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May 14, 2014

Tom Lippe
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Subject: Review of IS/MND
Kongsgaard Wine LLC – Atlas Peak Vineyard Conversion
Agricultural Erosion Control Plan #P14-00069

Dear Tom:

I am a hydrologist with over twenty five years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology. I have been providing professional hydrology services in California since 1991 and routinely manage projects in the areas of surface- and groundwater hydrology, water supply, water quality assessments, water resources management, and geomorphology. Most of my work is located in the Coast Range watersheds of California, including the Northern and Southern San Francisco Bay Counties. My areas of expertise include: characterizing and modeling watershed-scale hydrologic and geomorphic processes; evaluating surface- and ground-water resources/quality and their interaction; assessing hydrologic, geomorphic, and water quality responses to land-use changes in watersheds and causes of stream channel instability; and designing and implementing field investigations characterizing surface and subsurface hydrologic and water quality conditions. I co-own and operate the hydrology and engineering consulting firm Kamman Hydrology & Engineering, Inc. in San Rafael, California (established in 1997). I earned a Master of Science in Geology, specializing in Sedimentology and Hydrogeology as well as an A.B. in Geology from Miami University, Oxford, Ohio. I am a California Certified Hydrogeologist (CHg) and a registered Professional Geologist (PG).

I have reviewed the Initial Study/Proposed Mitigated Negative Declaration (IS/MND) dated March 11, 2015 and all associated appendices/exhibits for the Kongsgaard Wine LLC – Atlas Peak Vineyard Conversion (Agricultural Erosion Control Plan #P14-00069). In addition to the IS/MND, I have reviewed the following documents and rely on technical information contained in these documents to help formulate my opinions.

- Farrar, C.D. and Metzger, L.F., 2003, Ground-water resources in the Lower Milliken-Sarco-Tulucay Creeks area, Southeastern Napa County, California, 2000-2002. U.S. Geological Survey Water-Resources Investigations Report 03-4229, prepared in cooperation with the Napa County Department of Public Works, 106p.
- Faye, R.E., 1973, Ground-water hydrology of Northern Napa Valley. U.S. Geological Survey Water-Resources Investigations 13-73, prepared in cooperation with the Napa County Flood Control and Water Conservation District, November, 72p.
- Johnson, M.J., 1977, Ground-water hydrology of the Lower Milliken-Sarco-Tulucay Creeks area, Napa County, California. U.S. Geological Survey Water Resource Investigations 77-82, Open file report, August, 40p.
- Kunkel, F. and Upson, J.E., 1960, Geology and ground water in Napa and Sonoma Valleys, Napa and Sonoma Counties, California. U.S. Geological Survey Water-Supply Paper 1495, prepared in cooperation with the California Department of Water Resources, 264p.

- Luhdorff & Scalmanini (LSCE) and MBK Engineers, 2013, Updated Hydrogeologic Conceptualization and Characterization of Conditions. Prepared for: Napa County, January, 181p.
- Napa County, 2015, Working Draft Water Availability Analysis (WAA) – Guidance Document (three drafts reviewed: updated December 18, 2014, March 2, 2015, and April 23, 2015).
- Napa County, 2005, Napa County Baseline Data Report – Chapter 16 Groundwater Hydrology (Version 1). 13p.
- Napa County Department of Environmental Management, 2012, Milliken-Sarco-Tulocay (MST) groundwater deficient basin. Presentation to Napa County Groundwater Resources Advisory Committee (GRAC), April 26, 2012, 9 slides.

Based on my review of these materials, it is my professional opinion that the project:

1. Has not demonstrated sufficient groundwater recharge occurs on-site at an annual rate equivalent to or greater than the estimated annual project water demands;

2. Failed to analyze the impacts of project groundwater withdrawals on the groundwater supply to the County designated water deficient MST Basin;

3. Has the unstated potential to impart significant adverse impacts to the water quality of Milliken Creek, Milliken Reservoir and the Napa River via increased erosion and sediment loads from the project; and

4. Has failed to properly analyze potential adverse impacts on project-induced erosion and the potential impacts on the receiving water bodies.

