

2005 ANNUAL PROGRESS REPORT
FOR THE
ROBLES DIVERSION FISH PASSAGE FACILITY
AND
VENTURA RIVER IMPEDIMENT MONITORING



CASITAS MUNICIPAL WATER DISTRICT
1055 N. VENTURA AVENUE
OAK VIEW, CALIFORNIA 93022
DRAFT

October 27, 2005

TABLE OF CONTENTS

	Page
Executive Summary	
Summary	2
Robles Fish Passage Schematic	2-1
Monitoring	
1. Introduction.....	3
2. Monitoring Plan Data.....	3
2.1 Vaki Riverwatcher	3
2.2 Ventura River Estuary Monitoring	4
2.3 Fish Attraction	4
2.4 Potential Upstream Impediments.....	5
3. Additional Data.....	5
3.1 Temperature	5
3.2 Water Quality.....	6
3.3 Trout Sightings.....	6
3.4 Cost	7
Operations	
1. Facility Status.....	8
2. Flow Observations and Control	10
3. Costs Associated With the Activity	11
4. Assessment of the Effectiveness to Provide Fish Passage.....	11
5. Recommendations Regarding the Prioritization of Future Activities.....	11
6. Recommendations on Any Revisions Deemed Necessary to the Operations.....	12
Evaluation of Diversion Operational Criteria at the Robles Fish Passage Facility	
1 Background.....	14
2. Evaluation Data and Factors	14
Table 1 – Determination of Monthly Flows Under the 1959 Trial Operation Criteria.....	16
Table 2 – Changes to Lake Casitas Storage Resulting from Operational Criteria Differences based on Daily Data and Operational Limits	17
Table 3 – Changes to Lake Casitas Storage Resulting from Release Requirement Differences and Water Passing Over the Cutoff Wall	18
3. Evaluation summary	18
Table 4 – Comparison of Lake Casitas Recovery Under Difference Operational Criteria.....	19
4. Conclusion	19

Appendix A

Riverwatcher Data A-1
 Figure 1 – Summary Table A-1
 Figure 2 – Images of Fish Traveling Upstream on April 20, 2005..... A-1
 Figure 3 – Example of Images of Non-Fish Traveling Upstream on 4/21/05 A-2
 Figure 4 – Images of Algae & Debris..... A-3

Appendix B

Estuary Monitoring
 Figure 1 – Summary Table of Data Collected From Monitoring in 2005 B-1

Appendix C

Fish Attraction
 Figure 1 – Summary Table of Data Collected By Bank & Snorkel Survey in 2005 C-1

Appendix D

Potential Impediments 2004
 Figure 1 – Potential Impediment Locations from Robles to Highway 150 Bridge
 from February/March 2004 Survey D-1
 Figure 2 – Potential Impediment Locations from Highway 150 Bridge to Casitas
 Springs from February/March 2004 Survey D-2
 Figure 3 - Potential Impediment Locations from Casitas Springs to Foster Park
 from February/March 2004 Survey D-3
 Figure 4 – Transect Data of Potential Impediments Gathered in Feb/March 2004..... D-4

Appendix E

Potential Impediments 2005
 Figure 1 – Potential Impediment Locations from Robles Fish Passage to
 Highway 150 Bridge from February 2005 Pre-Survey.....E-1
 Figure 2 - Potential Impediment Locations from Highway 150 Bridge to
 Santa Ana Blvd Bridge from February 2005 Pre-SurveyE-2
 Figure 3 - Potential Impediment Locations from Robles Fish Passage to
 Highway 150 Bridge from May 2005 Pre-SurveyE-3
 Figure 4 - Potential Impediment Locations from Highway 150 Bridge to
 Casitas Springs from May 2005 Pre-Survey.....E-4
 Figure 5 - Potential Impediment Locations from Casitas Springs to
 Foster Park from May 2005 Pre-SurveyE-5
 Figure 6 – Combined Potential Impediment Surveys from Feb. 2005
 and May 2005E-6
 Figure 7 – Transect Data & Photograph of Mark 5 from May 2005 Survey.....E-8
 Figure 7.1 – Transect Data on 6/7/05.....E-8
 Figure 7.2 – Graph of Transect Data on 6/5/05 for Mark 5E-8

Figure 7.3 – Photo of Mark 5 Looking Upstream.....	E-9
Figure 8 – Transect Data & Photograph of Mark 6 from May 2005 Survey.....	E-10
Figure 8.1 – Transect Data Taken on 6/14/05.....	E-10
Figure 8.2 – Graph of Transect Data Collection on 6/14/05 for Mark 6	E-10
Figure 8.3 – Photo of Mark t Looking Upstream.....	E-11
Figure 9 – Transect Data & Photograph of Mark 9 from May 2005 Survey.....	E-12
Figure 9.1 - Transect Data Taken on 6/17/05	E-12
Figure 9.2 – Graph of Transect Data Collected on 6/17/05.....	E-12
Figure 9.3 – Photo of Mark 9 Looking Downstream.....	E-13
Figure 10 – Transect Data & Photograph of Mark 10 from May 2005 Survey	E-14
Figure 10.1 – Transect Data Taken on 6/17/05.....	E-14
Figure 10.2 – Graph of Transect Data Collected on 6/17/05 for Mark 10.....	E-14
Figure 10.3 – Photo of Mark 10 Looking Upstream.....	E-15
Figure 11 - Transect Data & Photograph of Mark 12 from May 2005.....	E-16
Figure 11.1 – Transect Data Taken on 5/26/05.....	E-16
Figure 11.2 – Graph of Transect Data Collected on 5/26/05 for Mark 12.....	E-16
Figure 11.3 – Photo of Mark 12 Looking Upstream.....	E-17
Figure 12 - Transect Data & Photograph of Mark 13 from May 2005 Survey	E-18
Figure 12.1 – Transect Data Taken on 6/20/05.....	E-18
Figure 12.2 – Graph of Transect Data Collected on 6/20/05 for Mark 13.....	E-18
Figure 12.3 – Photo of Mark 13 Looking Downstream.....	E-19
Figure 13 - Transect Data & Photograph of Mark 17 from May 2005 Survey	E-20
Figure 13.1 – Transect Data Taken on 6/13/05.....	E-20
Figure 13.2 – Graph of Transect Data Collected on 6/13/05 for Mark 17.....	E-20
Figure 13.3 – Photo of Mark 17 Looking Downstream	E-21
Figure 14 - Transect Data & Photograph of Mark 18 from May 2005 Survey	E-22
Figure 14.1 – Transect Data Taken on 6/14/05.....	E-22
Figure 14.2 – Graph of Transect Data Collected on 6/14/05 for Mark 18.....	E-22
Figure 14.3 – Photo of Mark 18 Looking Upstream.....	E-23

Appendix F

Temperature Data.....	F-1
-----------------------	-----

Appendix G

Water Quality Data	G-1
--------------------------	-----

Appendix H

Trout Sightings.....	H-1
----------------------	-----

Appendix I

Ventura River Flow Assessment for the Robles Fish Passage Facility – Winter 2005	I-1
Figure I-1 – 2005 Flows at Robles Fish Passage Facility	I-7

Figure I-2 – January 2005 Storm RecessionI-8
Figure I-3 – February-March 2005 Storm RecessionI-8
Figure I-4 – March-April 2005 Storm RecessionI-9

Appendix J

Photo AppendixJ-1

Appendix K

Correspondence..... K-1

Appendix L

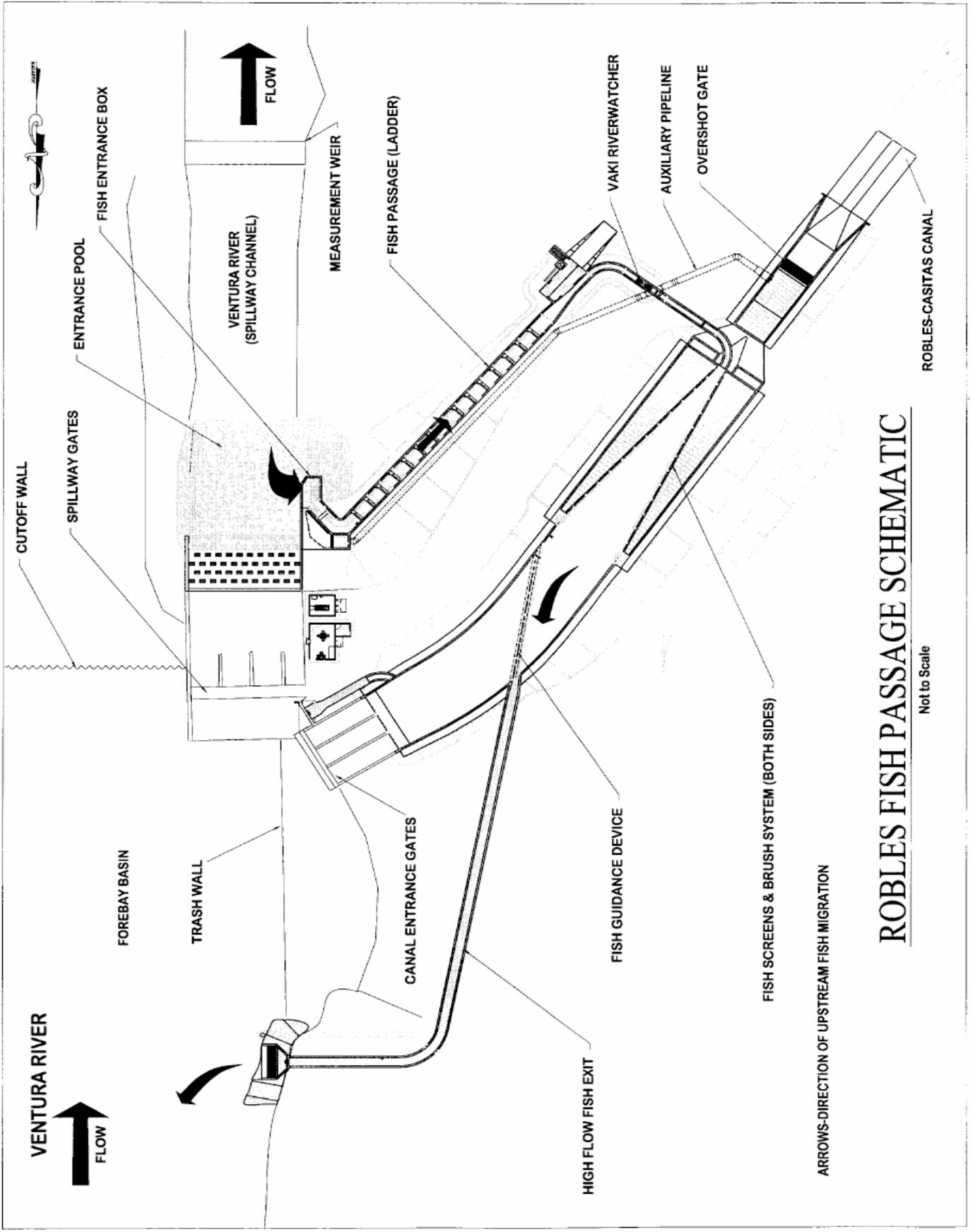
Project Post Construction Performance Evaluation Plan.....L-1
National Marine Fisheries Service Letter dated 10/25/05L-6

Executive Summary

The Casitas Municipal Water District has prepared the following report on the operational and monitoring activities for the Robles Diversion Fish Passage Facility, in compliance with the Biological Assessment and Biological Opinion. The District has operated the facility in an interim status while construction was being completed and has performed certain in-stream monitoring of the Ventura River while the monitoring plan is being developed. At the time of the preparation of this report, the District has completed the interim weir project, which completes the provision of the passage corridor through the Robles reach. The information provided in this report may be considered in the assessment of the facility, although it has been concurred that the operational period for the facility will likely start in the 2006 season.

The Ventura River system has experienced significant rainfall and runoff events during the winter of 2005. The extreme flows in the Ventura River being generated from the Matilija and North Fork Matilija watersheds tested the endurance of the facility and initiated the District to the changes in Robles Diversion facility and its operating procedures. The winter storms provided sufficient peaks and recessions that provided opportunities for monitoring through the winter and spring months. This report provides the information and experiences gathered during the operation of the Robles Fish Passage Facility during the Winter 2005 season.

The District respectfully files this report with the United States Bureau of Reclamation, the NOAA National Marine Fisheries Service, and the California Department of Fish and Game for review by the respective committees associated with this project.



ROBLES FISH PASSAGE SCHEMATIC

Not to Scale

Monitoring

1. Introduction

The following data and observations were taken in 2004 and 2005, before and during interim operations at the Robles Fish Passage Facility (Facility). During that time, Casitas Municipal Water District (District) did not have an agency approved monitoring plan. Therefore, the District collected the following data primarily to determine the feasibility of the workload for the monitoring plan and develop a working plan before the Facility becomes fully operational.

The data provided is divided into two sections; 1) Monitoring Plan Data and 2) Additional Data. That which follows the monitoring plan heading refers to preliminary data collected in a similar manner to the proposed monitoring plan. Most of the efforts at collecting data were trials, i.e. examining the feasibility of workload for the various components of the monitoring plan. Additional data refers to data collected to provide the District with general background information regarding the physical condition (temperature, turbidity, dissolved oxygen) of the Ventura River. All other fisheries related relevant data will be provided in this section as well. Please note that only one part-time District employed fisheries technician collected the vast majority of the data, and was collected to the best of that employee's ability. Time and individual workload were obvious constraints. The District currently employs two part-time fisheries biologists and additional seasonal biologists will be hired prior to and for the duration of the upcoming 2006 steelhead migration season. The current and seasonal employees mentioned above will be trained on proper documentation and fish handling techniques prior to the initiation of the 2006 steelhead migration season.

2. Monitoring Plan Data

2.1 Vaki Riverwatcher

Installation of the Vaki Riverwatcher (Riverwatcher) took place on April 18th 2005 with the assistance of field representatives provided by Vaki. The following day, April 19th, the Vaki representatives trained District personnel on the operation and maintenance of the Riverwatcher as well as the associated computer software. The Riverwatcher was in operation from April 19th through May 19th. The Riverwatcher accumulated a total of 269 counts during this time frame (Appendix A). 159 of the total were recorded as upstream counts and 110 as downstream counts. Of the 269 counts, all but one was assumed to be false. On April 20th one upstream count was positively identified as a fish (Appendix A). However, the exact species of the fish is unknown. The Riverwatcher is programmed to record 5 images of a fish migrating upstream. The first three photos did not capture an image of the fish in question. The fourth photo shows only a small portion of the fish's mouth. The fifth photo shows the head of the fish. It appears that the fish was turning at the exact moment the fifth photo was taken. Unfortunately the turn did not provide a good photographic profile and the exact species remains unknown.

Several problems occurred during the brief interim operations of the Riverwatcher. The most significant problem was the build-up of debris, mainly algae, on the Riverwatcher shroud (Appendix A). First, as algae and debris plugged the shroud, the scanner became blocked. The Riverwatcher unit has a built-in monitor, which is constantly watching for anything that may get stuck in the scanner. If the monitor records more than 25 disturbances (for example, a large clump of algae) at the same area in one hour, it will give the counter instructions to start ignoring this area. As a result of this fail-safe mechanism, if a fish swims through the scanner at this "ignored" area, it will not be counted. Second, debris and algae trapped in the Riverwatcher shroud restricted the flow of water through the fish ladder. In turn, an increase of water velocity through the Riverwatcher occurred. Increased water velocities are not favorable for the safe and successful passage of steelhead migrating through the fish passage facility.

The Riverwatcher was cleaned twice during interim operations. On 5/16/05 the District's fisheries technician climbed into the fish passageway and pulled the algae and debris off the shroud. However, two days after the initial cleaning the Riverwatcher was plugged with algae and debris again. This time, the entire Riverwatcher unit

was pulled out of the fish passageway and cleaned. Fish ladder operations had to be shut off for the duration of the cleaning, approximately one hour. The District recognizes that the flows in the Ventura River during the 2005 steelhead migration season were unusual due to the large amounts of rainfall. Atypical flows continued through the month of June, when the air temperature was well into the 80's, contributing to large algal blooms. The District is expecting algae and debris to be a problem in the future, however, the extent to which is unknown. Until data regarding algae/debris management is gathered by the District and then analyzed by the Biological Committee, the only efficient way to clean the Riverwatcher will be to shut down fish passage operations for a short period of time, pull the entire unit out and remove the algae/debris by hand.

The Robles BA/BO states that the Riverwatcher would be operational at a minimum flow of 10cfs through the fish passage. Through preliminary operation, it appears that the minimum operational flow of the Riverwatcher is around 35cfs. Further observations during the upcoming 2006 monitoring season will provide the District with information on the minimum operational flow of the Riverwatcher.

2.2 Ventura River Estuary Monitoring

The Ventura River estuary was monitored on numerous occasions from January through June 2005 (Appendix B). The District's fisheries technician monitored the estuary to determine when the sandbar located at the mouth of the estuary had breached. Also of interest was the duration of time that it stayed open. Field observations concluded that on all monitoring dates the sandbar was breached, allowing steelhead of all age classes to freely enter or exit the Ventura River.

An interesting field observation was that the mouth of the estuary at some point shifted from the south bank to the north bank. At the beginning of the monitoring operations, the mouth of the estuary was on the south bank. Following the three major storm events the mouth of the estuary shifted to the north bank. This observation does not affect the District's data in any way, but it does show the very dynamic nature of the Ventura River.

2.3 Fish Attraction

Several bank and snorkel surveys were completed to determine if steelhead were migrating upstream. The surveys were primarily focused at or near the Facility, at the Fish passage entrance pool and downstream of the measurement weir. The measurement weir site was chosen because it was considered an impediment to upstream migrating steelhead and to observe if steelhead, unable to pass over the weir, were congregating below the weir. The pool was chosen because it is a requirement of the Robles BA/BO and allowed the District to judge the feasibility of conducting such surveys in the coming years as part of the Robles Monitoring Plan. The other surveys were at random location, chosen to observe if steelhead were present in other locations in the river.

Between 1/14/05 and 5/17/05 24 bank or snorkel surveys were completed (Appendix C). 17 of the surveys were conducted at or near the Facility, with 14 of them at the entrance pool or measurement weir. Most of the surveys were bank with only 4 of the 24 surveys being snorkel surveys. No steelhead were observed during any of these surveys. Not until late spring, 5/17/05 snorkle survey, were any fish observed. The small number of fish observed were arroyo chub, three-spine stickleback, and mosquito fish.

It was difficult to conduct effective surveys after storm events because of the high flows and high turbidity. For instance, on 1/14/05, 4 days after the peak of the storm event, visibility at the entrance pools and measurement weir was less than 1ft (visually estimated). Four days later, on 1/18/05, the visibility was still less than 1ft (visually estimated). By the tenth day after the peak of the storm event, on 1/20/05, the visibility was less than 2ft (visually estimated). Poor visibilities, such as the ones above, make bank and snorkel surveys an ineffective tool during high flows and high turbidities.

2.4 Potential Upstream Impediments

Potential impediments to upstream migration were identified in the 2004 season (Appendix D). On 2/26/04, 2/27/04, 3/3/04, and 3/4/04 potential instream impediments were identified and water depth transects were conducted at several of the potential impediment sites. Twenty-eight potential impediments were identified, using professional judgment, between the Facility and Foster Park. Twenty transects were completed at various impediment location, with multiply transects at several of the sites. At the time of the survey the flows measured at the Robles Measurement Weir (VRNMO) were between 11cfs and 18cfs. In general, for each cross-sectional transect, a measuring tape was strung across the river perpendicular to the flow. Water depths were then recorded at 2ft intervals between the wetted edges of the channel.

In 2005 a potential impediment pre-survey was conducted on 2/3/05 and 2/10/05 (Appendix E). The survey was conducted from the Facility to the Santa Ana Blvd Bridge. The survey was intended to be conduct from the Facility to Foster Park, but a large storm event mid-month prevented the completion of the survey. At the time of the survey, river flows were measured at VRNMO to be between 80cfs and 91cfs. Twenty-eight potential impediments were identified, using professional judgment, between the Facility and Santa Ana Bridge. Each impediment was identified, marked on a map, and drawn in a field notebook. In addition, rebar head pins, flagged with impediment number, were staked into the ground on the left and right banks were future transects surveys were to be conducted at most potential impediment. Because of the large storm event in February, no transects surveys were completed and it was decided to wait until later in the migration season to re-survey the river.

In May of 2005, a pre-survey to identify potential impediments was repeated (Appendix E). On 5/10/05, 5/11/05, 5/13/05, and 5/19/05 the survey was conducted from the Robles Fish Passage Facility to the Foster Park Bridge. At the time of the survey, the flows measured at VRNMO were between 68cfs and 74cfs (note: on 5/19/05 the recorded flow was 127cfs because of water releases from Matilija Reservoir, but survey was conducted in the morning and was not influenced by the increased flows). Seventeen potential impediments were identified using professional judgment. GPS points and photographs and water depths were taken of all potential impediments enabling their prioritization in order of increasing severity.

On 5/26/05, 6/7/05, 6/13/05, 6/14/05, 6/17/05, and 6/20/05 the transect surveys were conducted at the impediments deemed most severe (Appendix E). At each cross-sectional transect site, flagged rebar head pins were staked on each side of the channel, perpendicular to the flow. A measuring tape was strung from one head pin to the other and water depths were recorded, in a field book, every 2 feet, starting from one wetted edge and ending at the other wetted edge. During the transect surveys; the flows measured at VRNMO were between 33cfs to 60cfs. As seen from the impediment data provided, the Ventura River is constantly changing. Many of the impediments surveyed by Entrix in 1999 are no longer in existence. The same applies to a large number of potential impediments observed in 2004 and early 2005.

During the 2006 steelhead migration season, as outlined in the monitoring plan, the fisheries biologists and seasonal technicians will perform more extensive surveys using flow models to determine ideal flows for safe upstream steelhead migration.

3. Additional Data

3.1 Temperature

Although, not a requirement of the BA/BO, the District has and will continue to collected water temperature data from various locations on the Ventura River and its tributaries. Water temperatures are collected using HOBO Water Temp Pro underwater temperature probes. The temperature probes are set to record water temperatures at either every 6 minutes or every 15 minutes, although the majority has been set to record every 6 minutes.

At the start of 2005 Steelhead migration season 8 HOBO temp probes were actively recording temperatures, they included: upper Matilija Creek, Matilija Creek above dam, Matilija Creek below the dam, North Fork Matilija Creek, Facility, Foster Park, Main St. Bridge, and Estuary.

During the storm events of 2005, 5 of the 8 temperature probes were lost. In addition, a probe was installed in the Ventura River, near the Highway 150 Bridge, on 1/28/05. Recently, an attempt to be collected data from the probe was made, but the data was unable to be collected. It is believed that the temperature probe was damaged during the large storm events. On 2/15/05, a replacement probe deployed on upper Matilija Creek. On 5/15/05, the upper Matilija Creek site was visited and temperature probe could not be located, it is assumed that the probe was lost during the large storm event in February. Overall, 7 temperature probes were lost and/or damaged during 2005 fish migration season.

Additional problems occurred this year including: dropping a PDA, used to download data from data-logger in the field, into the water and losing of several data files; improper set-up of probe, which causes the probe not to record any data; and allowing PDA to run out of power thus losing data stored on PDA.

No analysis of the water temperature data has been completed this year. The District is in the data collected process and will focus on analysis in the future when more data has been collected (Appendix F). The District will continue to monitor water temperatures in the river using the temperature probes. In, addition replacement probes will be placed in location where probes were lost early in the year before the next fish migration season. One replacement temperature probe has already been placed in the Ventura River near Foster Park. Additionally, all attempts will be made to prevent data loss over in the future.

3.2 Water Quality

The water quality sampling is not a requirement of the Robles BA/BO, but the District believes that valuable information can be gather on the physical nature of the Ventura River. Water is sampled for temperature, dissolved oxygen, and turbidity, in the Ventura River, with the majority of sampling occurring within Robles Reach.

The majority of samples were collected between mid May through late June (Appendix G). The primary sample sites are at the Facility, Highway 150 Bridge, Santa Ana Blvd Bridge, and Foster Park. Water temperatures ranged from 12.7 °C to 24.3 °C, dissolved oxygen ranged from 8.36 mg/L to 9.83 mg/L, and turbidity ranged from 0.42 ntu to 1.33 ntu.

No analysis of the data was completed this year. Several more years of data will need to be collected before any formal presentation of the data is made. The District will continue to collect water quality samples in the Ventura River over the next several years.

3.3 Trout Sightings

Between 5/10/05 and 5/18/05 14 trout were observed at or near the Robles Fish Passage Facility (Appendix H). Although 14 trout were observed, on two of the days, multiple observations were made on the same day, thus the fish were probably recounted. In addition, because of the short time period of observation, many of the fish were probably counted multiple times, thus it is impossible to get an accurate count of how many fish were actually at the Facility. The Riverwatcher was operational at the time of the sighting, but no fish were counted during that time period (the fish may have been counted but the Riverwatcher images could not be differentiate between debris or fish). Attempts were made on 5/17/05 to observe the fish underwater by snorkeling, but no trout were observed at the time. In general, the observations were of secondary actions, other activities were being done at the Facility and trout happened to be observed. In the future, the District will continue to note if trout are observed at or near the Facility, but will not be an active part of any monitoring activities.

3.4 Cost

Employment costs were approximately \$19,597 from July 2004 through June 2005, providing approximately 1256 hours of employee time for fish monitoring activities, report/grant writing, development of the monitoring plan and other associated activities. Two part-time fisheries biologists are currently employed by the District; one worked for the entire year, the other for approximately 4 months.

Equipment cost for the monitoring activities for the Facility were approximately \$4000 for the 2005 season. Equipment purchased included: turbidity meter, DO meter, drysuit, snorkeling equipment, wading equipment, stream survey equipment, nets, measuring boards, camera, and other miscellaneous equipment. All of the equipment purchased will be used during the implementation of the Robles Monitoring Plan. Additional equipment will need to be purchased for the 2006 season to assist with implementation of the Robles Monitoring Plan.

Operations

1. Facility Status

The construction of the Fish Passage Facility began in August 2003. By October 2004, when the first runoff was seen in the Ventura River for the 2004/05 season, the following portions of the Fish Passage Facility were complete and operable:

- Fish passage structures including the 5 entrance gates and the sill gates.
- Diversion channel structures
- Fish Guidance device
- High-flow fish passage
- Fish screens & diffusers
- Diversion headworks
- Spillway gates
- Level measurement devices (bubblers) at the measurement weir and in the Diversion canal

The following items **were not complete**:

- Overshot gate
- Fish screen cleaning (brush) system
- Control for all of the new gates
- All new instrumentation
- Vaki Riverwatcher
- Interim and permanent weir/low flow crossing modifications

The fish passage is designed to operate based on the water elevation of the diversion channel and the forebay. The overshot gate is the primary elevation control element. The spillway gates were used to control the elevation of the diversion channel and forebay until the overshot gate became operational on February 20, 2005. The facility began to receive stream flows during the week of October 22, 2004.

During the week of December 17, 2004 the brush drive units were installed. The Contractor and Casitas began to operate and test the brush system during the week of December 26, 2004. Prior to the brush system being operable, Casitas had four of the fish screen panels removed. The brushes operated reasonably well for a 24 hour period so Casitas made the decision to install the remaining fish screen panels. The brushes failed within 24 hours of the fish screen panels being installed. Casitas attempted to operate the fish passage and diversion without the brushes and with the screens in place, through the storm events of December 30 and 31. On December 31, with flows carrying heavy debris loads, Casitas decided to remove four fish screen panels to allow for diversions. The resource agencies were contacted before the screens were removed. However, because of the holiday season, contact was not completed until after January 2, 2005.

Beginning on January 9, 2005 a large storm hit the Ventura River watershed and most of Southern California. The storm was later declared a federal disaster. This was the first storm after January 1, thereby beginning steelhead migration season. The storm developed flows well in excess of 7000 cfs and provided heavy sediment and debris loads entering the Fish Passage Facility. The heavy sediment loads deposited in the forebay basin and caused a split in the river flow, with approximately half of the flow being sent over the cutoff wall and the other half through the fish passage facility. The split flow

condition persisted through the winter, spring and summer periods. The heavy sediment flows silted in portions of the diversion channel and prevented any further testing of the brush system. Extensive damage was caused to the fish guidance device. Many of the vertical panels were bowed and sprung out of the fish guidance device framing. During the recession of the storm, the facility was operated in accordance with the BA/BO for required augmentation flows.

During the week of January 21, 2005, the overshot gate became operational. Instrumentation and controls were still limited, but Casitas personnel began controlling the level of the diversion channel with the overshot gate on that date.

During the week of February 23, 2005, the fish passage facility was shut down for a morning to allow for the removal of sediment, make some repairs to the brush system and reinstall the fish screens. This allowed Casitas to get one brush operating on a limited basis. Additional instrumentation also came on line at various times, as the contractor completed the installation of each system and device. The flow meter for the fish passage was installed. However at flows below about 35 cfs, the readings did not correlate with the reading at the measurement weir. The manufacturer's installation technician explained the system uses Manning's equation if only one transducer is wet. The system has four transducers. Manning's equation requires a slope. The fish passage is flat in this area thereby providing an erroneous reading. The correction is to lower two of the transducers further in the channel. *(Casitas had the contractor lower the transducers during the July maintenance shutdown. The low flow readings seem to be tracking must closer to the measurement weir readings).*

On March 21, 2005, Lake Casitas reached two feet below spill elevation. The standard operating procedure is to stop diversions once the lake reaches two feet below spill elevation. Casitas stopped diversions from the Robles Fish Passage Facility on March 21, 2005. The flows entering the Robles Diversion and Fish Passage Facility continued to be released downstream through the fish ladder and spillway (Note that flows also continued to pass over the cutoff wall due to the split flow condition).

During the week of April 18, 2005, the Vaki Riverwatcher unit was set up by the manufacturer. The unit recorded a picture of a fish's head on April 20. Algal growth and low flows prevented further operation of the unit. The species of fish could not be determined from the picture. The unit was removed from the shroud and stored for next season.

In late May, Casitas received authorization from the Bureau to divert additional water to Lake Casitas. Casitas moved water from storage at Lake Matilija to Lake Casitas. This is done by releasing water from Lake Matilija into Matilija Creek and the Ventura River and diverting this water from the river to Lake Casitas through the Robles Fish Passage. NOAA Fisheries was notified of Casitas' intentions prior to the diversion operation. Because of the sediment in Robles Fore bay resulting in split flows and the high levels of algae in the water, the efficiency of the storage relocation was quite low, resulting in higher downstream flows in the river. Casitas began the relocation of the water on May 19 and ended the relocation on May 20. When the relocation of the water was ended, the discharge valve at Lake Matilija was not set correctly, resulting in lower than anticipated river flows. The valve was set on a Friday before a holiday weekend and was readjusted early on the following Tuesday. In the future, Casitas will avoid stopping the relocation of stored water on a Friday.

