FINAL REPORT

2015 SEQUIM-AREA SURFACE WATER FLOW MONITORING

Centennial Clean Water Program
Grant No. WQC-2015-SequPW-00008
Task 7

By
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August 2016



Stormwater Stewardship
Our Water, Our Future!

CITY OF SEQUIM

ACKNOWLEDGEMENTS

This monitoring wouldn't have been possible on its limited budget without the assistance of volunteers enlisted by City of Sequim, Streamkeepers of Clallam County, and the North Olympic Salmon Coalition's 2014 "CATS" class:

Field Work:
Peggy McClure
Bob Phreaner
Janet Bruening
Linda White
Kay Dill
Budd Nash
Scott Chichester
Pete Sekac
Dave Shreffler

Equipment Support:
Karen Westwood
Sarah Miller
Sue Nattinger
Clallam Conservation District for the loan of its Swoffer flow meter

Data Management and Analysis:
Coleman Byrnes
Judy Gordon
Walt Johnson
Tim Fortman
Ed Chadd

BACKGROUND AND OBJECTIVES

The City of Sequim's physical setting is fairly unique for western Washington, located in a prairie that historically had no surface runoff. Ever since irrigation conveyances were constructed toward the end of the 19th century to bring Dungeness River water to farms throughout the region, ditches have intercepted and conveyed storm runoff. Several irrigation ditches pass through the City, sometimes utilizing stream courses for conveyance or for tailwater discharge, and some ending at marine bluffs.

In the wet season, stormwater runoff follows the path of least resistance, entering stream channels, irrigation ditches and roadside ditches. It is discharged to surface waters of the state relatively quickly, compared to pre-development conditions when local precipitation was absorbed by the gravels of the prairie (Ice-Age Dungeness River floodplain) and streams didn't extend inland as far as they do now.

Given the many conveyances of surface water in the City and the fact that the source of flowing water depends on the season, irrigation ditches are often mistaken for creeks, and vice versa. Irrigation managers as well as City crews work hard to maintain the irrigation ditch infrastructure during the wet season when debris carried in stormwater runoff clogs intake screens; trash grates protecting expensive infrastructure (several siphons and sag pipes) under Highway 101, as well as Bell Creek, are closely watched.

In addition, roadside ditches, especially those receiving overflow from detention ponds on Bell Hill and those draining central and western Happy Valley (all in County jurisdiction), fill to overflowing with the largest storms and sometimes spill onto private property in the City. At the start of the rainy season, at least, runoff may infiltrate but later in the season and during larger storms it floods neighboring properties.

Because of its small size and the lack of historical flooding or specific water quality concerns affecting commerce (such as the commercial shellfish industry), the City of Sequim is not a NPDES permittee like most jurisdictions in Puget Sound watersheds. However, Bell Creek, Johnson Creek, and Sequim Bay (all with portions in or adjacent to the City) have multiple reaches listed by the state as "impaired" or "waters of concern" for bacteria, pH, dissolved oxygen, temperature, and/or bioassessment.

Whether or not these issues are directly tied to stormwater runoff originating in the City is not certain, but information on year-round surface flows documented by this project will help with assessments of contaminant loading, especially when combined with water quality data collected by Clean Water Work Group partners (Clallam County Environmental Health, Jamestown S'Klallam Tribe, Clallam Conservation District, and Streamkeepers of Clallam County).

The surface water flow monitoring described herein implements Task 7 of the City of Sequim's Stormwater Stewardship Project (Ecology's Centennial Clean Water grant no. WQC-2015-SequPW-00008), with these monitoring objectives:

1. To document typical flows coming into and flowing out of the Sequim city limits and UGA within creek channels, irrigation conveyances, and roadside ditches, in all seasons. This flow information has been needed so that water management planning can address water quality and capacity concerns, and to facilitate a common understanding and inform agreements with water management partners.

2. To achieve cost-effective data collection by partnering with Streamkeepers of Clallam County, rather than direct investment by the City for a limited application. The number of sites, frequency, methods, and costs in general were limited to the minimum that effectively meet the City's objectives for 2014-16 storm and surface water management planning under its Ecology Centennial grant, and the quality objectives listed in the QAPP.

Finally, documentation of the City's drainage system is continually improving and flow monitoring will provide quantitative data with which to inform planning and modeling in the future.

