Attachment #1 COPY 31871

**TO:** Chief, Division of Water Rights, State Water Resources Control Board

**FROM: David and Julie Dewey**

**DATE: October 31, 2010.**

**SUBJECT:** WATER AVAILABILITY ANALYSIS (WAA) FOR APPLICATION ON NASSAU CREEK FOR DAVID AND JULIE DEWEY, 153 LOBO LANE, ANGELS CAMP, CALAVAERAS COUNTY, CALIFORNIA.

## 1.0 INTRODUCTION

The purpose of this report is to summarize the results of the water availability analysis conducted for the subject application located within the Nassau Creek watershed, sub watershed to the South Fork Calaveras River in Calaveras County. The objectives of the analysis are as follows:

- To provide the California State Water Resources Control Board (SWRCB), Division of Water Rights information required under California Water Code section 1275 (a), 1375 (d), 1243, 1243.5 and California Code of Regulations, Title 23, section 782, to demonstrate whether water is available for appropriation; and

- To determine the impact of the applications/project on streamflow and downstream uses in order to evaluate potential impacts to Public Trust Resources and provisions for compliance with various federal and state requirements. Examples include the California Environmental Quality Act (CEQA), California Fish and Game Code, and the California Endangered Species Act (CESA) and the Federal Endangered Species Act (ESA).

A water right complaint on the water body was raised against the previous property owner on February 17, 2006. A subsequent field inspection by the SWRCB Complaint Unit staff was completed on September 20, 2006. The September site visit revealed the typical low season site conditions in the water body. A second site visit was completed by Complaint Unit staff on February 20, 2007. The water body was full and water flowing over the spillway during the second site visit. A number of observations and measurements of the water body were recorded with the use of a transit and related survey equipment. A subsequent letter issued by the Division of Water Rights' Complaint Unit staff dated May 1, 2009, to the previous property owner recommended that the previous owner notify the Division of Water Rights as to whether they intended to file an appropriative water right to seasonally store a maximum of 40 ac-ft of water diverted from Nassau Creek or take other appropriate action identified in the letter. The current property owner, Mr. David Dewey, purchased the property in February of 2010.

This Water Availability Analysis is intended to compliment the attached Water Rights Application. The current property owner intends to complete the required Appropriative Water Rights Application and secure the necessary water rights as recommended by the Division of Water Rights' Complaint Unit staff.

## PROJECT DESCRIPTION

The project is located in Calaveras County approximately 4.5 miles west of the town of Angels Camp (coordinates 38°04'23.10"N; 120°38'51.41"W) (Figure 1). The application seeks to store a maximum of 40 acre-feet (af) of water on a seasonal basis into an existing on-stream reservoir during the runoff season between Fall to Spring (November 1 thru May 1). The existing water body was constructed by previous land owners in approximately 1970. Although local residents familiar with the construction of the water body have provided testimony that the Soil Conservation Service (currently Natural Resource Conservation Service (NRCS) and possibly the U.S. Army Corps of Engineers (USACE) assisted with the design and engineering of the storage feature, no records are available at this time to substantiate this claim.

### 2.1 Point of Interest (POI)

The single Point of Interest (POI) for this Project is an existing water body used to store surface water on a seasonal basis. The POI is located on Nassau Creek approximately 2.3 miles upstream of its confluence with Cherokee Creek (Figure 1). The POI is further described in the following Section 3.0.

## 3.0 WATER BODY DESCRIPTION

Nassau Creek flows from south to north before emptying into the water body. The water body was constructed in approximately 1970 by placing a dam across Nassau Creek channel. A spillway and bypass channel was constructed in the water body to divert higher flows around the dam. No outlet pipe was constructed in the dam. Heavy clay soils are found locally throughout the water body and immediate vicinity. Numerous bedrock outcroppings exist along the banks and bottom of the water body.

The water body has a total maximum surface area of 6.4 acres when full, and considerably less during the late summer and early fall prior to the runoff season (Figures 2-5). The water body is bisected by a private road and bridge that provides access to a single family home on the eastern property, adjacent to the water body. The dam height was measured at 18 feet from toe to crest of dam. The dam is approximately 225 feet long and 18 feet wide. The inner slope of the dam is approximately 3.5:1.

The spillway is located west and south of the dam (Figure 6). The spillway is designed to function with riser boards to allow for the increase in water body depth, or draining the upper portion of the water body when full. Slight damage to the spillway has occurred over the years as a result of erosion caused when water flows onto and over the spillway apron. Although the erosion and slight damage does not appear to affect the integrity of the structure, the spillway may not properly function to increase the surface water elevation. Based on bank erosion levels, vegetation, and bank deposition of previously floating objects, there is no evidence that riser boards have been used in the spillway in the recent past.

**Figure 2.** Northern Section of Water Body Looking South to North from Gravel Road Which Bisects the Water Body. October 2, 2010.

**Figure 3.** Northern Section of Water Body with Dam in Background. October 2, 2010.

**Figure 4.** Southern Section of Water Body Looking North to South from Bridge Which the Bisects Water Body, October 2, 2010.

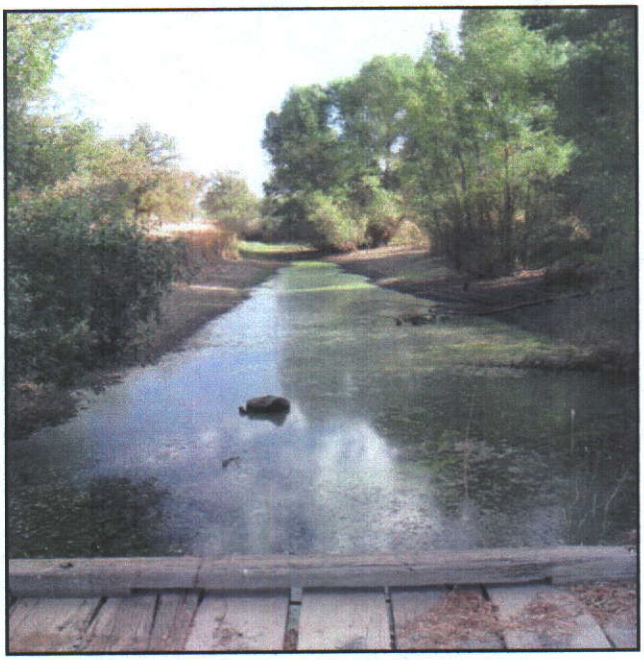
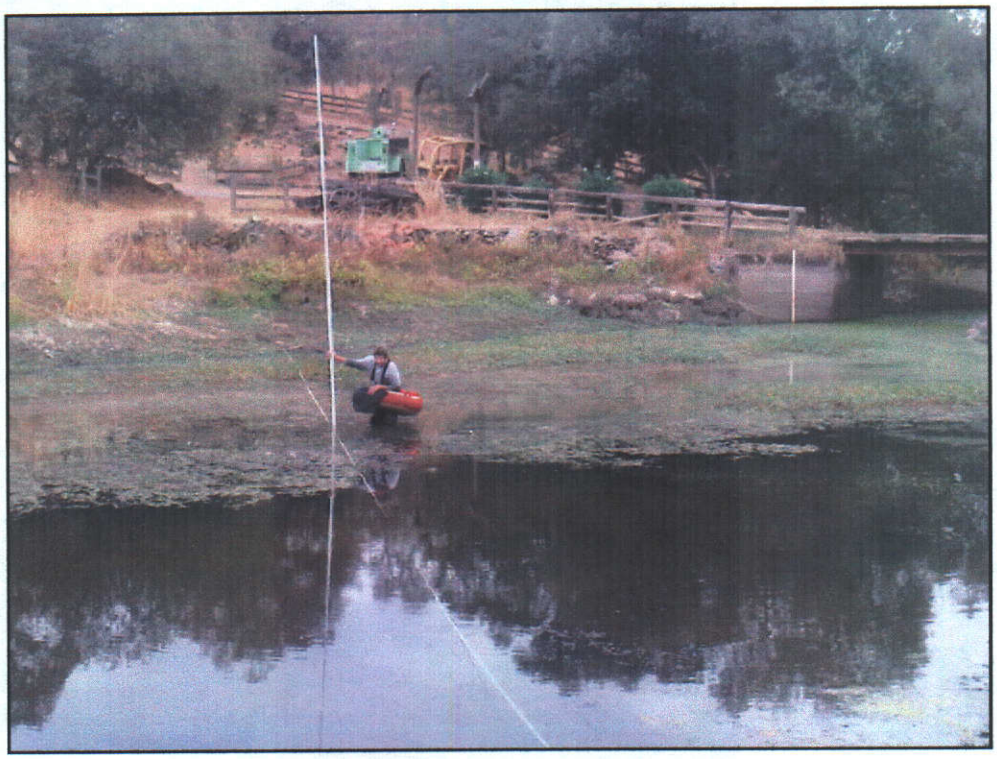


**Figure 5.** Portion of Southern Section of Water Body. October 2, 2010.

**Figure 6.** Spillway in Background located Southwest of Dam. October 2, 2010.

A survey of the water body basin and related elevations was completed on October 17, 2010 using a transit, survey rod, and float tube (Figure 7). A total of 7 cross sectional profiles were completed during the survey in various locations within the northern basin to provide representative and average depths for the basin (see Appendix A). The purpose of the survey was to document water basin size and specific elevations in the basin and to use the information for calculating maximum storage capacity of the water body. Elevations were recorded of the spillway and bridge support, water level at maximum storage volume, pond depths, bank slopes, and surface water elevations for that date. The survey data, including graphs of each profile depths are provided in Appendix A. The northern (downstream) portion of the water body is approximately 1.9 acres in size with a maximum depth measured on October 17, 2010 of 19.2 feet from the spillway height. The average depth of the northern water body is approximately 11 feet and average bank slope extending to the pond bottom of 4:1. Water volume of the northern water body is estimated to be 13.8 ac-ft. The southern (upstream) portion of the water body is approximately 4.5 acres in size with a maximum depth measured on October 17, 2010 of 11.1 feet. The average depth of the southern water body is estimated at 7 feet and average bank slope throughout the perimeter of the water body at 5.5:1. Water volume of the southern water body is estimated to be 25.8 ac-ft.