The rationale for these opinions is presented in the following sections.

1. Inaccurate Groundwater Recharge Estimate

The stated main purpose of the RCS groundwater recharge study (Exhibit 4 in IS/MND) is, "*To help provide compliance with the new Tier 1 Water Availability Analysis requirements that are currently being developed for Napa County, as specifically requested by the County for this project*." From the perspective of Water Use Criterion, the RCS analysis assumes that the project falls under the WAA designation of "All Other Areas" (i.e., not located in the Napa Valley Floor or a groundwater deficient area). The new County WAA indicates that no single criterion can be established for "All Other Areas" due to the uncertainty of the geology, and the increasingly fractured rock aquifer systems in the mountainous and non-Napa Valley areas. The WAA stipulates that project applicants need to estimate the average annual recharge occurring on the project parcel and consider the amount of recharge relative to the estimation of project water use, including all current and proposed project water demands. The estimate of average annual recharge can be made by various methods including water balance methods. The new WAA also states; a) that the selected method should be based on data from the parcel or watershed where the proposed project is located, and b) the estimated project water use, including existing and proposed uses of water on the project parcel(s), shall include estimates for normal and dry water years. It is my opinion that the recharge estimate completed by RCS is inaccurate (over inflated) and their study does not comply with the WAA for the following reasons.

- RCS presents only a single estimated "long-term average" project water demand. I was unable to find a dry year water demand estimate in the RCS report or anywhere else in the IS/MND.
- The "conservative" deep groundwater recharge estimate used by RCS in their study is equivalent to 9% of rainfall. This value is based on their uncited work in Sonoma County and, in part, on the hydrology work by Johnson (1977) in the MST basin. Without more information on the origin/source/location of other recharge estimates cited by RCS, information presented by Johnson (1977) is most representative of the project site. Per the RCS study, a 9% recharge rate yields an average annual recharge volume of 35-acre fee (AF), assuming an average annual precipitation total of 40 inches (3.33 feet) and recharge area of 117 acres. Their estimated average annual recharge rate is greater than the short- and long-term project water demands of 18.4- and 11.2 AF/yr, respectively. The problem with applying Johnson's 9% recharge rate to the project site is that it reflects an MST watershed-wide average, incorporating the high stream and volcanic tuff infiltration rates in the lower elevations of the eastern hills with much lower infiltration rates representative of the higher elevation volcanic terrain. The Johnson (1977) and Farrar and Metzger (2003) studies indicate that of the total 5,400 AF of average annual recharge to the MST, 3,050 AF/yr is supplied by stream flow infiltration along the eastern margin of 15-square MST storage area, 2,100 AF/yr comes as subsurface inflow from the 27-square mile higher elevation volcanic terrain, and 250 AF/yr is direct infiltration of precipitation to the 15-square mile lower MST storage area on the valley floor. Given the volcanic terrain headwater area of the MST basin covers 27 square miles (Johnson, 1977, suggests this area may be up to 33 square miles) and the 2,100 AF/yr of groundwater inflow from the block reflects the annual deep groundwater recharge rate, the annual deep groundwater recharge rate in the higher elevation volcanic terrain is only 1.46 in/yr (4% of average annual precipitation). Applying this recharge rate to the project area covered with Sonoma Volcanics (117-acres) yields an average annual deep groundwater recharge volume of 15.6 AF/yr, a value less than the project short-term water demand (18.2 AF/yr).
- In their hydrogeology report from 2013, LSCE present detailed information about the spatial variability of groundwater recharge and associated conditions (geology, soil, slope, and landuse) that control recharge in Napa County. LSCE placed particular emphasis on the variable of slope, in that recharge potential is "significantly reduced" where ground surface slopes exceed 30 degrees (58%). The RCS study does not factor ground surface slope into their recharge analysis, however, and the IS/MND states (page 2) that 50 acres of the site are in excess of 30%. Project soil types described in the IS/MND are noted to occur on slopes as high as 75%. The RCS study does not factor slope into their analysis, but it is likely that some portion of the 117-acre recharge area contains steep slopes that will diminish the recharge potential, further reducing the annual recharge volume in combination with the more representative and lower recharge rate.

