Description and Photo-Documentation of Field Work Activities – Westside Monitoring Station Maintenance

Report 4.1.1

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List of Acronyms

CDEC	California Data Exchange Center
DO	dissolved oxygen
EERP	Ecological Engineering Research Program
QA	quality assurance
sonde	YSI 600XL waterquality sonde
SpC	specific conductance
TMDL	total maximum daily load

Introduction

The Ecological Engineering Research Program (EERP) at the University of the Pacific (UOP) is contracted through the San Joaquin Valley Drainage Authority at the Department of Water Resources to perform monthly maintenance on eight flow and water quality monitoring stations. These stations are located on tributaries to the San Joaquin River (SJR) and measure the collected non-point source waters of their respective watersheds at a point close to where they enter the SJR. These sites are an integral component of watershed assessment and planning activities and the data attained from these sites is useful to a variety of agencies for a variety of purposes including TMDL development, best management practice (BMP) assessment, regulatory compliance, storm water monitoring, ecosystem modeling, and hydraulic modeling.

In accordance with the agreement between EERP and the San Joaquin Valley Drainage Authority, the EERP field research team is responsible for monthly flow and water quality station maintenance including equipment calibration and quality checks, downloading data, general equipment maintenance, and housekeeping. The major objectives of the field research team are to support stakeholder flow monitoring efforts, maintain a high level of quality control on all flow and water quality monitoring activities, and to organize collected data for scientific and engineering analysis. The purpose of this report is to document EERP field research activities for the years 2011 and 2012.

Methods

EERP performed maintenance at eight water quality flow stations within the upstream region of the San Joaquin River (Figure 1). Table 1 lists each site with its DO TMDL Project site number, California Data Exchange Center (CDEC) Station ID, and its GPS coordinates. Maintenance was performed on all sites once a month, unless access to the sites was not possible. All station maintenance follows guidelines from the West-Side San Joaquin River Tributaries Monitoring Station Maintenance Plan (Hanlon et. al., 2008).

Each station is equipped with a YSI 600XL water quality sonde (YSI Inc., Yellow Springs, CO) and a WaterLOG H-355 gas purge water level sensor (Design Analysis Associates, Inc., Logan, UT) connected to a WaterLOG H-350XL data logger. The logger is programmed to record concurrent water level and sonde readings every 15 minutes. Sonde measurements include specific conductance (mS/cm) and temperature (°C). The bubbler calculates depth (ft) from pressure measurements.

Upon arrival at the monitoring station, the site location, time, and initial flow and water quality measurements were recorded in the field notebook and logger data was downloaded to a PCMCIA Compact Flash data card. Once measurements were recorded, a manual purge was performed on the bubbler to prevent blockages and battery performance was verified by a load test. In order to prevent biofouling, the sonde and its sensors were cleaned using water and a small brush. The post-cleaning measurements were then recorded in the notebook.

Quality assurance (QA) measurements were recorded for specific conductance (SpC),

temperature, depth, and stage. Specific conductance, temperature, and depth QA measurements were taken using a YSI 600XL data sonde connected to a YSI 650 MDS handset (YSI Inc., Yellow Springs, OH) which was independently calibrated before station maintenance in the EERP lab with a post calibration check occurring within 24 hours of returning from site maintenance. QA stage was measured using a staff gauge. These measurements were recorded and compared with the post-cleaning measurements and corrective actions or updates to the calibration tables were undertaken for any significant disparities.

A QA measurement was taken for flow using an ITRC weir stick, a sharp crested weir, and the ideal weir equation (Cal Poly, Irrigation Training and Research Center, 2003). At Del Puerto Creek where no weir structure exists, flow depth and velocity measurements were taken in place of weir stick measurements using a top-setting wading rod and a March- McBirney Flo-Mate 2000 Portable Flowmeter (HACH, Loveland, CO). QA flow measurements were used to develop a rating curve.

General housekeeping was also performed at each site. This involved removal of sediments and debris from sensors, stations, and weir structures, removal of dust and debris from solar panels, and the removal of insect infestation from inside stations. Equipment condition and connections between system components were checked. Desiccant is used to extend the life of the water level system compressor and was replaced on an as needed basis.

Field notebooks and a camera were used to document field conditions and all field activities. Upon return to the EERP laboratory, field notes were scanned to pdf files, photos were uploaded to EERP servers, and post calibration values were recorded.