**Figure 7.** Survey of Water Basin Dimensions. October 17, 2010.



Bank slopes were measured on October 10, 2010 to calculate the storage capacity of the water body. Slopes within the water body vary from approximately 3:1 extending from the crest of the dam to its toe, to less than 10:1 from the spillway to the center of the pond in an easterly direction. Bank slopes on the southern portion of the water body vary from 4:1 along the east bank to less than 10:1 on the westerly bank. The total storage volume of the water body measured from the spillway is estimated to be 39.6 ac-ft (see water body volume calculations, Appendix B). This volume was calculated using the USDA method identified in the Natural Resource Conservation Service, Agriculture Handbook Number 590, "Ponds - Planning, Design, Construction", and is based on surface dimensions, average depth, and average slopes.

The surface water elevation in the water body is estimated to drop in elevation by approximately 5 feet over the summer. Pan evaporation rates identified for this region are approximately 65-70 inches (5.4–5.8 feet) per year (Farnsworth and Thompson, 1982, NOAA Technical Report NWS 34). The October 17, 2010 pond survey measured the surface water elevation at 5.03 feet below the spillway. It is unknown as to whether spring water enters the pond in a subsurface manner to help maintain the surface water elevation during the non-runoff season. In the absence of known contributions of groundwater into the water body, it can be assumed that water losses from the water body as a result of percolation, infiltration, evaporation, and diversions are similar to what one can expect from evaporation alone. As a result, one can assume that the water body is stable and bottom adequately sealed, and that a minimal amount of water leaves the pond during the non-runoff season by methods other than evaporation. The applicant requests storage for the purposes of: domestic use, recreation,

wildlife habitat, fire protection, and aesthetic use. The volume of storage requested is also supported by the estimated volume of the water body by the Division of Water Rights' Complaint Unit staff identified in a May 1, 2009 letter from Michael Contreras to the previous landowner, Mr. Robert L. Kerr and adjacent property owners.

The project will allow surface water to flow unregulated into the water body and fill the water basin during precipitation and runoff events in the fall and early winter. All of the water will be diverted and stored in the water body with the first runoff event of the season and will continue until the storage capacity is reached. Once the maximum water body volume is reached, the water will exit the spillway and flow downstream. Groundwater from existing wells may be used during the dry months to augment or increase surface water elevations in the water body. If groundwater will be used for such purposes, it will be used on an infrequent and inconsistent basis, and not intensively managed or maintained over time.

## 4.0 WATERSHED DESCRIPTION

Nassau Creek is a seasonal creek which drains into Cherokee Creek and eventually the South Fork of the Calaveras River. The Calwater Hydrologic Unit Name for the watershed is the Upper Calaveras. Springs that feed Nassau Creek are relatively shallow with limited volume and provide quick discharge response during and immediately after rain storms. The total size of the Nassau Creek watershed was measured at 7.11 square miles, or 4,550.4 acres. See Attached Figure 1. Included in the figure is the delineated boundary of the entire Nassau Creek watershed, delineated boundary of the Nassau Creek watershed above the point of interest, and the Project's water body as the Point Of Interest.
The area above the Project site was measured as 6.01 square miles, or 3,846.6 acres.

A total of twelve earthen water bodies are located throughout the watershed above the project site that are capable of storing surface water. These water bodies vary in size from 0.07 to 3.2 surface acres and have a combined estimated storage capacity of 81.3 acre-feet.
Based on an October 25, 2010 water rights search via the e-WRIMS database, two water rights currently exist in the watershed above the Project. Both rights are current with a cumulative permitted storage volume of 5.4 acre feet of water in stockponds on Bear Mountain Ranch. The annual storage season has been identified to begin on November 1 and end on May 1.

## 5.0 METHODS

The watershed can be characterized by having a lot of open space, including areas of relatively undisturbed blue oak woodlands. Elevations in the watershed range from Bear Mountain at approximately 2,600 ft mean sea level (msl) to approximately 1,000 ft msl at the confluence of Nassau and Cherokee creeks. Streambed elevation ranges from approximately 1,720 ft msl at its head waters to 1,000 ft msl. No stream gauge or flow data is measured for the seasonal Nassau Creek. The average property size within the watershed is over 40 acres each. Based on aerial photographs, there are approximately twelve water bodies located in the watershed that function in a similar way to the Project's POI. These water bodies receive some seasonal surface water runoff and store an unknown quantity of water. Some of the water bodies may add groundwater to the water feature; therefore, it is not known the quantity of surface water stored in each of the features.

The Rational Method was used to calculate runoff for the watershed area. This method was used because no streamflow data exists for Nassau Creek at or above the POI. The Rational Method assumes that rainfall is of equal intensity over the entire watershed. The Rational Method is most accurate when used within relatively small watershed areas where rainfall is likely to be relatively uniform. As a result, this method generally over estimates peak runoff in larger watersheds. Larger watersheds that include significant tributary inflows should be divided into smaller areas and modeled using flow routing methods or regional regression equations when flow data is available.

A planimeter was used to measure the entire watershed area of Nassau Creek, including the area above the POI. The area above the POI was measured to be 6.01 square miles = 3,846.4 acres. The average rainfall of 31.9 inches (2.66 feet) for the watershed was taken from the Country Studies website and provides the most conservative estimate of average annual rainfall (Table 1.)

**Table 1. Reported Annual Weather Conditions at Angels Camp, Calaveras County, California. Source: Country Studies (http://countrystudies.us/united-states/weather/California/angels-camp.htm).**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. Precip (inches) | 5.6 | 5.0 | 5.3 | 2.7 | 0.8 | 0.3 | 0.1 | 0.3 | 0.6 | 1.8 | 4.8 | 4.6 | **31.9** |

The SONORA RS Weather station (Cooperative Station ID # 48353) located 10.99 miles south and east from Angels Camp (http://www.idcide.com/weather/ca/angels-camp.htm) lists the average annual precipitation to total 32.8 inches (2.73 feet) (Table 2). Because this station reported greater precipitation than the information in Table 1, the rainfall was not used to reduce the potential opportunity for over estimating the amount of runoff in the watershed.

**Table 2. Reported Annual Weather Conditions at Angels Camp, Calaveras County, California. Source: Cooperative Station ID # 48353, Sonora RS Weather station, (http://www.idcide.com/weather/ca/angels-camp.htm).**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inches | 6.39 | 5.76 | 5.65 | 2.49 | 1.22 | 0.26 | 0.07 | 0.14 | 0.57 | 1.84 | 3.83 | 4.26 | 32.48 |

The Runoff Coefficient was calculated from the "California Department of Transportation (Caltrans) Highway Design Manual", see completed worksheet for the Project (Appendix C).

The runoff coefficients given in the Caltrans Highway Design Manual are applicable for storms of up to 5 or 10 year frequencies. These coefficients are not adjusted for less frequent, higher intensity storms in the watershed. The coefficients were adjusted slightly to reflect a more conservative (slightly less) runoff than might be expected.

Water yield as runoff for the project was calculated based on the Rational Method equation: Q = C I A

Where: Q = Estimated average annual runoff (acre-feet per annum);
C = Runoff coefficient;
I = Average annual precipitation (feet per annum); and
A = Tributary watershed area (acres)

**ESTIMATED WATER YIELD AS RUNOFF FOR DEWEY PROJECT:**
**Q = (0.51) (2.66ft) (3,846.6 acres) = 5,218.3 ac-ft per year**

## 6.0 ANNUAL UNIMPAIRED FLOW

Annual unimpaired flow is the total volume of water, on average, that would flow past a particular point of interest on an annual basis if no diversions (impairments) were taking place in the watershed above that point. Due to the limited data available on 10 of the 12 identified water storage features in the watershed, the unimpaired flow was estimated based on the combined reported water rights volume and the estimated storage capacity of undocumented water bodies identified from aerial maps. The estimated volumes of all identified water storage features located above the Project are provided in Table 3. The estimated cumulative total storage volume added to the water yield for the watershed identified in 4.0 above (Q = 5,218.3 ac-ft per year). Flow is estimated in units of acre-feet per year.

Volume of each identified water body was estimated based on aerial photo measurements of surface area, and depths estimated based on conditions observed from the June 14, 2010 photos. Each of the water bodies are unnamed, with nine water bodies located on unnamed tributaries and three water bodies located on the Nassau Creek channel. Longitude and latitudes, surface areas, depth, and estimated volumes of each water body are provided (Table 3). The total annual unimpaired flow has been estimated based on the estimated capacity of all twelve water bodies in the watershed above the Project site. The total capacity estimated for all twelve water bodies represents 1.6% of the total annual estimated water yield as runoff in the Nassau Creek watershed above the Project.

**Table 3. Characteristics of Unnamed Water Bodies Observed from June 14, 2010 Aerial Photos in the Nassau Creek Watershed, Angels Campo, Calaveras County, California. Sources: Google Earth, Calaveras County Aerial Imagery, and the SWRCB e-WRIMS.**

| Water Body | Location (Lat/ Long) | Elevation (msl) | Surface Area (acres) | Avg. Depth (ft) | Total Estimated Volume (ac-ft) |
|---|---|---|---|---|---|
| #1 | 38° 03' 18.32" N<br>120° 37' 35.45" W | 1422 ft | 62,100 $ft^2$ = 1.4 ac. | 10 ft | 14.0 ac-ft |
| #2<br>(# C001421) | 38° 02' 38.91" N<br>120° 37' 35.17" W | 1462 ft | 59,200 $ft^2$ = 1.36 ac. | 8 ft | 10.88 ac-ft<br>(including one island) |
| #3 | 38° 02' 35.57" N<br>120° 37' 51.49" W | 1499 ft | 16,125 $ft^2$ = 0.37 ac. | 6 ft | 2.22 ac-ft |
| #4 | 38° 02' 21.91" N<br>120° 37' 25.41" W | 1463 ft | 59,100 $ft^2$ = 1.35 ac. | 7 ft | 9.45 ac-ft<br>(including one island) |
| #5 | 38° 02' 14.24" N<br>120° 37' 37.85" W | 1515 ft | 139,500 $ft^2$ = 3.2 ac. | 9 ft | 28.8 ac-ft<br>(including one island) |
| #6 | 38° 02' 13.19" N<br>120° 37' 28.51" W | 1503 ft | 5,292 $ft^2$ = 0.12 ac. | 7 ft | 0.84 ac-ft |
| #7<br>(# C001423) | 38° 02' 05.41" N<br>120° 37' 30.27" W | 1532 ft | 11,610 $ft^2$ = 0.38 ac. | 7 ft | 2.66 ac-ft |
| #8 | 38° 02' 03.37" N<br>120° 37' 17.79" W | 1506 ft | 18,528 $ft^2$ = 0.43 ac | 8 ft | 3.44 ac-ft |
| #9 | 38° 01' 53.34" N<br>120° 37' 02.45" W | 1549 ft | 2,952 $ft^2$ = 0.07 ac | 6 ft | 0.42 ac-ft |
| #10 | 38° 01' 35.94" N<br>120° 36' 43.71" W | 1601 ft | 8,236 $ft^2$ = 0.19 ac | 7 ft | 1.33 ac-ft |
| #11 | 38° 00' 57.80" N<br>120° 36' 30.62" W | 1751 ft | 17,940 $ft^2$ = 0.41 ac | 7 ft | 2.87 ac-ft |
| #12 | 38° 02' 50.28" N<br>120° 39' 31.72" W | 1913 ft | 21,280 $ft^2$ = 0.49 ac | 9 ft | 4.41 ac-ft |
| **TOTAL ESTIMATED ANNUAL STORAGE VOLUME IN THE NASSAU CREEK WATERSHED ABOVE THE POI** | | | | | **81.3 AC-FT** |