2. Failure to Analyze Potential Project Impacts on the MST Groundwater Deficient Basin

A 117-acre portion of the project site is a groundwater recharge area for the Milliken-Sarco-Tulucay groundwater basin (MST). The IS/MND does not evaluate the potential adverse impacts of project groundwater withdrawals on the groundwater supply of the MST basin. The MST is the second largest groundwater basin in the County. It is located adjacent to the city of Napa along the eastern edge of the valley floor and covers an area of approximately 15 square miles. Because of acknowledged over-pumping from the MST basin, the County has designated the MST as a "groundwater deficient area", as defined in the Groundwater Conservation Ordinance.

The County delineates the MST basin as indicated in Figure 1 (Napa County Ordinance No. 1294, Chapter 13.15 Groundwater Conservation). The County's MST delineation likely comes from the "Study Area" designation presented in the 1977 USGS report (Johnson, 1977) cited in the WAA. The "Study Area" outlined in 1977 USGS report defines the downstream alluvial aquifer and underlying Sonoma Volcanic groundwater storage areas associated with known groundwater overdraft. This "Study Area" encompasses a 15-square mile area within the cumulative 42-squre mile drainage area for the Milliken, Sarco and Tulucay Creek watersheds (see Figure 2). The point of this discussion is to distinguish between the County's jurisdictional MST "Study Area" and the physically-based MST hydrologic watershed and groundwater system.

The 1977 USGS study, along with the more recent follow-up study completed by the USGS (Farrar and Metzger, 2003) clearly indicate that the 27-square mile higher elevation bedrock area lying to the east (and including a portion of the Project area) are in direct hydraulic connection with and provide recharge to the 15-square mile MST groundwater storage "Study Area." The USGS (2013) provides a graphical representation of the groundwater system underlying the MST Creeks watershed, reproduced here in Figure 3. This conceptual groundwater flow model indicates that rainfall infiltrates and recharges the Sonoma Volcanic bedrock groundwater in the eastern uplands up to the topographic drainage divide. The groundwater in the Sonoma Volcanic bedrock then migrates westward over time towards the main alluvium and deeper Sonoma Volcanics storage area in the valley bottom, adjacent to the Napa River (designated "Study Area"). The eastern boundary of the County's designated MST basin generally occurs where the foot of the mountains intersect the valley floor. In reference to the MST basin, Farrar and Metzger (2003, page 59) state, "*The principal source of ground-water replenishment to the study area is lateral flow of ground water that is recharged in the Howell Mountains to the east of the study area."* They also state (2003, page 21), "*Johnson (1977) estimated that the average annual recharge in the area of this study in 1975 was 5,400 acre-ft/yr: 3,050 acre-ft/yr from streamflow infiltration; 2,100 acre-ft/yr from subsurface inflow from the Howell Mountain block; and about 250 acre-ft/yr from direct infiltration of precipitation.*

I believe that the 1977 and 2003 USGS studies provide conclusive information that the portion of the project area underlain by Sonoma Volcanics and draining to Milliken Creek lies in an important recharge area to the MST groundwater basin and is hydraulically connected to the lower MST groundwater storage area. Thus, any withdrawals from the Sonoma Volcanics within the Project site will directly reduce the groundwater inflow and supply to the MST basin and further deplete groundwater resources in an already groundwater deficient basin.

