Policy DE ~~5.1g~~ 5.1f**.

The provisions of the policy require the owner/operator of a proposed dairy development/~~redevelopment~~ or expansion to ~~ensure that~~ follow measures ~~developed by the SJVUAPCD are implemented, as appropriate,~~ to control ~~exhaust~~ emissions (ROG, NOx, and PM_{10}) generated from heavy-duty construction equipment as required by the SJVUAPCD. ~~These measures include:~~

- ~~The idling time of all construction equipment used at the site shall not exceed ten minutes;~~

- ~~Minimize the hours of operation of heavy-duty equipment and/or the number of equipment in use at one time;~~

- ~~All equipment shall be properly tuned and maintained in accordance with the manufacturer's specifications;~~

- ~~When feasible, alternative fueled or electrical construction equipment shall be used at the project site;~~

- ~~Gasoline-powered equipment shall be equipped with catalytic converters, where feasible;~~

- ~~Curtail construction during periods of high ambient pollutant concentrations; this may include ceasing of construction activity during the peak-hour of vehicular traffic on adjacent roadways;~~

- ~~Implement activity management (e.g., rescheduling activities to reduce short-term impacts).~~

The construction phase exhaust emissions would present a short-term impact. Implementation of the Element would reduce construction related exhaust emissions to a less-than-significant level.

Mitigation Measure 4.2-2

None required.

Impact 4.2-3

Operation of new or expanded dairies ~~would~~ could increase PM_{10} air pollutant emissions from fugitive dust, exhaust from agricultural and dairy equipment, vehicular traffic exhaust, and formation of secondary $PM_{2.5}$. This is a significant and unavoidable impact.

Similar to existing conditions, PM_{10} emissions from fugitive dust would be generated during operation of new or expanded dairies. Fugitive dust sources from a new or expanded dairy are attributed to cattle movement in unpaved corrals, corral maintenance activities, vehicular use along unpaved or gravel paved roadways within the dairy facilities and unpaved areas within the dairy facilities, and from combustion engines on dairy operation equipment and vehicles moving to and from the dairies.[52] Fugitive dust sources from related agricultural activities at a new or expanded dairy site would include land

[52] As previously indicated, windblown dust across dairy pasture land would generate very minimal PM_{10} emissions. However, new or expanded dairies under the Element would primarily be situated at freestall barns or unpaved corrals, and not on pasture lands.

preparation, harvesting, and from wind blowing across exposed agricultural land. Fugitive dust from cattle movement is considered the most significant source.

PM_{10} Emissions from Fugitive Dust during Cattle Movement in Unpaved Corrals

As indicated previously, the main fugitive dust source from dairies is from cattle movement in unpaved corrals. New and expanded dairies would typically house dry cows, bred heifers, heifers (one year to bred ages), calves, and baby calves would commonly be placed in unpaved corrals. Milk cows would be housed in the freestall barns; little to no fugitive dust would be expected to be generated from the freestall barns as these facilities are typically paved with concrete.

PM_{10} emissions were estimated for future conditions (emissions from all additional support stock cattle allowed under the Element) and for a typical 500-, ~~735-~~ 705-, 2,000-, and 5,000-milk cow dairy facility (Table 4.2-5c). Under future conditions, the number of support stock considered in calculating PM_{10} emissions were based on data provided in Table 5 of the Element (Theoretical Dairy Herd Capacity for Kings County).[53] In estimating the emissions for the 500-, ~~735-~~ 705-, 2,000-, and 5,000-milk cow dairies, the number of support stock assumed to be housed at the unpaved corrals were based on the individual support stock to milk cow ratio used in Table 5 of the Element.

Potential PM_{10} emissions were estimated using PM_{10} emission factors published by CARB as well as the Department of Agricultural Engineering at Texas A&M University for cattle feedlots (Tables 4.2-5a through c). However, actual PM_{10} emissions generated could be less than the estimated emissions since cattle feedlots are known to generate more PM_{10} emissions than dairy corrals constructed to current California Department of Food and Agriculture standards. The PM_{10} emission factor for dairy cattle may be less than 20 percent of the cattle feedlot PM_{10} emission factor developed by Texas A&M (15 pounds per 1,000 head per day), according to a personal communication between Mr. Jim Sweeten (Texas A&M University professor) and the Confined Livestock Air Quality Committee of the USDA Agricultural Air Quality Task Force (2000).

Similar to existing conditions, PM_{10} emissions for future conditions and typical dairy sizes were estimated using CARB's emission factor under the following two scenarios to account for PM_{10} emission reduction from the wet season (rainfall effects) and for potential additional PM_{10} emissions generated from new born calves and calves between 320 to 700 pounds:

[53] The theoretical future capacity was determined by subtracting the number of support stock at existing dairies and the individual support stock to milk cow ratio, as identified in Table 5 of the Element.

- Scenario 1: Exclude all calves in PM_{10} emission estimate and account for potential PM_{10} emission reduction during wet season;[54] and

- Scenario 2: Conservatively include all calves in PM_{10} emission estimate (assuming that PM_{10} emission rates for calves are equivalent to those for the heavier and larger dry cattle and heifers),[55] and ignore potential PM_{10} emission reduction during wet season.

Similarly, the PM_{10} emissions for future conditions and typical dairy facilities were estimated using the University's nonannualized emission factor under the following two scenarios:

- Scenario 3: Exclude all calves in PM_{10} emission estimate and account for potential PM_{10} emission reduction during wet season;[56] and

- Scenario 4: Conservatively include all calves in PM_{10} emission estimate, and ignore potential PM_{10} emission reduction during wet season.

For future conditions, potential PM_{10} emissions could range from 695 to 10,400 tons per year, based on the four scenarios; this range reflects between 5 and 77 percent of the total estimated PM_{10} emissions estimated for Kings County in 2000. However, it should be noted that the 2000 emission inventory did not account for PM_{10} emissions from unpaved corrals at dairy facilities.

Approximately 5,165, 10,400, 769, and 1,548 tons per year of PM_{10} emissions were estimated for scenarios 1, 2, 3, and 4, respectively. PM_{10} emissions ranging from 1 to 14 tons per year could be generated for a 500-cow dairy, from 1 to ~~20~~ 19 tons per year for a ~~735~~ 705-cow dairy, from 4 to 54 tons per year for a 2,000-cow dairy, and from 10 to 136 tons per year for a 5,000-cow dairy (Table 4.2-5c). The fugitive dust emission from corrals is the dominant source of PM_{10} emissions at dairy facilities.

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[54] PM_{10} emission reductions from rainfall were based on guidance from CARB (Gaffney, 1999).

[55] The emission factor used to estimate PM_{10} emissions was based on beef cattle feedlots. Production of beef calves usually consists of raising calves to weaning weights of 480 pounds as part of a range-pasture program; calves from weaning to weights between 550 to 700 pounds are typically grazed on pastures and also maintained in cattle feedlots. Therefore, the emission factor would not be expected to account for PM_{10} emissions generated from baby calves or from partial raising of calves from weaning to weights of 550 to 700 pounds.

[56] PM_{10} emission reductions from rainfall were based on guidance from CARB (Gaffney, 1999).

PM_{10} Emissions from Fugitive Dust during Vehicular Use along Unpaved/Gravel Paved Roadways and Other Unpaved Areas

PM_{10} emissions would also be generated from vehicular use along potentially unpaved or gravel paved roadways and from other unpaved areas at new or expanded dairies. The amount of PM_{10} emissions that could be generated from vehicular use along roadways at a dairy facility would be dependent on various factors, including the road type, vehicle miles traveled along the roadway, number of vehicular trips, vehicle type (number or wheels and weight), travel speed, silt content of the roadway, and vehicle weight. Similarly, the amount of PM_{10} emissions that could be generated from unpaved areas throughout a dairy facility would be dependent on several factors, including area size and silt content of the area. Since these factors could vary widely with each dairy, PM_{10} emissions from vehicular use along unpaved or gravel paved roadways at new or expanded dairies could not be estimated. PM_{10} emissions from vehicular use are typically minimal compared to PM_{10} emissions generated from unpaved corrals (Kings County, 1999).

PM_{10} Emissions from Fugitive Dust during Cropland-related Activities

PM_{10} emissions from fugitive dust during cropland-related activities would continue to be generated under future conditions. Fugitive dust sources would be from land preparation, harvesting, and from wind blowing across exposed agricultural land. PM_{10} emissions generated under future conditions would be less than current conditions since the size of the agricultural cropland would be less under future conditions because of the conversion of existing cropland into new or expanded dairies.

PM_{10} emissions from land preparation activities were estimated for future conditions, assuming the maximum capacity of cattle are housed in the County. The emissions were estimated using a PM_{10} emission factor published in the August 1997 CARB Emission Inventory Procedural Manual, Volume III, Section 7.4, Agricultural Land Preparation.

The amount of PM_{10} emissions from cropland preparation depends on the crop type grown and the acreage used for each crop type. Under future conditions, the crop types that would be grown were assumed to be consistent with the crop types harvested in 1999 countywide.[57] The theoretical maximum cropland acreage available would be 235,483 acres, based on the maximum theoretical capacity of Kings County to host dairies. PM_{10} emissions from land preparation under future conditions would decrease from 1,241 tons per year (existing conditions) to 1,191 tons per year (maximum buildout of new or expanded dairies) (Table 4.2-5a). Potential future PM_{10} emissions generated from cropland

[57] The crop types are included in the Theoretical Capacity Model.

preparation reflects approximately ten percent of the total PM_{10} emissions estimated for Kings County in 2000.

PM_{10} emissions from wind blowing across the agricultural cropland were estimated for future conditions, assuming the maximum capacity of cattle are housed in the County. The emissions were estimated using a PM_{10} emission factor for non-pastureland in Kings County, as published in the August 1997 CARB Emission Inventory Procedural Manual, Volume III, Section 7.12, Wind Blown Dust, Agricultural Land. PM_{10} emissions for future conditions would reduce from 1,577 tons per year (existing conditions) to 1,514 tons per year (maximum buildout of new or expanded dairies) (Table 4.2-5a). Potential future PM_{10} emissions generated from windblown dust reflect approximately 11 percent of the total PM_{10} emissions estimated for Kings County in 2000.

In addition, crop harvesting activities would also generate PM_{10} emissions. ~~Although,~~ PM_{10} emission factors for all the crop types were not available~~, PM_{10} emissions would decrease~~. However, similar to land preparation and wind blowing, PM_{10} emissions from crop harvesting activities under future conditions would decrease compared to existing conditions due to the reduction of crops harvested in the future.

PM_{10} Emissions from Agricultural and Dairy Equipment Exhaust

PM_{10} emissions would also be generated from the use of agricultural and dairy equipment. Under existing conditions, approximately 245,300 acres subject to the Element are currently used for cropland and approximately 4,756 acres are occupied by existing dairies. Land preparation, planting, cultivation, harvesting, and postharvesting activities on the cropland would involve the use of diesel-fueled equipment, such as stalk cutters, cultivators, discing equipment, seeder, dressing- and mulch-related equipment, tractors, trucks, and miscellaneous equipment. Similarly, dairy operations would also involve the use of diesel-fueled equipment, including diesel-fueled dairy equipment such as feed trucks, tractors, and miscellaneous equipment. Ozone precursors (ROG and NOx) and PM_{10} emissions are generated from the use of diesel-fueled equipment.

Based on the theoretical capacity of Kings County to host dairies, approximately 9,817 acres of existing cropland would be converted into new or expanded dairy facilities under the Element. The net increase in PM_{10} emissions generated for an area converted from cropland to dairy facilities would depend on the specific types of equipment used, length of equipment operation, equipment rating, equipment annual operating hours, and crop type originally grown.

For example, if approximately 100 acres of cropland growing corn and wheat are converted into a 5,000-milk cow dairy facility, a net increase of 0.4, 4.6, and 0.3 tons per year of ROG, NOx, and PM_{10} emissions, respectively, could be generated from diesel exhaust at the dairy

facility. This estimate assumes that one tractor, one manure truck, and two pieces of miscellaneous equipment are used at the dairy on a daily basis. Quantification of the potential exhaust emissions that could result from all dairies subject to the Element can be approximated by assuming that the remaining available capacity (257,312 milk cows) for full dairy development under the Element could be accommodated by the operation of approximately 52 additional 5,000-milk cow dairies. Under this assumption, operational equipment exhaust from 52 additional 5,000-cow dairies would contribute a total of approximately 14 tons per year of additional PM_{10}.

PM_{10} Emissions from Additional Vehicular Exhaust

Operation of new or expanded dairies under the Element would create a slight increase in vehicular traffic. Increased vehicular traffic would result in an increase in regional air pollutant emissions, including PM_{10}.

The increase in vehicular traffic associated with dairy operations would be from employee vehicles, manure haul trucks, feed trucks, milk trucks, and other miscellaneous vehicle use. The Element proposes that approximately 257,312 additional milk cows can be accommodated on land within designated Dairy Development Overlay Zones (DDOZs) and Nutrient Spreading Overlay Zones (NSOZs) in Kings County. Assuming an average dairy size of approximately 5,000 milk cows, the number of new dairies that could be accommodated is about 52. Since the theoretical dairy herd is the factor limiting dairy development, development of larger dairies would result in fewer dairies being constructed.

Average daily truck traffic due to each new 5,000-cow dairy is assumed to be approximately 84 one-way vehicle trips per day. This estimate is based on information provided by recent dairy applicants (Kings County, 1999) for milk delivery trucks, feed delivery trucks, dry manure trucks, and workers/visitors for large dairy facilities. It is also assumed that each new dairy would include at least one new residence. Truck trips would account for approximately 38 percent of the total estimated additional vehicular trips generated by the new dairies.

The projected regional air pollutant emissions (NOx, ROG, and PM_{10}) from additional traffic generated by the 52 new 5,000-cow dairy facilities were calculated using the URBEMIS7 computer model developed by CARB. The emissions were calculated for the year 2020, a trip generation rate of 84 vehicle trips per day for each of the new dairies, and a vehicle distribution of 40 percent heavy duty trucks, 30 percent light duty trucks, and 30 percent light duty automobiles. The estimated emission of PM_{10} would be 0.02 ton per year per dairy and a total PM_{10} emission from additional dairy related vehicle trips of 0.79 ton per year.

Potential Additional PM_{10} Emissions Related to Secondary $PM_{2.5}$ Emissions

Ammonium nitrate particles in the $PM_{2.5}$ range could form as the result of reactions between ammonia emissions and nitrates available in the environment. These secondary $PM_{2.5}$ emissions are generated as the organic nitrogen contained in cattle fecal manure decomposes and the urea manure hydrolyzes. $PM_{2.5}$, known as fine particulates, comprise a fraction of PM_{10}.

As indicated in the discussion of existing conditions, limited information about $PM_{2.5}$ secondary particulate emissions from ammonia reactions is currently available. In the San Joaquin Valley, ammonia is believed to be more abundant than nitrates, indicating that the generation of ammonium nitrate is dependent on the availability of nitrates in the environment rather than the availability of ammonia (Gaffney, 2001). Potential $PM_{2.5}$ emissions from ammonium nitrate formation cannot be accurately estimated for new and expanded dairies.

Fugitive dust from unpaved corrals at new or expanded dairies would likely be the largest contributor of PM_{10} emissions from fugitive dust. Crop production and exhaust from dairy equipment and vehicular traffic would also contribute additional PM_{10} emissions. Formation of secondary $PM_{2.5}$ would also produce an unknown but potentially significant amount of additional PM_{10} emissions. The increase of PM_{10} emissions from a new or expanded dairy, compared to existing conditions, could exceed 15 tons per year (the PM_{10} significance threshold level for SJVUAPCD), depending on the cattle capacity of a new or expanded dairy.

The Element includes goals, objectives, and policies for dairy siting, control, monitoring, and reviewing the effectiveness of control measures specified. **Policy DE 3.1a** adequately requires that air quality, including dust control from construction and operation, be considered during the preparation of the countywide policy designed to evaluate and distribute dairies within the County.

Policy DE 5.1e sufficiently requires the control of fugitive dust emissions from cattle movement and maintenance activities at the unpaved corrals, perimeter roadways, and other unpaved areas throughout dairy ~~sites~~ facilities. This policy's PM_{10} reduction control efficiencies are based on the control efficiencies in SJVUAPCD's ~~Draft~~ Regulation VIII (SJVUAPCD, ~~2000~~ 2001).

PM_{10} emissions for future conditions were estimated based on the implementation of **Policy DE 5.1e** (Tables 4.2-5b and 4.2-6). The emissions reflect a 50 percent reduction of PM_{10} emissions through implementation of a stabilizer throughout unpaved corrals at new and expanded dairies only. No reduction was considered for existing dairies. Similar to existing conditions, four scenarios were considered in the estimation. The emissions

accounted for natural PM_{10} reduction from rainfall from December through March for scenarios 1 and 3. The reduction of PM_{10} emissions from implementation of a 50 percent effective stabilizer at new and expanded dairies ranges from 202 to 3,503 tons per year (Table 4.2-6). Table 4.2-6 provides a breakdown of the PM_{10} emissions from unpaved corrals for new and expanded dairies with and without the 50 percent effective stabilization.

TABLE 4.2-6: **PM_{10} Emissions Reduction from Stabilization at Unpaved Corrals for New and Expanded Dairies**

Scenario	Future Net Emissions (tons/year)		Future Net PM_{10} Emissions Reduction (tons/year)
	Without 50 Percent Effective Stabilization	With 50 Percent Effective Stabilization	
1	3,479	2,122	1,357
2	7,006	3,503	3,503
3	518	316	202
4	1,043	521	521

Notes: The scenarios exclude PM_{10} emissions from existing dairies.
See Tables 4.2-5a and b for scenario description.

The Element includes two additional measures to support **Policy DE 5.1e**. **Policy DE ~~5.1h~~ 5.1g** requires all applications for proposed dairies to estimate the anticipated PM_{10} emissions from cattle movement and maintenance activities at the unpaved corrals, perimeter roadways, and other unpaved areas throughout the dairy site; the policy also requires the preparation of a Fugitive Dust Emissions Control Plan (FDECP). The FDECP must describe and demonstrate conformance with **Policy DE 5.1e** and **DE ~~5.1i~~ 5.1h**.

Policy DE ~~5.1i~~ 5.1h requires compliance with the ~~Best Available Control Measures (BACM)~~ control measures for fugitive dust emissions from agricultural sources as established by the most recently adopted SJVUAPCD Regulation VIII. ~~The proposed rules address administrative requirements (rule 8011), construction, demolition, excavation, extraction, landfill, and other earth moving activities (rule 8021), bulk materials (rule 8031), carryout and trackout (rule 8041), open areas and vacant lots (rule 8051), paved and unpaved roads (rule 8061), unpaved vehicle and equipment traffic areas (rule 8071), and off-site agricultural sources (rule 8081).~~ The SJVUAPCD estimates the control efficiency for ~~BACMs~~ control measures for unpaved roads ranges from 37 percent (reduced speed) to 75 percent (apply chemical treatment). The control efficiency of ~~BACMs~~ control measures for bulk materials range from approximately 60 to 80 percent (SJVUAPCD, 2000).

Policies DE ~~6.1b~~, ~~6.1e~~ 6.2d, and ~~6.2a~~ 6.3a provide for monitoring of dairy operations to demonstrate the Element's effectiveness in protecting the environment and the effectiveness of the mitigation measures required for each operating dairy facility in Kings County. ~~Policy~~ **Objective DE ~~6.1b~~ 6.1** provides for continuous monitoring of dairies to determine whether operations are being operated within the limits of the standards specified in the Element. **Policy DE ~~6.1e~~ 6.2d** requires the preparation of a dairy system monitoring program. **Policy DE ~~6.2a~~ 6.3a** provides for a continuous testing program to demonstrate that a dairy facility is operating within its approved parameters. **Policy DE ~~6.1d~~ 6.2c** has been included in the Element to require establishment of specific monitoring standards for dust control monitoring at dairy facilities. At a minimum, the standards shall provide for the following:

- Performance of periodic visual inspections at dust sources throughout the dairy (i.e., cattle movement at unpaved corrals and all other unpaved or gravel paved areas).

- Visual inspections shall be conducted and documented by the dairy operator to determine the effectiveness of dust control measures required under **Policy DE 5.1e** and presence/absence of breeding of mosquitoes and other vectors due to the implementation of dust control measures.

- Visual inspections shall be conducted at the dairy site boundaries and shall be conducted at least on a weekly basis during the dry season (April through October) and on a monthly basis during the remainder of the year. During periods of high winds and dry conditions, more frequent inspections shall be conducted, as deemed necessary by the Dairy Monitoring Office.

- All visual inspections shall be documented by the dairy operator in logs maintained at the Dairy Facility.

- Performance of ~~routine~~ inspection and ~~(at least monthly)~~ documentation on the implementation of the Fugitive Dust Emissions Control Plan (FDECP) and ~~BACM~~ control measures required by the most recently adopted SJVUAPCD Regulation VIII by the dairy operator at the dairy shall be done no less frequently than monthly.

Policies DE ~~7.1a,~~ 6.1a.A ~~7.1b~~ 6.1a.B, and ~~7.1c~~ 6.1a.C provide a mechanism for the County to track and evaluate monitoring data (**Policy DE ~~7.1a~~ 6.1a.A**), address dairy operational problems encountered (**Policy DE ~~7.1b~~ 6.1a.B**), and compile general results of the monitoring program specified under the Element for submittal to the Planning Commission (**Policy DE ~~7.1c~~ 6.1a.C**). The Element provides **Policy DE ~~7.1d~~ 6.1b** to ensure that the Dairy Monitoring Office includes a qualified compliance specialist to review all monitoring control plans, including FDECPs prepared for and implemented at the dairies.

The policy requires that the compliance specialist be familiar with air issues associated with dairy operations so that he/she can determine whether the practices described in the FDECPs are appropriate, whether they are being implemented correctly, and whether modifications of the practices are necessary.

The Element includes **Policy DE 5.1i** as a mechanism to ensure that the net increase in exhaust emissions for each dairy development/redevelopment project would not exceed the SJVUAPCD threshold levels for PM_{10} and other exhaust pollutants (i.e., ROG and NOx). The policy requires that, as part of the technical report to be submitted with each application to either establish a new dairy or expand an existing dairy, dairy applicants shall be required to estimate the anticipated net increase in ROG, NOx, and PM_{10} emissions generated from anticipated dairy equipment and vehicular traffic compared to existing conditions and demonstrate that the net increase will not exceed the SJVUAPCD threshold limits for ROG, NOx, and PM_{10}.

Policies DE 3.1a, 5.1c, 6.2d, and **6.3a**, and other policies under **Goal DE 6** are relevant to ammonia emissions and the related potential for the formation of secondary $PM_{2.5}$ from cattle manure decomposition. Although **Policy DE 3.1a** specifically addresses ammonia emissions in the development of the countywide policy, **Policy DE 5.1c** requires the preparation of an MTMP that would be implemented to reduce air pollutant emissions from the manure, including ammonia. **Policy DE 4.1b.B** requires that the timing and method of application of manure and process water to land minimize unnecessary contact with air to minimize the release of ammonia into the atmosphere. **Policy DE 6.2d** requires that the County set standards for implementation of the OMP and MTMP and minimally requires that quality assurance/quality control be implemented and documented. In addition, **Policy DE 6.2e** requires that, when standard methods for testing air emissions become available, dairy owner/operators would be required to test for ROG, hydrogen sulfide, ammonia, and methane emissions (possible odor-related gases). Because of the current lack of available standard methods to monitor the effectiveness of the treatment technologies in reducing air pollutants (ROG, ammonia, hydrogen sulfide, and methane) and lack of regulatory standards, dairy operators can only provide VS removal efficiency level data of the selected treatment technology to the County to certify that the MTMP is being implemented as part of the monitoring program. **Policy DE 6.1b** requires that the Dairy Monitoring Office include a compliance specialist capable of technically reviewing monitoring programs required by the Element, including the OMP and MTMP. However, there is a current lack of available standards to determine the effectiveness of manure treatment technologies in reducing ROG, hydrogen sulfide, ammonia, and methane. An accurate method for quantifying the potential air pollutant emissions from treated manure is anticipated to be available following completion of USDA ARS research activities under the national programs.

Mitigation Measure 4.2-3a (Fugitive Emissions from Unpaved Areas)

No additional feasible mitigation measures are available for the control of fugitive dust.

Implementation of **Policies DE 5.1e, ~~5.1h~~ 5.1g, ~~5.1i~~ 5.1h, ~~6.1b~~ 6.1a, ~~6.1d~~ 6.2c,** and **~~7.1d~~ 6.1b** of the Element would reduce and control PM_{10} emissions from fugitive dust at future or expanded dairies. Implementation of **Policy DE 5.1e** (stabilization) could reduce PM_{10} emissions from unpaved corrals at new and expanded dairies between 202 and 3,503 tons per year (Table 4.2-6). However, even after implementation of this mitigation measure, PM_{10} emissions generated from a dairy may still exceed the SJVUAPCD PM_{10} threshold of 15 tons per year. Therefore, PM_{10} emissions from fugitive dust generated during project operations are conservatively considered to constitute a significant and unavoidable impact.

Mitigation Measure 4.2-3b (Secondary $PM_{2.5}$)

No additional feasible mitigation measures are available.

Implementation of **Policies DE 3.1a, 5.1c, 5.1e, 6.1a, 6.2d, 6.3a,** and **6.1b** would be expected to reduce ammonia generated from dairy facilities and would also reduce other air pollutants generated from cattle manure. As a result, $PM_{2.5}$ emissions (as ammonium nitrate) would also be reduced. However, testing methods are not currently readily available to quantify the reduction in ammonia from advanced treatment technologies, although the VS removal efficiency level of a treatment system may be considered an appropriate indicator for determining the remaining potential for treated manure to emit air pollutants to the atmosphere. In addition, temporarily stockpiled manure would release ammonia. It is considered infeasible to immediately treat all manure generated at dairies operated in conformance with the Element. Therefore, the impact would remain significant and unavoidable.

Mitigation Measure 4.2-3c (Equipment Exhaust)

No additional feasible mitigation measures are available.

Implementation of **Policy DE 5.1i** would reduce the potential for PM_{10} emissions from exhaust sources although the amount of the reduction is unknown. However, PM_{10} emissions are already considered to constitute a significant and unavoidable impact due to fugitive dust sources from dairy operations.

~~Impact 4.2-4~~

~~Operation of new or expanded dairies could increase exhaust emissions from agricultural and dairy equipment. This is a less-than-significant impact.~~

~~Under existing conditions, approximately 245,300 acres subject to the Element are currently used for cropland and approximately 4,756 acres are occupied by existing dairies. Land preparation, planting, cultivation, harvesting, and postharvesting activities of the cropland would involve the use of diesel-fueled equipment, such as stalk cutters, cultivators, discing equipment, seeder, dressing- and mulch-related equipment, tractors, trucks, and miscellaneous equipment. Similarly, dairy operations would also involve the use of diesel-fueled equipment such as dairy diesel-fueled equipment such as feed trucks, tractors, and miscellaneous equipment. Ozone precursor (ROG and NOx) and PM_{10} emissions are generated from use of diesel-fueled equipment.~~

~~Based on the theoretical capacity of Kings County to host dairies, approximately 9,817 acres of existing crop land would be converted into new or expanded dairy facilities under the Element. The net increase of ROG, NOx, and PM_{10} emissions generated for an area converted from cropland to dairy facilities would depend on the specific types of equipment used, length of equipment operation, equipment rating, equipment annual operating hours, and crop type originally grown. For example, if approximately 100 acres of cropland growing corn and wheat is converted into a 5,000-milk cow dairy facility, a net increase of 0.4, 4.6, and 0.3 tons per year of ROG, NOx, and PM_{10} emissions could be generated from diesel exhaust used at the dairy facility. This estimate assumes that one tractor, one manure truck, and two pieces of miscellaneous equipment are used at the dairy on a daily basis.~~

~~Although the actual sizes of future dairies under the Element are currently unknown, it is unlikely that the net increase of exhaust emissions generated from the use of dairy farm equipment would generate a net increase of ROG, NOx, and PM_{10} emissions at concentrations greater than the SJVUAPCD threshold levels. The Element includes **Policy DE 5.1j** as a mechanism to ensure that the net increase in exhaust emissions would not exceed the SJVUAPCD threshold levels for ROG, NOx, and PM_{10}. The policy requires that, as part of the technical report to be submitted with each application to either establish a new dairy or expand an existing dairy, dairy applicants shall be required to estimate the anticipated net increase in ROG, NOx, and PM_{10} emissions generated from anticipated dairy equipment (including cropland and dairy farm equipment) compared to existing conditions and demonstrate that the net increase will not exceed the SJVUAPCD threshold limits for ROG, NOx, and PM_{10}. Implementation of this policy would reduce the impact of dairy equipment exhaust emissions to a less-than-significant level.~~

~~Mitigation Measure 4.2-4~~

~~None required.~~

Impact ~~4.2-5~~ 4.2-4

Operation of new or expanded dairies could generate adverse odors. This is a significant and unavoidable impact.

New or expanded dairies under the Element would include management of cattle manure generated at the site. Cattle manure contains complex organic compounds and simple organic and inorganic compounds and will anaerobically decompose under natural conditions. During anaerobic decomposition, gases are formed, some of which include odorous compounds (Zhang, et al., 1997). Odorous compounds include ammonia, hydrogen sulfide, and ROG. To a lesser degree, odor could also be directly associated with the dairy animals.[58]

Manure management operations at dairies would necessarily include collection, treatment, storage, and reuse of the manure. New dairy facilities would typically consist of freestall barns and unpaved corrals. Expanded dairy facilities would typically consist of unpaved corrals as freestall barns generally house dairy cows. Manure generated at freestall barns would generally be collected in drive lanes and flushed with process water into on-site storage ponds. Some dairy facilities may first separate out (via gravity) the heavier, dense particles from the manure waste stream using mechanical solid separators, prior to storage in the ponds. The collected solids would typically be removed periodically, stockpiled on-site, and applied to on-site agricultural fields or transported off-site to other agricultural fields. The manure waste in the storage ponds would typically be mixed with irrigation water and applied to on-site agricultural fields.

Manure generated at the unpaved corrals of a new or expanded dairy could be managed using a flushed system or could be physically mechanically scraped off from the corral on a scheduled basis; a combination of these two techniques could also be employed. Similar to the freestall system, flushed manure would typically be deposited in storage ponds; manure may undergo gravity separation. Scraped manure would typically be removed on a scheduled basis, stockpiled on-site, and loaded onto trucks for transport or for application to on-site agricultural fields.

Manure placed in the storage ponds would naturally undergo anaerobic decomposition. In addition, stockpiled manure and possibly retained manure separated solids could naturally undergo anaerobic decomposition, depending on several factors, including moisture content and solids particle size. As a result, odorous compounds could be released into the environment, especially when the surface layer of the manure is agitated. Stockpiled manure could release odorous compounds when the material is agitated prior

[58] Cattle and their housing areas (i.e., freestall barns and corrals) may create foul odor if poorly maintained (e.g., wet environment, dirty animal exterior coating).

to, and during, application on to agricultural fields. Manure liquid waste would not be expected to generate significant odors during land application since the waste is typically mixed with irrigation water prior to application.

Manure odor is strongest at its sources and dissipates with increasing distance. The offensiveness and degree of manure odor is ultimately dependent on the sensitivity of the receptors exposed to the odor. Temperature, wind, dust conditions, topography, and the presence of physical obstructions affect the degree of odor impacts on nearby receptors. The average summer temperature in Kings County is in the upper 90° F; therefore, odorous compounds would tend to travel greater distances within the county compared to cooler conditions. During windy conditions, odor compounds are diluted with fresh air and, as a result, odors disperse more quickly and are not as noticeable at a distance. However, wind direction also defines the direction that odor travels.

Fugitive dust particles act as a transport mechanism for odor, enabling odorous compounds to be transported by air currents, even during windy conditions. Dust particles carrying odorous compounds could potentially deposit within human olfactory cells, exposing a person to the odorous compounds for an extended duration (Livestock Industry Facilities & Environment, undated). However, physical obstructions, such as windbreaks or topographical changes, cause more rapid dilution of odorous compounds and also capture odor-containing fugitive dust.

Treatment technologies are currently available to reduce the release of odors into the environment from manure storage/collection systems. As indicated in the Setting section of this analysis, available treatment technologies to reduce odors include the biological waste supplements, chemical additives, placement of covers over waste storage systems, composting, aerobic treatment, and anaerobic treatment of collected manure. Except for the inclusion of biological waste supplements and chemical additives, these treatment technologies would also reduce or prevent the release of ROG emissions; in addition, aerobic and anaerobic treatment systems would also reduce or prevent the release of other air pollutants generated from manure storage/collection systems, such as methane, ammonia, and hydrogen sulfide. In composting operations, reduction of methane and hydrogen sulfide would also be expected.

However, the use of aerobic and anaerobic technologies at dairy facilities is currently not common in California and there are few examples of use in the San Joaquin Valley. An aerobic treatment system was operated at two dairy facilities in the San Joaquin Valley, one in Kings County and another in Kern County. The system operated in Kings County was a six-month pilot study and the system operated in Kern County was only recently implemented in May 1999 (see discussion in Setting section). There are no anaerobic

digesters in use at any dairy in Kings County.[59] In addition, implementation of composting may require large land areas to appropriately handle the manure. However, significant reduction of odors from manure treated by closed-system anaerobic digesters is expected.

The Kings County's Right to Farm Ordinance indicates that no lawful agricultural activity, operation, or facility "*conducted or maintained for commercial agricultural purposes in a manner consistent with proper and accepted customs and standards as established and followed by similar agricultural operations in the same locality, shall be or become a nuisance, private or public, due to any changed condition in or about the locality, including, but not limited to, the encroachment of non-agricultural uses such as rural residences*." Common inconveniences and discomforts associated with agricultural operations include manure odors.

The policies under Goal 1 address siting requirements for dairies. **Policy DE 1.2g** requires that dairies (including manure and dairy process water storage areas) be located more than one-half mile from any existing public or private school site although, manure used as fertilizer and dairy process water used to irrigate cropland may be transported to and used within the one-half mile buffer zone but must be scheduled during weekends or summer vacation when the schools are closed. **Policy DE 1.2h** requires a minimum distance of one-quarter mile between dairy facilities and other dairies and confined animal feeding operations. The Element also requires a minimum buffer zone of one-half mile between a dairy and an existing residential zone (**Policy DE 1.2i**).

The Element also provides siting restrictions for new or expanded dairies near individual residences within the agricultural zoned areas. **Policy DE 3.1b** requires that proximity of rural residences be considered in the siting of individual dairy structures; and **Policy DE 3.1c** requires that barns, corrals, and waste disposal systems be located a sufficient distance from residences not associated with the dairy so that a conflict of land uses does not occur.

Policy DE 3.1a adequately requires that air quality, including odor control from construction and operation, be considered during the preparation of the countywide policy required under **Goal DE 3**. **Policies DE 5.1b** and **5.1c** require the preparation of an Odor Management Plan (OMP) and a Manure Treatment Management Plan (MTMP), respectively, as part of a technical report to be submitted with each new or expanded dairy application. These plans would be reviewed and approved by Kings County. **Policy DE 5.1b** requires the OMP to address standard operating practices for livestock handling, manure collection, treatment, storage, and land application. The policy also requires that practices be identified and implemented to reduce or control odors released from dairy

[59] A flushed swine manure covered pond digester system has been in operation since 1982 at Royal Farms in Tulare. No major problems have been encountered during operation and the system has generated $44,000 per year in offset power bills (U.S. EPA, 1997).

operations. **Policy DE 5.1c** specifies that the MTMP provide for manure treatment to reduce air emissions, the source of odors. As discussed in the Settings section, treatment technologies are available to reduce odors generated from manure storage/collection systems. **Policy DE 5.1c** requires the estimation of anticipated ROG, ammonia, and methane emissions generated by manure and process water management. The policy requires that the MTMP would provide treatment of all manure to reduce ROG, nitrous oxides, ammonia, methane, hydrogen sulfide, and odor emissions. The MTMP would describe general housekeeping practices, feed management, solid manure moisture management, the purpose and procedures for the use of additives or adsorbents, and land application methodologies that effectively minimize air pollutant emissions. The policy further requires that the MTMP include an advanced treatment technology to reduce ROG emissions for all new dairies and dairy expansions that include construction of new dairy facilities. Effective advanced treatment technologies provided in the policy include: 1) controlled anaerobic digestion; 2) aerobic treatment; and 3) combined controlled aerobic/anaerobic treatment.

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 stationary sources.

Policy DE 5.1c also requires that the selected treatment system should meet or exceed a 50 percent VS removal efficiency. As discussed in the Settings section, the VS removal efficiency level of a treatment system may be considered an appropriate indicator for determining the remaining potential for treated manure to emit air pollutants to the atmosphere since standard testing methods for quantifying the reduction of air pollutant gases from treated manure (anaerobically or aerobically) are currently not readily available.

As indicated in Impact 4.2-3, **Policies DE ~~6.1b~~ 6.2a** and **~~6.1e~~ 6.2b** provide for monitoring of dairy operations to demonstrate the Element's effectiveness in protecting the environment and the effectiveness of the mitigation measures required for each operating dairy facility in Kings County. Although these policies specifically address odor control, the effectiveness of the OMP or MTMP in the reduction of odor cannot be determined. Therefore, **Policy DE ~~6.1e~~ 6.2d** was included in the Element to ensure that standards were established for OMP monitoring. At a minimum, the following requirements would apply to implementation of OMPs at dairy facilities.

- ~~Periodically~~ The dairy operator shall conduct quality assurance/quality control on the implementation of the MTMP and the standard operating procedures described in the OMP.

- Quality assurance/quality control shall be conducted by the dairy operator in a manner that will determine whether the implementation of the MTMP and specified standard operating procedures indicated in the OMP are effectively reducing or controlling odors generated from livestock handling, manure collection, treatment, storage, and land application.

- Quality assurance/quality control shall be conducted ~~at least on a weekly basis during conditions~~ by the dairy operator when ~~the potential for~~ odor release/migration ~~is high (e.g., high temperature) and on a monthly basis during the remainder of the year~~ occurs, and corrective action shall be taken.

- The results of all quality assurance/quality control shall be documented by the dairy operator in logs maintained at the dairy facilities.

In addition, **Policy DE ~~6.1f~~ 6.2e** requires that, when standard methods for testing air emissions become available, dairy owner/operators would be required to test for ROG, hydrogen sulfide, ammonia, and methane emissions (possible odor-related gases).

The policies under **Objective DE ~~7.2~~ 6.4** would establish a mechanism to evaluate and respond to public complaints regarding nuisances or permit violations due to dairy operations. A common nuisance at dairies is odor. **Policy DE ~~7.1d~~ 6.1b** specifically indicates that the County would review the implementation of the OMP or MTMP.

Mitigation Measure ~~4.2-5~~ 4.2-4

No additional feasible mitigation measures are available.

Implementation of **Policies DE 1.2g, 1.2h, 1.2i, 3.1a, 3.1b, 3.1c, 5.1b, 5.1c, ~~5.1h~~ 5.1g, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~7.1d~~ 6.1b,** and **~~7.2a~~ 6.4a** through **~~7.2c~~ 6.4c** would significantly reduce odors generated from dairy facilities operated in conformance with the Element. However, even with the implementation of the OMP and MTMP and the establishment of a nuisance complaint system, receptors may continue to be exposed to adverse odor, specifically since the degree of manure odor is ultimately dependent on the sensitivity of the receptors exposed to the odor. Therefore, this impact would be considered significant and unavoidable.

Impact ~~4.2-6~~ 4.2-5

Operation of new or expanded dairies would generate ozone precursor (ROG and NOx) emissions from cattle manure and combustion engine exhaust. This is a significant and unavoidable impact.

Manure Decomposition

Similar to existing conditions, new or expanded dairies may emit ROG emissions from cattle manure at any location where cattle manure is present, provided the manure is undergoing natural anaerobic decomposition. These locations could include the freestall drive lanes, storage ponds, unpaved corrals, manure stockpiles, and areas where manure waste is applied. As indicated earlier, limited data for estimating ROG emissions from cattle manure are currently available. The most recent emission factor is published in CARB's Emission Inventory Procedural Manual, Methods for Assessing Area Source Emissions.

ROG emissions were estimated for future conditions (assuming the maximum capacity of cattle are housed in the County) and for a typical 500-, ~~735-~~ 705-, 2,000-, and 5,000- milk cow dairy facility, based on the emission factor developed by CARB. Under future conditions, the number of milk cows and support stock considered in calculating ROG emissions were based on Table 5 of the Element (Theoretical Dairy Herd Capacity of Kings County).[60] In estimating the emissions for the 500-, 2,000-, and 5,000-milk cow dairies, the assumed number of support stock were based on the individual support stock to milk cow ratio provided in Table 5 of the Element (Theoretical Dairy Herd Capacity of Kings County).

Potentially 5,191 tons per year of ROG could be generated from the manure produced under future conditions at maximum buildout if no controls on emissions are implemented (Table 4.2-5a). This amount reflects approximately 51 percent of the total ROG emissions and greater than 100 percent of the ROG emissions from livestock waste decomposition estimated by CARB for Kings County in 2000. In addition, 7, 10, 27, and 68 tons per year of ROG could be generated by manure decomposition from a 500-, ~~735-~~ 705-, 2,000-, and 5,000- milk cow dairy facility, respectively (Table 4.2-5c). While ROG is not in itself a regulated pollutant, it is a precursor of ozone, which is a Federal- and State-regulated pollutant. The net increase in ROG emissions generated from cattle manure decomposition at a new or expanded dairy is considered a significant impact since the emissions from each dairy facility may exceed the SJVUAPCD significance threshold of 10 tons per year.

As discussed in Impact ~~4.2-5~~ 4.2-4 and in the Settings section, treatment technologies are currently present to reduce or prevent the release of ROG emissions into the environment from manure storage/collection systems. These treatment technologies include placement of impermeable covers over waste storage systems, composting, aerobic treatment, or anaerobic treatment of collected manure. Of these treatment technologies, aerobic and anaerobic treatment systems would also reduce or prevent the release of other air

[60] The theoretical future capacity was determined by subtracting the number of cattle at existing dairies from the total theoretical capacity of Kings County to host dairies, as provided in Table 5 of the Element.

pollutants generated from manure storage/collection systems, such as methane, ammonia, and hydrogen sulfide. In composting operations, reduction of methane and hydrogen sulfide would also be expected.

The effectiveness of these technologies in reducing ROG has not been critically evaluated. Containment of biogas in anaerobic digesters and subsequent use of biogas as electricity or fuel (i.e., combustion) would be expected to reduce ROG. Direct measurement of ROG is not typically performed during monitoring of emissions from treatment systems. Although methane levels are sometimes monitored, ROG and hydrogen sulfide are not typically monitored at anaerobic digesters. Under aerobic conditions (i.e., during effective aeration and aerobic composting), significant production of ROG would not be expected. However, production of ROG (due to anaerobic conditions) could be expected in any untreated stockpiles of manure and in open process water storage ponds that are not aggressively aerated.

Dairy Equipment and Vehicular Traffic Emissions

As described under Impact 4.2-3, implementation of the Element would result in additional internal combustion engine emissions as the result of dairy equipment operation and increased vehicular traffic generated by the expected new and expanded dairy developments. The exhaust would include increased emission of ROG and NOx. An accurate estimate of these emissions is difficult to make without knowledge of the specific location, size, and operational characteristics of the new dairies. However, a general estimate of these emissions can be made by assuming that the remaining capacity for the maximum theoretical County dairy herd could be accommodated by the development of 52 5,000-milk cow dairies. Using this assumption and the same assumptions and methodologies described for exhaust emission of PM_{10} (see Impact 4.2-3), ROG and NOx emissions for dairy equipment and vehicular traffic have been estimated. The estimated emissions for 500-, 705-, 2,000-, and 5,000-milk cow dairies are shown in Table 4.2-5c. The ROG and NOx emissions related to exhaust for 52 additional 5,000-milk cow dairies have been included in the estimate of the net increase in emissions associated with implementation of the Element as shown in Tables 4.2-5a (without controls) and 4.2-5b (with controls).

Several policies of the Element address air quality issues. **Policy DE 3.1a** requires that air quality be considered during the preparation of the countywide policy required under **Goal DE 3**. **Policy DE 5.1c** requires the preparation of a MTMP as part of a technical report to be submitted with each new or expanded dairy application. The policy requires that the technical report also present an estimate of the anticipated increase in ROG, ammonia, and methane emissions generated by manure and process water management proposed by the dairy development project.

The MTMP would provide treatment of all manure to reduce ROG, nitrous oxides, ammonia, methane, hydrogen sulfide, and odor emissions. The MTMP would describe general housekeeping practices, feed management, solid manure moisture management, the purpose and procedures for the use of additives or adsorbents, and land application methodologies which effectively minimize air pollutant emissions. The policy further requires that the MTMP include an advanced treatment technology to reduce ROG emissions for all new dairies and dairy expansions that include construction of new dairy facilities. Effective technologies include 1) controlled anaerobic treatment, 2) aerobic treatment, and 3) combined controlled aerobic/anaerobic treatment.

The MTMP would demonstrate that the proposed advanced treatment system shall meet or exceed the goal of 50 percent reduction in volatile solids in the treated manure and dairy process water. As indicated in the Settings section (Anaerobic and Aerobic Treatment Systems Efficiency), volatile solids provide the food and energy source for bacteria that essentially create and release gaseous compounds. Once the volatile solids are completely depleted from the manure, no further release of ROG emissions would result.

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.

ROG emissions for future conditions were estimated for dairies requiring the implementation of an advanced treatment system (Tables 4.2-5b and 4.2-7). Since scientific data specifying the correlated release of ROG emissions with volatile solids are currently unavailable, the estimate assumed that a corresponding 50 percent reduction in ROG emissions would be achieved with a 50 percent reduction in volatile solids. Approximately ~~369~~ 334 tons per year of ROG would be emitted from dairy expansion projects not subject to the advanced treatment requirement and ~~1,564~~ 1,581 tons per year of ROG would be emitted from new dairies and expanded dairies subject to the advanced treatment system (Table 4.2-7). The estimate indicates that the total ROG emissions would reduce from ~~3,497~~ 3,609 (no treatment) to ~~1,933~~ 1,915 (advanced treatment) tons per year (a total reduction of ~~1,564~~ 1,581 tons per year) when emissions controls required by the Element are implemented.

Policies DE ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, and **~~6.2a~~ 6.3a** provide for monitoring of dairy operations to demonstrate the Element's effectiveness in protecting the environment and the effectiveness of the mitigation measures required for each operating dairy facility in Kings County. **Policy DE ~~6.1f~~ 6.2e** specifically addresses monitoring of the MTMP and requires testing of ROG emissions when standard testing methods become available. The policy

also requires dairy owners/operators to maintain daily logs documenting general process operations, problems encountered in manure management, and actions taken to resolve problems, including modification of treatment processes.

The policies under **Goal DE ~~7~~ 6** provide a mechanism for the County to track and evaluate the monitoring program and address dairy operational problems encountered.

TABLE 4.2-7: **Estimated Manure Decomposition Emissions for Existing and Future Conditions under the Element (tons per year)**

Condition	ROG	Methane
EXISTING CONDITIONS		
Total head from existing dairies	1,694	14,804
FUTURE CONDITIONS		
Dairy expansion projects not subject to advanced treatment[1]	~~369~~ 334	~~3,221~~ 2,916
Total new dairies and dairy projects subject to advanced treatment[2]	~~1,564~~ 1,581	~~13,667~~ 13,820
Subtotal Future Conditions (Existing and Future)	~~3,627~~ 3,609	~~31,693~~ 31,541
TOTAL NET INCREASE IN EXISTING EMISSIONS FROM MANURE DECOMPOSITION (UNDER THE ELEMENT)	~~1,933~~ 1,915	~~16,889~~ 16,736

[1] The values in this table represent emissions generated from dairy expansion projects that do not exceed the ROG threshold limit and are not subject to the Element's advanced treatment requirement. The total allowable head from dairy expansion projects was estimated based on the maximum allowable expansion of the individual existing dairies without exceeding the ROG threshold limit.

[2] Dairy expansion projects that exceed the ROG threshold limit are subject to the Element's requirement for advanced treatment. The values represented in this table reflect a 50 percent reduction in ROG and methane emissions released to the environment from further decomposition of treated manure and dairy process water from implementation of an advanced treatment system.

The Element includes **Policy DE 5.1i** as a mechanism to ensure that the net increase in emissions from individual new or expanded dairy development projects would not exceed the SJVUAPCD threshold levels for ROG and NOx. The policy requires that, as part of the technical report to be submitted with each application to either establish a new dairy or expand an existing dairy, dairy applicants shall be required to estimate the anticipated net increase in ROG and NOx emissions generated from anticipated dairy equipment compared to existing conditions and demonstrate that the net increase will not exceed the SJVUAPCD threshold limits for ROG and NOx.

Mitigation Measure ~~4.2-6~~ 4.2-5

No additional feasible mitigation measures are available.

Implementation of **Policies DE 3.1a, 5.1c, 5.1i, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e,** and **~~6.2a~~ 6.3a** would be expected to reduce ~~ROG~~ ozone precursors generated from dairy facilities within the project site and would also reduce other air pollutants generated from cattle manure and equipment and vehicle exhaust. Standard testing methods are not currently readily available to quantify the reduction of ROG under each manure treatment technology. However, the VS removal efficiency level of the advanced treatment system (required under **Policy DE 5.1c**) may be considered an appropriate indicator for determining the remaining potential for treated manure to emit air pollutants to the atmosphere. An accurate method for quantifying the potential air pollutant emissions from treated manure are anticipated to be available following completion of USDA ARS research activities under the national programs.

In addition, anaerobic decomposition of manure, and the associated release of ROG emissions, would occur nearly immediately upon generation of manure and during temporary stockpiling of manure. As immediate treatment of manure is not practical, some ROG emissions would be expected even with the implementation of the MTMP. Therefore, future dairy facilities may continue to exceed the 10 tons per year SJVUAPCD threshold limit for ROG. Therefore, this impact would be considered significant and unavoidable.

Impact ~~4.2-7~~ 4.2-6

Operation of new or expanded dairies would generate ammonia emissions from cattle manure. This is a significant and unavoidable impact.

New or expanded dairies allowed under the Element could potentially generate ammonia emissions from manure generated at the facilities. Ammonia emissions would contribute to odor problems and would be expected to increase $PM_{2.5}$ generation. Potential ammonia emissions from cattle manure at the animal housing units and decomposing stored manure for future (assuming the maximum capacity of cattle are housed in the County) and typical dairy facilities (500-, ~~735-~~ 705-, 2,000-, and 5,000-cow dairies) were estimated. It should be noted, however, that additional ammonia would also be released into the environment during application of process water and stockpiled manure onto agricultural fields. However, ammonia emissions would also be expected with the use of nitrogen-rich manufactured fertilizer that would be necessary if manure were not used as fertilizer.

Similar to existing conditions, a range in emissions was calculated for future and a typical 500-, ~~735-~~ 705-, 2,000-, and 5,000-cow dairy using emission factors published in the 1994 Development and Selection of Ammonia Emission Factors, developed by Battye, et al. (1994) for the U.S. EPA (Scenario One) and from James, et al. (Scenario Two). Potentially between 7,338 and 29,821 tons per year of ammonia could be generated from future conditions (Table 4.2-5a); similarly a range between 10 and 39 tons per year, 14 and 57 tons per year, 38 and 156 tons per year, and between 96 and 390 tons per year of could be

generated at a typical 500-, ~~735-~~ 705-, 2,000-, and 5,000-milk cow dairy, respectively (Table 4.2-5c).