The field activity summaries included in this report documents activities by maintenance day. Below the heading is a brief description of the objectives and work performed along with any complications that were encountered during maintenance. Photographs are also included to provide further documentation.

Results

During the years 2011 and 2012, the field research team completed a total of 24 station maintenance events. Problems were encountered with site access due to weather or inadvertent locking of gates by land owners, thus occasionally preventing maintenance at some stations. The maintenance history of each site is detailed in the following paragraphs.

Marshall Road Drain

Sand tends to collect at the bottom of Marshall Road Drain making it difficult to take accurate stage QA measurements. On January 21 and February 23, 2011, no QA measurements were taken due to lack of flow. On March 30, 2011, no QA measurements were taken because the stage was flooded. On June 19, 2012 it was discovered that the sonde was not taking measurements. After initial in-field diagnostics, the field team removed the sonde and logging system and brought it back to the EERP lab for further investigation. It was

determined that the cable was defective and it was shipped to the manufacture for repair. A replacement cable was installed on July 24, 2012 and logging capabilities were restored. On October 30, 2012, the sonde was found to be reading negative values for temperature and SpC. The sonde was brought back to the EERP lab and it was determined that the sonde must be sent to the manufacturer for repair. EERP is currently waiting to receive the repaired sonde from the manufacturer. On December 11, 2012, the logger would not turn on. The battery was brought back to EERP lab for recharging and was reinstalled on January 10, 2013.

Spanish Land Grant Drain

A large amount of sand has collected at the bottom of Spanish Grant Drain which makes it difficult to take QA stage measurements. A stage measurement could not be taken on March 30, 2011, July 12, 2011, or April 30, 2012 because the weir was completely submerged. On April 27, 2011, a QA measurement could not be taken because it was discovered that a weir board was missing. On May, 25, 2011, it was discovered that the missing weir board had been replaced by an unknown third party and QA measurements resumed. On September 13, 2011, the specific conductance sensor was replaced. On December 11, 2012 the logger would not turn on. The battery, which is shared with Marshall and Moran Drains, was brought back to EERP lab for recharging and was reinstalled on January 10, 2013.

Moran Drain

QA could not be performed on January 21, 2011, February 23, 2011, March 30, 2011, October 18, 2011, November 8, 2011, December 14, 2011, or January 6, 2012 because there was no flow. The logger and sonde were found to be inactive and removed on April 27, 2011. They were later fixed and reinstalled on July 12, 2011. On December 11, 2012 the logger would not turn on. The battery, which is shared with Marshall and Spanish Drains, was brought back to EERP lab for recharging and was reinstalled on January 10, 2013.

Ramona Lake at Levee

On August 9, 2011, it was discovered that one of the weir boards had broken off and that water was leaking through gaps in the remaining boards. After several attempts to re-situate the existing boards, they were replaced with entirely new boards by EERP on June 19, 2012. Frequent movement of the boards by local land owners makes it particularly challenging to maintain a flow to discharge relationship.

Del Puerto Creek

A dam formed downstream of the Del Puerto Creek flow station, creating backflow conditions and preventing the establishment of an accurate relationship between stage and flow. In addition, the creek bed is shifting and frequently covers the sonde in sediment which could affect accuracy of water quality measurements. This is in spite of the fact that the field team frequently digs the creek bed out around the sonde.

On January 21, 2011, Del Puerto Creek was completely dry. One of the land owners near

Del Puerto Creek installed a steel cable preventing access to the station on February 10, 2012 and March 23rd. On March 30, 2011, November 20, 2012, and December 11th, 2012, wet dirt roads prevented access to the station. For these months no maintenance was performed.

Westley Wasteway

Westley Wasteway is frequently a collection point for dumped wastes such as wood, rocks, plant matter, and trash. The field team frequently removes this debris from around the weir boards and the sonde. On September 18, 2012 it was found that a large amount of broken concrete was dumped into the canal, effectively burying the sonde and altering the path of flow in the waterway. This issue has yet to be resolved and will require use of heavy equipment.

No specific conductance measurements were available until the sensor was replaced on April27, 2011. Due to wet dirt roads, the site was inaccessible on March 30, 2011. On July 24, 2012, it was discovered that the sonde at Westley would not take measurements. The field team switched the sonde with the one that was removed from Ingram and water quality measurements resumed. On September 18, 2012 it was discovered that the logger was not logging. The logger was removed and brought back to the lab for diagnostics. The logger is currently with the manufacturer undergoing repairs.