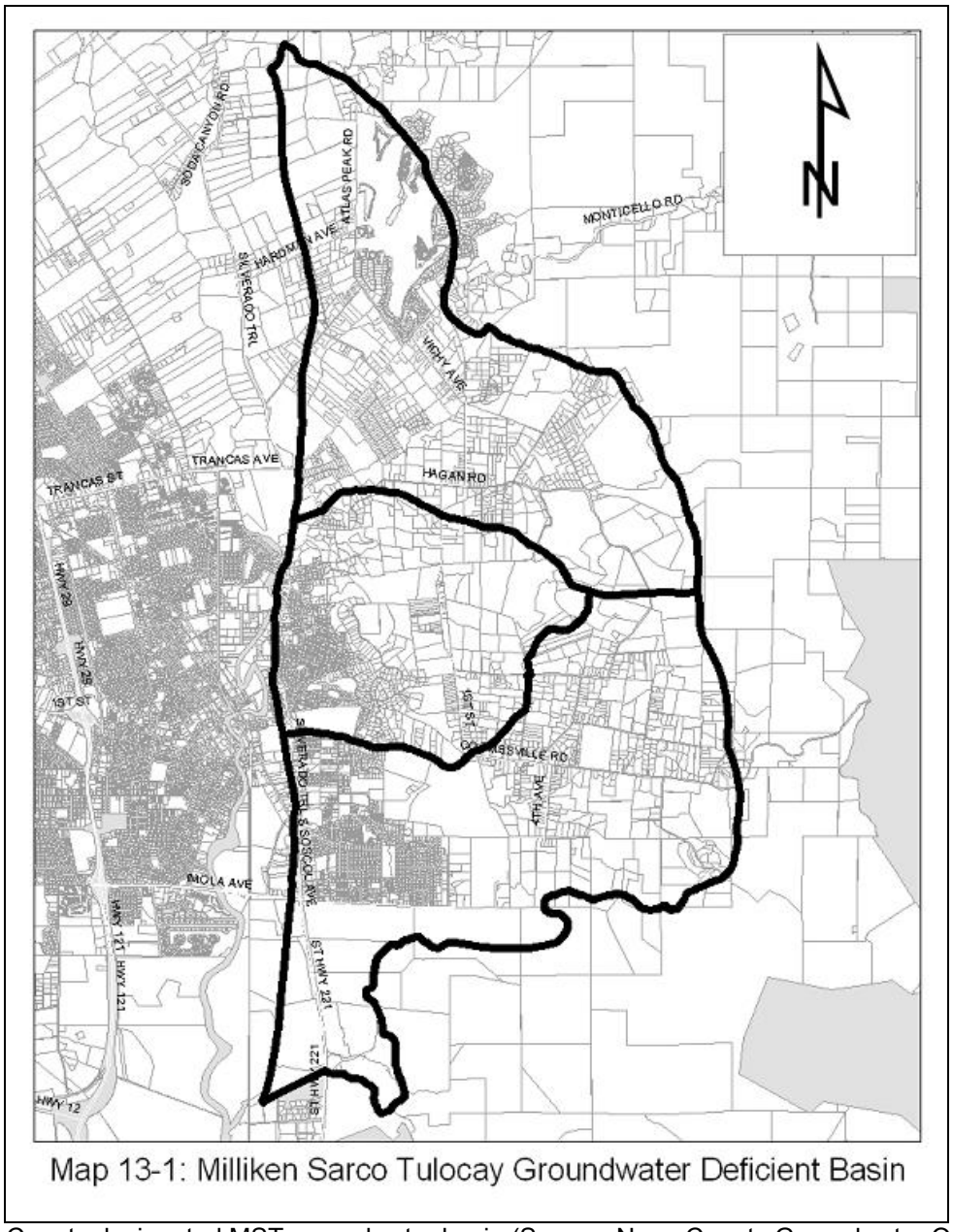

FIGURE 1: County designated MST groundwater basin (Source: Napa County Groundwater Ordinance).