The lower ranges reflect the emission factors developed in 1994 and are based on the animal quantity, animal type (applicable only for the 1994 emission factor), and emission factors for decomposition of newly generated manure at the animal housing unit and decomposition of stored manure. The higher ranges reflect the emission factor developed by the University of California at Davis (74 pounds per head per year) and are based on the animal quantity at a dairy facility. This emission factor reflects the emission factor from a combination of the different cattle typically housed at a dairy facility and is not specific to the cattle type (e.g., cow, heifer, calf).

The number of cattle under future conditions was obtained from Table 5 of the Element (Theoretical Dairy Capacity of Kings County); for the typical dairy conditions, the number of support stock (dry cows, heifers, and calves) was determined using the ratio of milk cow to individual support stock and existing milk cow data provided in Table 5 of the Element (Theoretical Dairy Capacity of Kings County). Actual ammonia emissions that could be generated are highly variable and are dependent on site-specific factors as discussed above.

Ammonia is included under the State Air Toxics "Hot Spots" Information and Assessment Act (AB2588) as substances for which emissions must be estimated for facilities that exceed certain thresholds. These thresholds include facilities that emit ten tons or more of PM_{10} per year. Prior to December 1998, agricultural and livestock operations were exempted from AB2588. However, Section 44380.1 of the California Health and Safety Code has been revised and agricultural and livestock operations are now only exempt from paying fees associated with AB2588, but not from complying with the remainder of the act. Enforcement of AB2588 requirements is the responsibility of local air quality control districts. The SJVUAPCD is currently not devoting staff time to enforce AB2588 requirements on agricultural or livestock operations (Villalvazo, 1999).

In the late 1990s, an evaluation of the methods for determining ammonia emissions in the San Joaquin Valley was conducted (Coe, et al., 1998). The purposes of the study were to review existing literature to determine the most recent understanding that has evolved to date regarding ammonia emission inventories; compile an improved ammonia inventory for the San Joaquin Valley, conduct a pilot-scale field study to test the techniques to quantify ammonia emissions; and develop and demonstrate uncertainty measures. For livestock emissions, the evaluation considered the emission factors developed by Asman in 1992, as published and evaluated in the 1994 Development and Selection of Ammonia Emission Factors, developed by Battye, et al. for the U.S. EPA. The pilot study evaluated livestock, soil, and wastewater plant ammonia emissions since these sources contributed a relatively large fraction of the total inventory and because the contribution from

wastewater plants were determined to be less than previously estimated. The ammonia emission inventory concluded that livestock sources contributed 50 percent of the ammonia generated in the valley, natural soil emissions contributed 40 percent, fertilizer application contributed 6 percent, and the remaining 4 percent were from publicly owned treatment waste systems, landfills, mobile sources, miscellaneous solvents, stationary combustion, industrial sources, ammonia refrigeration, and geothermal emissions. The study indicated that the livestock population was dominated by cattle.

It is unknown whether future regulation of ammonia emissions from livestock operations would occur. While ammonia is an air pollutant of concern and is being studied, this EIR considers conservatively that emissions from the project are a significant and unavoidable impact.

As indicated in the Setting section, treatment technologies are currently ~~anaerobic~~ available to reduce or prevent the release of ammonia emissions into the environment from manure storage/collection systems, such as permeable and impermeable covers, aerobic treatment systems, and anaerobic digester systems. Of the treatment technologies available, aerobic and anaerobic treatment systems would also reduce or prevent the release of other air pollutants generated from manure storage/collection systems, such as methane, ROG, and hydrogen sulfide. Ammonia generation would not be expected in aerobic treatment systems that are designed to denitrify nitrogen compounds. In anaerobic digestion systems, ammonia that may be generated from manure treatment would be captured and combusted. However, effluent discharged from these systems would have the potential to release ammonia. Therefore, effluent produced by controlled anaerobic digestion would need to be stored in aerobic ponds (to allow conversion of ammonia to atmospheric nitrogen or nitrates) or applied immediately to crops to minimize the release of ammonia to the atmosphere.

Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, and **~~6.2a~~ 6.3a**, and policies under **Goal DE ~~7~~ 6** are also relevant to ammonia emissions from cattle manure. Although **Policy DE 3.1a** specifically addresses ammonia emissions in the development of the countywide policy, **Policy DE 5.1c** requires the preparation of an MTMP that would be implemented to reduce air pollutant emissions from the manure, including ammonia. **Policy DE 4.1b.B** requires that the timing and method of application of manure and process water to land minimize unnecessary contact with air to minimize the release of ammonia into the atmosphere. **Policy DE ~~6.1e~~ 6.2d** requires that the County set standards for implementation of the OMP and MTMP and minimally requires that quality assurance/quality control be implemented and documented. In addition, **Policy DE ~~6.1f~~ 6.2e** requires that, when standard methods for testing air emissions become available, dairy owner/operators would be required to test for ROG, hydrogen sulfide, ammonia, and methane emissions (possible odor-related gases). Because of the current lack of available standard methods to monitor the

effectiveness of the treatment technologies in reducing air pollutants (ROG, ammonia, hydrogen sulfide, and methane) and lack of regulatory standards, dairy operators can only provide VS removal efficiency level data of the selected treatment technology to the County to certify that the MTMP is being implemented as part of the monitoring program. **Policy DE ~~7.1d~~ 6.1b** requires that the Dairy Monitoring Office include a compliance specialist capable of technically reviewing monitoring programs required by the Element, including the OMP and MTMP. However, as indicated previously, there is a current lack of available standards to determine the effectiveness of manure treatment technologies in reducing ROG, hydrogen sulfide, ammonia, and methane. An accurate method for quantifying the potential air pollutant emissions from treated manure is anticipated to be available following completion of USDA ARS research activities under the national programs. This is a significant impact.

Mitigation Measure ~~4.2-7~~ 4.2-6

No additional feasible mitigation measures are available.

Implementation of **Policies DE 3.1a, 5.1c, 5.1e, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.2a~~ 6.3a,** and **~~7.1d~~ 6.1b** would be expected to reduce ammonia generated from dairy facilities and would also reduce other air pollutants generated from cattle manure. However, testing methods are not currently readily available to quantify the reduction of ammonia from the advanced treatment technology although the VS removal efficiency level of a treatment system may be considered an appropriate indicator for determining the remaining potential for treated manure to emit air pollutants to the atmosphere. In addition, temporarily stockpiled manure would release ammonia emissions. It is considered impractical to immediately treat all manure generated at dairies operated in conformance with the Element. A significance criteria for ammonia has yet to be established by SJVUAPCD and the significance of the impact of the expected ammonia releases cannot be defined at this time. Therefore, the impact would remain significant and unavoidable.

Impact ~~4.2-8~~ 4.2-7

Operation of new or expanded dairies would generate hydrogen sulfide emissions. This is a significant and unavoidable impact.

Hydrogen sulfide is an odorous compound that is also produced during anaerobic decomposition of manure (Shultz and Collar, 1993).[61] Hydrogen sulfide can cause dizziness, respiratory tract irritation, nausea, and headaches. Hydrogen sulfide emissions generated from decomposition of cattle manure are conservatively considered a significant

[61] An emission factor for hydrogen sulfide production from manure decomposition is not available.

impact since emissions may adversely affect receptors and on-site workers (e.g., odor release and health hazard).

Hydrogen sulfide is included under the State Air Toxics "Hot Spots" Information and Assessment Act (AB2588) as substances for which emissions must be estimated for facilities that exceed certain thresholds. These thresholds include facilities that emit ten tons or more of PM_{10} per year. As indicated in Impact ~~4.2-7~~ 4.2-6, enforcement of AB2588 requirements is the responsibility of local air quality control districts.[62]

California has an ambient air quality standard for hydrogen sulfide, although monitoring data are limited statewide and the San Joaquin Valley is yet to be assigned an attainment or nonattainment designation. Significance criteria for hydrogen sulfide for the San Joaquin Valley have not been developed by SJVUAPCD.

As indicated in the Setting section, treatment technologies are currently present to reduce or prevent the release of hydrogen sulfide emissions into the environment from manure storage/collection systems such as chemical additives, permeable and impermeable covers, composting, aerobic treatment, and anaerobic digestion. Of the available treatment technologies, aerobic and anaerobic treatment systems would also reduce or prevent the release of other air pollutants generated from manure storage/collection systems, such as methane, ROG, and ammonia. Composting would also reduce the release of methane and ROG emissions.

Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, and **~~6.2a~~ 6.3a**, and policies under **Goal DE ~~7~~ 6** are also relevant to hydrogen sulfide emissions from cattle manure. In summary, **Policy DE 3.1a** addresses ammonia emissions in the development of the countywide policy. **Policy DE 5.1c** requires the preparation of an MTMP that would be implemented to reduce air pollutant emissions from the manure, including ammonia. **Policies DE ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d,** and **~~6.2a~~ 6.3a** do not specifically address monitoring of the MTMP. In addition, **Policy DE ~~6.1f~~ 6.2e** requires that, when standard methods for testing air emissions become available, dairy owners/operators would be required to test for ROG, hydrogen sulfide, ammonia, and methane emissions (possible odor-related gases). Because of the current lack of available standard methods to monitor the effectiveness of the treatment technologies in reducing air pollutants (ROG, ammonia, hydrogen sulfide, and methane), dairy operators can only provide VS removal efficiency level data of the selected treatment technology to the County to certify that the MTMP is being implemented as part of the monitoring program. **Policy DE ~~7.1d~~ 6.1b** requires that the Dairy Monitoring Office includes a compliance specialist capable of technically reviewing monitoring programs required by

[62] However, the SJVUAPCD is currently not devoting staff time to enforcing AB2588 requirements for agricultural or livestock operations (Villalvazo, 1999).

the Element, including the OMP and MTMP. However, as indicated previously, there is a current lack of available standards to determine the effectiveness of manure treatment technologies in reducing ROG, hydrogen sulfide, ammonia, and methane. An accurate method for quantifying the potential air pollutant emissions from treated manure are anticipated to be available following completion of USDA ARS research activities under the national programs. This is a significant impact.

Mitigation Measure ~~4.2-8~~ 4.2-7

No additional feasible mitigation measures are available.

Implementation of **Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.2a~~ 6.3a,** and **~~7.1d~~ 6.1b** would be expected to reduce hydrogen sulfide generated from dairy facilities and would also reduce other air pollutants generated from cattle manure. However, the effectiveness of the various treatment systems in reducing hydrogen sulfide at dairies currently cannot be demonstrated since standard testing methods for emission of this pollutant from manure at dairies are not readily available although the VS removal efficiency level of an advanced treatment system (required under **Policy DE 5.1c**) may be considered an appropriate indicator for determining the remaining potential for treated manure to emit air pollutants to the atmosphere. In addition, hydrogen sulfide would be emitted by temporarily stockpiled manure. Because emission of hydrogen sulfide would be expected after mitigation and no significance criteria have been developed for this compound, the residual impact is conservatively considered significant and unavoidable in this EIR.

Impact ~~4.2-9~~ 4.2-8

Operation of new or expanded dairies would generate methane emissions from cattle and cattle manure. This is a significant and unavoidable impact.

Similar to existing conditions, new or expanded dairies would also generate methane emissions from cattle and manure management. Potential methane emissions were estimated for future (emissions from all cattle allowed under the Element) and typical 500-, ~~735-~~ 705-, 2,000-, and 5,000-milk cow dairies. Cattle digestion at new or expanded dairies the project site could potentially generate on the order of 71,000 tons per year of methane under future conditions if no emission controls are implemented (Table 4.2-5a). Potentially 93, ~~137~~ 131, 372, and 929 tons per year of methane could be emitted from cattle digestion at a 500-, ~~735-~~ 705-, 2,000-, and 5,000-milk cow dairy, respectively (Table 4.2-5c). The emissions were estimated based on EPA-developed emission factors for dairy cattle in the

western United States (U.S. EPA, 1998c) and the projected number of cows at the dairies.[63] However, the actual amount of methane generated by cattle depends on the feed quality, feeding level and schedule, and animal health.

Cattle that are productively efficient generate less methane. The EPA-developed voluntary Ruminant Livestock Efficiency Program provides beneficial practices to improve the production efficiency of ruminant livestock and, consequently, reduce methane emissions. Methane-reducing measures recommended in the program include ensuring proper herd health, nutritional feed quality, and selecting cattle that are known to be efficiently productive. The owner/operator may implement some of the methane-reducing measures, such as providing on-site cattle with a balanced ration of feed containing proper nutrients and vitamin/mineral additives, in an effort to reduce methane emissions at the dairies.

Cattle manure generated at the dairies would also release methane during the decomposition process. The amount of methane that could be released from decomposing manure under future conditions at maximum buildout (emissions from all cattle allowed under the Element) could be on the order of 45,360 tons per year (Table 4.2-5a); approximately 59, ~~87~~ 84, 238, and 594 tons per year of methane could be generated from cattle manure at a 500-, ~~735~~- 705-, 2,000-, and 5,000-milk cow dairy facility, respectively (Tables 4.2-5c). The estimates were based on the projected number of cows at each proposed dairy and emission factors for natural manure decomposition available from the Emission Inventory Procedural Manual, Methods for Assessing Area Source Emissions developed by the California Air Resources Board (CARB, 1989b; Radian, 1988).

Although the contribution to global increases of greenhouse gases by the methane generated from dairy cattle and manure decomposition from new or expanded dairies under the Element could not be quantified due to the complexities of global climatology, additional methane released to the environment would contribute to the problem of worldwide increase in greenhouse gases and would be considered a significant impact. Although Federal, State, and local regulations to enforce methane emissions have not been developed, voluntary programs established by the U.S. EPA, in coordination with other agencies, are a means to minimize or reduce methane emissions.

Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, and **~~6.2a~~ 6.3a**, and policies under **Goal DE ~~7~~ 6** are also relevant to methane emissions from cattle manure. Methane emissions for future conditions were estimated for dairies requiring the implementation of an advanced treatment system specified under **Policy DE 5.1c** (Table 4.2-5b). Similar to ROG estimations, the methane estimate assumed that a corresponding 50 percent reduction in

[63] The emission factors were based on a mechanistic model outlined in the 1993 U.S. EPA Report to Congress entitled "Anthropogenic Methane Emissions in the United States: Estimates for 1990."

methane emissions released into the atmosphere (i.e., not captured from the treatment system) would be achieved with a 50 percent reduction in volatile solids. Approximately ~~3,221~~ 2,916 tons per year of methane would be emitted from dairy expansion projects not subject to the advanced treatment requirement and ~~13,667~~ 13,820 tons per year would be emitted from new dairies and expanded dairies subject to the advanced treatment system (Table 4.2-7). The estimate indicates that the total net methane in methane emissions from manure decomposition would be reduced from ~~30,556~~ 45,360 (no treatment) to ~~16,889~~ 16,736 (advanced treatment) tons per year when emission controls required by the Element are implemented.

~~In addition, **Policy DE 5.1f** requires the preparation of a Livestock Management Plan (LMP) as part of the technical report submitted with each application to either establish a new dairy or expand an existing dairy. The policy requires that the LMP identify practices to reduce methane emissions from ruminant livestock and must be consistent with the voluntary practices incorporated in EPA's Ruminant Livestock Efficiency Program. **Policy DE 6.1g** establishes minimum standards for LMPs, including requirements for maintaining records regarding control of disease and animal health, management of sick animals, feed quality and nutritional levels, herd nutrition, and herd selection. **Policy DE 7.1d** requires that the DMO include a compliance specialist that is capable of reviewing the LMPs and dairy facility logs regarding their implementation. This is a significant impact.~~

Mitigation Measure ~~4.2-9~~ 4.2-8

No additional feasible mitigation measures are available.

Implementation of **Policies DE 3.1a, 5.1c, ~~5.1f, 6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.1g~~, ~~6.2a~~ 6.3a,** and ~~**7.1d**~~ **6.1b** would reduce methane generated from ruminant livestock and manure. However, methane would continue to be released by the dairy cattle and temporarily stockpiled manure even after the mitigation measures are implemented. Increase of methane in the atmosphere contributes to worldwide increases in greenhouse gases. To date, a numerical significance criterion for the impact of increases in greenhouse gases has not been established. Therefore, the residual impact of increased methane emissions after mitigation is considered significant and unavoidable.

~~**Impact 4.2-10**~~

~~**Increased localized and regional air pollutant emissions would be generated during operation of new or expanded dairies from vehicular traffic. This is a less-than-significant impact.**~~

~~Operation of new or expanded dairies under the Element would create a slight increase in vehicular traffic. Increased vehicular traffic would result in an increase in localized CO~~

~~levels in the project area and regional air pollutant emissions such as PM_{10} and ozone precursors, specifically ROG and NOx.~~

~~The increase in vehicular traffic associated with dairy operations would be from employee vehicles, manure haul trucks, feed trucks, milk trucks, and other miscellaneous vehicle use. The increase in vehicular traffic is considered to be minimal since heavy traffic volumes and congestion do not result from dairy operations, even for large dairies. Additional vehicular traffic from future or expanded dairies would not be expected to violate the SJVUAPCD threshold levels for CO, ROG, NOx, and PM_{10}, and is therefore, considered a less-than-significant impact.~~

~~Mitigation 4.2-10~~

~~None required.~~

Impact 4.2-9

Increased localized carbon monoxide would be generated from vehicular traffic during operation of new or expanded dairies. This is a less-than-significant impact.

The Element proposes approximately 257,312 additional milk cows and 285,654 head of support stock on land within designated DDOZs and NSOZs in Kings County. Assuming an average dairy size of approximately 1,000 milk cows, the number of new dairies that could be accommodated is about 257 new dairies, or an increase of 172 percent from the County's existing inventory of 149 dairies. Since the theoretical dairy herd is the factor limiting dairy development, development of larger dairies would result in fewer dairies being constructed.

Average daily truck traffic due to each new 1,000-cow dairy is assumed to be approximately 26 one-way vehicle trips per day. This estimate is based on information provided by recent dairy applicants on milk delivery trucks (two trips), feed delivery trucks (four trips), dry manure trucks (four trips), and workers/visitors for large dairy facilities. It is also assumed that each new dairy would include at least one new residence (16 trips). Truck trips would account for approximately 38 percent of the total estimated additional vehicular trips generated by the new dairies.

As indicated in the Transportation section, construction of approximately 257 new dairy facilities would generate approximately 6,682 daily trips to the local and regional roadway system, which would be distributed according to where each new dairies was located. The traffic added by each dairy project to any given roadway would be approximately 25 to 30 vehicle trips per day. The addition of this small amount of new dairy traffic would not exceed the capacity of the existing roadways in the agricultural areas of the County.

The SJVUAPCD considers that a project will have no potential to create a violation of the CO standard if the level of service at intersections in the project vicinity will not be reduced to LOS E or F and if the project will not substantially worsen an already existing LOS F on one or more streets or intersections in the project vicinity.

The only roadways in Kings County that are operating near capacity are located in urban areas, such as Hanford, where new dairy development would not be allowed. Therefore, based on the estimated traffic increase resulting from construction of approximately 257 new dairy facilities, the proposed project would not be considered to violate the CO standard, according to the District's guidelines. Therefore, the increase in CO emissions is considered a less-than-significant impact.

Mitigation Measure 4.2-9

None required.

Implementation of **Policy DE 3.1g** would reduce the potential for adverse queuing of traffic generated by dairy development and the potential for a significant increase in CO emissions.

Impact ~~4.2-11~~ 4.2-10

Implementation of the Element would result in a cumulative increase in PM_{10} emissions. This is a significant and unavoidable cumulative impact.

The San Joaquin Valley is currently in nonattainment for PM_{10} Federal and State standards. Operation of new or expanded dairies within the county would adversely contribute to the air basin's PM_{10} attainment problem from dairy and agricultural operations. The SJVUAPCD ~~is currently amending~~ has recently amended the Regulation VIII rules and is also conducting on-field agricultural research projects to determine appropriate control strategies. Until the research projects are completed, SJVUAPCD is strongly recommending that the voluntary conservation practices developed by SJVUAPCD and the Natural Resource Conservation Service be implemented to reduce emissions from on-field agricultural activities, including livestock management. ~~Proposed~~ Rule 8081 deals with off-field agricultural activities.

Mitigation Measure ~~4.2-11~~ 4.2-10

None available.

Although implementation of **Policies DE 5.1e, ~~5.1h~~ 5.1g, ~~5.1i~~ 5.1h, ~~6.1b~~ 6.1a, ~~6.1d~~ 6.2c, ~~6.1e,~~** and **~~7.1d~~ 6.1b** of the Element would reduce PM_{10} emissions from cumulative project operations, PM_{10} emissions could continue to be generated during cumulative operations;

therefore, the impact would constitute a significant and unavoidable adverse cumulative impact.

Impact ~~4.2-12~~ 4.2-11

Implementation of the Element would result in a cumulative increase in ~~ROG~~ ozone precursor emissions. This is a significant and unavoidable cumulative impact.

Existing dairies, as well as new or expanded dairies under the Element, are or would be generating ROG and NOx emissions during operations. ROG and NOx ~~is an~~ are ozone precursors and the San Joaquin Valley is currently in nonattainment for both the Federal and State ozone standards. Additional ~~ROG~~ ozone precursor emissions would exacerbate the valley's nonattainment conditions. Therefore, the cumulative projects would be considered to have a significant and unavoidable adverse cumulative impact on regional air quality.

Mitigation Measure ~~4.2-12~~ 4.2-11

None available.

Although implementation of **Policies DE 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e,** and **~~6.2a~~ 6.3a** would reduce or prevent the release of ~~ROG~~ ozone precursor emissions into the environment from manure storage or collection systems, ~~ROG~~ ozone precursor emissions would continue to be generated from existing, new, or expanded dairies in the County (i.e., exhaust emissions, manure stockpile, initial deposition of manure). Therefore, this impact would constitute a significant and unavoidable adverse cumulative impact.

Impact ~~4.2-13~~ 4.2-12

Implementation of the Element would result in a cumulative increase in methane emissions. This is a significant and unavoidable cumulative impact.

Increases in greenhouse gases, such as methane, to the atmosphere are an international environmental air quality problem. Manure decomposition and ruminant animal digestive systems are considered two major methane generating sources as identified by the U.S. EPA. None of the existing or approved animal feed operations in Kings County is known to be designed to prevent methane emissions. Therefore, existing, new, or expanded dairy-related feed operations would most likely be generating methane emissions from dairy operations. New or expanded dairies under the Element would further increase the amount of methane generated within the County from confined animal facility operations.

Mitigation Measure ~~4.2-13~~ 4.2-12

None available.

Even with the implementation **Policies DE 3.1a, 5.1c, ~~5.1f~~, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.1g~~, ~~6.2a~~ 6.3a,** and ~~7.1d~~ 6.1b of the Element, some methane emissions would still be generated from cumulative projects. Therefore, methane emissions generated from the cumulative projects would be considered to result in a significant unavoidable and adverse cumulative impact.

Impact ~~4.2-14~~ 4.2-13

Implementation of the Element would result in a cumulative increase in hydrogen sulfide emissions. This is a significant and unavoidable cumulative impact.

New and expanded dairies under the Element, as well as existing animal feed operations in the County would or are generating hydrogen sulfide emissions during operation activities. None of the existing confined animal facility operations in Kings County is known to be designed to prevent hydrogen sulfide emissions. The cumulative projects would further increase the amount of hydrogen sulfide generated in the project vicinity from confined animal facility operations.

Mitigation Measure ~~4.2-14~~ 4.2-13

None available.

Hydrogen sulfide emissions would continue to be generated from cumulative project operations even with the implementation of **Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.2a~~ 6.3a,** and ~~7.1d~~ 6.1b in the Element. Therefore, this impact would constitute a significant and unavoidable adverse cumulative impact.

Impact ~~4.2-15~~ 4.2-14

Implementation of the Element would result in a cumulative increase in ammonia emissions. This is a significant and unavoidable cumulative impact.

New and expanded dairies under the Element, in addition to existing animal feed operations in the County, would or are generating ammonia emissions during operation. None of the existing or approved confined animal facility operations in Kings County is known to be designed to prevent ammonia emissions. The cumulative projects would further increase the amount of ammonia generated in the project vicinity from confined animal facility operations.

Mitigation Measure ~~4.2-15~~ 4.2-14

None available.

Ammonia emissions would continue to be generated from cumulative project operations even with the implementation of **Policies DE 3.1a, 5.1c, ~~6.1b~~ 6.1a, ~~6.1e~~ 6.2d, ~~6.1f~~ 6.2e, ~~6.2a~~ 6.3a**, and **~~7.1d~~ 6.1b** in the Element. Therefore, this impact would constitute a significant and unavoidable adverse cumulative impact.

4.3 WATER RESOURCES

4.3 WATER RESOURCES

This section describes the existing hydrological setting for the County, including a discussion of water quality, based on published and unpublished reports and data compiled by regional agencies. Agencies contacted include the United States Geological Survey, the California Department of Water Resources, and the Central Valley Regional Water Quality Control Board. This section also identifies impacts that may result from the project.

SETTING

CLIMATE

The local climate is considered warm desert receiving approximately six to eight inches of rainfall per year (U.S. Department of Agriculture, 1986). Rainfall occurs primarily in the winter months, with lesser amounts falling in late summer and fall. Kings County would also be considered a dry climate since evaporation greatly exceeds precipitation.[1] A common characteristic of dry climates, other than relatively small amounts of precipitation, is that the amount of precipitation received each year is highly variable. Generally, the lower the mean annual rainfall, the greater the year-to-year variability (Lutgens and Tarbuck, 1979).

SURFACE WATER HYDROLOGY

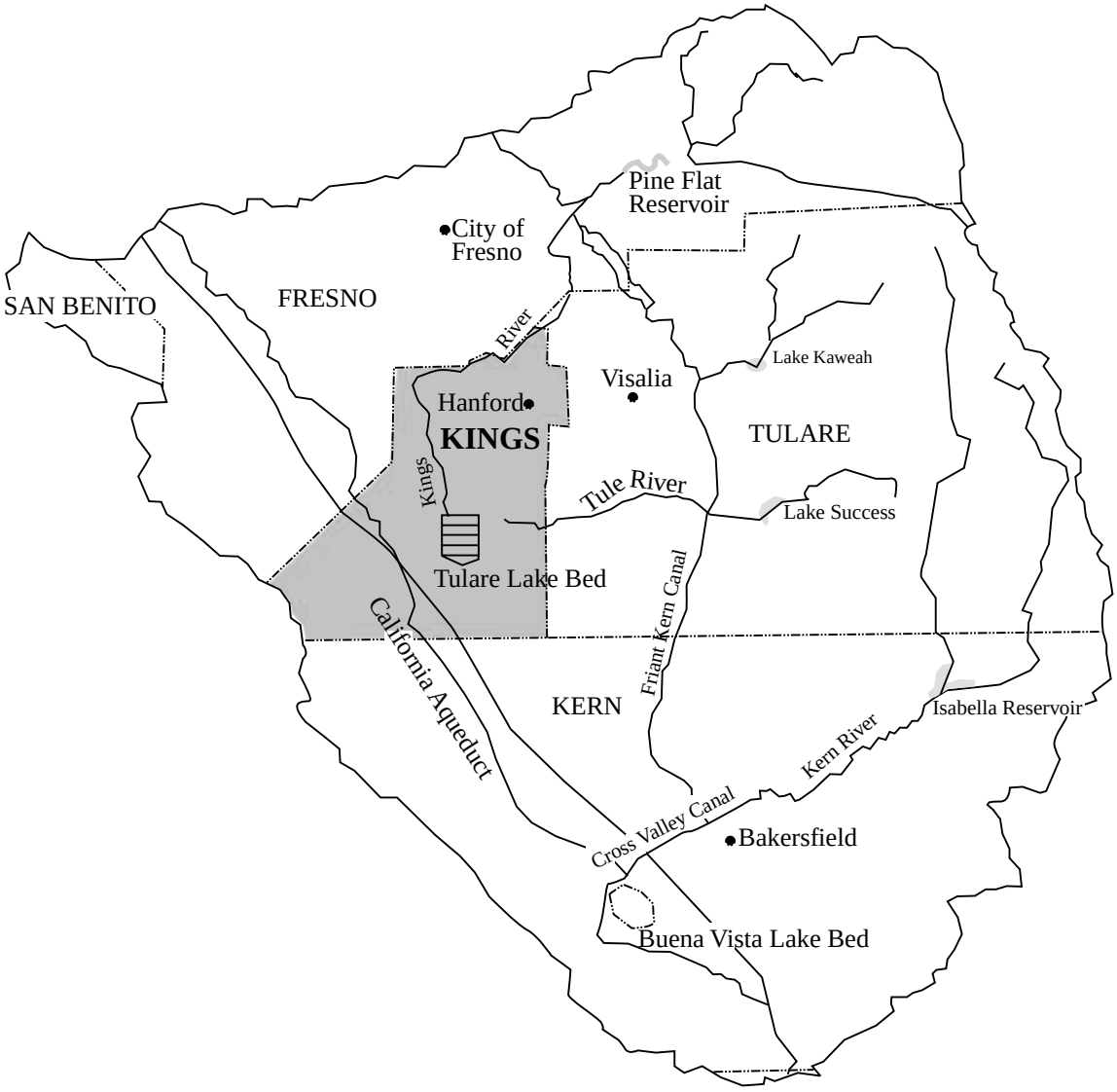
The County is part of a hydrologic system referred to as the Tulare Lake Basin (Figure 4.3-1). The management of water resources within the Tulare Lake Basin is a complex activity and is critical to the region's agricultural operations.

The County can be divided into three main hydrologic subareas: the northern alluvial fan and basin area (in the vicinity of the Kings, Kaweah, and Tule rivers and their distributaries), the Tulare Lake Zone, and the southwestern uplands (including the areas west of the California Aqueduct and Highway 5) (Figure 4.3-2).

The alluvial fan/basin subarea is characterized by southwest to south flowing rivers, creeks, and irrigation canal systems that convey surface water from the Sierra Nevada to the west toward the Tulare Lake Bed. The dominant hydrologic features in the alluvial fan/basin subarea are the Kings, Kaweah, and Tule rivers and their major distributaries.

[1] The class "A" pan evaporation rate in an irrigated pasture environment is approximately 79 inches per year within the area of Kings County (California Department of Water Resources, 1979).

HYDROLOGY OF TULARE LAKE REGION Figure 4.3-1



Approximate
0 28 Miles

Source: Modified from California Department of Water Resources, 1993, p.317.

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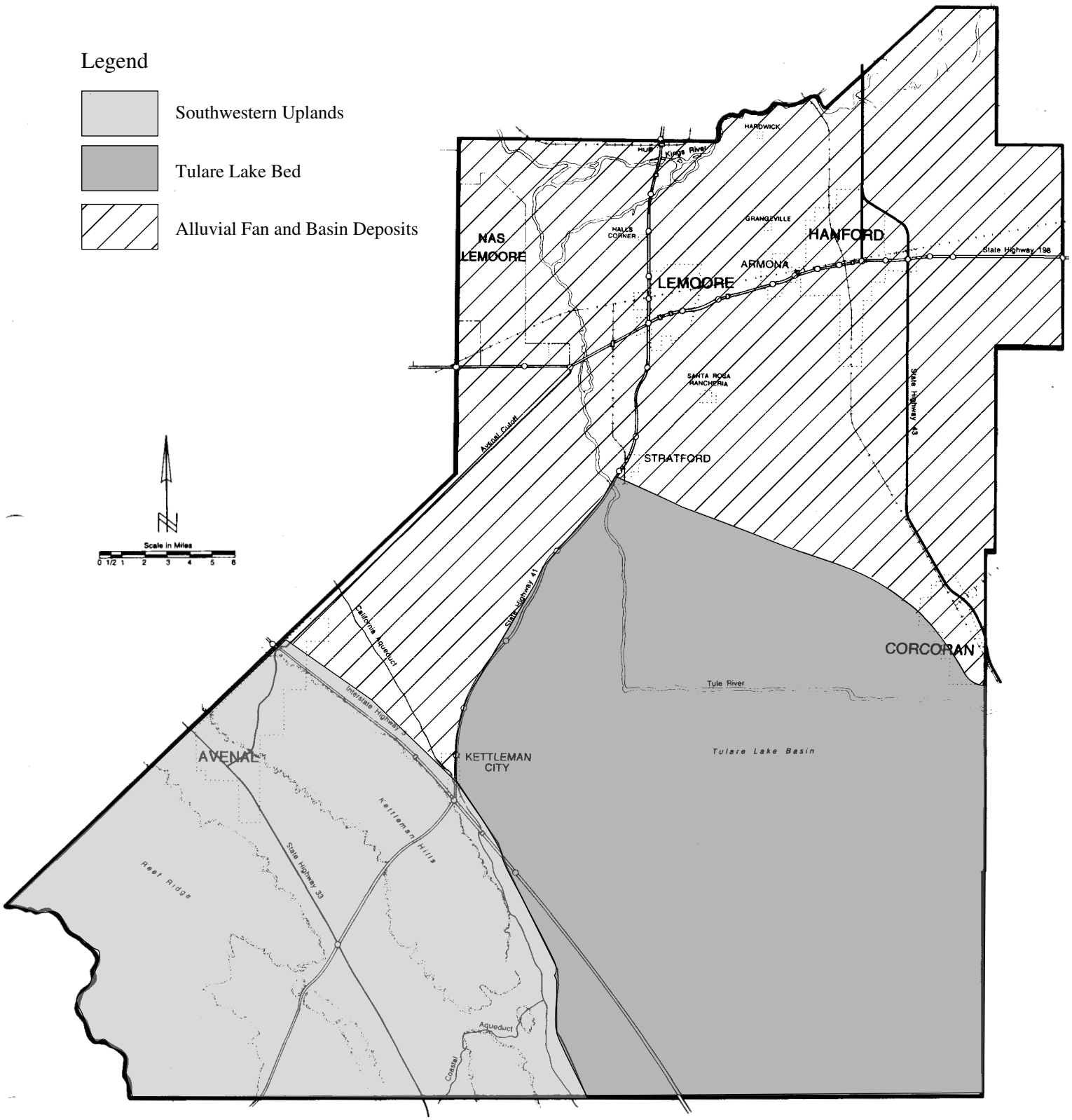
GROUNDWATER BASIN SUBAREAS Figure 4.3-2



BASELINE

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The Kings River, which is the primary source of irrigation water for the area, is regulated by the Pine Flat Dam east of Fresno. The Kings River provides irrigation water to more than one million acres of agricultural land in Fresno, Tulare, and Kings counties (Kings County, 1993a).

Tulare Lake Bed is a remnant of a much larger Pleistocene lake that once occupied most of the basin (Bertoldi, et al., 1991). Historically, much of the southern San Joaquin Valley drained to the historic Tulare Lake Basin, and the basin remains one of internal drainage (i.e., no streams or rivers flow out of the basin). In the event of extreme rainfall and flooding of the basin, surface water would flow north from the basin to the San Joaquin River (RWQCB, 1995).

The southwestern upland area represents the eastern extension of the Coast Ranges into the valley, and is characterized by northwest to southeast trending valleys and ridges. The ridge tops within this subarea reach elevations of up to 3,500 feet National Geodetic Vertical Datum (NGVD) in the western portion of the County. In contrast, the lowest elevation of the lake bed is approximately 175 feet NGVD. In general, surface water drainage from the upland subarea flows toward the valley to the east.

Flooding

Portions of the County are located in the 100-year flood hazard area (Figure 4.3-3) as mapped by the Federal Emergency Management Agency (FEMA). The flood hazard areas are mainly along the Kings River and Cross Creek corridors and in the Tulare Lake Bed area.

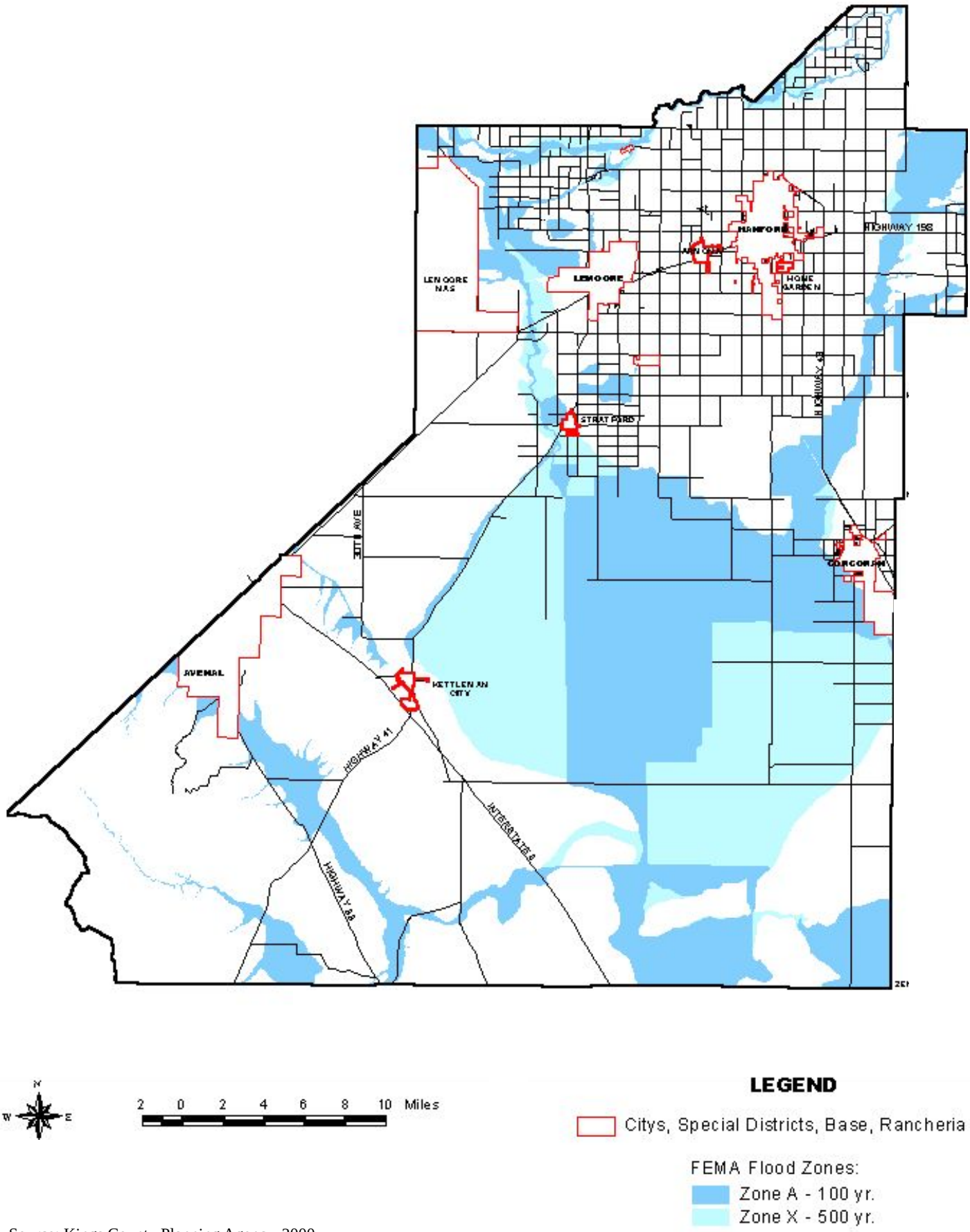
The County includes regions that are within the mapped flood inundation areas that would result from failure of Pine Flat Dam, Success Dam, and Terminus Dam, located to the northeast and east, respectively. In the event of a failure of any of these dams, flood waters would not reach the County line for hours (Kings County, 1993). The extremely low probability of the occurrence of dam failure, large volume of flood water available for dilution of potential pollutants, and the relatively long warning period to ready the dairy sites for flooding indicate that inundation related to dam failure would not be a significant impact of the project.

GROUNDWATER HYDROLOGY

The County can be divided into three groundwater subbasins, similar to the surface water hydrologic subareas discussed above, based on the hydrogeologic characteristics of the subsurface. The three subbasins include: 1) the northern alluvial fan and basin deposits, 2) the central and southeast lacustrine and marsh deposits (Tulare Lake Bed), and 3) the southwestern uplands (Figure 4.3-2).

FLOOD HAZARD ZONES

Figure 4.3-3



Source: Kings County Planning Agency, 2000.

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Alluvial Fan and Basin Deposits/Lacustrine and Marsh Deposits. The main difference between these two subbasins is the near-surface hydrogeology. The alluvial fan subbasin near-surface geology is characterized by a heterogeneous mixture of poorly sorted clay, silt, sand, and gravel, and in 1989, depth to first groundwater was measured to range from approximately 2.8 to 16.1 feet below the surface (Fujii, et al., 1995). The Tulare Lake Bed subbasin near-surface geology is characterized by silt and clay deposits with a minor amount of sand, and in 1989, depth to first groundwater was measured to range from approximately 2.2 to 9.0 feet below the surface (Fujii, et al., 1995).

In both subbasins, shallow groundwater (above a depth of approximately 250 to 900 feet above the E clay) occurs in unconfined[2] or semi-confined water-bearing zones, while deeper groundwater is confined. The shallow and deep aquifers are separated by the E clay, a laterally extensive clay layer within the Corcoran Clay Member of the Tulare Formation. The E clay is the most extensive lacustrine[3] clay in the entire Central Valley, covering an area of approximately 5,000 square miles (Page, 1986; Croft, 1972).

The shallow water-bearing zone is composed of alternating layers of silt, clay, and sand. Six of the most laterally extensive clay layers have been designated, from youngest to oldest, with the letters A through F (Croft, 1972). For the purposes of this discussion, the E clay, described above, is considered the bottom of the shallow water-bearing zone. Groundwater occurs at various depths within the shallow zone, since partially-confining clay layers or lenses occur throughout. In the Tulare Lake Bed subbasin, water levels were found to stabilize in wells installed to depths of 20, 56, 103, and 200 feet at 9.1, 15.7, 28.3, and 54.6 feet below the surface, respectively (Fujii, et al., 1995).

The deeper aquifer (below the E clay) is confined and, therefore, groundwater is under hydraulic pressure in this zone. Water rises up into wells installed in the deep aquifer to a level of approximately 150 to 200 feet below the ground surface (Kings County, 1993a).

Southwestern Uplands. In general, groundwater supplies are limited in the southwestern upland subarea. The relatively small valleys are isolated from surface water recharge; no major rivers or creeks flow through the subarea. In addition, the uplands are located on the eastern side of the Coast Range, and therefore experience a "rain shadow" effect. The area receives approximately six inches of rainfall per year (USDA, 1986), which does not provide a substantial amount of recharge to the aquifers in the isolated valleys (e.g., the

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[2] An unconfined aquifer is one in which the surface of the water table is free to move up and down and is not "confined" by a low permeability soil or rock layer.

[3] "Lacustrine" clays were deposited on the bottom of a lake. In this case, the deposits are primarily composed of silt and clay with some sand layers.

Kettleman Plain and Sunflower Valley). Groundwater is typically more than 200 to 300 feet below the ground surface (DWR, 2000).

WATER QUALITY

The quality of surface and ground water at the project site is affected by land uses within the watershed and the composition of subsurface geologic materials. Water quality in surface and ground water bodies is regulated by the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB). The County is under the jurisdiction of the Central Valley RWQCB, which is responsible for implementation of State and Federal water quality protection guidelines in the vicinity of the project site. The RWQCB implements the Water Quality Control Plan for the Tulare Lake Basin (Basin Plan) (California RWQCB, 1995), a master policy document for managing water quality issues in the region. The Basin Plan establishes beneficial water uses for waterways and water bodies within the region. Beneficial uses of surface waters in the Central Valley include water contact recreation, noncontact water recreation, industrial service supply, irrigation supply, navigation, shellfish harvesting, fishing, and preservation of rare and endangered species. Beneficial uses of the Tulare Lake Basin groundwater aquifer (the aquifer underlying the site) include municipal and domestic supply, industrial process supply, industrial service supply, agricultural supply, and wildlife habitat.

Surface Water Quality

The quality of runoff is regulated by the Federal National Pollutant Discharge Elimination System (NPDES) Nonpoint Source Program (established through the Clean Water Act); the NPDES Nonpoint Source Program objective is to control and reduce pollutants to water bodies from nonpoint discharges. The Program is administered by the California Regional Water Quality Control Boards. Dairy projects implemented under the Element would be required to comply with the general nonpoint source permits covering both construction activities and operation-period industrial activities.

General Construction Permit

Projects disturbing more than five acres of land during construction are required to file a Notice of Intent (NOI) with the RWQCB to be covered under the State NPDES General Construction Permit for discharges of storm water associated with construction activity. A developer must propose control measures that are consistent with the State General Permit. A Storm Water Pollution Prevention Plan (SWPPP) must be developed and implemented for each site covered by the general permit. A SWPPP should include Best Management Practices (BMPs) designed to reduce potential impacts to surface water quality through the construction and life of the project.

General Industrial Permit

The control of nonpoint source runoff from industrial sources and associated pollutants is regulated in California by the State Water Resources Control Board under the statewide General Permit for Stormwater Discharges Associated with Industrial Activities Order No. 97-03-DWQ. The General Permit presents the requirements for compliance of certain industries with the NPDES. A wide range of industries is covered under the general permit, including mining operations, lumber and wood products facilities, petroleum refining, metal industries, and some agricultural product facilities such as dairies.

In an effort to address the need to permit numerous dairies throughout the Central Valley, the RWQCB adopted General Waste Discharge Requirements for Milk Cow Dairies (Order No. 96-270), which established the specifications for dairy manure management and an application process for dairy operations intending to comply with the requirements of the Clean Water Act. These waste discharge requirements represent more specific requirements for the dairy industry than the requirements of the General Industrial Permit.

In practice, very few dairies in the Central Valley region are currently operating under Order No. 96-270 (Wass, 1999), which presents facility design and operation requirements that address potential sources of pollution from both storm water runoff and application of manure and dairy process water to land. The General Industrial Permit described above covers only the potential sources of pollution from runoff. In the past, dairy operators have typically requested, and received, waivers of the RWQCB waste discharge requirements described under Order No. 96-270, and opted to comply with the NPDES requirements under the General Industrial Permit.

Groundwater Quality

The groundwater basin in the Kings County portion of the San Joaquin Valley is an internally drained and closed basin. It has no appreciable surface or subsurface outflow, except in extremely wet years. Salts (generally measured as total dissolved solids [TDS]) are introduced into the basin with imported water supplies. Although the water may leave the basin by evaporation or evapotranspiration, the majority of the salts stay behind, potentially leading to a build-up of salt in the soil and groundwater. Excessive salt loading can result in a degraded water supply, particularly if concentrations exceed the Secondary Drinking Water standard of 500 mg/L. Salt loading of managed groundwater basins is an important issue throughout the San Joaquin Valley. In addition, many of the naturally-occurring deposits in the vicinity of the project site are of marine origin and, therefore, have high salt content.

The distribution of TDS and trace elements in the Tulare Lake Basin was assessed by the U.S. Geological Survey (USGS) to evaluate potential problems associated with disposal of irrigation drain water containing elevated levels of selenium and other trace elements

(Beard, et al., 1994; Fujii, et al., 1995). In 1983, deformities of embryos and young waterfowl associated with elevated selenium concentrations were discovered at Kesterson Reservoir (Tulare Lake Drainage District, 1988). The concern was that the disposal of irrigation drain water into evaporation ponds of the Tulare Lake Basin (the same practice employed at Kesterson) could concentrate the trace elements to levels that could be harmful to wildlife.

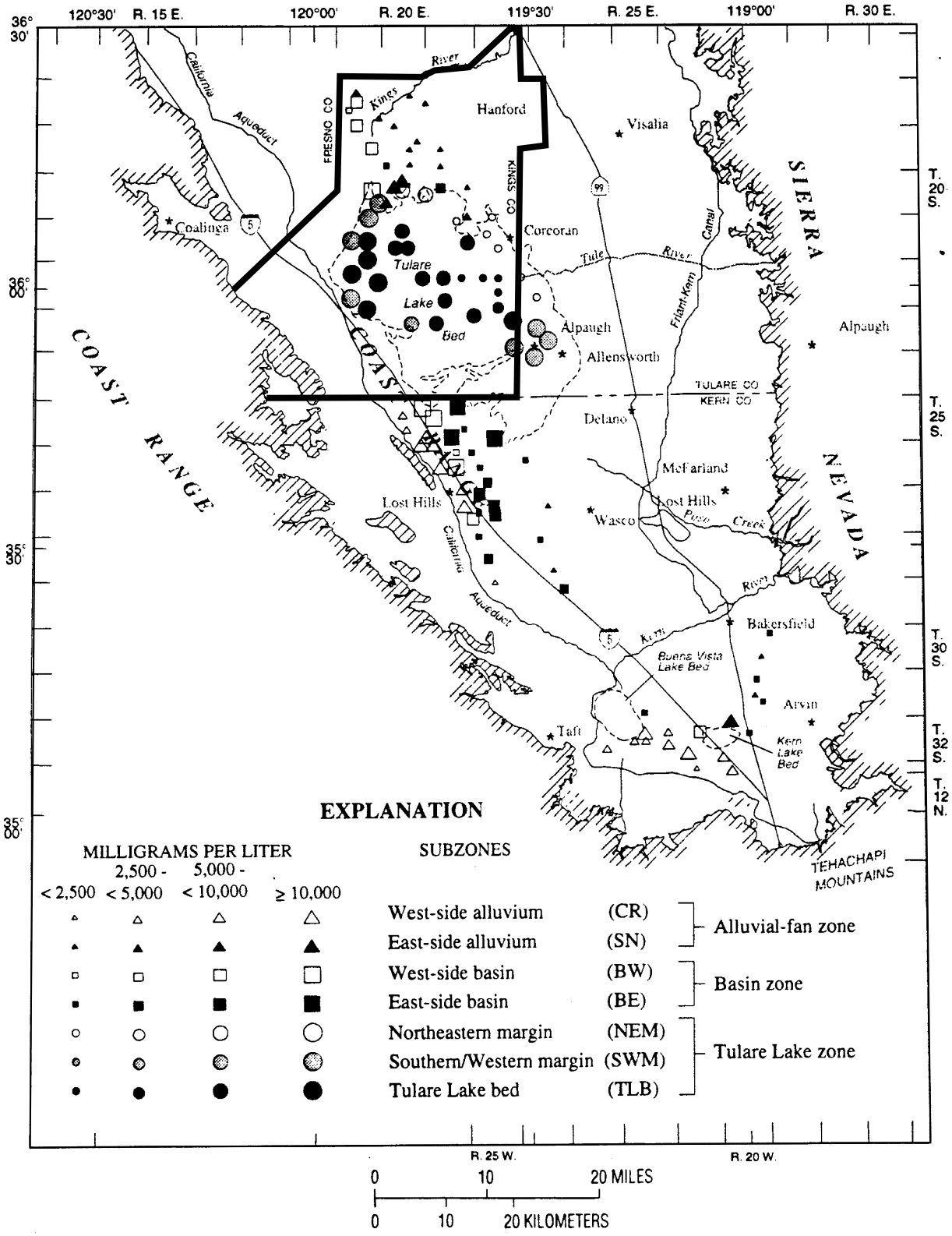
The results of the USGS study regarding TDS are summarized on Figure 4.3-4, which indicates that much of the shallow groundwater in the Tulare Lake Bed and alluvium/basin areas contains elevated levels of TDS, far in excess of the EPA's secondary drinking water standard of 500 mg/L. In general, water quality improves with depth. The deeper confined aquifer below the E-clay has been reported to contain water with TDS levels ranging from 179 to 569 mg/L (Kings County Planning Agency, 1999).

Additional analysis of shallow groundwater quality was conducted during the evaluation of environmental effects of the evaporation ponds northeast of Corcoran operated by the Tulare Lake Drainage District (TLDD). Water quality data collected from the tile drains and shallow monitoring wells in the vicinity of the TLDD evaporation ponds indicate that the perched (uppermost) groundwater in the central portion of the Tulare Lake Bed exceeds drinking water quality standards for total dissolved solids (and electrical conductivity), sulfate, chloride, and other constituents. The findings presented in the RWQCB 1993 Waste Discharge Requirements (WDR) for the TLDD evaporation ponds included a determination (#32) that the perched groundwater in the vicinity (within one mile) of the ponds "cannot be used for municipal or domestic supply without extensive treatment" and "is therefore not expected to supply a public water system." Finding #31 suggests that groundwater within the Tulare Lake Basin with total dissolved solids (TDS) concentration in excess of 3,000 mg/L is not suitable as a drinking water supply.