Ingram Creek

Dredging at Ingram Creek has caused severe erosion of the channel and the water level has fallen below the reach of the sonde. On July 19, 2012 when it was realized that the water level would never return to previous levels, the sonde was removed in order to preserve the sensors as well as prevent theft or vandalism. The sonde will be moved to a new location under the bridge next to the stage sensor in the spring of 2013.

The field team continues to take monthly stage and flow QA measurements, however, no measurements could be taken on January 21, 2011, February 23, 2011, March 30, 2011, or December 11, 2012 as Ingram Creek was found to be dry.

Hospital Creek

Despite being a dumping ground for large pieces of trash such as high chairs, kitchen sinks, and car seats, water quality and flow measurements at Hospital Creek remain stable. Quality Assurance measurements could not be taken on January 21, 2011, February 23, 2011, March 30, 2011, October, 18, 2011, December, 14, 2011, January 6, 2012 November 20, 2012 or December 11, 2012 since there was no flow.

Discussion

During the years 2011 and 2012, quality assurance measurements were attempted 192 times. No QA measurements were obtained for 29 of the attempts due to lack of flow or no site access. In

the event of no flow, site maintenance, including sensor care, housekeeping, and data downloads, was still performed. Gaps in continuous water quality data occurred ten times at five locations due to equipment failure. Of the ten equipment failures, eight were repaired and logging was resumed. Ingram Creek station will not be capable of taking water quality measurements until the sonde is relocated, but flow measurements are still being logged. In addition, Westley Wasteway station will continue not to have logging capabilities until debris from the canal is removed and the manufacturer returns the repaired logging equipment.

This report includes field activity summaries for all 24 maintenance events which were completed in 2011 and 2012. These summaries include both written and photo documentation.

Acknowledgements

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References

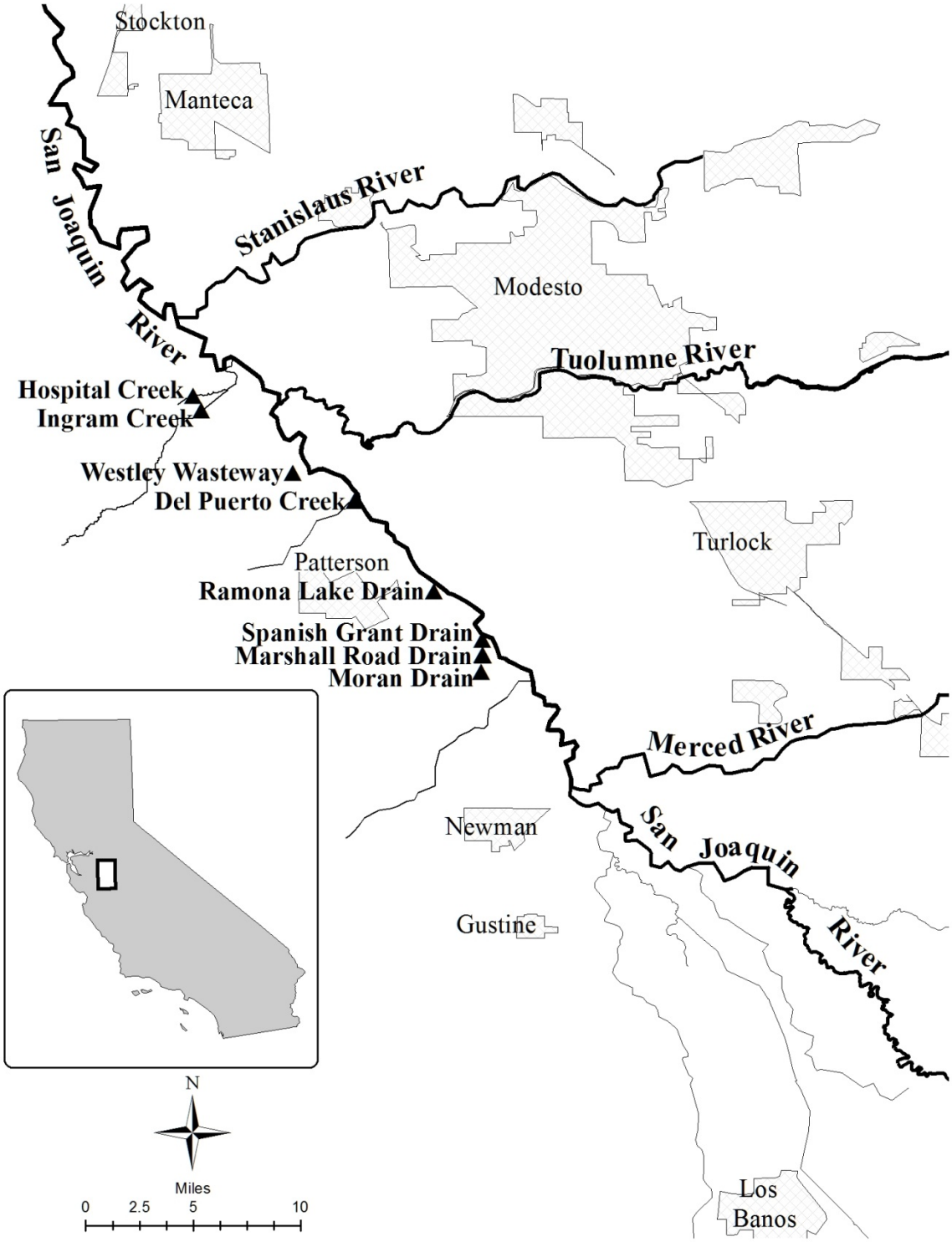
Hanlon, J., Graham, J., Stringfellow, W., 2008. West-Side San Joaquin River Tributaries Monitoring Station Maintenance Plan. Ecological Engineering Research Program. Stockton, CA.