During the late spring and summer seasons, it is Casitas' practice to balance the flows at Lake Matilija. This is done by adjusting the discharge valves at the Matilija Dam to maintain a reasonably constant lake elevation. In late July, the Robles spillway gates were opened, thereby diverted water around the fish passage, to allow for the removal of debris from the fish passage and for maintenance. A fish

presence/absence survey was conducted by the District's biologist prior to changes being made in flow routing. The debris required removal before Casitas could begin to correct the brush system deficiencies. Upon completion of the work, the spillway gates were closed and water was routed through the fish passage again. Casitas continues to test and modify the brush system.

The District has taken numerous photographs that chronicle the events of the Winter 2005. The photographs are attached to this report in Appendix J.

The District communicated frequently with agency staff regarding the experiences and status of the fish passage facility. Many of these communications are in the form of emails and letters, and are attached to this report in Appendix K.

2. Flow Observations and Control

The District collected flow information and verified flows where and when reasonably safe conditions existed in the Ventura River. There were also new flow measurement devices placed in the Robles Fish Passage Facility that were eventually activated and tested during the 2005 winter season. The primary points of measuring and recording stream flows entering and leaving the Robles Diversion and Fish Passage Facility are:

- Matilija Creek at Matilija Hot Springs – located approximately 2,100 feet downstream of Matilija Dam – good rating for low to moderate flows – operated by Casitas Municipal Water District, formerly a USGS station;
- North Fork Matilija Creek – located approximately 3,000 feet upstream of its confluence with Matilija Creek – good rating for low to moderate flows – operated by the Ventura County Watershed District;
- Robles-Casitas Diversion Canal – located on the diversion canal approximately 1,300 feet downstream of the Robles Diversion Dam – trapezoidal channel with a good rating for flows up to 600 cfs;
- Ventura River near Meiners Oaks (VRNMO) – located approximately 540 feet downstream of the Robles Diversion Dam – concrete weir section – good rating to 70 cfs, use of equations above 70 cfs with poor ratings above 1000 cfs (no verifications at higher flows).

The information gathered from each of these locations have been reduced to the daily reporting of flows in the form of cubic-feet per second-day (cfsd). The spreadsheets are in Appendix I, entitled “Ventura River Flow Assessment for the Robles Fish Passage Facility – Winter 2005”.

The spreadsheets also provide the data for the elevation of water level driving flows through the fish ladder and the diversion canal. The flows down the fish ladder were primarily represented by the flow measurements at the Ventura River near Meiners Oaks (VRNMO) weir. The instrumentation in the fish ladder channel was not operable for a portion of this period and it was recognized that the fish ladder instrumentation was not accurate at the 30 cfs flow setting. In July 2005, the District had the construction contractor reposition the flow sensors to accurately monitor flows in the fish ladder below the 30 cfs setting. Because of this recognized inaccuracy, flow releases from the fish ladder are represented by the data collected at the VRNMO weir.

The summations of flow data gathered at each of the primary stream gaging stations provide an assessment of the total flow entering and leaving the Robles reach. A calculation is provided to approximate the amount of water that did not move through the facility, but rather was directed to move

over the cutoff wall. There are no monitoring stations directly downstream of the cutoff wall to account for this split in flow. The calculation of the water traveling over the cutoff wall is reasonable, from Casitas observations, for the non-storm event flows. It is recognized that there are differences between actual flow and the rating curve flow for the higher flow regime primarily due to the lack of verifying field measurements at these higher flow rates. As noted during each major storm, large flows traveled over the cutoff wall during these event that are not reflected by the negative numbers in the calculation. It is important to note that during all flow conditions for the winter through the summer of 2005, a considerable amount of water did travel over the cutoff wall and into the lower river system without being monitored through the Robles Diversion and Fish Passage Facility.

The District implemented the stormflow supplementation release pattern criteria as specified in the BA/BO.

3. Costs Associated With The Activity

The BA/BO specified that the District provide the costs that are associated with the activity. The following is a summary of the direct costs incurred by the District during the 2004-05 fiscal year:

• Monitoring:		
Salaries	\$	19,597
Equipment	\$	<u>4,000</u>
	\$	23,597
• Operations:		
Salaries	\$	18,486
Equipment	\$	<u>368</u>
	\$	18,854
• Capital Improvements:		
Fish Passage Facility		
Salaries	\$	79,551
Equipment	\$	1,432
Outside Contracts	\$	<u>2,463,407</u>
		\$2,544,390
Interim Weirs		
Salaries	\$	0
Equipment	\$	68
Outside Contracts	\$	<u>38,700</u>
	\$	38,768

4. Assessment Of The Effectiveness To Provide Fish Passage

The facility is in the initial start up phase. An assessment of the effectiveness cannot be provided at this point in time.

5. Recommendations Regarding The Prioritization Of Future Activities

The District is in the initial start up phase of facility operations. Key elements include:

- Installation of interim weirs below the measurement weir.
- Damage restoration of the fish guidance panels after the 2005 storm.

- Installation of additional trash wall height to prevent debris flow into the facility.
- Adjustments and alterations to the brush system.
- Completion and approval of the fisheries monitoring plan.

6. Recommendations On Any Revisions Deemed Necessary To The Operations

- A. The District is in the start up phase of the project. Key recommendation to the operations are contained in the attached letter from the District and NOAA dated July 29, 2005, attached to this report in Appendix K. The following understandings in this letter are to be applied to the operations of the system:
- 1) Fish Screen Maintenance. Casitas will make every reasonable attempt to repair the brush system in accordance with the maintenance procedures (BA Section 2.5.3, BO page 15). If the repairs are more extensive or that the debris loading has elevated to above the capacity of the brush system, Casitas will (1) perform a fish survey of the river both above and below Robles to assess whether or not fish migration is occurring, and (2) if Casitas' fisheries biologist determines that fish are not moving through the passage facility, Casitas will remove selected numbers of fish screen panels from the most upstream section of the fish passage to provide water for diversions, (3) monitor fish migration at the facility on a daily basis during the repair period, (4) reinstall the fish screens if either there are fish migrating through the facility or if the fish screens can be returned to operational capacity (either mechanical devices are repaired or the level of debris has diminished to operable levels).
 - 2) Revise the BA/BO condition that maintenance work in the forebay "when the channel is dry" to an understanding that this work can proceed when the channel is not dry provided that the water is diverted around the work and the diversion methods follow the best management practices.
 - 3) The five-year trial period will start next season.
 - 4) If the flow entering the fish passage is blocked or significantly reduced because of irregular sediment loading in the settling basin of Robles, Casitas can move sediment the minimum necessary to restore flows. Casitas will only move sediment after notifying the agencies of the intent to do so. Surveys for fish in the area will be conducted by Casitas' Fisheries personnel prior to the sediment movement and Best Management Practices will be followed to minimize environmental issues.
- B. The BA/BO are not specific on the point in time that a determination is to be made regarding a recommendation for adjustments in release patterns from the system. Staff has determined that a flow condition assessment will be made during the period of 0800 to 100 hours and the adjustment made between 100 to 1200 hours of each day.
- C. The District is also planning to implement the Post-construction Performance Evaluation Plan (Appendix L) during the Winter 2006. The ability to perform the system evaluations is dependent upon the Ventura River developing desirable flow conditions and the ability to divert to Lake Casitas.

D. The District recommends a change in the submittal schedule of future draft reports to the Bureau of Reclamation to December 1 and February 1 to move the report to the committees for the following reasons:

- 1) Normal water year data is gathered at all stations on October 1 and processed during the month of October for all other reporting purposes.
- 2) The existing schedule does not allow for time to implement committee recommendations prior to the next season.

Evaluation of Diversion Operational Criteria at the Robles Fish Passage Facility

The District is interested in evaluating the change, if any, to diversions at the Robles Diversion Dam on the Ventura River that results from implementing a change of operation from that of the 1959 Operational Criteria to the operational criteria prescribed in the Robles Fish Passage Facility Biological Assessment and Opinion. The events of 2005 can provide an insight into the level of impact to stored water supply in Lake Casitas that results from the change in the operation criteria at Robles Diversion Dam.

1. Background

The 2005 winter storms produced large peak flow events and long flow recessions in the upper reaches of the Ventura River. During the 2005 winter, the District operated the Robles Diversion Dam in accordance with the BA/BO criteria and collected data as water passed through and around the facility. The District did stop diversion operations on March 20th as required by Standard Operating Procedures for Lake Casitas reaching the two feet from spill level. The District did receive permission from the Bureau of Reclamation to divert while Lake Casitas was less than 2-feet from spill condition and performed the diversion in late May 2005 that move approximately 116 acre-feet of water from Matilija Dam to Lake Casitas.

The key questions to answer for the water supply storage side of the equation are:

Did Lake Casitas storage level recover to a similar or equal level of storage with either operational before the onset of the following summer, or the onset of the next drought cycle? If not, what are the calculated differences in storage resulting from the two different operational criteria, the 1959 Trial Operating Criteria and the BA/BO criteria?

Also, what is the difference in storage at Lake Casitas if the water passing over the cutoff was available for diversions to Lake Casitas?

In the following evaluations, the data is reviewed to provide answers to these questions.

2. Evaluation Data and Factors

There are several ways to evaluate the impacts resulting from operational changes, all depending upon the variation of limiting factors applied in each evaluation. The following evaluations use the data gathered during the 2005 winter season, beginning December 1, 2004 and ending June 30, 2005, to assess the impact to Lake Casitas water storage. The constant factors in the evaluation are the actual data for diversions at Robles to Lake Casitas, direct inflow to Lake Casitas, precipitation, evaporation, releases to the main conveyance system, and stream flow measurements at Matilija Creek at Matilija Springs, North Fork Matilija Creek, and Ventura River near Meiners Oaks (measurement weir).

Because the District was operating in accordance with the BA/BO criteria, the operation under the 1959 Trial Operating Criteria will have to be synthesized in order to perform a comparison. The other piece of data that had to be calculated was the amount of water passing over the cutoff wall. The cutoff wall is not equipped with a flow monitor and therefore must be determined by the addition and subtraction of other known flows.

The evaluation first established whether there was water available in the system entering the Robles forebay, in excess of 20 cfs, that could be diverted and that was otherwise released downstream. If so, this amount of water that could have been diverted is accounted for in the “Divertable Releases” column. The upper limit to the amount of water included in divertable releases is capped by the 500 cfs capacity of the diversion canal. There are several factors that may be attributed to the divertable releases, including but not limited to the difference between operational criteria release requirements, clogging of fish screens that reduces the diversion transfer efficiency, and/or storm debris interference with diversions. Table 1 presents a monthly summary of the water releases and divertable releases that would have otherwise occurred under the 1959 Trial Operating Criteria during the Winter 2005 conditions. This evaluation does not include as a divertable release the shift of the river flow to pass over the cutoff wall, as it did during the winter of 2005, although the flow over the cutoff wall is calculated and presented in Table 1.

Once the divertable releases under the 1959 Trial Operating Criteria conditions for Winter 2005 has been determined, Table 1, the divertable releases can applied to determine the change in the Lake Casitas storage level with the addition of the divertable releases. It should be noted that the same standard operation procedures is applied in regards to the limit of storage and the requirement to cease diversion when Lake Casitas reaches two feet from spill stage. The initial storage level for this analysis was selected as the actual December 1, 2004, storage level of 158,406 acre-feet. The variable in this analysis is the “Adjusted Diversion” based on divertable releases. The monthly changes to Lake Casitas storage are summarized in Table 2. It is noted that the diversions that occurred during December 2004 were not under the influence of the BA/BO Criteria, but were partially impacted by the presence of the fish screens.

The system flows were further evaluated to include in the previous evaluation the potential to divert water that was otherwise allowed to course over the cutoff wall. The “Adjusted Diversions” is re-calculated to include water the may have been redirected to the fish passage channel rather than allowed to course over the cutoff wall. The changes to monthly storage are summarized in Table 3.

Table 1 - Determination of Monthly Flows under the 1959 Trial Operating Criteria

The purpose of the following spreadsheet is to calculate the diversions that would have occurred if operated under the 1959 Trial Operating Criteria for Robles Diversion Dam and without the fish passage facility. The impact of the water flowing over the cutoff wall is not considered in this evaluation, but is noted.

Method of Calculations:

For the period of this evaluation, the hydrologic records from the Ventura River near Meiners Oaks gaging station (VRMO) and the Robles Canal gaging station were implemented. These records provide daily flows in terms of cubic feet per second-day (CFSD).

The divertable flow does not include water that flows over the cutoff wall.

The flow measured at the VRNMO weir (4) is reduced by 20 cfsd, for flows above 20 cfsd, to provide divertable waters (5) in accordance with the 1959 Trial Operating Criteria.

Column (6) is the difference of the divertable release (5) and the Diversion Canal (3), contributing to equal or less than 500 cfsd canal diversion.

For period that the cutoff wall flow numbers are negative, the negative value is not a part of the sum and that day is not included in the total value. Note that these discounted days were generally during extremely high flow periods, and therefore the estimated total water passing over the cutoff wall is less than the actual quantity passing over the cutoff wall.

Table does include divertable releases for those months of 2005 that Lake Casitas did achieve a 2-foot from spill stage, note that allowable diversions were stopped on March 22, 2005 because of the Lake Casitas stage.

In the estimate of water over the cutoff wall, negative values were not included in the monthly summation due to the inaccuracies of the station equation at the higher flows.

Equations: if $Q_{vrnmo} > 20$ cfs, then $Q_{div} = Q_{div1} + (Q_{vrnmo} - 20)$, if $Q_{div} < 500$ cfs = $Q_{div1} + (Q_{vrnmo} - 20)$

	(1)	(2)	(1)+(2)	(3)	(4)	(3)+(4)	(5)	(6)	((1)+(2))-((3)+(4))
	<u>Source Stream Daily Flows</u>			<u>Robles Facility Daily Flows</u>			Water Release	Divertable	Estimate of
	Matilija Ck @ MHS (cfsd)	North Fork Matilija Ck. (cfsd)	Sum of Creek Flows (cfsd)	Diversion Canal (cfsd)	VRNMO Weir (cfsd)	VRNMO + Canal (cfsd)	above 20 cfs $Q_{vrnmo} - 20$ (cfsd)	Releases $500 - Q_{div}$ (cfsd)	of Water Over the Cutoff Wall (cfsd)
Dec-04	2,755	1,061	3,816	846	3,221	4,067	2,949	742	360
Jan-05	21,694	8,720	30,414	6,527	27,031	33,558	26,411	1,871	3,820
Feb-05	14,044	3,240	17,284	4,697	17,487	22,184	16,927	885	2,238
Mar-05	6,021	1,324	7,345	2,306	1,913	4,219	1,293	1,293	3,126
Apr-05	2,597	627	3,275	0	1,848	1,848	1,248	1,248	1,427
May-05	1,614	477	2,091	59	1,128	1,187	508	508	904
Jun-05	963	251	1,214	0	624	624	149	149	590
Totals	49,688	15,700	65,439	14,435	53,252	67,687	49,485	6,696	12,465

Description of Measurement Stations:

- (1) Matilija Creek at Matilija Hot Springs. Casitas MWD Station. Well rated channel located approx. 2,100 feet D/S of Matilija Dam.
- (2) North Fork Matilija Creek. Data recorded and furnished by the Ventura County Watershed Protection District.
- (3) Robles-Casitas Diversion Canal. Casitas MWD. Trapezoidal concrete channel at bridge located approx. 1,300 feet D/S of Robles Diversion Dam. Well rated section.
- (4) Ventura River near Meiners Oaks (VRNMO) Weir. Casitas MWD. Concrete hardened stream section rated well to 72 cfs. Flow ratings above 72 cfs are based on a channel formula equation that is noted to be inaccurate and unverified at high flows.

Table 2 - Changes to Lake Casitas Storage Resulting from Operational Criteria Differences based on Daily Data and Operational Limits

Assuming that the divertable releases were available to divert to Lake Casitas and given the conditions that occurred between December 2004 and April 2005, would Lake Casitas filled earlier or perhaps spilled?

Using actual data for precipitation, evaporation, direct inflow, diversions, and water to the pipe system, the change in storage for each month is calculated and added to the previous month's beginning storage. No divertable releases for December 2004.

A Casitas Dam spill condition occurs at a Lake Casitas storage of 254,000 acre-feet. At a Lake Casitas storage of 248,616 acre-feet, and Lake Casitas stage of two feet below spill, the Standard Operating Procedures for Robles Diversion Dam is to stop diversions from the Ventura River to Lake Casitas.

Summary data from evaluation of daily sequences.

Month	Lake Casitas Inflow					Lake Casitas Releases			Monthly Change in Storage (AF)	Lake Casitas Storage on First Day of Month			
	Actual Diversion to Lake Casitas (cfsd)	(AF)	Divertable Releases (cfsd)	(AF)	Adjusted Diversions (AF)	Actual Direct (AF)	Actual Precip (AF)	Actual Evap (AF)		Actual To System (AF)	Spill (AF)	ADJUSTED (AF)	ACTUAL (AF)
Dec-05	846	1,675	0	0	1,675	7,275	1,829	134	1,071	0	9,574	158,406	158,406
Jan-05	6,537	12,943	1,871	3,705	16,648	32,445	3,664	141	808	0	51,808	167,980	167,980
Feb-05	4,697	9,300	885	1,752	11,052	15,541	2,131	197	642	0	27,885	219,788	216,222
Mar-05	2,306	4,566	1,293	2,560	1911	4,063	1,024	523	664	0	5,810	247,674	242,227
Apr-05	0	0	1,248	2,471	0	1,094	186	838	1,166	0	(724)	253,484	250,514
May-05	0	0	524	1,038	0	724	338	870	1,377	0	(1,185)	252,760	249,974
Jun-05	0	0	149	295	0	357	0	971	1,905	0	(2,519)	251,575	248,621
Totals	14,386	28,484	5,970	11,821	31,286	61,499	9,172	3,674	7,633	0	90,649		

Table 3 - Changes to Lake Casitas Storage Resulting from Release Requirement Differences and Water Passing Over the Cutoff Wall

The "Adjusted Diversion" is a combination of diversable releases that is a result of the change from the 1959 Operational Criteria to that of the BA/BO operational criteria and also includes divertable waters that were otherwise allowed to course over the cutoff wall.

Assuming that the "Adjusted Diversion" was available to divert to Lake Casitas and given the conditions that occurred between December 2004 and April 2005, would Lake Casitas filled earlier or perhaps spilled?

Using actual data for precipitation, evaporation, direct inflow, diversions, and water to the pipe system, the change in storage for each month is calculated and added to the previous month's beginning storage.

A Casitas Dam spill condition occurs at a Lake Casitas storage of 254,000 acre-feet. At a Lake Casitas storage of 248,616 acre-ft Lake Casitas stage is two feet below spill, the Standard Operating Procedures for Robles Diversion Dam is to stop diversions from the Ventura River to Lake Casitas.

Summary data from evaluation of daily sequences.

Month	Lake Casitas Inflow			Lake Casitas Releases			Monthly Change in Storage (AF)	Lake Casitas Storage on First Day of Month	
	Adjusted Diversion (AF)	Actual Direct (AF)	Actual Precip (AF)	Actual Evap (AF)	Actual To System (AF)	Spill (AF)		ADJUSTED (AF)	ACTUAL (AF)
Dec-04	1,675	7,275	1,829	134	1,071	0	9,574	158,406	158,406
Jan-05	20,588	32,445	3,664	141	808	0	55,748	167,980	167,980
Feb-05	10,239	15,541	2,131	197	642	0	27,072	223,728	216,222
Mar-05	0	4,063	1,024	523	664	141	3,758	250,800	242,227
Apr-05	0	1,094	186	838	1,166	198	-922	254,558	250,514
May-05	0	724	169	870	1,376	0	-1,353	253,636	249,974
Jun-05	0	357	0	971	1,905	0	-2,519	252,285	248,621
Totals	30,827	54,224	7,174	3,540	6,561	339	81,784		

3. Evaluation Summary

The analysis of the daily trends shows that with the application of the diversable releases, Lake Casitas would have reached the two-foot from spill stage earlier than the lake actually achieved in winter 2005. If Lake Casitas had reached the two-foot from spill mark on March 6, 2005, as may have occurred under the 1959 Trial Operating Criteria (TOC), the direct inflow to Lake Casitas during the remaining spring period would likely not have resulted in a spill condition at Casitas Dam and there would not have been the diversion opportunities during late March that otherwise did occur by reaching the 2-foot from spill mark on March 22, 2005. The filling of Lake Casitas earlier in the season and not having storage for later

diversion opportunities is illustrated in Table 4 by the different operation criteria being applied to diversions at Robles Diversion Dam and Fish Passage Facility. The addition of water by applying 1959 TOC and/or cutoff wall flow being applied to the diversions opportunities lessens later diversion opportunities, but because of the earlier fill, may have resulted in a spill condition at Casitas Dam. The lake fills earlier and actually lessens diversions later in the winter season, the net result is less diversion occurring at Robles.

Table 4 – Comparison of Lake Casitas Recovery under Different Operational Criteria

Condition	2005 BA/BO Operation	1959 TOC Operation	1959 TOC Ops plus Cutoff Wall
Date to Achieve 2-feet from Spill Condition at Lake Casitas	March 20	March 6	February 25
Date of Maximum Storage at Lake Casitas	April 5	April 11	March 29
Maximum Storage Achieved at Lake Casitas (acre-feet)	250,519	252,584	254,480
Lake Casitas Storage on June 30 (acre-feet)	246,208	249,349	249,933
Ventura River Diversions to Lake Casitas (acre-feet)	28,484	31,579	30,827

As the Ventura River system entered into the late spring of the year, it is noted that the stream flow in the upper section of Ventura River and the direct inflow into Lake Casitas recede appreciably, water use and evaporation from Lake Casitas begins to increase, and the result is a decline in the lake storage into the summer and fall months. The Lake then begins to enter into the next drought cycle.

4. Conclusion

The winter 2005 brought heavy rainfall and runoff into the Ventura River system, Lake Casitas storage recovered to near full stage under the BA/BO operating criteria for the Robles Diversion and Fish Passage Facility, and large quantities of water were released downstream of Robles Diversion Dam in accordance with the BA/BO requirements. The BA/BO criteria does result in a change in the rate of storage recovery in Lake Casitas from the rate of recovery that would have occurred under the 1959 Trial Operating Criteria. Changes in river flow patterns, i.e., the breaching of the Robles cutoff wall can add to the impact on water supplies. The other event that influenced the diversion numbers in each operational scenario was the achieving a storage level at Lake Casitas that stopped diversions.

Appendix A

Riverwatcher Data

Figure 1: Summary Table

Total Hits	Upstream Hits	Downstream Hits
269	159	110
Avg Length (cm)	Avg Length (cm)	Avg Length (cm)
40	43	38
Avg depth (mm)	Avg depth (mm)	Avg depth (mm)
67	71	60
Number of fish	Number of fish	Number of fish
1	1	0
Number of trout	Number of trout	Number of trout
0.0	0.0	0.0

Figure 2: Images generated from Riverwatcher of fish counted traveling upstream through the Riverwatcher on April 20, 2005



image #4 of fish counted



image #5 of fish counted



Silhouette #1 of fish counted



Silhouette #2 of fish counted



Silhouette #1 and #2 of fish counted

Figure 3: Example of images generated by the Riverwatcher of non-fish traveling upstream through the Riverwatcher on 4/21/05.



4/21/05 - non fish – silhouette #1 and #2



4/21/05- non-fish – silhouette #1



5/21/05 – non-fish – silhouette #2



4/21/05 non-fish – image from Riverwatcher camera (note: nothing in photo)

Figure 4: Various images of algae and debris generated by the Riverwatcher.



5/3/05 0925 #110 – Image of object passing upstream (no object is seen passing through in photo) through Riverwater – correlating silhouette below – In addition, an example of debris, which clogs the Riverwatcher and shroud.



5/3/05 0925 #110 – Silhouette #1 and #2 of object passing upstream through Riverwatcher – correlating image above.



4/29/05 1007 #74 - Image of object passing upstream (object is not seen, i.e. false count) through Riverwater – correlating silhouette below – In addition, an example of debris, which clogs the Riverwatcher and shroud.



4/29/05 1007 #74 - Silhouette #1 and #2 of object passing upstream through Riverwatcher – correlating image above.



5/3/05 1017 #118 – Example of image generated from Riverwatcher, in which the camera is completely covered by algae.

Appendix B

Estuary Monitoring

Figure 1: Summary table of data collected from Ventura River Estuary monitoring in 2005.

Date	Time	Breeched Y/N	High Tide		Low Tide		Turbidity (ntu)	DO (mg/L)	Temp. (°C)	Notes	Initials
			Time	Height	Time	Height					
1-14	1435	Y	1150	5.1	1849	-0.2			13.5	High flows – very turbid	MG
1-19	0930	Y	0501	5.2	1251	0.3				High flows – water clearing up	MG
1-20	1300	Y	0549	5.3	1336	-0.1			13.5	High flows – water turbid – high surf- fish must travel over shallow riffle to get to sea	MG
1-21	1400	Y	0632	5.2	1413	-0.4				“ “	MG
1-25	1030	Y	0849	5.9	1610	-0.7				Small waves entering estuary	MG
1-31	1030	Y	1234	3.3	0716	1.9					MG
2-1	1300	Y	1410	2.6	0851	1.6			13.4	Still good flow into ocean – small waves entering estuary	MG
2-4	1530	Y	1938	3.2	1244	-0.5			15.8	Good flow into ocean	MG
2-11	1200	Y	1044	5.5	1723	-0.4			13.4	Very good connection – waves entering estuary	MG
2-17	1300	Y	1951	3.1	1234	0.3			13.4		MG
2-28	1300	Y	1133	3.6	1721	1.27				Small waves entering estuary	MG
3/14	1230	Y	1216	3.2	1727	1.7					MG
3/21	1100	Y	0637	4.8	1342	-0.3					MG
3/28	1300	Y	1052	3.7	1618	1.35					MG
3/31	1200	Y			0810	.7					MG
5/25	1330	Y	1228	3.3	1635	2.4		14.1	21.8	Estuary opening shifted to north side	AC

Appendix C

Fish Attraction

Figure 1: Summary table of data collected by bank and snorkel surveys in 2005

Date	Start Time	End Time	Type	Location	Species	Quantity	Length	Notes
1/14/05	1500	1515	Bank	Measurement Weir to 100 ft downstream	-	-	-	No fish Observed – low visibility - <1ft
1/14/05	1530	1545	Bank	Fish Passage Entrance Pool	-	-	-	No fish Observed – low visibility - <1ft
1/18/05	1400	1415	Bank	Measurement Weir to 100 ft downstream	-	-	-	No fish observed – low visibility - <2 ft
1/18/05	1430	1445	Bank	Fish Passage Entrance Pool	-	-	-	No fish observed – low visibility – hard to see into pool
1/18/05	1515	1545	Bank	Timber Cut-off wall to 500 ft downstream	-	-	-	No fish observed – high flow going over wall
1/19/05	1400	1445	Bank	Fish Passage Entrance Pool to 0.25 miles downstream	-	-	-	No fish observed – visibility <1 ft – could see bottom in riffles but not pools
1/19/05	1500	1545	Bank	Timber cut-off wall to 0.25 miles downstream	-	-	-	No fish observed – visibility <2 ft – clearer in this channel
1/19/05	1600	1615	Bank	Fish Passage Entrance Pool	-	-	-	No fish observed – hard to see into pool
1/20/05	1300	1315	Bank	Fish Passage Entrance Pool	-	-	-	No fish observed – can't see bottom of the pool
1/20/05	1345	1430	Bank	From Will's Canyon to just downstream of first major potential impediment	-	-	-	No fish observed – can see into riffles/shallow water – still hard to see into pools
1/20/05	1430	1445	Bank	Big pool just downstream of first potential impediment	-	-	-	No fish observed – could not see into pool – maybe 1 – 2 feet
1/20/05	1500	1515	Bank	Small pool just downstream of first potential impediment	-	-	-	No fish observed – hard to see into pool
2/17/05	1345	1400	Bank	Measurement Weir to 100 ft downstream	-	-	-	No fish observed
2/17/05	1415	1430	Bank	Fish Passage Entrance Pool	-	-	-	No fish observed
3/14/05	1315	1330	Snorkel	Rip/Rap pool – 1mile downstream of robes	-	-	-	No fish observed – could see bottom but hard to see bank to bank
3/14/05	1530	1545	Snorkel	Fish Passage Entrance Pool	-	-	-	No fish observed – shadows and bright light made it hard

								to see at times
3/21/05	1445	1500	Bank	Measurement Weir to 100 ft downstream	-	-	-	No fish observed – good visibility – could see bottom of pool and riffle
3/21/05	1515	1530	Bank	Fish Passage Entrance Pool	-	-	-	No fish observed – good visibility – hard to see bottom of pool – but overall could see good into pool
3/31/05	1030	1045	Bank	1 st pool upstream of 150 bride	-	-	-	No fish observed – good water visibility – hard to see bottom of pool – clearly see bottom of riffles
3/31/05	1100	1115	Bank	2 nd pool upstream of 150 bridge	-	-	-	No fish observed – good water visibility – hard to see bottom of pool – clearly see bottom of riffles
3/31/05	1130	1145	Bank	3 rd pool upstream of 150 bridge	-	-	-	No fish observed – good water visibility – hard to see bottom of pool – clearly see bottom of riffles
5/16/05	1500	1515	Bank	Measurement Weir to 100 ft downstream	-	-	-	No fish observed
5/17/05	1030	1050	Snorkel	Fish Passage Entrance Pool	-	-	-	No trout observed – small fish observed – could not positively ID Probably chub – stickleback - mosquito fish
5/17/05	1130	1200	Snorkel	Pool above diversion gates	-	-	-	No trout observed - small fish observed – could not positively ID Probably chub – stickleback - mosquito fish

Appendix D

Potential Impediments 2004

Figure 1: Potential Impediment Locations From Robles to Highway 150 Bridge From February/March 2004 Survey



Figure 2: Potential Impediment Locations From Highway 150 Bridge to Casitas Springs From February/March 2004 Survey