As described above, the hydrogeology of the Kings County area has played an important role in the development of the conditions that resulted in the presence of high salinity near-surface groundwater. The contribution of human activities (i.e., agriculture, groundwater pumping, water transfers) on the salt balance is less clear. A United States Geological Survey (USGS) study of the Sacramento Valley of California was conducted to determine whether human activities had affected groundwater quality through time (Bertoldi, et al., 1991). Significant increases in TDS and nitrates have been observed since the 1950s, indicating that groundwater quality was degraded as a result of increasing application of agricultural chemicals and growth of urban populations. No similar studies for the San Joaquin Valley were reported, but "because agricultural practices in the San Joaquin Valley are similar to those of the Sacramento Valley, it is likely that groundwater quality in the San Joaquin Valley is also degrading as a result of human activity."(Bertoldi, et al., 1991).

DISTRIBUTION OF SALINITY, TULARE BASIN, CALIFORNIA

Figure 4.3-4



Source: Fujii, et al., 1995.

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The results of a subsequent study conducted by the USGS on nitrate and pesticide trends in groundwater in the eastern San Joaquin Valley (Dubrovsky, et al., 1998) indicate that groundwater drinking water supplies have been degraded by fertilizers and pesticides. Of approximately 100 various types of wells monitored, nitrate concentrations exceeded U.S. EPA drinking water standards about one-fourth of the time and pesticides were identified about two-thirds of the time (although mostly at low concentrations).

As stated in the Basin Plan (1995 - page IV-1):

> *The greatest long-term problem facing the entire Tulare Lake Basin is the increase of salinity in groundwater. Even though an increase in the salinity of groundwater in a closed basin is a natural phenomenon, salinity increases in the Basin have been accelerated by man's activity, with the major impact coming from intensive use of soil and water resources by irrigated agriculture. Salinity increases in groundwater could ultimately eliminate the beneficial uses of this resource. Controlled groundwater degradation by salinity is the most feasible and practical short-term management alternative for the Tulare Lake Basin.*

RELEVANT GOALS, OBJECTIVES, AND POLICIES

The Kings County Draft Dairy Element (Appendix A) includes goals, objectives, and policies that address hydrology and water quality issues. Specifically, **Goal DE 1** proposes to restrict dairies to locations where they are most compatible with surrounding land uses and environmental constraints (including flood hazard areas and areas of high groundwater); **Objective DE 1.2** commits the County to using specific ~~criteria~~ standards to avoid associated land use conflicts. **Policy DE 1.2c** states that dairy facilities, including manure and dairy process water storage areas, shall not be located in Special Flood Hazard Areas (as designated by FEMA). However, dairy manure and process water could be transported into the flood hazard areas and applied to land if appropriate safeguards are implemented. **Policy DE 1.2d** would not allow dairy facilities or manured areas (including corrals and process water ponds) to be located in areas of high groundwater (defined as groundwater within five feet of the surface) without specific approved mitigation measures designed to protect groundwater quality. In addition, **Policy DE 1.2f** would not allow new or expanded dairies in the hilly uplands of the southwest portion of the County where it would be considered difficult to contain dairy manure and process water (and therefore protection of surface water quality would be more difficult).

Goal DE 3 proposes to develop a countywide policy for the evaluation and distribution of dairies and (**Objective DE 3.1**) to consider potential environmental effects of dairies when reviewing proposals for new or expanded facilities. One of the specific siting criteria (included as part of **Policy DE 3.1a**) is consideration of groundwater and surface water quality and quantity. **Objective DE 3.2** proposes that the suitability of a site be evaluated based on its ability to adequately manage generated waste. **Policy DE 3.2a** provides

specific hydrologic conditions that should be evaluated when siting dairy facilities. **Policy DE 3.2c** proposes a 150-foot setback of manured areas (at the dairy facilities) from surface water features and flood plains. **Policy DE 3.2d** would prohibit discharge of dairy process water to surface water features. **Policy DE 3.2f** would require implementation of monitoring programs to ensure that each dairy attains the desired results and significant adverse impacts are avoided.

Goal DE 4 proposes the use of comprehensive ~~system~~ manure nutrient management techniques in the operation of dairies. **Objective DE 4.1** would require that a ~~Comprehensive~~ Manure Nutrient Management Plan be submitted with each new or expanded dairy application. **Policy DE 4.1a** includes several specific provisions for proper handling and storage of manure to prevent water pollution. The provisions of this policy require dairies to demonstrate that clean water is diverted away from manured areas. In addition, the policy sets specific standards for minimizing infiltration of dairy process water from storage ponds. These provisions are discussed in Impact 4.3-7. **Policy DE 4.1b** would establish requirements for manure management, including maintenance of nutrient balance between land application and crop. Under **Policy DE 4.1c**, operators would be required to implement appropriate land management techniques to ensure that runoff of soil, nutrients, organic matter, and pathogens would be minimized. In addition, **Policy DE 4.1d** would mandate appropriate management of dead animals to protect surface and groundwater quality. Under **Objective DE 4.2,** dairy operators would have to prepare and submit a Comprehensive Dairy Process Water Application Plan with each new or expanded dairy application. **Policy DE 4.2a.B** would require an enforceable and recordable agreement specifying the terms of off-site use of the dairy's process water and manure. **Policy DE 4.2a.A** requires dairy operators to identify land available for reuse of process water and manure and estimate the amount of water and manure generated by the dairy (and the salt and nitrogen content). Additionally, the policy requires the operator to provide substitute acreage for any identified lands that are sold or to reduce the dairy herd in response to loss of available land.

Goal DE 6 would implement a monitoring program to demonstrate the effectiveness of the provisions of the Element and associated mitigation measures, and would allow for adjustments in dairy operations, if deemed necessary, to protect the environment (**Objective DE ~~6.1~~ 6.2**). ~~**Policies**~~ **Policy DE ~~6.1a~~ 6.2a** through ~~**6.1c**~~ **6.2b** would establish baseline environmental conditions, monitor the bovine carrying capacity of the county, and develop a database of dairy characteristics. **Objective DE ~~6.2~~ 6.3** would implement a monitoring program for each dairy. Under **Policy DE ~~6.2a~~ 6.3a**, each dairy would have to implement annual testing to demonstrate that the facility is operating under approved conditions and, if conditions are violated, would be subject to modification of the operation. **Policy DE ~~6.1h~~ 6.2f** establishes that a groundwater quality monitoring program be required of all approved dairies.

Goal DE ~~7~~ 6 and **Objective DE ~~7.1~~ 6.1** would establish a Dairy Monitoring Program in the Kings County Planning Agency. **Policies DE ~~7.1a~~ 6.1a.A** through **~~7.1c~~ 6.1a.C** establish procedures for, and requirement of, the ~~newly formed agency~~ Dairy Monitoring Program, including tracking individual dairies, problem resolution, and regular reporting to the Planning Commission. The Dairy Monitoring Program would be responsible for matters related to protection of water quality, as well as other issues.

~~**Goal DE 8** would establish the goal of bringing all existing non-permit holding dairies in Kings County into voluntary conformance with the provisions of the Element by the end of 2006. The objective (**Objective DE 8.1**) is to reduce the effect of the existing dairies on the environment (including impacts to water quality). **Policies DE 8.1a** and **8.1b** would implement a Dairy Conformance Program for existing dairies, promote cooperation with industry programs and dairy operators and work with the legislature to meet operating standards. **Policy DE 8.1c** states that the Element does not guarantee that a dairy that does not meet the specified standards will be able to come into conformance.~~

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The CEQA guidelines indicate that a project may have a significant effect on the environment, if it would:

- Violate any water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;
- Create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff;
- Otherwise substantially degrade water quality;

- Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;

- Place within a 100-year flood hazard area structures that would impede or redirect flood flows;

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;

- Inundation by seiche, tsunami, or mudflow.

The discussion of potential impacts and mitigation measures presented below first addresses **construction-period** erosion/chemical releases and associated degradation of water quality (Impact 4.3-1). Potential **operation-period impacts to surface water hydrology and water quality** are discussed under Impacts 4.3-2 (drainage patterns), 4.3-3 (increase in impervious surfaces), 4.3-4 (flood hazards), and 4.3-5 (surface water quality). Potential **operation-period impacts to groundwater supply and quality** are discussed under Impacts 4.3-6 (water supply), 4.3-7 (pollutant loading of groundwater), 4.3-8 (poorly constructed wells), and 4.3-9 (cumulative impacts to groundwater quality).

Impact 4.3-1

Construction activities associated with new or remodeled dairies could result in degradation of water quality in receiving waters by reducing the quality of storm water runoff. This is a less-than-significant impact.

Construction and grading associated with new or remodeled dairies would require temporary disturbance of surface soils and may result in removal of existing soil cover. During the construction period, grading and excavation activities would result in exposure of soil to runoff and wind, potentially causing erosion. Soil stockpiles and excavated areas of the project site may be exposed to wind erosion and runoff and, if not managed properly, the eroded materials could increase sedimentation at and away from the site.

The potential for chemical releases is present at most construction sites. Once released, substances such as fuels, oils, paints, and solvents could be transported to ditches and/or groundwater in wash water and dust control water, potentially reducing the quality of the receiving waters. Any runoff from the project (expected to be limited, if occurring at all) would be collected in the ditches and process water ponds at the project site and would not be expected to discharge to surface water canals. Potential chemical releases at the construction sites that may result in water quality impacts are regulated by the NPDES permitting process.

Prior to the initiation of grading, the owner/operator of the proposed dairies would be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) designed to reduce potential impacts to water quality during construction of the project. The SWPPP would include:

- Specific and detailed BMPs designed to mitigate construction-related pollutants. These controls would include practices to minimize the contact of construction materials, equipment, and maintenance supplies (e.g., fuels, lubricants, paints, solvents, adhesives) with storm water. The SWPPP would specify properly designed centralized storage areas that keep these materials out of the rain and/or protected from the wind.

  Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel or asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching and sand fences can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting on-site vehicle traffic to 15 miles per hour, and controlling the number and activity of vehicles on a site at any given time.

  The SWPPP is required to specify a monitoring program to be implemented by the construction site supervisor. RWQCB personnel, who may make unannounced site inspections, are empowered to levy appropriate fines if it is determined that the SWPPP has not been properly prepared and implemented.

The Element does not specifically discuss potential impacts to surface water quality associated with construction activities. However, implementation of existing regulations (including the construction period SWPPP) would reduce this potential impact to a less than significant level without additional mitigation.

Mitigation Measure 4.3-1

None required.

Impact 4.3-2

Projects implemented under the Element could modify surface water drainage patterns, potentially causing localized off-site migration of runoff, erosion, and/or flooding. This is a less-than-significant impact.

The Element includes several policies that would reduce the potential impacts associated with alteration of drainage patterns. **Policy DE 1.2c** restricts dairy facilities to locations outside the 100-year flood hazard area, and therefore grading projects associated with construction of dairies and process water storage ponds would not be conducted in the 100-year flood plain. This policy would effectively minimize alteration of drainage patterns in areas subject to flooding. In addition, **Policy DE 1.2f** restricts dairies in the southwestern upland area (west of Interstate-5 and the California Aqueduct) where grading could create drainage and process water containment problems in areas of excessive slopes.

The area designated as acceptable for location of dairy facilities is relatively flat, and therefore minor changes in grade could alter the direction of surface water runoff. Grading associated with development or redevelopment could cause runoff to be directed away from a dairy site, toward an adjacent property, or into a surface water feature potentially affecting water quality. Site-specific drainage control is necessary to ensure that runoff is properly managed. **Policy DE 3.2c** establishes a minimum setback of 150 feet between manured areas and water wells or surface water bodies. **Policy DE 3.2d** requires that no process water be discharged to surface water features. To ensure that irrigated fields are properly drained, **Policy DE 4.1b.C** requires dairy operators to present an irrigation management program to the County Planning Department that ensures that irrigation water and runoff from fields at each dairy unit would not be allowed to migrate away from the site or into surface water bodies (i.e., features other than tailwater ponds).

Conformance with State Confined Animal Facility regulations and implementation of **Policies DE 1.2c, 1.2f, 3.2c, 3.2d, 4.1b, and 4.1c** would reduce impacts associated with runoff from dairy facilities to a less-than-significant level.

Mitigation Measure 4.3-2

None required.

Impact 4.3-3

Implementation of the proposed project would result in an increase in impervious surfaces, potentially increasing runoff volumes and velocities. This is a less-than-significant impact.

The construction of roofed structures (e.g., barns, support buildings, and residences) and pavement (e.g., roads, manure storage pad, parking lots) would result in an increase in impervious surfaces at each of the facilities developed under the Element. Impacts related to an increase in impervious surfaces generally relate to increases in runoff volume and velocity. However, in the case of confined animal facilities, there are also water quality implications (refer to Impact 4.3-5).

Under existing State regulations, confined animal facilities shall be designed and constructed to retain all facility wastewater generated, together with all precipitation on, and drainage through, manured areas during a 25-year, 24-hour storm event (CCR Title 27, Division 2, Subdivision 1, Chapter 7, Subchapter 2 Section 22562(a)). All precipitation and surface drainage outside of manured areas shall be diverted away from manured areas unless it would be fully retained (CCR Title 27, Division 2, Subdivision 1, Chapter 7, Subchapter 2, Section 22562~~(a)~~ (b)).

The runoff from increased impervious surfaces outside of manured areas may be substantial during intense storm events. However, the annual rainfall amount for the County is relatively low, and under normal circumstances, little runoff would be expected. Further, the County Public Works Department maintains minimum requirements for storm drainage facilities and would ensure that any project implemented under the Element would include an adequate drainage system.

Compliance with existing regulations and programs would reduce the impact to a less-than-significant level without additional mitigation.

Mitigation Measure 4.3-3

None required.

Impact 4.3-4

Dairies located in flood-prone areas could be damaged or rendered temporarily inoperable during a flood event. In addition, flood waters could inundate dairy facilities (manured areas and/or process water storage facilities) and fields where wet or dry manure had been recently applied causing impacts to surface water quality. This is a less-than-significant impact.

A substantial portion of the County, particularly along the Kings and Tule rivers and Cross Creek, and in the Tulare Lake Bed area, is located in the 100-year flood hazard zone as mapped by FEMA (Figure 4.3-3). Dairy facilities located within flood hazard zones could be damaged by flood waters or be required to shut down for extended periods. Flood waters could mingle with wet or dry manure storage areas at the facilities, cause releases of process water from ponds, and/or come into contact with freshly applied manure on fields, impacting surface water quality.

Policy DE 1.2c of the Element restricts dairy facilities to locations outside the 100-year flood hazard area, and therefore effectively reduces potential flood-related impacts associated with new dairy facilities to a less-than-significant level.

~~Based on review of regional flood plain mapping, there are several existing dairy facilities along the Kings River and Cross Creek that are located within the 100-year flood hazard zone. A goal of the project is to bring all existing dairies into voluntary compliance with the policies of the Element (**Goal DE 8**). Existing dairies facilities located within the 100-year flood hazard zone could be considered out of compliance with the Element, and could represent a potentially significant impact.~~

Policy DE 3.2g is included in the Element to address this issue. Under the policy, existing dairies in the 100-year flood hazard zone would be allowed only if a site-specific hydraulic analysis (performed by a licensed engineer) demonstrates that the dairy facility is not in the 100-year flood zone (i.e., is at an elevation above the 100-year flood elevation at that location). Alternatively, the policy would allow dairies within the zone if 100-year flood protection is provided by constructing levees or other flood control structures.

The Element would allow application of wet and dry manure to fields (i.e., as a soil amendment/fertilizer) within the 100-year flood hazard zone if specific safeguards were to be established to prevent pollution (~~**Policy**~~ **Policies DE 1.2c** and **3.2d**), including:

- No spreading of manure or process water in flood plains during flooding or threat of flooding;
- Ensure that manure is worked into the soil immediately upon application.

Manure and process water applied to fields may contain substantial quantities of nutrients (i.e., nitrogen and phosphorus) and microorganisms, including pathogens (disease causing organisms). If these substances enter the surface or groundwater environments in sufficient concentrations, they could cause water quality degradation. Potential impacts to groundwater quality from excess nutrients and pathogens are described under Impact 4.3-7. Potential impacts to surface water quality associated with flooding of manure-fertilized agricultural fields would be mitigated by the Element and existing conditions as follows:

- The Element would require operational practices that would keep flood waters from coming into contact with recently applied manure or process water;
- A significant amount of adsorption to soil particles and inactivation of pathogenic organisms would be expected to occur in the fields prior to contact with any flood waters;
- Neither the flood water nor the receiving waters would be used as a drinking water source without prior treatment, and therefore any pollutants contained in the flood water would not be expected to be ingested by the public.
- During widespread regional flooding, all surface waters are expected to be degraded and precautions are already in place that minimize the likelihood of inadvertent

ingestion of pollutants by the public (i.e., public advisories to boil water before use, maintenance and disinfection of wells after flood waters recede).

Implementation of the pollution prevention actions required by the Element, including **Policies DE 1.2c, 3.2d,** and **3.2g**, would minimize the potential for degradation of water quality during flood events and reduce the impact to a less-than-significant level.

Mitigation Measure 4.3-4

None required.

Impact 4.3-5

Operation of existing and new dairies could result in releases of pollutants (including nutrients such as nitrogen and phosphorus), impacting the quality of surface waters. This is a less-than-significant impact.

Dairies must manage large volumes of manure and manure-laden process water (each milking cow excretes approximately 85 pounds of manure each day). Releases of process water to the environment and/or exposure of dry manure to uncontrolled rainfall and runoff could substantially impact the quality of receiving waters. Release of dairy process water or water that has come into contact with manure, feed, or dead animals could transport nutrients and other pollutants to receiving waters. Of particular concern, would be the release of substantial amounts of nitrogen and phosphorus into surface waters from dairy sites.

Excess nutrients (i.e., nitrogen and phosphorus) in surface waters have been associated with several environmental problems, including eutrophication and altering the productivity of natural ecosystems. While the effects of nitrogen (as nitrate) in drinking water is a human health concern (the U.S. EPA recommends the maximum concentration of 10 parts per million of nitrates in drinking water), phosphorus is not toxic[4] (Taylor, et al., 1980). The environmental problems related to nitrogen and phosphorus are mainly associated with the control of unwanted nutrient levels in surface waters. In nutrient-enriched surface waters, excessive plant growth may cause impacts. Plant growth in surface waters requires light, carbon dioxide, and nutrients (nitrogen and phosphorus, among others). Since light and carbon dioxide are readily available in plentiful quantities in shallow waters, it is typically the amount of nutrients available that limits plant growth.

It has been demonstrated that, in freshwater systems, phosphorus tends to be the limiting nutrient, while in marine systems nitrogen more often limits plant growth (Laws, 1993).

[4] Phosphorus may be toxic when present in certain pesticides.

This phenomena may be explained by the presence of cyanobacteria in freshwater systems that are capable of fixing nitrogen from the atmosphere. In freshwater systems, there is no such source for phosphorus. Conversely, nitrogen-fixing bacteria in marine systems are of relatively little importance (Laws, 1993). Based on this tendency, the County (which has no direct discharges to marine waters) should be particularly vigilant in controlling discharges of phosphorus to surface waters.

Regardless of the type of degradation (whether from phosphorus or nitrogen loading), for an impact to occur, the nutrients must reach the receiving waters. Several existing State regulations and numerous policies of the Element are designed to minimize potential impacts to surface water quality. Under existing State regulations, confined animal facilities shall be designed and constructed to retain all facility process water generated, together with all precipitation on, and drainage through, manured areas, feed storage areas, and dead animal storage areas during a 25-year, 24-hour storm event. All precipitation and surface drainage outside of manured areas shall be diverted away from these areas unless it would be fully retained (CCR Title 27, Division 2, Subdivision 1, 22562(a)). This State regulation is reiterated in the Element under **Policy DE 4.1a.B.3**.

The Element contains policies designed to minimize the potential impacts to surface water quality associated with existing and new dairies, including consideration of surface water quality when siting new dairies (**Policies DE 1.2f** and **DE 3.1a.A**) and construction methods and operational procedures designed to prevent leakage of pollutants (**Policy DE 4.1a.B.2**). **Policy DE 4.1b** would establish requirements for manure management, including maintenance of nutrient balance between land application and crops. Under **Policy DE 4.1c**, operators would be required to implement appropriate land management techniques to minimize the potential runoff of soil, nutrients, organic matter, and pathogens. In addition, **Policy DE 4.1d** would mandate appropriate management of dead animals to protect surface (and groundwater) quality. Implementation of existing State regulations and policies of the Element would adequately mitigate potential impacts associated with nutrients transported in surface water to a less-than-significant level.

Existing State regulations and policies of the Element do not directly address the potential for atmospheric fallout of nutrients to surface waters. It has been demonstrated that fallout of nitrogen compounds can affect surface water quality (National Atmospheric Deposition Program, 2000).[5] In addition to molecular nitrogen (which comprises 78 percent of the atmosphere), trace amounts of nitrogen oxides, nitric acid vapor, gaseous ammonia, and organic nitrogen circulate through the atmosphere. There are many human activities that represent sources of nitrogen compounds to the atmosphere. Motor vehicles, electric

[5] Phosphorus deposition is not further considered since investigators have found that it is a small contributor (David, et al., 2000).

utilities, and industrial boilers are the largest sources of nitrogen oxides and agriculture accounts for approximately 80 percent of the ammonia emissions in the United States (National Atmospheric Deposition Program, 2000).

Once in the atmosphere, ammonia has three possible fates: 1) dry deposition, 2) wet deposition, or 3) movement into the upper atmosphere. Movement into the upper atmosphere represents a very small percentage of the total volatilized nitrogen (Elliot, et al., 1993) and would not have direct effect on surface water quality, so is not further discussed. Most volatilized ammonia is dissolved in water vapor in the lower atmosphere and washed to earth by rainfall (wet deposition). Wet deposition of ammonia could be viewed as another source of fertilizer for agricultural crops, but it can also be an unwanted input of fertilizer to sensitive ecosystems (National Atmospheric Deposition Program, 2000). Monitoring of the wet deposition of nitrogen from nitrate and ammonium indicates that the San Joaquin Valley receives a moderate amount of fallout at 3.0 to 4.0 kilograms per hectare (kg/ha) (0.027 to 0.036 pound/acre) annually. Alaska and some parts of Oregon receive less than 1.0 kg/ha (0.009 pound/acre), while several states in the Midwest receive more than 7.0 kg/ha (0.06 pound/acre) annually. The direct impacts to surface water quality from atmospheric fallout associated with dairy operations in the County are difficult to measure, but would be related to the quantity of these compounds released to the air. The areas receiving the highest levels of fallout would be expected to be nearest to the dairy facilities and, in general, these areas would be in cultivated agriculture that may benefit from the nutrient input. Once the compounds enter the air column and move miles to tens of miles away from the source, they are more appropriately considered a potential air quality issue. The Air Quality section of the EIR includes mitigation measures designed to reduce emissions of nitrogen-containing compounds, and these measures would be expected to reduce potential indirect impacts to surface water quality of distant water bodies to a less-than-significant level.

Compliance with existing regulations and programs and **Policies DE 1.2f, 3.1a, 4.1a, 4.1b, 4.1c,** and **4.1d** proposed by the Element would reduce potential impacts to surface water quality to a less-than-significant level without additional mitigation.

Mitigation Measure 4.3-5

None required.

Impact 4.3-6

Implementation of the proposed project could result in depletion of water resources. This is a less-than-significant impact.

Overdraft (i.e., pumping in excess of recharge) of the groundwater resources has been a problem within the San Joaquin Valley, which includes most of the County. Overdraft has been of particular concern in some of the Coast Range valleys (e.g., the Kettleman Plain and Sunflower Valley) in the western portion of the County. Use of water at dairy facilities in the County could result in an increase in aquifer overdrafting. However, in a conjunctively managed basin, where surface water supplies are routinely used to recharge regional aquifers, the distinction between overuse of groundwater versus overuse of surface water is less meaningful. Supplemental surface water is used to recharge the aquifer for later recovery. In such a system, an impact to water supply may be interpreted to occur if a considerable increase in the quantity of water to be used relative to the existing condition were proposed, or water use was interpreted to be wasteful. The focus of this discussion is on efficient use of water, regardless of its source.

Water use associated with dairies can be divided into two main categories: 1) water used at the dairy facility (including milk cow washing, drinking, flushing, and residential uses) and 2) water used to irrigate support crops.

Dairy Facility Water Use

Some of the water used at a dairy facility is consumed (i.e., lost to evaporation or converted to milk by cows), but most of the water is recycled for use in flushing the facilities or applied to crops as irrigation water. The following relationships show the difference between total and actual dairy water demand.

Total dairy water demand = operations (to be reused) + evaporation (consumed) + milk (consumed)

Actual water demand = evaporation (consumed) + milk (consumed)

It has been demonstrated that acre-for-acre, dairy facilities **consume** less water than irrigated cropland (Kern County Planning Department, 1999; Kings County Planning Agency, 1999). Impacts associated with water demand at the dairy facilities that currently maintain double-cropped acreage would be less than significant. However, new dairies in those areas that may not be able to sustainably and economically support selected crops (as defined in the Element) because of insufficient water supply (e.g., the Kettleman Plain and Sunflower Valley), may result in overdraft of local groundwater supplies; compliance with **Policy DE 3.2h** proposed by the Element would reduce potential impacts to the groundwater supplies to a less-than-significant level without additional mitigation.

Cropland Water Use

Most of the arable land within the County is under cultivation. Essentially all crops grown in the County are irrigated. The Element estimates that approximately 314,313 acres of cropland are available within the County for support of the dairy facilities. Based on current cropping patterns, 84 percent of the cropland is single-cropped (grows one crop per year) and 16 percent is double-cropped.

Dairy designs often consider the cropland acreage available to manage the wet and dry manure as a limiting factor for the size of the dairy herd. In general, the goal is to maximize the herd size to increase profitability. Since double-cropping increases the amount of nitrogen and salt uptake, more manure can be applied (at agronomic rates) to double cropped-lands than single-cropped lands. Consequently, double-cropping is often specified in a dairy design to manage the nutrients and salts generated by the herd. If a substantial increase in the amount of double-cropped lands were to occur within the County, water demand to irrigate the additional crops would be expected to increase, potentially resulting in a significant impact. However, the Element based the size of the maximum herd (for the entire County) on the amount of nitrogen[6] that could be managed on the land available **using existing cropping patterns.** Therefore, the methodology used by the Element to determine the maximum herd size for the County effectively mitigates any potential increase in water use since cropping patterns are assumed to remain similar to existing conditions (there would be no reason to increase double cropping since current cropping patterns and available land could accommodate the generated manure). This is a less-than-significant impact.

Mitigation Measure 4.3-6

None required.

Impact 4.3-7

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.

According to the EPA's National Water Quality Inventory, agriculture (including animal feeding operations) is the leading source of water quality impairment in rivers and lakes in the United States (U.S. EPA, 1999), and has been identified as a major contributor to groundwater quality degradation in the Central Valley (Bertoldi, et al., 1991). Dairy operations can cause environmental degradation of groundwater quality unless the manure generated is collected, stored, and used in an environmentally sound manner. Substances

[6] Nitrogen was found to be the limiting factor, not salt.

contained in animal manure that, if not properly managed, could become pollutants include nutrients (i.e., nitrogen and phosphorus), pathogens, and salts.[7] Although salt loading in the closed system of the Tulare Lake Basin is a natural phenomena, any introduction of additional sources of salts to the basin may increase salt loading rates, impacting groundwater quality (California RWQCB, 1995).

Essentially all the arable land in the County is under cultivation, and current agricultural practices in the County (and elsewhere) dictate that some sort of soil amendment/fertilizer be added to the land on a regular basis to provide plants with the nutrients and trace elements essential to growth. The typical soil amendment/fertilizer used is either a manufactured fertilizer or manure, which contains salts and nitrogen (commercial fertilizers would be expected to have a substantially lower pathogen content, if any). Each of these potential pollutants is considered below.

Salt

Implementation of the Element may introduce more salts to the County than introduced under existing conditions. Dairy manure contains a significant quantity of salts (generally more than manufactured fertilizers [California RWQCB, Santa Ana Region, 1990]). Import of irrigation water to the County, which contains dissolved salts, would represent an additional source of salt input (although it is assumed that this is a current source that would remain essentially unchanged). Significant outputs of salt associated with agriculture from the basin would include only the salts contained in those products that are transported out of the basin (e.g., milk, meat, and crops). Therefore, under existing conditions, salt loading is probably already occurring in the County. Since no proven method exists to allow ongoing human activity in the basin and maintain groundwater salinity at current levels, the RWQCB supports controlling the rate of increase by prudent practices and source control.

Nitrogen

Nitrogen is an essential nutrient for plant growth. The nitrogen contained in dairy cow manure is a valuable commodity and a benefit provided by the dairy industry, if managed properly. Nitrogen would be applied to the cultivated crops in the County by application of commercial fertilizer (or some other type of animal manure) if the dairy manure supply was not available. The leaching of nitrates into groundwater depends on the solubility of the nitrogen-based fertilizer or manure, the rate at which the nitrate-containing leachate percolates into the soil, and the depth to the groundwater table. Sandy soils tend to permit greater percolation while clay-based soils inhibit infiltration and leaching to groundwater.

[7] The non-nitrogen salts of concern are typically the anions and cations of calcium, magnesium, sodium, potassium, chloride, sulfate, and phosphate (California RWQCB, Santa Ana Region, 1990).

Under most circumstances, the majority of the nitrates is taken up by the crops or resides in the root zone, since manufactured fertilizers and manures are a valuable commodity and overapplication would not be cost effective. However, elevated nitrate levels have been documented in groundwater underlying dairies, including dairies in the Central Valley (Davis, 1995).

Pathogens

When infected with disease, dairy cattle, like other animals, can shed infective organisms or pathogens in their manure. However, four steps need to occur for waterborne transmission of pathogens from dairy cows to humans (Atwill, 1997). First, the cow must shed the pathogens. Second, the pathogen must reach the water supply by the animal defecating into surface water, overland flow of tainted water to a surface water supply, or by infiltration to groundwater supplies. Third, the pathogen must remain active (infective) during transport in the environment. Fourth, upon ingestion by a human, an adequate concentration of infective organisms must be present to initiate an infection. Potential impacts to surface water quality from pathogens were discussed under Impacts 4.3-5 and 4.3-6. This analysis focuses on the infiltration to groundwater transmission pathway.

In general, the types of measures that limit the migration of one potential pollutant tend to limit the migration of others. For example, siting a dairy facility in an area underlain by clayey soils would tend to restrict the infiltration of salts, nitrogen compounds, and pathogens (hereafter referred to as pollutants). Adequate mitigation of pollutant loading should consider each of the following:

- Facility siting (i.e., favor siting dairies in areas where hydrogeologic conditions tend to limit or reduce pollutant migration and persistence);
- Source control (i.e., limiting the production and release of pollutants to levels that can be assimilated by the system without violating water quality objectives);
- Monitoring (i.e., monitoring of dairy operations to ensure that practices are maintained that minimize pollution potential and implementing a soil and groundwater quality monitoring program that provides feedback on the effectiveness of mitigation);
- Data evaluation (i.e., monitoring data must be evaluated in a way that allows early identification of potential impacts); and
- Response action (i.e., when data indicate an impact has occurred, a mechanism must be available to implement an appropriate response to eliminate the impact).

The Element is largely organized to address the items presented above.

Dairy Siting

Section III of the Element establishes general areas suitable for the location of dairies. Several of the criteria are based on the hydrogeology of the County and the goal to protect water quality.

- **Policy DE 1.2c** states that dairy facilities, including manure and dairy process water storage areas, shall not be located in Special Flood Hazard Areas (as designated by FEMA). However, dairy manure and process water could be transported into the flood hazard areas and applied to land if appropriate safeguards are implemented.

  Specific safeguards identified in ~~the policy~~ **Policy DE 3.2d** include avoiding spreading manure and process water during periods of flooding and immediate incorporation of manure into soil. **Policy DE 3.2g** requires existing dairies that propose to expand within the 100-year flood zone to demonstrate that the dairy facility is not actually in the flood hazard zone or to provide 100-year flood protection. These policies minimize the potential for water quality impacts related to inundation of flood-prone dairy facilities. **Policy DE 1.2f** prohibits dairy development in areas of excessive slope, reducing the potential for dairy runoff into surface water and ultimate infiltration to groundwater.

  Policy DE 1.2d restricts the development of dairies within areas underlain by shallow (perched) groundwater. The policy requires that minimum vertical separation of five feet between the bottom of dairy process water ponds or corral surfaces and the highest groundwater level. Proposed dairy facilities not meeting these criteria must present demonstrated site-specific mitigation measures that are approved by the RWQCB before an SPR approval can be considered. A minimum separation of five feet between groundwater and waste has been applied for storage or disposal of wastes that present a potential threat to groundwater (e.g., septic system design). However, the exclusion of dairies from areas with a separation between manured areas and storage ponds does not ensure that the potential for groundwater quality degradation would be reduced to a less-than-significant level. Pollutant migration toward the groundwater is controlled not only by the vertical distance that the pollutants must travel but also the hydraulic conductivity and chemistry of the media through which they must travel (i.e., soil and sediment) and the hydraulic gradient.

  Addressing this point, **Policy DE 3.1a** requires that ground and surface water quality and quantity must be considered by the County when reviewing and evaluating proposals for new and expanded dairies. This policy is supported by **Policy DE 3.2a**, which requires that specific information regarding hydrogeologic conditions (i.e., depth to first groundwater and groundwater usable for human consumption) must be provided to determine any constraints on dairy development related to water

quality. **Policy DE 3.2b** addresses the suitability of a proposed dairy site with respect to use of nutrients in manure and process water as fertilizer and irrigation. The policy requires evaluation of the capacity of the soils at the site for assimilating nutrients and the crop production requirements for the applied nutrients to ensure that excess nutrients are not released. Other policies of the Element that address the control of pollutant migration from dairy facilities are evaluated under the discussion of source control in the following section.

- **Policy DE 3.2h** further addresses the potential impact of infiltrating pollutants on shallow groundwater quality. The policy requires that a qualified professional (certified hydrogeologist or professional engineer) conduct a Hydrogeologic Sensitivity Assessment (HSA) for new or modified dairies in areas where drinking water wells are screened in shallow groundwater areas, specifically, in areas where wells are screened above the E-clay (described in the Setting section above) or where the E-clay is not present and therefore does not provide a barrier to pollutant migration (e.g., the Kettleman Plain and Sunflower Valley). For a proposed dairy project to be approved, the HSA is required to prove that adequate hydrogeologic barriers are present to prevent migration of pathogens or nitrates to drinking water supplies. The measure further specifies that the HSA be conducted in conformance with the principles contained in the U.S. EPA's Ground Water Rule (as proposed or most current version). A report of the findings of the HSA, including conclusions and recommendations, would be submitted to the County for review and approval prior to issuance of permits to construct the proposed dairy. Therefore, site-specific hydrogeologic analysis of pollutant migration is required for all dairy facilities proposed in areas of relatively shallow groundwater.

Each of these siting criteria provide additional protection of groundwater quality.

Source Control

Section II of the Element calculates the maximum theoretical herd size that the County can accommodate based on the assimilative capacity of the system to process the nitrogen and salt load and maintain water quality objectives. The assumption is that, if the manure generated from the theoretical herd is properly managed, impacts to groundwater quality can be avoided. The Element concludes that nitrogen loading would be the limiting factor for the herd size (based on factors included in Fact Sheet No. 4 [RWQCB, 2000]), and that associated salt loading would be expected to be well below recommended guidelines.[8] The

[8] The RWQCB has, based on historic best management practices, established recommended maximum application rates of 2,000 pounds of salt per acre per year (lb/acre/yr) for single-cropped lands and 3,000 lb/acre/yr for double-cropped lands for areas where salts have not impaired groundwater (Wass, 2000)

calculations accurately incorporate the guidelines provided by the RWQCB for sizing dairies.

An additional important component of source control is proper management of the manure and process water generated at each dairy. The manure and process water generated at the dairy facilities would represent a potential pollutant source. Degradation of groundwater quality (in the form of nitrogen, salt, or pathogen loading) can occur if the source is released into the environment at a rate greater than the assimilative capacity of the system. Pollutant loading associated with dairies can occur at the dairy facilities or at the support croplands where manure is applied as a soil amendment. Following is a discussion of existing regulations and policies of the Element that would act to limit pollutant loading to groundwater.

Source Control at the Dairy Project Cropland

Some nitrogen and salt are essential to plant growth, and therefore the support crops associated with the dairies have the capacity to process at least a portion of these substances contained in the manure generated at the dairy facilities. However, if the amount of nitrogen and salts applied to the crops exceeds crop uptake potential, infiltration of nitrogen and salt below the root zone (perhaps eventually reaching groundwater) could occur, causing degradation of groundwater quality. The Element, which addresses salt and nitrogen loading at the support croplands, is further described below.

Under normal circumstances, when manure and process water are applied to a field, pathogens are expected to be adequately rendered harmless by natural processes (i.e., sorption or retention to soil particles, inactivation/degradation or "die-off"). Adsorption and retention of viruses (typically the smallest and longest-lived of the pathogens) in the soil column occur nearly instantaneously (Tim, et al., 1991). Those pathogens stranded in the soil column would pose no threat to groundwater quality. Only those pathogens that travel with the infiltration water (a significantly reduced quantity) would be of concern. Inactivation times for mobile pathogens in water are extremely variable (Yates, et al., 1995) and depend on the type of pathogen and the water chemistry and temperature. Many states establish setbacks (ranging from 50 to 500 feet) between pathogen sources and drinking water supply wells. However, "the complexity of the processes that govern virus and bacteria transport in groundwater and the variability of groundwater velocity in sensitive hydrogeologic settings make it difficult, if not impossible, for EPA to specify setback distance that will be protective of public health for all hydrogeologic settings. Thus, EPA concluded that there was insufficient scientific data to mandate national setback distances..." (U.S. EPA, 2000, page 30226). The EPA does recognize that site specific hydrogeologic conditions may be capable of effective pathogen inactivation, such as sufficient thickness of unsaturated materials (vadose zone), vertical and horizontal groundwater travel times sufficiently long to inactivate pathogens, and/or a confining

layer isolating the drinking water resource (e.g., the E clay). Essentially all of the County where dairies could be located is underlain by E clay at a depth ranging from 250 to 900 feet below the surface (Page, 1986; Croft, 1972). The exception to this condition is the isolated valleys in the southwestern portion of the County (e.g., Kettleman Plains and Sunflower Valley) where the E-clay was not deposited.

If drinking water supply wells at, and within one-half mile of, a proposed dairy facility are (or would be) screened exclusively below the E clay, pathogen migration to drinking water would be considered a less-than-significant impact. However, if drinking water supply wells are located, or proposed to be located, above the E clay within one-half mile of a dairy facility, a potential impact to public health could occur.

Policy DE 3.2h addresses the potential of infiltrating pollutants on shallow groundwater quality. The policy requires that a qualified professional (certified hydrogeologist or professional engineer) conducts a Hydrogeologic Sensitivity Assessment (HSA) for new or modified dairies in areas where drinking water wells are screened in shallow groundwater areas (i.e., underlain by the E clay). The HSA is required to demonstrate that adequate hydrogeologic barriers are present to prevent pathogen or nitrate migration to drinking water supplies. The measure further specifies that the HSA be conducted in conformance with the principles presented in the U.S. EPA Ground Water Rule (as proposed or most recent version). A report of the findings of the HSA, including conclusions and recommendations, would be submitted to the County prior to the approval of SPRs for proposed dairy facilities. Therefore, site-specific hydrogeologic analysis is required by the Element for dairy facilities that present a potential impact to shallow drinking water sources. **Policy DE 3.2i** requires that all existing wells at dairy sites be inspected to ensure the appropriate well seals are in place to minimize the potential for vertical contaminant migration.

In addition to these policies, **Policy DE ~~6.1h~~ 6.2f** requires that each new and expanded dairy implement a groundwater monitoring program. The program would be developed on the basis of site-specific hydrogeologic conditions. A minimum of three monitoring wells, and possibly lysimeters would be required. All wells and lysimeters would be sampled prior to dairy operation and annually thereafter, and tested for total dissolved solids, electrical conductivity, general mineral content, nitrogen (as ammonia, nitrate, and nitrite), phosphorus, and coliform (or other indicators of biological contamination). The required testing parameters could be modified at the request of the RWQCB.

The confined animal facility regulations (CCR Title 27, Section 22563) and the General Waste Discharge Requirements for Milk Cow Dairies (Order No. 96-270) require that "application of manure and wastewater to disposal fields or cropland shall be at rates that are reasonable for the crop, soil, climate, special local situations, management system, and

type of manure." The policy requires that nutrient management shall ensure that the application rate of nutrients does not exceed the capability of the soil and crops to assimilate the applied nutrients.

In addition, the Element includes several objectives and policies designed to provide additional protection to groundwater from excessive nitrogen and salt inputs (among other constituents).

- **Objective DE 4.1** would require that a ~~*Comprehensive*~~ *Manure Nutrient Management Plan* be submitted with each new or expanded dairy application. Careful application of manure and process water to fertilize and irrigate agricultural crops is necessary to prevent the potential for the infiltration or runoff of excess nutrients. **Policy DE 4.1b** of the Element sets guidance for the appropriate reuse of the manure and process water. The policy identifies the primary purpose of nutrient management as the need to balance the available nutrients in site soils, in manure and process water, and commercial fertilizer with the nutrient requirements of the crops to be grown. The policy states that nutrients must be applied at rates that ensure that excess nutrients are not released to surface water or groundwater. The policy further states that soils and manure must be sampled to accurately determine nutrient levels. The policy also requires that manure application equipment must be calibrated to ensure that the planned rates of application are achieved. The policy also requires that dairy owner/ operators submit an Irrigation Management Program which ensures that irrigation water and runoff from fields within dairy units is not allowed to migrate away from the project site. In addition, **Policy DE 4.2a** requires that each dairy develop and implement a Comprehensive Dairy Process Water ~~Disposal~~ Application Plan ~~if any process water is to be used on cropland away from the dairy facility~~.

Source Control at the Dairy Facilities

The potential for releases of nitrogen and salts (among other constituents) from dairies facilities is regulated by specific Federal and State legislation designed to protect water quality. Specific regulation of large dairy operations and other "Confined Animals Facilities" (CAF) is provided by Title 27, Division 2, Chapter 7, Subchapter 2, Article 1 ("Confined Animals Facilities") of the California Code of Regulations commencing with Section 22560. These regulations were promulgated by the State Water Resources Control Board in 1984 and are enforced in the County by the RWQCB. The regulations specify that certain minimum standards shall either be implemented in the Waste Discharge Requirements (WDRs) for a particular CAF or made a condition to the waiver of such requirements. The requirements of Subchapter 2, Article 1 ("Confined Animals Facilities") of the California Code of Regulations that relate to protection of water quality at the dairy facility include (when appropriate, Element policies that address the stated regulation are provided):

- *The discharger shall prevent animals at a confined animal facility from entering any surface water within the confined area. (22561)*

- *Confined animal facilities shall be designed and constructed to retain all facility process water generated, together with all precipitation on, and drainage through, manured areas during the 25-year, 24-hour design storm. (22562(a))*

The Element contains a policy (**Policy DE 4.1a.~~A.3~~B.3**) that is consistent with this regulation.

- *All precipitation and surface drainage outside of manured areas, including that collected from roofed areas, and runoff from tributary areas during the storm events described in (a), shall be diverted away from manured areas, unless such drainage is fully retained. (22562(b))*

The Element contains a policy (**Policy DE 4.1a.~~A.1~~B.1**) that is consistent with this regulation.

- *Retention ponds and manured areas at confined animal facilities in operation on or after November 27, 1984 shall be protected from inundation or washout by overflow from any stream channel during 20-year peak stream flows. (22562(c)(1))*

The Element contains a policy (**Policy DE 4.1a.~~A.3~~B.3**) that is more stringent than this regulation, requiring that dairy facilities be located outside the 100-year flood hazard zone and that manured areas be setback a minimum of 150 feet from surface waters, recharge basins, and flood plains (Policy DE 3.2c).

- *Retention ponds shall be lined with, or underlain by, soils which contain at least 10 percent clay and not more than 10 percent gravel or artificial materials of equivalent impermeability. (22562(d))*

The soil survey (U.S. Department of Agriculture, 1986) indicates that many of the soils in the County are well-drained and may not meet these criteria. In addition, based on studies and regulatory experience gained since these regulations were adopted, it appears that these criteria may not be adequately protective of groundwater quality. Pollutants (nitrates and salts) have been documented to migrate through retention ponds and from corral areas at dairies in Merced and Stanislaus counties (Davis, 1995).

The minimum standard requiring a soil lining composed of at least 10 percent clay (and not more than 10 percent gravel) may not be adequate to prevent significant infiltration of process water from storage ponds at all sites. A soil with 10 percent clay, 10 percent gravel, and 80 percent coarse sand could be moderately to highly permeable.

The *Geotechnical, Design, and Construction Guidelines* published by the National Resource Conservation Service (NRCS) (1997) provide a more comprehensive approach to addressing potential impacts related to infiltration of process water from livestock process water management systems. Rather than set specific grain size requirements for soils surrounding process water storage facilities, the NRCS guidelines specifically address the ability of the soil to transmit water. The rate of flow through a porous medium (such as soil and sediment) is partially controlled by the hydraulic conductivity or permeability of the material. Flow rate is also affected by the hydraulic gradient. The NRCS Guidelines establish a maximum hydraulic conductivity (permeability) of 1×10^{-7} cm/s for soils lining retention ponds that would reduce infiltration to acceptable levels. From this hydraulic conductivity value, the NRCS Guidelines derive a standard for acceptable seepage losses (specific discharge) of 1×10^{-6} cm/s, which takes into account the thickness of the liner and the depth of water in the pond (hydraulic gradient), as well as the hydraulic conductivity of the liner. The NRCS Guidelines acknowledge that a certain amount of physical and chemical sealing of the pond sides and bottom occurs as the manure solids settle. One order of magnitude of hydraulic conductivity is credited to the manure solids sealing effect and, therefore, the pond liner must uniformly meet or exceed the standard of 1×10^{-5} cm/s (specific discharge) when installed, but in subsequent operation would be expected to quickly establish a specific discharge of 1×10^{-6} cm/s.

Significant infiltration of process water stored in the pits and ponds may occur. Ultimately, the infiltrating water would migrate downward to the shallow groundwater table. Although some pollutants in the water would be removed or geochemically treated as the water moves though the unsaturated zone, it is possible that the contaminants may reach the uppermost water-bearing zone. Therefore, mitigation to reduce infiltration is required to comply with Subchapter 2, Article 1 ("Confined Animals Facilities") of the California Code of Regulations, which states that:

- *Regulations are Minimum Standards - The RWQCB shall impose additional requirements, if such additional requirements are necessary to prevent degradation of water quality or impairment of beneficial uses of waters of the state. (22560(c))*

Calculations have been prepared to determine whether the dairy facilities (specifically the process water ponds within the facilities) would be expected to comply with the per-acre salt loading guidelines recommended by the RWQCB if the facilities were required to comply with the NRCS *Geotechnical, Design, and Construction Guidelines* for construction of the process water ponds. Results indicate that the salt loading rate at dairy facilities would be on the order of 500 to 1,000 pounds/acre/year, substantially lower than the RWQCB

guidelines for manure application.[9] In addition, the fine-grained pond liners would provide an effective mitigation that would be expected to reduce or eliminate pathogen migration (depending on the mobility of the pathogen) into the subsurface. **Policy DE 4.1a** of the Element sets requirements for the ~~Comprehensive~~ Manure Nutrient Management Plan (~~C~~MNMP) required for all new and expanded dairies. These requirements include the following provisions (**Policy DE 4.1aB.2**.) which address the potential for infiltration of pollutants from process water ponds and manure separation pits:

- *All manure separation pits and process water ponds shall be constructed so that the bottoms of the pits and ponds are at least five feet above the highest expected groundwater levels.*

- *The pits and ponds shall be maintained so that ~~losses due to infiltration are minimized~~ the integrity of the liners is ensured.*

- *The specific discharge of process water through the ~~soils lining~~ bottom and sides of the manure separation pits and ~~ponds~~ lagoons shall not ~~exceed~~ be greater than 1 x ~~10^{-5} cm/s~~ 10^{-6} centimeters per second in compliance with the Geotechnical, Design, and Construction Guidelines published by the National Resource Conservation Service (1997).*

- *A qualified professional (i.e., Professional Engineer or Certified Engineering Geologist) shall certify that the ~~design and installation of the~~ liner system ~~shall be supervised by a qualified professional (i.e., professional engineer or certified engineering geologist)~~ of a lagoon or pit is installed according to the NRCS design standards.*

- *The soil sampling and permeability testing program shall be designed to be representative of all soils underlying all proposed pond areas.*

- *Construction of the ~~ponds~~ lagoons shall be inspected by a qualified professional to ensure that geologic heterogeneities (e.g., channel deposits and sandy lenses) are identified and properly mitigated to ensure integrity of the liner in compliance with the NRCS standards. The liner must be protected against damage during operation and maintenance activities.*

The corrals could be locations of significant manure accumulation. Leaching and infiltration may result in introduction of salts to the subsurface. However, since the hydraulic pressure of standing water (which would tend to drive nutrients into the

[9] Uptake of salts by plants would not occur under the ponds. However, the RWQCB estimates that salt uptake by crops, depending on the type of crop, is about 1,200 pounds/acre/year (Wass, 1994). Maximum application rates of 3,000 pounds/acre/year for double-cropped agricultural lands are recommended by the RWQCB, and therefore 1,800 pounds/acre/year would be considered the assimilative capacity of the subsurface. The loading rate of 500 to 1,000 pounds/acre/year at the dairy facilities is substantially less than the calculated assimilative capacity.

subsurface at the pond locations) would not occur in the corrals or storage areas and annual precipitation is very low, the risk to groundwater quality is reduced relative to infiltration at the ponds. Detailed studies on the fate and transport of nitrogen and salts in feedlots have been conducted by many investigators. It has been demonstrated that, in an active feedlot, a layer (typically two to four inches thick) of trampled manure/soil forms an "excellent moisture seal" (Sweeten, 1993). The sealing layer (typically dark brown to black, often resembling charcoal) is very thin, however, and essentially eliminated when the upper inch is removed (Lehman, et al., 1975). Continued disturbance of this layer, requiring that it be reformed often, may allow substantial infiltration of nutrients. Another study conducted at a level feedlot underlain by silty loam indicated that the feedlot contributed no more nitrate or ammonia to the shallow water table than the adjacent cropland (Elliot, et al., 1972). Soils underlying the areas of heaviest manure accumulation appear to be least impacted by leaching of nitrates, apparently explained by the creation of conditions unfavorable to nitrogen transformation to leachable forms (Chang, et al., 1973). The results of investigations indicate that, at properly managed dairies (particularly in arid environments where infiltration of precipitation is minimal), the corrals should not contribute any more nitrates or salts to the subsurface than the adjacent cropland. In addition, if vertical moisture migration is controlled at the corrals and manure storage areas, substantial vertical pathogen migration would be reduced or eliminated.