Irrigation Training and Research Center, 2003. ITRC Weir Stick. California Polytechnic State University. San Luis Obispo, CA.

Table 1. List of Stations

Site Number	Site Name	Latitude	Longitude	CDEC Station code
33	Hospital Creek	37.610	-121.231	HSP
34	Ingram Creek	37.600	-121.225	ING
35	Westley Wasteway	37.558	-121.164	WSW
36	Del Puerto Creek	37.540	-121.122	DPC
38	Marshall Road Drain	37.436	-121.036	MSR
57	Ramona Lake at Levee	37.479	-121.069	RML
64	Moran Drain	37.436	-121.036	MON
65	Spanish Land Grant Drain	37.436	-121.036	SGD

Figure 1. Map of flow and water quality stations where regular maintenance was performed by the Ecological Engineering Research Program at the University of the Pacific during 2011-2012.



January 21, 2011

Westside Maintenance
Jeremy Hanlon, Chelsea Spier, and Michael Jue perform maintenance on water quality flow stations.

Ramona Lake Drain
Ramona lake is flooded.

Hospital Creek
Chelsea cleans the sonde.

Del Puerto Creek
Del Puerto Creek is dry.

Westley Wasteway
Photo of Westly Wasteway

February 23, 2011

Westside Maintenance
Jeremy Hanlon and Michael Jue perform maintenance on water quality flow stations.

Ramona Lake Drain
The water level at Ramona Lake is unusually high.

Ramona Lake
Mike cleans the sonde sensors at Ramona Lake Drain.

Del Puerto Creek
Backflow conditions exist at Del Puerto Creek.

Westley Wasteway
The conductivity sensor is out of the water at Westley Wasteway.

March 30, 2011

Westside Maintenance
Jeremy Hanlon and Michael Jue perform maintenance on water quality flow stations.

Spanish Grant Drain
Marshall and Spanish Grant drains are flooded.

Ramona Lake Drain
Mike examines the flow station at Ramona Lake Drain. Behind him it can be seen that the water level is unusually high.

Ingram Creek
There is only a trickle of water at Ingram Creek.

Ingram Creek
There is not enough water to take a QA measurement at Ingram Creek.

April 27, 2011

Westside Maintenance
Jeremy Hanlon and Michael Jue perform maintenance on water quality flow stations.

Spanish Grant Drain
The field behind Spanish Grant Drain which was flooded last month is now dry. A weir board had been removed from the drain.

Del Puerto Creek
Backflow conditions exist at Del Puerto Creek.

Westley Wasteway
The conductivity sensor was replaced at Westley Wasteway.

Hospital Creek
The weir structure at Hospital Creek.

May 24, 2011

Westside Maintenance
Michael Jue, Ashley Stubblefield, and Jeremy Hanlon perform maintenance on water quality flow stations.

Ramona Lake Drain
Ashley records logger readings.

Del Puerto Creek
Del Puerto Creek is flowing for the first time this year.

Ingram Creek
Mike cleans the sonde.