METHODS

Monitoring Locations and Frequency

Ambient: A network of sites for this project was systematically established for ***ambient*** flow measurement (once per month for 12 months) using the following criteria:

- Relatively high flow observed in prior wet seasons as compared to other locations
- Relatively easy access
- Pre-existing data available
- As near as possible to City limits
- Representative of stream, irrigation system, or roadside conveyances—in roughly equal numbers but not more than 30 sites in all
- At or near an identified problem area for flooding or water quality concerns (i.e., discharges to streams)

Storm Event: Within this network of sites a subset was selected for ***storm event*** monitoring (four events during the one-year project*). Criteria for selection of storm-event sites include:

- Particularly high flows observed in the past
- Association with a known problem
- Especially easy access
- Representative of stream, irrigation system, or roadside conveyances—in roughly equal numbers but not more than 6-9 in all

*A qualifying "storm event" was defined as daily rainfall measured to be 0.4 inches or greater at one of three local weather stations (Sequim 2E, 1.3SE, or 5.8 WNW; see NOAA 2014, Climate Data Online). This was based on two factors:

a) Daily rainfall events totaling >0.5 inches occurred more than 3 times/year on average between 1989 and 2014, and
b) The 2-year/ 24-hour storm is 1-1.5 inches for the Sequim area.

Appendix A lists project monitoring sites (28 sites to be monitored; 4 optional; 2 moved).

Field Methods

Field work was coordinated by Streamkeepers of Clallam County and City staff. Volunteers with both organizations, in addition to volunteers with North Olympic Salmon Coalition ("CATS" class), were trained in December 2014 and conducted the vast majority of field work throughout 2015. Monthly ambient flow measurements were obtained at most sites and seven storm events were measured within the 12-month official monitoring period, January-December 2015.

Streamkeepers staff and volunteers, based out of Clallam County courthouse, also conducted field equipment maintenance and calibration, data entry, and data submittal to the state Environmental Information Management (EIM) system. City staff and volunteers, based out of Sequim Public Works offices, conducted data analysis and prepared this report.

Monitoring involved observing and measuring surface water flows as follows:

- Stage (water level) measurements involved reading a staff gage set in the channel or measuring with a weighted tape down to water level from an established reference point (such as top of a culvert).
- Flow measurements involved using a Swoffer flow meter to measure velocity for sequential sections across the channel; using a bucket with stopwatch; and/or using the floating-object method, also with stopwatch.
- No flow (or no measureable flow) observations are valid "measurements" and also recorded.

Protocols for all methods are documented in Ecology-approved QAPPs for Streamkeepers of Clallam County and/or Ecology's protocols for reading gage heights and the tape-down method.

Data Analysis

Data for 28 sites were compiled for analysis, with the goal of reporting flow volume through the seasons at each site. When reliable flow data were available for a site throughout the year, this was straightforward. Normally, most data records for a site were stage readings with a few corresponding flow measurements with which to calibrate and establish a rating curve or other relationship (including the formula for a partially-filled pipe). All data records and calibration information may be found in Appendix C.

Flow in a natural channel is very difficult to measure accurately without the most modern tools and lots of time to double check the work. When a strong relationship between stage and flow can be established, flow can be estimated from stage readings. With this project, difficulties in data collection (as found in field notes) and the inherent unreliability of certain methods (compounded when used by a variety of individuals) made it impossible to produce strong, reliable flow estimates for most sites or along a certain water course or stream.

Data analysis had to account for project idiosyncrasies that require the analyst to interpret with care, using original field notes. For example,

- The **floating object method** was employed side-by-side with a wade-across flow meter at several sites and resulting flow measurements were sometimes 50% different. In these cases it was assumed that the flow meter produced the more accurate flow result, and the floating object method underestimated the actual flow. The discrepancy casts doubt on the accuracy of all floating object results.
- **Bucket measurements** of flow were also problematic. At some sites, bucket collection was physically awkward; these flow results are not as reliable as those obtained with a flow meter. In addition, some field teams recorded measurements of time and volume to the nearest 0.1 gallon and 0.01 second, while others rounded-off to the nearest 1.0 gallon and 1.0 second—a resolution probably too coarse for this study since comparing bucket flow results with staff gage readings from multiple teams presented conflicts. The fact that measurements were not always collected with exactly the same technique adds to overall project uncertainty.
- Performance of the **Swoffer flow meter** is not generally reliable at velocities less than about 0.1 ft/sec – which are common in the study area in many months at the margins of the stream. When this occurred in the deepest part of the stream (thalweg) as well, observed flows were listed as "too low to measure" due to inhibited or impeded propeller movement.

- **Tape-down** readings can be tricky when the tape doesn't hang straight, is blown by wind, or because it must be read upside down compared to a staff gage.
- In some cases the staff gage placement or tape-down **reference point was changed** part-way through the project, rendering some portion of data records not usable.
- **Rating curves** were attempted for many sites using Excel tools (Log, Power curve trendlines and the Logest function). Usually, the function with the best (reasonable, given project objectives) fit to empirical data was applied to stage data for estimating flow year-round. Sometimes, a reasonable fit was not possible and stage data alone was reported.

