



Photo Credit: SRP, June 2015-SRP Flowtography™ Station @ LM-3

***Upper Lake Mary Watershed equipped with SRP Flowtography™
Stations Proposal to Provide Equipment O&M Services***

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Lee W. Ester and Hector Buenrostro
Salt River Project***

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I. Introduction

SRP is providing the following proposal for the Operation and Maintenance (O&M) of 6 SRP Flowtopography™ stations, located in the Upper Lake Mary Watershed.

II. Water Monitoring Method and Data Collection

A. Direct Hydrographic Field Measurements (Ad-hoc for-fee additional services)*

To refine the estimated discharge values, direct hydrographic field measurements could be collected at each stream, when appropriate, to verify water stage and flow at each location. Collecting direct hydrographic measurements provides precise field discharge data that could be used to refine (calibrate) the preliminary flow equations derived from the Slope-Area Method, thus providing a more accurate discharge calculation.

Direct hydrographic measurements incorporate a technique used to invasively measure the discharge, or the volume of water moving through a channel per unit of time, of a stream. The height of water in the stream channel, known as a stage or gage height, can later be used to determine the discharge in that stream. When used in conjunction with velocity and cross-sectional area measurements, the recorded stage heights can be extrapolated to calculate discharge values for the stream during the time series stage values, thus generating a proofed rating curve and subsequent hydrograph of the flows in the channel. A rating curve is constructed by positioning several manually derived discharge measurements (e.g. measured using method described above) with a corresponding stage height. A best-fit curve is fit to these data points and the equation of the line corresponds to the relationship between stage and discharge. The greater the number of direct measurements, the more reliable the rating curve (Slope-Area method) will be to determine the discharge based on stage data (Bruckner, 2013).

Table 1 –Hydrographic Field Measurement Costs (Additional fee to this proposal if desired)

Costs			
	Qty	Estimated Cost	Total
Direct Hydrographic Measurement	Ea.	See Page #7	Qty. Driven
Download, Process and Incorporate Hydrographic Data	Ea.	\$145 / site / measurement	Qty. Driven
Total Costs			Qty. Driven
Travel, Hotel, Per Diem (1 person)			Qty. Driven
Grand Total (applicable taxes not included)			Qty. Driven

*SRP and City of Flagstaff to establish criteria for City authorization for SRP to conduct Hydrographic Field Measurements.

B. Data Management – Flowtopography Image Collection (SD Card On-Site)

High resolution site images must be manually extracted from the devices. Images collected may have missing periods caused by unforeseen circumstances such as break fix events and vandalism. Collection of the images would be facilitated at a level of frequency to be determined as part of this project. For



example, depending on runoff events and site visit costs, it could be done quarterly, monthly, or weekly (not to exceed 4 visits per site per 9 months). Once the images are collected they are converted to stage height in back office operations. The data is then uploaded into SRP’s Quality Assurance/Quality Control (QA/QC) back-office processing system. SRP uses Aquatic Informatics’ Aquarius hydrological software for data management and processing, analysis, and reporting. SRP may request to use the data for current/future business purposes.

C. Data Access/Sharing

Stage data collected from each site, whether early/provisional or later/finalized, will be made available via SRP’s secure password protected web portal accessible at www.azwatergage.com (see figure 1, figure 2, and figure 3). City of Flagstaff will determine who receives credentials to access the data. Each of the stream sites will have its own web page, graphics, and numerical reports. Data from the project’s inception to completion can be retained, viewed, and downloaded at the user’s discretion. Image retrieval must be requested to SRP. SRP may request to use the data for current/future business purposes.