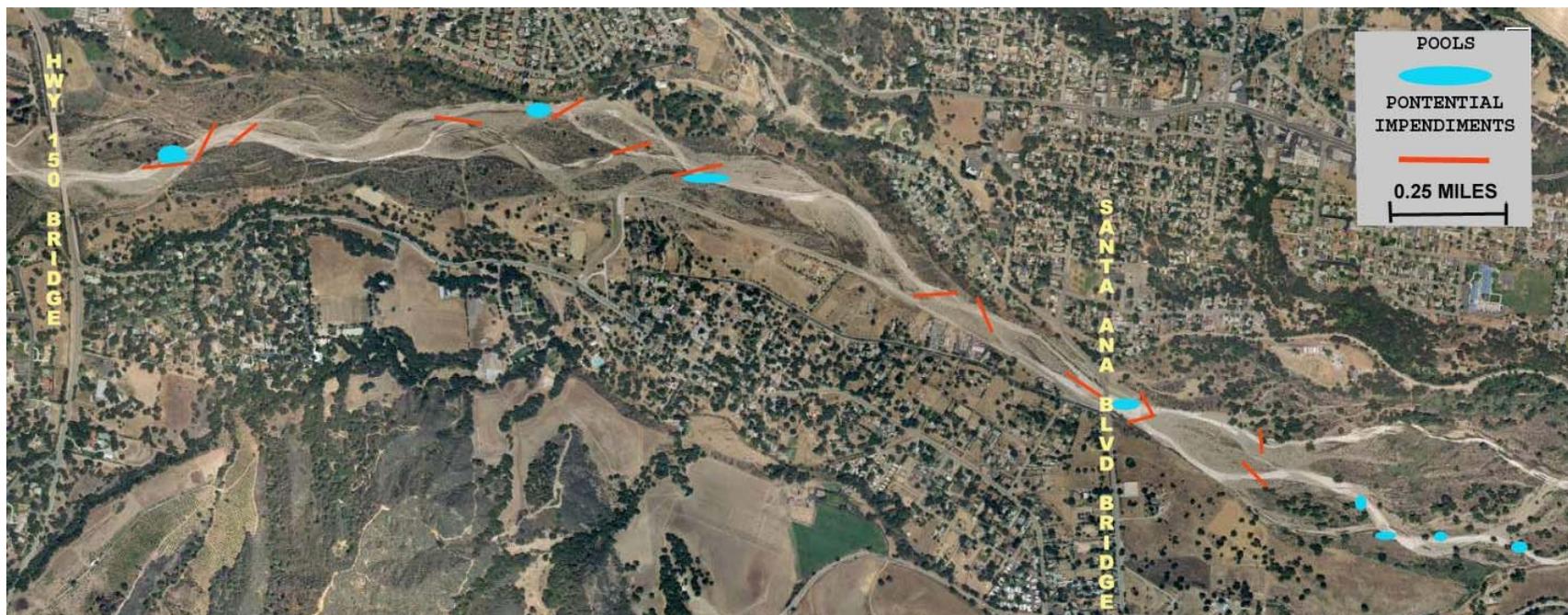
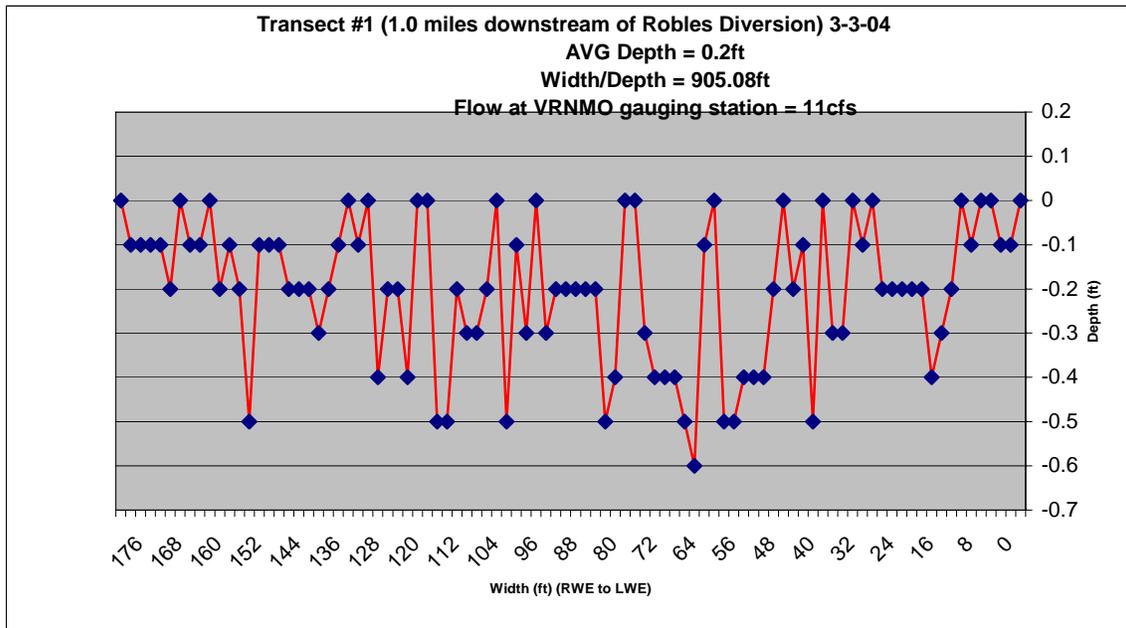
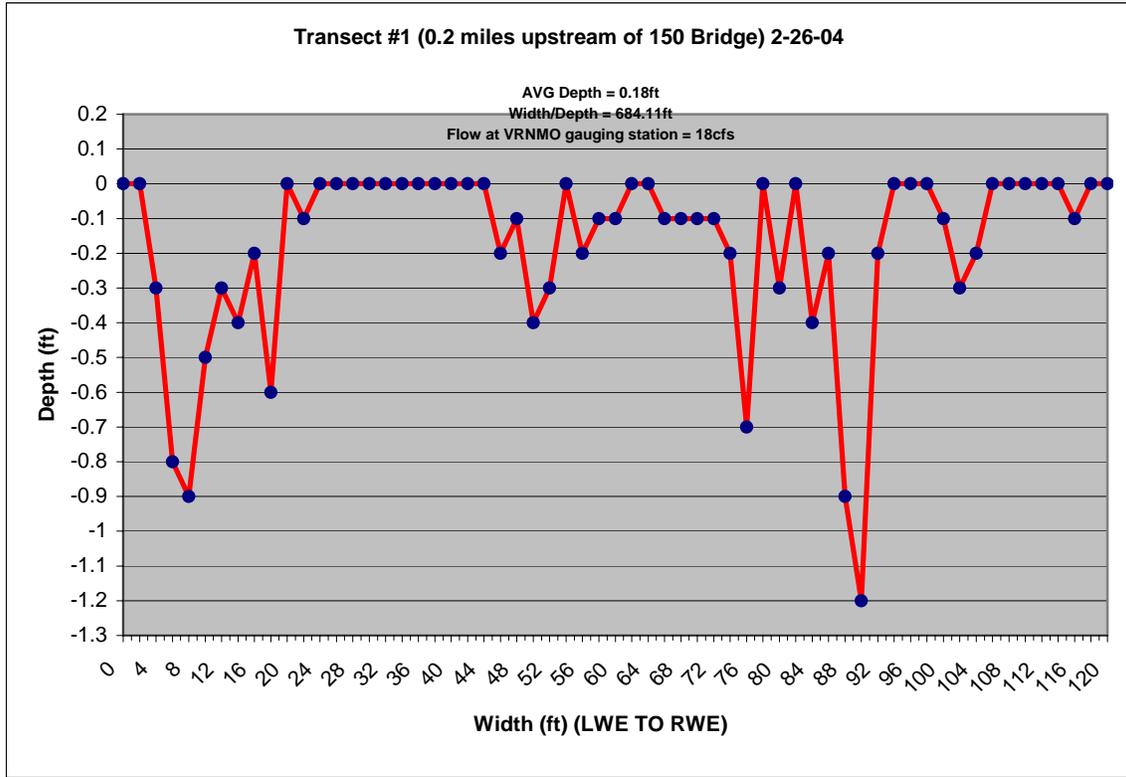


Figure 3: Potential Impediment Locations From Casitas Springs to Foster Park From February/March 2004 Survey

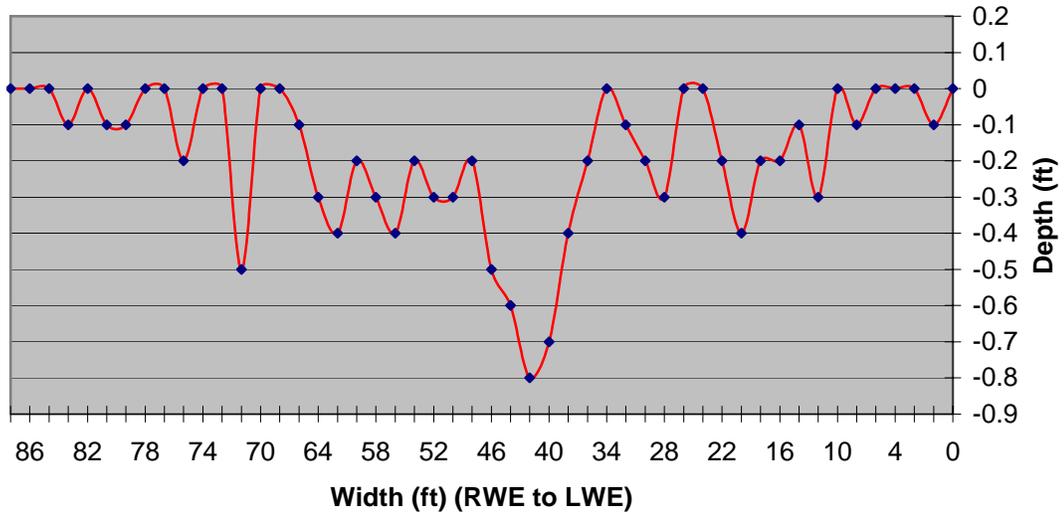


Figure 4: Transect Data Gathered in February/March 2004 of Potential Impediments



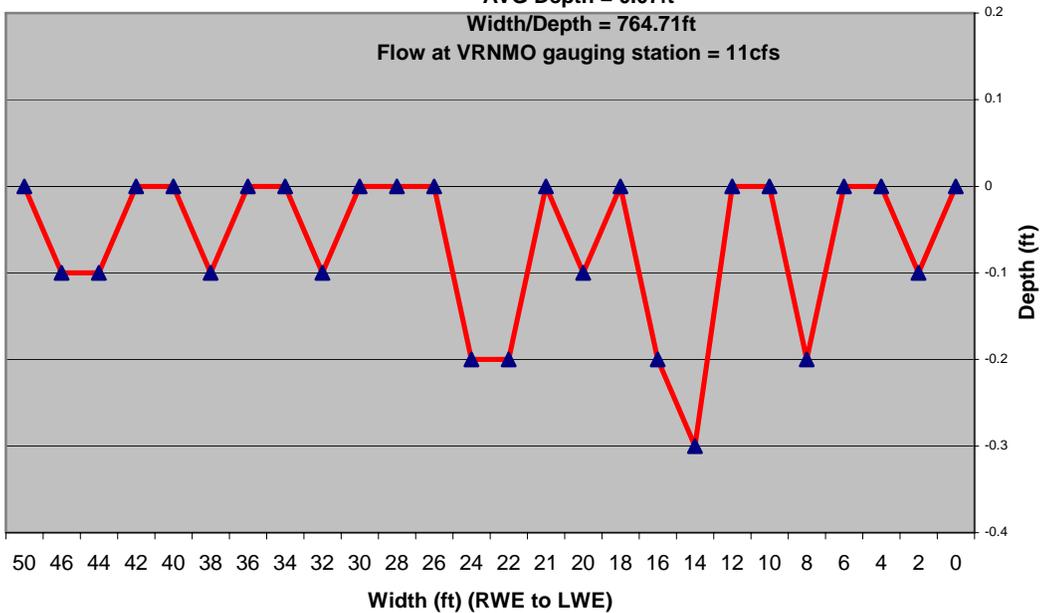
Transect #2 (1.3 miles downstream of Robles Diversion) 3-3-04

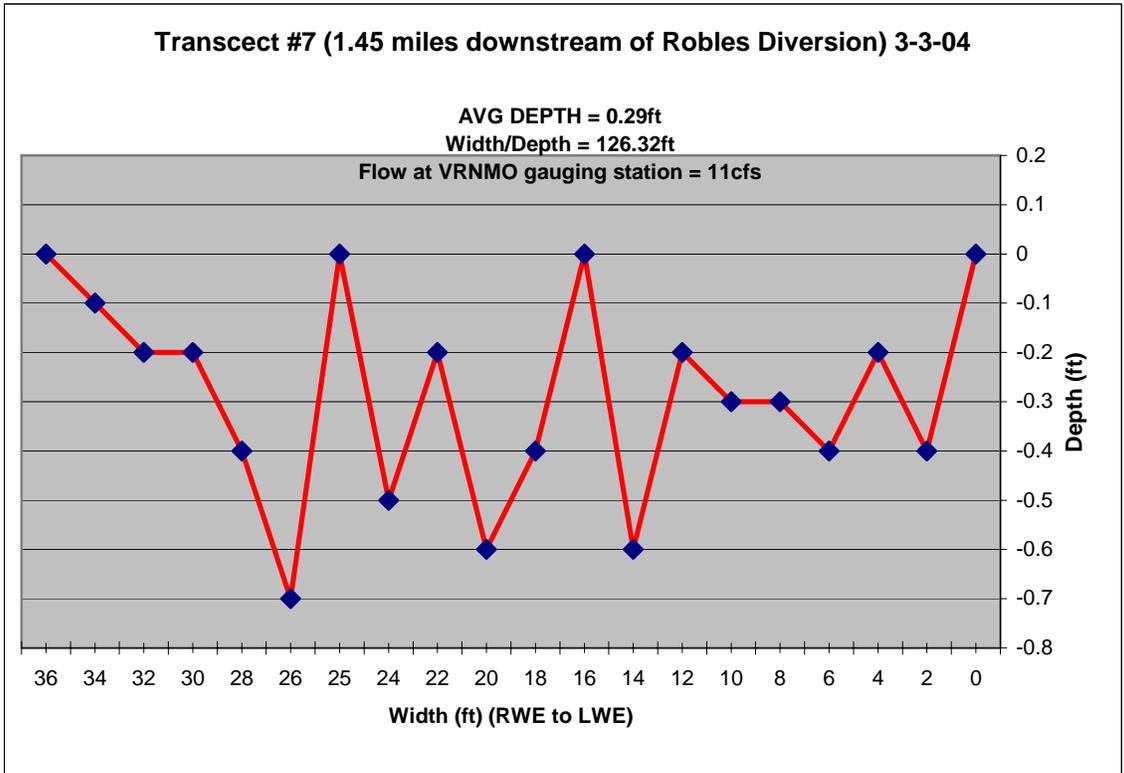
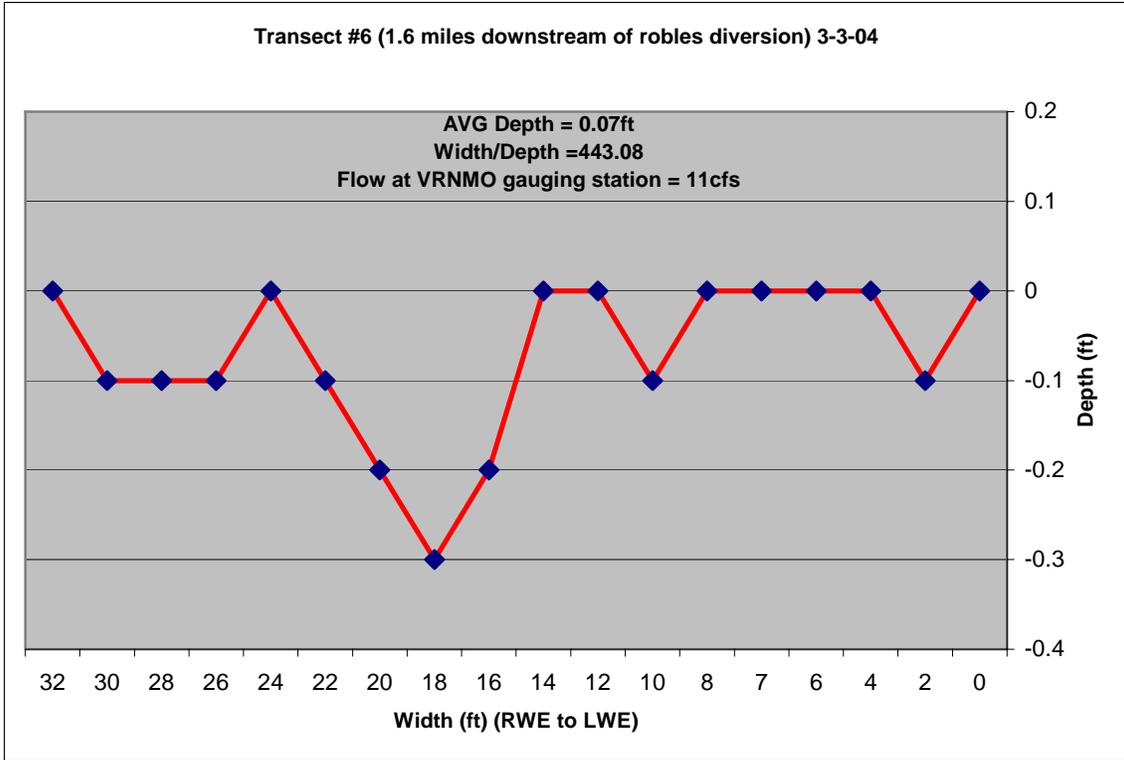
AVG Depth = 0.18ft
Width/Depth = 478.02ft
Flow at VRNMO gauging station = 11cfs

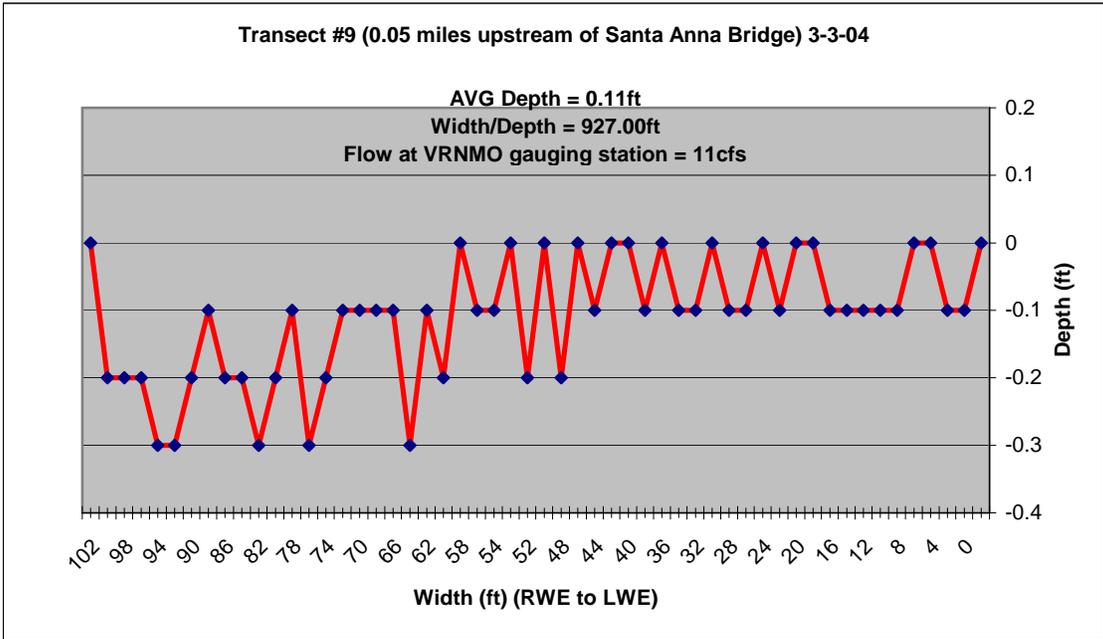
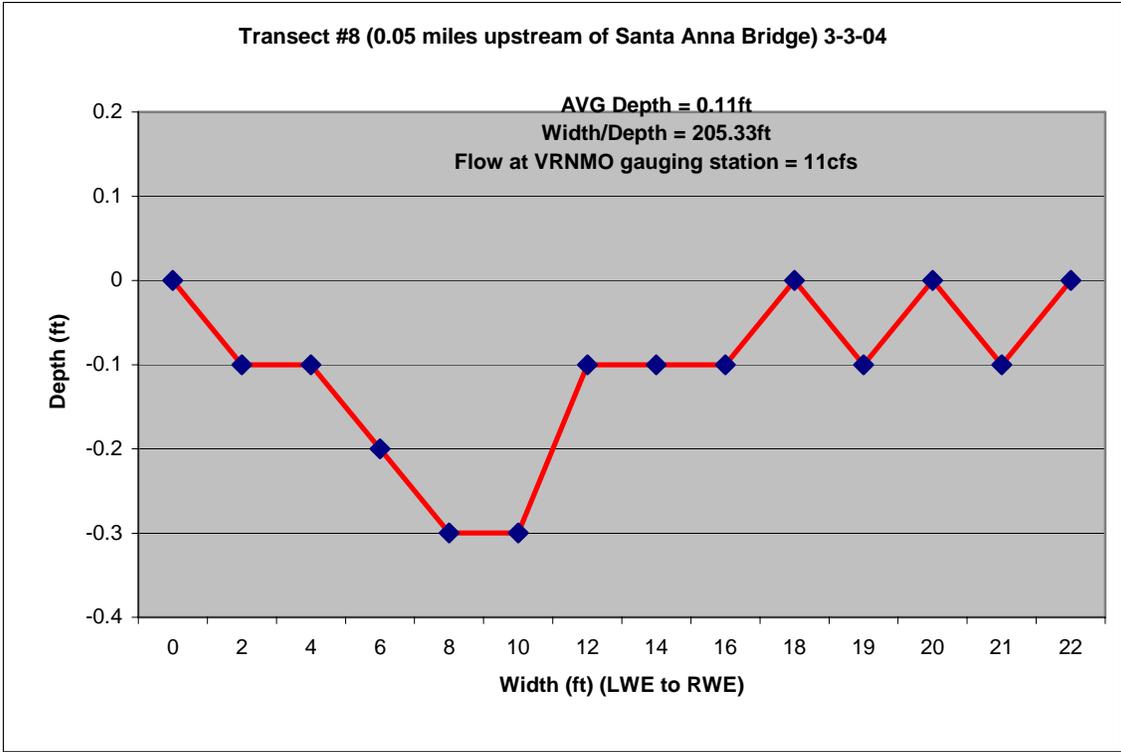


Transect #3 (1.35 miles downstream of Robles Diversion) 3-3-04

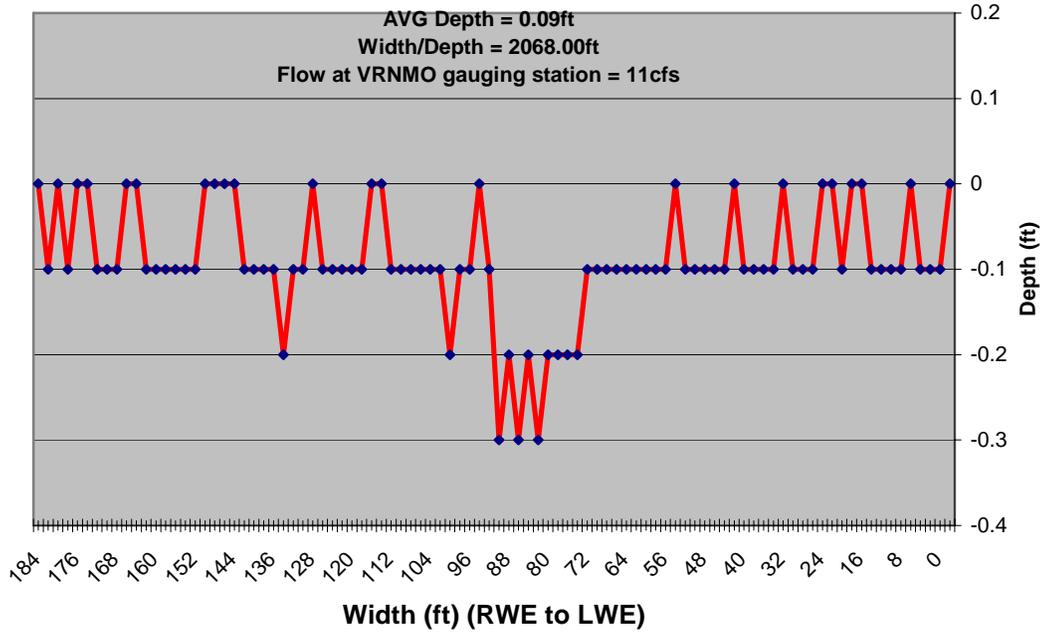
AVG Depth = 0.07ft
Width/Depth = 764.71ft
Flow at VRNMO gauging station = 11cfs



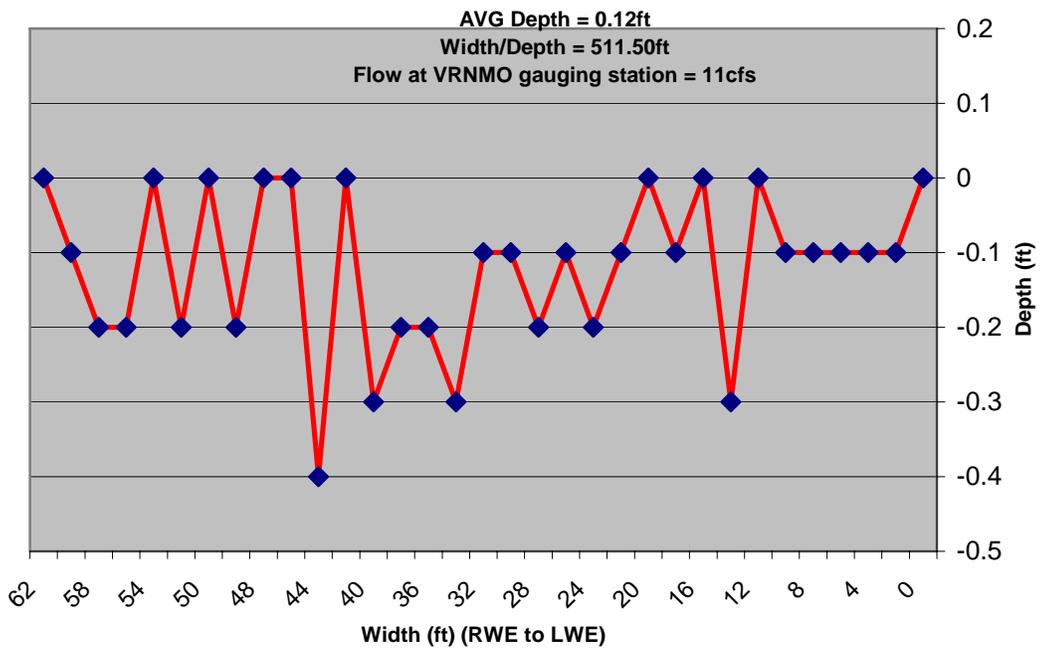


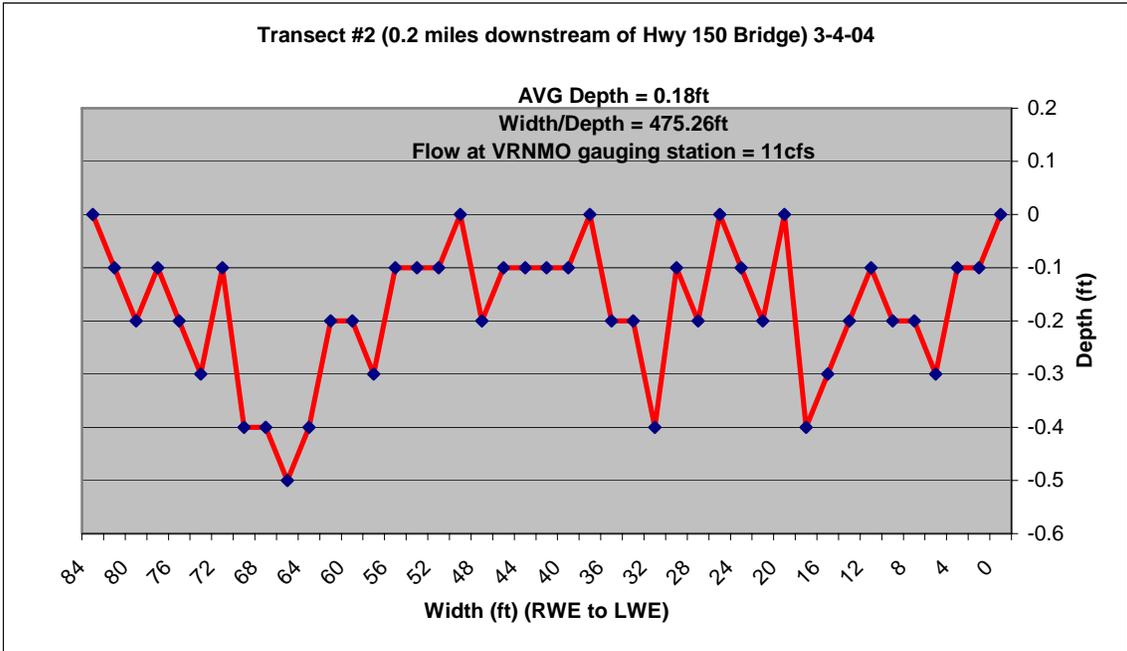
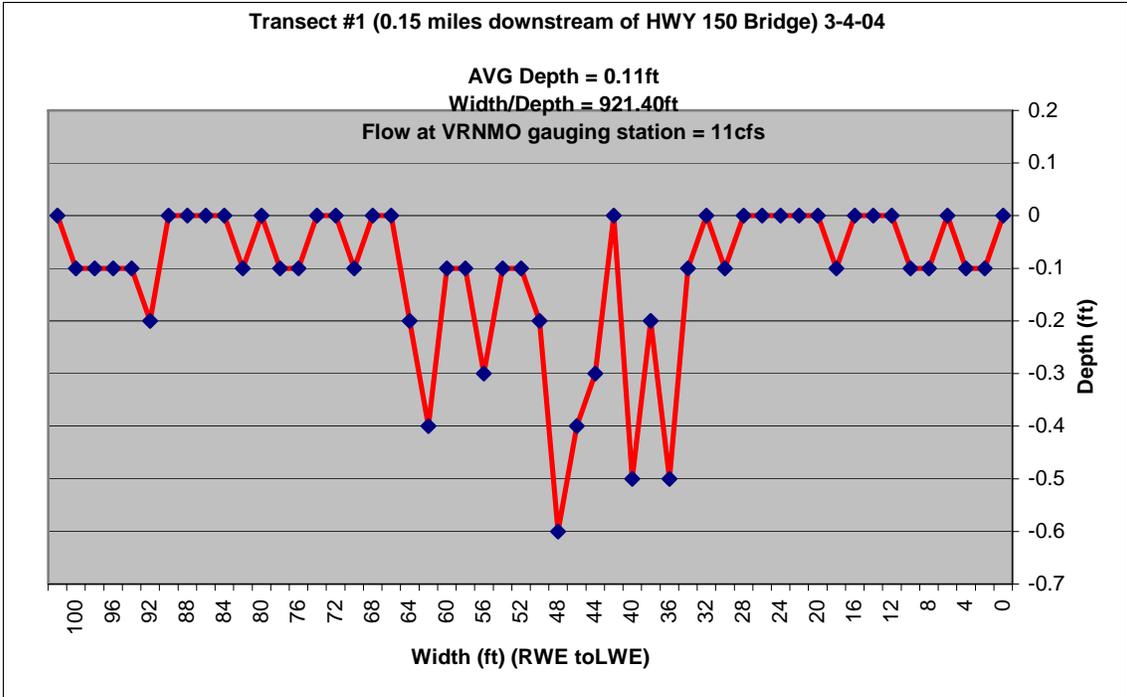