In addition, field work during storms adds a degree of difficulty in terms of potentially compromised visibility, communication and proficiency that may be reflected in results for all measurements obtained during storms.

Finally, the volume of data gathered by a dozen volunteers visiting 20-30 sites each month plus 4-6 storms is huge. Data entry errors and omissions are to be expected, and some were found, slowing the analysis down and causing uncertainty.

When a data record stood out and didn't make sense in an obvious way, field notes were consulted to confirm there hadn't been an error made in a mathematical calculation or in data entry. When a hand-written measurement or note on a field sheet could be interpreted in multiple ways, a judgment call was made to use or not allow use of the information.

RESULTS AND LIMITATIONS – (refer to illustrations in Appendix B)

First, monitoring results confirm the obvious—summer-time surface water flows are highest in irrigation ditches and winter flows are highest in streams. Winter storms can amplify ambient winter flows by 500% (20 or more cfs) in certain locations. One summer storm was monitored and found to have little or no effect on ambient conditions in streams and roadside ditches; some irrigation-influenced channels showed increased flow during the storm, but the change can't be distinguished from normal fluctuations in irrigation diversions.

Second, results generally give an idea of the volume of storm flows entering city limits from key upland areas to the south:

1. West of Bell Creek
    - Site HID-Main-Sporseen: Measured storms added 10 or more cfs to ambient flows in the Highland Irrigation main canal within the mile upstream of Sporseen Road. This volume continues down the canal with some spilling into Bell Creek when the intake for the siphon crossing the creek ravine gets clogged, such as with blown branches and leaf litter.
    - Site WHV: Runoff from western Happy Valley and Burnt Hill collected in the roadside ditch flowing west near Sporseen Road is estimated at roughly 10 cfs during two storms; however, it was noted for one storm that approximately half the runoff overflowed, spilling into a nearby irrigation ditch, and could not be captured in the measurement. The runoff that continues west in the roadside ditch crosses under (or floods over) Happy Valley Road and flows down a gulley to former Dungeness River floodplain, where it follows an irrigation lateral to join the Eureka irrigation ditch—except that during the higher flows the runoff floods vacant pasture land at the base of the slope.
    - Eureka-River and -Silberhorn: The Eureka ditch flow rises substantially between River Road and Silberhorn Road in winter due to the inflow from western Happy Valley.
        - Ambient winter flows between the two points rise from 0 to ~2 cfs.
        - Storm flows in mid-late winter (once the ground is saturated) are measured to rise 2 to 10 cfs—consistent with the estimated inflow from western Happy Valley.
    - Roadside ditch on Silberhorn Road: The roadside ditch on the east end of Silberhorn Road was normally dry unless a large enough storm caused ponding to the south of Jara Way. Storm flows were measured during two storms (estimated at 1 to 5 cfs), which overwhelmed the culvert and flooded the sidewalk, a sewer manhole, portions of Silberhorn Road, and private property downstream to the east.
    - Roadside ditch and spring on Reservoir Road: There are known flows not related to any streams in the developed areas on the north side of Reservoir Road. Originally, a monitoring site was established in a roadside ditch near the west end of the road which turns north along a property line across from the City reservoir entrance. This site had no water or standing water in winter and summer; its status during storms is not known as it was an optional site and did not get checked. In summer 2015, a different roadside ditch was found to be flowing, east of the original site but also flowing north into the developed area; a brief investigation showed it to be spring flow emerging from the hillside about 500' to the south. The culvert carrying this flow under Reservoir Road became the alternate monitoring site. Flow measurements using a bucket showed a 0.02 cfs ambient flow in summer-fall (during the 2015 drought) and slightly higher in winter; storm flow was estimated to be about 0.2 cfs (this may include additional runoff from the roadside ditch).

- Various sites in the western and northern areas of the city, north of Hwy 101: Storm flows rarely build up in roadside ditches; rather, they flow through the city in irrigation conveyances at volumes between 0-5 cfs, depending on the ditch and whether the flow is divided at key junctions (i.e, Sequim Prairie ditches at Grant, Hendrickson, and Evans Roads, and Independent ditch at Priest Road). All year, flows in irrigation ditches exit the city and UGA to locations determined by the demand for irrigation water.