Policy DE 4.1a.B.2. of the Element provides measures to reduce the potential water quality impacts related to dairy cattle corrals. The following specific measures are included in the policy:

- *At the corrals, naturally-occurring or imported clayey (not less than 10% clay) soils shall underlie the corrals and dry manure storage areas. ~~Positive~~ Site drainage shall be included in the project design and construction of any manured area, including but not limited to, dairy surroundings, corrals, and ramps, pursuant to Title 3, Division 2, Chapter 1, Article 22, §646.1 of the California Code of Regulations to ensure that ~~excessive~~ ponding does not occur. ~~The design shall comply with Title 3, Division 2, Chapter 1, Article 22, §646.1 of the Food and Agriculture Code for construction and maintenance of dairy surroundings, corrals, and ramps, as described below~~.*

- *Regular maintenance of corrals and dry manure storage areas shall include filling of depressions. Care shall be taken not to disturb the seal layer in the corrals. Dairy personnel shall be taught ~~the~~ to correctly use ~~of~~ manure collection ~~machines (wheel loaders or elevating scrapers)~~ equipment.*

Monitoring

Monitoring is a critical requirement that must be included in any water quality mitigation program to provide the means of determining whether the siting and source control measures (described above) are effective in protecting groundwater quality. Section V of the Element describes the proposed monitoring program. **Goal DE 6** would implement a monitoring program to demonstrate the effectiveness of the provisions of the Element and associated mitigation measures, and would allow for adjustments in dairy operations, if deemed necessary, to protect the environment (**Objective DE ~~6.1~~ 6.2**). **Policies DE ~~6.1a~~ 6.2a ~~and 6.1b~~** would establish baseline environmental conditions, monitor the bovine carrying capacity of the county, and develop a database on dairy characteristics.

Policy DE ~~6.1h~~ 6.2f specifically addresses water quality monitoring. The policy requires that the Dairy Monitoring Program (established under **Objective DE ~~7.1~~ 6.1**) establish monitoring requirements for each dairy facility. The minimum requirements include:

- *Installation of groundwater monitoring wells at each dairy adequate to characterize the variations in depth to uppermost groundwater across the site and chemical quality of the uppermost groundwater zone. If non-continuous perched groundwater zones underlie the site, deeper aquifers may require monitoring. ~~When appropriate and as determined by the County, vadose~~ Vadose zone monitoring using lysimeters shall be required to monitor the quality of soil water, particularly in the vicinity of the ~~ponds~~ lagoons. The design and ~~I~~installation of water quality monitoring ~~wells~~ system shall be ~~conducted by~~ performed under the direction of a Registered Geologist or a Professional Engineer in accordance with California Well Standards.*

- *Groundwater and soil water samples shall be analyzed, at minimum, for TDS, electrical conductivity, general mineral content, nitrogen ~~(~~as nitrate and nitrite~~)~~, phosphorus, and coliform, ~~(~~or other appropriate indicator of biological contamination~~)~~.[10] This list of constituents to be analyzed may be modified at the request of the RWQCB. All samples should be analyzed by a State-certified analytical laboratory.*

- *Sampling of all wells and lysimeters shall be conducted~~, at a minimum,~~ prior to dairy operation to establish background levels and thereafter on an annual basis. In addition, the depth to water in each well shall be measured ~~(~~to within an accuracy of 0.1 foot~~)~~ twice each year, ~~(~~once in the spring and once in the fall~~)~~.*

- *Reporting requirements shall be according to the RWQCB and Policy DE 6.4d, below.*

[10] The EPA is proposing *E. coli*., coliphage, and enterococci as indicators closely related to fecal contamination in the draft Ground Water Rule [40CFR Sections 141 and 142].

These goals, objectives, and policies would establish the requirement for a monitoring program, and provide minimum standards for what should be included in the monitoring program (i.e., areas and constituents to be monitored, frequency of monitoring, organization of monitoring reports).

Data Evaluation

Appropriate evaluation of the monitoring data is critical to the success of the Element. A program that does not provide meaningful data evaluation would not ensure protection of groundwater quality.

The purpose of data evaluation would be to determine whether the potential contribution to nitrogen and salt loading that may occur under the Element represents a significant increase relative to existing conditions. There are two main quantitative considerations when determining significance of potential impacts to water quality: 1) toxicity, and 2) violation of water quality objectives, standards, and/or criteria. Clearly, minor to moderate increases in TDS or EC levels would not result in toxicity. There are no primary drinking water standards (which are designed to protect human health) for TDS or EC; only secondary standards that tend to address aesthetics of water (e.g., taste, odor) not health concerns. The only pertinent regulatory water quality objective available that addresses salt loading in the basin is found in the Basin Plan (California RWQCB, 1995), which provides numerical criteria for allowable increases in electrical conductivity (salinity) for each of the subbasins within the Tulare Lake Basin. The average annual increase would be determined from monitoring data by calculating a cumulative average annual increase over a 5-year period (California RWQCB, 1995). The limits of Kings County includes four subbasins within the Tulare Lake Basin, including Tulare Lake, Westside North, Kaweah River, and the Kings River subbasins (Figure 4.3-5). Table 4.3-1 summarizes the numerical criteria for each of the subbasins.

TABLE 4.3-1: **Tulare Lake Basin, Groundwater Quality Objectives for Salinity**.

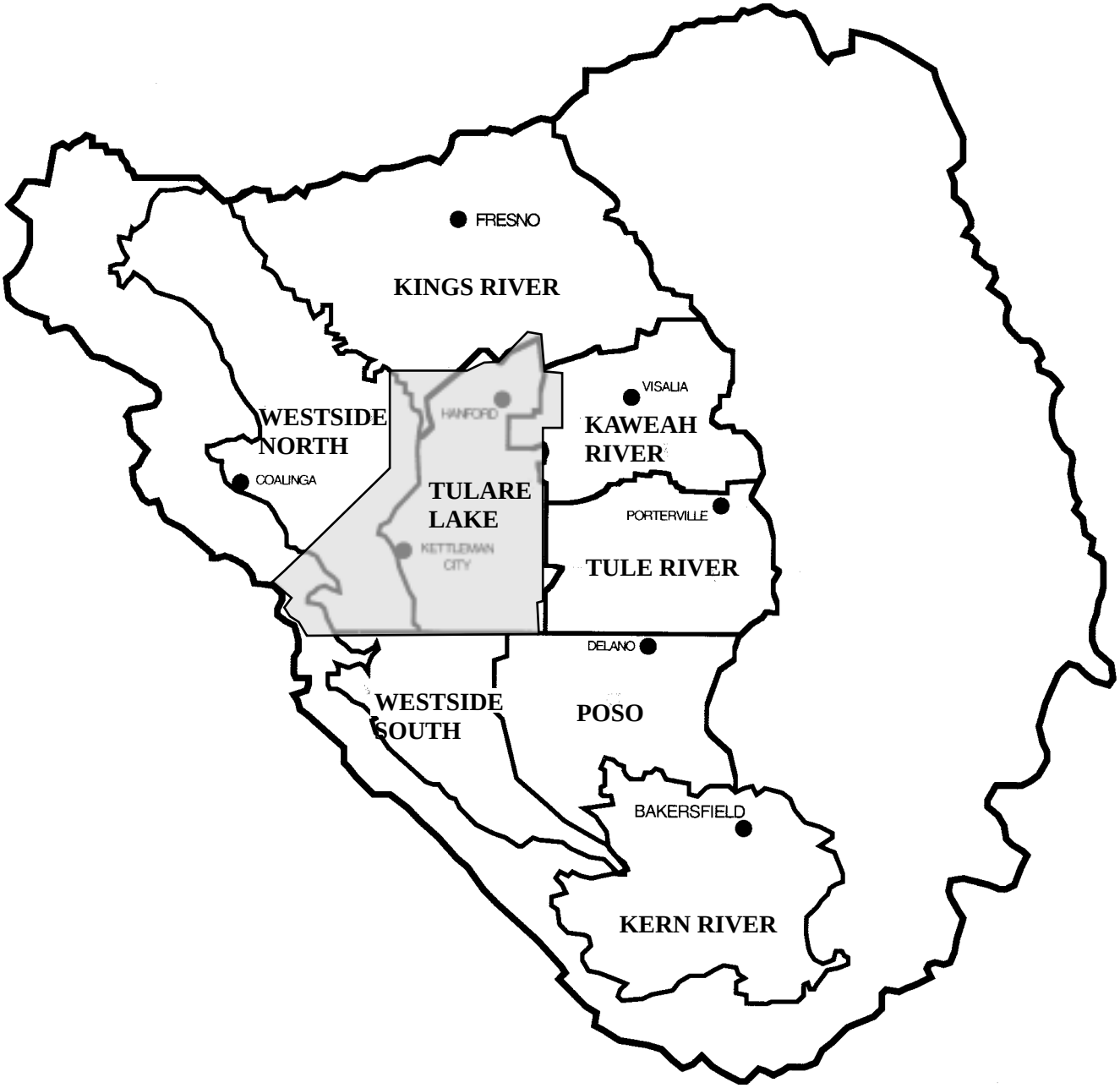
Subbasin	Maximum Average Increase in Electrical Conductivity (µmhos/cm)
Tulare Lake	3
Westside North	1
Kaweah River	3
Kings River	4

Source: Modified from California RWQCB, 1995.

Therefore, the analysis of whether project-related salt loading is significant must determine whether operation of the dairies would be expected to result in violation of water quality objectives stated in Table 4.3-1.

The Element includes goals, objectives and policies concerning water quality data evaluation. **Goal DE ~~7~~ 6** and **Objective DE ~~7.1~~ 6.1** would establish a Dairy Monitoring

GROUNDWATER HYDROGRAPHIC UNITS Figure 4.3-5



Source: California RWQCB, 1995.

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Program in the Kings County Planning Agency which would be responsible for monitoring all aspects of dairy operation. **Policy DE ~~7.3d~~ 6.4d** is included in the Element to specifically address the need to provide meaningful evaluation of groundwater data collected at Kings County dairies. The policy requires that each dairy operator performing required groundwater testing (**Policy DE ~~6.1h~~ 6.2f**) retains a qualified professional (certified hydrogeologist or professional engineer) to compile and evaluate groundwater data collected as part of the water quality monitoring program. The professional would be required to compare the water quality data to applicable State water quality objectives (as defined in the Basin Plan) to whether violations of the objectives have occurred and mitigation is required. The policy specifies that evaluation of salinity testing results include statistical analysis of variations in concentration over time. An acceptable statistical methodology for determining trends in data (e.g., Mann-Kendall test) would be established by the Dairy Monitoring Office. In recognition that the performance of such a test of the data requires a set of data, the policy requires that the first trend analysis be performed after five years of data collection, and then each year thereafter. In recognition of evolving water quality criteria and objectives, the policy states that "when considering response action for identified violations, the Dairy Monitoring Office shall ensure that water quality criteria and Basin Plan objectives used in the evaluation of the site-specific data are appropriate and current and consult with the RWQCB to confirm that a violation has occurred and that remedial action is required." The data evaluation provided for in **Policy DE ~~7.3d~~ 6.4d** appropriately addresses the need for professional analysis of water quality results.

Response Action

The purpose of data collection and evaluation is to determine whether ~~an impact~~ groundwater contamination may be occurring. Response action is required to mitigate any identified ~~impacts~~ problems. The Element includes policies that address impact resolution, including:

- **Policy DE 4.2d,** which provides the County with the authority to find a dairy operation in violation of its site plan review approval (and potentially revoke the approval) if a dairy operator fails to obtain approval for changes to process water and manure use agreements.
- **Policy DE ~~6.2a~~ 6.3a**, which requires new and expanded dairies to ~~submit~~ conduct annual tests ~~results~~ to demonstrate that the facility is operating within established guidelines. If guidelines are exceeded, the operator would be required to ~~reduce the herd size or make other changes to balance nutrient management~~ bring the facility into compliance or face potential modification or revocation of his permit.
- **Policy DE ~~7.1b~~ 6.1a.A**, which states that the dairy monitoring office would prepare specific reports, as necessary, on a case by case basis to address problems and work with dairy operators to solve problems in a timely manner.

- ~~**Policy DE 8.1c** which states that the Element does not guarantee that a dairy that does not meet the specified standards will be able to come into conformance, and that out of conformance dairies may be required to modify or cease their operations.~~
- **Policy DE 6.4d**, which requires the Dairy Monitoring Office to evaluate the data collected by dairy operators against applicable water quality standards and require corrective action in consultation with the RWQCB when necessary.

These policies indicate that the Kings County Planning Agency would be empowered and willing to modify or revoke the SPR approval or use permit of any and all dairies operating under the Element that do not meet the requirements established by the Element to protect groundwater quality. This appears to be an appropriate mechanism for enacting change if an impact is identified.

The discussion presented above demonstrates that the Element contains numerous specific policies that address protection of groundwater quality. The policies of the Element reflect the process under which the Element and this PEIR were developed in tandem. The policies reflect direct input from the PEIR team. The policies reflect concern regarding dairy siting (**Policies DE 1.2c, 1.2d, 1.2f, 3.1a, 3.2a, 3.2b, 3.2c, 3.2h,** and **3.2i**) as well as source control of pollution at dairy facilities (**Policies DE 4.1a.A** and **4.1a.B**) and in croplands irrigated and fertilized with process water and manure (**Policies DE 4.1b** and **4.1c**). The Element establishes policies to ensure monitoring of water quality at all new and expanded dairies (**Policy DE ~~6.1h~~ 6.2f**) and professional evaluation of collected monitoring data (**Policy DE ~~7.2d~~ 6.4d**). The policies are specific and conform with or exceed performance standards set by the responsible regulatory agencies. Implementation of these policies would minimize the potential for release of excess nutrients and pollutants and provide monitoring to ensure recognition of any water quality trends in the future. Therefore, the implementation of the policies identified above reduces localized and regional groundwater quality impacts to a less-than-significant level.

Mitigation Measure 4.3-7

None required.

Impact 4.3-8

Existing water supply wells may represent preferred pathways for pollutant migration to the subsurface. This is a less-than-significant impact.

Existing irrigation and water supply wells (either active or abandoned) that do not meet current wells standards of construction may act as conduits for pollutant migration to the subsurface. If any of the wells were not constructed with effective sanitary seals upon construction, or have been damaged since installation, or were to be damaged during

grading and construction of the new or modified dairies, surface water may seep into the wells and the underlying aquifer, causing water quality degradation.

Two policies included in the Element address the specific issue of potential pollutant migration into wells. **Policy DE 3.2c** establishes a minimum setback of 150 feet between any manured areas and water wells. This setback exceeds the California Well Standards which require a minimum setback of 100 feet between water wells and an animal enclosure.

Policy DE 3.2i requires that all existing water supply wells at a proposed new or modified dairy site (including those located away from the dairy facilities in the cropland areas) shall be inspected by a qualified professional to ensure that each well is properly sealed at the surface to prevent infiltration of waterborne contaminants into the well casing or surrounding gravel pack. If any of the wells are found not to comply with the California Well Standards, the applicant or dairy operator shall retain a qualified well driller to install the required seal or functional equivalent certified by a licensed engineer or other qualified registered professional. Documentation of the inspections and seal installations, if any, shall be provided to the County Planning Department prior to commencement of dairy operations.

Mitigation Measure 4.3-8

None required.

Implementation of **Policies DE 3.2c** and **3.2i** would reduce the impacts associated with potential direct migration of pollutants into wells to a less-than-significant level.

Impact 4.3-9

Implementation of the proposed Element could result in cumulative impacts to water quality. This is a less-than-significant impact.

The area covered by the Element is located within the Tulare Lake Basin, a hydrologic basin that covers approximately 10.5 million acres (RWQCB, 1995). The Regional Water Quality Control Board designates beneficial uses within the basin and sets water quality objectives to protect those uses. The Water Quality Control Plan for the Tulare Lake Basin ("Basin Plan") describes water quality concerns identified for the basin. Increased salinity in groundwater is identified as the most significant problem within the basin. Considered a natural condition in a closed basin in an arid environment, elevated salinity is exacerbated by human activities that result in discharges of dissolved solids to the surface and subsurface.

Irrigated agriculture and confined animal facilities, land uses proposed under the Element, are recognized in the Basin Plan as significant potential contributing sources for salt loading within the basin. The Element specifically addresses the potential water quality impacts associated with implementation of the theoretical dairy herd. The theoretical herd size was determined on the basis of estimated capacity of croplands within the DDOZ and NSOZ to accommodate the nutrient loading associated with manure and process water generated by the herd. In addition, the theoretical herd estimate accounted for land required to accommodate the nutrient load from manure generated at existing nondairy confined animal facilities and approved biosolids disposal facilities (refer to Table No. 5A of the Element). Therefore, the basis of the Element accounts for cumulative impacts of nutrient loading associated with the use of dairy manure and process water in Kings County.

Potential surface water impacts are essentially eliminated by dairy design and provisions of the Element (**Policies DE 1.2c, 1.2f, 3.1a, 3.2c,** and **3.2g**). Cumulative water supply impacts would not be expected to occur since water use would be expected to be similar to existing conditions. Potential cumulative impacts to groundwater quality would be the only impact described above that would be expected to have the potential to result in a cumulative impact. However, the method used by the Element to size the theoretical herd is based on mitigating the potential cumulative impact to groundwater quality associated with nitrogen and salt loading, and ensures that, overall, the County would be in compliance with RWQCB estimates of assimilative capacity of the subsurface. Coupled with careful controls on siting of dairies (**Policies DE 1.2c, 1.2d,** and **3.2c**), required assessment of site-specific hydrologic conditions (**Policies DE 3.2.a, 3.2b,** and **3.2h**), management of the manure (**Policies DE 4.1a, 4.1b**, and **4.1c**), ~~and~~ ongoing monitoring and data evaluation (**Policy DE ~~6.1h~~ 6.2f** and **~~7.2d~~ 6.4d**), and adoption of compliance with water quality objectives of the Basin Plan as a threshold of significance for impacts of the Element to water quality (**Policy DE 4.4a**), the cumulative impact to groundwater quality is reduced to a less-than-significant level.

Mitigation Measure 4.3-9

None required.

4.4 BIOLOGICAL RESOURCES

4.4 BIOLOGICAL RESOURCES

This biological resource assessment provides a brief description of the existing biological resources that could be affected by new dairy applications in the County, evaluates general impacts on sensitive resources, and identifies measures to mitigate the potentially significant effects on biological resources. Identification of the biological resources was based on a review of available information. Literature and mapping reviewed included: the California Native Plant Society (CNPS) *Inventory of Rare and Endangered Vascular Plants* (CNPS, 1994); the *Biological Resources Survey, Resource Conservation Element, Kings County General Plan* (Hansen's Biological Consulting, 1993); the Draft *Recovery Plan for Upland Species of the San Joaquin Valley* (U.S. Fish and Wildlife Service, 1997); and records of the California Natural Diversity Data Base (CNDDB) of the California Department of Fish and Game (CDFG) showing known occurrences of special-status species and sensitive natural communities.

SETTING

VEGETATION AND WILDLIFE

Agricultural, urban, and military uses have substantially altered the vegetative cover throughout most of Kings County, replacing the original native grasslands, valley sink scrub, valley saltbush scrub, freshwater marsh, and riparian natural communities. Remaining natural communities in the County include: valley and foothill grassland; blue oak-foothill pine woodland; chaparral; interior coast range saltbush scrub; riparian forest, woodland and scrub; valley sink scrub; valley saltbush scrub; valley freshwater marsh; and northern claypan vernal pool. The grasslands occur primarily in the rolling hills in the southwestern portion of the County, although some undeveloped parcels north of Corcoran and west of Guernsey still support grasslands. Scattered parcels supporting valley sink scrub, freshwater marsh, and valley saltbush scrub still occur on the valley floor within proposed DDOZs. Similarly, riparian habitat, woodland, and scrub associated with the Kings River, Cross Creek, the Kern River channel, and smaller streams also occur on the valley floor as bands of native vegetation along drainages. The oak and pine woodlands, chaparral, and interior coast range saltbush scrub communities are generally restricted to higher elevations in the westernmost portion of the County on lands considered unsuitable for dairy use because of steeper slopes.

Kings County supports a wide diversity of both resident and migratory wildlife species. Areas of seasonal wetlands and freshwater marsh, riparian corridors, and remnant natural communities are particularly attractive to wildlife. These areas provide important cover, undisturbed breeding locations, and foraging opportunities that are typically not available in intensively managed agricultural fields.

SPECIAL-STATUS SPECIES

Special-status species[1] are plants and animals that are legally protected under the State and Federal Endangered Species Acts[2] or associated regulations, as well as other species that are considered rare enough by the scientific community and trustee agencies to warrant special consideration, particularly with regard to protection of isolated populations, nesting or denning locations, communal roosts, and other essential habitat. Species with legal protection under the Endangered Species Acts often represent major constraints to development, particularly when they are wide ranging or highly sensitive to habitat disturbance and where proposed development would result in a "take"[3] of these species.

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[1] Special-status species include:

- Officially designated (rare, threatened, or endangered) and candidate species for listing by the California Department of Fish and Game (CDFG).

- Officially designated (threatened or endangered) and candidate species for listing by the U.S. Fish and Wildlife Service (USFWS).

- Species considered to be rare or endangered under the conditions of Section 15380 of the CEQA Guidelines, such as those identified on lists 1A, 1B, and 2 in the *Inventory of Rare and Endangered Vascular Plants of California* of the California Native Plant Society (CNPS).

- And possibly other species that are considered sensitive or of special concern due to limited distribution or lack of adequate information to permit listing or rejection for State or Federal status, such as those included on list 3 in the CNPS *Inventory* or identified as animal "Species of Special Concern" by CDFG. Species of Special Concern have no legal protective status under the State Endangered Species Act but are of concern to the CDFG because of severe decline in breeding populations in California.

[2] The Federal Endangered Species Act (FESA) of 1973 declares that all Federal departments and agencies shall use their authority to conserve endangered and threatened plant and animal taxa. The California Endangered Species Act (CESA) of 1984 parallels the policies of FESA and pertains to native California taxa.

[3] The USFWS and CDFG share responsibility for protection and management of natural resources. "Take" as defined by FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect" a threatened or endangered species. "Harm" is further defined by the USFWS to include the killing or harming of wildlife due to significant obstruction of essential behavior patterns (i.e., breeding, feeding, or sheltering) through significant habitat modification or degradation. The CDFG also considers the loss of listed species habitat as "take," although this policy lacks statutory authority and case law support under the CESA.

Two sections of FESA contain provisions that allow or permit "incidental take." Section 10(a) provides a method by which a state or private action that would result in "take" may be permitted. The applicant must provide the USFWS with an acceptable conservation plan and publish notification for a permit in the Federal Register. Section 7 pertains to a Federal agency that proposes to conduct an action that may result in "take," requiring consultation with USFWS and possible issuance of a jeopardy decision. Under CESA, "take" can be permitted under Section 2081 of the Fish and Game Code. The applicant must enter into a habitat management agreement with CDFG, which defines the permitted activities and provides adequate mitigation.

Review of records maintained by the CNDDB, together with other relevant information, indicates that historical occurrences of several species with special status have been reported in Kings County. Figure 4.4-1 shows the distribution of known occurrences of special-status species and sensitive natural communities in Kings County. Notable features in Figure 4.4-1 include: the large complex of sensitive valley saltbush scrub, valley sink scrub, and grasslands in the West Hacienda area along Interstate 5; the extensive potentially occupied San Joaquin kit fox habitat; and scattered occurrences of special-status plant and animal species.

Plant Species of Concern

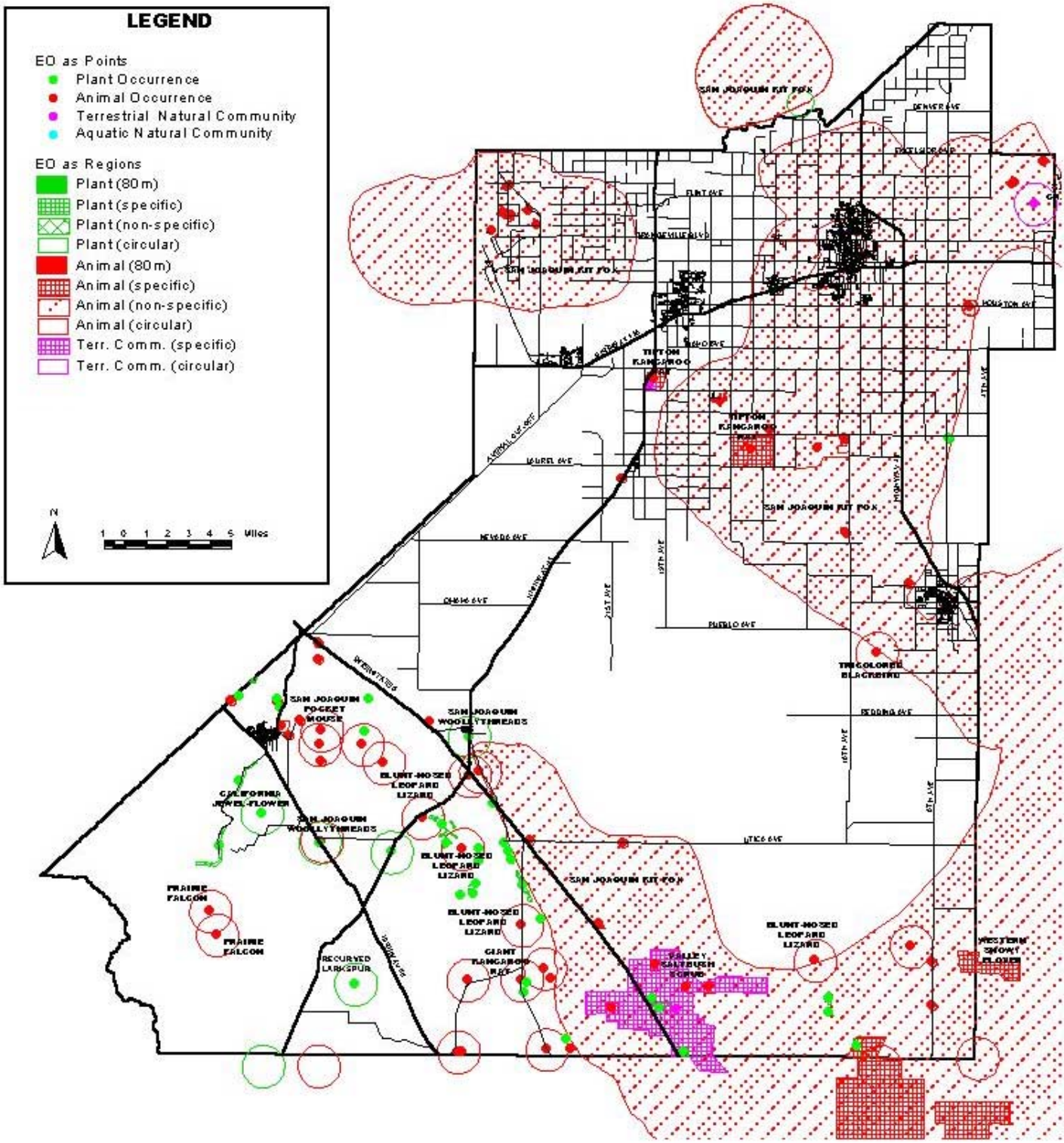
Based on recorded geographic range, plant species with special status that are known to occur or to have occurred in Kings County include: forked fiddleneck (*Amsinckia furcata*), slough thistle (*Cirsium crassicaule*), recurved larkspur (*Delphinium recurvatum*), hoover's woolly-star (*Eriastrum hooveri*), cottony buckwheat (*Eriogonum gossypinum*), and San Joaquin woolly-threads (*Lembertia congdonii*), among others. These species have varied State and Federal listing status, and most are considered rare (list 1B) by the CNPS. Most of the known occurrences of special-status plants are from the western hills where intensive agricultural use has not occurred. Grading associated with intensively managed agricultural use and urban development generally precludes the occurrence of populations of special-status plant species on most of the valley floor.

Animal Species of Concern

A number of bird, mammal, reptile, and insect species with special-status are known or suspected from the San Joaquin Valley and Kings County area. These include: Cooper's hawk (*Accipiter cooperi*), tricolored blackbird (*Agelaius tricolor*), burrowing owl (*Athene cunicularia*), golden eagle (*Aquila chrysaetos*), Swainson's hawk (*Buteo swainsoni*), ferruginous hawk (*Buteo regalis*), western snowy plover (*Charadrius alexandrinus nivosus*), mountain plover (*Charadrius montanus*), northern harrier (*Circus cyaneus*), California yellow warbler (*Dendroica petechia brewsteri*), white-tailed kite (*Elanus caeruleus*), prairie falcon (*Falco mexicanus*), American peregrine falcon (*Falco peregrinus anatum*), greater sandhill crane (*Grus canadensis tabida*), loggerhead shrike (*Lanius ludovicianus*), bank swallow (*Riparia riparia*), pallid bat (*Antrazous pallida*), tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), California mastiff bat (*Eumops perotis californicus*), Townsend's western big-eared bat (*Plecotus townsendii townsendii*), American badger (*Taxidea taxus*), San Joaquin kit fox (*Vulpes macrotis mutica*), southwestern pond turtle (*Clemmys marmorata pallida*), blunt-nosed leopard lizard (*Gambelia silus*), California horned lizard (*Phrynosoma coronatum*), giant garter snake (*Thamnophis couchi gigas*), San Joaquin dune beetle (*Coelus gracilis*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*).

WILDLIFE AND HABITAT IN KINGS COUNTY

Figure 4.4-1



Source: California Natural Diversity Database
Wildlife & Habitat Data Analysis Branch
Department of Fish & Game, 2000

BASELINE

99233\4#4-1bio.cdr 4/24/01

Habitat for most of these species has been greatly affected by past and ongoing agricultural production, flood control and drainage management, and other disturbance. Most of the remaining occurrences of special-status animal species are concentrated in locations where intensive habitat modification has not occurred, such as the southwestern portion of the County, the West Hacienda vicinity, and an area of valley sink scrub west of Guernsey. Further detailed surveys would be necessary to confirm the presence or absence of any occurrence of special-status animal species where suitable habitat remains. Species of particular concern because of their legal protective status and distribution in Kings County include: San Joaquin kit fox, tipton kangaroo rat, and blunt-nosed leopard lizard. Additional information on each of these species is summarized below.

San Joaquin Kit Fox

This subspecies is State-listed as threatened, and Federally-listed as endangered. Historically, San Joaquin kit fox occurred in several native plant communities of the San Joaquin Valley. In the central portion of its range, which includes King County, the subspecies is associated with valley sink scrub, saltbush scrub, non-native grassland, and remnant native grassland. Agriculture now dominates this region, and kit fox generally inhabit grazed, non-irrigated grasslands, but live next to and forage in tilled or fallow fields, irrigated row crops, orchards, and vineyards (USFWS, 1997).

Although the kit fox has been Federally-listed for over 30 years, its status throughout much of its current range is poorly documented and there has never been a comprehensive survey of its entire historical range. In 1990, the USFWS produced a range map based on earlier studies (Morell, 1975) that identified portions of Kings County as potentially occupied habitat, as shown on Figure 4.4-1. Records of kit fox sightings in Kings County are primarily from native plant communities of the Kettleman Hills west of the California Aqueduct, lands south of the Tulare Lake Basin, and from the isolated native scrub and grassland habitat west of Guernsey.

Tipton Kangaroo Rat

This rat is one of three subspecies of the San Joaquin kangaroo rat, and is found in Kings, Tulare, and Kern counties of the southern San Joaquin Valley. It is both State and Federally-listed as endangered. Historically, populations apparently were most abundant in the dune grasslands and saltbush scrub communities of the Tulare Lake Basin. Areas supporting this subspecies today tend to have sparsely scattered woody shrubs and a ground cover of introduced and native grasses and forbs. The CNDDB records and other information sources indicate suitable habitat and reported occurrences of this subspecies just west of Guernsey, between Stratford and Lemoore, and south of Kettleman City. Historic occurrences of other subspecies, giant kangaroo rat and Fresno kangaroo rat, have also been reported from Kings County.

Blunt-Nosed Leopard Lizard

This species is endemic to the San Joaquin Valley, with its range extending from Stanislaus County in the north southward to the Tehachapi Mountains in Kern County. It is both State and Federally listed as endangered. The currently occupied range is in scattered parcels of undeveloped land on the valley floor and in the foothills of the Coast Ranges. Suitable habitat includes native and non-native grasslands, valley sink scrub, valley saltbush scrub, and alkali playa natural communities.

WETLANDS

Although definitions vary to some degree, wetlands are generally considered to be areas that are periodically or permanently inundated by surface or ground water, and support vegetation adapted for life in saturated soil. Wetlands are recognized as important features on a regional and national level due to their high inherent value to fish and wildlife, use as storage areas for storm and flood waters, and water recharge, filtration, and purification functions.

The CDFG and U.S. Army Corps of Engineers (Corps) have jurisdiction over modifications to wetlands and unvegetated "other waters of the U.S." Jurisdiction of the Corps is established through the provisions of Section 404 of the Clean Water Act, which prohibits the discharge of dredged or fill material without a permit. Jurisdictional authority of CDFG over wetland areas is established under Sections 1601-1606 of the Fish and Game Code, which pertain to activities that would disrupt the natural flow or alter the channel, bed, or bank of any lake, river, or stream.

Potential jurisdictional wetlands within the County include river and stream corridors, freshwater marsh and seasonally inundated floodplains, and remnant vernal pools along Cross Creek and possibly along Cottonwood Creek, and the valley sink scrub natural community west of Guernsey. A detailed wetland assessment would be required to determine whether jurisdictional wetlands occur on individual parcels with likely indicators such as depressions or drainages.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

Under **Goal DE 1** of the Revised Kings County Draft Dairy Element (Element), **Objective DE 1.2** requires that specific criteria be applied to approval of proposed new or expanded dairies to ensure that dairy operations are compatible with environmental constraints, including constraints related to biological resources. **Policy DE 1.2e** specifically addresses protection of wetlands and other ~~wildlife~~ habitat for sensitive species. The policy prohibits approval of dairy development via the SPR process in designated wetlands and areas of ~~undisturbed wildlife~~ habitat for sensitive species. ~~The policy~~ **Policy DE 3.3a** presumes that

land that has been continuously cultivated since 1985 (including fallow land in rotation) would not qualify as designated wetland or ~~wildlife~~ habitat for sensitive species. **Objective DE 3.3** requires that protection of sensitive biological resources be evaluated during permit review. The objective is supported by **Policy DE 3.3a**, which describes the requirements for site-specific biological and wetland surveys for all new and expanded dairy operations.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

According to the CEQA Guidelines, potentially significant environmental effects on biological resources include:

- substantial adverse effect on a population or essential habitat of special-status plant or animal species.
- substantial adverse effect on any riparian habitat or other sensitive natural community type, such as native grasslands and scrub.
- substantial adverse effect on federally protected wetlands.
- substantial interference with the movement of any native resident or migratory fish or wildlife species, their wildlife corridors, or nursery sites.
- conflict with an adopted habitat conservation plan, natural community conservation plan, or other local, regional, or state conservation plan.
- conflict with any local ordinances protecting biological resources, including relevant policies of the Resource Conservation Element of the County General Plan.

Impact 4.4-1

Dairy development could result in conversion of existing vegetative cover and associated wildlife habitat, including habitat for special-status species or sensitive natural communities. This is a less-than-significant impact.

Future dairy use allowed under the proposed Element would result in the conversion of primarily agricultural crops to dairy-related facilities, which generally would not affect any significant vegetation resources or sensitive wildlife habitat. Most of the anticipated future dairy use would occur in areas of existing intensively managed agricultural use, which has only limited value as significant vegetation resources and ~~wildlife~~ habitat for sensitive

species. The construction of required improvements and irrigation associated with dairy use would generally not result in significant impacts on biological resources when located on existing agricultural fields.

Policy DE 1.2e ~~would generally~~ prohibits ~~dairies on~~ approval of dairy development via the SPR process in designated wetlands and ~~undisturbed wildlife~~ habitat for sensitive species. However, further detailed studies may be necessary to confirm presence or absence of sensitive biological resources, and the extent of any required avoidance. Conversion of remaining natural community types or essential habitat for special-status plant and animal species would be considered significant.

Compatibility zones identified as part of the theoretical dairy herd capacity for the County encompass numerous known occurrences of special-status plant and animal species, as well as locations with remaining natural community types, such as valley saltbush scrub, valley sink scrub, riparian woodland and scrub, and grasslands. Conversion of remaining natural habitat to dairy facilities and irrigated agriculture would have a significant impact on wildlife resources and could result in the take of one or more listed species. Of particular concern is the potential for conversion of essential habitat for tipton kangaroo rat, blunt-nosed leopard lizard, and San Joaquin kit fox in the remaining natural habitat between Stratford, Lemoore, and Guernsey. There is also a potential for inadvertent entrapment or killing of individual kit fox during construction of dairy facilities. Similarly, construction activities could also result in the destruction of raptor nests in trees or ground nests of burrowing owl, which would be a violation of the Migratory Bird Treaty Act and Section 3503.5 of the State Fish and Game Code.

Policy DE 1.2e of the Element states that new and expanded dairy developments ~~are prohibited~~ on wetlands and ~~undisturbed wildlife~~ habitat for sensitive species may not be approved via the SPR process. ~~The policy~~ **Policy DE 3.3a** assumes that land that has been continuously cultivated since 1985 does not qualify as wetlands or sensitive wildlife habitat. The potential for occurrence of special-status species on natural habitat, or the indirect effects (e.g., additional nighttime light and glare) of potential development adjacent to sensitive habitat, must be considered. This includes essential habitat for special-status species, riparian corridors and other natural community types, and seasonal or freshwater marsh habitat, which could all be affected by indirect effects, such as water quality degradation and increased human activity. The presence or absence of sensitive resources on or adjacent to individual dairy developments is addressed by **Objective DE 3.3** of the Element. The objective is supported by **Policy DE 3.3a**, which requires that site-specific biological and wetland surveys be conducted prior to approval of new or expanded dairy developments. The policy requires that ~~mitigations to avoid or minimize impacts to biological resources be recommended by the completed surveys~~ the CUP process be

completed if the site-specific biological resources survey identifies habitat for sensitive species.

Implementation of **Policies DE 1.2e** and **3.3a** would reduce the impacts to less-than-significant levels by requiring site-specific biological and wetland surveys for all new and expanded dairy developments.

Mitigation Measure 4.4-1

None required.

Impact 4.4-2

Loss and modification of wetlands. This is a less-than-significant impact.

According to **Policy DE 1.2e** of the Element, any land conversion associated with future dairy facilities would be prohibited on wetlands and no significant adverse impacts are anticipated. ~~However, detailed surveys may be necessary to confirm the presence or absence of wetlands, as called for in **Policy DE 3.3a**.~~ If surveys conducted in accordance with Policy DE 3.3a confirm the presence of wetlands, the applicant will be required to complete the CUP process.

Mitigation Measure 4.4-2

None required.

4.5 NOISE

4.5 NOISE

Noise is commonly defined as unwanted sound, sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, consideration of noise exposure has become an integral part of land use planning and environmental assessments. This section evaluates the noise impacts associated with implementation of the proposed project. The existing and future noise exposures of a potential dairy site are described; the compatibility of new and expanded dairies with the existing on-site and off-site noise environment is evaluated.

SETTING

Sound is measured in decibels (dB). Zero dB approximates the threshold of hearing. Although decibels can describe the purely physical intensity of sound, they cannot accurately describe sound as perceived by the human ear. The pitch or frequency of a sound must be taken into account when measuring human response to sound since most sounds consist of a broad band of frequencies, with each frequency differing in sound level. For this reason, a frequency-dependent weighting system must be employed whenever sound is measured. These measurements are generally reported in A-weighted decibels (dBA). Decibels and other technical terms are defined in Table 4.5-1; typical A-weighted noise levels measured in the environment and in industry are shown in Table 4.5-2 for different noise types.

The effects of noise on people can be grouped into three general categories: 1) subjective effects of annoyance, nuisance, and dissatisfaction; 2) interference with activities such as speech and sleeping; and 3) physiological effects such as hearing loss. An important method for determining a person's subjective reaction to a new noise is by comparing it to ambient (existing) conditions. The following statements describe the general relationship of noise effects on people:

- An increase or change of one dB cannot typically be perceived, except in carefully controlled laboratory experiments;
- A three-dB change is considered a just-perceivable difference;
- A minimum of a five-dB increase is required before any noticeable change in community response is expected;
- A ten-dB increase is subjectively heard as approximately a doubling in loudness, and would be expected to cause an adverse change in community response.

- Noise levels are reduced by six dB for every doubling of distance from the source, although a greater decrease in noise level could result from the presence of intervening structures or other physical barriers.

TABLE 4.5-1: **Definitions of Acoustical Terms**

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 PM to 10:00 PM and after addition of 10 decibels to sound levels in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 PM and 7:00 AM.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

TABLE 4.5-2: **Typical Sound Levels Measured in the Environment and Industry**

At a Given Distance from Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
	140		
Civil defense siren (100')	130		
Jet takeoff (200')	120		Pain Threshold
	110	Rock music concert	
Pile driver (50')	100		Very loud
Ambulance siren (100')			
	90	Boiler room	
Freight cars (50')		Printing press plant	
Pneumatic drill (50')	80	In kitchen with garbage disposal running	
Freeway (100')			
	70		Moderately loud
Vacuum cleaner (10')	60	Data Processing center	
		Department store	
Light traffic (100')	50	Private business office	
Large transformer (200')			
	40		Quiet
Soft whisper (5')	30	Quiet bedroom	
	20	Recording studio	
	10		Threshold of hearing
	0		

Source: Kern County, 1999.

REGULATORY ENVIRONMENT

The Kings County General Plan Noise Element includes noise and land use compatibility standards for various land uses (Table 4.5-3). Proposed land uses exposed to "acceptable" noise levels indicate that a proposed land use would be acceptable. Proposed land uses exposed to "conditionally acceptable" noise levels typically indicate that the proposed land use should be undertaken only after a detailed analysis of noise reduction requirements is made and noise insulation features are included in the design of the structures

corresponding to the specified land use. Proposed land uses exposed to "unacceptable" noise levels typically indicate that the proposed land use should be discouraged or should not be undertaken.

TABLE 4.5-3: **Noise and Land Use Compatibility Standards**

Land Use Category	Community Noise Exposure, L_{dn} or CNEL dB		
	Acceptable	Conditionally Acceptable	Unacceptable
Residential (single family and rural)	<60/<45	60 to 70	>70/>45
Residential (multi-family)	<65/<45	65 to 70	>70/>45
Transient Lodging	<65/<45	65 to 70	>70/>45
Institutional - Noise Sensitive (Schools, Libraries, Hospitals, Churches, and Nursing Homes)	<65/<45	65 to 70	>70/>45
Institutional - Non-Noise Sensitive (Auditoriums, Theaters)	No levels identified	<70	>70
Sports Arena and Outdoor Spectator Sports Activities	No levels identified	No levels identified	<70
Outdoor Activities/Recreation (Playgrounds, Neighborhood Parks, Golf Courses, Riding Stables, Water Recreation, Cemeteries)	<70	No levels identified	>70
Outdoor Spectator Sports Activities, Sports Arenas/Stadiums	No levels identified	No levels identified	>70
Industrial, Commercial, and Agriculture	<70	70 to 75	>75

Source: Kings County, 1993, as amended.

Note: xx/yy = Exterior/interior noise levels
xx = exterior noise levels

EXISTING CONDITIONS

The major sources of noise in Kings County are roadways/highways, airports, railroad operations, industrial operations, auto racing activities at the Kings County Fairgrounds and the Lemoore Jet Bowl, and agricultural activities (season dependent) (Kings County,

1993).[1] Highway traffic noise levels for various roadways throughout the County were contoured for the years 1992 and 2005 and are included in the Kings County General Plan Appendix VIII. The noise level contours identify the distances at which the 60 dB and 65 dB noise level would occur from a given roadway. The major roadways evaluated included Houston Avenue, Hanford/Armona Road, Dairy Avenue, Front Street, Laurel Avenue (Main Street, Stratford), Excelsior Avenue, and Grangeville Boulevard. The contours indicate that noise levels from Houston Avenue at Highway 43 would exhibit the loudest noise levels for both the 1992 and 2005 scenarios; the 60 and 65 dB noise contours at this location would be 147 and 68 feet from the center of the roadway, respectively (Kings County, 1993).

The Lemoore Naval Air Station, Hanford, Corcoran, Salyer, and agricultural airports also contribute to the existing noise within the County. The Lemoore station is a military jet aircraft base located in the northwest portion of the County. Kings County limits development activities within three miles of the Naval Station to control the jet aircraft noise effects on nearby land uses. Hanford and Corcoran airports are public facilities. The Hanford Municipal Airport is located south of State Highway 198 (southeastern part of the city), and the Corcoran airport is located on the western edge of the city of Corcoran. The Kings County General Plan Appendix VIII includes existing 60, 65, and 70 dB Community Noise Equivalent Level (CNEL) noise contours for the Hanford and Corcoran airports; future 2011 noise contours are also included for the Hanford airport. The noise contours indicate that areas within approximately 500 feet from the Hanford airport runway Number 14 could exhibit noise levels at 70 dB CNEL in 2011. Similarly, areas within one-half mile of the Corcoran airport runway could exhibit noise levels exceeding 100 dBA.

The Salyer airport is privately-owned and located east of the Corcoran airport. Agricultural aircraft operate from various private runways throughout the rural areas of the County. According to Table 16 of the Kings County General Plan Appendix VIII, the airport land use noise compatibility criteria for cropland consider noise levels between 50 and 70 as clearly acceptable and noise levels between 70 and 75 normally acceptable.[2] Similarly, the airport land use noise compatibility criteria for livestock breeding considers noise levels between 50 and 55 as clearly acceptable, between 55 and 60 as normally acceptable, between 60 and 70 as marginally acceptable, and between 70 and 75 as normally unacceptable.

Southern Pacific and Santa Fe Railroad operations also contribute to the noise environment in the County. The Southern Pacific railroad lines are situated in an east-west alignment

[1] The Lemoore Jet Bowl has since been relocated to SR 41 and Idaho Avenue, farther from the residential areas of Lemoore and the Lemoore fringe.

[2] The General Plan does not identify unacceptable noise levels for cropland land uses.

and the Santa Fe railroad lines are situated in a north-south alignment. According to Table 17 of the Kings County General Plan Appendix VIII, both the Southern Pacific and Santa Fe railroads exhibit 60 and 65 dB at greater than 100 feet from the centerline of the railroad tracks.

Several industrial operations in the County contribute to the existing noise environment, such as the Kings Industrial Park, the Corcoran Industrial Park, and the Crisp Grain Mill. Figures 26 through 28 of the Kings County General Plan Appendix VIII include the 45 and 50 dB noise level contours from these sources.

Agricultural operations throughout the County also contribute to the existing noise environment. Agricultural sources include the use of farming equipment, such as tractors, harvesting equipment, pump engines, and stationary equipment. Diesel engines typically generate between 75 and 85 dB at about 50 feet from the noise source. Auto racing is also considered a noise source within the County. The noise generated from auto racing varies depending on the season and activity.

EXISTING PLANS AND POLICIES

The Noise Element of the Kings County General Plan includes a goal, objective, and several policies that would be relevant to the proposed project (Kings County, 1993).

Goal 40: Ensure the compatibility of proposed land uses in terms of their appropriate noise levels.

Objective 40.1: Avoid incompatibility of adjacent land uses by requiring appropriate noise-reducing mitigation measures.

Policy 40a: Use the information shown in Noise and Land Use Compatibility Standards Table 18 of Appendix VIII of the General Plan (Table 4.5-3 of this EIR), as Kings County policy regarding the compatibility of land uses and noise levels produced or received.

Policy 40b: Require developers of projects expected to produce excessive noise to mitigate the effects of the excessive noise on existing land uses.

Policy 40c: Require developers of noise-sensitive projects to mitigate for existing excessive noise sources which may be expected to impact the project.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

The following goals, objectives, and policies of the Kings County Draft Dairy Element (Element) address noise issues:

Dairy Siting Goals, Objectives, and Policies

Goal DE 1 restricts the locations where dairies may be located to those areas of the County where they are most compatible with surrounding uses and activities, and environmental constraints. **Objective DE 1.1** commits to protect agricultural uses from encroachment of incompatible nonagricultural uses.

Policy DE 1.1a acknowledges the Kings County Right to Farm Ordinance and inherent potential inconveniences and discomforts, including noise from equipment and animals, often associated with agriculture uses.

Objective DE 1.2 requires that specific ~~criteria~~ standards be used to avoid potential land use conflicts when approving new dairies and expansion of existing dairies. Such conflicts could include nuisance noise at residences near existing or proposed dairies.

Policy DE 1.2b provides a mechanism for avoiding potential land use conflicts between jet aircraft noise and new dairies. The policy prohibits the placement of actual animal concentration facilities (e.g., corrals, freestall barns, milk barns) within the exclusive agricultural zone district but would allow the placement of manure and dairy process water storage areas in this zone.

Theoretical Herd Capacity Goals, Objectives, and Policies

Goal DE 3 requires the development of a countywide policy for the evaluation and distribution of dairies and dairy stock replacement location and operation. **Objective DE 3.1** requires consideration of mitigation measures developed in this PEIR when reviewing and evaluating proposals for new or expanded dairies.

Policy DE 3.1a requires the consideration of ~~the~~ various criteria, including noise, in the Technical Report for both the general dairy siting criteria and site specific dairy projects~~; including ground and surface water quality; traffic and road conditions; proximity to the nearest residences; and potential health, safety, and/or nuisance problems that may be identified on a case by case basis. Nuisance problems could include noise generation at dairies and by traffic generated by dairy development~~.

Policy DE 3.1i requires that dairy project applications include an assessment, which demonstrates that the project will comply with the Noise Element of the Kings County General Plan.

Element Monitoring and Enforcement Goals, Objectives, and Policies

Goal DE 6 requires the implementation of a monitoring program that both demonstrates the Element's effectiveness in protecting the environment, and the effectiveness of the mitigation measures required for each operating dairy facility in Kings County. **Objective DE ~~6.1~~ 6.2** requires the protection of the environment through monitoring of the dairy industry's operational activities so that adjustments in the operation can be made when necessary. **Policies DE ~~6.1a~~ 6.2a ~~and 6.1b~~** provide a mechanism for: determining the current baseline environmental conditions for comparison with future monitoring results; continuous monitoring of individual dairy operations subject to the Element; and the establishment of the dairy system monitoring program and its elements.

Objective DE ~~6.2~~ 6.3 requires the implementation of a continuous monitoring program for each operating dairy. **Policy DE ~~6.2a~~ 6.3a** requires that each new dairy, or expanded dairy conduct annual inspections to demonstrate that the facility is operating under approved conditions, and if conditions are violated would be subject to modification of the operation.

Goal DE ~~7~~ 6 requires the establishment of a Dairy Monitoring Program in the Dairy Monitoring Office, managed by the Kings County Planning Agency. **Objective DE ~~7.1~~ 6.1** would establish a Dairy Monitoring Program in the Kings County Planning Agency. **Policies DE ~~7.1a~~ 6.1a.A** through **~~7.1c~~ 6.1a.C** establish procedures and requirements for dairy data tracking, problem resolution, and reporting to the Planning Commission. **Objective DE ~~7.2~~ 6.4** establishes a formal complaint response system for complaints made by the public concerning dairy operations, potentially including issues related to noise generation. Corresponding **Policies DE ~~7.2a~~ 6.4a** through **~~7.2c~~ 6.4c** identify the requirements of the complaint system.