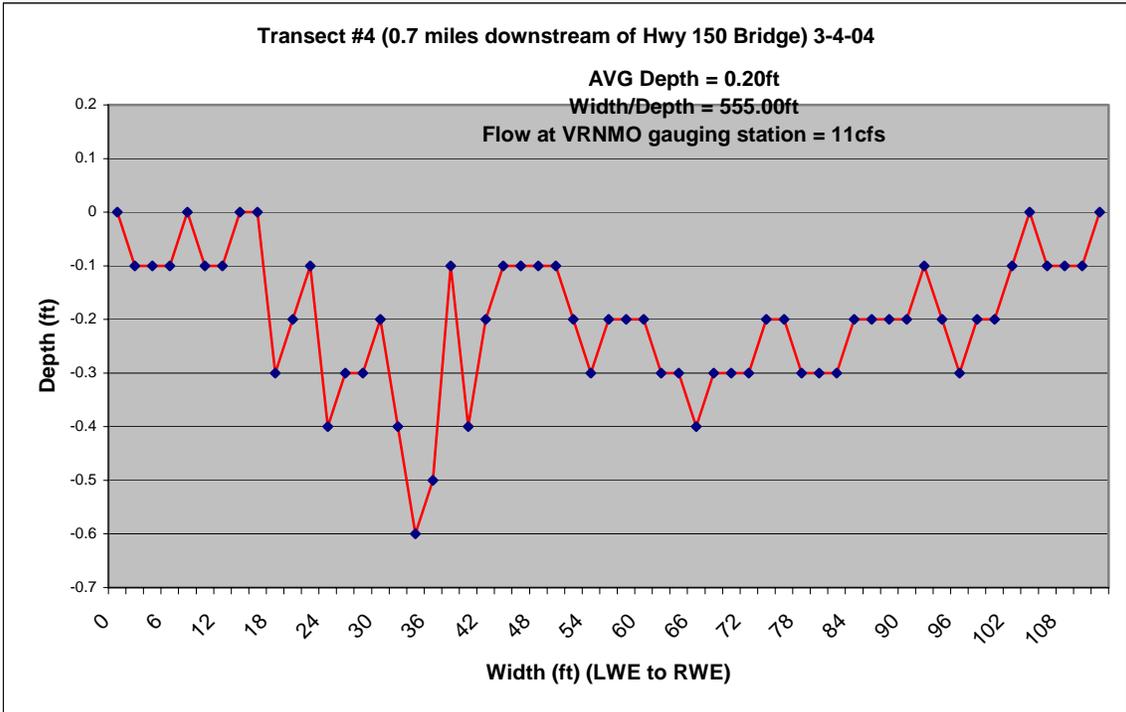
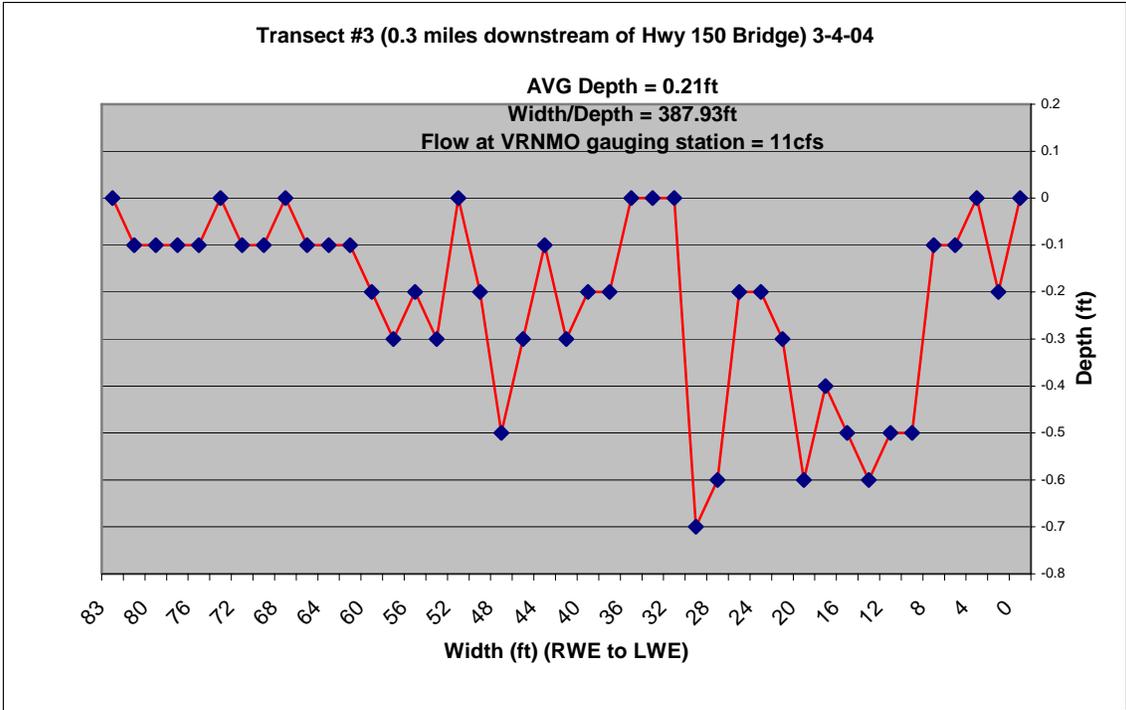
transect #10 (0.05 miles downstream of Santa Anna Bridge) 3-3-04

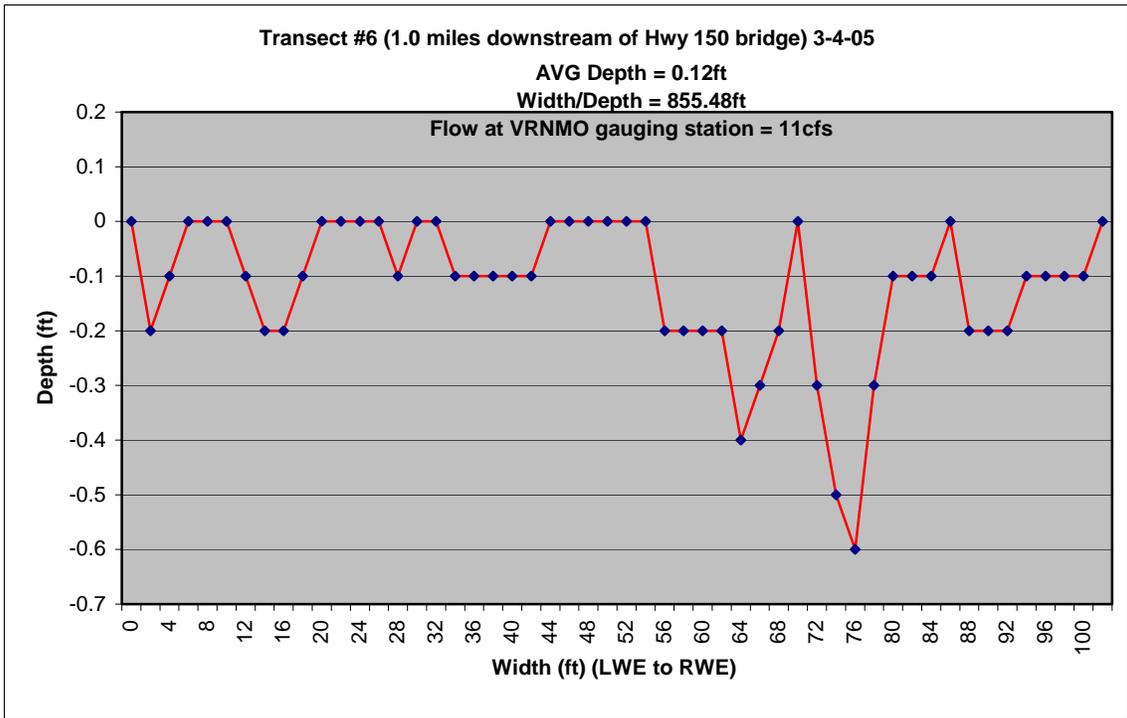
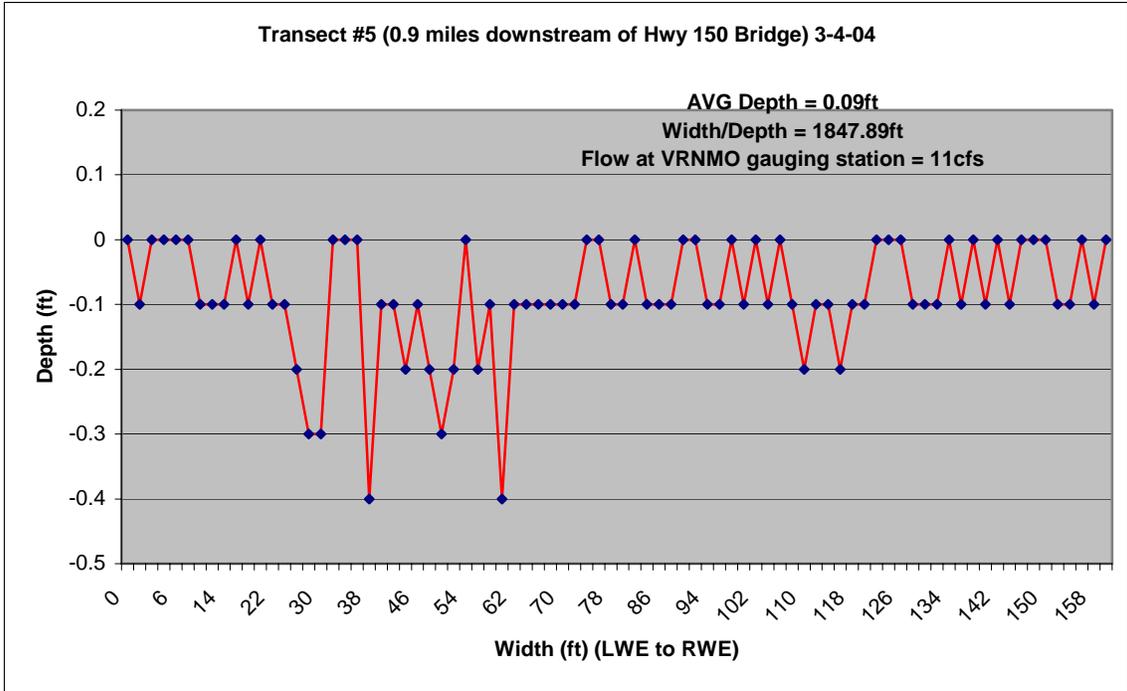


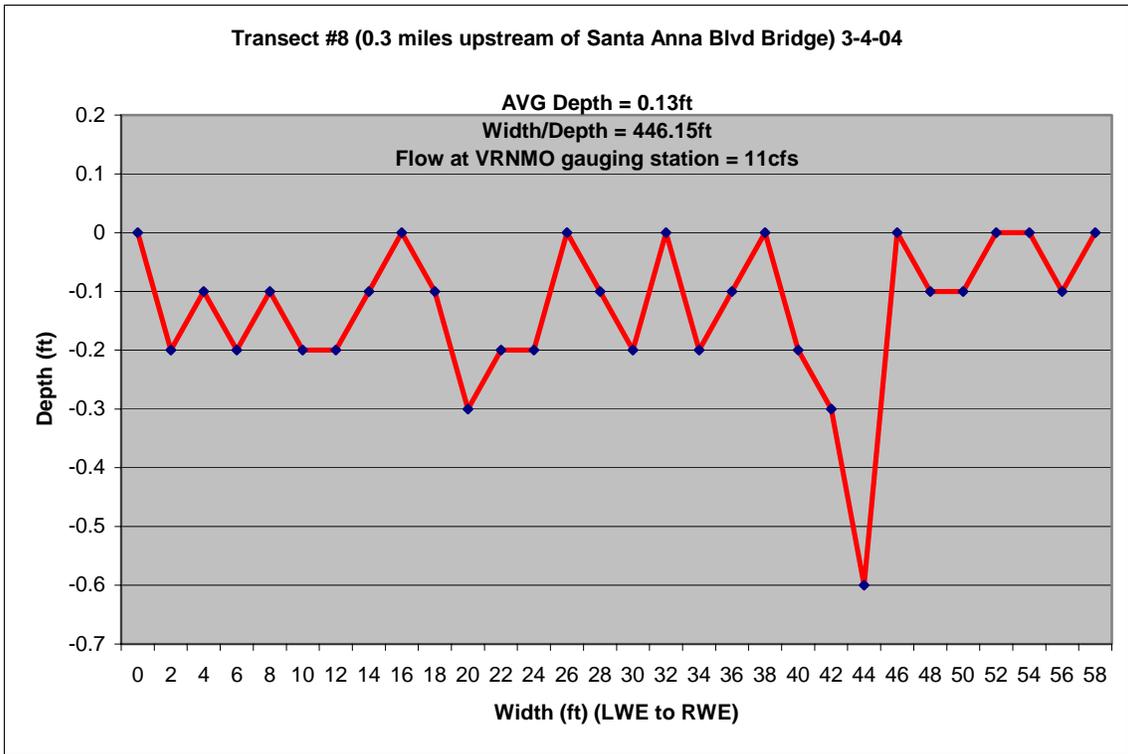
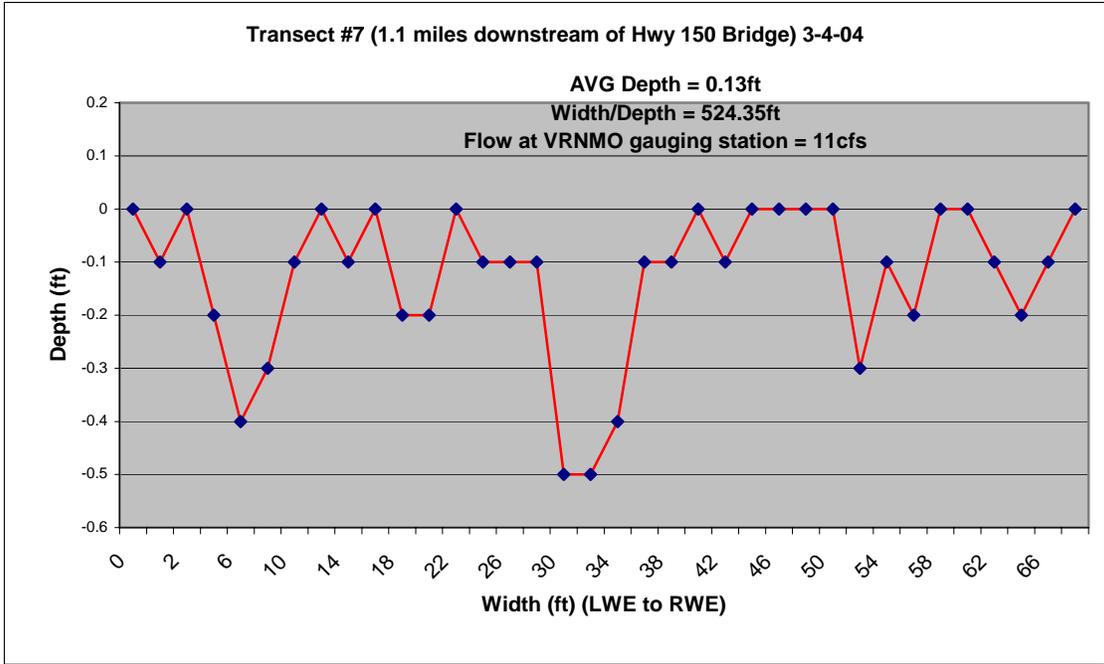
Transect #11 (0.05 miles downstream of Santa Anna Bridge 3-3-04)











Appendix E

Potential Impediments 2005

Figure 1: Potential Impediment Locations from Robles Fish Passage to Highway 150 Bridge from February 2005 Pre-Survey

Potential Impediment	W	N	Potential Impediment	W	N
1	119 17 31.29	34 27 25.86	8/9	119 17 56.95	34 26 19.58
2	119 17 33.81	34 27 17.27	10	119 17 59.67	34 26 11.74
3	119 17 37.09	34 27 01.52	11	119 17 59.93	34 25 59.98
4	119 17 40.56	34 26 55.46	12	119 18 00.80	34 25 54.96
5	119 17 46.09	34 26 41.73	13A	119 18 00.56	34 25 46.12
6	119 17 46.47	34 26 35.87	13B	119 17 59.05	34 25 38.85
7	119 17 50.57	34 26 31.31	14/15	119 18 07.30	34 25 34.20
			16	119 18 08.01	34 25 31.77



Figure 2: Potential Impediment Locations From Highway 150 Bridge to Santa Ana Blvd Bridge from February 2005 Pre-Survey

Potential Impediment	E	N	Potential Impediment	E	N
17	119 18 08.33	34 25 26.73	23	119 17 59.58	34 24 43.91
18	119 18 07.92	34 25 56.65	24	119 18 04.46	34 24 36.82
19	119 18 03.40	34 25 19.41	25	119 18 08.73	34 24 23.93
20	119 18 03.63	34 25 16.60	26a	119 18 11.07	34 24 20.14
21	119 18 01.70	34 24 36.65	26b	119 18 18.23	34 24 14.00
22	119 17 59.95	34 24 49.60	27	119 18 19.49	34 24 11.64
			28	119 18 19.84	34 24 09.56



Figure 3: Potential Impediment Locations From Robles Fish Passage To HWY 150 Bridge From May 2005 Pre-Survey

Potential Impediment	W	N
Mark 1	119 17 31.2	34 27 24.4
Mark 2	119 17 33.8	34 27 17.1
Mark 3	119 17 34.5	34 27 04.8
Mark 4	119 17 43.6	34 26 48.9
Mark 5	119 17 42.9	34 26 46.0
Mark 6	119 18 00.6	34 26 04.6
Mark 17	119 17 45.2	34 26 43.2
Mark 7	119 18 01.0	34 25 47.8
Mark 18	119 18 02.4	34 25 37.5



Figure 4: Potential Impediment Locations From HWY 150 Bridge to Casitas Spring From May 2005 Pre-Survey

Potential Impediment	W	N
Mark 9	119 18 03.1	34 25 06.3
Mark 10	119 18 03.0	34 24 56.5
Mark 11	119 18 08.6	34 24 41.2
Mark 12	119 18 06.0	34 24 33.3
Mark 13	119 18 33.4	34 23 46.9
Mark 14	119 18 33.5	34 23 35.3

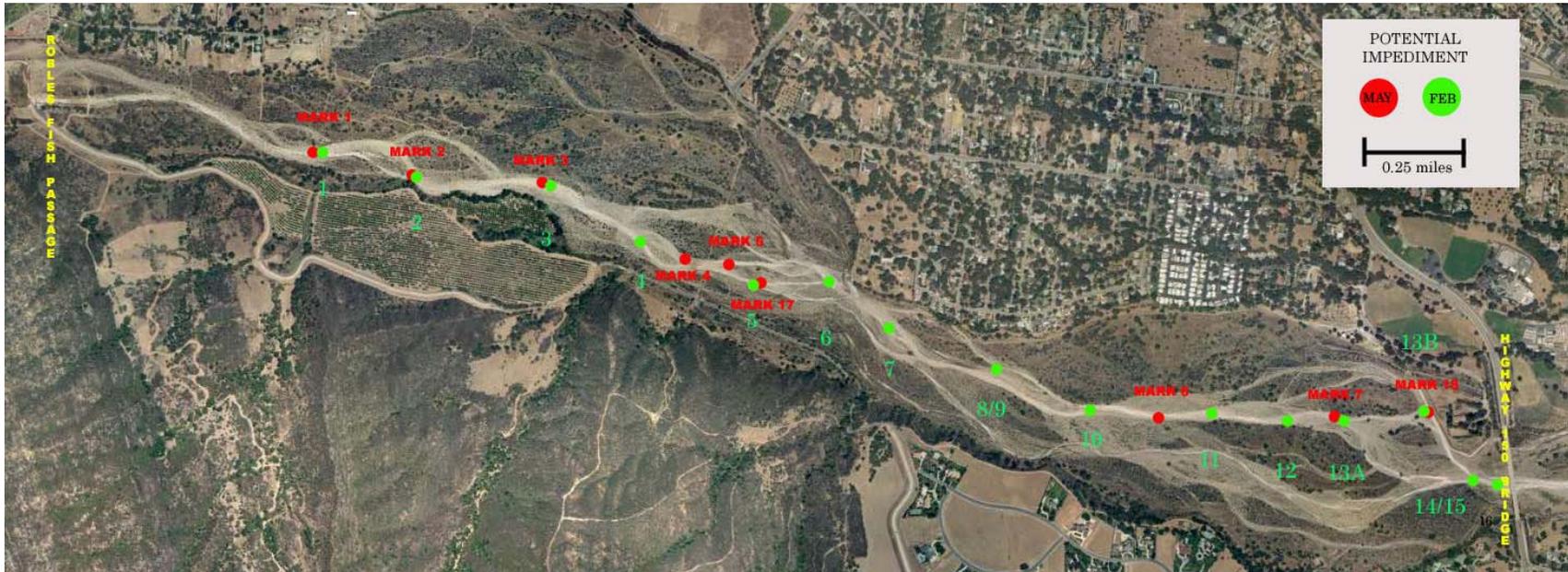


Figure 5: Potential Impediment Locations From Casitas Spring To Foster Park From May 2005 Pre-Survey

Potential Impediment	W	N
Mark 15	119 18 38.3	34 23 17.9
Mark 16	119 18 42.0	34 23 14.3



Figure 6: Combined Potential Impediments Surveys from February 2005 and May 2005



From Robles to Highway 150 Bridge



From Highway 150 Bridge to Santa Ana Blvd Bridge

Figure 7: Transect Data and Photograph of Mark 5 from May 2005 Survey

Figure 7.1: Transect data taken on 6/7/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth						
RHP	0	0	32	0.4	46	0.25	60	0.2
RWE	23.6	0.28	34	0.59	48	0.15	62	0.13
	24	0.26	36	0.77	50	0.1	64	0.12
	26	0.15	38	0.36	52	0.3	66	0.05
	28	0	40	0.32	54	0.05LWE	66.3	0
	30	0.16	42	0	56	0.12LHP	70	
			44	0.2	58	0.33		

Figure 7.2: Graph of transect data collected on 6/7/05 for Mark 5

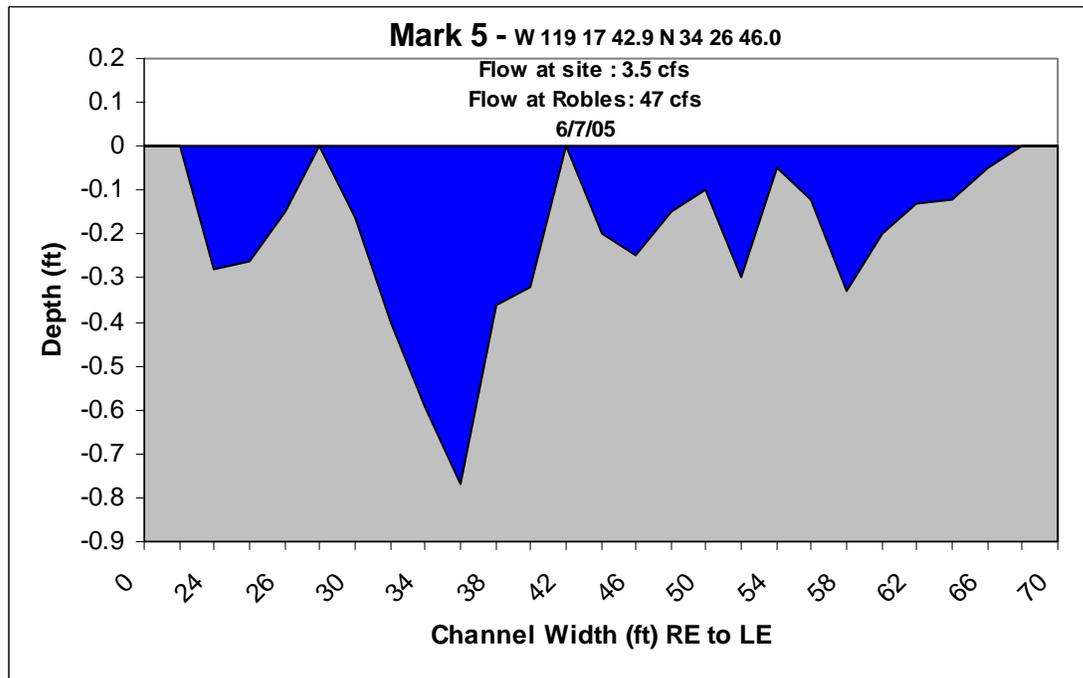


Figure 7.3: Photo of Mark 5 looking upstream, approximate transect location is marked in red.



Figure 8: Transect Data and Photograph of Mark 6 from May 2005 Survey

Figure 8.1: Transect data taken on 6/14/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth						
RHP	0	0	66	0.16	106	0	146	0
RWE	31.2	0	68	0	108	0	148	0
	32	0	70	0	110	0	150	0
	34	0.05	72	0.18	112	0	152	0
	36	0.32	74	0.1	114	0	154	0
	38	0.44	76	0.29	116	0	156	0
	40	0	78	0.18	118	0	158	0
	42	0.25	80	0.44	120	0.41	160	0
	44	0.53	82	0.35	122	0.04	162	0
	46	0	84	0.25	124	0.31	164	0
	48	0.14	86	0.56	126	0.5	166	0
	50	0.35	88	0.1	128	0.51	168	0
	52	0.36	90	0	130	0	170	0
	54	0.77	92	0.22	132	0.12	172	0.09
	56	0.52	94	0.25	134	0.48	174	0.18
	58	0	96	0	136	0.39LWE	176	0.16
	60	0	98	0.3	138	0.63LHP	209.2	
	62	0	100	0	140	0.2		
	64	0	102	0	142	0		
			104	0	144	0		

Figure 8.2: Graph of transect data collected on 6/14/05 for Mark 6

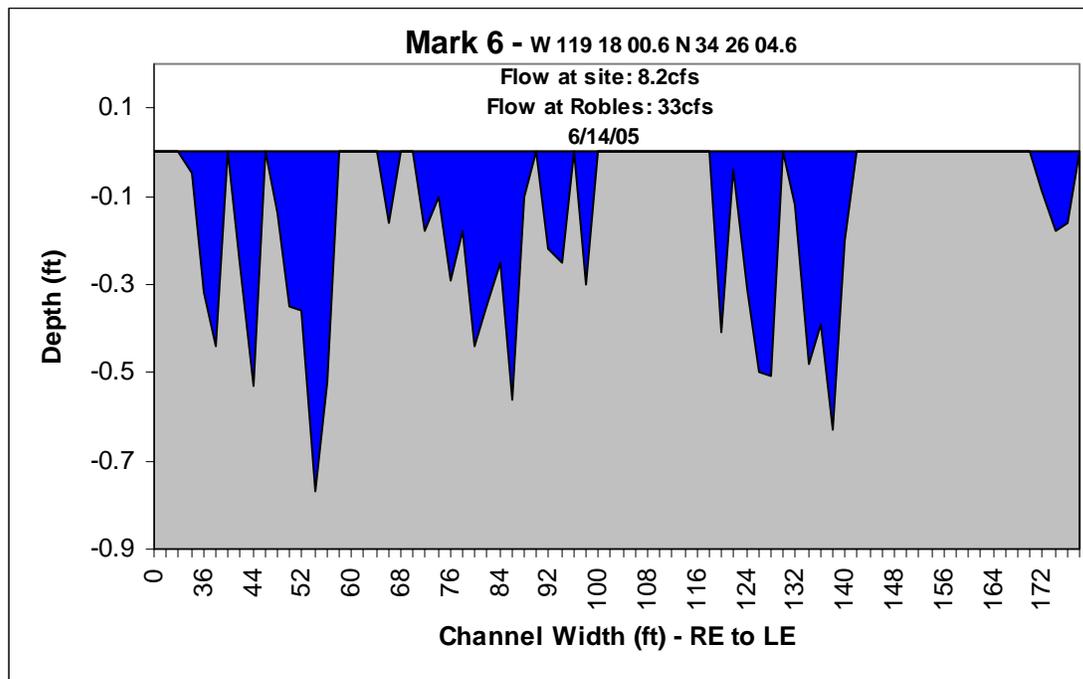


Figure 8.3: Photo of Mark 6 looking upstream, approximate transect location is marked in red.