2. Bell Creek
   - Bell 3.8a: Creek flows entering the UGA at Happy Valley Road range from <1 to possibly as much as 10 cfs during ambient winter conditions; storms flows added around 3 cfs in the fall before the ground is saturated to 15-25 cfs later in the wet season.
   - Bell 2.8 to 1.5: The creek hits former Dungeness floodplain at the start of this reach (Brownfield Road/SR 101), which readily absorbs water until the ground is saturated in the fall or early winter (in summer this reach is dry, to Carrie Blake Park). Storm flows are estimated at 5-10 cfs (with one potentially an order of magnitude higher); however, storms were hard to measure due to inability to install a staff gage at Bell 2.8 or 1.8, difficult conditions for accurate tape down readings, and lack of flow measurements at Bell 1.5 with which to calibrate staff readings.
   - Bell 1.4a (east end Carrie Blake Park): Bell Creek is supplemented with 0.1 cfs of reclaimed water at Carrie Blake Park during the dry season, which keeps the ponds full in summer but doesn't normally result in flow at or much past the staff gage at Bell 1.4a. In winter, staff gage fluctuations mirror those of Bell 1.5 at the Park entrance, with a rise of 1.5 feet common during storms.
   - Bell 0.2 (Schmuck Road, near the UGA boundary): In the vicinity of where Bell Creek passes the city limit (appx. RM 1), it flows through a wetland complex and is supplemented by springs and a tributary from the base of Gierin Hill to the north. At the Bell 0.2 monitoring site, the stream flows year-round with ambient flows in summer below 1-2 cfs and in winter between 1 and 10 cfs. Storm flows add one to two orders of magnitude—potentially as much as 100 or more cfs.

3. East of Bell Creek
   - Roadside ditch at Miller Road: Wet season runoff from the north side of Bell Hill primary enters the city limits in roadside ditches on Doe Run Road and Clara Crest Road, both of which lead to the ditch on Miller Road. Ambient conditions in winter are 0-1 cfs in these ditches, with storms measuring another 1-2 cfs. (City staff has observed flows on the order of 5 cfs causing problems at this location during the largest storms and/or when upstream detention is compromised.) Note that the irrigation conveyance near this site takes Highland canal water north under Miller Road and west and further north in an open ditch; this ditch carries water in summer only.
   - Roadside ditches at Brownfield and Hammond-Brown Roads: Some of the runoff in the Miller Road area flows north, downhill in a channel that is culverted under Brownfield and SR101, discharging to undeveloped private property west of S. Brown Road. During larger storms after the ground is saturated this runoff ponds up at the base of the slope until it flows east toward Hammond Road. Monitoring on Hammond Road showed ambient flow in winter up to 1 cfs and storm flows adding about 1-3 cfs. This runoff is routed to the wetlands north of West Sequim Bay Road, which eventually discharge to Bell Creek about a mile to the east.
   - Other culverts under Brownfield and SR101: There are at least 5 culverts or siphons under SR101 east of Bell Creek. Some collect runoff from the slopes south of Brownfield, but those flows are minor relative to the monitoring site described above. Some discharge overflow from WSDOT retention ponds along the edges of the highway onto private property on the north.

- Roadside ditch at Simdars Road: There is trace runoff in this ditch year-round since it has a large catchment and glacial till soils. Monitoring showed 6" of water coming out a culvert during winter; however, observations of low vs. high flows in the ditch don't correspond with dry vs. storm conditions. This runoff is routed toward an irrigation ditch to the east, and both empty into a large wetland and pond just south of the SR101 roadway. Eventually, the wetlands discharge to Johnson Creek.
- Roadside ditch on West Sequim Bay Road near John Wayne Marina, discharging to Johnson Creek: This small ditch was dry during every monthly observation except it had low volume flow in June and July, when it receives Highland irrigation tailwater, and during one December storm.

4. Johnson Creek (RM 0.0 only)
    - Winter-time ambient flows are between about 1 and 10 cfs, with storm flows jumping at least one or more order of magnitude. Johnson Creek is the largest in this study, with a large watershed and several tributaries, but only the lowest mile is within the city limits and UGA. There are at least 3 discharges from the Highland irrigation system that enter the creek, two of which are known to carry stormwater.

Data quality assessment looks at whether data are comparable and representative of flow conditions:

- "Comparability" expresses the confidence with which one data set can be compared to another for the same location. Results are "comparable" because 24 of 28 (86%) sites had at least 11 months where at least one measurement/observation was made following protocols outlined in the QAPP. However, measurements made using the floating object and bucket methods were not always reliable due to variations in implementation (use of stop watch, difficulty of site, and other reasons). See below for data limitations.
- Project measurements are considered "representative" of watershed conditions because monitoring activities were performed in compliance with the study design and procedures described in the project QAPP. However, not quite 90% of all observations are considered reliable due to variations in implementation. See below for limitations in the use of data.
- The "completeness" assessment showed success since measurements and observations of ambient conditions were made for at least 11 months at >80% of the sites proposed in this QAPP, and storm event conditions were measured for at least four qualifying storms at >80% of the storm sites proposed. In addition, the project was in compliance with the study design described in Part 7 of the QAPP.