Existing Dairy Voluntary Conformance Goals, Objectives, and Policies

~~**Goal DE 8** would bring all existing dairies in Kings County into voluntary conformance with the provisions of the Element by the end of 2006. **Objective DE 8.1** requires the development of a program by which an existing dairy operation can earn a certificate certifying that it is being operated in compliance with the policies of the Element. **Policies DE 8.1a** and **8.1b** require: the implementation of a Dairy Conformance Program for existing dairies and coordination with the Legislature, industry programs, and individual dairy operators to develop programs and funding to assist dairies meet current operating standards.~~ **Policy DE ~~8.1c~~ 3.7a** indicates that nothing in the Element guarantees that a dairy that does not meet the specified standards will be able to ~~come into conformance~~ make the changes necessary for future expansion.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

Based on the Kings County General Plan Noise Element goal, objective, and policies and the recently amended environmental checklist recommended in the CEQA *Guidelines*, project-generated noise would be considered to result in a significant noise impact on the environment if it would result in any of the following:

- exposure of persons to, or generation of, noise levels in excess of standards established in local general plan or noise ordinance;
- exposure of people to, or generation of, excessive ground borne vibration or noise levels;
- a substantial permanent increase in ambient noise levels in the project vicinity above existing levels without the project; or
- for a project in the vicinity of an airport, exposure of people to excessive noise levels.

Impact 4.5-1

Construction activities associated with new or expanded dairies would result in short-term noise increases. This is a less-than-significant impact.

Construction of new and expanded dairies would typically include soil excavation, soil grading, site preparation, construction of structures (e.g., freestall barns, manure management system, milking center, hospital, entry court), and installation of utilities and paving. Construction noise would depend on the equipment used, the distance from the noise source to a sensitive receptor, phasing of construction equipment use, and presence or absence of noise barriers.

Construction equipment that may be used at new or expanded dairies would likely include scrapers, water trucks, bulldozers, backhoes, and miscellaneous equipment (e.g., pneumatic tools, generator, portable air compressor). Noise levels generated by these types of construction equipment at various distances from the noise source are shown in Table 4.5-4.

Noise levels generated from the individual pieces of equipment would range from 76 to 89 dBA at a distance of 50 feet from the noise sources. Construction noise levels would decrease with increasing distance from the noise source; typically, noise levels are reduced by six dB for every doubling of distance from the source, although the presence of intervening physical barriers would result in a greater decrease in noise levels. Assuming that no intervening structures would be present in the vicinity of a dairy, noise levels generated by the individual construction equipment could range from 70 to 83 dBA at a distance of 100 feet and 36 to 49 dBA at a distance of 1.0 mile from the noise sources.

Noise levels would increase by three dBA for each doubling of sound sources with equal noise levels. Therefore, if two scrapers (emitting 88 dBA individually) were used simultaneously at a similar location, the cumulative noise level generated by the scrapers would be 91 dBA at 50 feet. Under a worst-case scenario, if each piece of equipment (or nine pieces of equipment with similar noise strengths) were used simultaneously at the same location, the cumulative noise level would be 109, 103, and 69 dBA at distances of 50 feet, 100 feet, and 1.0 mile from the noise source, respectively.

TABLE 4.5-4: **Estimated Noise Levels**

Construction Equipment Noise Source	Typical Noise Level (dBA) (distance from source)[1]		
	50 feet	100 feet	1.0 mile
Pneumatic tools	85	79	45
Truck (e.g., dump, water)	88	82	48
Concrete mixer (truck)	85	79	45
Scraper	88	82	48
Bulldozer	87	81	47
Paver	89	83	49
Backhoe	85	79	45
Generator	76	70	36
Portable air compressor	81	75	41
Combined equipment[2]	109	103	69

1 Noise levels 50 feet from the source were obtained from San Francisco, 1990, and Charles M. Salter Associates, Inc., 1998; noise levels 100 feet and 1.0 mile from the source were calculated by BASELINE.

2 Assumes that each piece of equipment (up to nine pieces of equipment with similar noise strengths) is used simultaneously at similar locations on site.

Nearby receptors, if present in the vicinity of a future dairy facility, could potentially be affected by construction noise, depending on the distance of the receptor to the noise source and the actual noise levels observed by the receptor. Potential nearby receptors would likely be rural residences throughout the agricultural-zoned areas. Exterior noise levels greater than 70 dB day/night noise level (L_{dn}) and interior noise levels greater than 45 dB L_{dn} would be would be considered unacceptable for rural farm residences, respectively, according to the noise and land use compatibility standards of the General Plan (Table 4.5-3).

Although the Element does not specifically address noise control from dairy construction activities, Policy 40b of the Kings County General Plan requires developers to mitigate excessive noise effects on existing land uses for projects that are expected to produce excessive noise. Policy 40a of the General Plan refers to the Noise and Land Use Compatibility Standards Table 18 (Table 4.5-3 of this EIR) for determining compatible land use noise levels. Compliance with policies 40a and 40b of the General Plan would reduce this potential impact to a less-than-significant level without additional mitigation.

Mitigation Measure 4.5-1

None required.

Impact 4.5-2

Operation of a new or expanded dairy could increase noise levels generated by additional vehicular traffic. This is a less-than-significant impact.

New or expanded dairies would generate an increase in vehicular trips from milk trucks, supply feed trucks, employee/visitor vehicles, manure haul trucks, and other miscellaneous vehicle use. The increase in vehicular trips associated with dairy operations is considered to be minimal since heavy traffic volumes typically do not result from dairy operations, even for large dairies. Typically, additional vehicular traffic from dairy operations would likely result in an increase in noise level of less than two decibels along the major roadways within the project vicinity; this minimal increase in existing traffic noise levels is not generally detectable and would not be expected to result in a significant noise impact or adverse community response.

Mitigation Measure 4.5-2

None required.

Impact 4.5-3

New or expanded dairies could be exposed to adverse existing noise sources. This is a less-than-significant impact.

New or expanded dairies could be exposed to noise generated from existing noise sources throughout the County, including aircraft noise from existing airports (i.e., Hanford, Corcoran, and Lemoore), roadway noise, railroad operations, industrial operations, auto racing, and agricultural activities. According to the Kings County General Plan, noise levels estimated in 1992 and projected for 2005 for several of these noise sources could reach levels greater than 75 dBA (unacceptable noise threshold), depending on the distance of the receptor to the noise source.

Policy DE 1.2b of the Element prohibits the siting of actual animal concentration facilities within the exclusive agricultural zone district. The policy indicates that it is "designed to protect the Lemoore Naval Air Station from encroachment of uses that are not compatible with the noise generated from the jet aircraft operations at the air station..."

In addition, Goal 40 of the Kings County General Plan requires that the noise levels of proposed land uses are compatible. Policy 40c of the General Plan requires developers of noise-sensitive projects to mitigate for existing excessive noise sources that may be expected to impact the project. Policy 40a refers to the Noise and Land Use Compatibility Standards Table 18 (Table 4.5-3 of this EIR) for determining compatible land use noise levels. Compliance with the policies of the General Plan and Element would be adequate

to reduce this potential impact to a less than significant level without additional mitigation. This is a less-than-significant impact.

Mitigation Measure 4.5-3

None required.

Compliance with Policy 40c of the General Plan and **Policy DE 1.2b** of the Element would reduce construction-related noise impacts to a less-than-significant level.

Impact 4.5-4

Noise levels generated by project operations. This is a less-than-significant impact.

In addition to traffic noise, described in Impact 4.5-2 above, project operations would generate outdoor noise levels from dairy operations and cattle above the existing ambient conditions. However, the area in the site vicinity is agricultural in nature and cattle noise is not generally considered offensive in rural agricultural areas. No noise complaints related to operation of existing dairies have been filed with the Kings County Planning Agency (Zumwalt, 2000).

Potential nearby receptors, such as rural farm residences that could be located near a new or expanded dairy, may be subject to noise from dairy operational activities. According to the Noise and Land Use Compatibility Standards of the Kings County General Plan (Table 4.5-3), rural residences exposed to exterior or interior noise levels or less than 60 and 45 dB L_{dn}, respectively, would be considered "acceptable"; noise levels between 60 and 70 dB L_{dn} would be considered "conditionally acceptable" and interior and exterior noise levels greater than 70 and 45 dB L_{dn} would be considered "unacceptable," respectively.

The Element does not provide specific noise control measures for dairy operations. However, **Objective DE ~~7.2~~ 6.4** establishes a formal complaint response system for any public complaints regarding dairy operations. The objective is supported by **Policies DE ~~7.2a~~ 6.4a** through **~~7.2c~~ 6.4c**, which define the requirements of the complaint response system. In addition, Policy 40b of the General Plan requires developers of noise-sensitive projects to mitigate for existing excessive noise sources that may be expected to impact the project; Policy 40a refers to the Noise and Land Use Compatibility Standards (Table 4.5-3 of this EIR) for determining compatible land use noise levels. Compliance with the policies of the General Plan and Element would be adequate to reduce this potential impact to a less than significant level without additional mitigation.

Mitigation Measure 4.5-4

None required.

Implementation of **Policies ~~7.2a~~ 6.4a** through **~~7.2c~~ 6.4c** of the Element would ensure that conditions leading to complaints related to dairy operations would be investigated and corrected. In addition, compliance with Policies 40a and 40b of the General Plan would reduce noise impacts related to dairy operations to a less-than-significant level.

4.6 VISUAL RESOURCES

4.6 VISUAL RESOURCES

This section analyzes visual impacts related to the permitting of new dairies under the Kings County Draft Dairy Element (Element). The section discusses whether any significant scenic views could be affected by the new dairy development, and examines impacts related to lighting and glare.

SETTING

Kings County is a predominantly agricultural county that encompasses irrigated fields on a flat valley floor in the northeast to dry rolling hills in the southwest portion of the county. Dairy development permitted under the Element would occur exclusively on flat, irrigated agricultural lands that are designated with the Dairy Development Overlay Zone (Figure 3-2). The lands designated for dairy development are located outside the Corcoran, Hanford, and Lemoore fringe areas, as well as in the rural agricultural areas of western and southwestern Kings County. Views across much of the agricultural lands that are designated for dairy development are largely unimpeded because of the topography. In the predominantly agricultural areas, the only defining landmarks are often either roads or the series of irrigation canals that run through the properties.

KINGS COUNTY GENERAL PLAN

The Open Space Element of the Kings County General Plan includes two goals and several policies that address scenic highways and community separators. The Scenic Resources section of the Open Space Element contains Goal 23, which states "Ensure that future land uses are compatible with the preservation of scenic highways." A figure in the Open Space Element identifies one scenic highway in the county: the portion of Highway 41 west of Highway 33 in the Coast Ranges. The figure also identifies "scenic lands" along the Kings River and its various distributaries, including Cole Slough in the northeast part of the county and the South Fork Kings and Fresno Slough in the northwest corner of the county. Policy 23c states the intent to "Design public works projects to minimize tree damage and removal along scenic corridors." There are no specific policies that address the "scenic lands" along the Kings River.

Goal 24 states "Preserve the visual identities of cities and communities by maintaining open space areas and boundary lines between them" and Objective 24.1 states "Preserve open space, maintain rural character, and prohibit development in community separator areas." Policy 24b identifies a community separator boundary line between Armona and Hanford and Policy 24c states the intent to retain the existing agricultural land use designations between the two communities. Policy 24d states "Maintain the existing

separation between Lemoore and Armona by preserving the predominantly General Agriculture and Rural Residential uses between 14½ and 17th avenues."

KINGS COUNTY ZONING ORDINANCE

Section 1902(A)(5) of the Kings County Zoning Ordinance requires that any application for a conditional use permit must submit a site plan that includes information about building heights and sizes; yards; walls and fence materials; landscaping; and "lighting: location and general nature, hooding devices." Section 1902(A)(6) of the Kings County Zoning Ordinance requires that "the site plan shall be so prepared by the applicant to enable the planning commission to find that" various design components of the project are arranged so "there will be no adverse effect on surrounding property" and that "Proposed lighting is so arranged as to reflect the light away from adjoining properties."

RELEVANT GOALS, OBJECTIVES, AND POLICIES

The section of the Element devoted to "General Restriction of Siting Dairies in Kings County" contains **Policy DE 3.1a**, which states "~~Consider, at a minimum,~~ A technical report shall be prepared and shall address the following ~~criteria for both the general dairy siting criteria and site specific dairy projects~~ siting issues." The policy is followed by ~~fourteen~~ twelve criteria, which include "light and glare."

As noted above, the Kings County General Plan identifies the lands along the Kings River and related tributaries as "scenic lands." Several policies of the Element address lands along the Kings River. **Policy DE 1.2c** states that dairy facilities, including manure and dairy process water storage areas, shall not be located in any flood zones identified by the National Flood Insurance Rate Maps (FIRM). The lands along the Kings, Tule, and Kaweah rivers and Cross Creek within the Tulare Lake Basin are designated by the FIRM as flood zones, and the accompanying figure in the Element clearly prohibits dairy development from locating within the flood zones in the County.

Policy DE 3.2c.A requires that dairy facilities be set back a minimum of 150 feet from wells and water bodies.

Policy DE 3.2c.B states that "~~The minimum setback from~~ Dairy facilities shall be designed to ensure that no runoff into surface waters, including rivers, creeks, intermittent streams, canals, reservoirs, lakes, ponds, sloughs, storm water basins, groundwater recharge basins, floodplains, floodways, etc., ~~of any manured area shall be 150 feet~~ will occur. This can be done by constructing barriers or grading the facility away from such water bodies.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The CEQA environmental checklist questions indicate that a project could have a significant adverse impact if it would:

- have a substantial, adverse effect on a scenic vista;
- substantially damage scenic resources in a state scenic highway;
- substantially degrade the existing visual character or quality of the site and its surroundings; or
- create a new source of substantial light or glare.

Impact 4.6-1

The general height, scale, lighting, and design of typical dairy facilities that would be allowed under the Element would be consistent with other farming operations in the agricultural zones of Kings County. This is a less-than-significant impact.

The flat, irrigated agricultural areas of Kings County that are designated for development of additional dairies are characterized by open agricultural fields with low rise (one- and two-story) agricultural structures and houses, with occasional tall structures such as grain silos. The site plan layout for a typical new dairy facility with several thousand milking cows would include freestall barns, shaded corrals, and several other barns. The shaded corrals would be approximately 18 to 20 feet in height; the main dairy barn, the calf barn, the commodity barn, and the hospital milk barn would range in height from 20 to 24 feet. If holding ponds are proposed for construction on-site, a typical design would be to excavate the ponds to below the ground surface. In areas of shallow groundwater, it may be necessary to construct embankments above the ground surface to impound the ponds.

The Kings County Zoning Ordinance specifies no height limit for structures within the Agricultural zone districts. The scale of the typical dairy facility described above would include project structures and buildings that are of a similar scale to other agricultural and residential buildings in the agricultural areas of Kings County. Views experienced by motorists traveling on nearby roads would be of the dairy structures, the main dairy barn, and shaded corrals in front of the property. The other structures toward the back of the typical dairy facility, such as the sides of the ponds and commodity barn, may not be readily visible to passing vehicles and occupants.

The zoning regulations for the Agricultural zone districts do not require any landscaping, although a 50-foot front yard is required for structures abutting a public road (Section 406(D)(1)).

Mitigation Measure 4.6-1

None required.

Impact 4.6-2

There is a potential for outdoor lighting and glare associated with dairies allowed under the Element to affect nearby rural residences. This is a less-than-significant impact.

New dairy facilities allowed under the Element would typically include night-time lighting of the freestall barns and corral areas. A potential impact of outdoor lighting constructed to illuminate the dairy buildings is a slight loss of darkness in the night sky, which could be experienced by any rural residents in the area of a new dairy.

The ~~Conditional Use Permit~~ approval process outlined in the Element contains **Policy DE 3.1a**, which requires that light and glare be ~~considered as "criteria for both the general dairy siting. criteria and site specific dairy projects."~~ addressed in the Technical Report for dairy applications. In addition, Section ~~1903 (A)(6)~~ 2102.C.3 of the Kings County Zoning Ordinance requires that ~~"the site plan shall be so prepared by the applicant to enable the planning commission to find that" various design components of the project are arranged so "there will be no adverse effect on surrounding property" and that~~ "In approving the site plan, the zoning administrator shall find that ... ~~P~~proposed lighting is so arranged as to reflect the light away from adjoining properties." In addition, Policy DE 3.1h requires that the Technical Report includes a design of outdoor lighting that ensures that lighting is directed away from adjoining properties

The Kings County Right to Farm Ordinance protects agricultural operations from the encroachment of incompatible, nonagricultural uses such as rural residences in agricultural areas of the County. The Right to Farm Ordinance does not address impacts of proposed agricultural operations on existing residences. Night lighting associated with new dairy facilities permitted under the Element is not expected to significantly impact existing nearby residences, since Element **Policy DE 1.2i** requires that new dairies be sited at least one-half mile from all residentially zoned lands, including isolated rural communities. In addition, **Policy DE 3.1b** of the Element requires that the proximity of rural residences shall be considered in the siting of individual dairy structures. **Policy DE 3.1c** requires that dairy structures be located the maximum distance from nearby off-site residences so that land use conflicts are minimized.

However, nearby residents may experience a slight brightening in the night sky due to the project lighting. Lighting and glare impacts would not be considered significant to these homes since the homes are already exposed to outdoor lighting from the other agricultural operations in the area.

Implementation of **Policies DE 1.2h**, **3.1a**, **3.1b**, ~~and~~ **3.1c**, and **3.1h** would reduce the potential for light and glare impacts through consideration of this issue during permit application review. In addition, **Objective DE** ~~**7.2**~~ **6.4** and **Policies DE** ~~**7.2a**~~ **6.4a** through ~~**7.2c**~~ **6.4c** would provide a formal process for responding to any complaints (including complaints associated with lighting) regarding dairy operations.

Mitigation Measure 4.6-2

None required.

Implementation of **Policies DE 1.2i, 3.1a, 3.1b, 3.1c, 3.1h,** and ~~**7.2a**~~ **6.4a** through ~~**7.2c**~~ **6.4c** will ensure that the potential site-specific impacts of lighting and glare are ~~evaluated~~ mitigated in the dairy development application review process, reducing the potential impacts to a less-than-significant level.

4.7 LAND USE AND POLICY CONSISTENCY

4.7 LAND USE AND POLICY CONSISTENCY

This section addresses the relationship of the proposed Kings County Draft Dairy Element (Element) policies and programs with existing and planned land uses. The analysis examines potential land use incompatibilities between new dairies and existing uses related to design, noise, odors, and lighting. This analysis also examines the consistency of the proposed Element policies with other adopted plans and policies, including the Kings County General Plan and Kings County Zoning Ordinance, and the County's Right to Farm Ordinance. Finally, this chapter discusses Williamson Act contracts and Farmland Security Zone contracts as they relate to lands proposed for new dairy development.

SETTING

The following setting section generally discusses existing land uses in the County, identifies relevant goals, objectives, and policies of the proposed Element, and also summarizes other relevant adopted plans and policies.

EXISTING LAND USE, PLANS AND POLICIES

Current Kings County General Plan

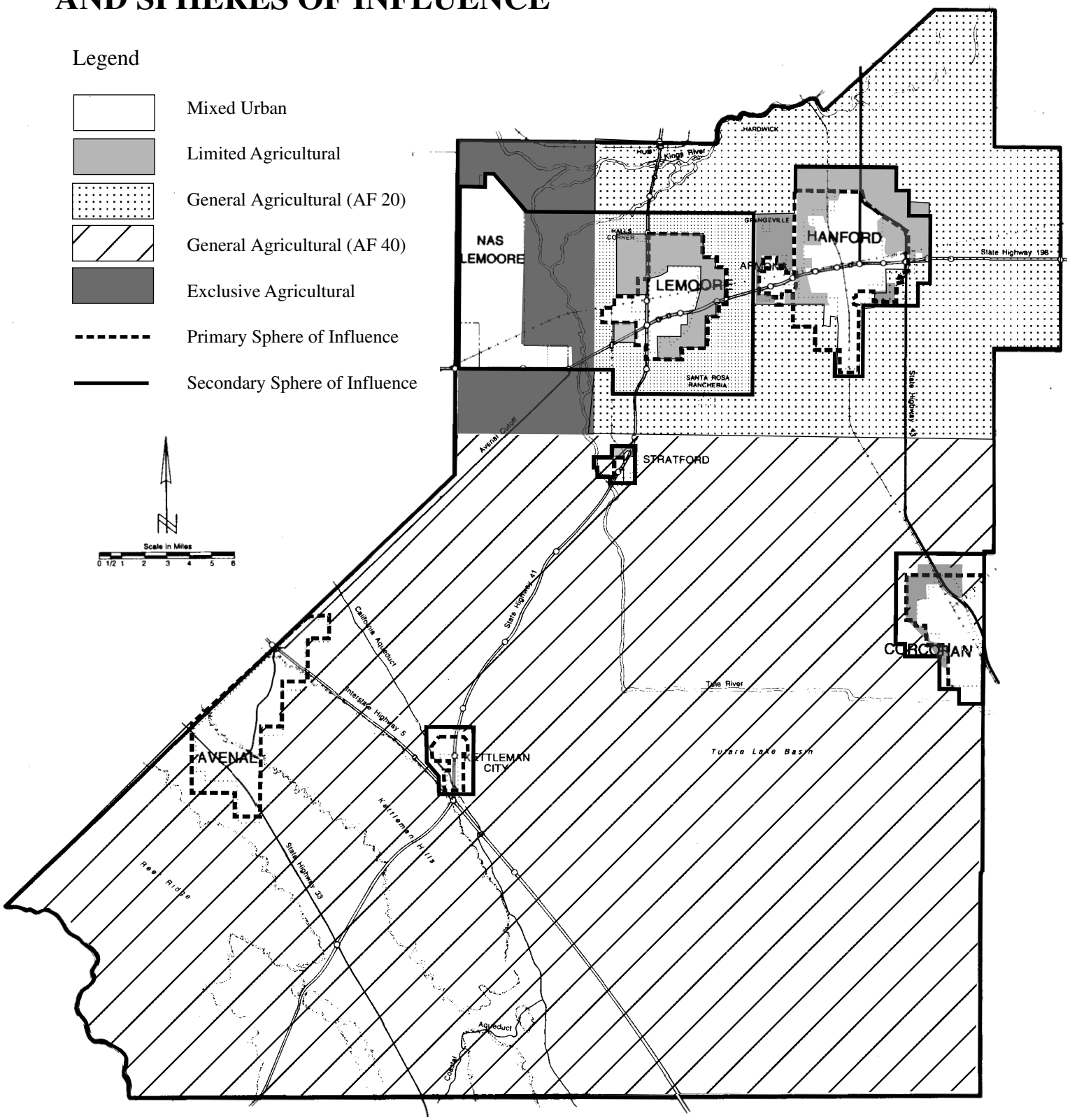
The Kings County General Plan, adopted in 1993, was an update, consolidation, and revision of various documents adopted over the preceding 28 years. It sets development policy for the 890,500 acres of land in the County. Approximately 88 percent of the County is devoted to agricultural uses. The remaining area includes Lemoore Naval Air Station and urban uses in the four established cities and their fringe areas, and unincorporated communities. The Kings County General Plan and Land Use Map includes four separate agricultural land use designations: General Agriculture-North County; General Agriculture-South County; Limited Agriculture; and Exclusive Agriculture.

Kansas Avenue is the dividing line between the General Agriculture land use designations on the General Plan map (Figure 4.7-1). Lands designated General Agriculture north of Kansas Avenue have a 20-acre minimum parcel size, and lands south of Kansas Avenue require a 40-acre minimum parcel size.

The Limited Agriculture designation is used as a buffer between urban and intensive agricultural uses, and is applied to lands around the four incorporated cities (Avenal, Corcoran, Hanford, and Lemoore and their fringe areas) as well as around the unincorporated communities of Armona, Home Garden, Kettleman City, and Stratford. The minimum parcel size in Limited Agriculture areas is ten acres. The Exclusive Agriculture designation is applied to lands generally in a three-mile-wide band around the

GENERAL PLAN LAND USE DESIGNATION AND SPHERES OF INFLUENCE

Figure 4.7-1



Source: Kings County Planning Agency.

BASELINE

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Lemoore Naval Air Station. The minimum parcel size in the Exclusive Agriculture area is 40 acres.

The General Plan states that permitted activities in the General Agriculture designation are the same as in the Limited Agriculture designation, except that "animal concentrations" and "agri-service businesses" are allowed in the General Agriculture areas and are not permitted in the Limited Agriculture areas. The General Plan text defines "animal concentrations" as "a collection of farm animals requiring concentrated feeding; includes, but is not limited to, dairies, stock feeding yards, and poultry operations."

Goals, objectives, and policies included in the Land Use, Open Space and Resource Conservation elements of the General Plan seek to protect and preserve agricultural soils, lands, and uses. For example, Goal 5 of the Land Use Element commits the County to "Protect agricultural lands by maintaining large parcel sizes and preventing the development of incompatible urban uses," and Goal 6 commits to "Support agriculture by preserving the right of farmers to operate efficiently, based on customary and usual agricultural practices."

Section I.D of the Element states that it is consistent with the other elements of the Kings County General Plan because the Element:

1. uses the same population, housing, and employment projections as the other General Plan elements;
2. uses information in the other General Plan elements in conjunction with the evaluation of new policies;
3. recommends changes to existing General Plan policies where necessary to ensure consistency;
4. includes policies that support, and are supported by existing General Plan policies; and
5. cross-references relevant existing General Plan policies.

An analysis of the project's consistency with the Kings County General Plan is included in this EIR under Impact 4.7-1.

Current Kings County Zoning Ordinance

The Kings County Zoning Ordinance allows bovine dairies as a conditional use in the AG-20 and AG-40 districts, permitted in accordance with the provisions of Article 19 of the Zoning Ordinance. The ordinance requires approval of a conditional use permit by the County Planning Commission. Section 406 of the ordinance includes "required conditions" for the issuance of any permit in the AG-20 and AG-40 zones. No conditional use permit is to be approved "and no process, equipment or materials shall be used which are found

by the planning commission...to be objectionable to persons living or working in the vicinity or injurious to property, crops, or livestock in the vicinity by reason of odor, fumes, dust, smoke, cinders, dirt, refuse, water-carried wastes, noise, vibration, illumination, glare or unsightliness or to involve any hazard of fire or explosion."

Section 406 of the Zoning Ordinance lists development standards "generally applicable to all Agricultural zone districts." The standards include requirements for minimum yard areas, heights, minimum distances between structures, off-street parking, and signs. A minimum ten foot side and rear yard is required for any residence at a dairy; there is no height limitation for any structure in the AG-40 zone, and there must be a minimum distance of 40 feet between a residence and a structure housing livestock or poultry.

Section 1903 of the County Zoning Ordinance details the application process and requires preparation of a site plan. The site plan for a conditional use shall be prepared "to enable the planning commission to find that all applicable provisions of this ordinance are complied with." Section 1903(A)(6)(b) and (c) of the ordinance requires that the facilities "are arranged so that traffic congestion is avoided and pedestrian and vehicular safety and welfare are protected and there will be no adverse effect on surrounding property," and "that proposed lighting is so arranged as to reflect the light away from adjoining properties."

Section 1903(9) details the specific requirements for a dairy application. The section requires that "all applications for a bovine dairy shall be accompanied by either:

a. A wastewater and manure management and disposal plan, prepared and signed by a professional engineer registered in the State of California, which determines the design of a proposed new dairy, or expansion of an existing dairy, will comply with the standard wastewater discharge requirements provided by the Regional Water Quality Control Board, to adequately dispose of all wastewater generated or produced by the new or expanded dairy operation, along with a groundwater monitoring plan to ensure that the plan works, or

b. Waste Discharge Requirements prepared by the Regional Water Quality Control Board specifically for that new or expanded dairy."

Section 1908(F) of the ordinance outlines specific findings that must be made by the planning commission before granting a conditional use permit for a bovine dairy. These findings include:

1. That the zoning administrator has included in his or her report to the planning commission the results of consultation with representatives of the County agricultural

commissioner, the County farm and home advisor, the County health officer, the Kings County Mosquito Abatement District, the Central Valley Regional Water Quality Control Board, and the Kings County Farm Bureau Dairy Committee before the planning commission may grant the application.

2. Said application may be granted only if the planning commission is able to make the following additional findings:

   a. The site is located a sufficient distance from the city limits or community or municipal service-type district boundaries of an urban area so that a conflict of land uses does not occur.
   b. The barns, corrals, and manure disposal systems are located a sufficient distance from residences not associated with the dairy so that a conflict of land uses does not occur.
   c. There is sufficient land under the control of the applicant to provide for management and disposal of process water produced by the dairy.
   d. Pollution and nuisance conditions will not occur as a result of discharge, stockpiling, handling, or storage of manure generated by the dairy.

In addition, Section 1908(F)(2)(e) lists eleven specific findings that must be made regarding the design and operation of the process water ponds for the dairies. Following the pond requirements, Section 1908(F)(2)(f) states the pond standards may be waived by the planning commission on an experimental basis in cases where there is evidence to indicate that the standards may be accomplished by alternative methods. Under this section, the experimental waste management methods must be reviewed in the field and their success or failure must be reported back to the commission within one year.

An analysis of the project's consistency with the Kings County Zoning Ordinance is included under Impact 4.7-2 of this EIR.

Right to Farm Ordinance

The Kings County Right to Farm Ordinance (Ordinance No. 546.1) states that it is the policy of the County to "protect agricultural land, operations, and facilities from conflicting uses due to the encroachment of incompatible, non-agricultural uses of the land in agricultural areas of the county," and to "advise developers, owners, and subsequent purchasers of property in the County of the inherent potential inconveniences and discomforts often associated with agricultural activities and operations, including, but not limited to, equipment and animal noise; farming activities conducted on a 24-hour a day, 7-day a week basis; odors from manure, fertilizers, pesticides, chemicals, or other sources; the aerial and ground application of chemicals and seeds; dust; flies and other insects; and smoke from agricultural operations."

The ordinance states that no lawful agricultural activity, operation or facility "shall be or become a nuisance, public or private, due to any changed condition in or about the locality, including, but not limited to, the encroachment of non-agricultural uses such as rural residences." The ordinance requires that all approvals for rezonings, land divisions, zoning permits, and residential building permits in the County shall include a condition that notice and disclosure of this policy be given to subsequent owners and occupants of the property, and that transfers of property also include the notice.

Williamson Act and Farmland Security Zone Contracts

Much of the agricultural land in Kings County has been enrolled in either the Williamson "California Land Conservation Act of 1965" or the Farmland Security Zone contracts. The Land Conservation Act is a State program that allows a land owner to enter into contracts with the County and receive a reduction in the amount of property taxes that are paid in return for a promise that the land will remain in agriculture or open space uses for ten years. The contract automatically renews itself every year, unless the owner or the County files a "notice of non-renewal." A recently enacted law has created a similar program, the Farmland Security Zone, that extends the ten year period under a Williamson Act contract to 20 years for a Farmland Security Zone contract in return for greater property tax benefits.

A substantial portion of the land that is identified in the Element as either "Dairy Development Overlay Zones" and "Nutrient Spreading Overlay Zones" has been placed in 20-year Farmland Security Zone contracts.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

Dairy Location Policies

The Kings County Draft Dairy Element (Appendix A) includes several components that address land use issues. Chapter III of the Element contains two sets of major goal and policy statements that define the areas of Kings County that are suitable for the location of new dairies and existing dairy expansion. **Goal DE 1** states "Restrict the location of new dairies to those areas of the County where they are most compatible with surrounding uses and activities, and where they are consistent with environmental constraints." **Objective DE 1.1** acknowledges the Kings County Right to Farm Ordinance and the County's commitment to protect agricultural land from encroachment of incompatible land uses. **Policy DE 1.1a** further describes the provisions of the ordinance as they apply to dairy development.

Objective DE 1.2 directs: "Use specific ~~criteria~~ standards to avoid potential land use conflicts when approving new dairies and expansion of existing dairies." ~~Nine~~ Separate policies under **Objective DE 1.2** set forth the criteria for restricting new dairies in certain

areas of the County. The first two policies indicate which agricultural zoning districts are not appropriate for certain dairy facilities. **Policy DE 1.2a** discusses the Limited Agriculture (AL-10) zoning district and states that "Animal concentration facilities, including associated dairy process water and manure storage areas, are intensive agricultural uses that are not appropriate in this urban to agricultural buffer area. However, manure used as fertilizer and dairy process water used to irrigate cropland may be transported to, and used in, the AL-10 zone districts."

Policy DE 1.2b discusses the Exclusive Agriculture (AX) zoning district and states that "This zone district is designed to protect the Lemoore Naval Air Station from encroachment of uses that are not compatible with the noise generated from the jet aircraft operations at the air station and potential hazards from aircraft accidents. This restriction is on new dairies and is designed to protect the huge investment of tax money at the air station from potential land use conflicts due to jet aircraft noise and accident potential. Areas used for manure and dairy process water storage and use are not prohibited from the AX zone district, only the location of the actual animal concentration facilities, e.g., corrals, freestall barns, milk barns, pens, ~~ponds~~ lagoons, feed storage, manure storage, etc."

The remaining ~~seven~~ policies under **Objective DE 1.2** identify other areas of the County that have specific characteristics that make them inappropriate for dairy development. **Policy DE 1.2c** restricts dairy facility development, including manure and dairy process water storage areas, from locating within any flood zones identified by the National Flood Insurance Rate Maps. However, the policy allows the spreading of manure and dairy process water on croplands within flood areas "if specific safeguards are in place to prevent pollution from these materials." ~~(i.e., do not spread manure or~~ **Policy DE 3.2d** restricts the application of dairy process water in flood plains during flood period or threat of flooding, and ~~insure~~ requires that manure is worked into soil immediately upon application~~)"~~.

Policy DE 1.2d prohibits dairy facility development within shallow or perched groundwater areas of the County unless ~~specific mitigation measures are provided that will protect groundwater from contamination by the dairy system operation~~ the applicant can demonstrate that the minimum vertical distance between proposed lagoon bottoms/corral surfaces and highest historic anticipated groundwater levels is at least five feet.

Policy DE 1.2e prohibits approval of dairy facilities in designated wetlands and ~~undisturbed wildlife~~ on habitat for sensitive species under the SPR process ~~areas~~, and **Policy DE 1.2f** restricts dairies in areas of excessive (over 5 percent) slopes, generally defined as west of the I-5 freeway or the California Aqueduct (except in the valley floor areas of the Kettleman Plain and Sunflower Valley).

Policy DE 1.2g prohibits dairy facilities from locating within one-half mile of any public or private school site. However, spreading of manure and process water may occur within one-half mile of schools if the spreading is scheduled during weekends or summer vacation when schools are closed.

Expansion of existing dairies can occur within one-half mile of a school through approval of a site plan review (SPR), but the dairy facility may not further encroach toward the school site.

Policy DE 1.2h requires a one-quarter mile separation between all dairy facilities and between other confined animal feeding operations. The one-quarter mile minimum distance does not apply to the spreading of manure and dairy process water on cropland. Expansion of existing dairies can occur within one-quarter mile of another dairy through approval of an SPR, but actual dairy operations may not further encroach toward the other dairy facility. **Policy DE 1.2i** prohibits locating dairy facilities within one-half mile of residential zones.

~~Chapter~~ Section III of the Element includes a map, Theoretical Dairy Herd Capacity for Kings County, which designates rural lands in the County as "Compatibility Zones" (Figure ~~3-~~2). The Compatibility Zones designation includes lands that are further divided into "Dairy Development Overlay Zones" and "Nutrient Spreading Overlay Zones."

Lands designated as "Dairy Development Overlay Zones" (DDOZ) include those areas within the County with the majority of the existing dairies and where new dairies can be located, based on the location criteria set forth in the eight policies identified above. The DDOZ lands are zoned for intensive General Agricultural use, and they are outside identified flood plains, high groundwater areas, wetlands, habitat areas, and areas of excessive slope. The DDOZ lands are also located more than one-half mile from schools and one-quarter mile from existing dairies or other animal confinement facilities.

The DDOZ lands identified in Figure ~~3-~~2 are divided into nine geographic units. DDOZ 1 through DDOZ 5, DDOZ West, and DDOZ SE (Southeast) are located on the floor of the San Joaquin Valley. DDOZ SW1 and DDOZ SW2 are located on the valley floors of Sunflower Valley and the Kettleman Plains in the southwest portion of the County. All of the DDOZ lands designated for additional dairy development total approximately 394 square miles, of which 340 square miles, or 217,657 acres, can support existing and new dairies.

The DDOZ lands can be used for all types of dairy operations, including freestall barns, and storage and spreading of manure and process water. These lands can also be used for reuse of manure and process water as fertilizer and irrigation supply. Additional areas in

Kings County have been designated as "Nutrient Spreading Overlay Zones" (NSOZ) in Figure ~~3-~~2.

The additional lands that can be used for manure and process water application are generally located in the flood zones identified in the central, southwestern, and southern portions of the County. The Nutrient Spreading Overlay Zones are divided into five geographic units: NSOZ 1 through NSOZ 5. All of the NSOZ lands designated for additional dairy effluent spreading total approximately ~~646~~ 642 square miles, or ~~413,693~~ 411,055 acres.

Approval Policies

The second set of goals and policies included in ~~Chapter~~ Section III of the Element addresses the approval process for new or expanded dairies under the new policies. **Goal DE 2** and the accompanying two objectives and policies state that dairy facility applications meeting the specified criteria in the Element may be approved through either the County's SPR or CUP process. The CUP process shall be required if the standards and requirements of the Element are not met by a dairy development project application. **Policy DE 2.1a** states that a SPR or CUP approval will be required for all proposed new dairies and dairy stock replacement facilities. The SPR or CUP that is approved for new or expanding facilities will evaluate the maximum number of animal units (AUs) that the site will accommodate, regardless of the proposed herd size. This limit on AUs will establish the "baseline" for future expansions of the facility.

Policy DE 2.1b allows a fluctuation in the herd size ~~below~~ up to the baseline without requiring an additional site plan review as long as construction of new dairy facilities is not proposed. For example, if only 75 percent of the facility capacity is being used and the herd is increased to ~~90~~ 100 percent of capacity, the dairy is still operating within its original baseline limits of the existing permit and no additional SPR is required. However, **Policy DE 2.1c** requires that, after the initial approval under the SPR or CUP process and construction of ~~the~~ a dairy facility has been completed, any new construction ~~for~~ facilities intended to accommodate additional AU capacity, ~~up to the original baseline limit of the previous approval,~~ will require a new site plan review for the expanded portion of the facility.

Policy DE 2.1d states that dairy facility expansions above the original approval will require a new SPR for the new portion of the dairy facilities. Additionally, **Policy DE 2.1e** states that new or expanded dairies of any kind that do not meet all of the ~~criteria~~ standards in Sections III and IV of the Element for siting, design, operation, and monitoring and reporting shall be subject to the conditional use permit process and shall be required to go through additional environmental review. Such projects shall be subject to all of the

applicable mitigation measures and monitoring and reporting requirements found in this Program EIR prepared for the Element.

Other relevant land use policies contained in the Element address procedural issues related to process water agreements for new applications and monitoring of dairy operations. For example, **Policy DE 4.1e** requires dairy operators to keep records of how much manure is produced and when, where, and how much manure is applied or sold to a commercial broker. **Objective DE 4.2** requires preparation of a Comprehensive Dairy Process Water Application Plan by all dairy applicants. The plan must take the form of an enforceable and recordable agreement specifying the terms of the use of the dairy's process water. The agreement must be approved by the zoning administrator and recorded prior to initiation of the dairy operation. The agreement must also be signed by other property owners who agree to receive process water on their land.

Dairy Monitoring and Conformance Programs

The remaining land use-related goals, objectives, and policies in the Element are found in ~~Chapter~~ Section V, Dairy Monitoring Program, and ~~Chapter~~ Section VI~~I~~, Dairy ~~Conformance Program~~ Quality Assurance.

The Dairy Monitoring Program contains **Goal DE 6** and ~~three~~ associated policies that require the County to conduct a survey of existing dairy operations to establish a baseline of current conditions, develop a monitoring program methodology, and require each new or expanded dairy to submit annual test results. The survey of existing dairy operations is presented in Appendix B of the Element. ~~The monitoring program is further described under **Goal DE 7**.~~ The annual test results would be used to demonstrate if the facility is still operating within its design parameters. If parameters are exceeded, the operator will be required to either reduce the herd size or make changes to balance nutrient management.

Goal DE ~~7~~ 6 establishes a Dairy Monitoring Program in the County Planning Agency, which would gather information on all dairies, as well as track the required data submitted by approved new or expanded dairies to determine that standards are being met. **Objective DE ~~7.2~~ 6.4** establishes a formal and effective process to evaluate and respond to public complaints of nuisances or permit violations.

~~**Goal DE 8** and the associated policies in Chapter VII establish a Dairy Conformance Program with the intent of bringing all existing dairies in the County into voluntary compliance with specific policies by 2006. The Dairy Conformance Program would allow existing dairies to earn a certificate acknowledging that the dairy is being operated in compliance with the policies of the Element. As part of the review of individual existing~~

~~dairies, the County would provide each operator with a checklist of items necessary to bring the dairy into compliance~~.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The CEQA Environmental Checklist Form indicates that a project could normally have significant adverse land use impacts if it:

- physically divides an established community;
- conflicts with any applicable land use plan, policy or regulation adopted for the purpose of avoiding or mitigating an environmental effect;
- induces substantial population growth; or
- displaces substantial numbers of existing housing or people.

A project could also have significant adverse policy and land use impacts if it conflicts with any applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

Other portions of the CEQA checklist indicate that significant impacts may also occur due to lighting and glare, noise, odors, design issues, or public health and safety issues.

Impact 4.7-1

Since the Element goals, policies, and programs would be consistent with applicable policies of the Kings County General Plan, there are no significant impacts.

The General Plan text indicates that "animal concentrations" such as dairies are allowed in General Agriculture areas. The goals and policies in the proposed Element are consistent with the existing General Plan Land Use Map and all of the relevant Land Use, Resource Management, and Open Space policies addressing land use and agricultural issues.

Other General Plan goals and policies address issues related to other aspects of the proposed dairy operations. For example, policies in the Resource Conservation Element focus on avoiding pollution to water resources in the County. The consistency of the project with other General Plan policies is analyzed in the other topical sections of this environmental impact report, e.g., water quality. The separate analyses indicate that there are no identified inconsistencies between the Element policies and programs and any General Plan policies.

Mitigation Measure 4.7-1

A new goal, new objective, and two new policies shall be added to the Kings County Land Use Element under "III. Policies for Rural Areas," which cross-references the Element, to direct readers to the additional policies in the adopted Element. The proposed new Land Use Element goal and policies recommended to be added are as follows:

"Goal ~~DE~~ 9A: Restrict the locations where dairies may be located to those areas of the County where they are most compatible with surrounding uses and activities and environmental constraints as ~~required by~~ presented in the *Dairy Element*.

"Objective ~~DE~~ 9A.1: Use specific ~~criteria~~ standards to avoid potential land use conflicts through the site plan review (SPR) streamlined review process when approving new dairies and expansion of existing dairies.

~~"Policy DE 9A.1a:~~ ~~Prohibit new dairy facilities in designated wetlands and undisturbed wildlife habitat areas; and in proximity to cities, rural communities, Lemoore Naval Air Station, schools, and other dairies.~~

"Policy ~~DE~~ 9A.1~~b~~ a: Proposed new dairies and expansions of existing dairies, and associated dairy stock replacement facilities, ~~and substantial expansions,~~ may be approved through the ~~site plan review~~ SPR process if they meet all of the ~~criteria~~ standards in the *Dairy Element* concerning siting, design, operation, monitoring and reporting."

Impact 4.7-2

Since some of the Element policies and programs supercede and are more restrictive than dairy regulations in the Kings County Zoning Ordinance, there are no significant impacts.

Under State law, counties must maintain their zoning regulations in a manner consistent with their General Plans (Government Code 65860). When a General Plan amendment is adopted (such as a new element) that makes the zoning inconsistent, the zoning must be changed to reestablish consistency "within a reasonable time" (Government Code 65860[c]).

State law does not prescribe what constitutes "a reasonable time" for reconciling the zoning ordinance with the General Plan. The Governor's Office of Planning and Research (OPR)

recommends that, when possible, General Plan amendments and necessary related zone changes be heard concurrently (Government Code 65862). When concurrent hearings are not feasible, OPR recommends that zoning changes to reflect consistency with extensive General Plan amendments dealing with large geographic areas be completed within two years. In addition, case law has supported the consistency doctrine with specific regard to the issuance of conditional use permits (*Neighborhood Action Group v. Calaveras County* (1984) 156 Cal.App.3d 1176).

Specific policies and programs of the Element supercede and are more restrictive than the dairy regulations in the Kings County Zoning Ordinance. Section 1903 of the Zoning Ordinance details the application process and requires preparation of a site plan. The site plan for a conditional use shall be prepared "to enable the planning commission to find that all applicable provisions of this ordinance are complied with." Section 1903(9) of the Zoning Ordinance requires that process water and manure management and disposal plans be prepared by a professional engineer, which determines that the design of the new dairy will comply with the standard process water discharge requirements of the Regional Water Quality Control Board. This section of the Zoning Ordinance should be deleted and replaced with a reference to the new, more restrictive requirements of the Element policies.

Section 1908(F)(2)(a) and (b) of the Zoning Ordinance requires that the site plans of proposed dairy facilities be designed so that the dairy facilities are "located a sufficient distance from the city limits or community or municipal service-type district boundaries of an urban area," and "the barns, corrals and waste disposal systems are located a sufficient distance from residences not associated with the dairy," so that "a conflict of land uses does not occur." This section of the Zoning Ordinance should be deleted and replaced with a reference to the new, more restrictive siting requirements of the Dairy Development Overlay Zone and the Element policies.

Section 1908(F)(2)(c) and (d) requires that a dairy application demonstrate that "there is sufficient land under the control of the applicant to provide for management and disposal of liquid wastes produced by the dairy," and that "pollution and nuisance conditions will not occur as a result of discharge, stockpiling, handling or storage of wastes generated by the dairy." Section 1908(F)(2)(e) requires that the design and operation of the ponds for proposed dairy facilities comply with eleven specific findings. These sections of the Zoning Ordinance should also be deleted and replaced with a reference to the new, more extensive design and engineering requirements of the Element policies.

Further discussion of the process water and manure management and disposal plan criteria set forth in the Element is included in Section 4.3, Water Resources, of this EIR.

Section 1909 lists typical conditions of approval that may be attached to conditional use permits. The conditions may include "special yards, spaces and buffers," "regulation of noise, vibration, odors, and similar characteristics," and "mitigation measures, identified in the environmental documentation evaluating the application, determined to be necessary to avoid or lessen significant environmental effects that may result from the construction or operation of the approved use."

Mitigation Measure 4.7-2

New text shall be added to the Kings County Zoning Ordinance, Section 2102, Site plan review application and fee, as follows:

"Applications for proposed new bovine dairy facilities, and ~~substantial~~ expansions of existing facilities exceeding the baseline capacity, shall be approved through the site plan review process if the applications meet all of the specified criteria of the Element ~~(Section IV and Appendix C)~~."

Section 1908(F) of the Kings County Zoning Ordinance shall be deleted in its entirety and replaced with the following text:

"Applications for proposed new bovine dairy facilities, and substantial expansions of existing facilities, shall be approved through the site plan review process if the applications meet all of the specified criteria of the Element ~~(Section IV and Appendix C)~~. A site plan review may be approved by the zoning administrator for a new or expanded bovine dairy facility if the dairy is in ~~substantial~~ compliance with the design criteria contained in the Element."

Impact 4.7-3

New and expanded dairy facilities allowed under the Element could cause impacts to natural resources and sensitive land uses. This is a less-than-significant impact.

As noted in the setting section, the Element includes eight policies that set criteria for limiting new dairy facilities to certain areas of the County. However, the mapping of the Dairy Development Overlay Zones (Figure 4.7-1) has not incorporated data for all the criteria.

Policy DE 1.2d prohibits dairy facilities in shallow or perched groundwater areas of the County, unless the applicant can demonstrate that the minimum separation between the bottom of proposed lagoons/corral areas and highest groundwater is at least five feet. ~~Additionally, specific mitigation measures, approved by the RWQCB, are provided that will protect groundwater from contamination by the dairy system operation.~~ The Dairy Development Overlay Zones in the Element include areas of the County that have shallow

or perched groundwater. In recognition that vertical separation is not the only critical condition related to groundwater quality protection, the Element contains numerous policies related to reducing the potential for water quality degradation.

In addition, **Policy DE 1.2e** prohibits approval of dairy facilities in designated wetlands and ~~undisturbed wildlife~~ on habitat ~~areas~~ for sensitive species under the SPR process. In addition, **Policy DE 3.3a** requires that biological and wetland surveys be conducted for all dairy development sites ~~that contain native pasture or rangeland or are within one-half mile of established reserves or native/naturalized areas~~. As discussed in Sections 4.3 and 4.4 of this EIR, implementation of the policies of the Element would reduce the potential adverse impacts to biological and water resources to a less-than-significant level.

Mitigation Measure 4.7-3

None required.

Impact 4.7-4

Implementation of the Element will prevent or minimize impacts to residentially zoned lands within the four cities, rural communities, and other sensitive uses. This is a less-than-significant impact.

The Element notes that certain sensitive land uses could be affected by dairy operations. **Policies DE 1.2a, 1.2b, 1.2g**, **1.2h**, and **1.2i** restrict the siting of new dairies close to cities, rural communities, Lemoore Naval Air Station, schools, and other dairies.

The prohibition of new dairies within one-half mile of residential zones includes unincorporated lands that are zoned for rural housing on large lots, as well as medium and high density housing on smaller lots within unincorporated communities, such as Armona, Home Garden, Kettleman City, the Santa Rosa Rancheria, and Stratford. However, the Element policies that refer to "residential zones" also include lands within the incorporated cities. Newly incorporated lands that are annexed into the cities from the County and developed with new residential subdivisions could experience impacts from dairy development.

The Element maps one-half mile buffers around residential zoning districts that are within incorporated cities and also designates a "compatibility zone" boundary that excludes dairies in the "fringe area," designated by the AL-10 zone district, around each of the three cities. The "compatibility zone" boundary around the cities includes unincorporated lands that are within some parts of the cities' Spheres of Influence, which are planned for future urban growth according to each of the cities' General Plans. Thus, homeowners in new subdivisions planned within the cities of Corcoran, Hanford, and Lemoore would not be

subject to impacts related to dairy development. Expansions of the AL10 zone district are necessary north of Corcoran, north of Hanford, and around the Santa Rosa Rancheria.

The "compatibility zone" boundary around the city of Hanford also includes unincorporated lands in the rural communities of Armona and Grangeville. If changes to the community plans of unincorporated communities occur in the future, the "compatibility zone" boundaries should be re-evaluated.

Policy DE 1.2j requires that the "compatibility zone" boundaries presented in the Element for Corcoran, Hanford, and Lemoore be updated periodically to ensure that any changes in spheres of influence of the General Plan are reflected in the boundaries.

Implementation of **Policies DE 1.2a, 1.2b, 1.2g, 1.2i, and 1.2j** of the Element would reduce the potential noise, lighting, and odor impacts of dairy facility operations and process water irrigation on new subdivision residents within the three cities.

Mitigation Measure 4.7-4

None required.

Impact 4.7-5

New and expanded dairy facilities allowed under the Element could cause impacts to adjacent individual rural residences in the agricultural areas. This is a less-than-significant impact.

Land use conflicts between dairies and nearby rural residences can be caused by various characteristics of dairy operations, such as generation of animal manure odors, night-time lighting of outdoor dairy stalls or parking lots, noise, traffic, and spreading of manure and process water on agricultural fields. The residents could be adversely affected by odors from the dairy operations as well as from the periodic application of manure and process water on the adjacent fields. Dairy equipment noise and traffic noise from trucks entering and exiting the dairy could also impact the residents.

The issue of odors generated by the dairy cows and by spreading effluent on agricultural fields is analyzed in more detail in Section 4.2. Noise impacts are analyzed in detail in Section 4.5, visual and lighting impacts in Section 4.7, and traffic and circulation impacts are discussed in Section 4.9. The following discussion summarizes some of the impact analysis in those other sections.