Figure 9: Transect Data and Photograph of Mark 9 from May 2005 Survey

Figure 9.1: Transect data taken on 6/17/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth		Distance	Depth		Distance	Depth
LHP	0	0		88	0		136	0
LWE	44	0		90	0		138	0
	46	0		92	0		140	0
	48	0.11		94	0		142	0
	50	0.1		96	0		144	0
	52	0		98	0		146	0
	54	0		100	0		148	0
	56	0.25		102	0		150	0
	58	0.19		104	0.24		152	0
	60	0.21		106	0		154	0
	62	0.68		108	0.3		156	0
	64	0.17		110	0		158	0
	66	0.04		112	0.05		160	0
	68	0.15		114	0		162	0
	70	0.25		116	0.3		164	0
	72	0		118	0		166	0
	74	0.4		120	0		168	0
	76	0.44		122	0		170	0
	78	0.21		124	0		172	0
	80	0.12		126	0		174	0
	82	0		128	0		176	0
	84	0		130	0		178	ORWE
	86	0		132	0		180	ORHP 317.5
				134	0		182	0

Figure 9.2: Graph of transect data collected on 6/17/05 for Mark 9

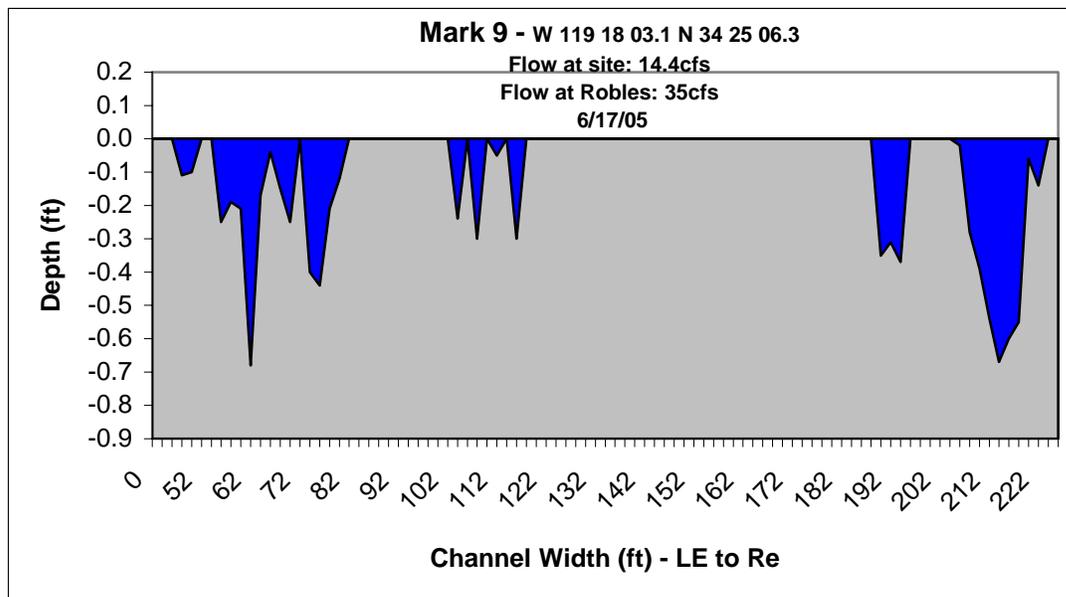


Figure 9.3: Photo of Mark 9 looking downstream, approximate transect location is marked in red.



Figure 10: Transect Data and Photograph of Mark 10 from May 2005 Survey

Figure 10.1: Transect data taken on 6/17/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth						
LHP	0	0	38	0.27	68	0	98	0.94
LWE	13	0.25	40	0.13	70	0	100	0.2
	14	0	42	0.09	72	0.27	102	0
	16	0	44	0.08	74	0	104	0.58
	18	0.55	46	0.43	76	0.03	106	0
	20	0.44	48	0	78	0	108	0
	22	0.51	50	0	80	0	110	0
	24	0	52	0.76	82	0	112	0
	26	0.32	54	0	84	0	114	0
	28	0.28	56	0	86	0	116	0.5
	30	0	58	0.37	88	0.37	118	0.2
	32	0.1	60	0	90	ORWE	120	0
	34	0.73	62	0	92	0.25RHP	140	0
	36	0.36	64	0	94	0.08		
			66	0.38	96	0.4		

Figure 10.2: Graph of transect data collected on 6/17/05 for Mark 10

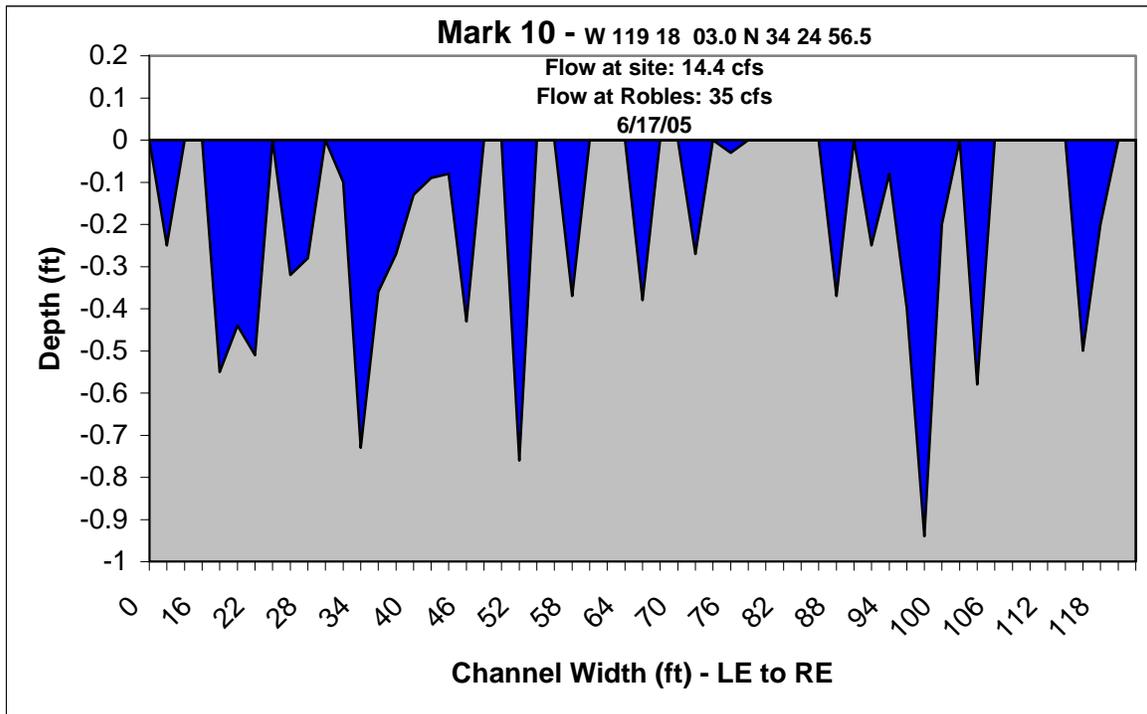


Figure 10.3: Photo of Mark 10 looking upstream, approximate transect location is marked in red.



Figure 11: Transect Data and Photograph of Mark 12 from May 2005 Survey

Figure 11.1: Transect data taken on 5/26/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth						
R HP	0	0	42	0.62	78	0.42	112	0.69
RWE	10	0.1	44	0	80	0.8	114	0.38
	12	0.6	46	0	82	0.58	116	0.71
	14	0.78	48	0.3	84	0.67	118	0.62
	18	0.34	50	0	86	0.52	120	0.3
	20	0.7	52	0	88	0.8	122	0.65
	22	0.58	56	0	90	0.64	124	0.45
	24	0	58	0	92	0.6	126	0.46
	26	0	60	0	94	0.64	128	0.37
	28	0	62	0	96	0.31	130	0.48
	30	0	64	0	98	0.49	132	0.65
	32	0.1	66	0	100	0	134	0.4
	34	0.05	68	0.02	102	0.05LWE	136	0
	36	0.37	70	0.1	104	0.28	138	0
	38	0	72	0.05	106	0.44	140	0
	40	0.62	74	0.3	108	0L HP	145.8	0
			76	0.2	110	0.53		

Figure 11.2: Graph of transect data collected on 5/26/05 for Mark 12

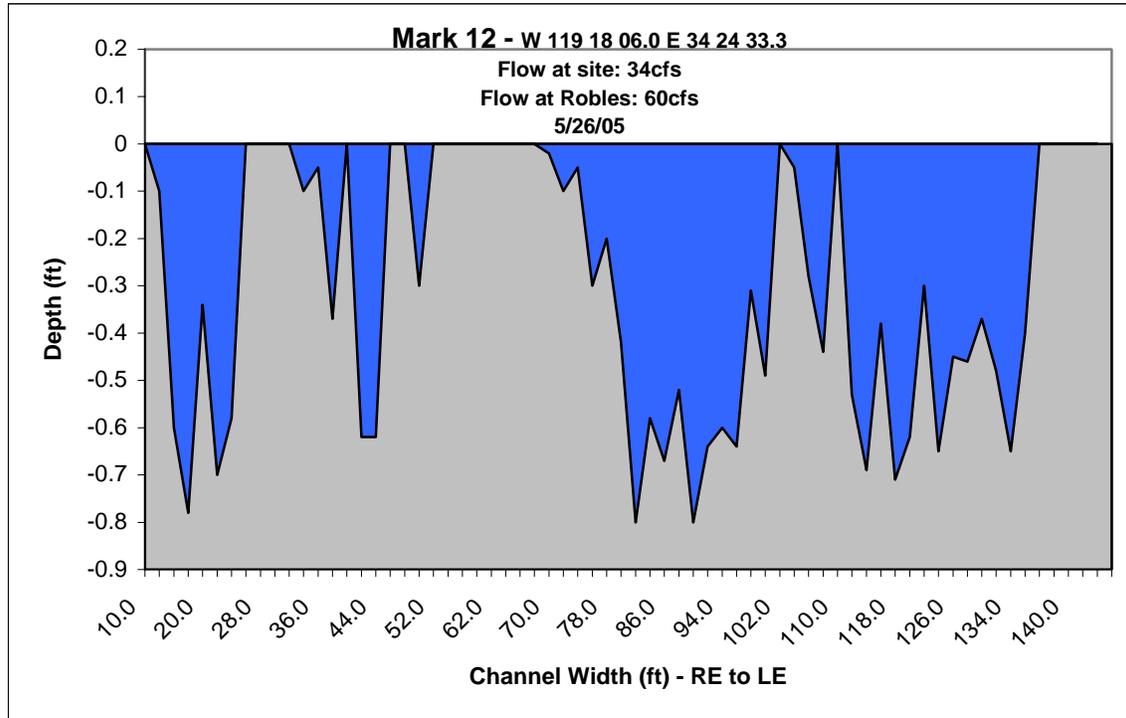


Figure 11.3: Photo of Mark 12 looking upstream, approximate transect location is marked in red.



Figure 12: Transect Data and Photograph of Mark 13 from May 2005 Survey

Figure 12.1: Transect data taken on 6/20/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth						
RHP	0	0	66	0.12	98	0	130	0
	30	0	68	0.42	100	0	132	0
	40	0	70	0.05	102	0	134	0
RWE	42	0	72	0	104	0.18	136	0.26
	44	0.12	74	0.15	106	0.15	138	0.14
	46	0	76	0	108	0.16	140	0.19
	48	0	78	0.06	110	0	142	0
	50	0.13	80	0	112	0.04	144	0
	52	0	82	0	114	0	146	0.18
	54	0.37	84	0	116	0.05	148	0.13
	56	0	86	0.13	118	0.21	150	0.29
	58	0.43	88	0.15	120	0.34	152	0.14
	60	0	90	0.35	122	OLWE	153	0
	62	0	92	0.07	124	OLHP	155.6	0
	64	0.13	94	0	126	0		
			96	0	128	0.2		

Figure 12.2: Graph of transect data collected on 6/20/05 for Mark 13

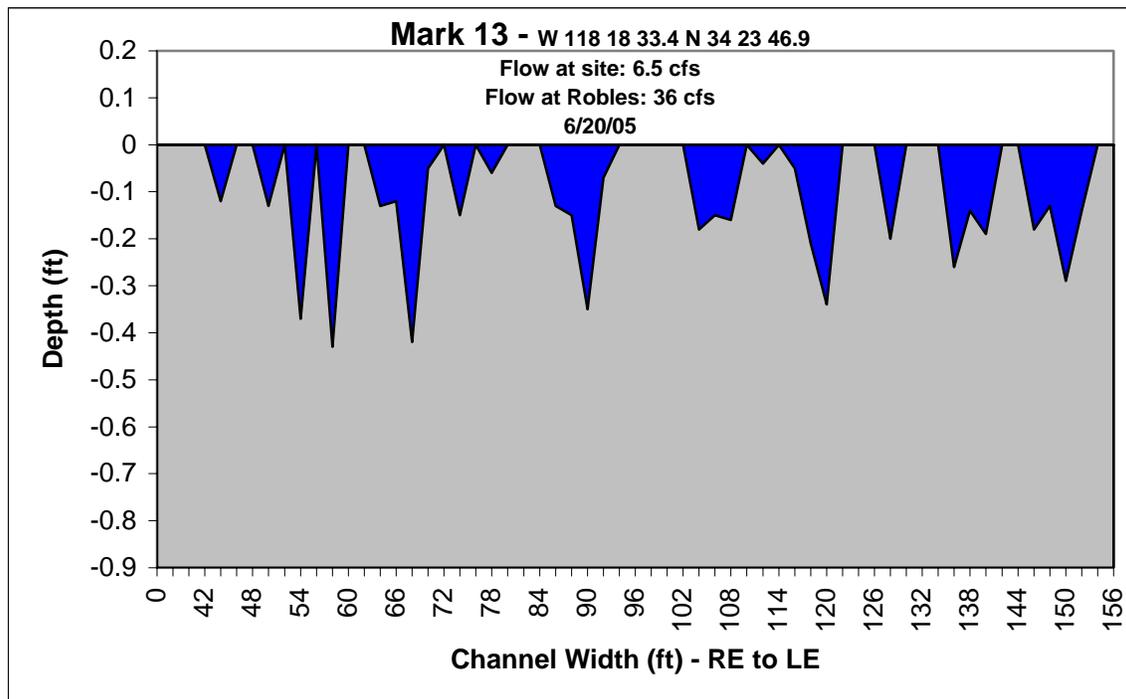


Figure 12.3: Photo of Mark 13 looking downstream, approximate transect location is marked in red.



Figure 13: Transect Data and Photograph of Mark 17 from May 2005 Survey

Figure 13.1: Transect data taken on 6/13/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth						
RHP	0	0	49	0.52	79	0.6	109	0
RWE	23	0	51	0	81	0.29	111	0
	25	0	53	0.19	83	0.55	113	0
	27	0.42	55	0.22	85	0	115	0.17
	29	0.39	57	0.7	87	0	117	0.25
	31	0.38	59	0.89	89	0	119	0
	33	0.29	61	0	91	0	121	0.21
	35	0.55	63	0.5	93	0	123	0
	37	0.59	65	0	95	0.17	125	0.2
	39	0.43	67	0	97	0	127	0.09
	41	0.66	69	0.28	99	0.29	129	0.08
	43	0.13	71	0	101	0.4	131	0.08
	45	0.23	73	0	103	0LWE	133	0
	47	0.29	75	0.14	105	0.01LHP	149.35	0
			77	0.52	107	0		

Figure 13.2: Graph of transect data collected on 6/13/05 for Mark 17

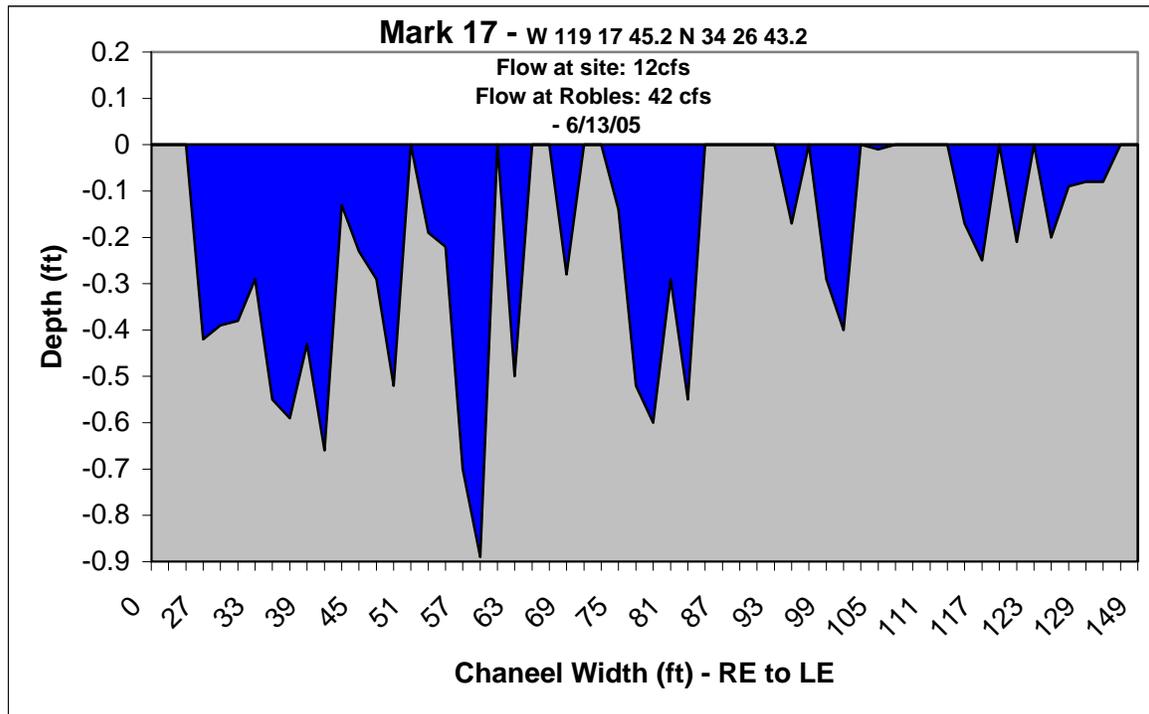


Figure 13.3: Photo of Mark 17 looking downstream, approximate transect location is marked in red.



Figure 14: Transect Data and Photograph of Mark 18 from May 2005 Survey

Figure 1: Transect data taken on 6/14/05 includes distances and depths with head pin and wet edge location.

	Distance	Depth						
LHP	0	0	80	0.56	96	0.28	112	0.2
LWE	69.2	0	82	0.14	98	0.12	114	0.25
	70	0.05	84	0.55	100	0.25	116	0.29
	72	0	86	0.23	102	0.22	118	0.36
	74	0.2	88	0.05	104	0.13RWE	120	0
	76	0	90	0	106	0RHP	142	0
	78	0.51	92	0	108	0		

Figure 2: Graph of transect data collected on 6/14/05 for Mark 18

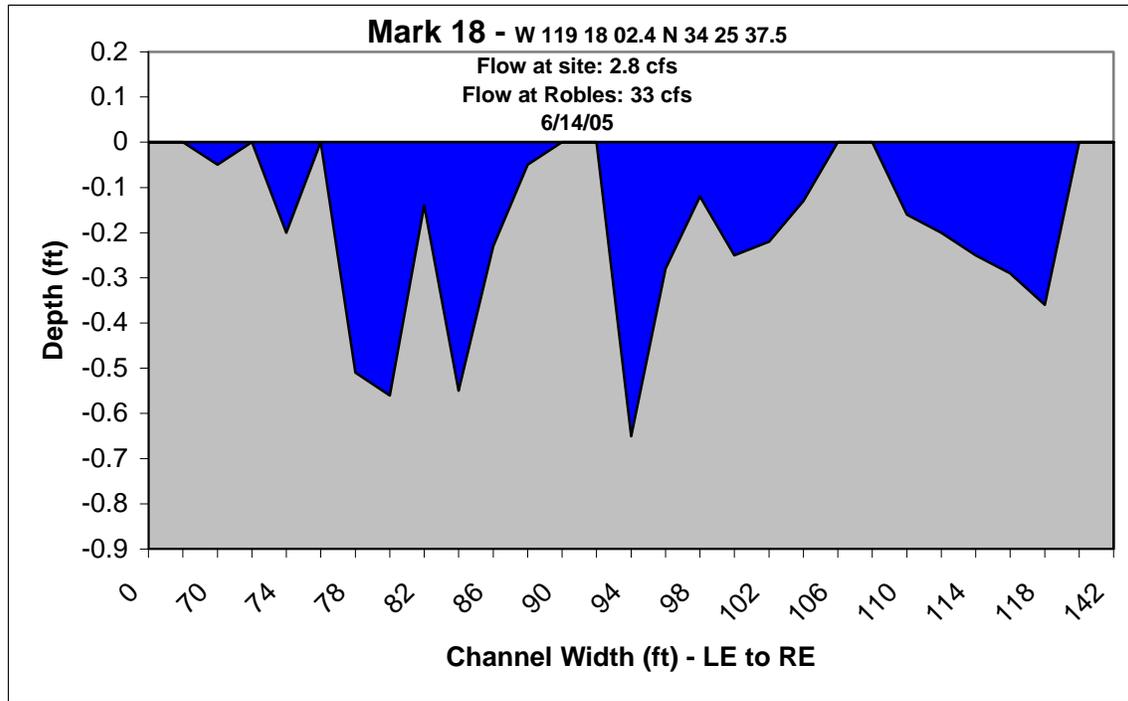
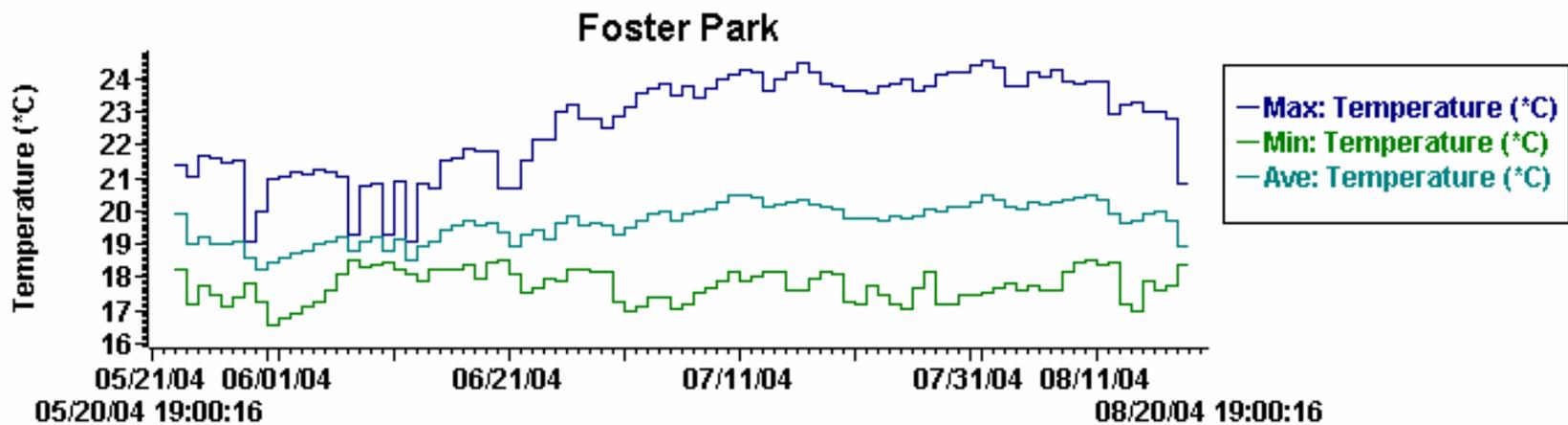


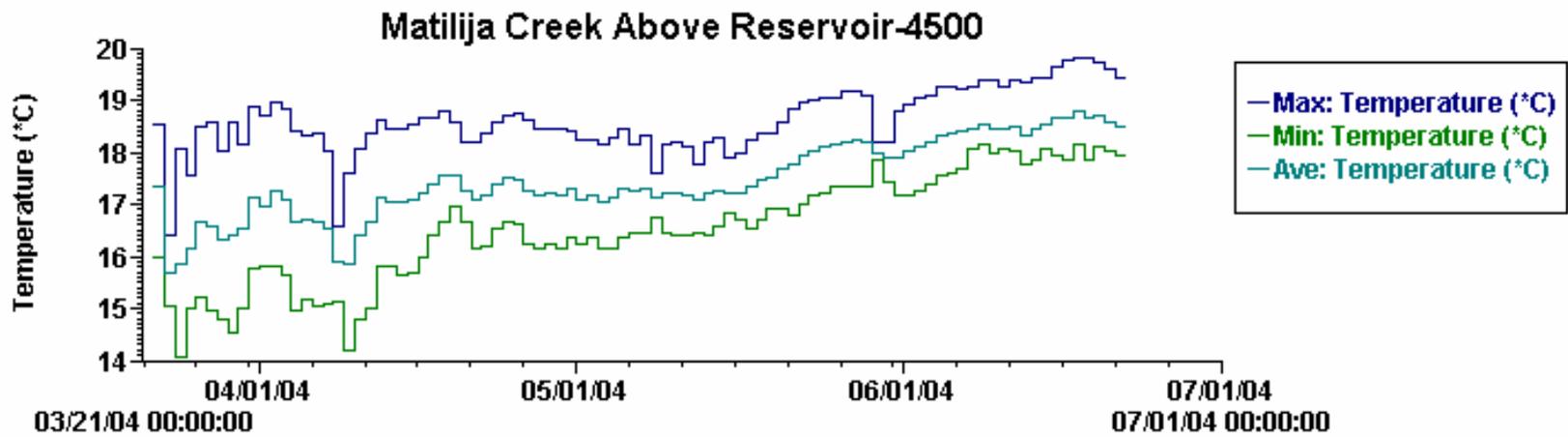
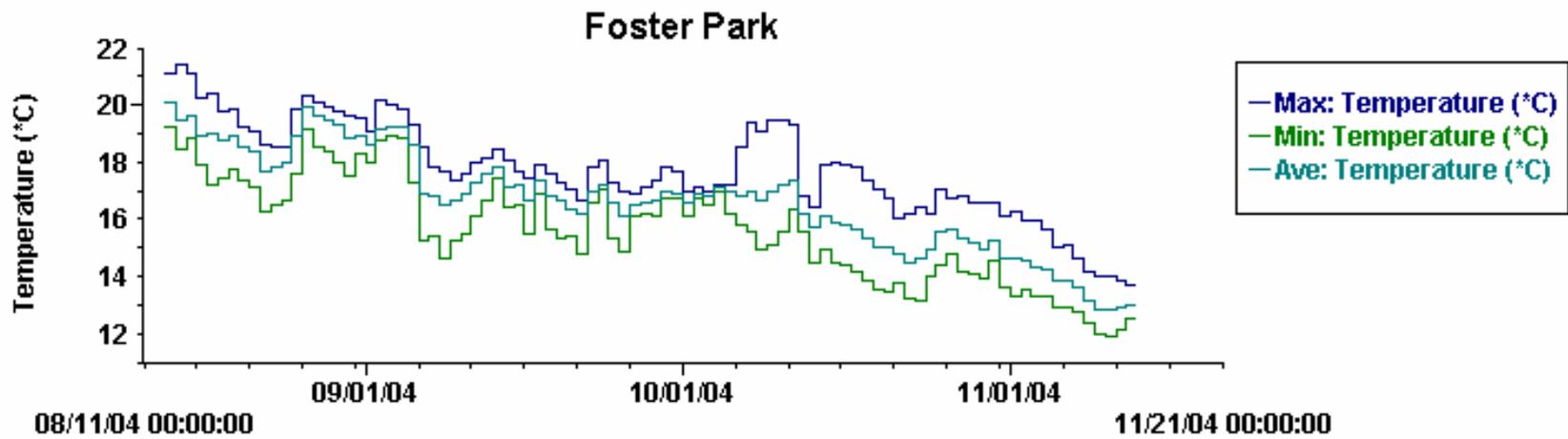
Figure 3: Photo of Mark 12 looking upstream, approximate transect location is marked in red.