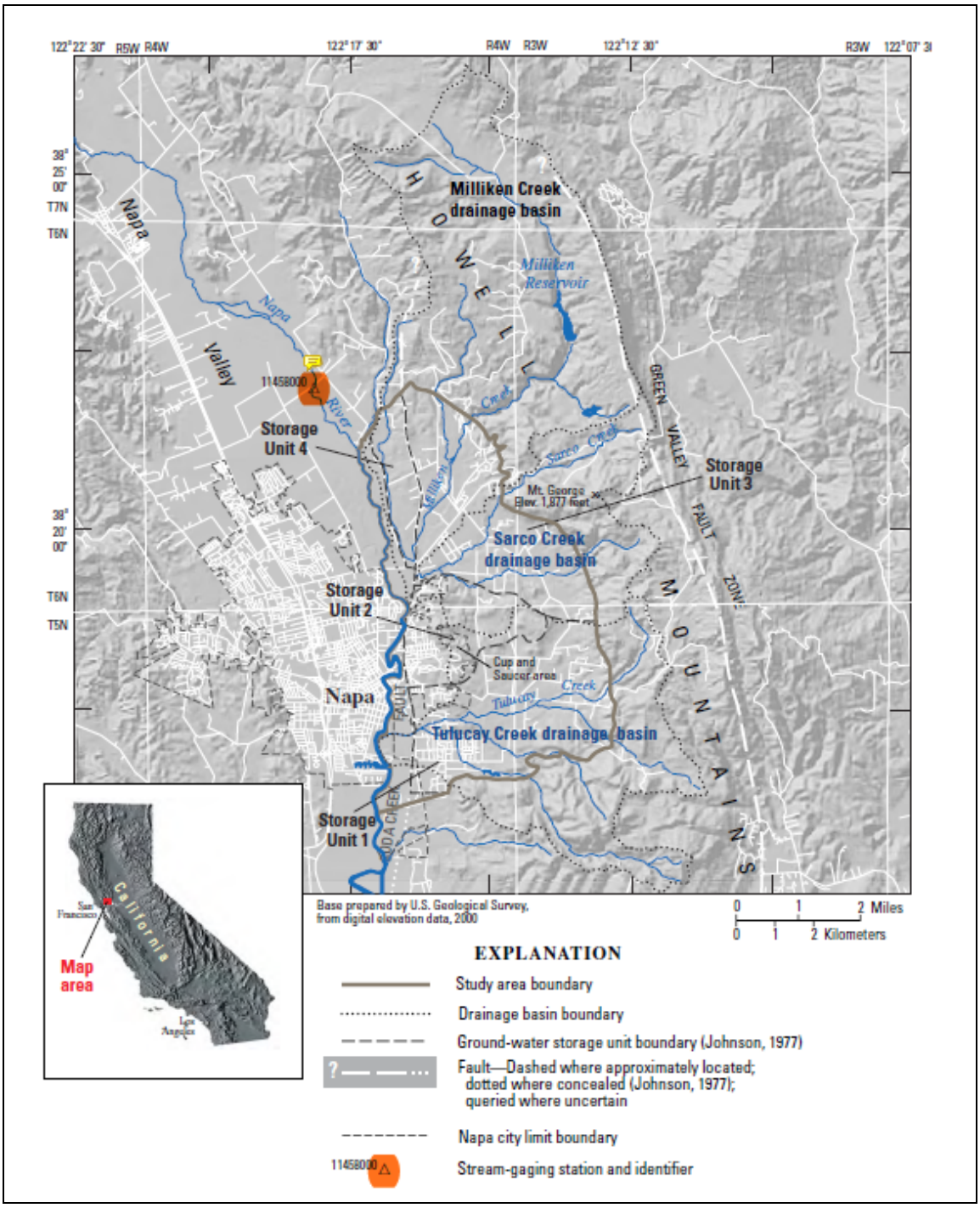

FIGURE 2: Location of 2003 USGS study area, differentiating between basin drainage area and "Study Area" boundaries (Source: Figure 1 in Farrar and Metzger, 2003).