Individual residences that are located adjacent to new dairies permitted by the Element could be subject to direct impacts from the dairy operations. The Element location criteria

limits dairy development within one-half mile of existing residential zoning (**Policy DE 1.2i**), which includes clusters of rural residences. The Element also includes policies related to siting of new dairy facilities close to individual residences that are within agricultural zones, but not within residential zone districts (**Policies DE 3.1b and 3.1c)**.

The Kings County Right to Farm Ordinance (Ordinance No. 546.1) addresses issues related to land use compatibility when new residences are located in agricultural areas, but not when new agricultural uses are located adjacent to existing rural residences. The ordinance states that it is the policy of the County to "protect agricultural land, operations, and facilities from conflicting uses due to the encroachment of incompatible, non-agricultural uses of the land," and to "advise developers, owners, and subsequent purchasers of property in the County of the inherent potential inconveniences and discomforts often associated with agricultural activities and operations, including, but not limited to, ...odors from manure, fertilizers, pesticides, chemicals, or other sources..." The ordinance states that no lawful agricultural activity, operation or facility "shall be or become a nuisance, public or private, due to any changed condition in or about the locality, including, but not limited to, the encroachment of non-agricultural uses such as rural residences."

Existing County zoning regulations do require a minimum setback between residences and livestock structures. Section 406 of the Zoning Ordinance lists standards applicable to all agricultural zoning districts. Section 406(F)(1) requires that "The minimum distance between a residence and a structure housing livestock or poultry shall be 40 feet."

The proposed location criteria policies of the Element address the issue of potential land use conflicts caused by siting new dairies immediately adjacent to rural residences. The existing Kings County zoning regulations for approving a Conditional Use Permit for a new dairy require the following finding to be made by the planning commission: "The barns, corrals, and waste disposal systems are located a sufficient distance from residences not associated with the dairy so that a conflict of land uses does not occur" (Section 1908(F)(2)(b)). **Policies DE 3.1b** and **3.1c** provide similar mitigation for potential impacts on individual rural residences near proposed or expanded dairies.

The Element contains two policies that address the need to assess impacts to nearby residences but do not explicitly address it. The section of the Element devoted to "General Restriction of Siting Dairies in Kings County" contains **Policy DE 3.1a**, which states "~~Consider, at a minimum,~~ A technical report shall be prepared and shall address the following ~~criteria for both the general dairy siting criteria and site specific dairy projects~~ siting issues." The policy is followed by ~~fourteen~~ twelve criteria, which include "air quality, including dust control (construction and operation) and odors," "traffic and road conditions," "light and glare and noise," and "proximity to the nearest residences~~," and~~

~~"other potential health, safety, and/or nuisance problems that may be identified on a case by case basis~~."

Policy DE 3.1b also requires that the proximity to rural residences be considered in evaluating location of dairy structures. **Policy DE 3.1c** requires that barns, corrals, and water disposal systems be located the maximum distance away from residences (not associated with the dairy) so as to minimize conflicts.

Also, ~~**Policy**~~ **Objective DE 6.1c** calls for the establishment of a dairy monitoring program that will gather data for all dairies. This monitoring program is to include data regarding "development within one (1) mile" of the dairy.

Implementation of the policies of the Element would reduce the potential noise, traffic, lighting, and odor impacts of dairy facility operations and process water irrigation on nearby residences to a less-than-significant level.

Mitigation Measure 4.7-5

None required.

4.8 HUMAN HEALTH / RISK OF UPSET

4.8 HUMAN HEALTH/RISK OF UPSET

This section evaluates potential public health and environmental risks associated with the proposed project, including potential impacts associated with the release of hazardous substances[1] during operation of existing and proposed dairy facilities, the potential exposure of people to harmful substances, the development of adverse conditions related to mosquito and fly breeding, and the potential for release of pathogens associated with dairy manure. Mitigation measures are recommended, as necessary, to reduce significant or potentially significant impacts of the project. The analysis contained in this section is based on information acquired from the General Plan, review of Federal, State, and local regulations, and interviews with County and State regulatory officials.

SETTING

The proposed project presents goals, objectives, and policies for development of new or expanded dairies within agricultural areas of Kings County. The dominant land use in the proposed Dairy Development Overlay Zones (DDOZs) and Nutrient Spreading Overlay Zones (NSOZs) is irrigated agricultural crop production. Other existing uses include animal confinement facilities for dairy cattle, poultry, sheep, goats, pigs and hogs, and horses. Additional land uses include agricultural crop processing facilities, grain storage facilities, and irrigation water supply canals and reservoirs.

The use and management of chemicals, including hazardous materials, within the agricultural areas of Kings County are dominated by the application of fertilizer and pesticides[2] for crop production. In 1997, commercial fertilizer was applied to 387,592 acres within the County (USDA, undated). Over 5.1 million pounds of pesticides were applied in the County in 1998 (U.C. Davis Integrated Pest Management Program, undated).

Hazardous materials management in agricultural areas also includes storage and use of hydrocarbon fuel. Diesel fuel is used to power mobile farm equipment (e.g., trucks, tractors, combines) and stationary equipment, including irrigation pumps and groundwater well

[1] The California Health and Safety Code defines a hazardous material as, "...any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety, or to the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, radioactive materials, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment." (Health and Safety Code § 25501)

[2] A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating insects, rodents, nematodes, fungi, weeds, or other pests.

pumps. Gasoline is also stored at some dairy facilities. Other hazardous materials used at dairies can include chlorine and other disinfectants, oils and lubricants, and antifreeze.

REGULATORY FRAMEWORK

HAZARDOUS MATERIALS MANAGEMENT

The use, storage, and disposal of hazardous materials, including management of contaminated soils and groundwater, are regulated by numerous local, State, and Federal laws and regulations. The United States Environmental Protection Agency (U.S. EPA) is the Federal agency that administers hazardous materials and waste regulations. State agencies include the California EPA (Cal EPA), which includes the California Department of Toxic Substances Control (DTSC), the Central Valley Regional Water Quality Control Board (RWQCB), the California Air Resources Board (CARB), and other offices. The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) has jurisdiction over the San Joaquin Valley air basin, which includes Kings County. Local regulatory agencies include the Kings County Department of Environmental Health Services and the Kings County Agricultural Commissioner's Office (KCACO). A description of agency jurisdiction and involvement in management of hazardous materials is provided below.

U.S. Environmental Protection Agency

The U.S. EPA is the Federal agency responsible for enforcement and implementation of Federal laws and regulations pertaining to hazardous materials. The legislation includes the Resource Conservation and Recovery Act of 1986 (RCRA), the Superfund Amendments and Reauthorization Acts of 1986 (SARA), and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The Federal regulations are primarily codified in Title 40 of the Code of Federal Regulations (40 CFR). The U.S. EPA provides oversight and supervision for site investigations and remediation projects, and has developed land disposal restrictions and treatment standards for the disposal of certain hazardous wastes.

Department of Toxic Substances Control

The California Department of Toxic Substances Control works in conjunction with the U.S. EPA to enforce and implement specific laws and regulations pertaining to hazardous wastes. The California legislation, for which DTSC has primary enforcement authority, includes the Hazardous Waste Control Act and the Hazardous Substance Account Act. Most State hazardous waste regulations are contained in Title 22 of the California Code of Regulations (CCR). The California Department of Toxic Substances Control generally acts as the lead agency for soil and groundwater cleanup projects, and establishes cleanup and action levels for subsurface contamination that are equal to, or more restrictive than, Federal levels.

Central Valley Regional Water Quality Control Board

The project site is located in the jurisdiction of the Central Valley RWQCB. The RWQCB is authorized by the California Porter-Cologne Water Quality Act of 1969 to implement water quality protection laws. The RWQCB provides oversight for sites where the quality of groundwater or surface waters are threatened, and has the authority to require investigations and remedial actions.

California Air Resources Board and San Joaquin Valley Unified Air Pollution Control District

CARB and SJVUAPCD have joint responsibility for developing and enforcing regulations needed to achieve and maintain State and Federal ambient air quality standards in the San Joaquin Valley air basin, which includes all of Kings, San Joaquin, Stanislaus, Merced, Madera, Fresno, and Tulare counties, and a portion of Kern County. CARB is responsible for enforcing the Clean Air Act and California's State Ambient Air Quality Standards. SJVUAPCD is responsible for regulating air emissions from stationary sources, monitoring air quality, and reviewing air quality issues in environmental documents.

LOCAL HAZARDOUS MATERIALS MANAGEMENT

The primary agencies responsible for local enforcement of State and Federal laws and regulations controlling hazardous materials management include the Kings County Environmental Health Services (KCEHS) agency. The KCEHS is a Certified Unified Program Agency (CUPA), the local agency responsible for coordination of hazardous waste generator programs, underground fuel tank management, and tiered permitting process for waste treatment. The KCEHS is also responsible for regulation of small water systems. Permitting of on-site sewage disposal systems is the responsibility of the Kings County Building Department. In general, most dairies would not meet the definition of a public water system (greater than five connections or more than 25 people served more than 60 days per year) and therefore would not be regulated by the California Department of Health Services, but rather would be regulated by the local health officer, in this case KCEHS (Tucker, 1999).

The KCEHS has contracted with the Tulare County Health and Human Services Agency, Environmental Health Division, Milk Inspection Service (Tulare County) to implement the dairy/milk inspection program. Tulare County conducts six inspections annually, checking milk houses, milking barns, corrals, and other areas at each dairy for cleanliness and fly infestation. In addition, Tulare County collects and analyzes water samples for biological contamination (coliform) from water supply wells on an annual basis. If coliform is detected in a supply well, the dairy operator is notified and instructed to treat the well and system with chlorine to disinfect the well (Johnson, 1999).

The Kings County Planning Department reviews applications for aboveground storage tanks (ASTs) in conjunction with zoning and building permits in the County. The plans for ASTs are reviewed by the Fire Department for conformance with the Uniform Fire Code. The KCACO issues pesticide use permits and collects information on agricultural (e.g., farmland) sites handling hazardous materials.

WORKER HEALTH AND SAFETY

Worker health and safety is regulated at the Federal level by the Federal Department of Industrial Relations. Under this jurisdiction, workers at hazardous waste sites must receive specialized training and medical surveillance according to the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations (29 CFR Section 1210.120). Additional regulations have been developed for construction workers potentially exposed to lead (29 CFR Section 1926.62) and asbestos (29 CFR Section 1926.1101). The U.S. EPA administers Federal regulations for the protection of agricultural workers involved in pesticide use (40 CFR).

Worker health and safety in California is regulated by the California Department of Industrial Relations, Division of Occupational Safety and Health (Cal OSHA). California standards for workers dealing with hazardous materials are contained in CCR Title 8 and include practices for all industries (General Industry Safety Orders), and specific practices for construction, and hazardous waste operations and emergency response. Cal OSHA conducts on-site evaluations and issues notices of violation to enforce necessary improvements to health and safety practices. State regulations pertaining to agricultural workers potentially exposed to pesticides (CCR Title 3) are administered by the California Department of Pesticide Regulations (Cal DPR), and are generally enforced by KCACO. These agencies also administer programs for the licensing of pesticide applicators and permitting of application of restricted use agricultural chemicals.

PEST CONTROL

The control of mosquito populations in Kings County is the responsibility of two active mosquito abatement districts, which are public agencies funded by property taxes. The Consolidated Mosquito Abatement District (CMAD) includes a relatively small area in the northeastern portion of the County. The Kings Mosquito Abatement District (KMAD) encompasses most of the northern and central portions of the County, including the areas surrounding Corcoran. The mission of the abatement districts is to suppress the population of mosquitoes to minimize the potential transmission of disease and reduce annoyance caused by these insects. As discussed above, dairy process water ponds can provide habitat for mosquito breeding and larval development. In addition, standing water within dairies and in associated agricultural fields can also provide mosquito habitat.

The KMAD recognizes the potential for mosquito habitat and infestation at dairy facilities and has developed mosquito control requirements for dairy process water management. These requirements are attached as conditions for dairy permits in Kings County, including facilities outside the boundaries of the KMAD. The requirements restrict the width of process water holding ponds and manure separation pits to ensure that all areas of these facilities can be treated for mosquito control, if necessary. The KMAD also requires that ponds be constructed with relatively steep slopes to minimize shallow water environments at the edges of the ponds. Additional requirements include adequate access for mosquito control equipment and removal of vegetation from within and around ponds.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

The Kings County Draft Dairy Element (Element) (Appendix A) specifically addresses the control of hazards and risk of upset. This policy supports conformance at dairy facilities with all applicable laws and regulations controlling the management of hazardous materials discussed above. The Element also contains other goals, objectives, and policies that would reduce potential risks to public health and the environment. The requirements for comprehensive nutrient management (**Goal DE 4**) help control the potential release of pollutants contained in manure and process water to surface and groundwater. Protecting the quality of surface water and groundwater reduces the potential for human contact with pollutants. **Policy DE 4.3b** requires the preparation and implementation of an ~~Integrated~~ Pest and Vector Management Plan (~~IPM~~ PVMP) for new and expanded dairies. Implementation of ~~IPMs~~ PVMPs at dairies would appropriately control insect and rodent pests. Similarly, **Goal DE 5** promotes the protection of air quality in the San Joaquin Valley. Requirements under **Objective DE 5.1** include the preparation and implementation of an Odor Management Plan (OMP) (**Policy DE 5.1b**) and a Manure Treatment Management Plan (MTMP) (**Policy DE 5.1c**). The required OMP and MTMP will promote dairy design and operations that will reduce the potential for insect infestations by controlling the storage, handling, and disposal of manure and process water generated during dairy operations. The potential adverse effects of constructing dairy facility structures above or near abandoned oil or gas wells is addressed by **Objective DE 3.5** and attendant **Policies DE 3.5a and 3.5b**.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The revised CEQA Guidelines include the following specific criteria for identifying when a project would result in significant health or safety hazard impacts:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;

- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;

- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-fourth mile of an existing or proposed school;

- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;

- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Impact 4.8-1

Workers could be exposed to hazardous materials during dairy operation, resulting in adverse health impacts. This is a less-than-significant impact.

Hazardous materials would be used for the operation of dairies under the Element and continued agricultural production at the project site. The use of fuel stored in aboveground tanks, lubricants, and cleaning solutions would be required for the operation and maintenance of equipment during and after construction of the dairy facilities. Pesticides (for control of vectors) and medicines would be used at the dairy. Agricultural chemicals, including insecticides, herbicides, and fertilizer, would be used for continued farming; however implementation of the Element would result in reduced acreage of cropland and a reduction in agricultural chemical use.

The RWQCB requires that a Water Pollution Prevention Plan (WPPP) be prepared for the dairies in compliance with the provisions of the General Waste Discharge Requirements for Milk Cow Dairies. The WPPP is required to include provisions for the safe storage, use, and disposal of hazardous materials. The Business Plans for the dairies, which are required to be submitted to Kings County Environmental Health Services (KCEHS), also need to include similar provisions. In addition, all use of restricted agricultural chemicals is controlled by Federal and State laws and regulations enforced by the California Department of Pesticide Regulations (CDP) and KCACO.

Construction workers could be exposed to pesticide residues from past applications and from current pesticide applications in soils during grading and excavation. Agricultural workers (who would continue to farm the row crop portion of the site under the proposed project) could also be exposed to residual contamination in soil from past or current applications or directly exposed to the agricultural chemicals themselves during mixing, application, and

harvesting. Use of pesticides and herbicides is strictly regulated to minimize exposure to workers. The regulations prescribe, among other things, times of application and length of time after applications before workers can reenter fields. Reentry restrictions would also apply to dairy construction workers. The potential for exposure of workers associated with project activities would be similar to exposure of farm workers for existing agricultural activities at the site (existing conditions). The Element does not propose significant changes in agricultural chemical use in the County.

The Element specifically addresses the potential exposure of workers and the public to unsafe conditions. **Objective DE 4.3** promotes dairy facility management practices that protect worker and public health and the environment; **Policy DE 4.3a** supports this objective by requiring conformance by dairy facilities with all applicable laws and regulations controlling the management of hazardous materials.

Mitigation 4.8-1

None required.

Impact 4.8-2

Potential exposure to residual agricultural chemicals during construction of the dairy facilities, resulting in adverse health impacts. This is a less-than-significant impact.

Construction of the dairies will require extensive grading of areas formerly under agricultural production. Past agricultural activities have included the application of a variety of chemicals (e.g., pesticides) to the surface soils at the site. Agricultural practices in the past and currently include the application of pesticides and herbicides. Until 1972, DDT was widely used throughout the United States. DDT is persistent in the environment and is still found in agricultural soils, creek and river sediments, and creeks and coastal bays more than 27 years after its ban (CDFA, 1985). The levels of residual DDT (and its breakdown products, such as DDE and DDD) in the environment vary depending on the history of the types of crops grown, the past application rates, and the past location of storage and mixing facilities of the pesticide. As part of a study prepared by the California Department of Food and Agriculture (CDFA, 1985), soil samples were collected from each county in the State. Two soil samples were collected in Kings County; the samples collected contained relatively low levels of DDT.

The agricultural fields in the County currently receive pesticide and herbicide applications, both ground and aerial. The pesticides and herbicides used today are strictly regulated and generally have short half-lives (the time it takes a chemical to degrade to half its original concentration). For example, in Kings County, the most frequently applied herbicide on cotton is Starfire (Kings County, 1999). Starfire includes paraquat with a half-life of 100 to 1,000 days (Extoxnet, 1996).

Mitigation Measure 4.8-2

None required.

Impact 4.8-3

Operation of the dairies could result in increased vector activity, potentially creating adverse human health impacts. This is a less-than-significant impact.

The generation and storage of manure and process water at the dairies and use of process water as fertilizer for agricultural fields at a site present the possibility of increased vector activity. Mosquito and fly infestations have been observed at dairies in the past, particularly at manure separation pits and ponds that have not been properly maintained (Cook, 1999). When vegetation becomes established around the pond perimeter or excessive floatable material persists in pits and ponds (often allowing establishment of vegetation on the floatables), mosquito infestations can occur. Mosquito infestation can create a significant risk to public health. Mosquito species common to Kings County that can feed on dairy cattle can be vectors for several significant infectious diseases, including the Western Equine and St. Louis viruses, forms of encephalitis.

The KMAD has established regulations for mosquito control at dairy facilities. These controls are aimed at preventing the development of mosquito habitat in process water ponds and manure separation pits and providing access for mosquito control equipment. The requirements include the installation of manure separation ~~pits~~ systems at all dairy facilities to limit the amount of manure solids delivered to process water ponds, reducing the potential for excessive floatable materials. Design requirements for pits and ponds ensure that shallow water habitat is limited. The KMAD inspects dairy facilities throughout the mosquito breeding season to ensure that conditions promoting mosquito breeding do not develop. Although the KMAD does not provide vegetation or solids removal services, vegetation and solids removal is the responsibility of the dairy operator.

Flies are another potential vector problem at a dairy operation. The KMAD does not provide services related to abatement of flies; but KCEHS responds to complaints regarding nuisance conditions associated with flies. The County has had numerous calls regarding fly problems at existing dairy operations in the County. Typically, complaints are made from residences within 0.5 to 3.0 miles of a dairy (depending on predominant wind direction) with a fly infestation (Cook, 1999). Most of these complaints have been directed at older dairies where drainage is often a problem and facility design makes maintenance and good housekeeping practices difficult (Cook, 1999).

Flies (predominantly house flies, but stable flies are also of local concern) typically deposit eggs in wet, decaying organic matter, such as manure and spilled feed (Stevenson, 1997). An

average female fly will produce about 500 to 600 eggs in her lifetime. The life cycle of the fly includes four stages: the egg, larva (maggot), pupa, and winged adult. Just one pound of manure can yield more than 1,500 maggots. As an adult fly feeds, it continually regurgitates droplets of food and saliva since it can only consume food in liquid form. This style of eating, and choice of food material, makes the dairy fly a constant threat to milk production and animal and human health (Stevenson, 1997).

Particular areas that have been identified as preferred breeding sites at dairies in the County include calving areas (flies are particularly attracted to the composition of calf manure) (Rutz, et al., 1993), around water troughs, leaking pipes or other moist areas, along fence lines (cows walking in corrals stepping on manure kill many maggots, but the fence lines are often untrampled), around the edges of solids separation areas, and areas where grain is spilled (Rutz, et al., 1993; Cook, 1999).

Control of fly populations has been demonstrated to result in increased milk production at dairies; the greater the number of flies on a dairy cow, the lower the milk production; up to 30 percent reduction in milk production has been documented with stable fly infestations. Therefore, dairy operators are motivated to aggressively minimize fly populations. It has been demonstrated that use of pesticides as a primary means of controlling populations is less effective than a tiered approach that first employs cultural controls (e.g., good housekeeping practices), then biological controls (e.g., encouragement of parasitic wasp populations), and careful pesticide application only when necessary (Rutz, et al., 1993). Parasitic wasps and other biological controls can effectively control flies if conditions at the dairy are suitable. Wasps lay eggs inside the fly pupa. When the wasp egg hatches, the larva feeds on the dead fly. The developed wasp breaks out and repeats the cycle. Proper spraying of pesticides will not reduce wasp populations. Reduced wasp populations could force a dairy to require more frequent pesticide use as the flies recover more quickly after each application than the wasps.

Research indicates that dairies employing biological controls as part of a~~n Integrated~~ Pest and Vector Management Plan (~~IPM~~ PVMP) ~~program~~ (e.g., wasp releases) use 80 percent less pesticides than dairies that rely on chemical controls. In addition, fly populations at dairies using biological controls are typically 50 percent lower than conventionally managed farms (Rutz, et al., 1993). Potential public health hazards associated with flies represent a significant impact.

Mice are a common vector problem at concentrated animal feeding operations where feed and grain are stored. KCACO provides oversight for vertebrate pest control at dairies including mice, rats, pigeons and other vertebrate pests. Loss of feed to mice reduces the profitability of the dairy, and therefore mice populations are minimized to the extent possible at successful dairy operations. The County has not received complaints of nuisance conditions associated

with mice in the vicinity of operating dairies (Cook, 1999). Potential public health hazards associated with rodents at the proposed dairies represent a less-than-significant impact.

The Element specifically addresses the need to control flies, mosquitos, and other pests. **Policy DE 4.3b** requires development and implementation of a~~n Integrated~~ Pest and Vector Management ~~Program~~ Plan as part of all dairy applications. Under **Policy DE 4.3c**, all dairy operators are required to comply with the guidelines of the Kings Mosquito Abatement District, even those dairies outside the jurisdiction of the district.

Implementation of these policies will reduce this impact to a less-than-significant level.

Mitigation Measure 4.8-3

None required.

Impact 4.8-4

Operation of the dairy facilities could expose people to dairy manure pathogens, potentially causing adverse human health impacts. This is a less-than-significant impact.

Pathogens[3] (including bacteria, viruses, fungi, protozoa, and parasites) have been demonstrated to be serious contaminants in drinking water supplies, frequently impacting public health (U.S. EPA, 1998d). The dairy facilities would generate large volumes of solid and liquid bovine manure, which contains pathogens. Pathogens most commonly associated with bovine manure include cryptosporidium, *Escherichia coli* 0157 (*E. coli* 0157), and salmonella. Cryptosporidium (a single cell parasite) and *E. coli* 0157 (a bacterium) are found in most dairy cattle manure, but elevated levels commonly occur in manure produced by newborn calves. These pathogens can cause disease within cattle herds and are a health management concern for dairy operations. These pathogens can also be transmitted to humans. Infection with cryptosporidium and *E. coli* can cause gastrointestinal illness, particularly to persons with compromised immune systems.

Physical factors controlling the transport of pathogens include the concentration of the source, natural disinfection ability of the subsurface,[4] and the distance to a sensitive receptor. Pathogens could enter the groundwater system by 1) infiltrating downward through the unsaturated zone, and/or 2) through poorly constructed water supply wells that are not properly sealed at the surface to prevent infiltration into the well casing or surrounding gravel

[3] Pathogens are defined as disease-causing microorganisms.

[4] Natural disinfection factors include sediment type, transport velocity, and temperature of the subsurface.

pack. Once in the groundwater system, pathogens could impact on-site wells and/or could be transported off-site to domestic wells.

For pathogens to present a public health impact, the pathogens must reach a sensitive receptor (e.g., a drinking water user). Since all surface water runoff from the dairy operations would be contained and managed, it is unlikely that the proposed project would directly impact the quality of surface water supplies.

The distances pathogens can travel in various hydrogeological environments are not well defined, and considerable ranges have been reported in the literature. Setback distances between wells and pollutant sources have long been used by regulating agencies to provide some level of protection for groundwater users. Setbacks generally range between 100 and 1,000 feet between a pathogen source and a drinking water supply well. The Tulare County Milk Inspection Program enforces a 100-foot setback between water supply wells and animal holding areas (Johnson, 1999).

The Element recognizes the importance of protecting water quality from the release of dairy pathogens. **Policy DE 4.1a.B.2.i** includes the following provision:

> "The potential for discharge of water-borne pathogens to existing and proposed domestic water supply wells shall be minimized by ensuring that the domestic wells are constructed in accordance with the California Well Standards and that appropriate minimum setbacks (150 feet~~)~~, or other distance set in the Waste Discharge Requirements issued for the dairy by the RWQCB) between ~~the~~ domestic wells and potential sources of pollution are maintained."

In addition, the Element requires that all process water be collected and stored in ponds with low permeability liners (**Policy DE 4.1a.B.2**), reducing the potential release of pathogens to water supplies.

Implementation of this policy will reduce this impact to less than significant.

> ***Mitigation Measure 4.8-4***
>
> *None required*

Impact 4.8-5

Residual manure remaining at dairy facilities following cessation of manure management facilities operation could expose people to elevated methane and nitrate levels, potentially causing adverse human health impacts. This is a less-than-significant impact.

Large amounts of manure are generated during the operational phase of dairy facilities. The Element includes objectives and associated policies that require that the manure be managed under a ~~Comprehensive~~ Manure Nutrient Management Plan (~~C~~MNMP), (**Objective DE 4.1**), CDPW~~D~~AP (**Policy DE 4.2a**), and a Manure Treatment Management Plan (MTMP) (**Policy DE 5.1c**) to control potential emission of pollutants to the environment. However, it is possible that, upon closure, significant residual amounts of manure could be left at dairy sites. For example, process water ponds or other containment facilities could be abandoned without having manure removed. If significant quantities of manure are buried, the manure could undergo anaerobic decomposition and produce methane, which could migrate to the surface. If structures are built above buried decomposing manure, it is possible that significant levels of methane could accumulate within the structures. In addition to the potential for methane to be generated, residual manure could be a source of releases of nitrate or pathogens (including bacteria, viruses, fungi, protozoa, and parasites) to surface or subsurface water which is discussed in Impact 4.3-7 of this EIR.

The Element includes a provision which directly addresses the potential impacts associated with residual manure. **Policy DE ~~5.1k~~ 5.1j** requires that, prior to conversion of dairy facilities to other land uses, the owner(s) of such facility submit documentation that all manure has been removed. The management of the removed manure must be shown to be in compliance with the facility's Comprehensive Dairy Process Water ~~Disposal~~ Application Plan and its Manure Treatment Management Plan.

Implementation of this policy will reduce the impacts associated with residual manure to a less-than-significant level.

Mitigation Measure 4.8-5

None required.

Impact 4.8-6

Construction of dairy facility structures over or near improperly abandoned oil or gas wells could result in accumulation of natural gas within the structures, presenting the potential for fire and explosion. This is a less-than-significant impact.

As described in Section 4.1 (Geology, Soils, and Seismicity) of this PEIR, oil and gas exploration and production have occurred and can be expected to continue in portions of Kings County, including the Tulare Lake Bed. It is possible that there are active or abandoned wells within potential dairy development sites in the DDOZs designated by the Element. The appropriate abandonment (closure) of inactive oil and gas wells is required by Division 3 of the California Public Resources Code. A well is properly abandoned when it has been shown, to the satisfaction of the California Department of Conservation Division of Oil, Gas, and

Geothermal Resources (DOGGR), that all proper steps have been taken to isolate all oil-bearing or gas-bearing strata encountered in the well, to protect water quality, and prevent subsequent damage to life, health, property, and other resources. It is possible that some abandoned wells do not meet these standards. If DOGGR determines that a well has not been appropriately abandoned, that the integrity of a properly abandoned well has been compromised, or that access to an improperly abandoned well would be impeded by construction of improvements, the DOGGR can require that the well be "reabandoned." Construction of structures over improperly abandoned wells presents the potential for natural gas leaking from the wells to accumulate within the structures. The accumulation of natural gas could present the potential of fire or explosion.

Objective DE 3.5 of the Element addresses the potential adverse effects posed by abandoned oil and gas wells. **Policy DE 3.5a** requires that applicants for dairy development projects contact DOGGR to determine if abandoned oil and gas wells are present at the proposed dairy site. **Policy DE 3.5b** further requires that all oil and gas wells located beneath or within 300 feet of proposed dairy structures be abandoned in accordance with specifications developed by DOGGR. The policies contained in the Element reduce the impact to a less than significant level.

Mitigation Measure 4.8-6

None required.

4.9 TRANSPORTATION AND CIRCULATION

4.9 TRANSPORTATION AND CIRCULATION

This section describes the current transportation setting for Kings County and generally assesses the impacts of future dairy development on the County's roadway system. The impact analysis is based on information obtained from the Kings County Public Works Department, the 1999 Kings County Regional Transportation Plan (RTP), the 2000 Kings County Federal Transportation Improvement Program, and Caltrans.

SETTING

The transportation system for Kings County is composed of one interstate highway, several State highways, and numerous county and city roads. More than two-thirds (69 percent) of the 1,412 miles of maintained roadways are under the jurisdiction of Kings County. The State of California Department of Transportation (Caltrans) maintains the one interstate freeway, Interstate 5, that traverses the western part of Kings County, plus portions of six State highways. The cities of Hanford, Lemoore, Corcoran, and Avenal maintain the portions of local roads within their city limits.

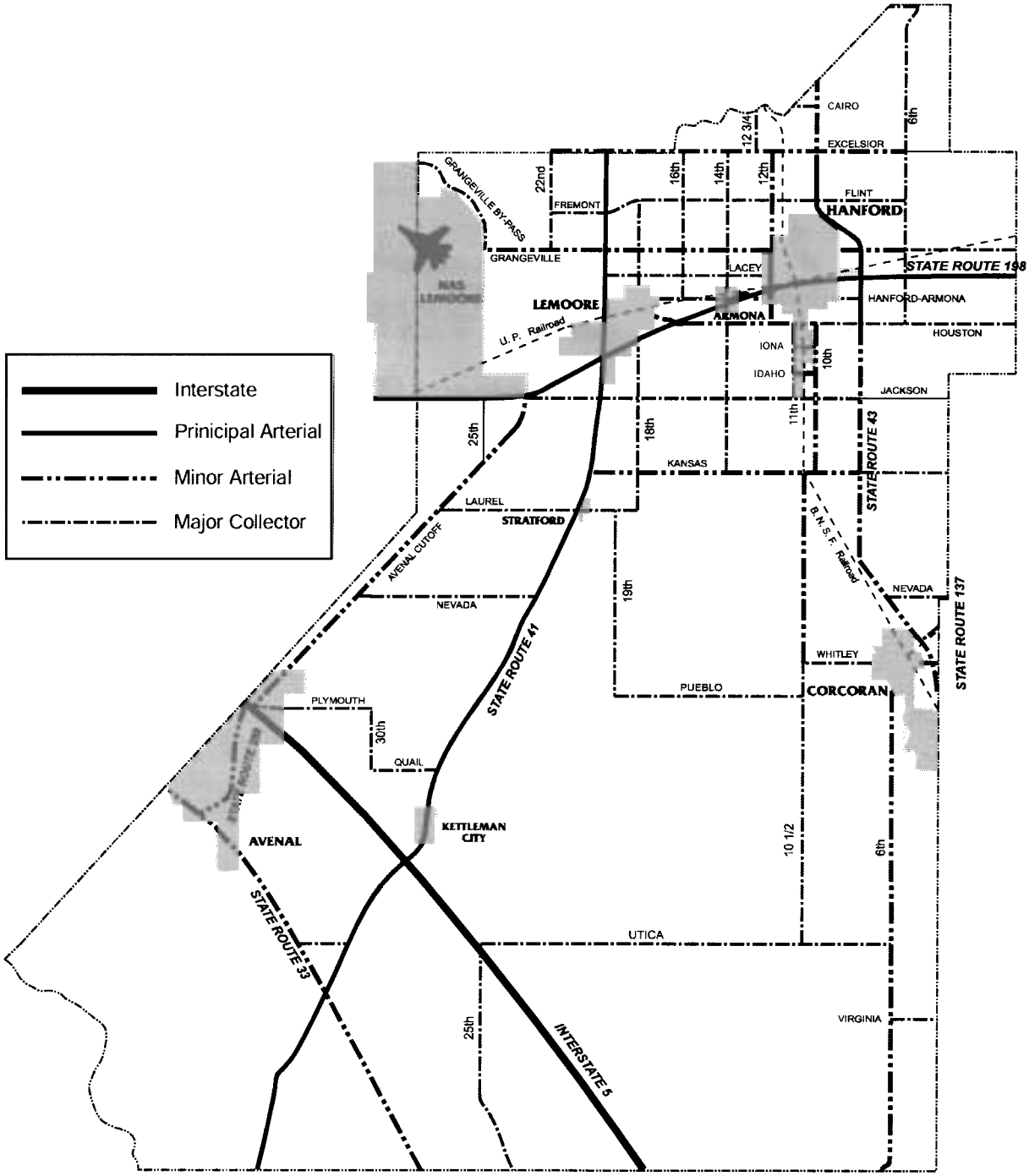
The 1999 Kings County RTP (KCAG, 1999a) identifies two sets of key transportation facilities: the Countywide Regional System of the most heavily used County and State rural roads; and Regionally Significant Roads in Urban Areas, which include busy roads that transect urban areas. The specific roadways designated under each functional category are listed in Table 4.9-1. The key routes according to circulation designation in the countywide regional system are shown on Figure 4.9-1.

The roads that make up the Countywide Regional Network are designated collectively as Routes of Regional Significance in the 1999 Kings County RTP. These roadways comprise a system whose role is to:

- serve intercounty and intra-county travel;
- link important population centers;
- join with other regional routes to form a comprehensive network; and
- provide access between agricultural areas and processing facilities and markets.

Included in this system are 157.3 miles of State-maintained regional routes, including Interstate 5. These are among the most important roads in this area because they serve most of the travel between Kings and surrounding counties, and carry a significant portion of intra-county traffic. The regionally significant, County-maintained roadway system satisfies the majority of the remaining intercounty demand.

TRAFFIC CIRCULATION DESIGNATIONS Figure 4.9-1



Source: KCGA, 1999a.

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TABLE 4.9-1: **Arterials in the Countywide Regional System**

Interstate and Other Principal Arterials Interstate 5 (Kern County to Fresno County) SR 41 (Kern County to Fresno County) SR 43 (Excelsior Ave. to Houston Ave.) SR 137 (SR 43 to Tulare County) SR 198 (Fresno County to Tulare County) Minor Arterials 6th Ave. (Ottawa Ave. to Kern County) 10th/10½ Ave. (SR 43 to Whitley Ave.) 11th Ave. (Idaho Ave. to City limits) 12th Ave. (Excelsior Ave. to City limits and Houston Ave. to City limits)	Minor Arterials - *continued* Avenal Cutoff Rd. (SR 198 to SR 33) Excelsior Avenue (6th Ave. to 22nd Ave.) Grangeville Blvd. (LNAS gate to City limits and 6th Ave. to City Limits) Houston Ave. (City limits to 10th Ave.) Idaho Ave. (10th Ave. to 11th Ave.) Kansas Ave. (SR 43 to SR 41) Whitley Ave. (SR 43 to Sweets Canal) SR 33 (Kern County to Fresno County) SR 43 (Excelsior Ave. to Fresno County and Houston Ave. to Tulare County)

Source: KCAG, 1999a.

EXISTING AND PROJECTED ROADWAY VOLUMES

Existing Levels of Service on State Routes

The existing traffic volumes on State highways in Kings County are relatively low, with many highway segments averaging less than 10,000 vehicles per day (Table 4.9-2). The only State highways that average more than 10,000 daily vehicles are the Interstate 5 freeway and a portion of State Route (SR) 198 from Hanford to the Tulare County line. All State roadways operate at acceptable conditions, i.e., levels of service (LOS) of A, B, or C (KCAG, 1999a). All County roadways are designated by Kings County as truck routes.

TABLE 4.9-2: **Level of Service Criteria, Two-Lane Roadways**

Level of Service	Volume/Capacity (V/C) Ratio
A	0.00 – 0.60
B	0.61 – 0.70
C	0.71 – 0.80
D	0.81 – 0.90
E	0.91 – 1.00
F	>1.00

Source: KCAG, 1999a.

The operating conditions experienced by motorists are described by the concept of "Levels of Service." Level of Service (LOS) is a qualitative measure of the effect of a number of factors, including speed and travel time, traffic interruptions, freedom to maneuver, driving comfort and convenience. Levels of service are designated "A" through "F," from best to worst, and cover the entire range of traffic operations that might occur. LOS A through LOS E generally represent traffic volumes at less than roadway capacity, while LOS F represents over capacity and/or forced flow conditions. Kings County uses a LOS D planning goal for minimum allowable roadway operating conditions. The Caltrans *Guide for Traffic Studies, January 2001* sets a goal of maintaining a target LOS at the transition between LOS "C" and LOS "D." Caltrans defines the volume to capacity ratios for LOS "C" and LOS "D" as 0.68 and 0.85, respectively. The daily traffic capacity of a two-lane roadway is assumed to be 15,000 vehicles per day. Thus, a two-lane roadway with 10,000

vehicles per day would be operating at a volume to capacity ratio of 0.67, which is defined as LOS B (Table 4.9-3).

Future projected traffic volumes on State highways in Kings County are also fairly low. By the year 2015, future traffic is expected to be acceptable on most regional highways. The most congested highways are projected to be the Interstate 5 freeway, the portion of SR 198 from Hanford to the Tulare County line, and the northern portion of SR 41 at Excelsior Avenue (Fresno County line). SR 198 and SR 41 would require widening from two lanes to four lanes to accommodate future volumes.

TABLE 4.9-3: **Existing and Projected Traffic Volumes on State Highways**

State Route Segment	1998 Existing Daily Volume (number)	2015 Projected Daily Volume (number)	Projected Increase (percent)
I-5			
Kern County Line to SR 41	24,600	39,900	46
SR 41 to Fresno County Line	24,300	35,200	48.1
SR 33			
Kern County Line to Avenal	1,900	2,700	42.1
North of Avenal to I-5	1,550	3,100	100
SR 41			
Kern County Line to Excelsior	5,600	7,400	32.1
Fresno County Line	7,800	17,700	126.9
SR 43			
Tulare County Line	3,950	7,200	82.3
Fresno County Line	8,300	12,300	48.2
SR 137			
Jct. SR 43 north of Jct Waukena	1,800	2,600	44.4
Tulare County Line	2,700	3,200	18.5
SR 198			
Fresno County Line to LNAS Main Gate	6,900	7,300	5.8
7th Ave. to Tulare County Line	13,500	18,400	36.3
SR 269			
Jct. SR 33	1,450	11,300	679.3
Fresno County Line	4,650	6,700	44.1

Source: KCAG, 1999a (Table 4-10).

Existing Levels of Service on Local Roads

Traffic volumes on many of the local roads are generally low in Kings County, ranging from several hundred vehicles per day to less than 10,000 vehicles. Rural roads such as Kansas Avenue and 10½ Avenue in the north-central portion of the County where many of the existing dairies are located average between 1,000 and 5,000 vehicles per day (Table 4.9-4). The only local roads that approach congested conditions are portions of Lacey Boulevard and other arterials in the Hanford city limits, which average more than 15,000 vehicles per day.

TABLE 4.9-4: **Existing Traffic Volumes on Local Roads**

Local Road Segment	Existing Daily Volume	Local Road Segment	Existing Daily Volume
Urban Area		**Minor Arterials**	
Lacey Blvd. west of Greenfield Ave.	22,323	South:	
Lacey Blvd. east of Mall Dr.	18,869	Kansas Ave. east of 20th Ave.	1,300
11th Ave. north of Lacey Blvd.	17,542	Kansas Ave. west of 10½ th Ave.	4,500
12th Ave. south of Mall Dr.	16,357	10th Ave. north of Kansas Ave.	1,100
		10½ Ave. south of Kansas Ave.	2,800
		North:	
		Grangeville west of 14th Ave.	3,660
		Excelsior west of SR 43	2,700
		12th Ave. north of Grangeville	3,650

Source: Kings County Association of Governments, Traffic Counts; BASELINE, Chamberlain Ranch Final EIR

Although average daily traffic levels are low on the roads in the rural portion of Kings County, a large portion of the traffic is composed of trucks. Table 4.9-5 identifies the percentage of total vehicular trips attributed to trucks on county roads with a high percentage of truck trips.

TABLE 4.9-5 **Truck Traffic on Roads, Percent**

Segment Location	Daily Truck Traffic (percent)
Nevada Ave. west of Cutoff	33.2
Grangeville bypass west of 22nd Ave.	29.7
Nevada Ave. west of SR 41	22.9
Kansas Ave. west of 14th Ave.	19.6
Kansas Ave. west of 11th Ave.	15.2
Grangeville west of 14th Ave.	3.4

Source: KCAG, 1999b.

PLANNED TRANSPORTATION IMPROVEMENTS

The various transportation and circulation improvements that are planned by Kings County are included in two documents: the Kings County RTP and the Federal Transportation Improvement Program (TIP). The RTP

is a 20-year plan for long-term improvements. The basic premise of the TIP is to provide incremental short-term implementation (three years) of the long-range RTP. The TIP serves to present information to Federal funding agencies that determine manageable annual components of a funding program for the long-range plan. The Federal TIP is a compilation of project lists from the State Transportation Improvement Program (STIP), urbanized and non-urbanized areas, and other projects using Federal funding. The TIP is composed of two parts, a priority list of projects and project segments to be carried out in each three year period following the initial adoption of the TIP. The second is a financial plan that demonstrates how the TIP can be implemented.

The major roadway improvement projects identified in the Kings County TIP are those included in the Caltrans State Transportation Improvement Program. These projects include widening of State highways, construction of one interchange, and rehabilitation of various local roads (Table 4.9-6).

Table 4.9-6 **Major Projects in the Kings County RTIP and State Transportation Improvement Program**

Location	Planned Improvement	Estimated Total Cost	Year(s) Programmed
SR 41 near Lemoore, 0.7 mile south of Route 198 to Hanford-Armona Rd.	Two-lane expanded to four-lane highway	21,201,000	Prior year RTIP
SR 198 near Hanford, 0.5 mile east of Route 43 to 0.4 mile west of Route 99	Widen to four-lane expressway	7,477,000	2000-2004
SR 198 in Lemoore at 19th Ave.	Construct interchange	1,781,000	2000-2004
Avenal Cutoff Rd. in Kings County from Laurel Ave. to Route 269	Reconstruction and widening	2,707,000	Prior year RTIP
10th Ave. in Hanford from Route 198 to Grangeville Blvd.	Wide to four lanes and construct bicycle route	4,300,000	2000-2001
Grangeville Blvd. in Hanford, SR 43 to 10th Ave.	Asphaltic concrete overlay and widen shoulders	800,000	2000-2001
7th Ave. in Avenal from SR 269 to SR 33	Reconstruct roadway	300,000	Prior year RTIP
Various locations in Hanford	Rehabilitate roadway	1,771,000	2000-2001
Various locations in Lemoore	Rehabilitate roadway	1,395,000	2000-2001
Various locations in Corcoran	Rehabilitate roadway	1,456,000	Prior year RTIP
Various locations in Avenal	Rehabilitate roadway	8395,000	2000-2001
Various locations in Kings County	Rehabilitate roadway	1,729,000	Prior year RTIP

Sources: Kings County 2000 Regional Transportation Improvement Program and State Transportation Improvement Program.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

Traffic generated by future dairy development under the Kings County Draft Dairy Element (Element) may impact local and regional roadways in Kings County. These impacts have been assessed by comparing the anticipated traffic volumes generated by new dairies with the existing traffic volume and roadway capacity on key roadways. Effects would be considered significant if future dairy development:

- Causes an increase in traffic that is substantial in relation to the existing traffic volume and capacity of key roadways, or
- Causes levels of service (LOS) for key intersection to drop below the County's operating standard of LOS D or better, or
- Increases traffic hazards to motor vehicles, bicyclists, or pedestrians.

Impact 4.9-1

Truck and other traffic from new dairy development would be added to County roadways. This is a significant impact.

The Element proposes that approximately 257,312 additional milk cows and 285,654 head of support stock can be accommodated on land within designated Dairy Development Overlay Zones (DDOZs) and Nutrient Spreading Overlay Zones (NSOZs) in Kings County. Assuming an average dairy size of approximately 1,000 milk cows, the number of new dairies that could be accommodated is about 257 new dairies, or an increase of 72 percent from the County's existing inventory of 149 dairies. Since the theoretical dairy herd is the limiting control on dairy development, development of larger dairies would result in fewer dairies being constructed.

Average daily truck traffic due to each new 1,000-cow dairy is assumed to be approximately 26 one-way vehicle trips per day. This estimate is based on information provided by recent dairy applicants on milk delivery trucks (two trips), feed delivery trucks (four trips), dry manure trucks (four trips), and workers/visitors for large dairy facilities. It is also assumed that each new dairy would include at least one new residence (16 trips). Truck trips would account for approximately 38 percent of the total estimate additional vehicular trips generated by the new dairies.

Milk trucks that serve the new dairy facilities are expected to travel between the dairies and existing creameries and cheese plants located in Lemoore, Hanford, Tipton, Fresno, and Tulare. The milk truck trip distribution pattern would vary over time, depending on production schedules at the processing plants. Therefore, the trips would be distributed

relatively evenly over the principal and minor arterials within the County. Feed trucks are expected to travel between the new dairies and nearby farms and grain elevators. Dry manure trucks are expected to travel from the new dairy locations in the central part of Kings County to various rural locations within the County. Employee traffic is expected to be between the new dairy facility locations and the local population centers, such as Corcoran, Hanford, and Lemoore.

Construction of approximately 257 new dairy facilities would generate a total of approximately 6,682 daily trips to the local and regional roadway system, which would be distributed according to where each of the new dairies was located. The traffic added by each dairy project to any given roadway would be approximately 25 to 30 vehicle trips per day. The addition of this small amount of new dairy traffic would not exceed the capacity of the existing roadways, since many of the roadways in the County are operating at a level of service in the LOS A and B range. Caltrans has recently established criteria for determining whether a Traffic Impact Study (TIS) should be required of proposed development projects (Caltrans, 2001). In general, a TIS would not be required for projects generating less than 50 peak hour trips assigned to a State highway facility operating at LOS "C" or "D" or higher or is experiencing noticeable traffic delays. A TIS would be required under these conditions if the potential for a traffic incident is significantly increased. The only roadways in Kings County that are operating near capacity are located in urban areas, such as Hanford, where new dairy development would not be allowed. The impacts of growth to local and regional roadways in Kings County due to implementation of the Element would generally be considered less than significant.

Similarly, when truck and employee traffic from future individual dairy facilities are added to existing peak hour traffic volumes at key intersections throughout the rural part of Kings County, most of the intersections would continue to experience levels of service in the LOS A to LOS C range, which are well within the acceptable LOS range (i.e., LOS A to LOS D). Individual dairy project impacts would be assessed, but generally, the impacts of future dairy development to key intersections would be considered less-than-significant.

Each dairy site would be expected to have its own access to the adjacent local roadway. Therefore, the project's traffic will be well dispersed geographically, precluding concentrated traffic flows at any access point. All local roadways in the rural areas of Kings County that are designated for future dairy development are straight, two-lane roads in a relatively flat terrain. Visibility and sight distances are good. All of the proposed dairy sites allowed by the Element policies are currently in use for agricultural purposes, as is most of the land in the general vicinity. Therefore, each dairy project's added traffic would generally not be expected to create or exacerbate traffic safety hazards. The potential safety impacts would be considered less than significant.

Kings County does not currently impose any traffic impact policies or fees that affect new dairy applications (Lear, 2000). The traffic impacts of dairy projects are examined on a case-by-case basis. Specific transportation improvements, such as left turn lanes, are sometimes required of dairy applicants. In addition, the local Caltrans District often requests that new dairy facilities not create new driveways on certain segments of State highways. Construction of driveways or other improvements require an encroachment permit from Caltrans.

Existing General Plan policies and zoning regulations require that new developments, including agricultural operations that require a use permit, mitigate identified traffic impacts. The Element contains additional policies that give further guidance to assessing and mitigating environmental impacts of new dairy facilities. For example, **Policy DE 3.1a** of the Element requires that "traffic and road conditions" be one of the criteria that are used to "consider potential environmental effects of dairies when reviewing and evaluating proposals for new or expanded dairies." This policy is further supported by **Policy DE 3.1f**, which requires that all proposed dairy permit applications be specifically reviewed to determine if right-of-way encroachment permits or site-specific roadway improvements are required. **Policy DE 3.4a** additionally requires that all dairy buildings and structures be set back from road rights of way. The expected low vehicle trip generation, acceptable existing and future LOS, dispersed traffic pattern, limited traffic hazards, and requirement for site-specific project review indicate that the traffic impacts of implementation of the Element will not be significant. However, to further protect against localized impacts related to specific dairies, the following mitigation measure is included.

Mitigation Measure 4.9-1

The following policy shall be included in the Element:

"Policy DE 3.1g: The Technical Report for new and expanded dairies shall include a Traffic Impact Study (see Component 8 of Appendix J) prepared by a qualified traffic engineer in conformance with guidelines provided by the California Department of Transportation, which demonstrates that the project will not result in degradation of the level of service of adjacent roadways to below Level of Service (LOS) D on County roadways and LOS C on State highways. Additionally, the Traffic Impact Study shall demonstrate that the proposed dairy project will not result in significant safety hazards.

Where the Traffic Impact Study determines that the LOS will be degraded to a LOS E or lower on adjacent roadways, a conditional use permit and additional environmental review focused on traffic related environmental issues will be required before any new dairy development or expansion of an existing dairy may occur."

Following implementation of this mitigation measure, the impact of additional traffic generated by dairies developed under the Element would be reduced to a less-than-significant level.

4.10 PUBLIC SERVICES AND UTILITIES

4.10 PUBLIC SERVICES AND UTILITIES

This section of the EIR discusses the public services and utilities that would be required to serve new dairies, and identifies any service and utility deficiencies or shortfalls.

SETTING

WATER SERVICE

Much of the agricultural land in Kings County is served by on-site water delivery systems operated by the owners. The water service typically relies on a combination of groundwater and surface water supplies. Groundwater supplies are often provided by on-site or nearby wells, and surface water supplies are provided by local irrigation districts during wet weather years when such supplies are available and are purchased.

Groundwater is pumped from both shallow and deep aquifers underlying Kings County. The shallow aquifer provides agricultural water supplies for irrigation of crops. The water in the shallow aquifer in Kings County is generally of a quality that is inappropriate for potable use. Domestic water supply is from wells that pump water from the deeper aquifer, where water quality meets drinking water standards for human consumption.

WASTEWATER SERVICE

One or more residences are often constructed on the site of approved dairies to house dairy owners, workers, or managers. These individual residences generally rely on individual septic tank/leach field systems that are constructed within each dairy facility. The construction of the systems requires a permit from the Kings County Department of Planning and Building Inspection.