### 6.1 Calculations

The Annual Unimpaired Flow during the Project's diversion season is calculated using the estimated water yield from section 4.0 above (5,218.3 ac-ft) and adding the total estimated annual storage volume in the Nassau Creek watershed above the POI (calculated above to be 81.3 ac-ft.). **The Annual Unimpaired Flow is estimated to be 5,299.6 acre feet.**

Bypass flows to protect migratory fish is not a concern within the Nassau Creek watershed since the creek is seasonal and New Hogan Reservoir (a barrier to anadromous fish migration) is located downstream of the POI. New Hogan Reservoir is located approximately 10 miles downstream of the POI.

A total of 40 acre-feet of water is requested to be stored in the water body throughout the year. Using the Rational Method, the tributary area above the point of diversion has an estimated annual runoff of 5,218.3 acre-feet during the allowable season of January to May and November to December. The estimated Annual Unimpaired Flow is 5,299.6 acre-feet above the POI. Therefore, after the storage of up to 40 acre-feet of water in the POI is subtracted from the Annual Unimpaired Flow, approximately 5,259.6 acre-feet of water will flow into the Project feature and pass downstream. **The 40 acre-feet of storage in the POI represents 0.76% (less than 1%) of the annual unimpaired flow within Nassau Creek channel.**

## 7.0 CUMULATIVE FLOW IMPAIRMENT INDEX (CFII)

Pursuant to CEQA, CESA and ESA evaluation of cumulative impacts to natural hydrology must be completed. The Cumulative Flow Impairment Index (CFII) is an index that is used to evaluate the cumulative flow impairment demand of all existing and pending projects in a watershed of interest. The CFII is a percentage obtained by dividing the identified Demand in acre-feet by the calculated Supply in acre-feet at a specified POI, and for a specified time period.

Based on the e-WRIMS database, as of October 25, 2010, the total entitlements of recorded water rights above the POI are estimated to be 5.4 acre-feet, including two stockpond water rights (Application #C001421 and #C001423). (See Appendix D). The total unimpaired water available at the POI was estimated to be 5,299.6 acre-feet.
The CFII value was estimated as follows:

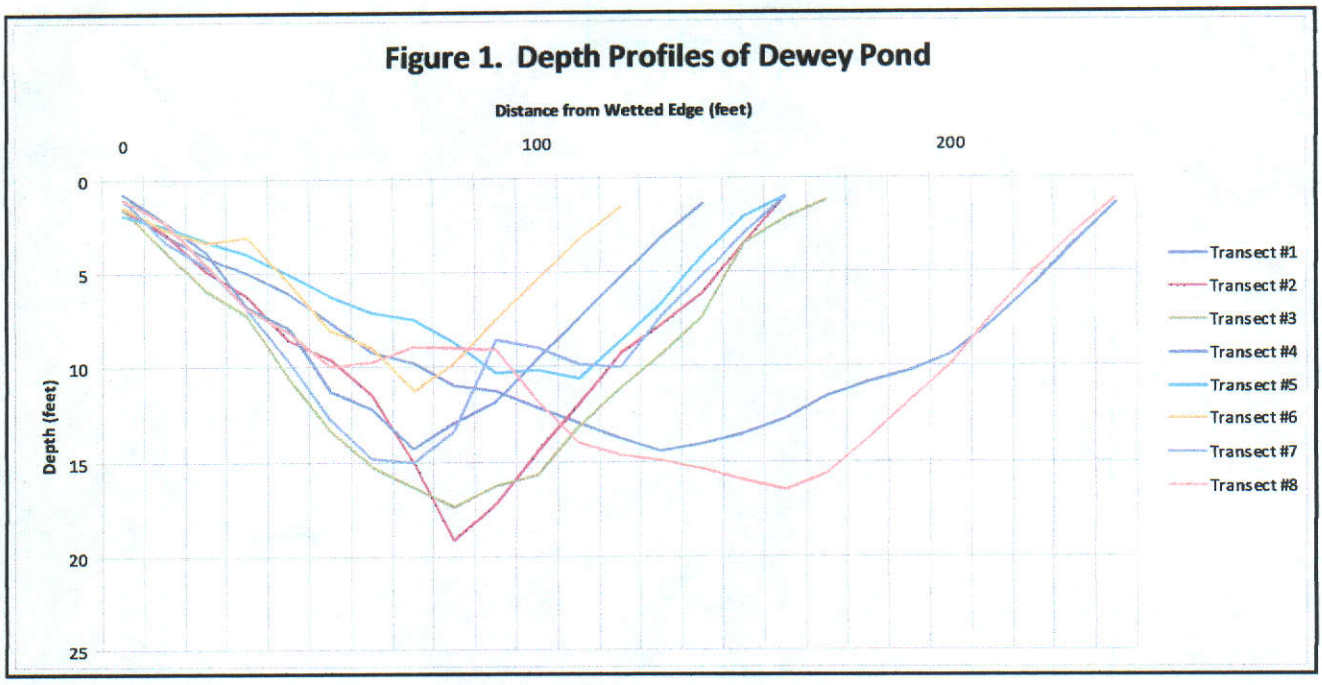
CFII @ POI = Upstream Demand (5.4 ac-ft) ÷ Supply (5,299 ac-ft) x 100% = 0.10%.

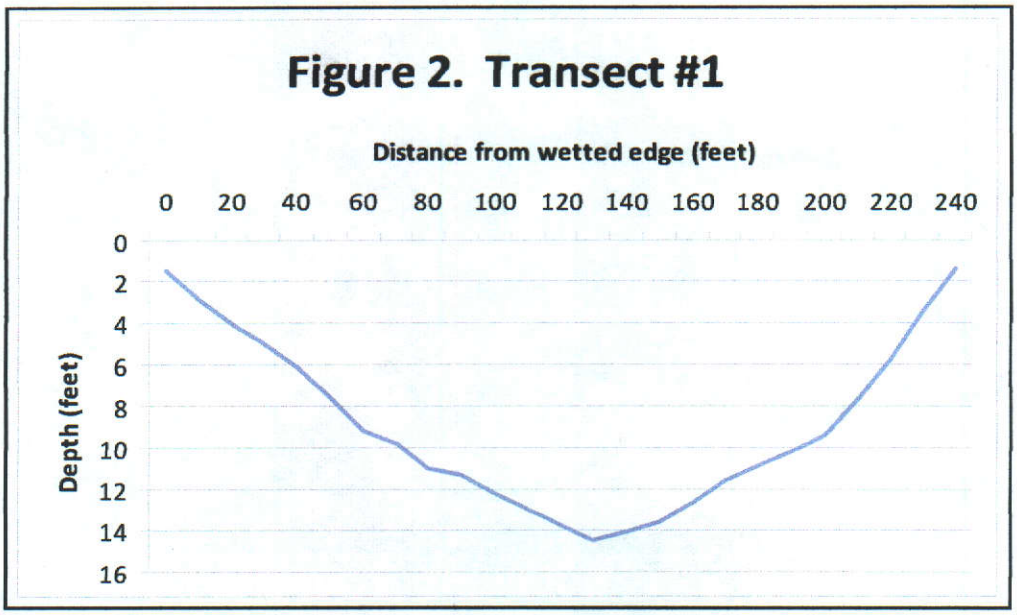
A modified CFII value can be estimated using the total estimated annual storage volume in the Nassau Creek watershed above the POI as stated in Table 3. This estimated storage volume includes a total of ten additional water storage features not currently listed or identified as having a water right in the Nassau Creek watershed. This estimated storage volume can be considered a modified upstream demand.

The Modified CFII value was estimated as follows:

Modified CFII @ POI = 81.3 ac-ft. ÷ 5,299 ac-ft x 100% = 1.53%.