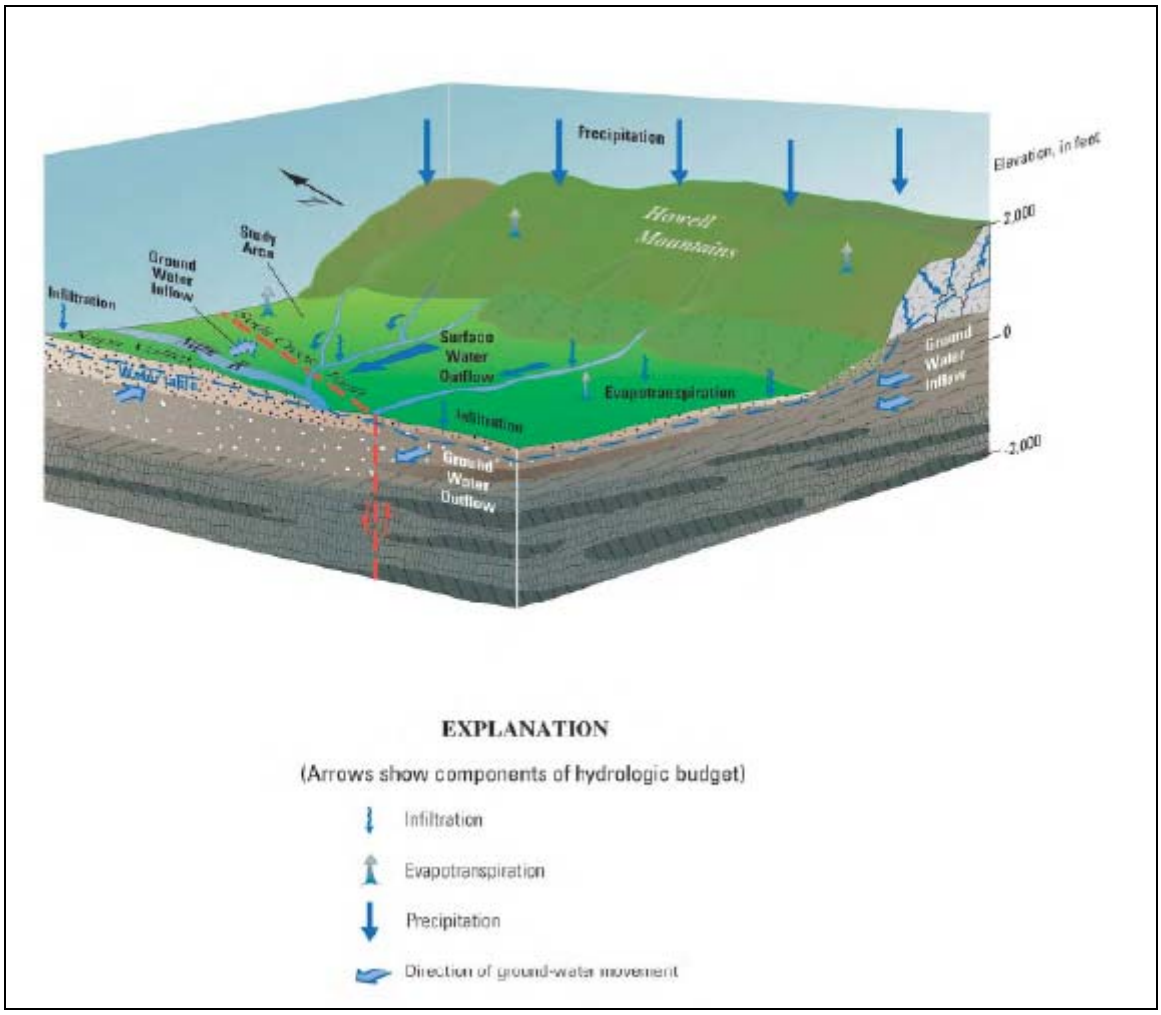

FIGURE 3: Conceptual model of groundwater flow system in the lower Milliken-Sarco-Tulucay Creeks area (Source: Figure 9 in Farrar and Metzger, 2003).