STORM DRAINAGE SERVICE

The storm drainage system for the typical dairy approved under the Kings County Draft Dairy Element (Element) would be integrated into the process water management system, and is discussed in Section 4.3, Water Resources, of this EIR. Surface water runoff from the manured areas of dairy facilities is required to be collected and retained on-site, typically in retention ponds. Runoff from roofed areas within dairy facilities and from adjacent areas is required to be diverted away from manured areas, usually into agricultural drainage ditches, unless the runoff is collected and treated. The storm drainage system for dairies established in rural agricultural areas would not normally require the construction of any public storm water drainage facilities.

POLICE AND FIRE PROTECTION

Police and fire protection services throughout the rural agricultural areas of Kings County are provided by the Kings County Sheriff's Department and Kings County Fire Department, respectively. The California Division of Forestry is responsible for providing fire protection to the remote and hilly area of the County west of State Highway 33.

The Kings County Sheriff's Department headquarters is located at the County government center in Hanford, with satellite sheriff's offices in the outlying communities of Avenal, Corcoran, and Kettleman City (Estes, 2000). The Kings County Fire Department headquarters is also located at the County government center in Hanford. The department operates twelve individual fire stations that provide fire and basic life support emergency services. Ten of the stations are located in the more populated northern portion of the County, including stations in or near Armona, Corcoran, Halls Corner, Hanford, Hardwick, Lemoore, and Stratford. County fire stations are also located in Avenal and Kettleman City in the southwest part of the County (Kings County, 1993).

The California Highway Patrol is responsible for patrolling the adjacent State highways (SR 33, 43, 41, and 198), as well as all dedicated roads in the unincorporated area.

SOLID WASTE

The solid manure generated by the herds of dairy cows that would be approved under the Element would either be used on-site as fertilizer for cropland, or would be collected and trucked off the site for sale and use on nearby fields as fertilizer. This aspect of manure management for a typical dairy facility would be regulated under the requirements of the Element. Potential impacts related to dairy manure are discussed in Section 4.3, Water Resources.

Municipal and industrial solid waste from the dairy facilities would be picked up by one of Kings County's thirteen existing service providers. One of the largest garbage companies that serves the unincorporated county area is USA Waste. Solid waste is collected from existing and future dairy facility sites in the northern and central portions of the County and is trucked to the Kings Waste and Recycling Authority materials recovery station in Hanford. The unrecyclable residual waste is then trucked to the USA Waste/Chemical Waste Management facility in Kettleman Hills. The Kettleman Hills facility has signed a contract to accept the Authority's municipal waste for 25 years (Gonzalez, 2000).

SCHOOLS

Kings County is served by fourteen separate school districts (Kings County, 1993). Any new residences associated with dairy development would be required to pay a per unit fee to the local school district as required under Proposition 1A (SB 50) passed by the voters in 1998.

PARKS AND RECREATION

The Parks and Grounds Division of the Kings County Public Works Department operates three regional parks in the northern half of the County. The County also maintains a community park in the unincorporated community of Stratford, while Armona and Kettleman City Community Services Districts maintain parks in each of those communities.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

~~Policies~~ Policy DE 3.6a ~~and 3.6b~~ requires that dairies conform to specific standards for dairy facilities established by the Kings County Fire Department. In addition, the numerous policies that address requirements for dairy process water and manure treatment management systems are summarized in Section 4.3, Water Resources, of this EIR.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

According to the environmental checklist recommended by the CEQA Guidelines, potentially significant impacts could occur if the project resulted in "substantial adverse physical impacts associated with the provision of, or need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives" for police or fire protection, schools, parks, or other public facilities. A proposed project could cause potentially significant impacts if it:

- exceeds wastewater treatment requirements;
- requires or results in the construction of new water, wastewater, or storm water drainage facilities, or expansion of existing facilities, the construction of which could cause significant environmental effects;
- does not have sufficient water supplies;
- would result in a determination by the wastewater treatment provider that it may not have adequate capacity to serve the project;
- would be served by a landfill with insufficient capacity; or

- fails to comply with Federal, State and local statutes and regulations related to solid waste.

Impact 4.10-1

Increases in water consumption. This is a less-than-significant impact.

Average daily water consumption for dairy projects that could be approved under the Element would vary according to the specific type of facility constructed. Total water demand for a modern freestall dairy is about 80 gallons per day per milking cow (Schultz, 1999). The 80 gallons of water are used for washing cows, cleaning milking areas, cooling systems, and drinking water for the animals.

Using an estimate of 80 gallons per day per milking cow, total water demand for a dairy facility of 5,000 milking cows would be approximately 1.23 acre-feet per day or 448 acre-feet per year. Assuming that the size of an average dairy facility for this milking cow herd size is about 115 acres (Kings County, 1999), the water demand would equal approximately 3.5 acre-feet per acre per year for the dairy facility land. However, most of the water at the dairy facility is process water that is reused to irrigate nearby fields. Dairy process water is usually mixed with fresh water to irrigate cropland and is therefore reused. Thus, the actual consumption of water at a dairy is equal to the amount of water that is turned into milk (approximately 8 gallons per milking cow per day) and the water that is lost to evaporation.

The remaining acreage of the typical dairy site that is not covered with the dairy sheds, corrals, and associated operations is planted with silage crops to be consumed by the dairy herd and irrigated with process water augmented with irrigation supplies. Wheat and corn silage are typically grown in Kings County for dairies, with double-cropping each year. Estimated water demand rates for double-cropping wheat and corn silage grown in the San Joaquin Valley are up to 3.9 acre-feet per acre per year (University of California, 1999a and 1999b).

Thus, a typical large dairy facility in the Tulare Lake Basin approved under the Element would use less water overall than if all the land was planted to row crops and irrigated. Irrigated silage lands for a dairy would use about the same amount of water as other crops, such as cotton, but the lands occupied by the dairy facilities would use less water than planted agricultural lands. However, dairy development in Sunflower Valley and the Kettleman Plain could cause depletion of water resources. **Policy DE 3.2h** acknowledges this potential impact and requires the Technical Report for dairy applications to demonstrate that an adequate and sustainable water supply is available.

On-site water demand would also include domestic water use by any residences proposed in conjunction with dairy facilities. Typical domestic water use for one family is approximately 0.5 acre-foot per year. Water quality of domestic wells varies throughout Kings County. Community wells must be tested on a regular basis to prove that water quality is within State Title 22 specifications for safe drinking water. Rural residences in Kings County generally rely on well water supplies. Any residences planned as part of a dairy project approved under the Element would have to meet Title 22 standards. This is a less-than-significant impact.

Mitigation Measure 4.10-1

None required.

Impact 4.10-2

Increase in the amount of storm water runoff. This is a less-than-significant impact.

Construction and operation of new dairy facilities approved under the Element would increase the amount of impervious surface area causing an increase in storm water runoff and requiring storm drain facilities. The runoff from manured areas would be required to be handled by the on-site process water systems designed for each dairy, and would be stored on the site.

Policy DE 4.1a of the Element ~~specifies~~ provides that clean water from dairy operations, including rainfall from roofs of dairy facilities, ~~shall~~ may be diverted from contact with any manured areas. If not, the runoff must be collected in the manure treatment system. Thus, storm water runoff from dairy facility roofs would be diverted away from on-site manure storage areas and corrals.

Mitigation Measure 4.10-2

None required.

Impact 4.10-3

Increases in the demand for police and fire protection, emergency medical response, solid waste collection and disposal services, school facilities, and recreation facilities. This is a less-than-significant impact.

Construction of on-site residences and operation of new dairy facilities approved under the Element would create a slight increase in demand for public and private services, such as police and fire protection, emergency medical response, solid waste, school, and recreation services.

The storage of large amounts of feed, particularly hay, at dairy facilities presents an increased risk of fire. The Kings County Fire Department has proposed specific minimum fire protection standards for dairy design and operation. **~~Policies~~ Policy DE 3.6a ~~and 3.6b~~** requires that new and expanded dairies comply with these standards.

For each new dairy that is approved, at least one new residence is typically constructed to house the herdsman and his or her family. Each new dairy can employ several dozen to over 100 workers, typically split between two ten-hour shifts each day. The creation of the on-site residents and employees would cause a slight increase in demand for police and fire protection and emergency medical services, which are provided by the Kings County Sheriff's Department and Kings County Fire Department and by the California Highway Patrol.

Solid waste from the dairy offices and residences would be picked up by one of the area's thirteen existing service providers. Solid waste would be disposed of at the USA Waste/Chemical Waste Management facility in Kettleman Hills, which has adequate disposal capacity (Gonzalez, 2000).

Operation of the proposed dairies would create a slight increase in demand for additional school facilities, as children of employees living on the site would attend schools in one of the school districts in the County. Each new residence constructed as part of a new dairy would be required to pay a per unit fee as set forth under Proposition 1A (SB 50), passed by the voters in 1998. The current fee as set by State law is a maximum of $2.05 per square foot for new residential use and $0.33 per square foot for commercial/industrial use. Under these current fees, a typical 2,000-square foot house would pay $4,100 in school fees.

Each new dairy facility would not be expected to significantly increase demand on local park facilities, since a relatively small number of employees would be at each dairy facility during a single shift, and only one family would be living at each dairy.

The slight increase in demand for public services is a less-than-significant impact.

Mitigation Measure 4.10-3

None required.

4.11 CULTURAL RESOURCES

4.11 CULTURAL RESOURCES

This section summarizes the cultural resources of Kings County. Information reviewed for the summary includes the Kings County General Plan, published reports on archaeological research in the Tulare Lake Basin, and data from the the California Historical Resources Information System (CHRIS) (Appendix E), Southern San Joaquin Valley Information Center in Bakersfield. The records at CHRIS include known and recorded archaeological and historic sites, inventory, and excavation reports filed with the center, and properties listed on the National Register of Historic Places, the California Historical Landmarks, the California Inventory of Historic Resources, and the California Points of Historic Interest. The records at the Native American Heritage Commission include a database of sacred lands.

SETTING

PREHISTORY

The project site is located in the southern San Joaquin Valley in an area known to have been the home of the Tachi tribe of the Yokuts. The Tachi Yokuts lived north of Tulare Lake and westward to the hills near Coalinga. Archaeological evidence indicates that the historic Native American people were "the last in a series of hunting or hunting-gathering populations" to live in the Tulare Lake region (Wallace, 1991). Artifacts collected from archaeological sites in the vicinity of the lake, primarily along a former (lower) lake shoreline, include over 325 Clovis-type lithic projectile points (Stepp, 1997). Clovis points are typically considered index fossils of an early North American stone tool technology developed 11,000 to 13,000 years ago. Therefore, human occupation of the Tulare Lake margin probably began more than 10,000 years ago.

Significant Tulare Lake archaeological sites include the Witt site in southern Kings County (near Dudley Ridge) and the Creighton Ranch site in western Tulare County. Fossilized human bone from the Witt site has been radiometrically dated as being 11,380 to 15,800 years old. The bones of Pleistocene mammals from that site are similarly dated. Several sites have also been identified south and west of Hanford (including three mound sites that were leveled in the 1940s). Other sites have been recorded in the area of Stratford, the area south and west of Lemoore, and in the area surrounding Alpaugh in southwest Tulare County and southeastern Kings County (Wallace, 1993). The CHRIS records indicate that 90 recorded cultural resource sites have been identified in Kings County.

Most of the archaeological resources are located in the upper three feet of the subsurface. Throughout most of the valley floor portion of the County, intensive agricultural production has disturbed surface soils to below this depth. Therefore, it is likely that

agricultural activities have disturbed most of the archaeological resources. In addition, ardent collection of artifacts by local residents and other collectors has complicated systematic, scientific evaluation of the Tulare Lake archaeological resources.

HISTORIC PERIOD

The Kings County General Plan identifies four sites in the County that are listed on the National Register of Historic Places, and three additional sites that have been designated as California Historical Landmarks. Three of the sites on the National Register are in Hanford: the Taoist Temple; the old County Courthouse; and the Carnegie Library. The fourth site is the Witt archaeological site near Dudley Ridge. The three California Historical Landmarks are the Mussel Slough Tragedy site south of Hardwick; the Kingston Town site north of Hardwick; and the El Adobe de los Robles Rancho west of Lemoore.

The County General Plan also identifies thirteen historic sites of local importance. The sites include seven cemeteries and two churches located in Corcoran, Lemoore, Grangeville, and other rural areas in the northern County. Additional sites include the original site of Lemoore; the Avenal Ranch; Kettleman Hills fossil beds; and First High School on the Kings River.

RELEVANT GOALS, OBJECTIVES, AND POLICIES

Objective DE 3.1 of the Draft Dairy Element (Element) (Appendix A) requires that potential environmental effects be considered during the review and evaluation of applications for new or expanded dairies. **Policy DE 3.1d** specifically requires that known cultural and archaeological resources be considered for general dairy siting criteria during the dairy development review process. **Policy DE 3.1e** addresses the potential for disturbance of unknown cultural and paleontological resources during construction of individual dairy projects.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The following criteria have been established for determining the significance of potential impacts on cultural resources, based on the CEQA Guidelines environmental checklist. A significant impact would occur if the proposed project would:

- cause a substantial adverse change in the significance of historical resources;
- cause a substantial adverse change in the significance of archaeological resources;
- directly or indirectly destroy a unique paleontology resource or site or geologic feature;

- disturb any human remains, including those interred outside of formal cemeteries.

Impact 4.11-1

Disturbance or destruction of cultural (historical and archaeological) resources. This would be a significant impact if archaeological resources were to be identified at dairy development sites. This is a less-than-significant impact.

Portions of the County identified in the Element as suitable for dairy development could potentially contain significant archaeological resources. The large number of recorded archaeological sites that have been identified in the County indicate that the Tulare Lake Basin may contain other unidentified sites. Pleistocene animal fossils have been identified in association with many archaeological sites in the Tulare Lake Basin. Most of these areas with DDOZs have been disturbed by agricultural activities, which may have disturbed or displaced artifacts at or near the ground surface. As the precise sites of future dairy facilities are not known, it is possible that dairy development could also result in disturbance of known archaeological sites. It is also possible that excavation for dairy structures and manure management facilities could encounter as-yet undetected (i.e., buried) resources. Such finds may meet the definition of a "unique archaeological resource" as specified in Section 21083.2 of the Public Resources Code. It is also possible that human remains could be encountered.

In addition to archaeological resources, the DDOZs may contain significant historical resources. The CEQA Guidelines (Section 15064.5(a)) define a "historical resource" as a resource that: 1) is on or eligible for listing on the California Register of Historical Resources, 2) is included in a local register of historical resources, 3) determined by a lead agency to be "historically significant," or 4) could be a historic resource as defined in Public Resources Code sections 5020.1(j) or 5024.1. Some of the recognized historical resources in Kings County that would apparently meet these criteria may be located, wholly or partly, within DDOZs. These resources include the Indian Cemetery, Kings River Cemetery, Kings River Church, First High School, Kingston Town, and Mussel Slough Tragedy sites.

The protection of cultural resources is addressed in **Policies DE 3.1d** and **3.1e** of the Element. Under **Policy DE 3.1d**, documentation of a CHRIS records review and a Sacred Lands file check is required to be submitted with all dairy applications. If the search indicates the presence of known or suspected cultural resources, a site-specific evaluation by a qualified archaeologist is required. The provisions of **Policy DE 3.1e** require that, if archaeological or paleontological resources are encountered during dairy development, work is to be suspended pending evaluation of the resources by a qualified archaeologist. The evaluation must be conducted in accordance with State and Federal guidelines

(including Section 15064.5 of the CEQA Guidelines). Implementation of **Policy DE 3.1d** will ensure that known cultural resources are identified and managed during consideration of dairy development applications. The potential for disturbance of unknown (i.e., buried) cultural and paleontological resources is mitigated in conformance with CEQA requirements by **Policy DE 3.1e**.

Implementation of **Policies DE 3.1d** and **3.1e** would minimize the potential for disturbance or destruction of cultural resources during dairy development and reduce the impact to a less-than-significant level.

Mitigation Measure 4.11-1

None required.

5. CEQA STATUTORY SECTIONS

SECTION 5
CEQA STATUTORY SECTIONS

This section of the EIR includes discussions of specific issues that are required by the California Environmental Quality Act. These statutory topics are: cumulative impacts related to the proposed project; significant irreversible impacts of the project; and growth-inducing impacts that may be caused by the project.

CUMULATIVE IMPACTS

Cumulative impacts have been addressed in some of the preceding topical sections of Chapter 4, including 4.2 Air Quality, 4.3 Water Resources, and 4.9 Transportation. The discussion below summarizes these analyses and provides an evaluation of other cumulative impacts that may occur from this project when considering other past, existing, and future similar projects.

The *California Environmental Quality Act Guidelines* require that all environmental impact reports contain an analysis of cumulative impacts for the project. An EIR must discuss the "cumulative impacts" of a project when its incremental effect will be cumulatively considerable. Section 15355 defines cumulative impacts as "*two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts*." A cumulative impact "*consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts*" (Section 15130(a)(1)). The discussion of cumulative impacts "*shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone*" (Section 15130(b)).

The Guidelines state that "*Lead agencies should define the geographic scope of the area affected by the cumulative effect and provide a reasonable explanation for the geographic limitation used*" (Section 15130(b)(1)(B)(3.)). The cumulative impacts analysis "*shall examine reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects*" (Section 15130(b)(3)). With some projects, "*the only feasible mitigation for cumulative impacts may involve the adoption of ordinances or regulations rather than the imposition of conditions on a project-by-project basis*" (Section 15130(c)).

Section 15130(a)(3) states also that an EIR may determine that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable, and thus not significant, if a project is required to implement or fund its fair share of a mitigation measure(s) designed to alleviate the cumulative impact.

To be adequate under CEQA, a discussion of cumulative effects must include either:

- A list of past, present and probable future projects, including, if necessary, those outside the agency's control, or
- A summary of projections contained in an adopted general plan or related planning document, or in a prior certified EIR, which described or evaluated regional or area-wide conditions contributing to the cumulative impact, provided that such documents are referenced and made available for public inspection at a specified location (Section 15130(b)[1]).

As used above, the term "probable future projects" includes approved projects that have not yet been constructed; projects that are currently under construction; projects requiring an agency approval for an application that has been received at the time a Notice of Preparation is released; and projects that have been budgeted, planned, or included as a later phase of a previously approved project (Section 15130[b][1][B][2]).

The types of development and geographic area that are being analyzed for cumulative impacts are all categories of confined animal facilities in Kings County, including existing and proposed dairy facilities. The environmental impact analysis presented in Section 4 of this EIR identified five significant and unavoidable cumulative impacts, all of which are related to air quality. The analysis of those impacts acknowledges that air quality effects associated with development under the proposed Element (with the exception of odor impacts) affect the ambient air quality within the San Joaquin Valley air basin. The air basin has geographic boundaries that encompass approximately 25,000 square miles of land, including all or portions of eight counties. The air quality within the basin is affected by biogenic or natural sources (e.g., methane emissions from decomposition of organic materials, including sewage) and a wide range of human activities, including stationary sources of air emissions (e.g., industrial facilities and power plants), and mobile sources (e.g., cars, trucks, and mobile equipment). The air basin is also affected by emissions generated by a wide range of agricultural activities, such as the dairy operations and crop production similar to those subject to the requirements of the Element.

Stationary facilities that generate emissions are generally regarded as point sources, while more diffuse sources are considered nonpoint sources. Point sources are typically regulated by an air quality permit process, which attempts to reduce pollution by imposing the requirement that these sources employ the best available and practicable air emissions control technologies. Although monitoring and evaluation of the emissions generated from point sources are regularly conducted by the regulatory community, the contributions to ambient air quality conditions by some nonpoint source categories are not as closely monitored. For the most part, agricultural activities are not subject to land use permits or

air quality permits. Consequently, comprehensive information is not available from either air quality control districts or counties on air emissions generated by agricultural activities.

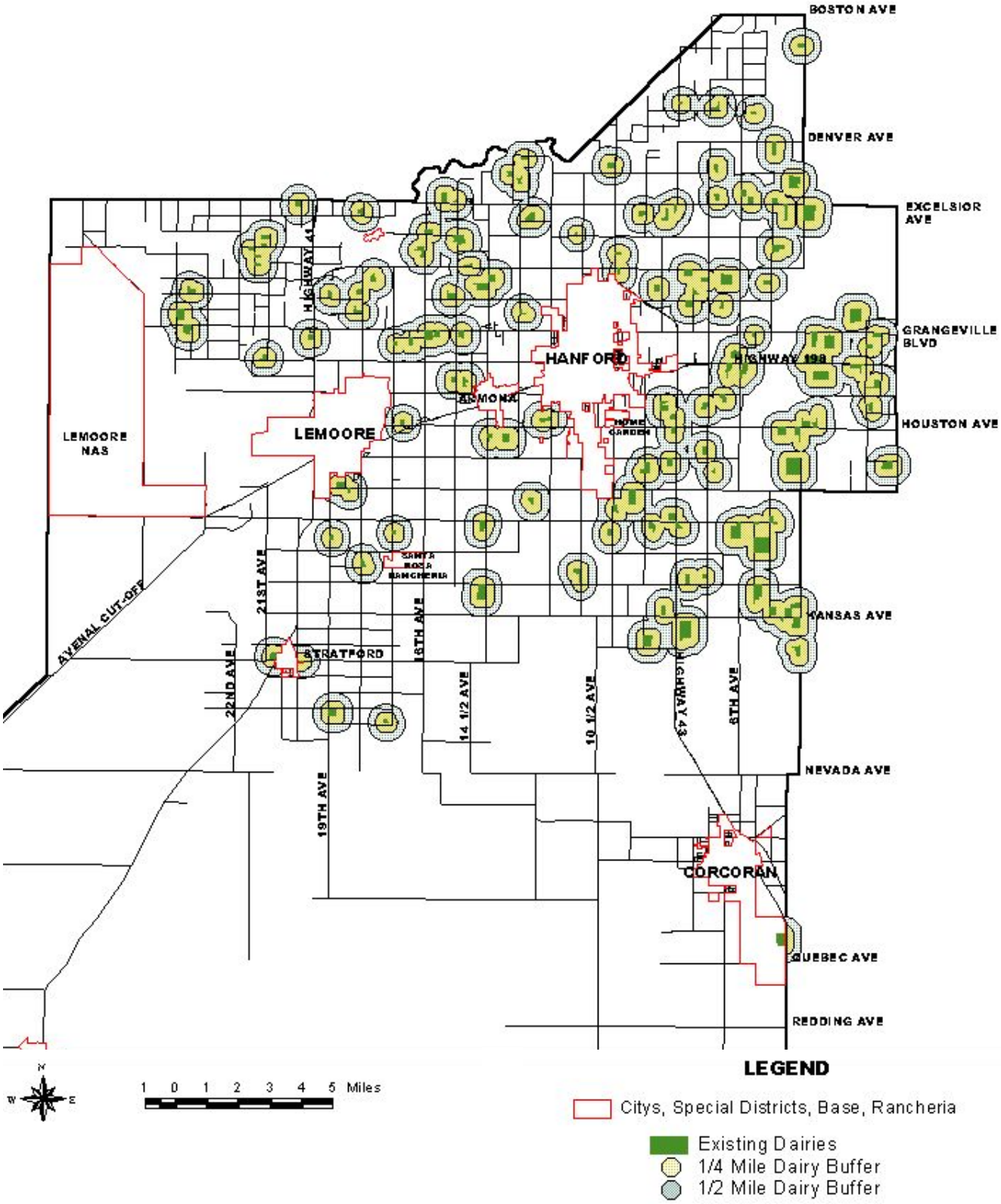
Although CARB and SJVUAPCD have developed emissions inventories for selected air pollutants resulting from some agricultural activities (e.g., land preparation, harvesting, and beef cattle feedlots), air emissions inventories and site-specific monitoring data on relevant parameters (e.g., hydrogen sulfide, PM_{10}, and methane) for other animal confinement facilities (including dairies) within the San Joaquin Valley air basin are not available. General inventories of estimated emissions from agricultural activities are under development but are not based on site-specific conditions (i.e., the number of animals, volume of manure generated, area of animal confinement, or process water management).

The primary threshold of significance for cumulative air quality impacts is defined by Ambient Air Quality Standards, which define the attainment status of the air basin. These ambient standards do not discern which sector of sources contributes to air pollution (or how much), but nevertheless act to trigger the significance classification of cumulative impacts. All sources (point or nonpoint sources, permitted and unpermitted sources) of air emissions for which the air basin is not in attainment (PM_{10} and ozone precursors) contribute to the nonattainment condition. Under these circumstances, the air quality impact analysis presented in this EIR emphasizes the discussion of measures that may be able to mitigate the project-specific air quality impacts while recognizing that significant cumulative air quality impacts will result from project approval.

In Kings County in 1999, there were 149 dairies with 124,668 milking cows (Figure 5-1; Table 5-1). The majority (65 percent) of the dairies in the County have herd sizes of 200 to 1,000 cows. Of the 149 dairies, about 39 dairies (26 percent) have a herd size greater than 1,000 cows. In addition to the existing dairies, there are 26 poultry (turkey and chicken) operations in Kings County. Other large confined animal facilities in the County include three calf-raising facilities that are operated separately from dairies, one rabbit raising facility, one hog facility (approximately 16,500 hogs) at Avenal State Prison, and two goat raising facilities. The location of existing nonbovine dairy confined animal facilities are shown on Figure 5-2.

A list of recently approved and proposed dairy projects in Kings County has been compiled (Table 5-2) . The list includes one recently approved dairy, and several pending applications for new dairy operations or expansions of existing operations. There are no approved or pending permit applications for other types of confined animal facilities. In addition, applications for four proposed new or expanded dairies had been submitted to the County at the time of preparation of this EIR, but had not yet been deemed complete by County staff, had not been scheduled for public hearing, or had expired.

EXISTING DAIRY FACILITIES Figure 5-1

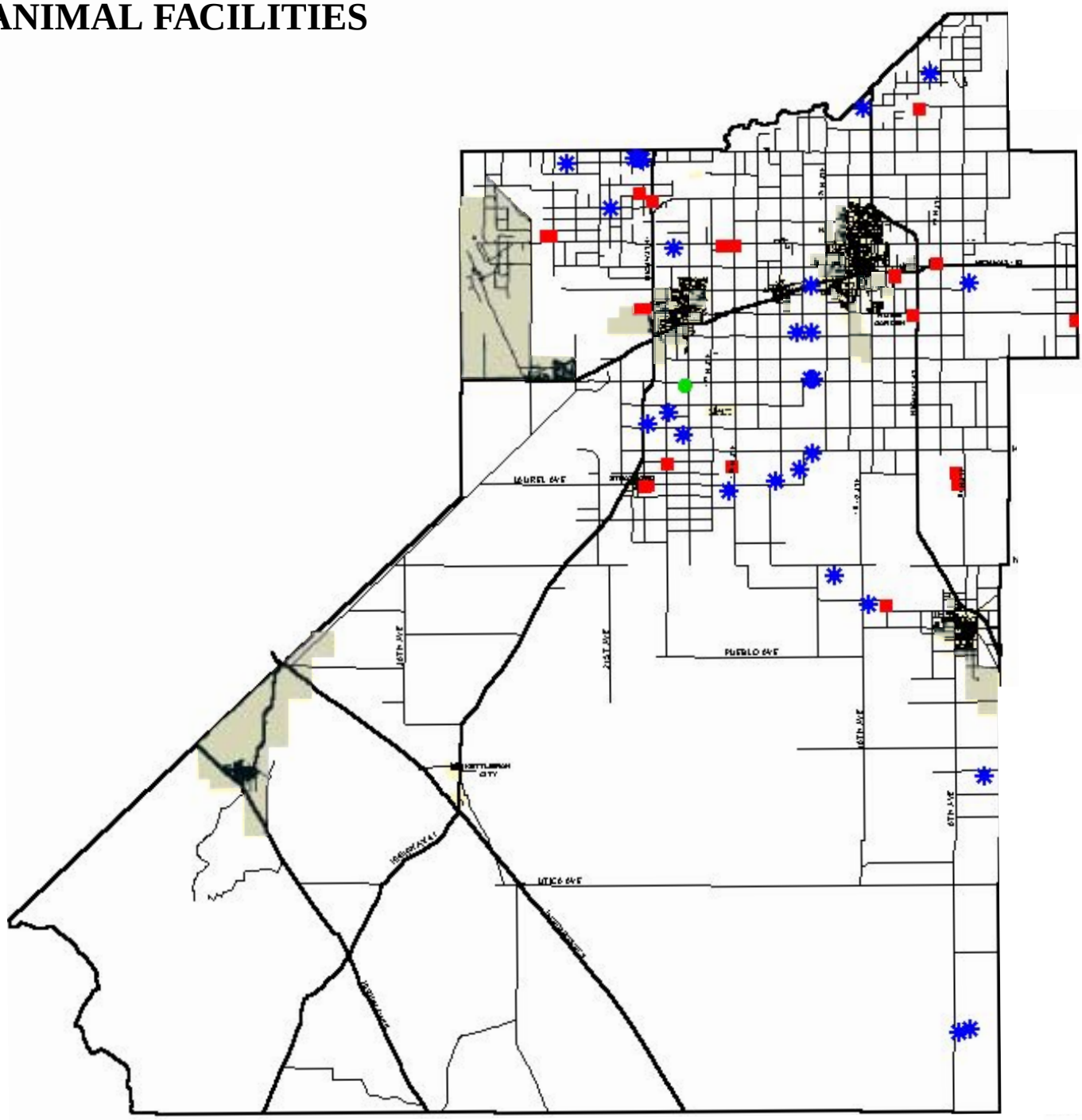


Source: Kings County Planning Agency, 2000.

BASELINE

EXISTING NON-DAIRY CONFINED ANIMAL FACILITIES

Figure 5-2



Source: California Department of Conservation.

TABLE 5-1: **Growth of Dairies and Herd Size (Milk Cows) in Kings County (1982-2000)**

Dairy Herd Size	1999		1995		1990		1987		1982	
	Dairies	Cows	Dairies	Cows	Dairies	Cows	Dairies	Cows	Dairies	Cows
50-199	13	1,876	20	3,045	23	3,467	22	3,408	41	5,901
200-499	43	15,959	53	18,276	56	18,708	67	21,921	68	20,724
500-999	54	38,671	61	42,857	52	35,881	52	37,235	34	25,740
1,000-2,499	32	43,191	21	30,522	18	23,767	6	7,931	3	4,267
> 2,500	7	24,971	2	6,830	0		0		0	
TOTAL	149	124,668	157	101,530	149	81,823	147	70,495	146	56,632

Source: University of California Cooperative Extension, 2000; U.S. Bureau of the Census, 1992 Census of Agriculture.

TABLE 5-2: **Approved and Proposed Dairies in Kings County**

Name, Application Number, and Location	Herd Size	Status
Gerrit DeJong, (CUP 98-01) 22564 4th Avenue	1,800 milk cows 300 support stock	Approved and in operation
Bernard TeVelde (CUP 98-04) 1301 Iona Avenue	1,600 milk cows 1,464 support stock	Approved and is in operation
J.G. Boswell (CUP 98-12) 19142 10 ½ Avenue	3,898 milk cows 3,598 support stock	Approved and nearly complete
Manuel Galhandro (CUP 98-14) 9200 19 ½ Avenue	500 milk cows 509 support stock	Environmental review in public comment period. Planning Commission is monitoring.
J.G. Boswell (CUP 98-16) 20304 10 ½ Ave.	3,931 milk cows 3,629 support stock	Approved but withdrawn by applicant due to lawsuit
J.G. Boswell (CUP 98-17) 11716 Nevada Ave.	4,597 milk cows 4,243 support stock	Approved but withdrawn by applicant due to lawsuit
J.G. Boswell (CUP 98-18) 12658 Nevada Ave.	10,348 milk cows 9,552 support stock	Approved but withdrawn by applicant due to lawsuit
J.G. Boswell (CUP 98-19) 13375 Laurel Ave.	5,928 milk cows 5,472 support stock	Approved but withdrawn by applicant due to lawsuit
Neves Bros. (CUP 99-03) 13539 Laurel Ave.	3,900 milk cows 2,407 support stock	Application was never certified complete, closed for inactivity
Robin Martella (CUP 99-15) 8749 Lansing Avenue	3,925 milk cows 3,830 support stock	Initial study complete which required an EIR; applicant is waiting for Dairy Element Program EIR
V&F Dairy (CUP 01-06) 18321 Idaho Avenue	550 milk cows 605 support stock	Application incomplete, awaiting technical documentation
Ariolo-Bosio Trust (CUP 00-11) Near 16th Ave. and Laurel Ave.	Not yet determined	Application incomplete, waiting for Dairy Element Program EIR
Ariolo-Bosio (CUP 00-12) Near 16th Ave. and Manteca Ave.	Not yet determined	Application incomplete, waiting for Dairy Element Program EIR

Source: Kings County Planning Agency; BASELINE Environmental Consulting.

The CEQA Guidelines require that cumulative impacts be identified for "probable future projects." In addition to recently approved, pending, and proposed dairy applications recorded with the County planning agency, the Guidelines definition of probable future projects includes "*projects included in an adopted capital improvements program, general plan, regional transportation plan, or other similar plan or included in a summary of projections of projects(or development areas designated) in general plans or similar plan, and those projects anticipated as later phase of a previously approved project (e.g., a subdivision)* [and] *those public agency projects for which money has been budgeted*" (Section 15130[b][1][B][2]).

Under the Element, dairy development within the County would be limited to those areas designated as Dairy Development Overlay Zones (DDOZs). Application of manure and process water as fertilizer and irrigation supply would be restricted to the DDOZs and Nutrient Spreading Overlay Zones (NSOZs). Future dairies would be generally located in the San Joaquin Valley floor portion of Kings County: in the intensively farmed areas around Hanford and Lemoore, and between Hanford and Lemoore, and the flood zones of the Tulare Lake Basin, southwest of the Lemoore Air Station, and south of Corcoran. In addition, DDOZs and NSOZs are designated in Sunflower Valley and in the Kettleman Plain.

The Element defines the maximum theoretical dairy herd that could reasonably be supported by the amount of land available for manure and process water application. Analysis of the potential environmental impacts of "buildout" of the theoretical dairy herd was the subject of Section 4 of this EIR. In effect, the analysis evaluates the cumulative effects of the construction and operation of dairies built and expanded to accommodate the theoretical herd. The precise number and location of dairies that could be developed under the Element cannot be known with certainty.

Analysis performed for this EIR has identified five significant and unavoidable impacts, which are also cumulative impacts:

- Particulate matter (PM_{10}) emissions
- ~~Reactive organic gas~~ Ozone precursor (ROG and NOx) emissions
- Ammonia emissions
- Hydrogen sulfide emissions
- Methane emissions

These significant unavoidable impacts are discussed fully in the following section. Other cumulative impacts that are potentially significant relate to vehicular emissions, traffic and circulation, biotic habitat and wildlife movements, water quality and supply, land use, and cultural resources. These impacts would all be reduced to a less-than-significant level

under the proposed project through implementation of proposed goals, policies, and objectives, as discussed previously in this EIR and below.

For each of the environmental issues identified as causing possible cumulative impacts, the appropriate area of cumulative significant impact analysis is identified. For all environmental issues that could cause cumulative impacts, except air quality and water resources, the area of analysis is Kings County. The topography of those portions of Kings County that include designated DDOZs and NSOZs is relatively flat and used predominantly for agricultural production. The climate and surface water hydrologic conditions are relatively uniform throughout these portions of the County. The similarity of physiographic conditions and land use throughout most of the County promote defining the County boundaries as the cumulative impact area for all environmental issues associated with the proposed project, except air quality and water resources.

For the cumulative air quality analysis, the effect is at the larger air basin level but the analysis has focused on Kings County as well as other areas in the San Joaquin Valley air basin where air emissions from planned dairy facilities have been quantified. For example, although PM_{10} and reactive organic gas emissions from development associated with the project are a cumulative impact contributing to emissions generated throughout the San Joaquin Valley air basin, the area of the basin is nearly 25,000 square miles and covers all or portions of eight counties. In the case of methane releases from the proposed dairy operations, the adverse impact contributes to a global climate problem.

It is impractical and unreasonable to identify all individual past, present, or future projects within the eight-county area that may contribute to the cumulative air quality impacts identified for the proposed project. Emission of PM_{10} and ~~ROG~~ ozone precursors occurs during performance of a wide range of human activities, including vehicle use, agricultural activities, and many industrial and commercial operations.

To place the environmental effects of implementation of the proposed Element into a regional context, the cumulative impacts of air emissions from bovine dairies in the San Joaquin Valley air basin can be estimated semi-quantitatively on the basis of information available from the California Department of Food and Agriculture and similar assumptions made for estimating emissions presented in Section 4.2 of this EIR. This analysis focuses on confined animal facilities within the basin that are similar to the agricultural development proposed by the Element. The CDFA Dairy Marketing Branch provides annual estimates of the number of dairies and milk cows in dairy product-producing counties within California. The 1996 and 1999 estimated number of dairies and herd size for the eight counties within the San Joaquin Valley air basin are presented in Table 5-3. In 1996, there were 1,499 dairies with an average of 690 milk cows per dairy. The total number of dairies in 1999 decreased (1,447), but the average herd size rose to 847. The total

number of milk cows in the eight counties in 1996 and 1999 were 928,605 and 1,060,167, respectively. The Kings County dairy herd represented approximately 12 percent of the total milk cow herd in the San Joaquin Valley air basin in 1999.

TABLE 5-3: **San Joaquin Valley Dairy Herd, 1996 and 1999**

	1996			1999		
	Cows	Dairies	Average Cows/Dairy	Cows	Dairies	Average Cows/Dairy
County	Head					
Fresno	74,827	117	640	84,172	105	802
Kern	39,011	30	1,300	57,942	36	1,609
Kings	104,751	158	663	124,668	146	854
Madera	25,393	50	508	35,507	52	683
Merced	163,493	348	470	185,130	338	548
San Joaquin	86,593	162	535	88,778	154	576
Stanislaus	140,032	340	412	146,285	323	453
Tulare	292,509	294	995	337,685	293	1,253
Totals	**926,609**	**1,499**	**690**	**1,060,167**	**1,447**	**847**

Source: California Department of Food and Agriculture, Dairy Marketing Branch.

The determination of an estimate of the air emissions into the San Joaquin Valley air basin from existing dairies must consider support stock as well as milk cows. Therefore, the distribution and number of support stock were estimated using the same assumptions presented in the proposed Element (Table 5 of the Element). Furthermore, the estimated dairy cattle populations have also been converted to animal units (AU). The estimated 1999 dairy herd distribution (Table 5-4) serves as the basis for estimating the air emissions generated by the San Joaquin Valley air basin dairy herd.

Details on management practices at all 1,447 dairies within the San Joaquin Valley air basin are not available. However, the emission of ~~ROG~~ ozone precursors, methane, and ammonia from dairy cows and the decomposition of manure are directly related to the population of bovine cattle. Applying the methodologies presented in Section 4.2 of this EIR , the emissions of ~~ROG~~ ozone precursors, methane, and ammonia from the San Joaquin Valley air basin dairy herd can be estimated. The calculation of these emissions assumes that the manure decomposes under anaerobic conditions and that no advanced treatment technologies are practiced. Assuming that milking cows at new dairies are housed in freestall barns and support stock are kept in unpaved corrals also allows the PM_{10} emissions to be estimated. The calculations of air emissions for the existing (1999) San Joaquin Valley air basin dairy herd are presented in Appendix F.

TABLE 5-4: **1999 Estimated Dairy Herd Distribution, San Joaquin Valley**

	Cattle Type (Animal Units)[1]					
County	**Milk Cows**	**Dry Cows**	**Heifers >2 years**	**Heifers 1-2 years**	**Calves**	**Baby Calves**
Fresno	117,841	14,141	27,528	13,764	16,498	1,980
Kern	81,119	9,734	18,949	9,475	11,357	1,363
Kings	174,535	20,944	40,771	20,386	24,435	2,932
Madera	49,710	5,965	11,612	5,806	6,959	835
Merced	259,182	31,102	60,545	30,272	36,286	4,354
San Joaquin	124,289	14,915	29,034	14,517	17,400	2,088
Stanislaus	204,799	24,576	47,841	23,921	28,672	3,441
Tulare	472,759	56,731	110,437	55,218	66,186	7,942
Subtotal	1,484,234	178,108	346,717	173,359	207,793	24,935
					Total	**2,415,145**

[1] The estimation of animal units assumes that all dairy animals are Holstein cattle.

The economic analysis prepared for the Element (Appendix B) estimates a 2.6 percent growth rate in Kings County dairy development over the next 20 years. However, the estimate was based on the results of a survey of existing dairies in the County. Only 32 of 149 existing dairy operators responded to the survey, which included questions regarding potential expansion of existing dairies. Therefore, the 2.6 percent growth rate probably only reflects the growth associated with expansion of existing dairies. The estimate may not reflect the growth impacts associated with the development of new dairies.

Information presented in the Element (Appendix A, Table 3) on trends in dairy development in Kings County indicates that the milk cow herd in the County increased from 69,792 to 124,667 head from 1988 to 2000. Although the rate of change in the dairy herd varied year to year over this period, the herd increased by an average of approximately five percent per year.

Regionally, the growth rate of the San Joaquin Valley air basin dairy cow herd also averaged approximately five percent per year over the period 1996 to 1999. Data available from the California Department of Food and Agriculture indicate that the number of milk cows in the eight counties in the air basin increased from 928,605 in 1996 to 1,060,167 in 1999 (Table 5-3).

Based on these recent trends, the cumulative analysis for this PEIR assumes that the average annual increase in the dairy cow herd in Kings County and the San Joaquin Valley will be maintained at approximately five percent. The projected future San Joaquin Valley dairy herds for the years 2010 and 2020 (assuming a five percent annual growth rate) are

presented in Table 5-5. At a growth rate of five percent, the maximum theoretical bovine herd proposed for Kings County by the Element (381,980 milk cows) would be "built out" in the year 2022.

TABLE 5-5: **Projected Future San Joaquin Valley Dairy Herds**

		Cattle Type (head)					
Year	**Projected Herd**	**Milk Cows**	**Dry Cows**	**Heifers >2 years**	**Heifers 1-2 years**	**Calves**	**Baby Calves**
1999	~~2,415,145~~ 2,236,952	1,060,167	159,025	339,253	169,627	424,067	84,813
2010	~~3,269,168~~ 3,825,948	1,813,246	271,987	580,239	290,119	725,298	145,060
2020	~~3,716,842~~ 6,232,066	2,953,586	443,038	945,147	472,574	1,181,434	236,287

[1] The projection of future dairy herds assumes a five percent annual increase in the number of milk cows and support stock.

POTENTIAL CUMULATIVE AIR QUALITY IMPACTS

Increase in PM_{10} and Ozone Precursors

The dairy operations and crop production related to the proposed project would contribute incrementally to the generation of PM_{10} (refer to Impact ~~4.2-12~~ 4.2-11) and ~~reactive organic gas~~ ozone precursor (ROG and NOx) (refer to Impact ~~4.2-13~~ 4.2-12) emissions in the San Joaquin Valley air basin. The San Joaquin Valley is currently in nonattainment for both Federal and State PM_{10} and ozone standards. Any contribution of PM_{10} emissions to the environment would further exacerbate the nonattainment condition, and could cause a delay in the eventual attainment of the standards. Similarly, since ROG and NOx are ~~is a~~ precursors of ozone and the San Joaquin Valley is in nonattainment for ozone, additional ~~ROG~~ ozone precursor emissions would also exacerbate the nonattainment condition. Therefore, the project would be considered to have a significant unavoidable cumulative impact on regional air quality.

Major contributing sources of PM_{10} emissions in the air basin (in descending order of contribution) are entrained roadway dust, farming operations, waste burning, and industrial processes. The main sources of ~~ROG~~ ozone precursor emissions are vehicle and other mobile sources, solvent use, farming, petroleum storage and transfer, and waste burning. The 2000 CARB inventory estimates that 513 tons of PM_{10}, 598 tons of NOx, and 481 tons of ROG are produced daily within the air basin. The PM_{10} emissions estimates do not include the emissions from dairies and other livestock facilities. CARB has not completed a comprehensive inventory of PM_{10} and ROG emissions in the air basin. In January 2001, CARB estimated emissions of PM_{10} and ROG from dairies in the basin to be

1,700 and 19,900 tons per year; estimates of NOx emissions were not included. As discussed in Section 4.2 of this PEIR, there are discrepancies in the methods used by CARB in generating these estimates. Therefore, a reasonable estimate of the increment of increase in emissions within the basin generated by the dairies in the basin presented in this cumulative analysis is based on the analysis and assumptions presented previously in this PEIR.

The estimated ROG emissions for the existing (1999) San Joaquin Valley air basin bovine dairy herd is 14,406 tons per year or approximately 10.0 tons per year per dairy. Again, Kings County dairy cows account for approximately 12 percent of this total. The estimated PM_{10} emissions from the total dairy herd under Scenario 1[1] (Appendix F) is approximately 14,335 tons per year (or 9.9 tons per year per dairy). The SJVUAPCD threshold limits for point sources of ROG and PM_{10} emissions are 10 and 15 tons per year, respectively.

The SJVUAPCD ~~is in the process of adopting~~ has recently adopted guidelines for agricultural conservation practices to reduce the emissions of PM_{10} from agricultural activities, including management practices for off-field activities in unpaved areas. Significant emission of PM_{10} from dairies will occur even after implementation of these measures. There are no current plans to develop emission reduction practices for ROG or NOx generated by agricultural activities and significant emission of this pollutant are likely to continue.

The estimated future PM_{10} emissions from dairy operations in the San Joaquin Valley air basin for the years 2010 and 2020 are presented in Table 5-6. The estimated PM_{10} emissions in Table 5.6 do not include secondary $PM_{2.5}$ emissions, which may be generated by formation of ammonium nitrate. Therefore, the estimated PM_{10} emissions should be considered minimum values. Two distinct future conditions are considered. Under each future condition, four scenarios are presented that reflect the range of assumptions regarding emissions from a dairy, which are discussed fully ~~on page 4.2-32 of this~~ in Section 4.2 of the Draft PEIR. Future Condition 1 assumes future conditions without implementation of the proposed Element. Future Condition 2 assumes implementation of the Element. Under Future Condition 2, the emission estimate assumes a 50 percent reduction of PM_{10} at all future dairies in Kings County (**Policy DE 5.1c**). No reduction of emissions at other dairies within the basin is assumed as no specific control measures on PM_{10} emissions are known to be required in other jurisdictions. Under Future Condition 1 (Scenario 1), the expected PM_{10} emissions would be 24,517 tons per year in 2010 and

[1] Four PM_{10} emission scenarios were evaluated in this EIR, representing a range of assumptions regarding factors affecting emissions (see Section 4.2 of this EIR). For this cumulative analysis, Scenario 1 is considered the most appropriate as it assumes CARB emission factors and includes rainfall effects.

TABLE 5.6: **Estimated Total Net Increase in San Joaquin Valley Air Basin Emissions without and with the Element** (tons per year)

Activity	Future Condition 1 (without Element)					Future Condition 2 (with Element)				
	ROG	PM_{10}[4] ~~-~~	Ammonia	Methane	NOx	ROG	PM_{10}[4] ~~-~~	Ammonia	Methane	NOx
EXISTING CONDITIONS (1999)[1] ~~- Fugitive Dust from Cattle Movement at Unpaved Corral~~										
Fugitive Dust from Cattle Movement at Unpaved Corral										
Scenario 1	- -	14,335	- -	- -	- -	- -	14,335	- -	- -	- -
Scenario 2	- -	28,864	- -	- -	- -	- -	28,864	- -	- -	- -
Scenario 3	- -	2,133	- -	- -	- -	- -	2,133	- -	- -	- -
Scenario 4	- -	4,295	- -	- -	- -	- -	4,295	- -	- -	- -
Manure Decomposition[2]	14,406	- -	- -	125,896	- -	14,406	- -	- -	125,896	- -
Scenario 1	- -	- -	20,367	- -	- -	- -	- -	20,367	- -	- -
Scenario 2	- -	- -	82,767	- -	- -	- -	- -	82,767	- -	- -
Cattle Digestion	- -	- -	- -	197,057	- -	- -	- -	- -	197,057	- -
Vehicle Traffic Exhaust	unknown	unknown	- -	- -	unknown	unknown	unknown	- -	- -	unknown
Dairy Equipment Exhaust	unknown	unknown	- -	- -	unknown	unknown	unknown	- -	- -	unknown
1999 Total	**~~14,406~~**	**~~2,133 to 28,864~~**	**20,367 to**	**322,953**		**~~14,406~~**	**~~2,133 to 28,864~~**	**20,367 to**	**322,953**	
	14,558	**2,197 to 28,928**	**82,767**		**1,340**	**14,558**	**2,197 to 28,928**	**82,767**		**1,340**
2010 PROJECTIONS[2, 3] ~~- Fugitive Dust from Cattle Movement at Unpaved Corral~~										
Fugitive Dust from Cattle Movement at Unpaved Corral										
Scenario 1	- -	24,517	- -	- -	- -	- -	24,050	- -	- -	- -
Scenario 2	- -	49,368	- -	- -	- -	- -	48,162	- -	- -	- -
Scenario 3	- -	3,648	- -	- -	- -	- -	3,579	- -	- -	- -
Scenario 4	- -	7,346	- -	- -	- -	- -	7,167	- -	- -	- -
Manure Decomposition[2, 3]	24,639	- -	- -	215,324	- -	~~24,222~~	- -	- -	~~211,677~~	- -
						24,205			211,525	
Scenario 1	- -	- -	34,834	- -	- -	- -	- -	34,834	- -	- -
Scenario 2	- -	- -	141,560	- -	- -	- -	- -	141,560	- -	- -
Cattle Digestion	- -	- -	- -	337,035	- -	- -	- -	- -	337,035	- -
Vehicle Traffic Exhaust	46.27	6.56	- -	- -	361.34	46.27	6.56	- -	- -	361.34
Dairy Equipment Exhaust	154	98	- -	- -	1,800	154	98	- -	- -	1,800
2010 Total	**~~24,639~~**	**~~3,648 to 49,368~~**	**34,834 to**	**552,360**		**~~24,222~~**	**~~3,579 to 48,169~~**	**34,834 to**	**~~548,712~~**	
	24,839	**3,753 to 49,473**	**141,560**		**2,161**	**24,422**	**3,684 to 48,274**	**141,560**	**548,560**	**2,161**

TABLE 5-6 - *continued*

Activity	Future Condition 1 (without Element)					Future Condition 2 (with Element)				
	ROG	PM_{10}[4]	Ammonia	Methane	NOx	ROG	PM_{10}[4]	Ammonia	Methane	NOx
2020 PROJECTIONS[2] ~~- Fugitive Dust from Cattle Movement at Unpaved Corral~~										
Fugitive Dust from Cattle Movement at Unpaved Corral										
Scenario 1	- -	39,936	- -	- -	- -	- -	38,636	- -	- -	- -
Scenario 2	- -	80,415	- -	- -	- -	- -	77,384	- -	- -	- -
Scenario 3	- -	5,943	- -	- -	- -	- -	5,749	- -	- -	- -
Scenario 4	- -	11,966	- -	- -	- -	- -	10,628	- -	- -	- -
Manure Decomposition	40,135	- -	- -	350,741	- -	~~38,806~~ 38,636	- -	- -	~~339,131~~ 338,979	- -
Scenario 1	- -	- -	56,740	- -	- -	- -	- -	56,740	- -	- -
Scenario 2	- -	- -	230,586	- -	- -	- -	- -	230,586	- -	- -
Cattle Digestion	- -	- -	- -	548,995	- -	- -	- -	- -	548,995	- -
Vehicle Traffic Exhaust	31.16	8.94	- -	- -	298.53	31.16	8.94	- -	- -	298.53
Dairy Equipment Exhaust	252	160	- -	- -	2,932	252	160	- -	- -	2,932
2020 Total	**~~40,135~~ 40,418**	**~~5,943 to 80,415~~ 6,112 to 80,584**	**56,740 to 230,586**	**899,736**	**3,231**	**~~38,806~~ 39,089**	**~~5,749 to 77,384~~ 5,918 to 77,553**	**56,740 to 230,586**	**~~888,126~~ 887,974**	**3,231**

Notes: See Table 4.2-5a for notes on assumptions for emissions scenarios.

