Project: K-149
Brian Arden Winery
PPC#2

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

February 13, 2012

Joe Gaffney
Project Manager
Green Valley Consulting Engineering
335 Tesconi Circle
Santa Rosa, CA 95401

Subject: Brian Arden Winery Hydrology Report
Response Letter to Peer-Review Comments

Joe,

In response to your memorandum dated February 06, 2012 addressed to Derek Rayner of the City of Calistoga's Public Works Department regarding your review of the Brian Arden Winery Hydrology Report dated February 01, 2012, the following are our itemized responses to your comments:

1. *Comment: The Table of Contents and the first sheet were omitted from the revised report. The Table of Contents should include a listing of the Appendices to the report.*

   Response:
   The Table of Contents and the first sheet were submitted with the revised report provided to the City of Calistoga. The list of appendices is located on page 17 of the report. The revised report dated February 13, 2012 will include these sheets.

2. *Comment: The engineer wants to exclude the runoff from the upstream watershed areas in his analysis of peak runoff from the site. I feel that this is not correct for the following reasons:*

   Response:
   The upstream watershed areas are included in the analysis to determine the peak storm water runoff from the site. Please see the Pre-Construction Runoff Map on sheet 3 of **Appendix A**, and the Post-Construction Map on sheet 4 of **Appendix A**. Also, refer to **Appendix G** for the Post-Construction Runoff Map. These maps show the breakdown of the on-site and upstream watersheds used to determine the peak storm water runoff.

   The pre-construction watersheds are partitioned into two watersheds: Site Watershed and Upstream Watershed. The storm water derived within each of these watersheds is taken into account in the analysis of the peak storm water runoff exiting the site (which occurs at the southern corner of the property).

   The post-construction watersheds include five watersheds, including: Site Watershed (storm water not entering Detention Basin), Site Watershed (storm water entering Detention Basin), Upstream Watershed 1, Upstream Watershed 2, and Upstream Watershed 3. Each watershed is routed through the property based each watershed's proposed runoff pattern, and the composite peak storm water flow is calculated at the southern corner of the property.

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a. *Comment: In the three different methods of peak runoff computation that are compared in the study, slope has a big impact on the final runoff. There is a large difference in the slopes of the upper watersheds and the project site area, which will have a large difference in the peak runoff from the total area.*

Response:
Two analyses were presented in this report: 1.) the determination of required on-site detention, and 2.) the determination of the peak runoff flows exiting the property for the pre-construction and post-construction conditions. In the analysis to quantify the required on-site storm water detention (using the three methods mentioned in this comment), the footprint of the proposed site improvements was identified and used to create the pre- and post-construction watershed. This watershed was determined to be 1.908 acres and located within the flatter plain of the property. The slight increase in slopes along the west side of this watershed has been taken into account in the calculation of the runoff coefficients within each design method (SCS and Rational). The steep hillside of Mount Washington (also noted in this comment) is identified as the upstream watershed in the report exhibits, is not included in the detention storage calculations as this is irrelevant to the impact of the proposed site improvements for this project due to the fact this area shall remain undisturbed by the proposed project development. The upstream watershed shall produce the same storm water runoff flows in the pre-construction and post-construction conditions and does not have an effect on the required on-site storm water detention quantity.

However, the second analysis of this report described in Section VI is purposed to determine the peak runoff from the site. In this analysis, the upstream watersheds were included as the storm water runoff derived in the upstream watershed combines with the site watershed's runoff to produce the total flow exiting the property. The steep slopes of the hillside were taken into account and a time of concentration was determined as a product of the slopes, the surface cover, and the length of flow.

b. *Comment: In the pre-construction scenario, both in reality and in Appendix H, the flows from the upstream watersheds are physically included in the final discharge at the southeast corner of the site. The study should show the computation of these flows.*

Response:
The peak discharge from the pre-construction conditions has been computed by producing the rainfall-runoff hydrographs for each design storm within each watershed. The hydrographs from each watershed were then combined to determine the peak composite storm water runoff rate from the property. Please see the composite hydrographs and results tables in **Appedix I** of this report.

c. *Comment: In the post-construction scenario, the upstream watersheds have a big impact on the routing of the stormwater runoff:*

i. *Upstream Watershed #1 is allowed to flow onto the north end of the property and is included in the final discharge at the southeast corner.*

ii. *Upstream Watershed #2 is collected in the drain inlet at the northwest corner of the building. Storm flows are conveyed via an 8" pipe (how was this pipe sized?) to a bubble-up inlet in the swale south of Silverado Trail. The flow is then routed in the swale until it sheet flows across the north end of the site and is then included in the*

final discharge at the southeast corner.