3. Unstated Potential Impact on Water Quality of Milliken Creek and Napa River

The IS/MND conclusions regarding project-induced changes in erosion potential are based on summing vineyard block soil loss subtotals and presenting the total (net) change for the entire project area. The net Unified Soil Loss Equation (USLE) results presented in the IS/MND indicate that there is an overall reduction in potential soil loss associated with the project. However, this type of lumping of results masks the watershed-specific potential impacts, which when considered alone, actually result in a potential significant impact on water quality to the Milliken Creek and Napa River watersheds.

Breaking down the changes in modeled soil loss results presented in Table 6 of the IS/MND (page 16) by watershed indicates that overall net post-project soil loss from Vineyard Blocks (Blocks 1, 2 and 3) draining to the Milliken Creek watershed will increase by 0.41- to 1.72-tons/year over existing conditions, (the actual value depends on how much of Block 1 drains to Milliken Creek vs. Capell Creek). The

overall net post project soil loss from Vineyard Blocks (Blocks 4 and 5) draining to Capell Creek will decrease by 4.18-tons/year. There is heightened significance to this potential adverse impact to Milliken Creek, tributary to Napa River, as the Napa River has been designated as an impaired water body for sediment under Section 303(d) of the Clean Water Act. Trapping of project derived sediment in Milliken Reservoir does not mitigate this potential impact as indicated in the following text found on page 24 of the IS/MND.

> *"Historically, the construction of large dams and other impoundment structures between 1924 and 1959 on major tributaries in the eastern Napa River watershed and northern headwater areas of the Napa River has affected sediment transport processes into the mainstem of the Napa River by reducing the delivery of the coarse load sediments to the river (Stillwater Science and W. Dietrich, 2002). However, the finer sediments that are not trapped by dams, are negatively affecting salmonid habitat by reducing gravel permeability potentially affecting special status fish species (Stillwater Science and W. Dietrich, 2002). In response, the Regional Water Quality Control Board, San Francisco Bay District has released a technical report that proposes a TMDL for the Napa River, which calls for reductions in the amount of fine sediment deposits into the watershed to improve water quality and maintain beneficial uses of the river, including spawning and rearing habitat for salmonid species."*

Although results of the soil loss analysis bode well for the Capell Creek watershed, they clearly indicate a potential and significant impact to an already sediment impacted Napa River and also an important drinking water supply reservoir for Napa County.

4. Failure to Analyze Project Erosion Potential and Associated Water Quality Impacts

The project contends that development activities will reduce runoff rates from vineyard areas. The runoff analyses that inform this conclusion only address and incorporate the changes in land-use type on runoff rates/volumes. However, the project proposes a number of surface drains and subdrains that will intentionally and unintentionally concentrate and accelerate runoff off through proposed vineyard blocks. The hydrology storm runoff analysis did not incorporate these drainage elements into the storm water runoff calculations, where applicable. Based on my experience, project drainage elements will lead to significant increases in the estimated runoff rates, both on- and off-site. Thus, the peak flow rates for project conditions are underestimated, which means the potential impacts associated with high storm flows have not been accurately identified and evaluated.

Increases in site runoff rates not only effect erosion on-site, but also can propagate downstream and off-site. For purposes of the following discussion, surface erosion is defined as that process by which rainfall and non-concentrated (sheet flow) rainfall-runoff erode and transport sediment off of relatively flat upland surfaces. In contrast, channel erosion refers to the erosion (down cutting and side cutting) in swales, ditches and channels by concentrated runoff and flow.

The project sedimentation and erosion potential evaluation for the site utilized the empirically-based Universal Soil Loss Equation (USLE) to determine changes in annual erosion rates between existing and project conditions. The erosion potential assessment using the USLE only addresses surface erosion from individual vineyard blocks. The project erosion potential analysis does not consider or evaluate the potential for channel erosion within intervening or downstream receiving slopes, swales, and creeks outside of the vineyard blocks. This is a significant omission of potential erosion and sediment sources, especially in light of the fact that the project is underestimating the peak runoff from vineyard blocks. Thus, without considering the increase in channel runoff and associated channel erosion due to project development, the erosion potential analysis should be considered incomplete.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter report.

Sincerely,

Greg Kamman, PG, CHG
Principal Hydrologist