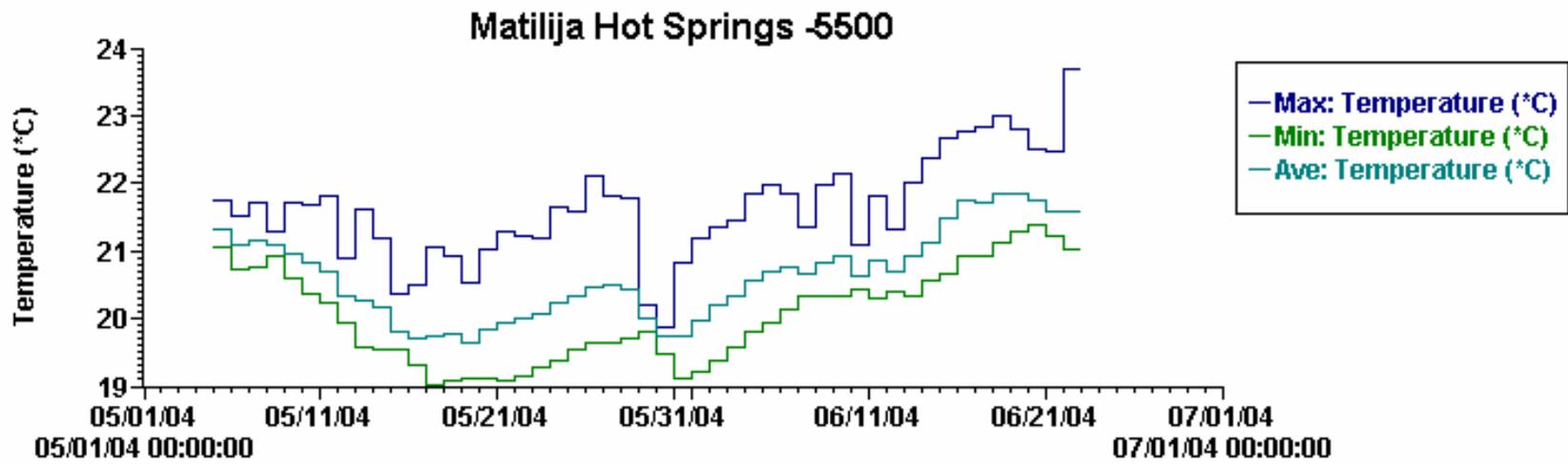
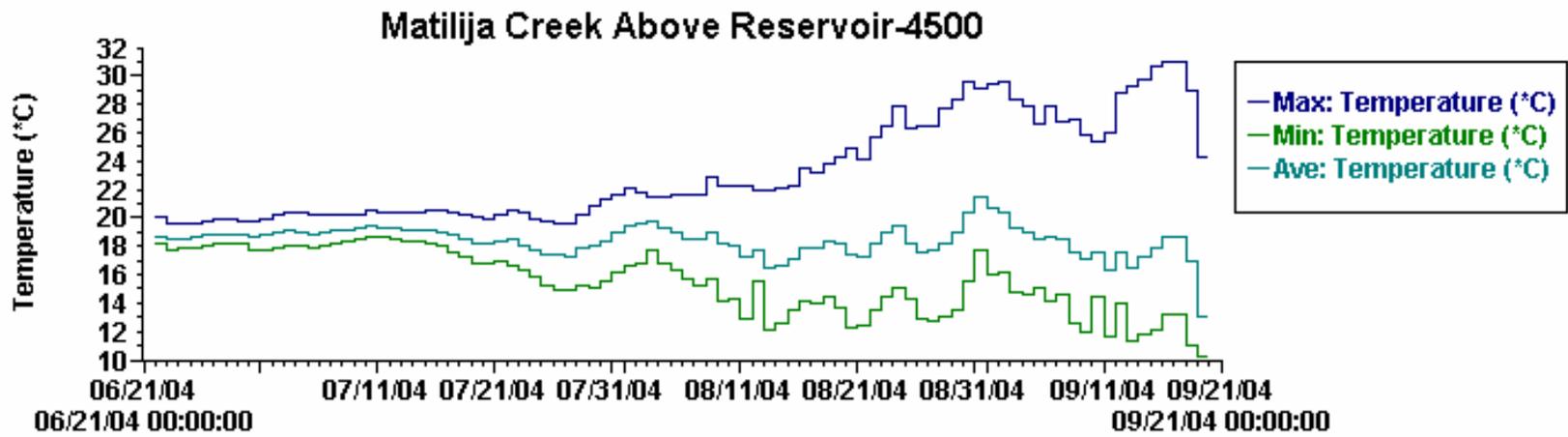


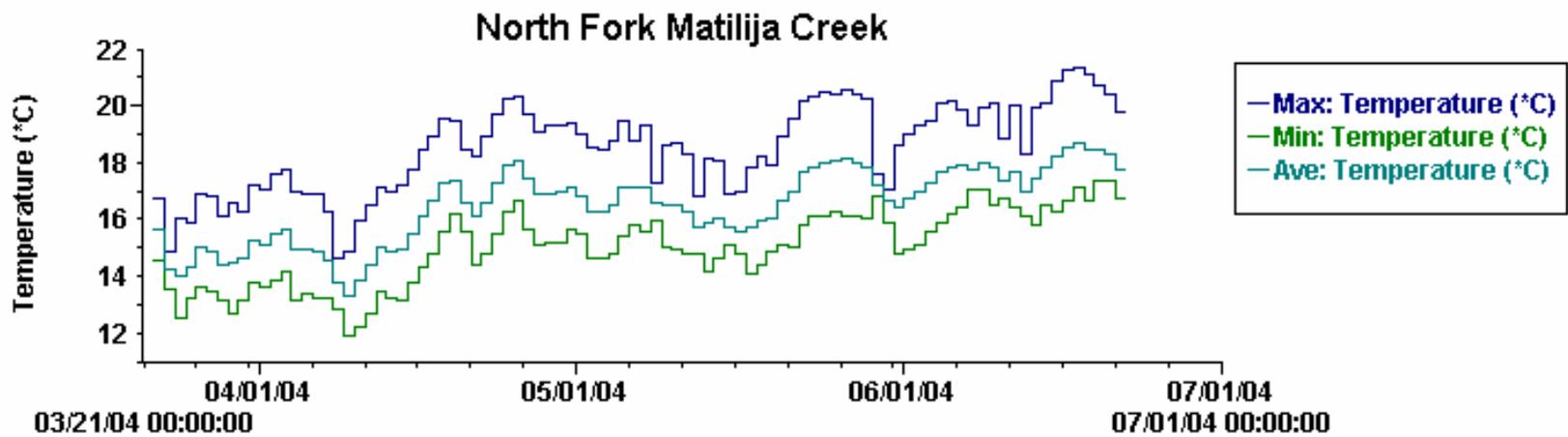
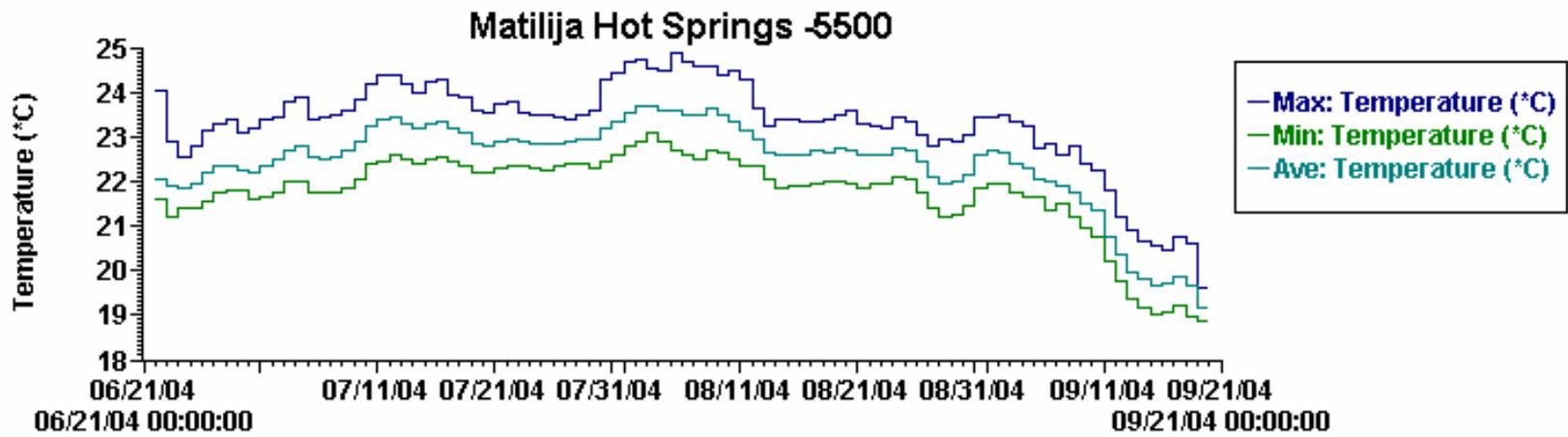
Appendix F

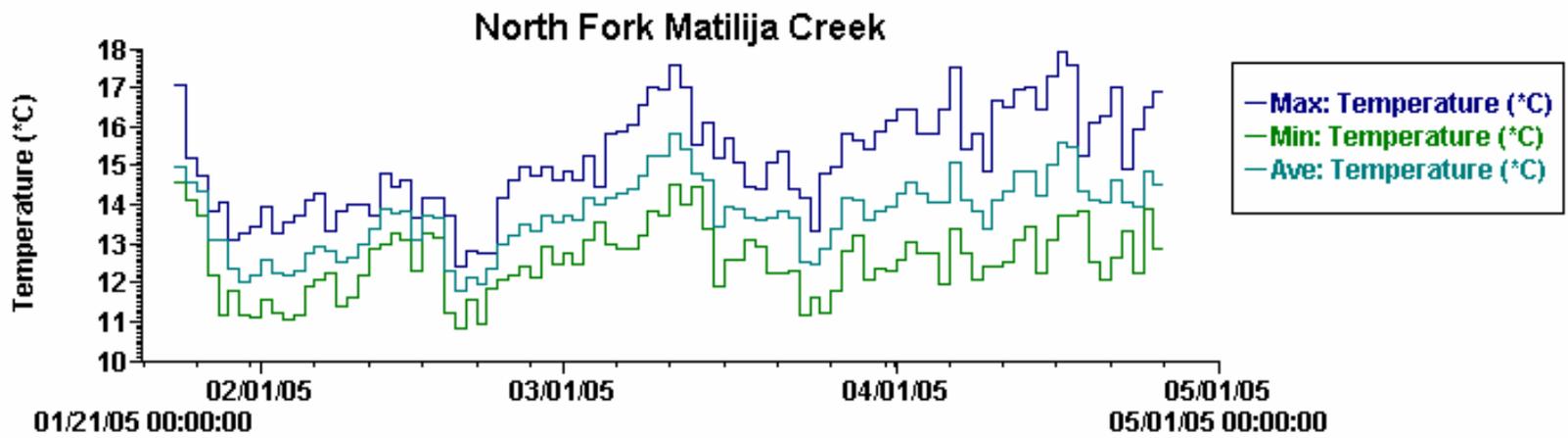
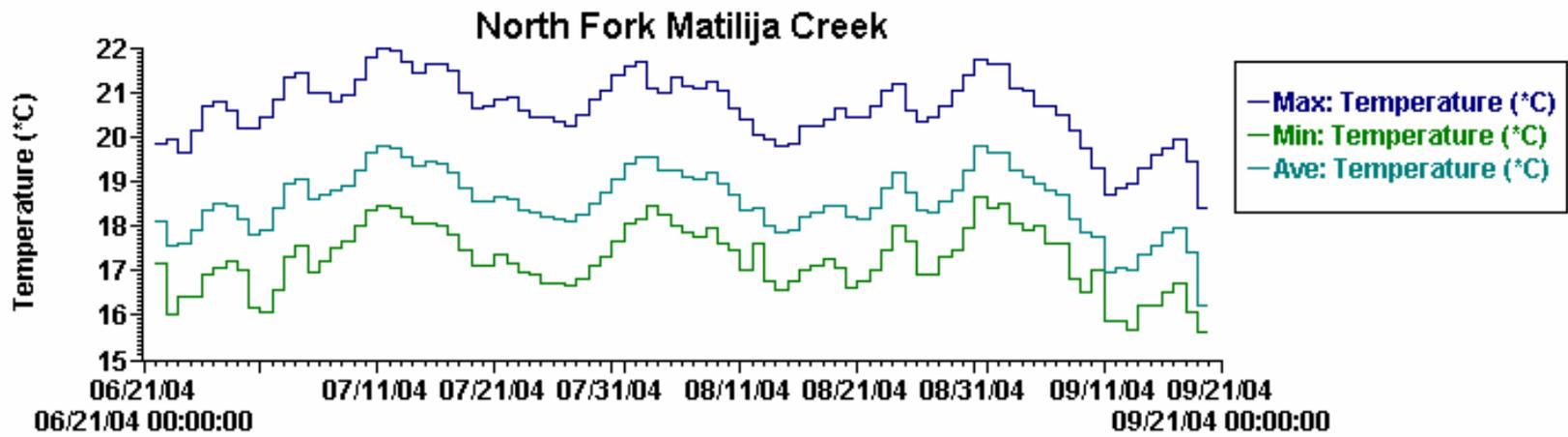
Temperature Data

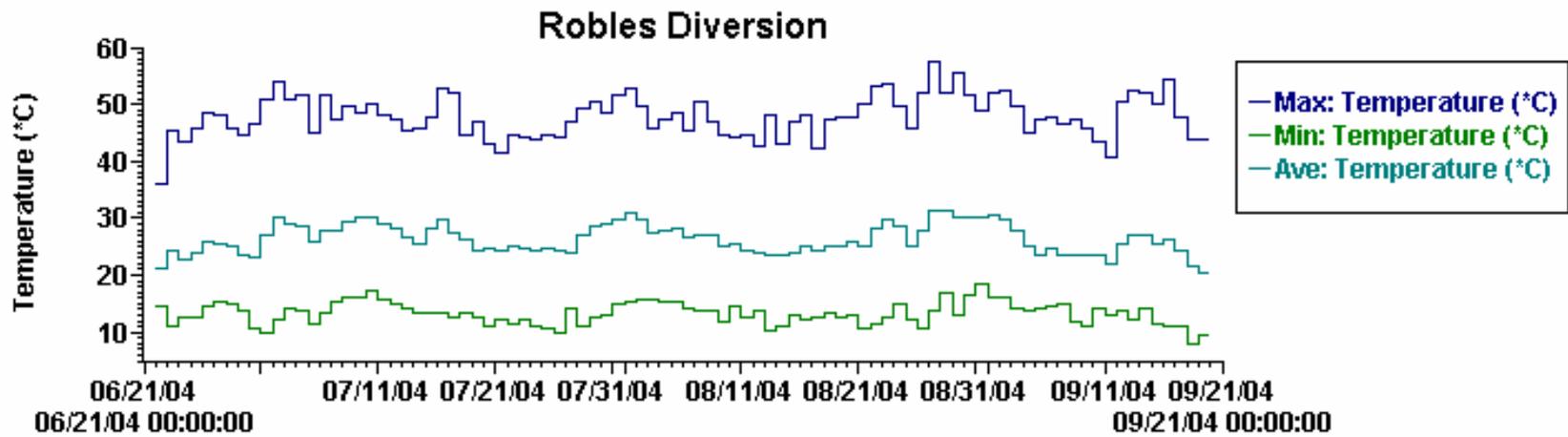
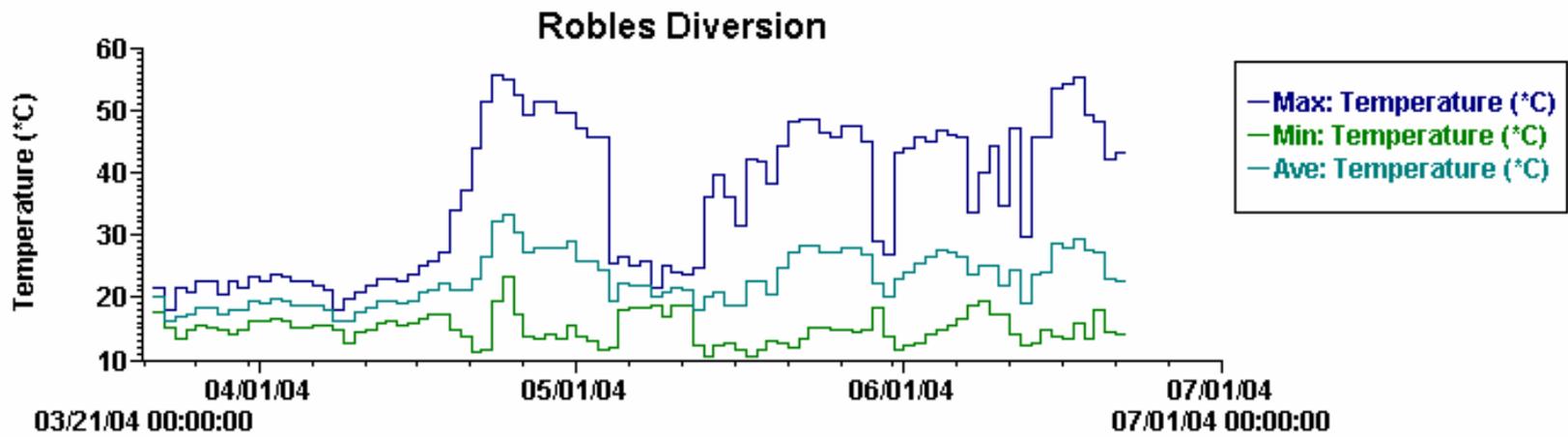


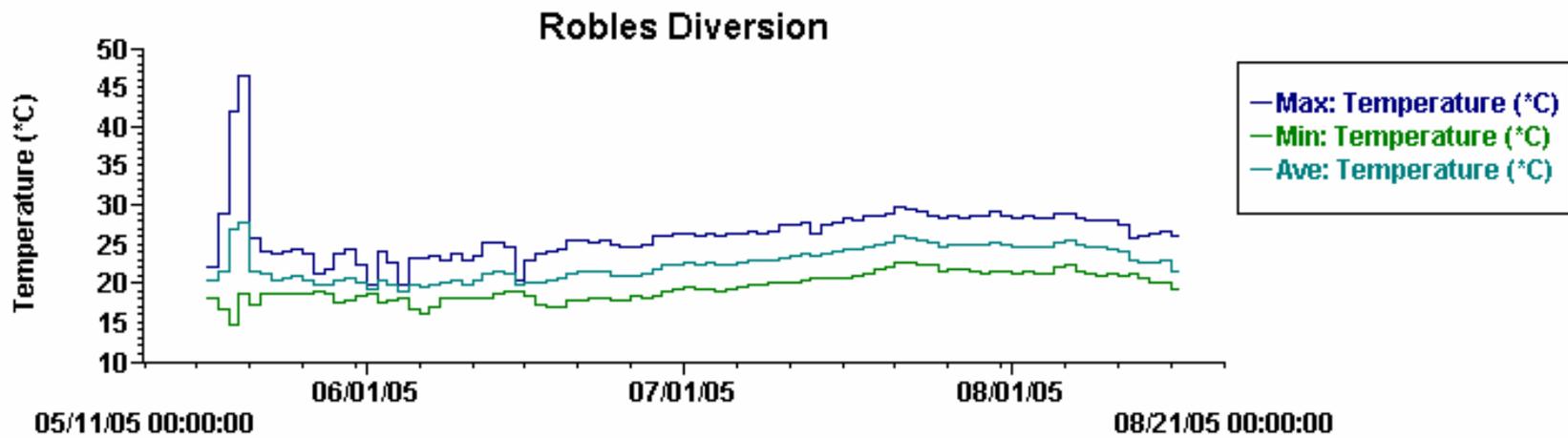
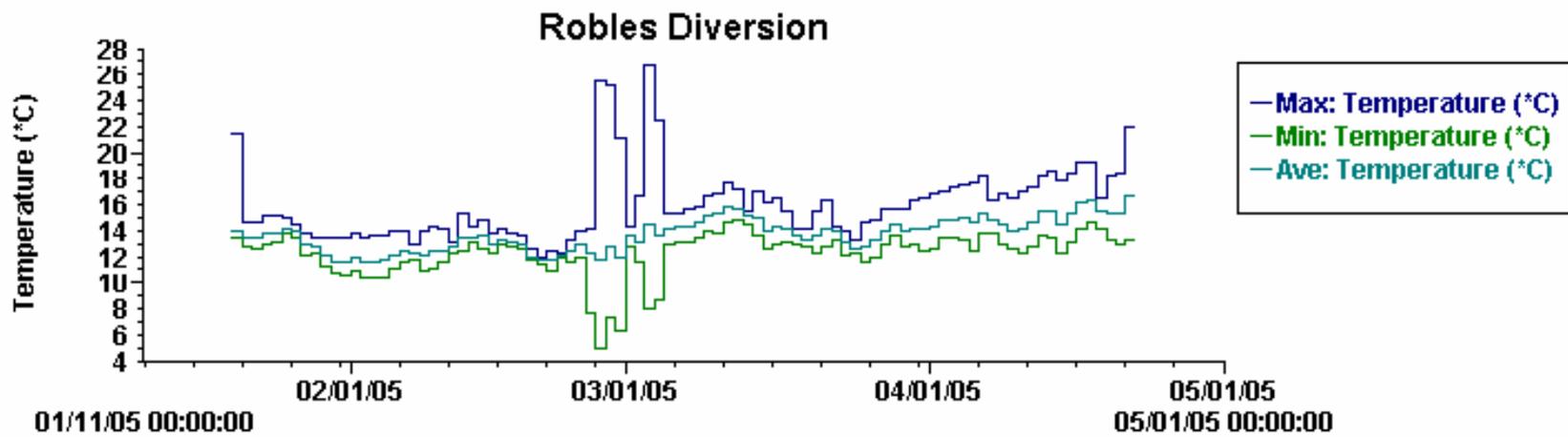


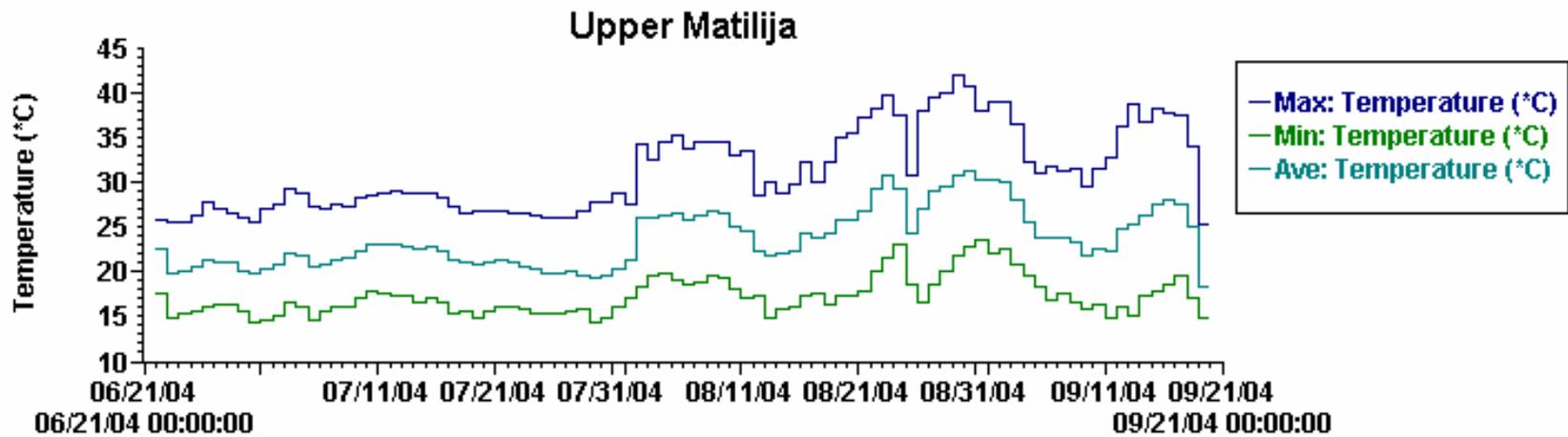
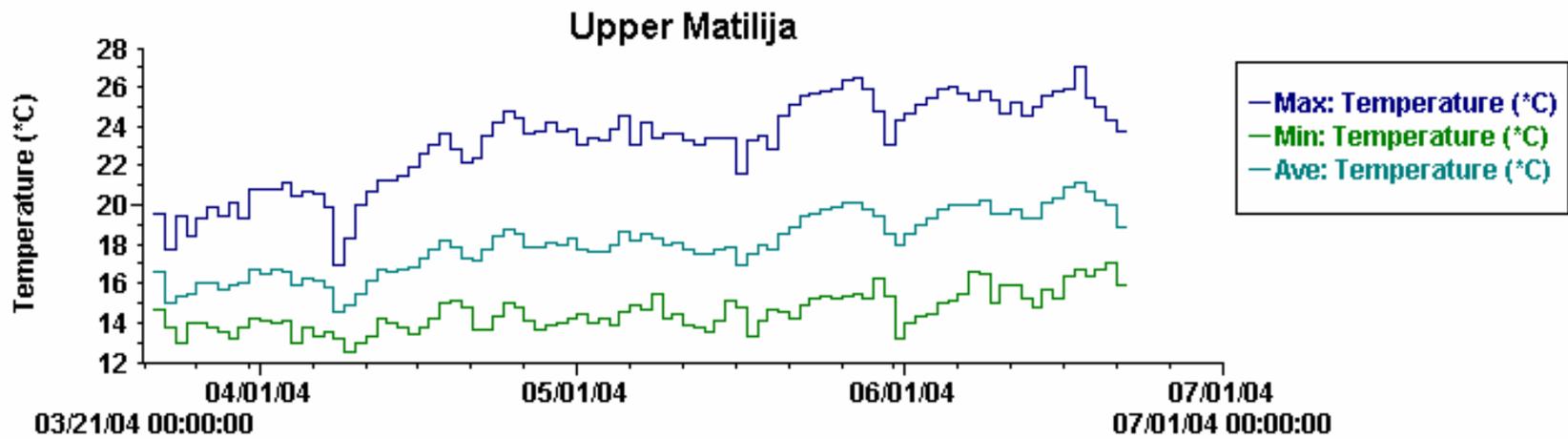


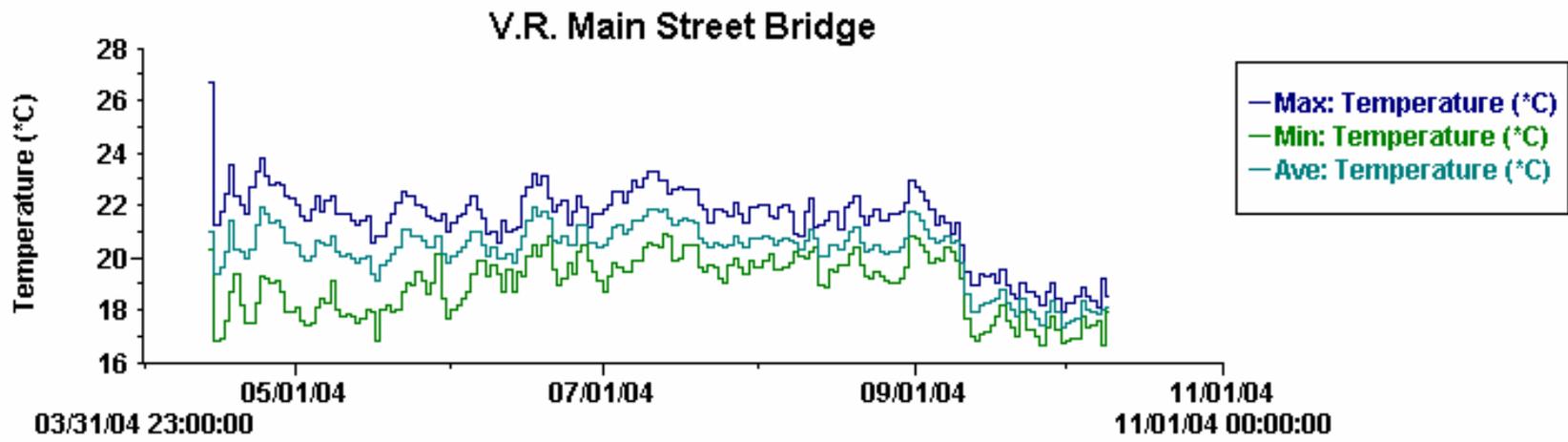












Appendix G

Water Quality Data

Figure 1: Summary table of results from water quality samples collect in 2005

Date	Location	Time	Temp (C°)	DO (mg/L)	Turbidity (ntu)
1/22/05	NF Matilija creek				
1/26/05	Matilija Caynon Rd.	1300	12.7		
1/28/05	150 Bridge	1200	13.7		
1/31/05	150 Brgide	1400	14.2		
2/10/05	150 Bridge	0930	13.3		
5/17/05	NF Matilija creek	1530	17.8		
5/18/05	Robles	1130	18.2	8.87	0.67
5/23/05	Foster Park	1515	24.0	9.01	
5/23/05	Santa Ana Bridge	1445	24.0	9.16	
5/23/05	150 Bridge	1415	19.7	9.4	
6/6/05	Foster Park	1500	23.3	9.45	1.33
6/6/05	150 Bridge	1445	22.9	8.57	
6/6/05	Robles	1400	22.3	8.52	0.52
6/16/05	Foster Park	1500	22.0	8.7	
6/16/05	Santa Ana Bridge	1430	20.7	8.36	
6/16/05	150 Bridge	1400	18.9	8.46	0.75
6/23/05	Foster Park	1145	21.3	9.63	0.53
6/23/05	Santa Ana Bridge	1200	24.3	8.89	
6/23/05	150 Bridge	1215	20.3	9.83	
6/23/05	Robles	1230	22.5	9.35	0.42

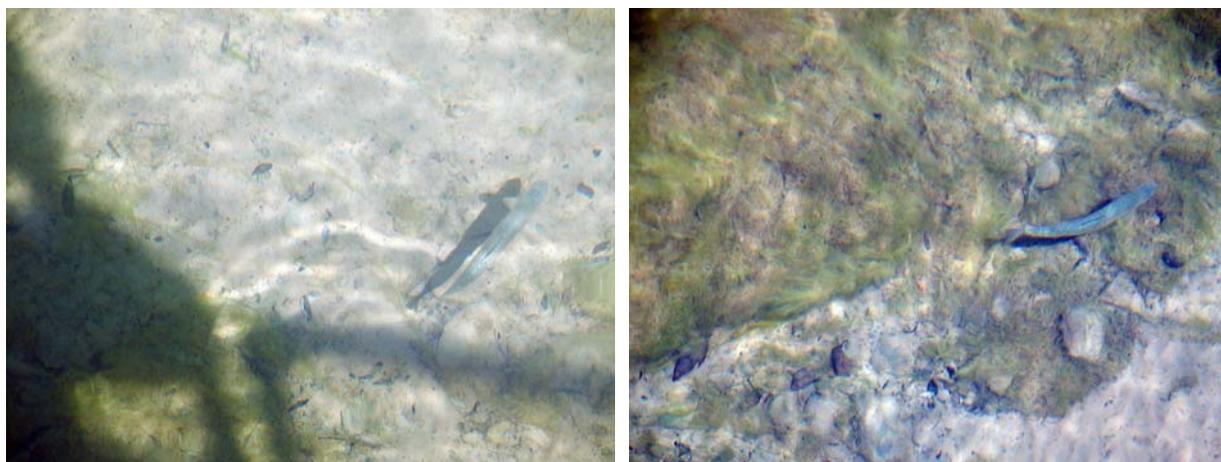
Appendix H

Trout Sightings

Figure 1: Summary table of trout observed at the Robles Fish Passage Facility in 2005

Date/Time	Location	Quantity	Est. Size (in)
5/10/05 1200	Upstream of diversion near diversion gates	2	8-10
5/10/05 1500	Upstream of fish passage gate near downstream end of fish screens	1	8-10
5/13/05 1200	2 fish in fish passage entrance pool, 2 fish in Robles forebay near fish screens, 1 upstream of diversion near diversion gates	5	8-10
5/13/05 1300	Upstream of diversion near timber debris fence	2	8-10
5/17/05	Upstream of fish passage gate near downstream end of fish screens	2	8-10
5/18/05 1100	In Robles forebay near low flow fish exit	2	8-10

Figure 2: Photos of trout observed in the Robles Fish Passage Facility diversion channel on 5/10/05.



Ventura River Flow Assessment for the Robles Fish Passage Facility
Winter 2005
CASITAS MUNICIPAL WATER DISTRICT
Monthly Summary of Flow Data

Month-Year	(1)	(2)	(1)+(2)	(3)	(4)	(3)+(4)	((1)+(2))-((3)+(4))
	<u>Source Stream Daily Flows</u>		Sum of Creek Flows (cfsd)	<u>Robles Facility Daily Flows</u>			Estimate of Water Over the Cutoff Wall (cfsd)
Matilija Creek @ Matilija Hot Sprg (cfsd)	North Fork Matilija Ck. (cfsd)	Diversion Canal (cfsd)		VRNMO Weir (cfsd)	Sum VRNMO & Canal Diversion (cfsd)		
Dec-04	2,755	1,061	3,816	846	3,221	4,067	360
Jan-05	21,694	8,720	30,414	6,527	27,031	33,558	3,820
Feb-05	14,044	3,240	17,284	4,697	17,487	22,184	2,238
Mar-05	6,021	1,324	7,345	2,306	1,913	4,219	3,126
Apr-05	2,597	627	3,275	0	1,848	1,848	1,427
May-05	1,614	477	2,091	59	1,128	1,187	904
Jun-05	963	251	1,214	0	624	624	590
Total (CFSD)	49,688	15,700	65,439	14,435	53,252	67,687	12,465
Total (Acre-feet)	98,382	31,085	129,569	28,581	105,439	134,020	24,681

Station Information:

- (1) Matilija Creek at Matilija Hot Springs. Casitas MWD (previously USGS station). Well rated channel located approx. 2,100 feet D/S of Matilija Dam.
- (2) North Fork Matilija Creek. Data recorded and furnished by the Ventura County Watershed Protection District.
- (3) Robles-Casitas Diversion Canal. Casitas MWD. Trapezoidal concrete channel at bridge located approx. 1,300 feet D/S of Robles Diversion Well rated section
- (4) Ventura River near Meiners Oaks (VRNMO) Weir. Casitas MWD. Concrete hardened stream section rated well to 72 cfs. Flow ratings above 72 cfs based on channel formula that is recognized as a higher reading than actual flows present at the weir. Flows measured here are indicators of releases through the fish ladder (Q< 60 cfs) and the spillway (Q>60 cfs).