**APPENDIX A. Surveyed Depth Profiles of Dewey Pond, October 17, 2010.**



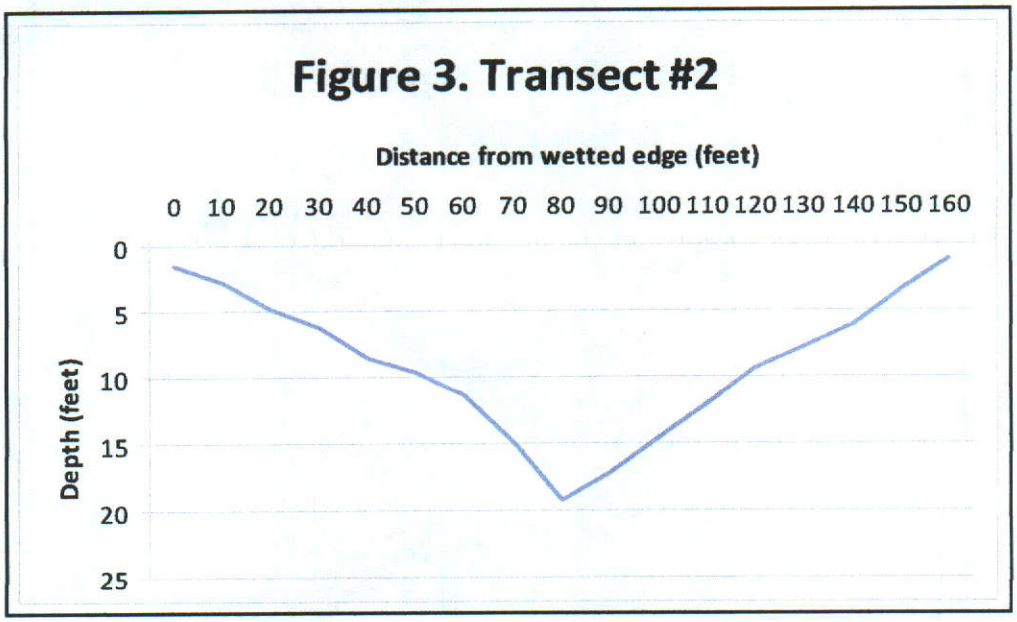


Figure 3. Transect #2
Distance from wetted edge (feet)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
0
5
10
15
20
25
Depth (feet)

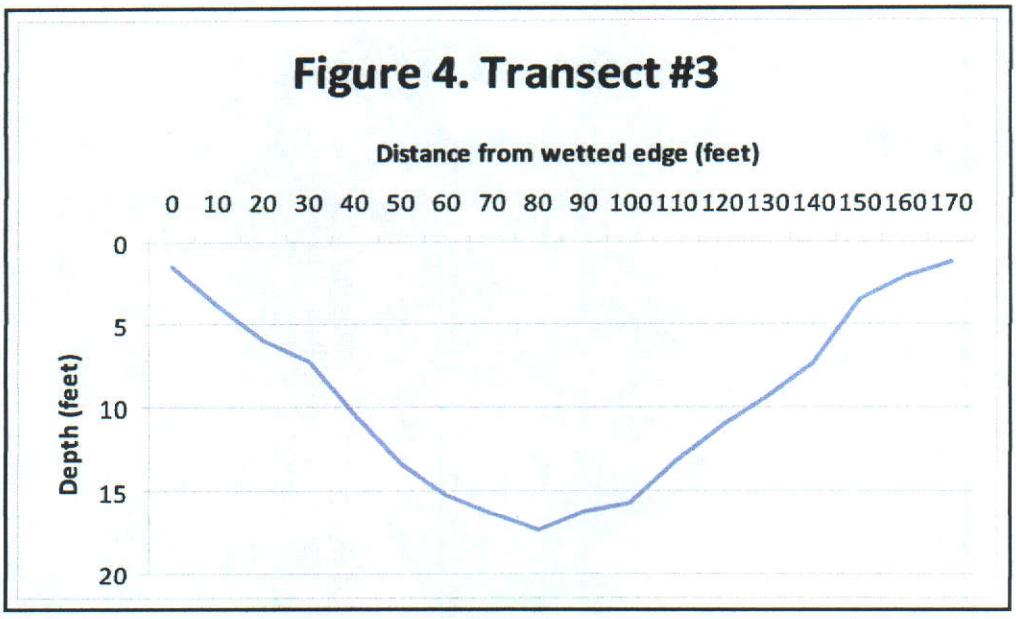


Figure 4. Transect #3
Distance from wetted edge (feet)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170
0
5
10
15
20
Depth (feet)

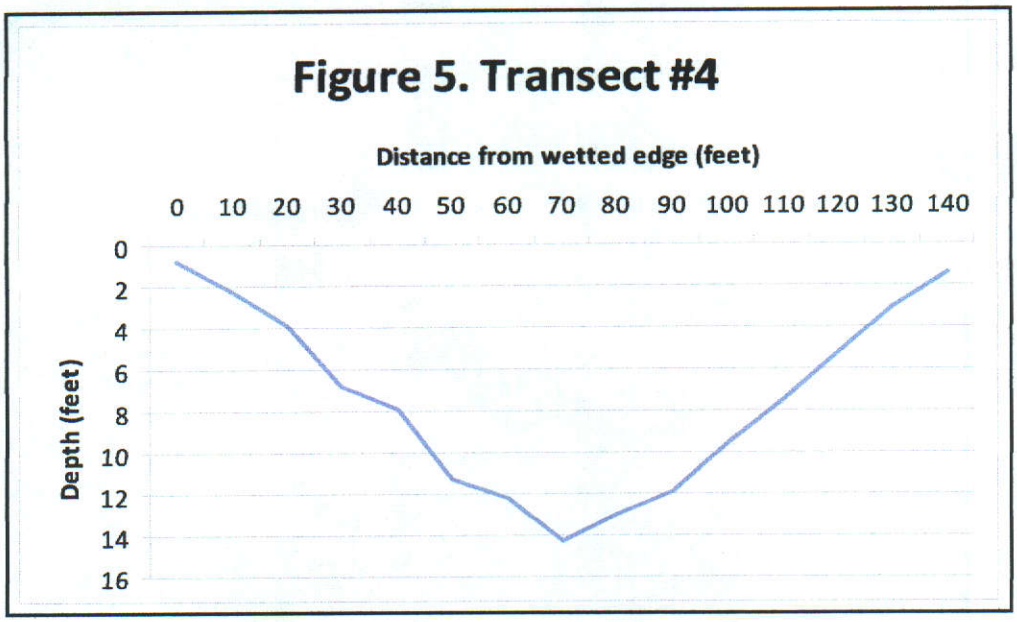


Figure 5. Transect #4
Distance from wetted edge (feet)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
Depth (feet)
0 2 4 6 8 10 12 14 16

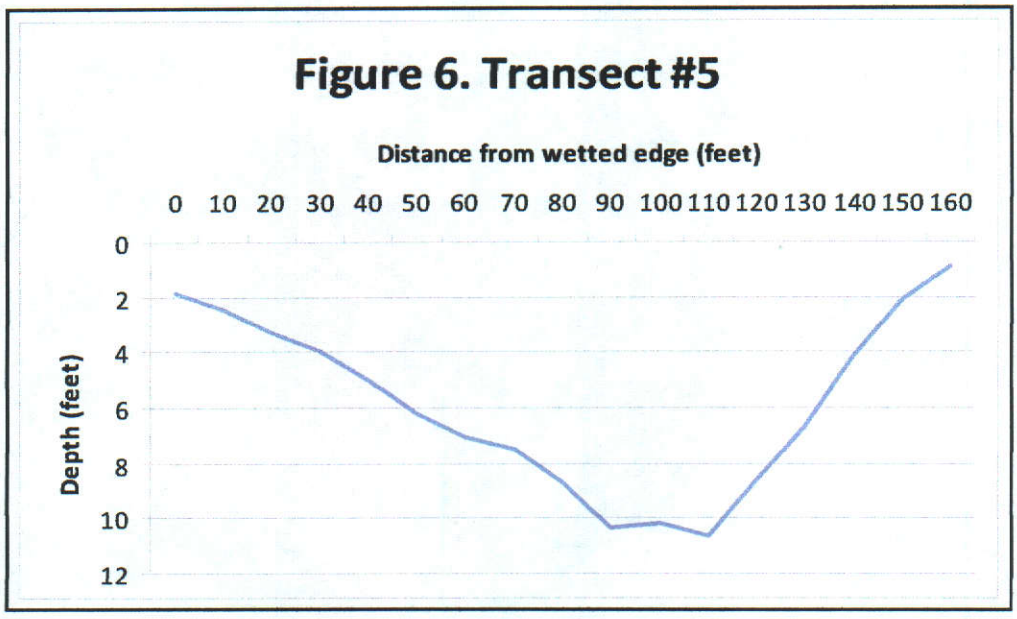


Figure 6. Transect #5
Distance from wetted edge (feet)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
Depth (feet)
0 2 4 6 8 10 12

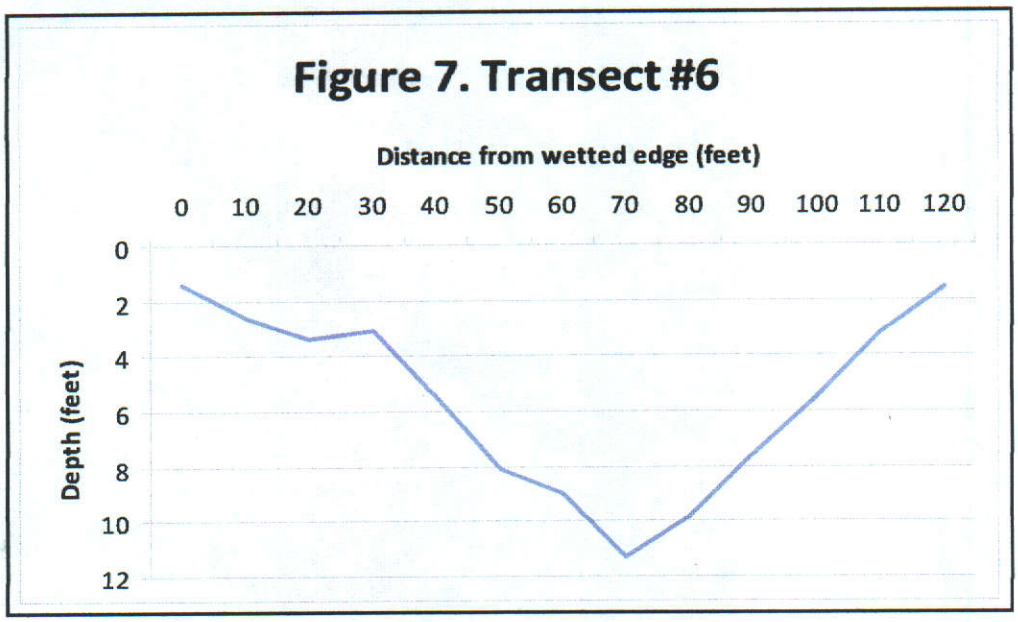


Figure 7. Transect #6
Distance from wetted edge (feet)
0 10 20 30 40 50 60 70 80 90 100 110 120
Depth (feet)
0 2 4 6 8 10 12