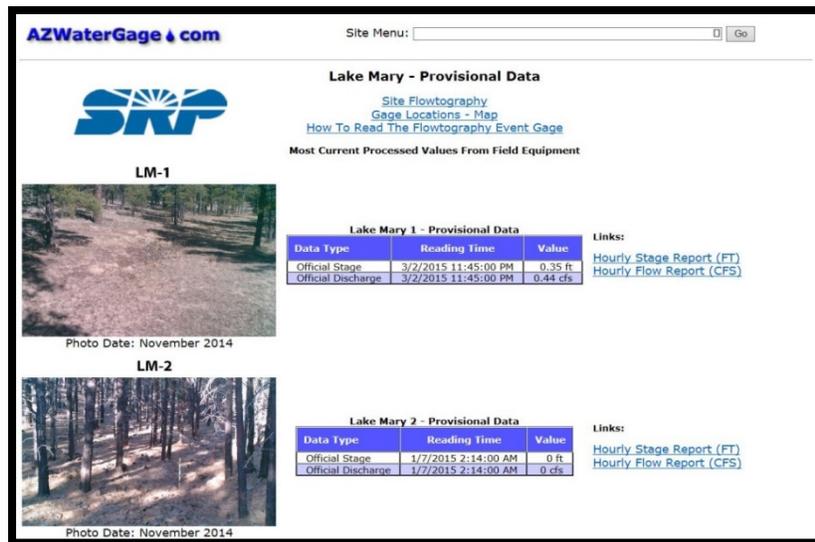


Figure 1 AZWaterGage LM-1 & LM-2

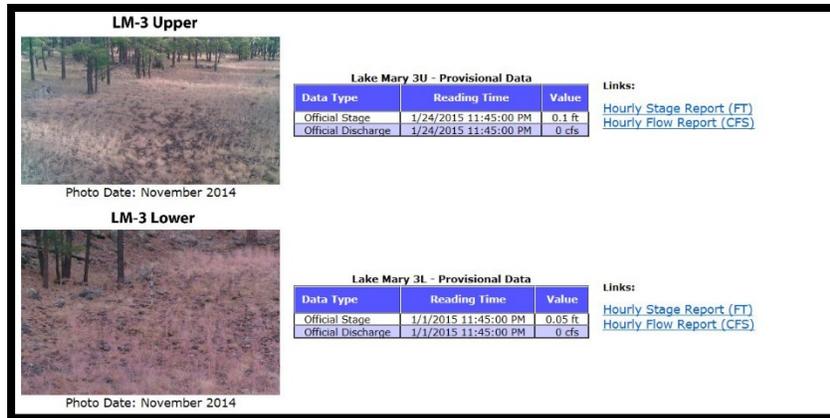


Figure 2 AZWaterGage LM-3 Upper & LM-3 Lower

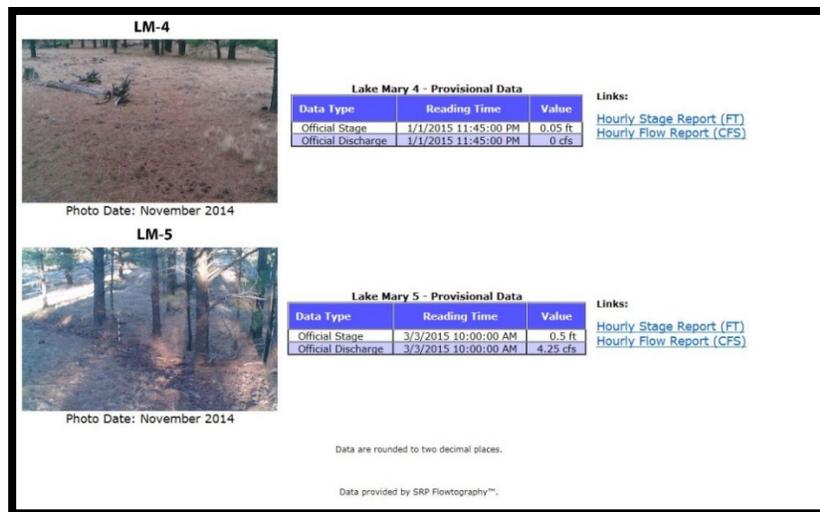


Figure 3 AZWaterGage LM-4 & LM-5

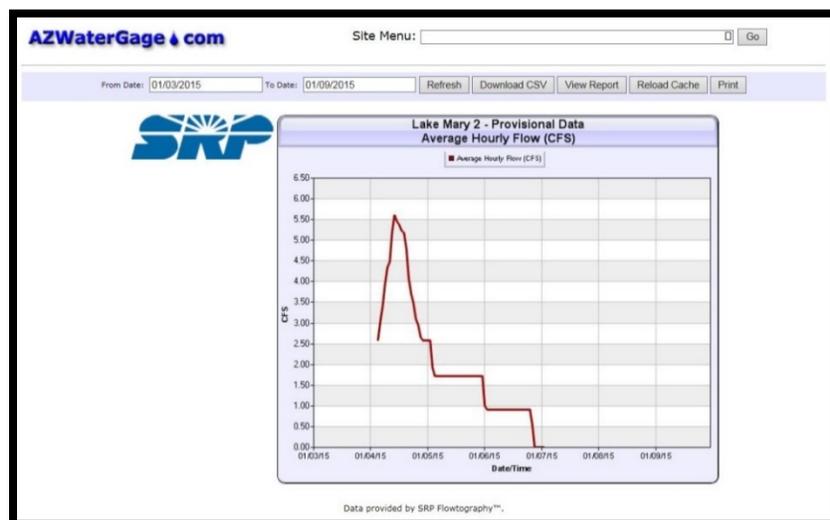


Figure 4 - Sample Provisional Hydrograph from AZWaterGage LM-2

D. Drone Command Hub

Flowtography thumbnail images will be available by User ID/Password at a third party’s website (www.dronewireless.com).