Notes:

The sum of creek flows is considered as the amount of water entering the Robles forebay basin. Actual amount may be larger when accounting for other tributaries and watersheds feeding the Ventura River above robles and below the Matilija Creek and North Fork confluence. The forebay elevation is provided as a daily indicator of the level of pool maintained in the fish passage facility. The sensors for monitoring the forebay pool elevation were not operable until February 20, 2005.

The negative values for the "Estimate of Water Over the Cutoff Wall" are not included in the monthly summation value, although these dates did have significant flow over the cutoff wall.

Appendix I

Ventura River Flow Assessment for the Robles Fish Passage Facility - Winter 2005									
CASITAS MUNICIPAL WATER DISTRICT									
Daily Flow Data - December 1, 2004 through June 30, 2005									
Dec-04	(1) (2) (1)+(2)			Robles Forebay Elev. (ft)	(3) (4) (3)+(4)			((1)+(2))-((3)+(4))	Notes
	<u>Source Stream Daily Flows</u>				<u>Robles Facility Daily Flows</u>				
	Matilija Creek @ Hot Sprgs (ctsd)	North Fork Matilija Ck. (ctsd)	Sum of Creek Flows (ctsd)		Diversion Canal (ctsd)	VRNMO Weir (ctsd)	Sum VRNMO & Canal Diversion (ctsd)	Est. of Water Over the Cutoff Wall (ctsd)	
1	5	2	7		0	9	9		
2	5	2	7		0	9	9		
3	5	2	7		0	8	8		
4	5	2	7		0	8	8		
5	5	2	7		0	9	9		
6	5	2	7		0	9	9		
7	5	2	7		0	9	9		
8	5	2	7		0	10	10		
9	5	2	7		0	9	9		
10	5	2	7		0	10	10		
11	5	2	7		0	9	9		
12	5	2	7		0	8	8		
13	5	2	7		0	8	8		
14	5	2	7		0	8	8		
15	5	2	7		0	8	8		
16	5	2	7		0	8	8		
17	5	2	7		0	7	7		
18	5	2	7		0	8	8		
19	5	2	7		0	7	7		
20	39	2	41		9	10	19	22	
21	31	2	33		11	11	22	11	
22	5	2	7		1	3	4	3	
23	5	2	7		0	0	0	7	
24	5	2	7		0	0	0	7	
25	5	2	7		0	0	0	7	
26	5	2	7		0	0	0	7	
27	5	5	10		0	7	7	3	
28	398	130	528		189	972	1161	-633	
29	327	65	392		331	72	403		
30	274	64	338		132	62	194	144	
31	1561	751	2312		173	1923	2096	216	
Totals	2755	1060.6	3816		846	3221	4067	360	
Jan-05	(1) (2) (1)+(2)			Robles Forebay Elevation (ft)	(3) (4) (3)+(4)			((1)+(2))-((3)+(4))	Notes
	<u>Source Stream Daily Flows</u>				<u>Robles Facility Daily Flows</u>				
	Matilija Creek @ Hot Sprgs (ctsd)	North Fork Matilija Ck. (ctsd)	Sum of Creek Flows (ctsd)		Diversion Canal (ctsd)	VRNMO Weir (ctsd)	Sum VRNMO & Canal Diversion (ctsd)	Estimate of Water Over the Cutoff Wall (ctsd)	
1	307	151	458		395	106	501	-43	
2	179	79	258		228	67	295	-37	
3	1047	400	1447		396	1073	1469	-22	
4	559	160	719		406	163	569	150	
5	375	76	451		289	70	359	92	
6	291	53	344		188	65	253	91	
7	447	153	600		267	160	427	173	
8	1501	996	2497		400	1772	2172	325	
9	6183	2810	8993		305	7670	7975	1018	Extremely heavy flooding thru Jan 8 thru 12
10	3790	1950	5740		385	10000	10385	-4645	and large flows over the cutoff wall.
11	1543	541	2084		380	3573	3953	-1869	Scouring of area downstream of cutoff wall.
12	871	263	1134		396	1086	1482	-348	
13	628	189	817		417	268	685	132	
14	499	136	635		363	85	448	187	
15	414	96	510		267	79	346	164	
16	349	74	423		214	73	287	136	
17	307	62	369		175	67	242	127	
18	271	54	325		144	77	221	104	
19	241	49	290		109	69	178	112	
20	218	45	263		103	54	157	106	
21	202	41	243		90	54	144	99	
22	187	39	226		78	53	131	95	
23	174	37	211		71	46	117	94	
24	162	35	197		66	38	104	93	
25	153	34	187		62	35	97	90	
26	146	35	181		50	41	91	90	
27	138	36	174		62	37	99	75	
28	146	36	182		67	39	106	76	
29	128	31	159		57	38	95	64	
30	122	30	152		51	38	89	63	
31	116	29	145		46	35	81	64	
Totals	21694	8720	30414		6527	27031	33558	3820	

Appendix I

Ventura River Flow Assessment - Continued									
	(1) (2) (1)+(2)			Robles Forebay Elevation (ft)	(3) (4) (3)+(4)			(1)+(2)-((3)+(4))	NOTES
	Source Stream Daily Flows		Sum of		Robles Facility Daily Flows				
Feb-05	Matilija Creek @ Hot Sprgs (cfsd)	North Fork Matilija Ck. (cfsd)	Creek Flows (cfsd)	Forebay Elevation (ft)	Diversion Canal (cfsd)	VRNMO Weir (cfsd)	Sum VRNMO & Canal Diversion (cfsd)	the Cutoff Wall (cfsd)	NOTES
1	110	29	139		45	33	78	61	
2	105	28	133		43	34	77	56	
3	101	28	129		38	34	72	57	
4	98	26	124		37	34	71	53	
5	94	26	120		35	34	69	51	
6	91	25	116		33	34	67	49	
7	89	24	113		32	34	66	47	
8	86	23	109		34	24	58	51	
9	83	22	105		28	27	55	50	
10	80	22	102		22	40	62	40	
11	105	23	128		33	37	70	58	
12	106	22	128		37	38	75	53	
13	91	21	112		27	38	65	47	
14	86	21	107		25	36	61	46	
15	83	21	104		25	35	60	44	
16	94	22	116		30	36	66	50	
17	103	23	126		38	36	74	52	
18	356	175	531		242	53	295	236	
19	954	232	1186		473	1060	1533	-347	
20	787	168	955	10.5	500	510	1010	-55	- Overshot gate becomes operable
21	4057	1130	5187	11.05	449	9280	9729	-4542	- Heavy flood flows, large flow over the cutoff wall
22	1892	444	2336	10.16	456	3602	4058	-1722	
23	1289	212	1501	10.14	477	1496	1973	-472	
24	896	137	1033	10.12	487	372	859	174	
25	697	105	802	10.3	141	343	484	318	
26	578	88	666	10.06	359	69	428	238	
27	494	76	570	9.4	283	70	353	217	
28	439	67	506	9.52	268	48	316	190	
Totals	14044	3240	17284		4697	17487	22184	2238	
	(1) (2)		(1)+(2)	Robles Forebay Elevation (ft)	(3) (4) (3)+(4)			((1)+(2))-((3)+(4))	Notes
Mar-05	Source Stream Daily Flows		Sum of Creek		Robles Facility Daily Flows			Estimate of Water	
	Matilija Creek @ North Fork Matilija Hot Sprg (cfsd)	Matilija Ck. (cfsd)	Flows (cfsd)	Forebay Elevation (ft)	Diversion Canal (cfsd)	VRNMO Weir (cfsd)	Sum VRNMO & Canal Diversion (cfsd)	Over the Cutoff Wall (cfsd)	Notes
1	390	59	449	9.29	223	47	270	179	
2	353	55	408	9.82	166	46	212	196	
3	321	52	373	9.67	162	45	207	166	
4	304	51	355	9.07	152	45	197	158	
5	274	49	323	8.81	135	44	179	144	
6	253	48	301	8.74	124	44	168	133	
7	297	47	344	8.85	114	44	158	186	
8	221	46	267	8.90	104	44	148	119	
9	207	45	252	9.92	93	41	134	118	
10	197	45	242	8.79	108	27	135	107	
11	184	45	229	6.34	109	27	136	93	
12	177	44	221	6.31	103	30	133	88	
13	169	42	211	6.35	98	24	122	89	
14	162	42	204	6.51	91	31	122	82	
15	153	41	194	6.71	82	33	115	79	
16	146	40	186	6.82	76	34	110	76	
17	142	37	179	6.93	72	35	107	72	
18	144	38	182	7.12	72	36	108	74	
19	144	37	181	7.20	71	37	108	73	
20	130	35	165	7.25	63	37	100	65	
21	126	33	159	7.35	56	38	94	65	
22	182	67	249	10.18	32	79	111	138	- Lake Casitas reaches 2 feet from spill condition, per SOP, diversions stopped. Fish ladder in operation.
23	232	56	288	10.15	0	166	166	122	
24	172	41	213	9.88	0	135	135	78	
25	155	37	192	9.21	0	129	129	63	- Note that minor leakage occurred thru the gate, but observed to be less than 0.5 cfs
26	144	35	179	8.29	0	116	116	63	
27	136	34	170	7.97	0	111	111	59	
28	134	33	167	9.74	0	99	99	68	- District also opened up the blowoff on the inverted siphon to keep the lower canal drained
29	128	31	159	9.75	0	97	97	62	
30	124	30	154	10.00	0	95	95	59	
31	120	29	149	7.16	0	97	97	52	
Totals	6021	1324	7345		2306	1913	4219	3126	

Appendix I

Ventura River Flow Assessment - Continued										
	(1) Source Stream Daily Flows		(1)+(2)	Robles Forebay Elevation (ft)	(3) Robles Facility Daily Flows			(3)+(4)	((1)+(2))-((3)+(4))	Notes
	Matilija Creek @ Hot Sprgs (cfsd)	North Fork Matilija Ck. (cfsd)	Sum of Creek Flows (cfsd)		Diversion Canal (cfsd)	VRNMO Weir (cfsd)	Sum VRNMO & Canal Diversion (cfsd)	Est. of Water Over the Cutoff Wall (cfsd)		
Apr-05										
1	116	28	144	7.33	0	95	95	49		
2	114	27	143	7.33	0	89	89	54		
3	112	27	141	7.37	0	85	85	56		
4	108	26	138	9.83	0	75	75	63		
5	106	25	133	9.93	0	75	75	58		
6	103	24	130	9.82	0	72	72	58		
7	101	24	127	9.55	0	72	72	55		
8	99	23	124	9.46	0	70	70	54		
9	98	23	122	9.19	0	69	69	53		
10	95	22	120	9.17	0	67	67	53		
11	94	22	117	8.61	0	64	64	53		
12	89	21	115	8.43	0	62	62	53		
13	89	20	109	8.20	0	61	61	48		
14	83	20	109	7.92	0	59	59	50		
15	84	19	102	7.76	0	58	58	44		
16	83	19	103	7.57	0	55	55	48		
17	80	19	102	7.30	0	53	53	49		
18	80	19	99	9.87	0	54	54	45		
19	78	19	99	7.39	0	56	56	43		
20	75	19	97	7.11	0	55	55	42		
21	74	18	93	7.03	0	53	53	40		
22	73	18	92	6.78	0	53	53	39		
23	72	18	91	6.86	0	50	50	41		
24	71	18	90	6.81	0	49	49	41		
25	68	18	89	6.82	0	48	48	41		
26	67	17	85	6.90	0	46	46	39		
27	65	17	84	7.08	0	46	46	38		
28	84	22	87	9.12	0	61	61	26		
29	71	18	102	8.30	0	50	50	52		
30	65	17	88	7.90	0	46	46	42		
	2597	627	3275		0	1848	1848	1427		
	(1) Source Stream Daily Flows		(1)+(2)	Robles Forebay Elevation (ft)	(3) Robles Facility Daily Flows			(3)+(4)	((1)+(2))-((3)+(4))	Notes
	Matilija Creek @ Hot Sprgs (cfsd)	North Fork Matilija Ck. (cfsd)	Sum of Creek Flows (cfsd)		Diversion Canal (cfsd)	VRNMO Weir (cfsd)	Sum VRNMO & Canal Diversion (cfsd)	Estimate of Water Over the Cutoff Wall (cfsd)		
May-05										
1	64	17	81	0.59	0	44	44	37		
2	61	17	78	0.66	0	43	43	35		
3	60	17	77	0.59	0	41	41	36		
4	57	17	74	0.65	0	41	41	33		
5	75	29	104	0.69	0	55	55	49		
6	74	23	97	0.68	0	56	56	41		
7	65	19	84	0.67	0	46	46	38		
8	61	18	79	0.67	0	49	49	30		
9	61	18	79	0.67	0	43	43	36		
10	57	17	74	0.64	0	41	41	33		
11	55	16	71	0.59	0	39	39	32		
12	52	16	68	0.66	0	38	38	30	USBR authorizes continued diversions at Robles	
13	51	15	66	0.67	0	36	36	30		
14	50	15	65	0.57	0	34	34	31		
15	48	15	63	0.63	0	34	34	29		
16	50	15	65	0.71	0	36	36	29		
17	49	15	64	0.54	0	34	34	30		
18	49	15	64	0.61	0	34	34	30		
19	144	14	158	1.29	31	38	69	89		
20	49	14	63	1.68	28	44	72	2		
21	1	14	15	0.38	0	13	13	0		
22	1	13	14	0.31	0	11	11	0		
23	21	13	34	0.20	0	25	25	9		
24	50	12	62	0.52	0	35	35	27		
25	51	12	63	0.54	0	36	36	27		
26	48	12	60	0.56	0	35	35	25		
27	43	12	55	0.56	0	25	25	30		
28	43	12	55	0.58	0	31	31	24		
29	43	12	55	0.55	0	30	30	25		
30	43	12	55	0.53	0	31	31	24		
31	39	11	50	0.57	0	30	30	20		
	1614	477	2091		59	1128	1187	904		

Appendix I

Ventura River Flow Assessment - Continued									
	(1)	(2)	(1)+(2)	Robles	(3)	(4)	(3)+(4)	((1)+(2))-((3)+(4))	Notes
	<u>Source Stream Daily Flows</u>			Forebay	<u>Robles Facility Daily Flows</u>			Est. of Water Over	
	Matilija Creek North Fork @ Hot Sprgs	Matilija Ck.	Sum of Creek Flows	Elevation (ft)	Diversion Canal	VRNMO Weir	Sum VRNMO & Canal Diversion	the Cutoff Wall (cfsd)	
Jun-05	(cfsd)	(cfsd)	(cfsd)	(ft)	(cfsd)	(cfsd)	(cfsd)	(cfsd)	
1	36	11	47	0.57	0	23	23	24	
2	36	11	47	0.55	0	22	22	25	
3	36	11	47	0.58	0	38	38	9	
4	37	10	47	0.58	0	40	40	7	
5	37	11	48	0.55	0	40	40	8	
6	37	10	47	0.58	0	40	40	7	
7	36	10	46	0.66	0	40	40	6	
8	37	9	46	0.55	0	40	40	6	
9	38	9	47	0.56	0	40	40	7	
10	38	9	47	0.55	0	22	22	25	
11	39	9	48	0.59	0	21	21	27	
12	39	9	48	0.57	0	21	21	27	
13	34	8	42	0.62	0	21	21	21	
14	25	8	33	0.54	0	14	14	19	
15	26	8	34	0.53	0	13	13	21	
16	27	8	35	0.56	0	13	13	22	
17	27	8	35	0.52	0	13	13	22	
18	27	8	35	0.43	0	12	12	23	
19	28	8	36	0.53	0	13	13	23	
20	28	8	36	0.47	0	23	23	13	
21	29	7	36	0.56	0	13	13	23	
22	30	7	37	0.46	0	13	13	24	
23	30	7	37	0.49	0	12	12	25	
24	30	7	37	0.47	0	11	11	26	
25	31	7	38	0.44	0	11	11	27	
26	32	7	39	0.48	0	11	11	28	
27	32	7	39	0.52	0	12	12	27	
28	33	7	40	0.50	0	12	12	28	
29	23	6	29	0.47	0	11	11	18	
30	25	6	31	0.44	0	8	8	23	
	963	251	1214		0	624	624	590	

Appendix I

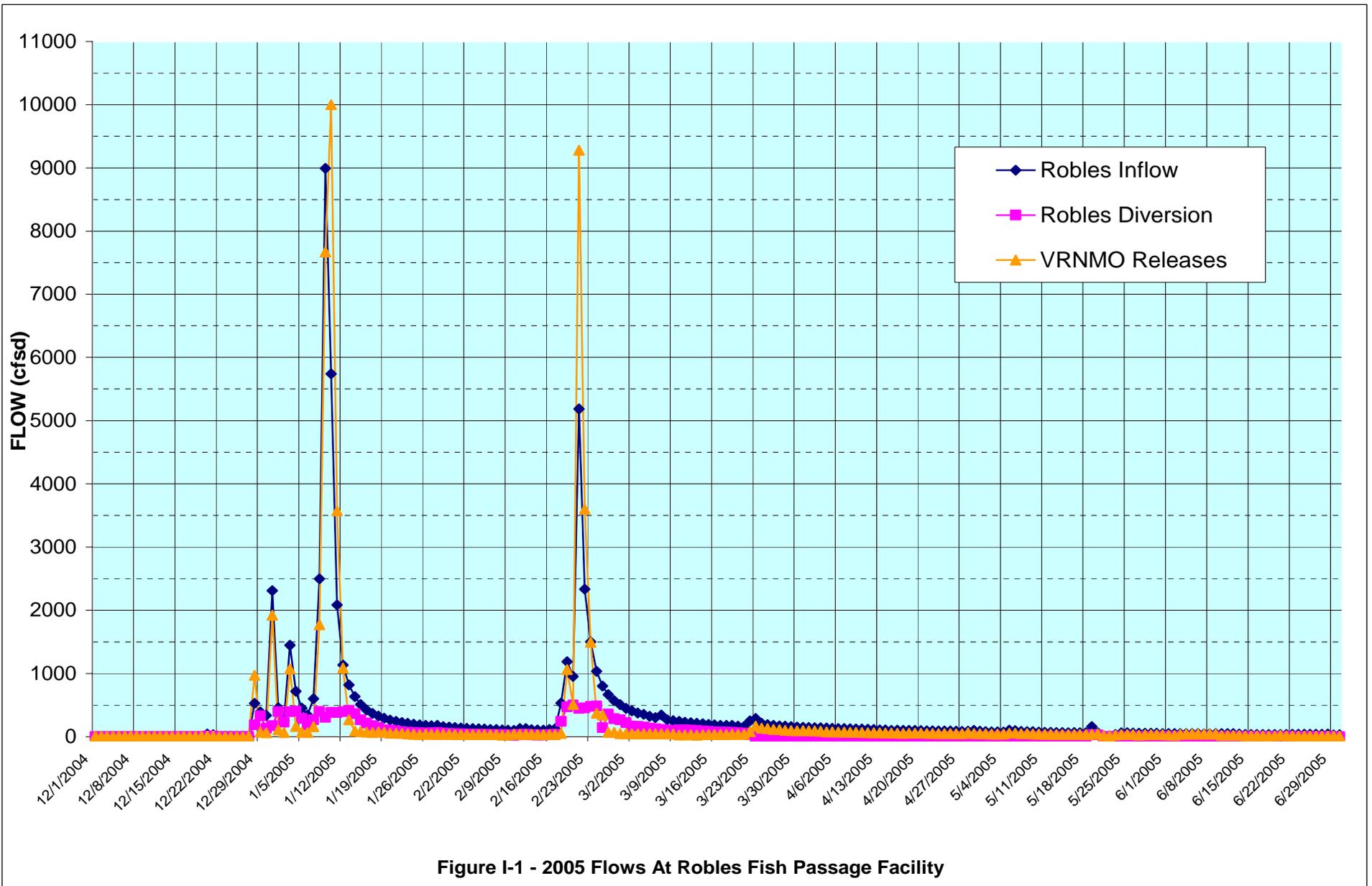
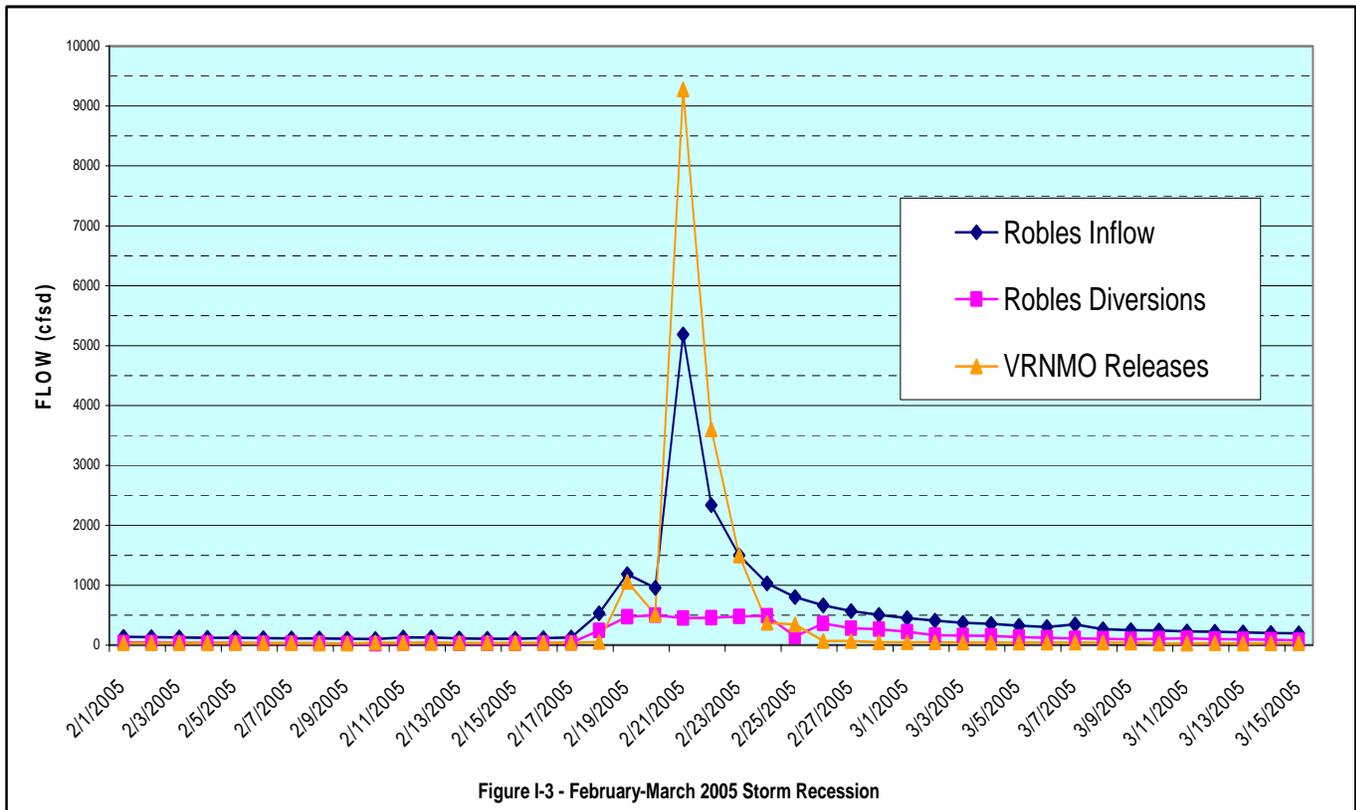
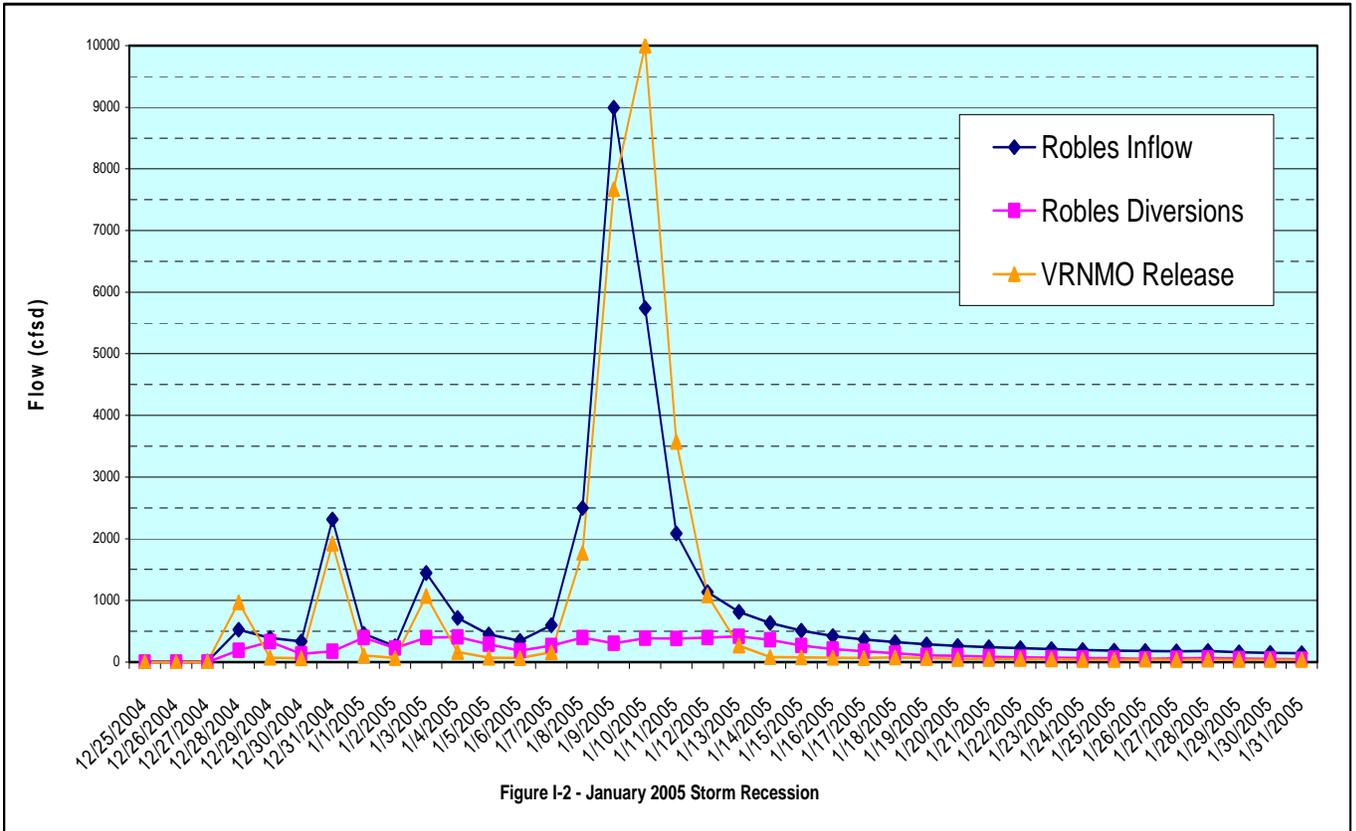
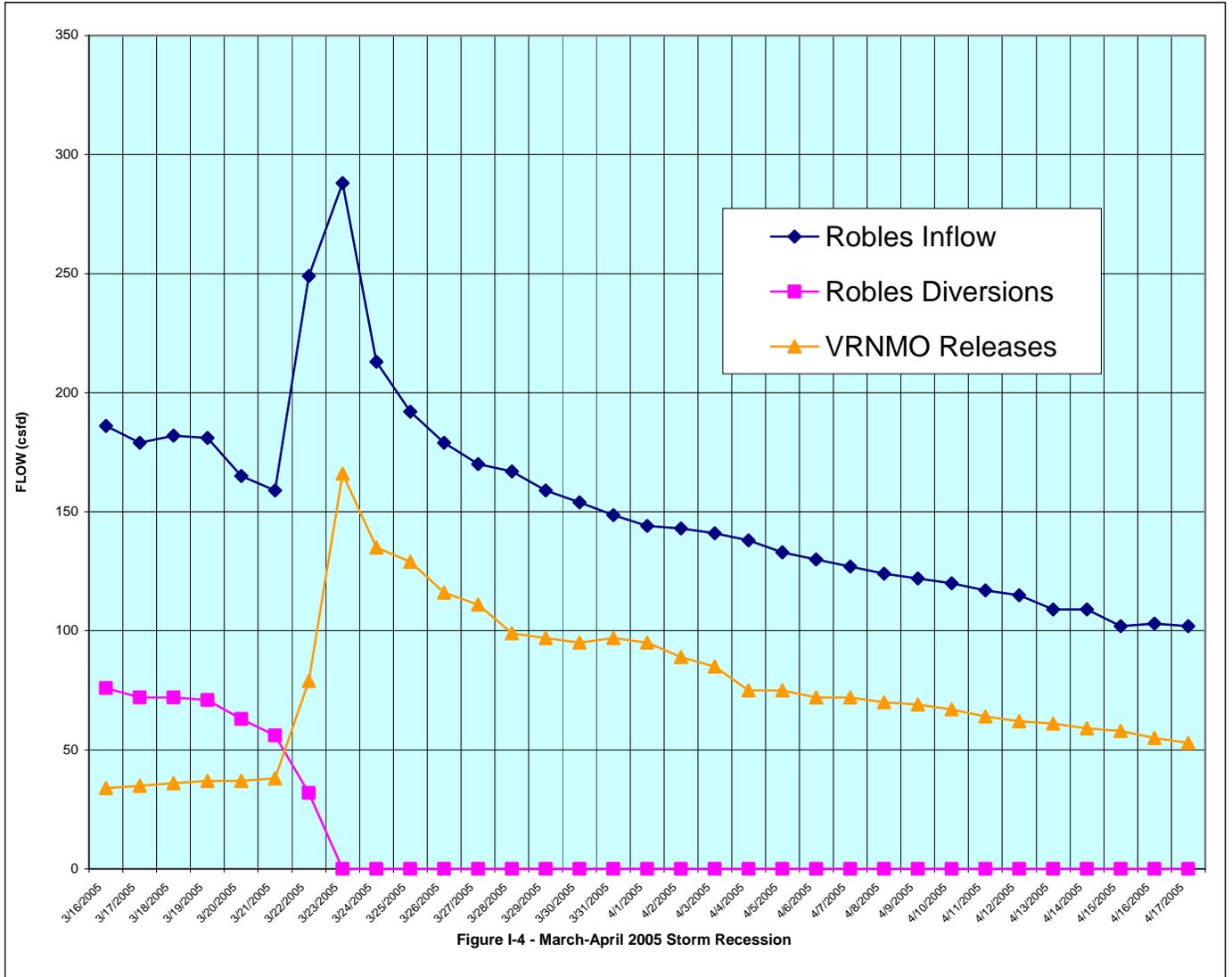


Figure I-1 - 2005 Flows At Robles Fish Passage Facility

Appendix I



Appendix I



Appendix J

Facility Photos

PHOTO APPENDIX

**ROBLES DIVERSION DAM
AND
FISH PASSAGE FACILITY**

OCTOBER 1, 2004 THROUGH APRIL 29, 2005





10/1/04 – Project construction continuing with the installation of fish screens and brush system. Note that the electrical and programming systems for the brush system were not installed until the last week of December 2004.