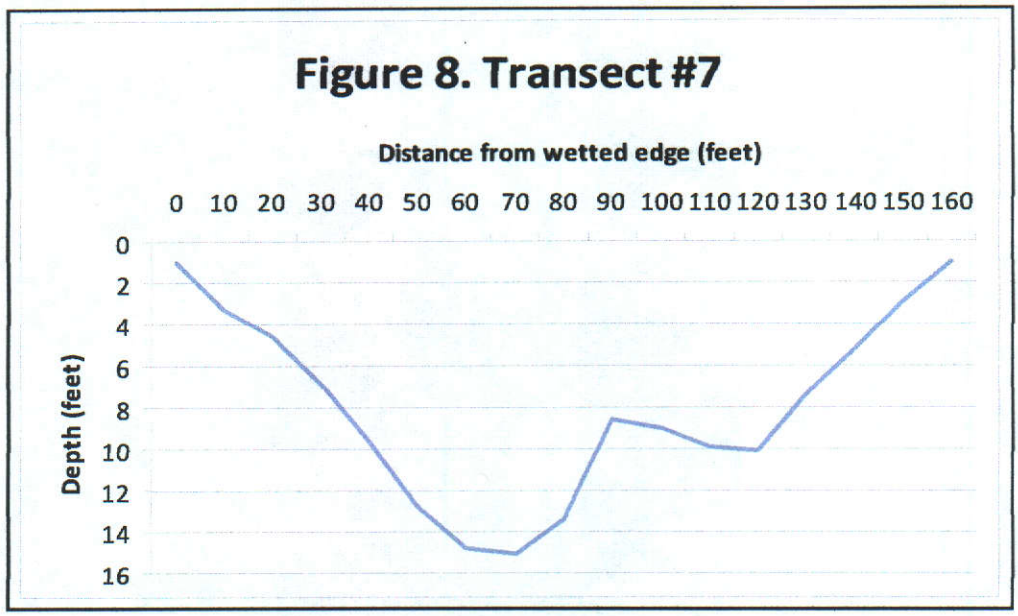


Figure 8. Transect #7
Distance from wetted edge (feet)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
Depth (feet)
0 2 4 6 8 10 12 14 16

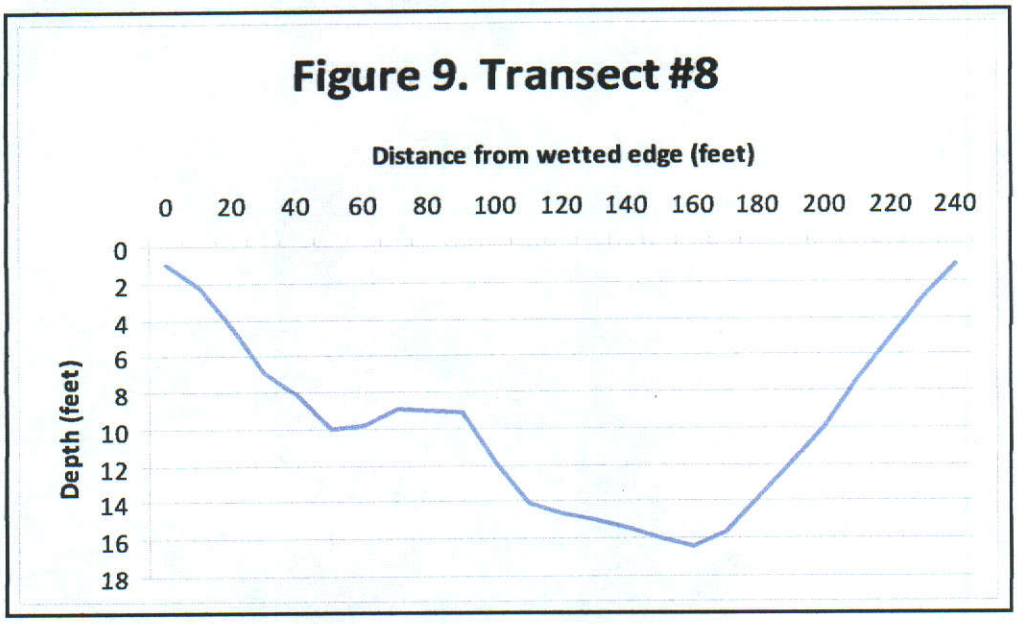


Figure 9. Transect #8
Distance from wetted edge (feet)
0 20 40 60 80 100 120 140 160 180 200 220 240
Depth (feet)
0 2 4 6 8 10 12 14 16 18

**APPENDIX B. Volume Calculations for Dewey Water Body (Northern Pond Section).**

**Northern Pond Section**

**Project : Dewey Pond**

| | | | | |
|---|---|---|---|---|
| Top Length = | TL = | | 525 | |
| Top Width = | TW = | | 160 | |
| Middle Length = | ML = | TL-MLA = | 475.5 | |
| Middle Width = | MW = | TW-MWA = | 113.25 | |
| Bottom Length = | BL = | TL-BLA = | 426 | |
| Bottom Width = | BW = | TW-BWA = | 66.5 | |
| Slope Length 1 = | SL1 = | | 3.5 | |
| Slope Length 2 = | SL2 = | | 5.5 | |
| Slope Width 1 = | SW1 = | | 4 | |
| Slope Width 2 = | SW2 = | | 4.5 | |
| Mid Length Adjustment = | MLA = | (.5D*SL1)+(.5D*SL2) = | 49.5 | |
| Mid Width Adjustment = | MWA = | (.5D*SW1)+(.5D*SW2) = | 46.75 | |
| Bottom Length Adjust = | BLA = | (D*SL1)+(D*SL2) = | 99 | |
| Bottom Width Adjust = | BWA = | (D*SW1)+(D*SW2) = | 93.5 | |
| Avg Depth = | D = | | 11 | |
| Area | | | | |
| Ground Surface = | A = | TL*TW = | 84000 | |
| Middepth Point = | B = | ML*MW = | 53850.37 | |
| Bottom Surface = | C = | BL*BW = | 28329 | |
| **Volume =** | V = | $\frac{(A+4B+C)}{6} \times \frac{D}{27}$ | 22253.30 | cubic yards |
| | | | 13.79326 | acre feet |
| | | | 4494500.1 | gallons |

Note: 6 is a constant in the volume equation. 27 is a factor converting cubic feet to cubic to yards.

| | | | |
|---|---|---|---|
| **Total Lake Volume** | Lake Volume | 22253.30 | cubic yards |
| | | 13.79326 | acre feet |
| | | 4494500.1 | gallons |

**APPENDIX B. Volume Calculations for Dewey Water Body (Southern Pond Section).**

**Southern Pond Section**

**Project : Dewey Pond**

| | | | | |
|---|---|---|---|---|
| Top Length = | TL = | | 715 | |
| Top Width = | TW = | | 275 | |
| Middle Length = | ML = | TL-MLA = | 676.5 | |
| Middle Width = | MW = | TW-MWA = | 236.5 | |
| Bottom Length = | BL = | TL-BLA = | 638 | |
| Bottom Width = | BW = | TW-BWA = | 198 | |
| Slope Length 1 = | SL1 = | | 5 | |
| Slope Length 2 = | SL2 = | | 6 | |
| Slope Width 1 = | SW1 = | | 7 | |
| Slope Width 2 = | SW2 = | | 4 | |
| Mid Length Adjustment = | MLA = | (.5D*SL1)+(.5D*SL2) = | 38.5 | |
| Mid Width Adjustment = | MWA = | (.5D*SW1)+(.5D*SW2) = | 38.5 | |
| Bottom Length Adjust = | BLA = | (D*SL1)+(D*SL2) = | 77 | |
| Bottom Width Adjust = | BWA = | (D*SW1)+(D*SW2) = | 77 | |
| Avg Depth = | D = | | 7 | |
| Area | | | | |
| Ground Surface = | A = | TL*TW = | 196625 | |
| Middepth Point = | B = | ML*MW = | 159992.2 | |
| Bottom Surface = | C = | BL*BW = | 126324 | |
| **Volume =** | V = | $\frac{(A+4B+C)}{6} \times \frac{D}{27}$ | 41607.56 | cubic yards |
| | | | 25.78961 | acre feet |
| | | | 8403480.4 | gallons |

Note: 6 is a constant in the volume equation. 27 is a factor converting cubic feet to cubic to yards.

| | | | | |
|---|---|---|---|---|
| **Total Lake Volume** | Lake Volume | | 41607.56 | cubic yards |
| | | | 25.78961 | acre feet |
| | | | 8403480.4 | gallons |

**APPENDIX C, Runoff Coefficient for Undeveloped Areas, Caltrans "Highway Design Manual", July 1, 1995, pp. 810-816.**

| | Watershed Types | | | |
|---|---|---|---|---|
| | Extreme | High | Normal | Low |
| Relief | 0.28 – 0.35<br><br>Steep, rugged terrain with average slopes above 30% | 0.20 – 0.28<br><br>Hilly, with average slopes of 10 to 30% | 0.14 – 0.20<br><br>Rolling with average slope of 5 to 10% | 0.08 – 0.14<br><br>Relatively flat land, with average slope of 0 to 5% |
| Soil Saturation | 0.12 – 0.16<br><br>No effective soil cover; either rock or thin soil mantle of negligible infiltration capacity | 0.08 – 0.12<br><br>Slow to take up water; clay or loam soil of low infiltration capacity; imperfectly or poorly drained | 0.06 – 0.08<br><br>Normal; well-drained, high or medium-textured soils, sandy loams, silt and silty loams. | 0.04 – 0.06<br><br>High; deep sand or other soil that takes up water readily, very high level drained soils. |
| Vegetal Cover | 0.12 – 0.16<br><br>No effective plant cover, bare, or very sparse cover | 0.08 – 0.12<br><br>Poor to fair; clean cultivation crops, or poor natural cover, less than 20% of drainage area over good cover | 0.06 – 0.08<br><br>Fair to good; about 50% of area in good grassland or woodland, not more than 50% of area in cultivated crops | 0.04 – 0.06<br><br>Good to excellent; about 90% of drainage area in good grassland, woodland or equivalent cover |
| Surface Storage | 0.10 – 0.12<br><br>Negligible surface depression few and shallow; drainage ways steep and small, no marshes | 0.08 – 0.10<br><br>Low; very well defined system of drainage ways; no ponds or marshes | 0.06 – 0.08<br><br>Normal; considerable surface depression storage, lakes and pond marshes | 0.04 – 0.06<br><br>High; surface storage high; drainage system not sharply defined, large floodplain storage or large number of pond marshes |

**RESULTS OF DEWEY PROJECT**: Watershed Conditions Evaluation:

1) Hilly to steep terrain with average slope of 25%, exclusive of Nassau Creek valley — Relief = 0.27
2) Clay loams soils with bedrock outcroppings and shallow soils on hillsides — Soil infiltration = 0.11
3) Good vegetative cover throughout the watershed with many stands of blue oak savanna grasslands — Vegetal Cover = 0.07
4) Normal to High surface storage. A number of existing water storage bodies present in the watershed — Surface storage = 0.06

**Estimated Runoff Coefficient, C, for the Nassau Creek watershed.** **C = 0.51**

## APPENDIX D
## Demand above POI - Private Water Body

### Case A

| Water Right ID | Source | Direct Diversion Rate (cfs) | Direct Diversion Season | Adjusted Direct Diversion Amount Oct. 1-Mar. 31 (af)* | Face Value Storage Amount (af) | Storage Season | Adjusted Storage Amount Oct. 1-Mar. 31 (af)* | Cumulative Adjusted Diversion Amount Oct. 1-Mar. 31 (af) | Purpose of Use Code** |
|---|---|---|---|---|---|---|---|---|---|
| C001421 | Nassau Creek (POD ID 1565) | 0 | 0 | 0 | 3.6 | Nov 1 – May 1 | 0 | 0 | S |
| C001423 | Nassau Creek (POD ID 13137) | 0 | 0 | 0 | 1.8 | Nov 1 – May 1 | 0 | 0 | S |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| **Totals:** | Nassau Creek | | | | 5.4 | Nov 1 – May 1 | | | |

* Place footnotes explaining adjustments here.