Hospital Creek
The sonde and bubbler location at Hospital Creek

June 21, 2011

Westside Maintenance
Michael Jue, Ashley Stubblefield, and Kylee Ah Choy perform maintenance on water quality flow stations.

Del Puerto Creek
Mike takes in stream velocity measure-ments.

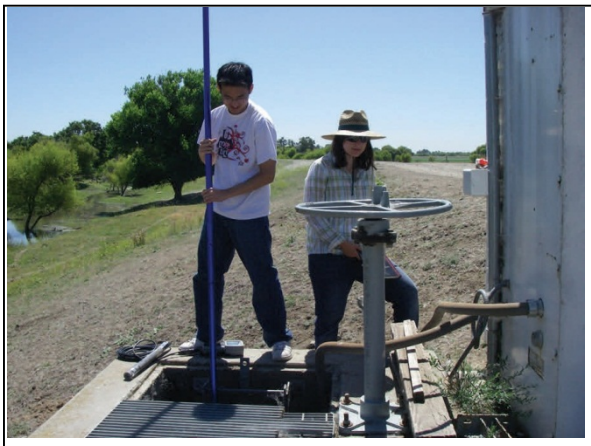
Westley Wasteway
Photo of Westley Wasteway.

Ingram Creek
There is a lot of flow at Ingram Creek.

Hospital Creek
Kylee, an undergraduate student in the EERP lab, joins the field team this month.

July 12, 2011

Westside Maintenance
Michael Jue, Ashley Stubblefield, and Jeremy Domen perform maintenance on water quality stations.



Ramona Lake Drain
Jeremy takes a stage measurement while Ashley prepares to take a sonde reading.

Del Puerto Creek
Mike takes flow measurements with a velocity meter.

Westley Wasteway
Jeremy cleans the sonde while Ashley records sonde QA measurements.

Ingram Creek
Photo of Ingram Creek

August 9, 2011

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations.

Moran Drain
Ashley uses a little water and a small brush to clean the sonde.

Del Puerto Creek
Del Puerto Creek is becoming over grown with vegetation.

Westley Wasteway
The debris at Westley Wasteway significantly reduced the flow of water.

Ingram Creek
The sonde at Ingram was found to be packed in mud.

September 13, 2011

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations.

Westley Wasteway
Plant life in Westley is filling in the wasteway.

Ingram Creek
Mike jumps into Ingram Creek to remove debris from the sonde cage.

Ingram Creek
Mike takes a weir stick reading next to the staff gauge.

Hospital Creek
Ashley cleans the sonde.

October 18, 2011

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations.

Ramona Lake Drain
The water level at Ramona Lake is unusually low.

Ramona Lake Drain
Ashley removes the grate from Ramona Lake Drain to access the sonde and weir structure.

Ingram Creek
The water level at Ingram Creek has fallen below the sonde.

Hospital Creek
There is no flow at Hospital Creek.

November 8, 2011

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations.

Spanish Grant Drain
Mike changes the desiccant to ensure the electrical panels stay dry.

Ramona Lake Drain
The water level at Ramona Lake is unusually low.

Hospital Creek
Ashley records logger readings in the notebook.

Hospital Creek
The QA sonde in dropped into the water next to the existing sensor.

December 14, 2011

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations.

Del Puerto Creek
Mike investigates the cause of the backflow conditions at Del Puerto Creek.

Westley Wasteway
An example of the logging system setup.

Ingram Creek
The field team removes brush that has collected around the sonde.

Hospital Creek
Ashley performs a QA calibration at Hospital Creek.

January 6, 2012

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations. Moran Drain and Hospital Creek are completely dry. A weir board was found removed from Ramona Lake Drain. The sonde at Del Puerto Creek was found to be buried under the creek bed. Due to dredging, the sonde at Ingram Creek is above water.

Moran Drain
There is no flow at Moran Drain.

Ramona Lake Drain
It appears that one of the weir boards at Ramona has been knocked out of place.

Del Puerto Creek
The rising creek bed at Del Puerto has risen to the level of the sonde. Mike digs out around it to ensure accurate measurements.

Hospital Creek
Hospital Creek is completely dry.

February 10, 2012

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations. The height of the weir boards was measured at each station. Ramona Lake Drain is leaking water between its weir boards. A steel cable prevented access to Del Puerto Creek. The sonde at Ingram Creek is still out of water.

Ingram Creek
Due to dredging, the water level has fallen below the sonde.