Figure 5 Drone Command Hub Login

III. Operation and Maintenance (O&M) - Recurring Costs Estimates

The O&M budget will be used to administer, travel, operate, maintain the sites and collect Flowtography images; manage the data analysis and processing; retain the images and host the data website.

To meet the above deliverables, SRP estimates the annual site costs in **Table 3**. *Taxes, if applicable, will be additional.* The actual timing of services provided could vary due to inclement weather, travel methods, site complexity, site access issues, forest closures, Pine Grove Quiet zone restrictions, hunting seasons, and break fix events.

Table 3 – Comprehensive O&M Costs (Includes data processing and web services).

Annual Maintenance Budget-Planned (not to exceed 4 site visits/9 Months)			
	Qty	Estimated O&M Cost	Total
SRP FLOWTOGRAPHY™ site – with event monitoring	6	\$ 3,225 / 9 Months / site / not to exceed 4 visits each site	\$19,350
Flowtography Images – Cataloged in SRP’s Cumulus system for storage and recovery as needed	6	Included	Included
Cellular Fees	1	\$240 / month / 6 sites (estimated 9 months. Monthly fees are recurring)	\$2,160

6 - SRP FLOWTOGRAPHY™ sites			
QA/QC Back Office	6	\$2,250 / 9 months / site (estimated recurring annual cost)	\$13,500
Web Service – Hosting of 6 sites on AZWatergage.com	1	Included	Included
Retention of Flowtography Images – 6 sites	1	Included	Included
Total Estimated 9 Month O&M Costs			\$35,010
O&M Costs per site (applicable taxes not included)			\$5,835

Renewed funding by Client will be subject to the approval of a recommended funding term as approved by the City of Flagstaff City Council and subsequent amendment to ICA.

**In the event of any unforeseen circumstances, equipment needs or break-fix events, the following SRP costs could apply:*

<i>Transportation – Helicopter</i>	<i>\$ 650 per rotor hour (avg. depends on aircraft)</i>
<i>Transportation – Vehicle - ground</i>	<i>\$ 10 per SRP labor hour</i>
<i>Additional Materials</i>	<i>Actual cost plus 15%</i>
<i>Cellular Network Fees (other equipment as required)</i>	<i>\$ 85 per site per month</i>
<i>Labor (Professional Services)</i>	<i>\$ 125 per hour</i>
<i>Labor (non-technical if appropriate)</i>	<i>\$ 105 per hour</i>
<i>Data Processing (Professional & Analytical Services)</i>	<i>\$ 145 per hour</i>
<i>Direct Hydrographic Measurement (exclusive of travel costs)</i>	<i>\$ 510 per site / event</i>
<i>Overnight stay and meal expenses (when required)</i>	<i>~ \$ 250 per day/person</i>

*SRP and City of Flagstaff to establish criteria for City authorization for SRP to conduct ad-hoc services or emergency services due to equipment outages prior to the installation of the equipment.

IV. Invoicing

All invoices will be accompanied by a detailed description of equipment and/or services provided by site, date, and purpose as follows.

A. Operation and Maintenance (O&M) - Recurring Charges

Invoicing for routine services will occur at regular intervals and will be submitted subsequent to scheduled or unscheduled (break fix service events subject to City authorization).

B. Break-Fix Event (Exception to Planned Schedule)

In the event any special services or equipment requirements are needed, these actions will be invoiced as they occur. A process for seeking City of Flagstaff approval for exceptions to equipment or service events will need to be defined.



C. Special Call Out and Change Orders

Special call-out for pre/post-storm or other servicing (such as collecting direct hydrographic measurements or collect data and photographs) will be charged as a Break-Fix event.

D. Future Pricing

Future pricing is subject to escalation by the published CPI. Costs will be reviewed/renewed annually in the month of April each year and an amendment to ICA and Schedules A&B prepared and submitted.



V. Notice to Proceed

This document outlines SRP's proposal for the Operation/Maintenance of 6 SRP Flowtography™ stations. SRP will operate, maintain the sites, host the stage value data and retain the Flowtography images in support of the City of Flagstaff Upper Lake Mary Watershed Monitoring Project.

An Independent Contractor Agreement (ICA), when appropriately signed, will serve as City of Flagstaff's notice to proceed for SRP. The ICA has been included as a companion document to this proposal. The ICA, Schedule A, refers to this project proposal. Schedule B summarizes Compensation and Payment costs.

If the City should have any questions or would like to discuss this project proposal in further detail, please contact:

Lee W. Ester, Manager
Water Measurement
Salt River Project
(602) 236-5592

Lee.Ester@srpnet.com

Hector Buenrostro, Analyst/Engineer
Water Measurement
Salt River Project
(602) 236-2410

Hector.Buenrostro@srpnet.com