**B-Mining, C-Milling, D-Domestic, E-Fire Protection, G-Dust Control, H-Fish Culture, I-Irrigation, J-Industrial, K-Incidental Power, L-Heat Protection, M-Municipal, N-Frost Protection, P-Power, R-Recreational, S-Stockwatering, T-Snow Making, W-Fish and Wildlife Protection and/or Enhancement, Z-Other.

## APPENDIX B
## Demand above POI - Private Water Body

### Case B

| Water Right ID | Source | Direct Diversion Rate (cfs) | Direct Diversion Season | Adjusted Direct Diversion Amount Oct. 1-Mar. 31 (af)* | Face Value Storage Amount (af) | Storage Season | Adjusted Storage Amount Oct. 1-Mar. 31 (af)* | Cumulative Adjusted Diversion Amount Oct. 1-Mar. 31 (af) | Purpose of Use Code** |
|---|---|---|---|---|---|---|---|---|---|
| C001421 | Nassau Creek (POD ID 1565) | 0 | 0 | 0 | 3.6 | Nov 1 – May 1 | 0 | 0 | S |
| C001423 | Nassau Creek (POD ID 13137) | 0 | 0 | 0 | 1.8 | Nov 1 – May 1 | 0 | 0 | S |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| **Totals:** | Nassau Creek | | | | 5.4 | Nov 1 – May 1 | | | |

* Place footnotes explaining adjustments here.

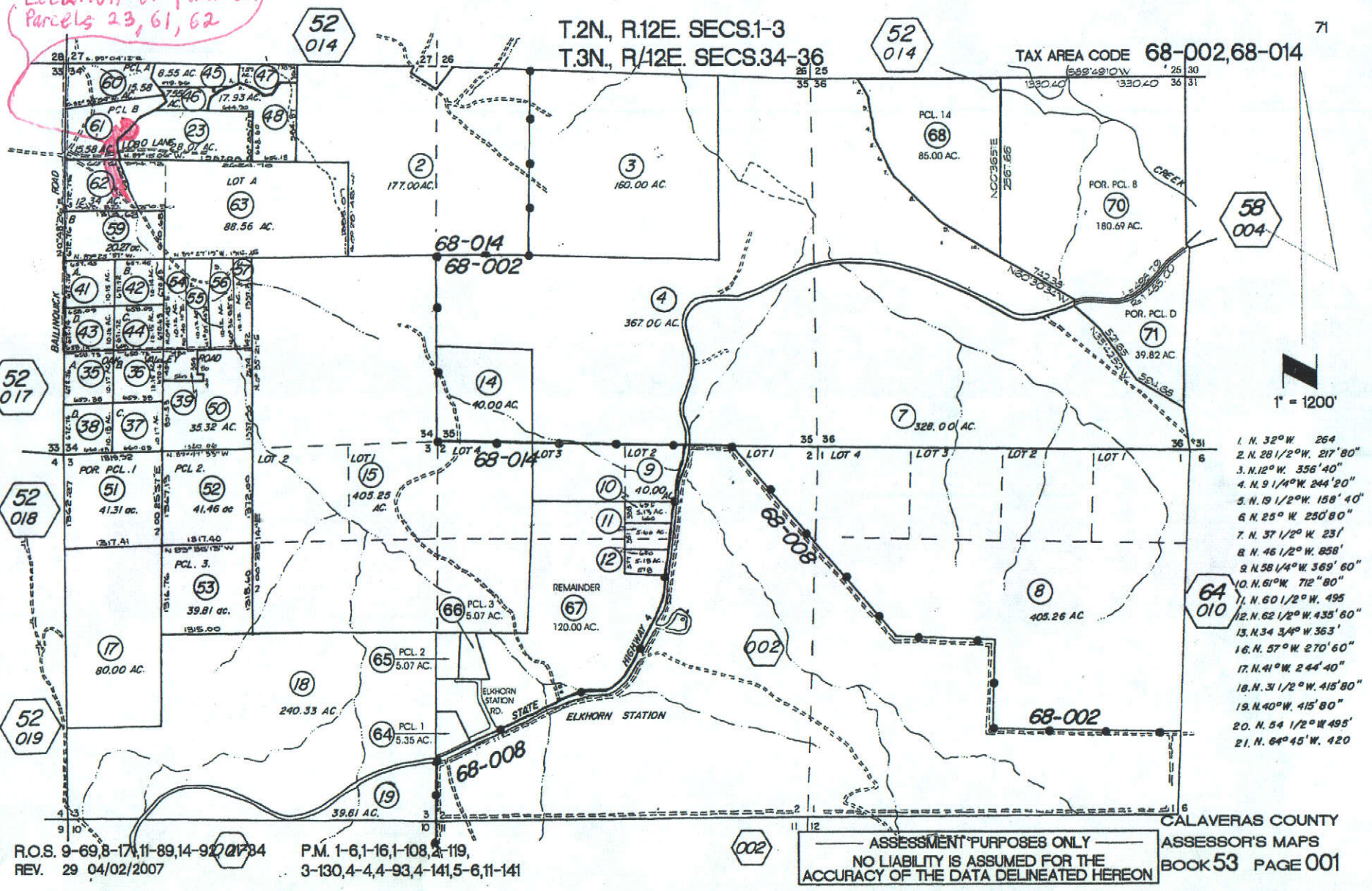
**B-Mining, C-Milling, D-Domestic, E-Fire Protection, G-Dust Control, H-Fish Culture, I-Irrigation, J-Industrial, K-Incidental Power, L-Heat Protection, M-Municipal, N-Frost Protection, P-Power, R-Recreational, S-Stockwatering, T-Snow Making, W-Fish and Wildlife Protection and/or Enhancement, Z-Other.

