# APPENDIX C

**TECHNICAL MEMORANDUM**
**Preservation Ranch – Evans 1.0**
**Avenue Swale Sizing Study**

**PREPARED FOR:** Matt McKamey, Premier Pacific Vineyards

**PREPARED BY**: John Riley PE, Winzler & Kelly

**REVIEWED BY**:

**DATE**: August 15, 2007

**JOB #**: 1025905001-32600

## 1. INTRODUCTION

Winzler & Kelly (W&K) has performed a Manning's Formula based sizing analysis for the proposed vineyard avenue swales which will divert overland stormwater flow to the proposed collection system. This study determines the most conservative swale size requirement to accommodate the 100 year return period storm event ($Q_{100}$). This will be used to determine standard avenue swale dimensions for the proposed vineyard improvements which will accommodate the storm flow, and be constructed such that the farming activity will not degrade the function of the swales over time.

## 2. SWALE SIZING ANALYSIS

AutoCAD's Manning Based Hydrology Module was used to calculate swale dimensions based on calculated storm flows included in the Hydrology Study. Swale slopes in the flow direction are to range from 0.75 percent to 1.5 percent and are to be located within proposed vineyard avenues. A maximum storm flow rate of 8.31 cubic feet per second was used for calculations; the average storm flow rate is 3.78 cubic feet per second. A Manning's **n** value of 0.035 for grass lined swales was used.

## 3. SUMMARY

The expected $Q_{100}$ storm flow rate will result in a flow depth of 9.8 inches to 11.5 inches depending on the swale slope. The swale shall provide a minimum flow area of 3.5 square feet, approximately equivalent to a 1 foot deep, 2 foot wide grass lined swale. Refer to the Evans

Erosion Control Plan details for proposed swale dimensions. Note that proposed swale dimensions will be significantly larger than the minimums listed here.

## REFERENCES

Winzler & Kelly Tech. Memo, *Hydrology Study of Existing and Future Conditions*, Aug 14, 2007