10/20/04 – Early storm runoff that caused a collection of vegetation debris on the face of the fish screens (middle left), near complete plugging of screens. Flow filled the upstream basin and caused overflow at the cutoff wall. When discovered, release made through spillway gates (bottom left) to downstream channel (bottom right).



11/3/04 – Small amount of runoff allowed to pass through the spillway gates while work is proceeding in the fish passage and on the overshot gate (top and middle).



12/21/04 – District performed a release of water from Matilija Dam and diversion to Lake Casitas (bottom). Brush system was still inoperable.



12/31/04 – Robles Basin conditions during the first major storm of the season. Trash wall and spillway gates (top left and right), Canal Entrance (middle left) and fish exit structure (middle right), and Robles basin and cutoff wall breaching (bottom left and right) during peak of storm.



12/31/04 – Conditions at the Fish Entrance Structure (top and middle), downstream of Robles at the measurement weir (bottom left and right).



1/3/05 – Storm flows through Robles spillway gates and downstream channel (top), over the measurement weir (middle) and damage to fish guidance device (bottom).



1/03/05 – Damage to fish guidance device resulting from flow entering facility and the collection of plant debris on the facing of each fish screen. Brush system failed to operate during this storm event.



Aftermath of 1/10/05 storm event – damage to fish guidance device, sediment loading in the upstream basin that cut off flow to Fish Passage Facility. (Photos not taken during the peak event due to emergency in other areas.)



3/03/03 – District performed maintenance on the fish passage facility. Sediment deposition in the forebay.



3/25/05 – Facility in operation without the use of the fish guidance device, water flowing over the cutoff wall.



4/29/05 – Cutoff wall overflow still occurring.



4/29/05 – Matilija Dam in spill condition, algae growth beginning to occur in river, flow condition at the entrance structure and downstream channel.

Appendix K

Correspondence

Page 1 of 1

Steve Wickstrum

From: Neil Cole
Sent: Monday, January 03, 2005 10:19 AM
To: 'Stan Glowacki'; 'Mary Larson'
Cc: John Johnson; Steve Wickstrum
Subject: Robles Fish Passage operation

Good morning & Happy New Year

Well we have water. Attached are some pictures of the flow we received over the weekend. Currently (9:00 am on Jan 3) we have around 1500 cfs flowing. Flow is going through the fish passage and the spillway gates. The auxiliary supply pipe is not being used because the gate is not currently controllable.

Last week we thought we had the brush system working so we installed the fish screen panels. The brush system then failed. The screens clogged with the Thursday night/Friday morning storm. Friday morning the decision was made to pull some of the screen panels. The panels are still off at this time. Over the weekend the brush system was modified. One side seems to be working. The other side still has issues.

We are currently operating under the interim diversion operations as spelled out in the BO. Should we be doing something different at this point?

Neil Cole
Casitas Water District

9/12/2005

Neil Cole

From: Stan Glowacki [Stan.Glowacki@noaa.gov]
Sent: Tuesday, January 04, 2005 3:59 PM
To: Neil Cole
Subject: Friday site visit and Interim Operations

- Hi Neil, we are currently evaluating this situation and are currently determining what the answer to your question is. We will get back to you shortly. I was also wondering if I could come by on Friday to check the facility and see some water. Please let me know if you will be available on Friday and what a good time would be. Thanks.

Stan

Neil Cole wrote:

Hi Stan
This is to confirm our understanding that we are still under the interim operation requirements for Robles Fish Passage. If this understanding is not correct, please let us know asap.
We will keep you updated on the Robles operations.
Neil Cole
Casitas Water District

9/13/2005

Neil Cole

From: Mary Larson [MLARSON@dfg.ca.gov]
Sent: Thursday, February 24, 2005 9:30 AM
To: ncole@casitaswater.com; Martin Potter; Stan.Glowacki@noaa.gov
Subject: Re: Robles fish Passage

I do not see a problem with this plan.

>>> Neil Cole <ncole@casitaswater.com> 02/24/05 8:43 AM >>>
Good morning

On Friday, February 25, 2005 we will be reinstalling the fish screens that have been out since late December. While we are shut down to install the fish screens, the contractor will replace the clamps on the brush system and we will remove the fish guidance panels. The crane should be on site at 9:30 am.

If you see any problems with this plan, please let me know as soon as possible.

Neil Cole
Casitas Water District

Neil Cole

From: Stan Glowacki [Stan.Glowacki@noaa.gov]
Sent: Friday, February 25, 2005 11:14 AM
To: Neil Cole
Subject: Re: Robles fish Passage

Hi Neil. I dont see any problem with this plan. Thanks for keeping me informed.

Stan

Neil Cole wrote:

Good morning

On Friday, February 25, 2005 we will be reinstalling the fish screens that have been out since late December. While we are shut down to install the fish screens, the contractor will replace the clamps on the brush system and we will remove the fish guidance panels. The crane should be on site at 9:30 am.

If you see any problems with this plan, please let me know as soon as possible.

Neil Cole

Casitas Water District

9/13/2005

Steve Wickstrum

From: Darrin Williams [DWILLIAMS@mp.usbr.gov]
Sent: Thursday, May 12, 2005 10:16 AM
To: SWickstrum@casitaswater.com
Cc: JJohnson@casitaswater.com; Antonio Buelna; David Young
Subject: Re: Diversions to Lake Casitas

This is to acknowledge your e-mail below and confirm that Reclamation approves of the addition diversion of water into Lake Casitas.

Darrin Williams, P.E.
Civil Engineer, Operations Division
South-Central California Area Office
1243 N Street
Fresno, California 93721-1813
Tel: 559-487-5340
Fax: 559-487-5397
Cel: 559-289-9463
e-mail: dwilliams@mp.usbr.gov

>>> Steve Wickstrum <SWickstrum@casitaswater.com> 5/12/2005 10:02:04 AM
>>>

This is to confirm that we have discussed the proposed diversions of water from Matilija Dam to Lake Casitas with the current Lake Casitas level approximately 1.5 feet below the spill elevation. It appears that the proposed late spring diversions will not result in a spill condition or compromise safety of Casitas Dam, therefore the Bureau has concluded that Casitas can proceed with the proposed diversions as stated in the District's letter of May 9, 2005. A copy of this letter is attached to this email.

To reiterate the reason for this request of the Bureau, the Casitas Dam SOP requires the stopping of diversions when the Lake Casitas elevation reaches two feet from spill elevation. In the interest of water supply storage for the critical drought period and due to the lessened threat of high spill rates as the summer season approaches, the District requests a temporary variance of the SOP requirement for late spring diversions.

The District is planning to perform the diversions the week of May 16th and be completed prior to June 1, 2005. If there is any change to what has been discussed or the Bureau feels that the diversions should not occur, please let me know as soon as possible.

A side note of interest, two trout were sighted in the entrance to the Robles Diversion, just downstream of the canal entrance gates. We have no reported sightings of upstream migratory fish this year, to date.

<<SOP Diversion Variance 5 02 05.doc>> <<P5100037.JPG>>

Neil Cole

From: Stan Glowacki [Stan.Glowacki@noaa.gov]
Sent: Wednesday, May 18, 2005 7:30 AM
To: Neil Cole
Subject: Re: starting diversions again



Card for Stan
owacki <Stan.G

Hi Neil, I was wondering if the screens were working yet and if they will be in place during the operation. Given the recent fish sightings in the forebay and ladder.
Stan

----- Original Message -----

From: Neil Cole <ncole@casitaswater.com>
Date: Monday, May 16, 2005 3:45 pm
Subject: starting diversions again

> Hello Stan & Mary
>
> Later this week, probably Thursday, we intend to download water
> from Lake
> Matilija to Lake Casitas. This means we will be diverting water again
> through the Fish Passage. We intend to down load the water slowly
> at a rate
> of 100 to 200 cfs.
>
> Are there any special precautions we should be taking before we
> begin this
> operation? We will probably lose about half the water over the
> cutoff wall.
> We currently are measuring 25 to 30 cfs at the measurement weir.
> We will
> keep this amount flowing through the fish passage during the
> diversion. The
> diversions will probably last 3 to 5 days at the 100 to 200cfs rate.
>
> Neil
>

Neil Cole

From: Stan Glowacki [Stan.Glowacki@noaa.gov]
Sent: Thursday, July 07, 2005 1:02 PM
To: Neil Cole
Subject: Re: results of surveys prior to closing fish passage for maintenance

Hi Neil, Thanks for keeping me up to date. That all sounds reasonable and I think it follows the opinion. Let me know what you find out with the brushes, or if you have any other questions.

Stan

Neil Cole wrote:

Hello Stan & Mary

Mike & Amy have completed their pre and shutdown survey of the fish passage. Polywogs, a few sticklebacks and chubb fry were observed. No trout or steelhead were spotted. After the low flow gate was closed, Amy & Mike walked through the fish passage.

We have now closed the low flow gate and opened the spillway gate, thus sending the water around the fish passage. We will allow the passage to dry out until Monday, at which time we will begin removing the sediment from the channel. This will allow us to proceed with testing the brushes. We will also complete an inspection for any additional repairs that may be needed. We expect the fish passage to be back in service on July 25, 2005.

Please let me know if you see any problems with our program.

Neil Cole

Casitas Water District

9/13/2005



1055 Ventura Avenue
Oak View, CA 93022
18051 649-2251
Fax: 18051 649-3001

July 29, 2005

Mr. Rodney R. McInnis
Regional Administrator
National Oceanic and Atmospheric Administration
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

RE: Questions on the Biological Assessment/Opinion for the Robles Fish Passage Facility

Dear Mr. McInnis:

This letter is in follow up to my telephone call to your office on June 14, 2005 requesting assistance to explain the subject Biological Opinion to our Board at its meeting of June 22, 2005. Scott Hill of your office called me on June 15, 2005 and indicated that his staff could not make our meeting, but if we would put the questions that we had on the Biological Opinion in a letter and send it to you, NOAA would try to answer them. The purpose of this letter is to pose the questions and understandings of our Board developed at the June 22, 2005 meeting.

1. Fish Screen System Maintenance.

The BA/BO does provide for the maintenance of the fish passage facility in such a manner that the interests in protecting the fish and water supply are primary. During the winter 2005 season, the fish passage facility experienced problems with the screen brush system and an abundant amount of fine debris that clogged the fish screen. The plugging of the fish screens causes a maintenance problem for fish in that there are no attraction flows and for diversions in that there are little or no diversions. In future years when similar type events occur, Casitas will make every reasonable attempt to repair the brush system in accordance with the maintenance procedures (BA Section 2.5.3, BO Page 15). If the repairs are more extensive or that the debris loading has elevated to above the capacity of the brush and screen system, Casitas will (1) perform a fish survey of the river both above and below Robles to assess whether or not fish migration is occurring, and (2) if Casitas' fisheries biologist determines that fish are not moving through the passage facility, Casitas will remove selected numbers of fish screen panels from the most upstream section of the fish passage facility to provide water for diversions, (3) monitor fish migration at the facility on a daily basis during the repair

Bill Hicks
Director

James W. Wood
Director II

Pete Kaiser
Director II

Chuck Bennett
Director II

Russ Raggan
Director I

John J. Johnson
General Manager

Robert M. Sawyer
Assistant

period, (4) reinstall the fish screens if either there are fish migrating through the facility or if the fish screens can be returned to an operational capacity (either the mechanical devices are repaired or the level of debris has diminished to operable levels. Casitas intends to implement this methodology immediately unless we hear from you differently. If you want us to operate differently, please advise.

2. Forebay Maintenance and Water Diversions.

After very wet years, it is often necessary to remove sediment from the forebay and the fish passage area. This work typically occurs after the nesting season is complete in late summer and fall. The BA/BO state that this work will be done "when the channel is dry." Debris needs to be removed from the fish passage facility and the forebay every year before the start of the next winter season to ensure that the facility is ready for moving fish. During large rainfall years, it is likely that some flow will remain in the channel after September 1. Casitas' interpretation is that this work can continue provided the water is diverted around the work areas and the diversion methods follow the best management practices. This will allow the facility and basin to be maintained for fish passage for the succeeding year. Therefore the work is performed as suggested in the Biological Opinion even though the channel is not entirely dry. Casitas intends to implement this methodology immediately unless we hear from you differently. If you want us to operate differently, please advise.

3. Start of the Trial Period.

The BA/BO calls for a five-year trial period. This year, the fish passage was partially operational. The downstream weirs were not constructed and the control features did not become operational until the mid- and late winter season. Casitas' interpretation is that the five-year trial period will start next season. Casitas intends to implement this methodology immediately unless we hear from you differently. If you want us to operate differently, please advise.

4. Removal of sediment in the Robles settling basin during migration season to ensure the fish passage and diversion facility are fully operational.

This past winter storms brought large quantities of material into the forebay. The sediment deposition in the Robles forebay partially blocked the flow of water to the fish passage and diversion causing significant flow over the cutoff wall and reducing the water available for diversion and fish passage. In the future, if the flow entering the fish passage is blocked or significantly reduced because of irregular sediment loading in the

settling basin of Robles. Casitas' interpretation of the BO is that Casitas can move sediment the minimum necessary to restore flows. Casitas will only move sediment after notifying DFG and NOAA Fisheries of our intent to do so. Surveys for fish in the area will be conducted by Casitas' Fisheries personnel prior to the sediment movement. Best management practices will be followed to minimize environmental issues. Casitas intends to implement this methodology immediately unless we hear from you differently. If you want us to operate differently, please advise.

We appreciate the assistance that you have given us in the past and realize that you do have a heavy workload for your people, but we thought that clarifying the Biological Opinion would be good for both of our agencies who have devoted so much to the fish passage facility on the Ventura River. Would you again assist us by reviewing our interpretation, solutions, and letting us know if your interpretation is different than ours or if any of the above are not within the parameters of the BA/BO and/or Take Permit. Casitas intends to implement our interpretation during the coming years unless we receive clarifying or different interpretations from NOAA Fisheries. It would be appreciated if any issue regarding the above is brought to our attention prior to the start of the next water year, October 1, 2005.

Should you need to contact with me, I can be reached at (805) 649-2251 ext 112.

Sincerely,


John Johnson
General Manager



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

In response refer to:
151422SWR02PR6168-SCG

AUG 4 2005

John Johnson, General Manager
Casitas Municipal Water District
1055 Ventura Avenue
Oak View, California 93022

Dear Mr. Johnson:

Thank you for your correspondence regarding the status of the Robles Diversion Fish Passage Facility (Fish Passage) as presented in your letter from July, 29 2005. NOAA's National Marine Fisheries Service (NMFS) appreciates the updates on the status of the Fish Passage, and the work that the Casitas Municipal Water District (Casitas) is implementing to get the Fish Passage fully functional as soon as possible. Your actions presented in the letter are consistent with the actions you have proposed in the Biological Assessment of February 23, 2003, and which were analyzed in the Biological Opinion issued on March 31, 2003.

NMFS will continue to provide technical assistance to Casitas to ensure that the Fish Passage will be fully functional in the foreseeable future. Please feel free to call me at (562) 980-4005 if you have any questions concerning this letter; or if your staff requires additional information on the technical issues involved in getting the Fish Passage fully operational, please call our fisheries biologist Stan Glowacki at (562) 980-4061.

Sincerely,

Rodney R. McInnis
Regional Administrator

cc: Christopher Keifer, NOAA General Counsel
Mark Capelli, NMFS
David Young, BOR
Marcin Whitman, CDFG
Mary Larson, CDFG



Appendix L



CASITAS MUNICIPAL WATER DISTRICT

ROBLES DIVERSION DAM FISH SCREEN AND FISHWAY PROJECT

POST-CONSTRUCTION PERFORMANCE EVALUATION PLAN

September 8, 2005

INTRODUCTION

This Post-Construction Performance Evaluation Plan summarizes the proposed methods and procedures to implement and confirm the hydraulic performance of particular features of the Robles Diversion Dam Fish Screen and Fishway Project (Project). The Casitas Municipal Water District (CMWD) substantially completed the construction of the project in Spring 2005.

The Project was designed to provide for the safe passage of adult and juvenile steelhead, upstream and downstream, of the existing Robles Diversion Dam. The Project is located on the Ventura River approximately 13.5 miles upstream from the Pacific Ocean, near Ojai, California.

PERFORMANCE TESTING

The features of the Project, from the standpoint of performance in relation to the design, are identified below. The design parameters and means of evaluation are noted for the respective features as well.

1. Fish Guidance Device

A fish guidance device was installed across the diversion flume for directing upstream migrating steelhead into the high-flow fish exit channel during conditions when flow is released through the existing spillway structure. The device was installed to avoid the risk of “fall back” of upstream migrating fish that would otherwise exit the facility through the existing diversion headworks. During the winter of 2004/2005, the facility was operated under adverse conditions and the device incurred damage. As a consequence, CMWD removed all panels. The walkway across the flume remains in place.

Recognizing the project design flow of the fish passage is 1,500 cfs, CMWD proposes, during flows of 1,500 cfs or less, to operate the spillway gate on the east side of the spillway structure rather than the gate nearest to the diversion headworks. Under this operating regime, the risk of fall back should be removed. To determine the validity of this operating protocol, velocity profiles will be measured in the forebay to determine the flow pattern and velocity magnitude. The Steelhead restoration and Management Plan for California (D. McEwan and T. Jackson) state that velocities in the above 10 to 13 feet per second hinder the swimming ability of adult steelhead. The goal of the will be to determine if velocities exceed 10 feet per second in the area upstream of an open spillway gate and for how long.

The results of this effort will be used to determine if it is necessary to reinstall the fish guidance device with the proposed operating protocol.

2. Fish Screen Structure

The Biological Opinion provides for a total flow through the fish screens of 621 cfs, 500 cfs for diversion and 121 cfs for auxiliary water supply. The design approach velocity perpendicular to the screen face is 0.40 fps and the design “sweeping” velocity parallel to the screen face is 2.0 fps or greater. The fish screen structure is equipped with an

adjustable orifice plate to facilitate adjustments and to achieve near uniform approach velocities along the fish screen.

3. Fishway

The fishway was designed for a maximum flow of 50 fps and should be functional for fish passage for a minimum flow of 10 fps.

a. Entrance

The fishway entrance was designed with five vertically aligned rectangular orifices to use individually or in conjunction, depending upon the total flow and operating criteria. The minimum velocity at the entrance port is 3.0 fps while the preferred velocity of approximately 8.0 fps is preferred. The recommended range in velocity is 4.0 fps to 8.0 fps.

b. Vertical Slots

At the design flow, the minimum depth on the upstream side of the slot is 5.0 feet. The minimum freeboard within the fishway is 3.0 feet to avoid harm to fish that may leap through the slots. The maximum slot velocity is 8 fps.

c. Exit

The design “transport” velocity within the fishway in the section downstream of the fish screen is 2.0 fps and should be greater than the velocity along the screen face.

4. Auxiliary Water Supply

The Biological Opinion provides for a flow of 121 cfs through the auxiliary water supply system. The velocity of the auxiliary water entering the fishway through the diffuser panel should not exceed 1.0 fps.

EQUIPMENT

Three types of velocity meters will be used to conduct the performance testing.

1. Forebay

Velocity profiles will be measured using a Sontek Argonaut-SW velocity meter(s) strategically located in the forebay to determine the velocity profile perpendicular to the headworks and extending into the forebay, a distance equivalent to the width of the spillway structure.

2. Fish Screen

The velocity measurements for the fish screen will be made with a three-dimensional Acoustic Doppler Velocimeter (ADV). Velocities will be measured at a distance of approximately three (3) inches from the face of each panel. Each measurement will be taken for no less than thirty (30) seconds at each point of interest to establish a reasonable representation of average velocities. Measurements along each screen face will be performed using a matrix of not more than two-foot by two-foot and a minimum edge clearance of one foot. This grid for measurement is to determine if any “hot spots” exist along the screen face.

3. Fish Ladder and Associated Features

The velocity measurements for the fish ladder and associated facilities will be made using a Marsh-McBirney Model 2000 Flo-mate Electromagnetic Flowmeter.

REPORTING RESULTS

The operating conditions, personnel involved, methods used, field data gathered, and conclusions will be recorded and presented in a final report. Testing results will be compared to the design criteria discussed above. The report will be prepared using the following headings:

- INTRODUCTION
- PERSONNEL
- METHODS AND EQUIPMENT
- RESULTS AND EVALUATION
- CONCLUSIONS AND RECOMMENDATIONS

SCHEDULE

The performance testing will be performed during the 2005/2006 winter season, depending upon the runoff conditions. Flow of 1,500 cfs for a period of three days is considered a minimum to obtain the data by which to assess the performance of a fish passage facility. Because of the hydrology of the river basin, this may not be accomplished for several years.

It is anticipated that a period of one week will be required to obtain the data.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

In response refer to:
151422SWR02PR6168:SCG

OCT 25 2005

John Johnson
General Manager
Casitas Municipal Water District
1055 Ventura Avenue
Oak View, California 93022

Attn: Neil Cole

Dear Mr. Johnson:

NOAA's National Marine Fisheries Service (NMFS) has reviewed the *Post-Construction Performance Evaluation Plan for Robles Diversion Dam Fish Screen and Fishway Project* (Plan) to be implemented at the Robles Diversion Fish Passage Facility (fishway facility). The following represents NMFS' views on the Plan.

Generally, the Plan as submitted is inadequate and does not provide enough information to make a reliable assessment of the performance and efficiency of the fishway facility. The Plan essentially provides only a general outline of the proposed methods for evaluating fish passage efficiencies at the intake structure. For instance, the Plan lacks even fundamental information regarding the equipment, personnel, and expertise necessary to reliably evaluate the complex fishway facility. The Plan also lacks a clear, detailed description of the methods to be employed, acceptable performance criteria against which to evaluate gathered field data, and the conditions under which each test will be carried out. Accordingly, the Plan should be revised to reflect the foregoing.

For a variety of reasons, the Plan should specify that Casitas Municipal Water District (Casitas) will use the findings obtained from the evaluations conducted at the fishway facility to formulate an Operations and Maintenance (O&M) manual. This manual would be helpful to both biologists and engineers, particularly those individuals not keenly familiar with this fishway facility or the migration-passage requirements of steelhead. Among other types of information, the O&M manual should contain information and guidance on how the fishway facility will be operated over time (i.e., within the defined period for migration of adult and juvenile steelhead).



Because the fishway facility comprises individual complex systems, NMFS recommends Casitas develop objectives and tests for each individual fishway facility system component, and then submit the individual plans to regulatory agencies for review. Data needed to satisfactorily evaluate each system component requires intimate knowledge of the equipment to be used, and a thorough understanding of all principles and concepts underlying the design of the facilities. NMFS recommends developing the following separate test plans:

- Fish guidance device methodology and evaluation
- Fish screen tuning and evaluation
- Fish ladder evaluation
- High flow fishway exit evaluation
- Low flow fishway exit evaluation
- Vaki system evaluation
- Low flow road crossing evaluation (post weir installation)
- Rock weir performance evaluations

With regard to evaluating the performance of the fish-guidance device, it seems reasonable to investigate the criteria for using the fish guidance system, and under what series of flows the system will be implemented for different fish migration conditions and circumstances. Certainly, it would be helpful if the fish-guidance system were operated under more benign conditions than what occurred last winter when the guidance louvers were damaged. NMFS has not been informed whether the damaged fish guidance louvers will be replaced, what the damaged louvers will be replaced with, and if the new components will be operated in a manner as intended in the original fishway facility design plans. Also, whether radial gate operations (e.g., opening the far radial gate(s) under low and moderate flow conditions to prevent fish wash-back) can be changed to alleviate the need for the fish guidance louvers and high-flow exit under most flow conditions has not been defined, as discussed with Casitas engineers during NMFS' site visits to the fishway facility. If the fish guidance louvers are to be repaired and replaced, then they should be tested under a range of flows, including the expected highest range of flows during which they can function effectively without being damaged. The proposed plan did not include any testing of the fish guidance device, or investigations on radial gate operations as a means of preventing fish wash-back, and getting fish back into the Ventura River as quickly as possible.

The submitted Plan proposes measuring "... velocity profiles in the forebay to determine the flow pattern and velocity magnitude." The Plan suggests using a SonTek Argonaut-SW for these measurements, but no methodology for mounting or positioning the instrument is stated. The Argonaut-SW is intended to be mounted in one location on the bottom of a waterway to measure 2-D velocity patterns, primarily for measuring discharge. SonTek also offers an instrument called a River Surveyor, which is ideal for gathering the desired data and may be more effective than the Argonaut. The River Surveyor is designed for mounting on a float, and being passed over the area of interest. The bottom-tracking feature allows a map of flow conditions to be developed over the entire area where it is expected fish will need to pass. A detailed methodology for deploying the correct equipment for the application should be included in the future plan for this task. Additionally, existing conditions during testing of the fish guidance system, and measuring forebay hydraulic patterns should represent as closely as possible actual

real-world conditions. A matrix of possible operating conditions for combinations of river flows and diversion rates should be prepared. Fish-guidance evaluations could then be scheduled around those conditions.

With regard to testing the performance of the fish-screen structure, the proposed Plan lack details of the methodology to be employed in testing the fish screen hydraulics. The chosen equipment, a SonTek ADV, is appropriate for the task. If the probe to be used is an Argonaut ADV, then the recommended minimum duration of sampling at any one point should be 60 seconds due to the slower sampling rate of those probes, in comparison to SonTek's field ADV probes. Equipment to be used to position the probe should also be included in the final evaluation plan. The jig used to hold the probe should index directly off the screen face to ensure consistent position and orientation of the probe. Preliminary tests should be carried out to ensure brush sweep arms or equipment associated with the evaluation do not interfere with velocity measurements. Typically for screens of this design it is most efficient to balance approach velocities over the entire screen using velocity measurements recorded in the center of each screen panel by adjusting porosity plate baffles behind the screens. Once those measurements agree, the finer patten proposed, "a matrix of not more than two-foot by two-foot and a minimum edge clearance of one foot" is appropriate.

The fish screen should be evaluated under flow conditions that will present a worst-case-scenario, but which still represent a realistic combination of diversion flow and bypass flow. This chosen condition could be at a maximum diversion rate of 621 cfs and a bypass flow of 50 cfs, and/or at some other condition that may occur at times of lower water availability. Casitas should consult with NMFS engineers and biologists to determine appropriate flow conditions for fish-screen evaluations.

The evaluation report should include a graphic matrix of approach velocity values using an Excel spreadsheet, or similar computer program. Cells for each velocity measurement should be color coded to show low, medium, high, and extra high approach velocity values. A similar graphic should be prepared for sweeping velocity data. The final report should also analyze velocity RMS values, and max/min velocity values to evaluate turbulence along the screen face. Raw data files should be made available to agency personnel for examination.

Water velocities and fish behavior in the canal approaching the fish screen should also be evaluated. Areas with eddies or upwelling can confuse migrating fish. Zones of stagnant water allow predatory fish to lie in wait for juvenile steelhead and other smaller fish to pass by. Such zones should be identified and be addressed appropriately.

With regard to testing the performance of the fish ladder and associated features, the fish ladder should be evaluated under at least three flow conditions: design low flow with no auxiliary water (10 cfs + 0 cfs), design high flow with no auxiliary water (50 cfs + 0 cfs), and design high flow with maximum auxiliary water (50 cfs + 121 cfs). Water surface elevations for each test condition would be helpful in the evaluation. Elevations may be taken in the fish-screen forebay, two locations along the bypass channel, in each fish ladder pool, the entrance pool, and in the downstream channel. Staff gauges should be installed inside and outside the entrance pool, in

the bypass channel, and in the fish-screen forebay so operators may estimate ladder flows based on water surface elevations. Water surface elevations for several operating conditions should be recorded in the O&M manual.

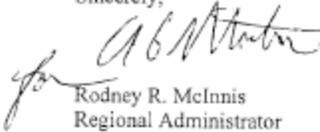
The fish ladder evaluation plan should investigate flow conditions at the fish ladder entrance under several flow conditions to determine which gate(s) should be open under given circumstances. The resulting recommendations should be included in the O&M plan.

Depth and velocity measurements should be taken in the fish ladder and in the bypass channel to ensure velocities and circulation patterns allow for fish passage under the full range of flows. Circulation patterns in each pool are important for energy dissipation; an evaluation of circulation patterns is somewhat subjective and should be conducted by personnel with experience in this matter. The junction between fish screen and bypass channel may create adverse passage conditions in both directions. Depth and velocity values in this region should be evaluated for upstream passage as well as downstream passage. Research has shown that emigrating juvenile salmonids will resist moving downstream where a sudden acceleration in flow exists. Time-lapse monitoring of passage using optical or sonic cameras, or the Vaki system should also be addressed.

Water velocities across the auxiliary water system's diffuser grate should be measured at several different flow rates, and the affects of those flows on circulation patterns in the entrance pool should be evaluated. Dye studies and/or ADCP measurements can be used to evaluate these conditions.

NMFS appreciates the opportunity to review the Plan and provide technical assistance to Casitas. Please call Stan Glowacki at (562) 980-4061 if you have any general questions concerning this letter, or NMFS engineer John Gildersleeve at (707) 575-6054 if you have questions on the engineering specifics of this letter.

Sincerely,



Rodney R. McInnis
Regional Administrator

cc: John Gildersleeve, NMFS
Marcin Whitman, CDFG
David Young, BOR
Mary Larson, CDFG