ATTACHMENT 2

Location of pond on Parcels 23, 61, 62

COPY

31871




R.O.S. 9-69,8-171,11-89,14-92,21-84
REV. 29 04/02/2007

P.M. 1-6,1-16,1-108,2-119,
3-130,4-4,4-93,4-141,5-6,11-141

ASSESSMENT PURPOSES ONLY
NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA DELINEATED HEREON

CALAVERAS COUNTY
ASSESSOR'S MAPS
BOOK 53 PAGE 001

ATTachment #3

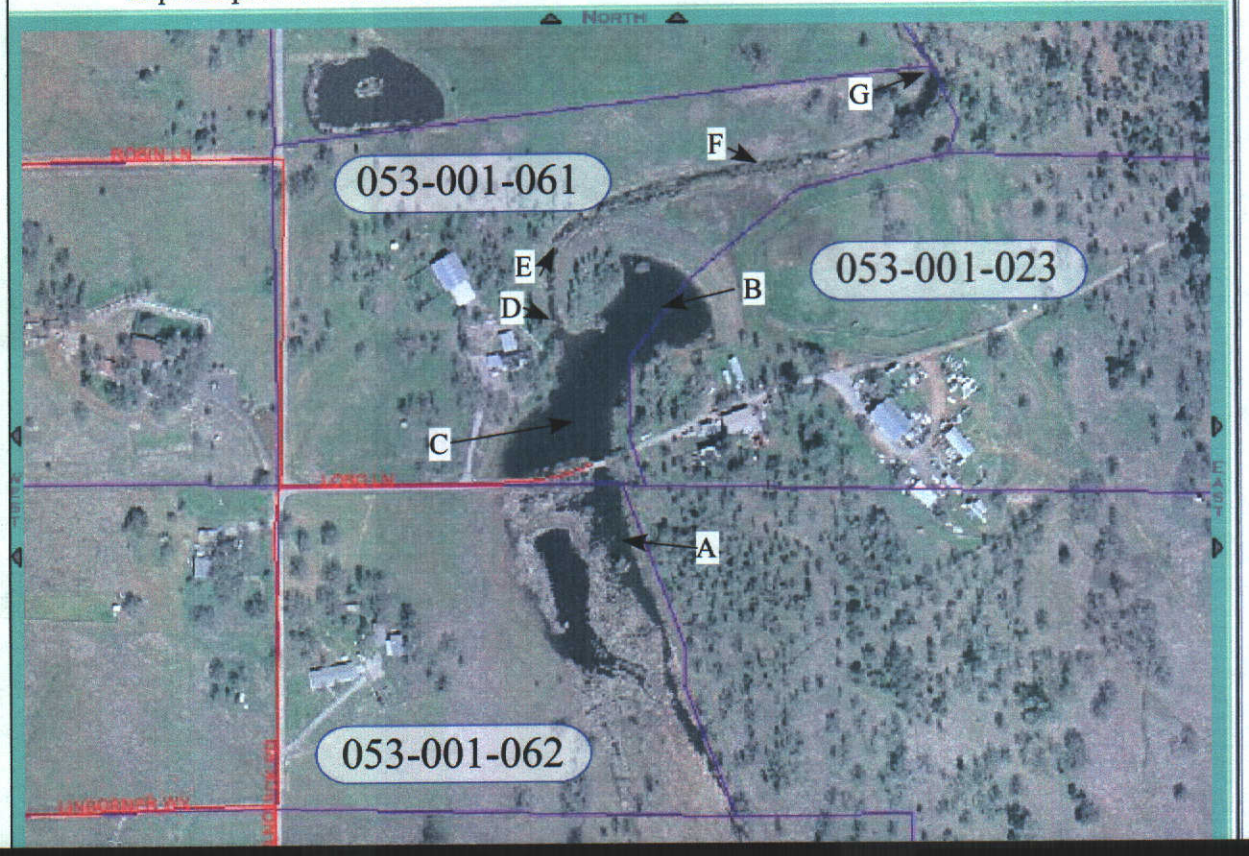
# Environmental setting

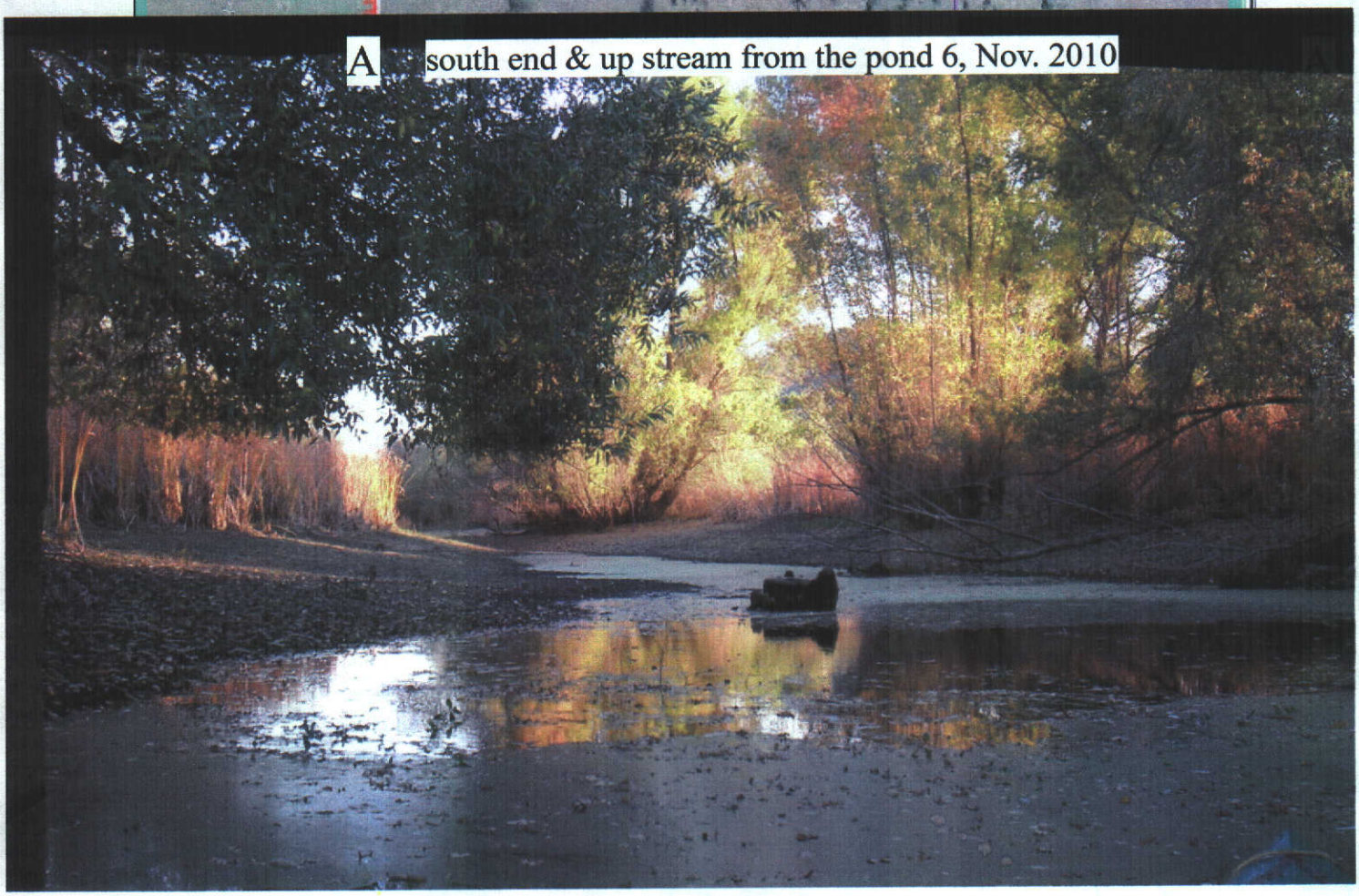
COPY

31671

## Calaveras County Aerial Imagery, 2002 image.

http://mapserver.co.calaveras.ca.us/website/Calaveras2002Aerial_IMSPub/viewer.htm