Del Puerto Creek
A steel cable was installed preventing truck access to the Del Puerto Creek station.

Hospital Creek
Ashley uses water and brushes to clean the sonde and sensors.

Hospital Creek
Due to low flow, it is impossible to make a measurement with a weir stick at Hospital Creek.

March 23, 2012

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations. Water is still leaking through the weir boards at Ramona. The sonde at Ingram is still above water.

Marshall Road Drain
Inside the flow station at Marshall Road; the station houses logging setups for Marshall, Moran, and Spanish Grant Drains.

Marshall Road Drain
Ashley fetches clean water; the sonde at Marshall Road Drain is packed in red colored mud.

Ramona Lake Drain
The water level at Ramona Lake is unusually low.

Hospital Creek
Ashley packs the QA sonde for transport back to the lab once the last site is finished.

April 30, 2012

Westside Maintenance
Jeremy Hanlon, Michael Jue, and Zehra Avdan perform maintenance on water quality flow stations. The weir boards at Spanish Grant Drain are completely submerged. A dam has formed downstream at Del Puerto Creek causing a backup and preventing accurate stage measurements. The sonde at Ingram Creek is still above water.

Westley Wasteway
Jeremy removes debris which have collected around the sonde at Westley Wasteway.

Ramona Lake Drain
Mike and Jeremy take a stage reading at Ramona Lake.

Hospital Creek
Zehra, a visiting doctoral student from Turkey, records field notes while Jeremy inspects the sonde.

Marshall Road Drain
Jeremy uses a small test tube brush to clean the SpC sensor at Marshall Road Drain.

May 29, 2012

Westside Maintenance
Michael Jue, Ashley Stubblefield, and Annelea Vuontela perform maintenance on water quality flow stations. There is still a backup at Del Puerto Creek. The sonde is still above water at Ingram Creek.

Westley Wasteway
Mike encounters a snake while taking stage measurements at Westely Wasteway.

Del Puerto Creek
Mike takes flow measurements across the creek at Del Puerto.

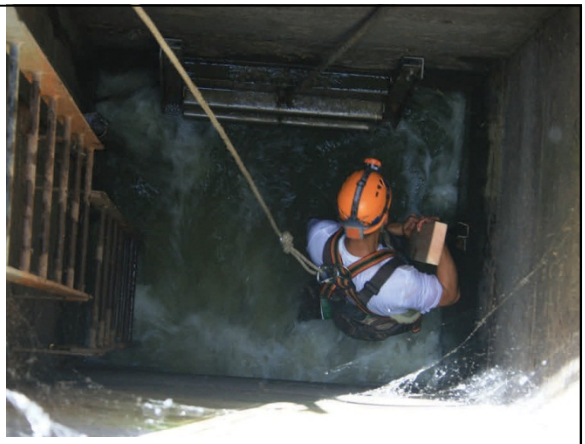
Spanish Grant Drain
Annelea Vuontela, a visiting undergraduate student from Finland, records sonde measurements for Spanish Grant Drain.

Spanish Grant Drain
An independently calibrated sonde connected to an MDS 650 handset is used to take QA measurements at each site.

June 19, 2012

Westside Maintenance
Jeremy Hanlon, Michael Jue, Ashley Stubblefield, and Annelea Vuontela perform maintenance on water quality flow stations. No measurements are being taken at Marshall Drain, the sonde and the logger are brought back to the lab for diagnostics. The weir boards at Ramona Lake are replaced. The sonde at Ingram Creek was removed to preserve the sensors.

Marshall Road Drain
The team runs diagnostics after it is discovered that no measurements have been logged at Marshall Road Drain. The logger is removed and brought back to the lab.



Ramona Lake Drain
Mike goes into the drain to replace a broken weir board.

Ramona Lake Drain
Jeremy cuts a board to length to replace the broken weir board at Ramona Lake Drain.

Marshall Road Drain
Jeremy cleans out the station at Marshall Road. Flow stations are often infested with spiders, ladybugs, wasps, and other insects.

July 24, 2012

Westside Maintenance
Michael Jue, Ashley Stubblefield, and Annelea Vuontela perform maintenance on water quality flow stations. Installed a new cable at Marshall Drain, measurements are now being logged. There is still a backup at DPC. The sonde at Westley isn't reading correctly, the field team replaced the sonde with the one from Ingram.

Westley Wasteway
The sonde at Westley Wasteway isn't taking SpC readings. It is removed and taken back to the lab for diagnostics.