1 The 1999 projections reflect existing conditions and, therefore, do not consider implementation of the Element emission control measures.
2 Implementation of the Element emission control measures were applied only for applicable dairies located in Kings County.
3 Air emissions are based on the projected future dairy herds presented in Table 5-5.
4 Estimated PM_{10} emissions do not include the potential contribution of secondary $PM_{2.5}$, which could form by the reaction of ammonia with nitrogen oxides to form ammonium nitrate particles.

39,936 tons per year in 2020. The emissions would be reduced to 24,050 tons per year in 2010 and 38,636 tons per year in 2020 under Future Condition 2 (Scenario 1).

The Element contains provisions for the control of PM_{10} and ROG, which are discussed in Section 4.2 of this EIR. These measures would significantly reduce PM_{10} and ROG emissions. Under the provisions of the Element, the control of PM_{10} emissions from unpaved areas would be expected to be on the order of 50 percent. The effectiveness of the ROG control measures are not known as very few dairies within the San Joaquin Valley air basin are subject to such controls and direct measurement of the performance of the controls has not been made. ROG emissions would be minimized by controlled anaerobic and/or aerobic treatment of manure and process water (**Policy DE 5.1c**).

Although the reduction of ROG cannot be accurately estimated, **Policy DE 5.1c** of the Element sets a goal of 50 percent reduction in volatile solids. It is estimated that reduction in volatile solids (the food source for microbes generating ROG) would result in a similar reduction in ROG. With these controls, the future ROG emissions for Future Conditions 1 (without the Element) and 2 (with the Element) for years 2010 and 2020 are also presented in Table 5-6. Future Condition 1 assumes no controls on ROG emissions from dairies within the air basin. Under Future Condition 2, a 50 percent reduction in ROG emissions created by decomposition of manure generated by the dairy herd within Kings County that would be subject to advanced manure treatment. Under Future Condition 1, the expected ROG emissions would be 24,639 tons per year in 2010 and 40,135 tons per year in 2020. The emissions would be reduced to 24,222 tons per year in 2010 and 38,806 tons per year in 2020 under Future Condition 2.

However, the complete control of ROG and NOx emissions cannot be assured as immediate treatment of manure is not practically or technically feasible. Similarly, PM_{10} emissions can be controlled but not eliminated from farming and livestock management. Therefore, the emission of ~~ROG~~ ozone precursors and PM_{10} would be a cumulative significant unavoidable impacts.

Increase in Methane Emissions

Increases in greenhouse gases, including methane, to the atmosphere are an international environmental issue. Therefore, methane sources throughout the world (regardless of their location) contribute to the accumulation of methane in the atmosphere. Livestock and livestock manure are a major contributor to methane emissions.

Methane emissions would be generated during project operations and would contribute incrementally to the increase in greenhouse gases (refer to Impact ~~4.2-9~~ 4.2-8). Without control measures (Future Condition 1), the existing dairy herd in the San Joaquin Valley air basin is expected to generate approximately 197,057 tons per year from the cattle

themselves and 125,896 tons per year from manure decomposition (Table 5-6). The projected total emission (from cattle and manure decomposition) of methane is 552,360 tons per year in 2010 and 899,736 tons per year in 2020. Aerobic treatment and/or anaerobic treatment of manure required by the Element would significantly reduce the amount of methane emissions from manure decomposition within Kings County. Appropriate livestock management would reduce the methane emissions from the cows themselves.

Under the Element controls (Future Condition 2), it is assumed that a reduction of 50 percent of volatile solids in treated manure would result in an approximate 50 percent reduction in methane generated from decomposition of manure generated by new and expanded dairies implementing advanced manure treatment in Kings County. The effectiveness of control of methane emissions from the dairy cattle at Kings County dairies through cattle diet and health management cannot be accurately estimated. However, these controls would reduce emissions further. With controls imposed in Kings County, the cumulative emissions within the San Joaquin Valley air basin would be reduced to 548,712 tons per year in 2010 and 888,126 tons per year in 2020.

However, as described for ROG emissions, it is practically and technologically infeasible to eliminate all methane emissions. Proper herd management and implementation of biogas collection and/or treatment systems reduce, but do not eliminate, methane generation. Methane production is, therefore, considered a cumulative significant unavoidable impact.

Increase in Ammonia Emissions

Dairy development under the proposed project and existing and approved animal feed operations in the vicinity of the project site would generate ammonia emissions during operation activities. Without controls, the existing San Joaquin Valley air basin dairy herd could emit ammonia at a rate of approximately 20,367 tons per year. The estimated ammonia emission (Scenario 1) from the projected future San Joaquin Valley air basin herd would be 34,834 tons per year (in 2010 and 56,740 tons per year in 2020). Few of the existing or approved animal feed operations in the air basin are known to be designed to prevent ammonia emissions. The cumulative projects (i.e., continued dairy development within the San Joaquin Valley air basin) would further increase the amount of ammonia generated in the vicinity from confined animal facility operations. Dairy development projects under the proposed Element would be required to control ammonia emissions. However, an accurate estimate of the reduction of ammonia after implementation of the required controls cannot be made at this time because control efficiencies for ammonia have not been measured. In addition, ammonia could be emitted as soon as manure is generated (i.e., prior to treatment). Although emissions would be controlled in Kings County to the extent practical, the ammonia emissions would remain cumulatively significant and unavoidable.

Increase in Hydrogen Sulfide Emissions

Operation of existing and future dairies developed within the San Joaquin Valley air basin would result in continuing release of hydrogen sulfide emissions during manure decomposition under uncontrolled anaerobic decomposition. Currently (as described in Section 4.2 of this PEIR), an emission rate for hydrogen sulfide generated by dairy cattle manure decomposition is not available. However, the emission of hydrogen sulfide would be expected to be proportional to the amount of manure undergoing anaerobic decomposition. Under this assumption, the hydrogen sulfide emissions from the San Joaquin Valley air basin dairy herd would be expected to increase proportionally to the expected five percent per year increase in the San Joaquin Valley air basin dairy herd.

Under Future Condition 1 (No Element), the hydrogen sulfide emissions would not be controlled within the San Joaquin Valley air basin and would increase by five percent per year. Under Future Condition 2 (with implementation of the Element), hydrogen sulfide emissions would be controlled at new and expanded dairies in Kings County that would be required to implement advanced manure treatment. The hydrogen sulfide emissions would be reduced either by collection and incineration under controlled anaerobic digestion technologies or would not form under aerobic treatment technologies. The reduction in hydrogen sulfide cannot be accurately estimated but would be reduced under Future Condition 2.

As described for the emission of ROG, methane, and ammonia, hydrogen sulfide could be emitted as soon as manure is generated (i.e., prior to treatment). Therefore, increased hydrogen sulfide emissions would be expected and would remain cumulatively significant and unavoidable.

CUMULATIVE WATER QUALITY IMPACTS

The area covered by the Element is located within the Tulare Lake Basin, a hydrologic basin that covers approximately 10.5 million acres (RWQCB, 1995). The Regional Water Quality Control Board designates beneficial uses within the basin and sets water quality objectives to protect those uses. The Water Quality Control Plan for the Tulare Lake Basin ("Basin Plan") describes water quality concerns identified for the basin. Beneficial uses and water quality objectives are established for both surface and subsurface waters. Increased salinity in groundwater is identified as the most significant problem within the basin. Considered a natural condition in a closed basin in an arid environment, elevated salinity is exacerbated by human activities that result in discharges of dissolved solids to the surface and subsurface.

Irrigated agriculture and confined animal facilities, land uses proposed under the Element, are recognized in the Basin Plan as significant potential contributing sources for salt

loading within the basin. The Element specifically addresses the potential water quality impacts associated with implementation of the theoretical dairy herd. The theoretical herd size was determined on the basis of estimated capacity of croplands within the DDOZ and NSOZ to accommodate the nutrient loading associated with manure and process water generated by the herd. In addition, the theoretical herd estimate accounted for land required to accommodate the nutrient load from manure generated at existing non-dairy confined animal facilities and approved sewage sludge land application operations. Therefore, the basis of the Element accounts for cumulative impacts in Kings County.

For purposes of this EIR, it is not feasible to quantify all of the sources, the amount, and rate of dissolved solids discharges within the Tulare Lake Basin. However, the Basin Plan specifically addresses confined animal activities as a potential source of water quality degradation. Potential pollutants associated with discharge of animal manure that are recognized in the Basin Plan include bacteria, organic compounds, nitrate, and total dissolved solids. In recognition of the potential water quality degradation posed by confined animal facilities, the Basin Plan describes the regulations developed to specifically reduce the potential for pollutant releases. As described previously in this EIR, the water quality regulations for confined animal facilities are presented in Sections 2510 through 2601 in Title 23, Chapter 15 of the California Code of Regulations. Not only does the Element require all dairies to comply with these regulations, the Element sets more specific requirements for ensuring the protection of water quality (see Section 4.3 of this EIR). Therefore, the proposed project incorporates and exceeds minimum standards presented in the Basin Plan. The County, through the proposed Element, has determined that dairy projects that 1) comply with the Basin Plan and 2) comply with provisions in the Element allowing approval of an SPR, do not create a cumulatively significant environmental impact on water quality (**Objective DE 4.4**). Under CEQA Guidelines section 15064.7, a County may adopt such thresholds of significance.

The Element ensures that the State regulations will be met by all proposed and expanded dairies. In addition, the Element provides a mechanism to bring existing dairies into compliance with the requirements of the Element, including water quality protection requirements. The Element also requires groundwater quality monitoring that provides early detection of potential water quality degradation. Therefore, compliance with the Element, in combination with the Basin Plan, which will be adopted as a threshold of significance as part of this project, would reduce the cumulative impact on water quality to a less-than-significant level.

CUMULATIVE TRANSPORTATION IMPACTS

The impact of truck and other traffic generated by dairy development on roadways throughout Kings County was evaluated in Impact 4.9-1. Although individual dairy development projects could result in significant local impacts, the effect of implementation

of the Element would not significantly impact the overall County roadway system. The additional trips generated by dairies developed under the Element would be distributed on most of the principal and minor arterials within the County. All county roadways are designated truck routes and are constructed for truck traffic. In addition, nearly all roadways in the County are operating at level of service D or better. The analysis presented in Mitigation Measure 4.9-1 was included to minimize the potential local impacts related to individual projects.

A portion of the additional vehicle trips would be expected to generate additional traffic on roadways in adjacent counties. These "exported" trips would generally represent milk truck deliveries to milk processing facilities in Tulare, Merced, and Fresno counties. The distribution of the milk truck trips cannot be accurately estimated as the specific locations of dairies developed under the Element cannot be known. However, the relatively low volume of additional truck trips generated by the proposed project and the distribution of DDOZs throughout most of the County indicated that "exported trips"would not be expected to significantly impact LOS on adjacent rural County roads, State highways, or Interstate I-5. In addition, implementation of the Element would not be expected to increase future dairy development in Kings County above the recent historic growth rate of the dairy industry within Kings County. Furthermore, additional trip generation related to the proposed project would be similar to that expected for future dairy development if the Element were not implemented. Therefore, the cumulative impacts related to transportation are less-than-significant.

OTHER CUMULATIVE IMPACTS

No other potential cumulative impacts have been identified related to the remaining topics that were studied in this EIR.

SIGNIFICANT IRREVERSIBLE IMPACTS

Section 15126.2(c) of the CEQA Guidelines requires that EIRs provide a discussion of "*significant irreversible environmental changes which would be caused by the proposed project should it be implemented*." This section goes on to provide examples of such irreversible changes including use of non-renewable resources, land use actions that commit future generations to similar uses, and irreversible damage resulting from environmental accidents. Additionally, Section 15127 specifically requires irreversible changes to be considered in EIRs prepared for adoption, amendment, or enactment of a plan, policy, or ordinance of a public agency.

The development of dairies under the proposed Element would likely result in or contribute to the following irreversible environmental changes:

- The construction of the dairies and site grading would expend non-renewable fossil fuels for machinery operations and use building materials that most likely would not be reused following completion of dairy operations; and

- Operation of dairies would require use of non-renewable energy (e.g., fossil fuel) for the life of the dairies.

GROWTH-INDUCING IMPACTS

Section 15126.2(d) of the CEQA Guidelines requires that EIRs provide a discussion of the "growth inducing impacts of the proposed project." Growth inducing impacts could be caused by projects that foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Growth inducing impacts could also be caused by removing obstacles to population growth, such as an expansion of a wastewater treatment plant. Growth inducement could result from population increases that require the construction of new community services facilities that cause environmental impacts.

The development of dairies under the Element is unlikely to result in or contribute to population growth inducement. The additional population and housing associated with the dairy developments would be necessary only to serve dairy and dairy processing workers and would not be considered growth inducing. No obstacles to population growth would be removed as a result of the dairies constructed under Element guidelines, nor would there be construction of any new community service facilities that would cause environmental impacts. Specific impacts are identified and discussed in Section 4 of this EIR.

The Element would allow continued, orderly development of bovine dairies and associated growing of crops for feed and process water and manure management. Thus, the agricultural uses would be within areas zoned for such use. The Element does not propose any additional infrastructure projects to serve areas outside the County. There are therefore no direct growth-inducing activities associated with the Element.

However, dairy development could indirectly induce growth in other related industries (e.g., creameries). The Element could indirectly induce dairies to consider Kings County as a location for additional dairies. Thus, the Element may result in indirect growth inducement in Kings County. Such indirect growth would also be responsive to increases in market demand for dairy products.

6. ALTERNATIVES

SECTION 6
ALTERNATIVES

The 1998 amendments to the CEQA Guidelines indicate that:

> *An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which could feasiblely attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to the project. Rather it must consider a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation* (Section 15126.6(a)).

As required under the California Environmental Quality Act (CEQA), this section of the EIR discusses alternatives to the project. Several alternatives were preliminarily considered during scoping for the PEIR, including off-site, reduced herd, increased manure treatment, reduced individual dairy size, and no project alternatives. Evaluation of the feasibility of these alternatives and their potential to meet the major objectives of the **Proposed Project** resulted in the selection of four alternatives to be assessed in detail: **No Project**, two **Reduced County Herd Size**, and **Increased Manure Treatment** alternatives.

Eleven significant and unavoidable air quality impacts were identified for the proposed project, including cumulative impacts. In general, the amount of air emissions and volume of manure and process water generated at dairy facilities are proportional to the number of animals managed at the facilities. A reduction in the number of dairy cows and support stock would result in a corresponding reduction in manure and associated air emissions. Therefore, a **Reduced County Herd Size** alternative is an effective option for reducing significant impacts identified by the environmental analysis of the Element.

Two **Reduced County Herd Size** alternatives are discussed to demonstrate the proportional effect of herd reduction on impact severity. The alternatives would result in a reduction in the overall number of dairy cows and support stock within the County (the maximum theoretical herd) by 10 percent (Alternative 2) and 50 percent (Alternative 3). The selection of two reduced herd alternatives is based on the goal of evaluating a suitable range of alternatives that would reduce or eliminate significant impacts related to air emissions that were identified for the **Proposed Project**. The rate of air emissions generated by a dairy is generally proportional to the number of dairy cattle (i.e., overall herd size).

The fourth alternative, the **Increased Manure Treatment** alternative, was also developed as an approach to reducing air emissions. Under this alternative, all new and expanding dairies (including dairies expanding to a herd size of less than 735 milk cows) would be required to implement advanced manure treatment.

ALTERNATIVES CONSIDERED AND REJECTED DURING SCOPING OF PROJECT

ALTERNATIVE LOCATION

This EIR considered a location alternative to the project, but rejected it because alternative locations of Dairy Development Overlay Zones (DDOZs)within or outside Kings County would not eliminate identified significant impacts of the project or reduce them to less-than-significant levels, as discussed below. The CEQA Guidelines describe the process by which an alternative location should be chosen for an alternatives analysis. Section 15126.6(f)(2)(A) and (B) state that:

> *The key question and first step in analysis is whether any of the significant effects of the project would be avoided or substantially lessened by putting the project in another location. Only locations that would avoid or substantially lessen any of the significant effects of the project need be considered for inclusion in the EIR... If the lead agency concludes that no feasible locations exist, it must disclose the reasons for this conclusion, and should include the reasons in the EIR.*

The Kings County Revised Draft Dairy Element (Element) proposes to identify the most appropriate locations for dairy development within the County and establish controls that reduce the potential for adverse environmental effects associated with dairy construction and operation. The Element restricts dairy development in areas where dairy operation could present significant adverse effects on adjacent incompatible land uses (e.g., locations closer to urban uses, residential areas, and schools) or on the environment (e.g., locations within flood zones, in steep terrain, or within biologically sensitive areas). Locating dairies in locations outside the DDOZs designated in the Element would result in increased conflicts with incompatible land uses and increased environmental impacts. In effect, the Element has screened the appropriate alternative locations for dairy development within the County.

The County cannot exercise control on the siting of dairy development outside the County boundaries. Therefore, there are no appropriate and feasible alternatives for the location of dairy development under the Element evaluated in this EIR. In addition, none of the primary objectives of the project would be met by considering out-of-County

implementation of the Element. Conceptually, "relocating" the Element is infeasible and would be contrary to the purpose of the proposed project.

LIMIT ON INDIVIDUAL DAIRY HERD SIZES

The alternatives analysis for this PEIR considered the merits of including an alternative that set an upper limit on the allowable herd size at individual dairy sites. Under existing zoning, there is no limit on the size of dairy herds at individual dairy sites. In effect, the herd size is currently controlled by the provision that dairy operations conform with RWQCB permitting requirements. Those requirements are based on the capacity of available cropland within the dairy site to receive and assimilate manure and process water generated at the dairy facility (a function of the number of dairy cattle) as fertilizer and irrigation without resulting in the release of excess nutrients to the environment. Therefore, the herd size is limited by the amount of land controlled by a dairy applicant and crop management (i.e., types of crops and cropping patterns). The County does not and cannot control the amount of land owned or leased by a single entity nor can it control the crop management decisions made by landowners at individual farms.

Relative to the proposed project, a restriction on the size of individual dairies would not reduce environmental impacts associated with dairy construction and operation identified in this PEIR. It is recognized that a smaller dairy herd would generate less manure and process water and would result in decreased impacts related to management of those materials. The environmental impact analysis presented in this PEIR analyzes the effects of the maximum theoretical herd without assuming that a broad range of dairy sizes could be proposed for new and expanded dairies. However, under current conditions and those assumed for the Element, a dairy operator can optimize herd size by balancing nutrient generation and crop production within an individual dairy site on the basis of available land. Under the Element, an applicant for a new or expanded dairy would be required to control air emissions by implementing all feasible control measures. Assuming dairy herd size would be optimized under available land restrictions, the maximum theoretical herd would not be affected by setting a limit on the allowable herds at individual sites. A limit on herd sizes for individual dairies would likely only result in an increase in the number of dairies.

ALTERNATIVE 1: NO PROJECT ALTERNATIVE

The CEQA Guidelines have clarified that, under a "No Project" alternative, an EIR must examine both the existing conditions, as well as a "buildout" scenario (i.e., what would occur if the site were developed as allowed under applicable County plans). The amended CEQA Guidelines Section 15126.6(e)(2) states:

*The **No Project** analysis shall discuss the existing conditions at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental review is begun as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.*

Therefore, the analysis of the **No Project** alternative in this EIR describes existing dairy development in Kings County as well as expected continued dairy development under the current permitting processes.

Under the **No Project** alternative, the Element would not be adopted and, therefore, would not be implemented. The existing permitting process for new and expanded dairies would not be changed. Currently, Article 4 of the Kings County Zoning Ordinance allows dairy development as a conditional use within AG-20 and AG-40 districts. These districts encompass approximately 85 percent of the land within the County. Under the proposed Element, 70 percent of the County could have dairies and/or manure spreading areas. The districts include areas in which dairy development would be prohibited under the proposed Element, including the upland areas of the southwestern portion of the County and areas within 100-year flood hazard zones.

The Ordinance currently requires that individual dairy projects obtain a Conditional Use Permit (CUP) prior to construction and operation of new dairies and dairy expansions. Section 1903 of the Zoning Ordinance details the conditional use permit application process requirements and identifies specific findings that must be made by the Planning Commission in consideration of permit approval. These requirements are discussed in more detail in the comparison of land use impacts of the alternatives, below.

In 1999, there were 149 dairies in Kings County. The total dairy cow population in the County is 124,668 milk cows; the average herd size is 837 milking cows. Future development of new and expanded dairies within the County is expected as the trend of relocation of southern California dairies to the Central Valley continues. Since 1988, an average of four new dairies has been approved by the County on an annual basis. During that period, the yearly average increase in the number of dairy cows has been 4,573 milking cows per year. Although this rate could increase the County's dairy herd due to relocation of southern California dairies, the rate would be controlled to a degree by the capacity of the KCPA to process permit applications, including review of the applications under CEQA. The rate of dairy development is controlled primarily by market demand. The demand is affected by many complex factors, including milk pricing, consumer population, and competition. Due to the variability of these factors over time, speculation regarding changes in the market demand for dairy products is considered outside the scope of this EIR. However, as described in Section 5, the environmental analysis presented in this PEIR

assumes that the average annual growth rate of the dairy herd in Kings County will be maintained at approximately five percent, the average rate of growth during 1988 through 1999.

Existing conditions and historic agricultural uses throughout the AG-20 and AG-40 districts of Kings County (including the DDOZs designated in the Element) indicate that most of these lands would remain in row and field crop production. The crops currently grown in the County would not typically support development of permanent, large agricultural processing facilities. An exception could be the future development of dairy product processing facilities (e.g., cheese factories). Development of large agricultural processing facilities would require a CUP from the County. However, operation of portable equipment used for processing and packaging certain crops would be expected to continue.

Regardless of the future growth rate of the dairy industry (and thus the dairy cattle population), this alternatives analysis assumes that the ultimate dairy herd size in Kings County would be controlled by the existing RWQCB guidelines on manure nutrient loading rates for the protection of water resources. Under this assumption, the potential dairy herd size developed under the **No Project** alternative would be similar to the theoretical herd considered under the Element. The analysis also assumes that the average annual dairy herd growth rate under all alternatives would be five percent.

ALTERNATIVE 2: TEN PERCENT REDUCED COUNTY HERD SIZE

Although reducing the size of the herd by 10 or 50 percent under Alternatives 2 or 3 would reduce emissions, individual dairy projects under each alternative would continue to exceed identified thresholds of significance for particulate matter (PM_{10}) and reactive organic gases (ROG).

Under the **Ten Percent Reduced County Herd** alternative, the maximum theoretical bovine herd within the County would be reduced from 870,181 to 783,163 animal units (AU). Considering that the existing (1999) County herd consists of an estimated 329,383 AU (milk cows and support stock), the County herd could be expanded by 453,780 AU (Table 6-1). Implementation of the Element would control dairy siting, design, and operation and would remain essentially the same as for the **Proposed Project**, except that the overall County herd size would be reduced by ten percent. Furthermore, the acreage devoted to the dairy facilities may be reduced somewhat, and the excess acreage would be added to the area of crop lands available.

Table 6-1. Dairy Herd Development under Existing Conditions, the Proposed Project and Project Alternatives

	1999		Proposed Project		No Project		10% Reduced Herd		50% Reduced Herd		Increased Manure Management	
Herd Distribution	**Head**	**AU**	**Head**	**AU**	**Head**	**AU**	**Head**	**AU**	**Head**	**AU**	**Head**	**AU**
Milk cows	124,668	*174,535*	381,980	*534,772*	381,980	*534,772*	343,782	*481,295*	190,990	*267,386*	381,980	*534,772*
Dry cows and bred heifers	18,700	*20,944*	57,297	*64,173*	57,297	*64,173*	51,567	*57,755*	28,649	*32,086*	57,297	*64,173*
Heifers (2 years and older)	39,894	*40,771*	122,234	*124,923*	122,234	*124,923*	110,010	*112,430*	61,117	*62,461*	122,234	*124,923*
Heifers (1 to 2 years)	19,947	*20,386*	61,117	*62,461*	61,117	*62,461*	55,005	*56,215*	30,558	*31,231*	61,117	*62,461*
Calves (3 months to 1 year)	49,867	*69,814*	152,792	*74,868*	152,792	*74,868*	137,513	*67,381*	76,396	*37,434*	152,792	*74,868*
Baby calves (<3 months)	9,973	*2,932*	30,558	*8,984*	30,558	*8,984*	27,503	*8,086*	15,279	*4,492*	30,558	*8,984*
Total	**263,049**	***329,383***	**805,978**	***870,181***	**805,978**	***870,181***	**725,380**	***783,163***	**402,989**	***435,090***	**805,978**	***870,181***
Available Expansion	n/a	n/a	542,928	540,798	542,928	540,798	462,331	453,780	462,331	105,708	542,928	540,798

The amount of manure, associated nutrients, and acreage needed for production of crops to take up nutrients would be reduced by ten percent. The area of land no longer needed for manure and process water reuse would be available for other uses allowed by the Zoning Ordinance. Milk production and truck trips would be reduced proportionally. It is assumed that the number of dairy employees, and the associated number of daily vehicle trips generated, would also be reduced by ten percent.

Assumptions regarding the operational characteristics of the dairies under Alternative 2 would remain the same as for the **Proposed Project**. Flushing of the freestall barns and scraping of corrals would generate manure and process water. The process water generated by the dairies would be reused as irrigation for the growing of silage and other crops within the DDOZs and NSOZs designated in the Element. The dry manure that is generated by the dairies developed under Alternative 2 would also be applied as fertilizer within these zones. The amount of process water and manure generated at dairies under this alternative would be generally proportional to the herd size. Therefore, the size (volume) of the process water storage ponds would be reduced by ten percent under Alternative 2. The design and operation of the ponds would be subject to the requirements of the Element.

ALTERNATIVE 3: FIFTY PERCENT REDUCED COUNTY HERD SIZE

Under the **Fifty Percent Reduced County Herd Size** alternative, the size of the maximum theoretical bovine herd in Kings County would be reduced by one-half (50 percent) relative to the proposed project. The County herd would be reduced from 870,181 to 435,090 AU. The potential expansion of the County herd above existing (1999) conditions would be 105,708 AU (Table 6-1). As with the **Proposed Project** and Alternative 2, the location, design, and operation of dairy facilities under Alternative 3 would be controlled by the provisions of the Element. The acreage required for future dairy development would be reduced to serve only one-half as large a herd, and land required for process water application as irrigation water and fertilizer to silage crops would be also be reduced by approximately 50 percent. The volume of traffic generated by dairy development would be reduced proportionally.

ALTERNATIVE 4: INCREASED MANURE TREATMENT

Under the **Proposed Project**, **Policy DE 5.1c** requires that new and expanded dairies implement advanced manure treatment to control emissions of air pollutants. However, **Policy DE 5.1c** includes an exemption from the requirement for advanced manure

treatment for existing dairy expansions that would not require construction of new dairy facilities and would not expand the existing herd to a level (approximately ~~735~~ 705 milk cows and associated support stock) that would result in ROG emissions above SJVUAPCD threshold limits for stationary sources. Under the **Increased Manure Treatment** alternative, all expanding dairies would be required to implement advanced manure treatment for manure generated by the herd expansion. In effect, all existing dairies expanding to a herd size of ~~735~~ 705 milk cows or greater would be required to implement either controlled anaerobic, aerobic, or combined anaerobic/aerobic treatment systems to reduce air emissions related to manure decomposition. The maximum theoretical County bovine herd would be equivalent to that proposed by the Element (870,181 AU). The DDOZs and NSOZs proposed by the Element would not change.

COMPARATIVE ANALYSIS OF ALTERNATIVES

This section compares the potential impacts of the **No Project**, the two **Reduced County Herd Size**, and the **Increased Manure Treatment** alternatives with the **Proposed Project**. The comparative analysis of the alternatives follows the same sequence of topical issues addressed in Section 4 of this PEIR.

GEOLOGY, SOILS, AND SEISMICITY

No change to the existing permit approval process would occur under the **No Project** alternative. Current standards for the geotechnical aspects of construction of new and expanded dairies would apply to new dairy development. Minimum current standards do not require the completion of site-specific geotechnical reports for dairy development. However, at its discretion, the Planning Agency can require above- and below-grade construction of manure separation pits and process water ponds. Therefore, the potential for erosion or failure of the slopes surrounding the pits and ponds could occur if unstable slopes were created. The potential for slope failure and erosion could be increased relative to the **Proposed Project**. Less-than-significant impacts related to seismic damage or injuries associated with dairy development would be similar under the **No Project** alternative as building code requirements would be enforced.

The potential impacts related to geotechnical conditions under either of the **Reduced County Herd Size** and **Increased Manure Treatment** alternatives would be similar to those described for the proposed project because each of the dairy facilities could be located anywhere within the DDOZs and would be subject to all of the provisions of the Element. Each facility would be required to implement the recommendations of the site-specific geotechnical report required by **Policy DE 2.1f** of the Element, reducing the potential for adverse soil conditions and slope instability.

*The potential impacts related to seismic shaking, slope stability, and erosion would be similar for the **Proposed Project**, **Reduced County Herd Size**, and **Increased Manure Treatment** alternatives. These impacts could remain higher under the **No Project** alternative because site-specific geotechnical standards would not necessarily be required.*

AIR QUALITY

The **No Project** alternative would not result in significant changes to existing air emissions. Agricultural tillage would be expected to continue, resulting in PM_{10} emissions and exhaust from farm equipment. The intensity of dairy development is assumed to be similar under the proposed project and the **No Project** alternative. Although dairy operations and associated crop production are not currently required to obtain permits from the SJVUAPCD, the district has developed draft revisions to Regulation VIII that would control PM_{10} at agricultural operations, including dairies. Implementation of the draft requirements would result in PM_{10} emissions that would be similar to those expected under the **Proposed Project**.

The emission of methane, ROG, ammonia, hydrogen sulfide, and odors would occur from dairies developed under the **No Project** alternative. Currently, neither the County nor the SJVUAPCD has specific requirements for the control of these emissions from dairies. It is possible that control of these emissions could be required as a condition of approval for future dairies under the County's current permitting process. However, to date, no specific controls on these air emissions have been made a requirement for new or expanded dairies. Therefore, the emission of methane, ROG, ammonia, hydrogen sulfide, and odors would be expected to be greater under the **No Project** alternative relative to the **Proposed Project**. The minimum air emissions for the **Proposed Project** and each alternative are presented in Table 6-2. The emissions calculations are included in Appendix D.

Under the **Reduced County Herd Size** alternatives, the Element would be implemented, including the policies for emissions control under **Objective DE 5.1**. The overall air quality impacts related to the **Reduced County Herd Size** alternatives (Table 6-2) would be less than those identified for the **Proposed Project**, since the number of dairy animals would be reduced and air emissions from dairy operations are generally proportional to the number of animals managed. Under Alternatives 2 and 3, the maximum theoretical herd would be reduced by 10 and 50 percent, respectively, relative to the **Proposed Project** and the **No Project** alternatives (Table 6-2). The maximum theoretical herd includes the existing dairy herd and additional cattle resulting from new and expanded dairy applications subject to the provisions of the Element. The reduction in herd size would result in limiting the number of cattle added to the existing herd. Air emissions from the existing herd would not change while emission of PM_{10}, ~~ROG~~ ozone precursors, methane,

TABLE 6-2: **Summary of Air Pollutant Emissions from Agricultural and Dairy Operation Alternatives**

	Emissions (tons/year)								
		PM_{10}[1]				Ammonia[2]			
Activity	**ROG**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 1**	**Scenario 2**	**Methane**	**NOx**
No Project									
Fugitive Dust									
Land Preparation	--	1,191	1,191	1,191	1,191	--	--	--	--
Windblown Dust	--	1,514	1,514	1,514	1,514	--	--	--	--
Cattle Movement at Unpaved Corral	--	5,165	10,400	769	1,548	--	--	--	--
Manure Decomposition	5,191	--	--	--	--	7,338	29,821	45,360	--
Cattle	--	--	--	--	--	--	--	71,000	--
ALTERNATIVE TOTAL	**5,191**	**7,870**	**13,105**	**3,474**	**4,253**	**7,338**	**29,821**	**116,360**	**--**
Proposed Project									
Fugitive Dust									
Land Preparation	--	1,191	1,191	1,191	1,191	--	--	--	--
Windblown Dust	--	1,514	1,514	1,514	1,514	--	--	--	--
Cattle Movement at Unpaved Corral	--	3,808	6,897	567	1,026	--	--	--	--
Manure Decomposition	3,627	--	--	--	--	7,338	29,821	31,693	--
Cattle	--	--	--	--	--	--	--	71,000	--
Vehicle Traffic Exhaust	4.01	1.15	1.15	1.15	1.15	--	--	--	38.39
Equipment Exhaust	22	14	14	14	14	--	--	--	258
ALTERNATIVE TOTAL	~~**3,627**~~ **3,653**	~~**6,513**~~ **6,528**	~~**9,602**~~ **9,617**	~~**3,271**~~ **3,286**	~~**3,731**~~ **3,746**	**7,338**	**29,821**	**102,693**	**296**
10 Percent County Herd Reduction									
Fugitive Dust									
Land Preparation	--	1,228	1,228	1,228	1,228	--	--	--	--
Windblown Dust	--	1,561	1,561	1,561	1,561	--	--	--	--
Cattle Movement at Unpaved Corral	--	3,373	6,377	502	949	--	--	--	--
Manure Decomposition	~~3,367~~ 3,350	--	--	--	--	6,604	26,839	~~29,425~~ 29,273	--
Cattle	--	--	--	--	--	--		63,900	--
Vehicle Traffic Exhaust	3.64	1.04	1.04	1.04	1.04	--	--	--	34.85
Equipment Exhaust	22	14	14	14	14	--	--	--	258
ALTERNATIVE TOTAL	~~**3,367**~~ **3,376**	~~**6,161**~~ **6,176**	~~**9,165**~~ **9,179**	~~**3,290**~~ **3,304**	~~**3,737**~~ **3,751**	**6,604**	**26,839**	~~**93,325**~~ **93,173**	**293**

TABLE 6-2 - ***continued***

Activity	Emissions (tons/year)								
		PM_{10}[1]				Ammonia[2]			
	ROG	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 1	Scenario 2	Methane	NOx
50 Percent County Herd Reduction									
Fugitive Dust									
Land Preparation	--	1,375	1,375	1,375	1,375	--	--	--	--
Windblown Dust	--	1,748	1,748	1,748	1,748	--	--	--	--
Cattle Movement at Unpaved Corral	--	2,156	4,297	327	639	--	--	--	--
Manure Decomposition	~~2,329~~ 2,312	--	--	--	--	3,669	14,911	~~20,353~~ 20,201	--
Cattle	--	--	--	--	--	--	--	35,500	--
Vehicle Traffic Exhaust	2	0.57	0.57	0.57	0.57	--	--	--	19.19
Equipment Exhaust	22	14	14	14	14	--	--	--	258
ALTERNATIVE TOTAL	**~~2,329~~ 2,336**	**~~5,320~~ 5,335**	**~~7,420~~ 7,434**	**~~3,450~~ 3,464**	**~~3,763~~ 3,777**	**3,669**	**14,911**	**~~55,853~~ 55,701**	**277**
Increased Manure Treatment									
Fugitive Dust									
Land Preparation	--	1,191	1,191	1,191	1,191	--	--	--	--
Windblown Dust	--	1,514	1,514	1,514	1,514	--	--	--	--
Cattle Movement at Unpaved Corral		3,808	6,897	567	1,026	--	--	--	--
Manure Decomposition	3,442	--	--	--	--	7,338	29,821	30,082	--
Cattle	--	--	--	--	--	--	--	71,000	--
Vehicle Traffic Exhaust	4.01	1.15	1.15	1.15	1.15	--	--	--	38.39
Equipment Exhaust	22	14	14	14	14	--	--	--	258
ALTERNATIVE TOTAL	**~~3,442~~ 3,468**	**~~6,513~~ 6,528**	**~~9,602~~ 9,617**	**~~3,271~~ 3,286**	**~~3,731~~ 3,746**	**7,338**	**29,821**	**101,083**	**296**

1 PM_{10} scenarios are described in Section 4.1 .
2 Ammonia scenarios are described in Section 4.1.

ammonia, and hydrogen sulfide from manure decomposition, PM_{10} from cattle movement in unpaved corrals, and methane from cattle added to the existing herd would be reduced with herd size reduction. Under the **Reduced County Herd Size** alternatives, the emission of PM_{10} from land preparation would increase as dairy facilities would occupy less land than is currently assumed to be in crop production.

Under Alternative 4, all new and expanding dairies would be required to implement advanced manure treatment to reduce air emissions. Relative to the **Proposed Project**, emissions of ROG, methane, ammonia, and hydrogen sulfide caused by decomposition of manure would be reduced as all expanding dairies would be required to implement controlled anaerobic, aerobic, or combined anaerobic/aerobic treatment technologies. However, the reduction of manure decomposition emissions (Table 6-2) under the **Increased Manure Treatment** alternative would be relatively small compared to the **Proposed Project**. The reason for the small reduction is that the exemption for implementation of advanced manure treatment under **Policy DE 5.1c** of the proposed Element would probably only apply to a small number of existing dairies. However, the emissions from Alternative 4 would be significantly lower than those estimated for the **No Project** alternative. Compared to Alternative 4, the **Reduced County Herd Size** alternatives would result in a reduction in manure decomposition emissions that would be comparable to the reductions relative to the **Proposed Project**.

The PM_{10} emissions resulting from Alternative 4 would be comparable to the PM_{10} caused by the **Proposed Project** and the **No Project** alternative. The emissions would be similar because, under each case, the PM_{10} emissions would be controlled by similar measures, implementation of the draft SJVUAPCD Rule VIII guidelines for dust control. PM_{10} emissions from the **Ten** and **Fifty Percent Reduced County Herd Size** alternatives would be reduced proportionally to the herd reductions relative to the **Proposed Project** and the **Increased Manure Treatment** alternatives.

However, the air quality emissions generated by dairy facilities developed under either of the **Reduced County Herd Size** or the **Increased Manure Treatment** alternatives would continue to result in adverse unavoidable impacts as emissions would not be reduced to levels below significant thresholds set by SJVUAPCD for PM_{10} and ROG. In addition, substantial emissions of methane, ammonia, and hydrogen sulfide would be released from the dairies evaluated under the **Reduced County Herd Size** alternatives. As with the **Proposed Project**, dairy facilities under Alternatives 2 and 3 would be augmented with appropriate air emissions control technologies to substantially reduce but not eliminate ~~reactive organic gas~~ ozone precursor (ROG and NOx), ammonia, methane, and hydrogen sulfide emissions.

*The air quality impacts of the **No Project** alternative are likely to be significantly greater than those of the **Proposed Project** and all of the alternatives. The overall air quality impacts of Alternative 2, **Ten Percent Reduced County Herd Size**, would be less than for the **Proposed Project** and the **Increased Manure Treatment** alternative, and the air emissions from Alternative 3, **Fifty Percent Reduced County Herd Size,** would be less than those for Alternative 2. These reductions in emissions would not eliminate adverse and unavoidable impacts.*

WATER RESOURCES

The **No Project** alternative would not reduce potential adverse impacts on water quality relative to the **Proposed Project** or any of the alternatives. Under the **No Project** alternative, current minimum requirements for confined animal facilities set by State regulations (CCR Title 27, Division 2, Subdivision 1, 22562) would be implemented for the protection of surface and subsurface water quality. Implementation of the minimum requirements could result in construction and operation of process water ponds with higher seepage velocities than those specified by **Policy DE 4.1a.B** of the Element, which would be applied to all of the alternatives. Therefore, the infiltration of nutrients into the subsurface could be increased relative to the **Proposed Project** and the alternatives. Compared to the **Proposed Project**, water demand under the **No Project** alternative would be similar to the water demand of the **Proposed Project**, depending on the intensity of dairy development, the types of crops grown in DDOZs and NSOZs, and climate conditions. The impacts on water resources under the **Increased Manure Treatment** alternative would be similar to those described for the **Proposed Project** and, therefore, less than those posed by the **No Project** alternative.

The impacts of the **Reduced County Herd Size** alternatives on water resources would be less than those described for the **Proposed Project** and the **Increased Manure Treatment** alternative as the requirements of the Element for protection of water quality would be implemented, but less dairy development would occur in the County. The level of the impacts would be less than those of the proposed project, since the amount of manure and process water (and associated nutrients) generated and used to irrigate the crop lands would be reduced. The reduction would be proportional to the reduction of the herd size. Under the **Reduced County Herd Size** alternatives, less crop land would be required for reuse of nutrients in manure and process water. Some form of fertilizer would continue to be applied on lands that would, under the **Proposed Project**, be used for reuse of manure and process water. If commercial fertilizers were used, a reduction in the amount of salt applied to crop land would be reduced relative to the **Proposed Project**.

Under the **Reduced County Herd Size** alternatives, the water demand for dairy operations relative to the **Proposed Project** and the **Increased Manure Treatment** alternative would be reduced proportionally to the percentage of herd reduction. It is likely that the amount

of double cropping of silage crops would be reduced under these alternatives compared to the **Proposed Project** and Alternative 4, resulting in lower water demand. Relative to the **No Project** alternative, the water use under the **Reduced County Herd Size** alternatives would also probably be reduced, particularly in the case of the **Fifty Percent Reduced County Herd Size** alternative. The water use impacts would be similar under the **Proposed Project** and the **Increased Manure Treatment** alternative.

> *The water quality impacts of the **No Project** alternative would be greater than those of the **Proposed Project** and the **Increased Manure Treatment** alternative. The water quality impacts of the **Reduced County Herd Size** alternatives would be expected to be less than those under the **Proposed Project** and the **No Project** and **Increased Manure Treatment** alternatives as less dairy development would be expected. Water use would be reduced under the **Reduced County Herd Size** alternatives relative to the **Proposed Project** and the **No Project** and **Increased Manure Treatment** alternatives.*

BIOLOGICAL RESOURCES

Impacts on existing biological conditions could occur under the **No Project** alternative, as dairy development proceeds under existing permitting practices. The specific restriction on dairy development in areas of sensitive biological habitat (**Policy DE 1.2e**) and the requirement for biological surveys **(Policy DE 3.3a**) contained within the Element are not specified under the existing permitting process. Although not specified, dairy development within sensitive habitat could be controlled under the CUP permit review and associated environmental review. The potential for "incidental take" of protected species caused by increased equipment operation and vehicular traffic would be similar to that described for the **Proposed Project** and **Increased Manure Treatment** alternative if a similar level of dairy development were to occur under the **Proposed Project** and the **No Project** alternative.

The potential impact on biological resources with implementation of the **Reduced County Herd Size** alternatives would be reduced relative to the **Proposed Project** and the **Increased Manure Treatment** alternative. The restrictions and requirements for the protection of biological resources contained in the Element would be implemented under both **Reduced County Herd Size** alternatives. However, reduced dairy development would result in less land converted to dairy facilities and the potential for disturbing habitat would be reduced. The potential for "incidental take" of protected species caused by increased equipment operation and vehicular traffic would be reduced under the **Reduced County Herd Size** alternatives relative to the **Proposed Project** and the **Increased Manure Treatment** alternative as less dairy development would be allowed.

*The biological impacts of the **No Project** alternative would be similar or increased relative to the **Proposed Project** and all other alternatives, depending on the effectiveness of the current permitting process in protecting resources. The impacts on biological resources would be reduced under the two **Reduced County Herd Size** alternatives with less dairy development occurring relative to the **Proposed Project** and the **No Project** and **Increased Manure Treatment** alternatives.*

NOISE

Under the **No Project** alternative, the potential for noise impacts related to dairy development would not change. All dairy operations would need to comply with the noise standards of the General Plan. Therefore, the noise impacts under this alternative would be similar to those resulting from the **Proposed Project**, the **Reduced County Herd Size** and **Increased Manure Treatment** alternatives, as the Element relies on conformance with these same standards. However, dairy construction and operational noise would be reduced under the **Reduced County Herd Size** alternatives as less dairy development would occur relative to the **Proposed Project**, **No Project**, and **Increased Manure Treatment** alternatives. Agricultural crop production activities would be expected to be greater under the **Reduced County Herd Size** alternatives. These activities would be expected to generate less noise than dairy construction and operation. In addition, noise related to vehicular traffic generated by dairies under the **Reduced County Herd Size** alternatives would be reduced relative to the **Proposed Project**, **No Project**, and **Increased Manure Treatment** alternatives.

*The noise impacts of the **Reduced County Herd Size** alternatives would be less than those of the **No Project**, **Increased Manure Treatment** alternative, and **Proposed Project**.*

LIGHTING AND GLARE/VISUAL RESOURCES

Lighting and aesthetic impacts related to dairy development would be similar under the **No Project** and **Increased Manure Treatment** alternatives and the **Proposed Project**. The intensity of dairy development would be similar and localized impacts near dairy facilities would occur. The same local effects would be expected under the **Reduced County Herd Size** alternatives, but the intensity of dairy development would be reduced with smaller herds relative to the **Proposed Project**, **Increased Manure Treatment**, and **No Project** alternatives.

*The lighting and visual impacts of the **Reduced County Herd Size** alternatives would be less than those of the **Proposed Project** and the **No Project** and **Increased Manure Treatment** alternatives.*

LAND USE AND POLICIES

Under the **No Project** alternative, no change in dairy permitting process would occur. Dairy development could continue to occur but would be controlled by existing permitting requirements and required environmental review of dairy applications. The potential for conflicts with incompatible land uses could be greater relative to the **Proposed Project** and all other alternatives as less specific controls on setback of dairy facilities from other uses are currently in effect compared to those presented in the Element. However, potential land use conflicts are required to be considered during review of dairy development applications. Considering that the Element would be implemented under the **Reduced County Herd Size** and **Increased Manure Treatment** alternatives, the potential land use impacts under these alternatives would be similar to those under the **Proposed Project**. The **Proposed Project**, **Reduced County Herd Size**, and **Increased Manure Treatment** alternatives would be consistent with all applicable policies of the amended Kings County General Plan and the Zoning Ordinance following the approval of SPRs for individual dairy projects.

> *The land use and policy impacts of the **Reduced County Herd Size** alternatives would be less than for any of the other alternatives.*

HUMAN HEALTH AND SAFETY

The **No Project** alternative would present similar potential for human health impacts compared to the proposed project. Control of hazardous materials specifically used for dairy operations and the potential for release of pathogens would be evaluated on a site-specific basis during dairy application review. Pesticides and fertilizers typically used in agricultural crop production would continue to be used.

The **Proposed Project**, **Reduced County Herd Size**, and **Increased Manure Treatment** alternatives have similar impacts related to increased vector activity and pathogens and would require similar use of hazardous materials. Under the **Proposed Project** and these alternatives, dairy development projects would be required to implement an ~~integrated~~ pest and vector management ~~plan~~ program (~~IPM~~ PVMP). Additionally, dairy projects developed under the provisions of the Element would be required to implement specific measures to minimize infiltration or runoff of water that could potentially contain pathogens. Under the **No Project** alternative, dairies are not required to have ~~IPMs~~ PVMPs or specific water quality controls. Therefore the potential for impacts related to insect and rodent pests and pathogens would be increased. However, less dairy development would occur under the **Reduced County Herd Size** alternatives. All alternatives would have similar potential exposure of workers to residual agricultural chemicals in the soil. Under the **Reduced County Herd Size** alternatives, less manure and process water would be

available for reuse as fertilizer, increasing the reliance on commercial fertilizer relative to the **Proposed Project** and **Increased Manure Treatment** alternative.

> *The potential human health and safety impacts of the **Reduced County Herd Size** alternatives would be less than those of the **No Project** and **Increased Manure Treatment** alternatives and the **Proposed Project**.*

TRANSPORTATION

Under the **No Project** alternative, traffic levels could be expected to increase with continued dairy development and would ultimately be similar to the increase associated with the **Proposed Project** and the **Increased Manure Treatment** alternative. Traffic levels would probably continue to be within acceptable levels and no intersections would require improvements.

Traffic generated by the **Reduced County Herd Size** alternatives would be 10 to 50 percent less than for the **Proposed Project** and the **No Project** and **Increased Manure Treatment** alternatives. Under the **Proposed Project**, **Reduced County Herd Size**, and **Increased Manure Treatment** alternatives, traffic levels would continue to be within acceptable levels and no nearby intersections would require improvements. Under cumulative conditions, the background traffic volumes along Kansas Avenue and area highways would continue to increase (approximately three percent per year) as the Corcoran and Hanford urban areas grow, and eventually improvements would be required at several intersections in the project area.

> *The transportation impacts of the **No Project** alternative would be similar to those of the **Proposed Project** and **Increased Manure Treatment** alternative. Traffic level impacts would decrease proportionally to the **Reduced County Herd Size** and **Increased Manure Treatment** alternatives and would be less than the impacts of the **Proposed Project** and **Increased Manure Treatment** alternative.*

PUBLIC SERVICES AND UTILITIES

Operation of the dairy facilities expected under the alternatives and the proposed project would create a slight increase in demand for certain public services, such as police and fire protection, solid waste, schools, and park facilities, since more employees and new families would be located on new and expanded dairy facilities. The increased demand for public services would be similar for the proposed project and the **No Project** and **Increased Manure Treatment** alternatives. The demand under the **Reduced County Herd Size** alternatives would be reduced proportionally to the herd size reduction relative to the **Proposed Project**, **No Project**, and **Increased Manure Treatment** alternatives. Therefore,

the **Fifty Percent Reduced County Herd Size** alternative would result in the lowest increase in demand for public services.

> *The public service impacts of the **Reduced County Herd Size** alternatives would be less than those of the **Proposed Project**, **No Project**, and **Increased Manure Treatment** alternatives.*

CULTURAL RESOURCES

The intensity of dairy development controls the potential for impacts on cultural resources. Excavation during construction of dairy facilities could result in the disturbance or destruction of historical or archaeological resources. Under the **No Project** and **Increased Manure Treatment** alternatives and the **Proposed Project**, the intensity of dairy development would be similar. The **Reduced County Herd Size** alternatives would be expected to result in the construction of fewer dairies. Therefore, the **Fifty Percent Reduced County Herd Size** alternative would present the least potential for cultural resource disturbance. Under the **Reduced County Herd Size** and **Increased Manure Treatment** alternatives and **Proposed Project**, the requirements for investigation of cultural resources provided by **Policies DE 3.1c, d,** and **e** of the Element would be implemented. Such requirements could be also be imposed during permit application review under the No Project alternative.

> *The potential for impacts to cultural resources of the **Reduced County Herd Size** alternatives would be less than those of the other alternatives or the **Proposed Project**.*

ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The CEQA Guidelines require that the "environmentally superior" alternative (including consideration of the proposed project) be identified in an EIR. If the no project alternative is found to be the least environmentally damaging alternative, which it often is, then a second superior alternative shall be identified. The environmental impacts of the **No Project** alternative would be similar to or greater than those of the **Proposed Project** and the **Reduced County Herd Size** and **Increased Manure Treatment** alternatives. Additionally, the **No Project** alternative would not meet the major objectives of the proposed project.

Based on the comparative analysis above, the **Fifty Percent Reduced County Herd Size** alternative would be environmentally superior. This alternative is superior because it would result in a smaller increase in potential impacts (especially air quality) compared to the **Proposed Project**, albeit not eliminate the impacts or reduce all of them to less than significant. In general, the reduction in most impacts (including air emissions) would be proportional to the reduction in maximum theoretical herd size. Therefore, the **Fifty**

Percent Reduced County Herd Size alternative would reduce impacts to levels below those expected for the **Proposed Project** and all other alternatives.