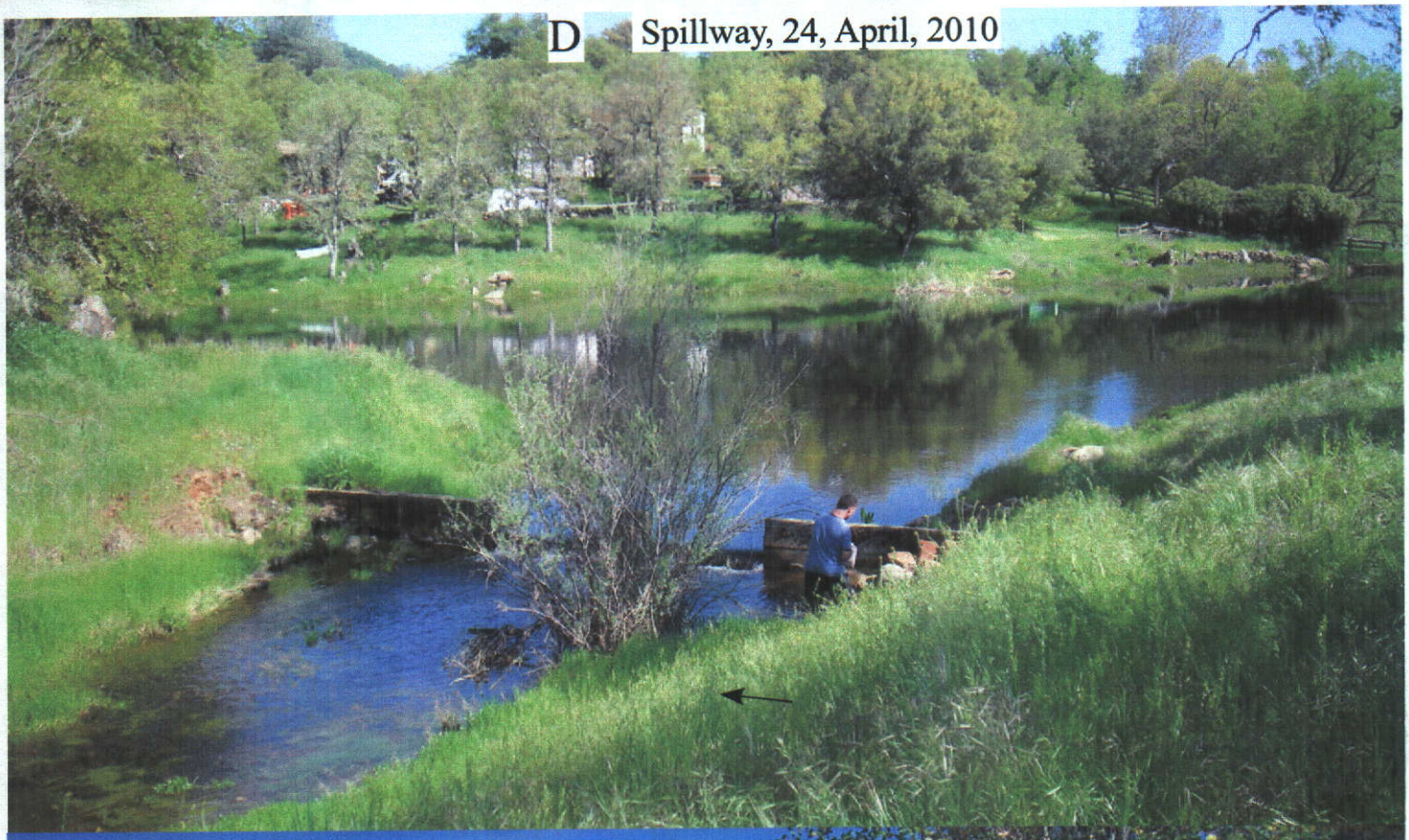


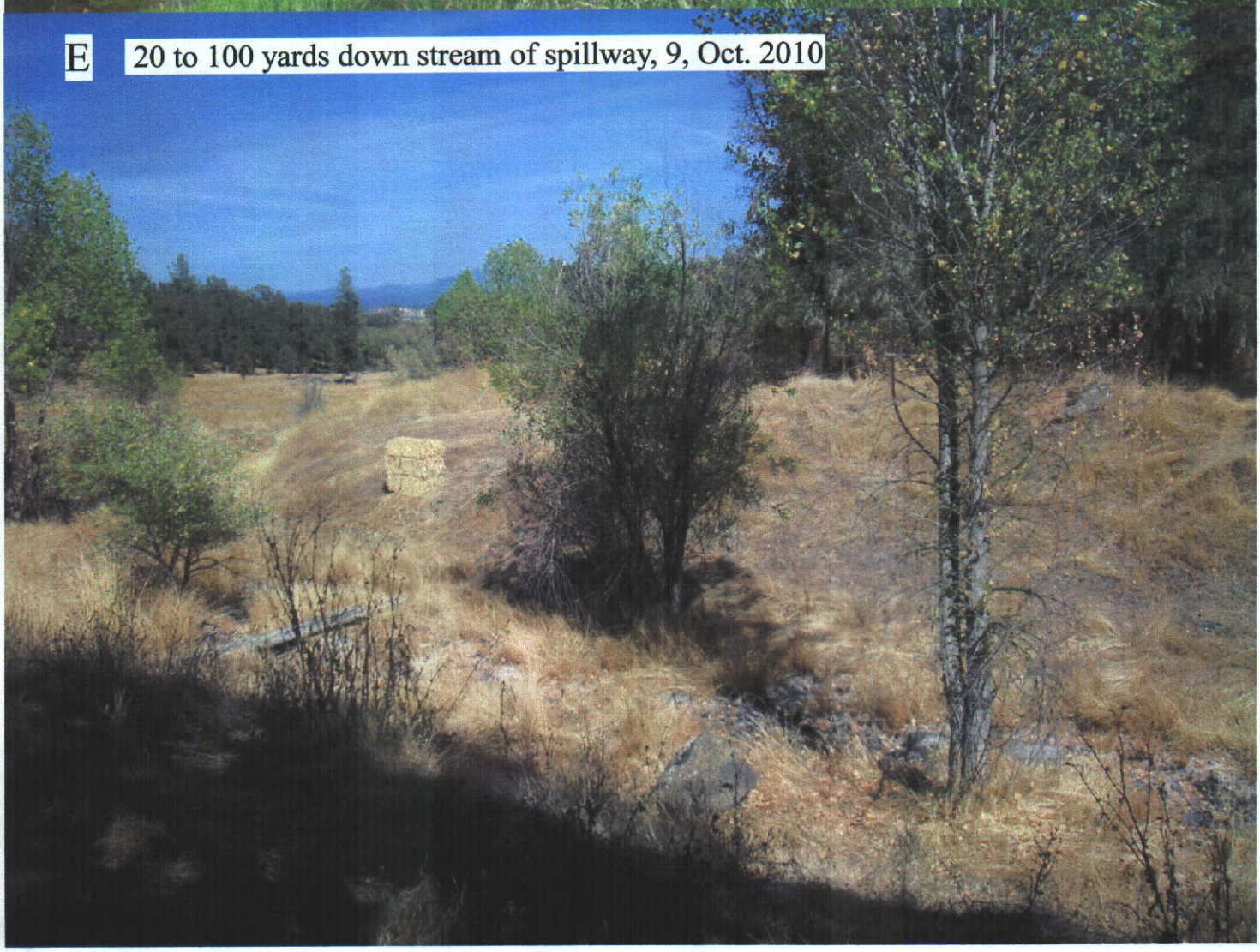
B At the pond, 28 May, 2010

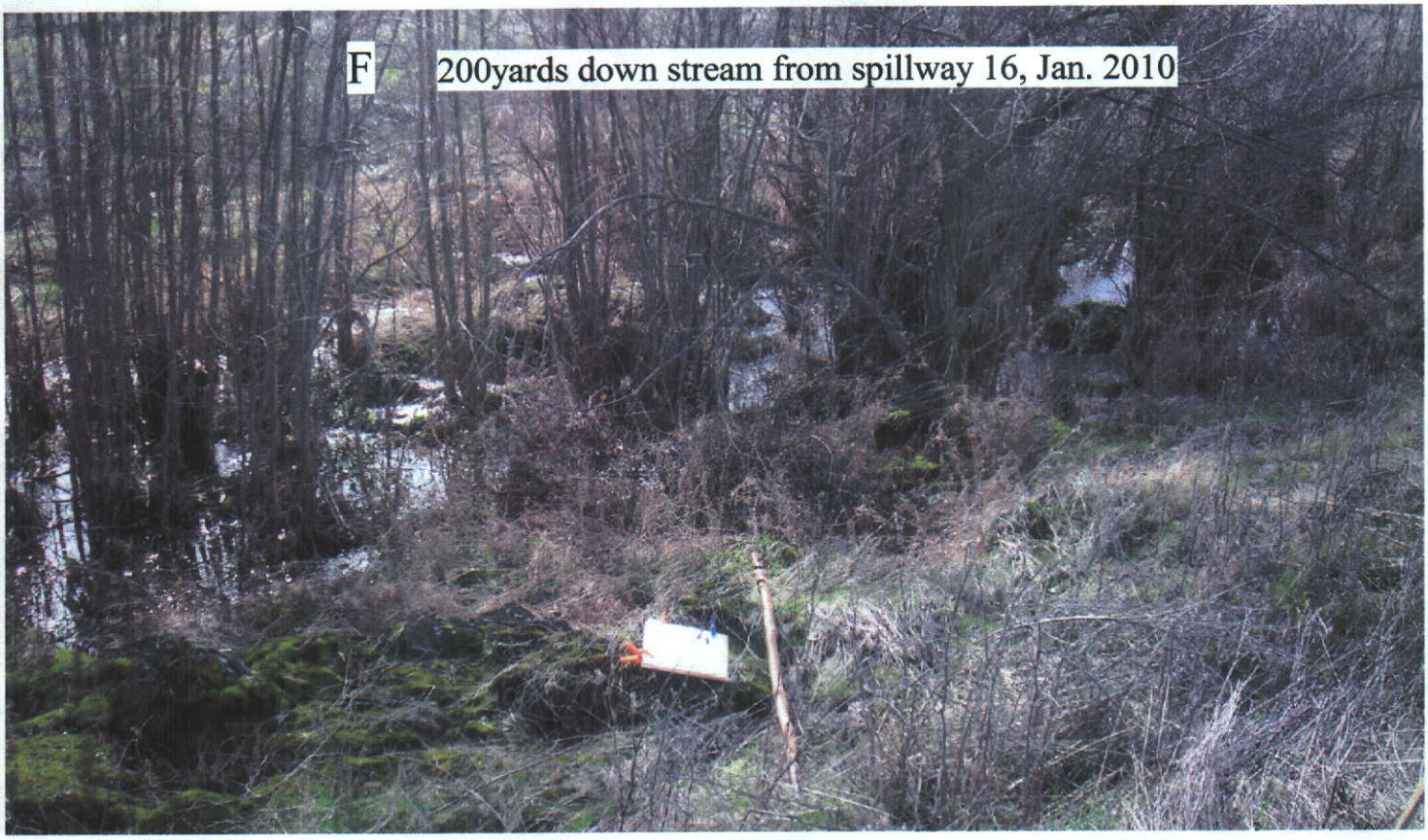
C At the pond, 28 May, 2010

D Spillway, 24, April, 2010



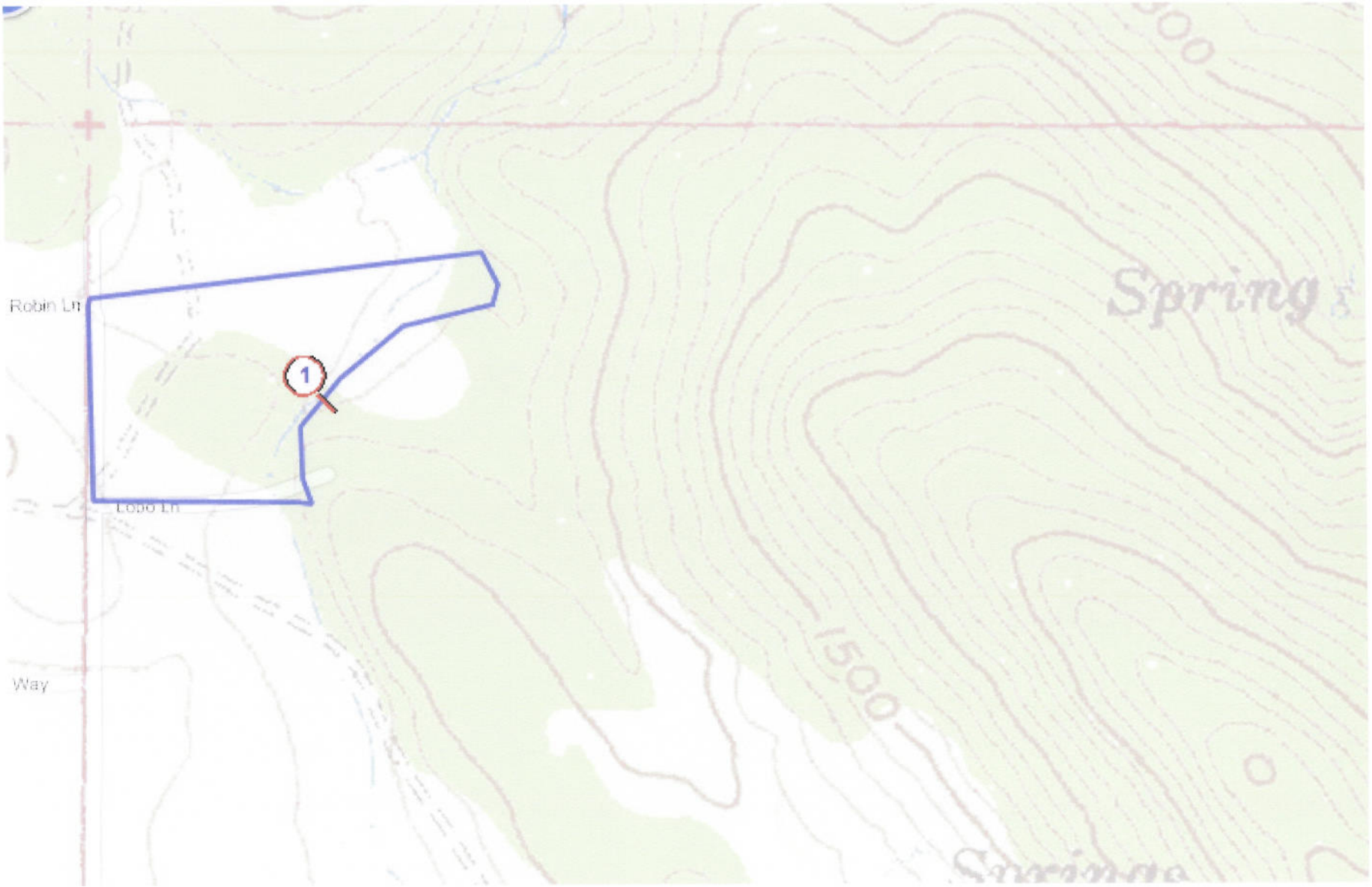
E 20 to 100 yards down stream of spillway, 9, Oct. 2010




F
200yards down stream from spillway 16, Jan. 2010


G
300yards down stream from spillway 16, Jan. 2010

Attachment #4




Calaveras County APN 053-00-061; 153 Lobo Lane, Angels Camp, CA 95222-9597
Located within the NW ¼ of the NW ¼ of Section 34, T3N, R12E, MDB&M (Salt Springs Valley, California USGS 7.5 min. Quad)
POD Coordinates: CCS 83, Northing 2213530, Easting 6519420