Del Puerto Creek
Annelea learns to take flow measurements.

Westley Wasteway
The sonde at Westley Wasteway is infested with some type of insect eggs.

Ingram Creek
The stage and bubbler at Ingram Creek.

August 21, 2012

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations. Desiccant was changed at Marshall and Spanish Grant Drains and Hospital Creek. There is still a backup at Del Puerto Creek. New Jerusalem Drain is added to the site list.

New Jerusalem Drain
New Jerusalem Drain is added to the site list.

Marshall Road Drain
The sonde at Marshall Road Drain is packed in mud and worms.

Spanish Grant Drain
Mike takes a stage reading at Spanish Grant Drain.

Ingram Creek
Mike takes a weir stick reading at Ingram Creek.

September 18, 2012

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations. After performing diagnostics on the sonde at the EERP lab, it was decided to also remove the logger from Westley Wasteway. There is still a backup at Del Puerto Creek.

Moran Drain
Mike reads the stage at Moran Drain.

Ramona Lake Drain
The water around Ramona Lake is covered in duckweed.

Westley Wasteway
After running diagnostics on the sonde at the EERP lab, it was decided to also remove the logger at Westley Wasteway.

Ingram Creek
Ashley clears the area around the sonde access site.

October 30, 2012

Westside Maintenance
Jeremy Hanlon, Michael Jue, and Ashley Stubblefield perform maintenance on water quality flow stations. The sonde is removed at Marshall Drain after it is found to be reading negative SpC and temperature values. There is still a back up at Del Puerto Creek. The team attempts to install the GOES satellite system at Hospital Creek but is missing a few parts.

Marshall Road Drain
The sonde is removed and brought back to the lab after it was found to be taking negative SpC and temperature measurements.

Hospital Creek
Jeremy attempts to install the GOES satellite system at Hospital Creek.

Ingram Creek
Mike and Jeremy investigate whether the sonde can be relocated next to the bubbler at Ingram Creek.

Del Puerto Creek
The station at Del Puerto Creek is infested with wasps. Ashley sprays some bug spray so she can access the logger.

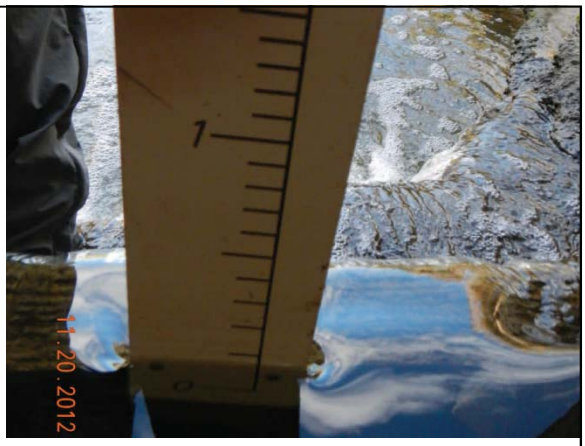
November 20, 2012

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations. The sonde is still uninstalled at Marshall Road Drain. The desiccant is changed at Marshall Road Drain. Del Puerto Creek was inaccessible due to wet dirt roads. Hospital is dry.

Marshall Road Drain
Mike puts the pole together which is used to take stage and weir stick measurements in deep drains.

Marshall Road Drain
Mike replaces the desiccant at Marshal Road Drain.

Ingram Creek
The area around a drain pipe at Ingram Creek is eroding away. You can see the sonde pipe which used to be buried.



Ingram Creek
Mike takes a weir stick reading at Ingram Creek.

December 11, 2012

Westside Maintenance
Michael Jue and Ashley Stubblefield perform maintenance on water quality flow stations. The battery is found dead at Marshall, Spanish, and Moran Drains. It is brought back to the lab for recharging. Del Puerto Creek is inaccessible due to wet dirt roads. Westley Wasteway still does not have a logger or sonde. Ingram and Hospital Creeks are dry.

Marshall Road Drain
It appears the battery is dead at Marshall, Moran, and Spanish Grant drains. The battery is removed and brought back to the lab for recharging.

Ramona Lake at Levee
The cows at Ramona Lake flock to the truck making it difficult to navigate the levee. The farmer who feeds them also drives a white pickup.

Ingram Creek
There is too little flow at Ingram Creek to take a stage or weir measurement.

Hospital Creek
There is too little flow at Hospital Creek to take a stage or weir measurement.