Response:
The proposed 8" pipe purposed to convey the storm water flows from Upstream Watershed #2 has been analyzed, and has been determined to be adequately sized to handle the flow from the watershed. Please refer to **Appendix L** of the hydrology report. The 8" pipe has a capacity of 1.18 cubic feet per second, exceeding the peak storm water demand from Upstream Watershed #2 during the 100-year design storm of 0.92 cubic feet per second.

iii. *Upstream Watershed #3 is collected in the infiltration ditch at the southwest corner of the driveway. A portion of the flow is collected in the rainwater storage tanks, and the remainder is routed into the underground detention basin. Any overflows from the infiltration ditch are routed to the storm water dissipater above the south end of the driveway.*

d. *Comment: The three factors described above are not adequately addressed in the study.*

Response to 2c. and 2d.:
Please refer to **Appendix G** of the hydrology report for the Post-Construction Runoff Map. The map shows each watershed in the post-construction scenario, including descriptions and arrows depicting the flow patterns for all three Upstream Watersheds and the Site Watersheds. The storm water derived from each watershed has been routed through the site based on the post-construction conditions. The storm water runoff derived in the Upstream Watersheds has been routed as described above in 2c. i, ii, and iii.

3. *Comment: In Appendix H, in the design calculations for the openings in the metering plates, the peak flow through the opening are input variables to the calculations for each of the three plates. The study does not describe how these peak flow values were selected.*

Response:
The peak flow through each opening within the metering box was selected to restrain the post-construction storm water runoff flows to remain less than the pre-construction runoff flows while preventing the detention basin from flooding due to undersized orifices. The flows presented in **Appendix H** were determined through an iterative design process. This information has been added in the fourth paragraph on Page 14 of the revised hydrology report dated February 13, 2012.

4. *Comment: In Appendix H, in the tables comparing pre- and post-construction flows, it appears that SCS curve numbers are used to determine peak runoff from the different subareas. Given the wide range of results from the three methods of determining peak runoff studied in the report, the report should provide justification for the exclusive use of the SCS Method in determining peak runoff at the southeast corner of the property. Also, the peak runoff from the Site Watershed (only the area to be developed) in the 100-year storm does not match the value in Table 9, the summary of results from the three different calculation methods in the report.*

Response:
The SCS method was used to determine the flows in A**ppendix H** (**Appendix I** in the revised hydrology report dated 02-13-12). The SCS Method is calibrated to localized rainfall information and is capable of producing a rainfall-runoff hydrographs over an entire storm event (in this case, the 100-year 24 hour storm event). The storm water runoff is able to be routed through the detention basin and metering box and able to provide flow information over the extent of the storm event. This has been stated in Section VI of the revised hydrology report dated February 13, 2012.

In volume-sensitive calculations and for storm water routing, the SCS method is more appropriate than the Rational Method. The Rational Method was developed for the purpose of approximating peak flow rates from a watershed, and typically considers only a critical (short) duration of the storm to determine the peak flow. The Rational Method is not capable of routing storm water flows through volume-based features such as a detention basin as it does not consider volumes over time.

The composite peak runoff values in **Appendix H** (**Appendix I** in the revised hydrology report dated 02-13-12) are not meant to match the values in Table 9. The peak flow values provided in Table 9 were determined, in the analysis to quantify the required on-site water detention. The extent of the watershed for this analysis was the footprint of the proposed site improvements and did not include the area within the upstream watershed. See the response to 2a in this letter for an explanation of the watershed partitioning between the two analyses.

The post-construction peak flow values in **Appendix H** (**Appendix I** in the revised hydrology report dated 02-13-12) were determined in the second analysis when determining the peak flow at the southern corner of the property. This flow includes storm water runoff derived from the upstream watershed and shows the peak storm water flow leaving the property higher than those shown in Table 9.

5. *Comment: Again, in the tables in Appendix H, it is not clear that the runoff from Upper Watershed #3 is included in the Outflow from the Detention Basin.*

   Response:
   Upstream Watershed #3's runoff was included in the inflow and outflow analysis of the detention basin. A sentence in the second paragraph of Section VI on page 13 of the revised hydrology report dated February 13, 2012 denotes this.

6. *Comment: Finally, in Appendix H, the outflow hydrograph from the detention basin is included in the post-construction hydrographs for the project. The report should include a separate inflow-outflow hydrograph for the detention basin, including flows from the developed site and collected flows from Upstream Watershed #3 less any overflow that is routed to the flow dissipater above the south end of the driveway.*

   Response:
   Inflow-Outflow hydrographs have been produced for each storm event using the SCS Design Method and added to **Appendix I** of the hydrology report. In addition to the inflow-outflow hydrographs for each storm event, two additional exhibits have been added to **Appendix I** for clarification:

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1.) Hydrograph showing the storm water runoff entering the detention basin from Upstream Watershed 3 and the Site Detention Basin Watershed for each storm event.
2.) Volume analysis of the detention basin over the 24-hour storm event for each storm interval.

In total, **Appendix I** has 4 exhibits per storm event:

- Peak Storm Water Runoff at Southern Corner of Property
- Storm Water Runoff Entering Detention Basin
- Inflow-Outflow Hydrograph
- Detention Basin Volume throughout 24-Hour Storm Event

Additional Notes:

To utilize the full capacity of the detention basin, an impermeable liner is proposed to be lined around the extent of the basin. This will avoid the potential for high groundwater to reduce the capacity within the basin. Page 12 of the hydrology report has been revised to note this.

Please feel free to contact me if you have any questions.

Sincerely,

Bryan Jackson
Project Engineer

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