Limitations

As explained in the Data Analysis section, the variety of methods used combined with data collection, entry, and analysis challenges creates limited reliability of project results (complete data analysis is provided in Appendix C). For this reason, **results are illustrated in Appendix B as estimated ranges with at least but not much more than an order of magnitude level of accuracy.** Within these limits, results as reported are considered representative of watershed conditions.

That said, flow and gage height were the only parameters measured and there were no water quality-assessment objectives of this monitoring work. The results should not be used to make regulatory decisions and they should not be compared to a standard nor used to determine trends.

CONCLUSIONS

This project was intended to characterize typical base flow and storm flow patterns in channels that carry water into and through the City during annual wet and dry seasons. For this purpose, the limitations of the results are not significant. Indeed, a great deal of hydrologic understanding and improved relationships with water managers were gained through the monitoring even if these were not quantified and measured—such as management methods, the location of discharges, and amount of natural infiltration occurring.

This flow monitoring task supports two other grant tasks in several ways:

- Task 2 (stormwater management plan and program) was informed by the monitoring project in terms of local hydrology and stormwater flow patterns. Many projects and activities listed in the City's Storm & Surface Water Management Plan adopted in April 2016 were founded on knowledge gained through implementation of flow monitoring during the planning process throughout 2015:
    - Problem areas to be addressed by capital projects—see table below.
    - Direct discharges to streams, including runoff type (urban/suburban/rural)—see table.
    - The need to maintain cooperative relationships with water management partners—as described in the next paragraphs.
- Task 6 (agreements with water management partners) was furthered by having a field presence during storms and all year, paying attention to private facility and land ownership related to runoff concerns, and sharing of information obtained. During storms, it behooves the City and its partners to have ready communications with one another—the more eyes and hands in the field the better.

Monitoring and working with water management partners resulted in several new management methods:

- Winter flows in irrigation ditches are stormwater runoff that historically would have infiltrated in pasture or forest conditions, but now which is intercepted by the ditch infrastructure.
- Eureka ditch flow is conveyed via siphon under Hwy 101. When flowing normally, storm runoff enters downtown Sequim between the siphon outlet and the intersection of Washington and 7th, which floods if the runoff overwhelms the irrigation conveyance capacity, or if any trash racks get clogged.
    - When the siphon intake (at E. Cobblestone Lane) is clogged the overflow follows a spillway into the Hwy 101 Bypass cut and flows east to a WSDOT retention pond which stores the runoff unless it, in turn, overflows to Bell Creek.
    - This alternate route for high runoff alleviates many potential issues in central Sequim since irrigation conveyances are not built to handle flows that high, nor are the trash racks built to capture the volume of tree/leaf litter and garbage that storm runoff generally carries.
- The area at the base of the slope from western Happy Valley receives runoff via gulleys in the terrace edge, ponds up on private property south of Jara Way, and overflows into a piped conveyance at the base of the slope. This pipe empties into a ditch at the property line between Cherry Blossom and Heckman subdivisions, which spills into the roadside ditch at Silberhorn causing flooding over the sidewalk, road, and private property to the north. This flow eventually infiltrates on private property to the east of S. 7th Avenue. This area used to drain via an old

irrigation ditch making its way to Bell Creek near 3rd Avenue (considered the "west fork of Bell Creek"), now partly filled in and partly replaced with the pipe that discharges to Silberhorn.

- Miller Road concerns (damage to ditches, culverts, erosion, etc.) prompted the City to ensure inspections and improvements from Bell Hill HOAs and that the County is requiring new building permits to have ample onsite management.

We learned that, within the city, Bell and Johnson Creeks receive stormwater in several places, some of which can be addressed by city-owned capital facility improvements (most of which are included in high priority stormwater CIP project lists adopted by Council):

Location on Bell Creek	**Runoff Type**	**Flow Control/Treatment**
Spillway and/or valve at the Highland Irrigation siphon at ~RM 3.6*	Rural runoff from western Happy Valley	Needed: detention and metering; energy dissipation
Overflow from SR101 retention pond between 3rd and Sequim Ave. at RM 2.7	Rural and suburban runoff	Needed if not already installed by WS DOT: energy dissipation
Overflow from the Emerald Highlands detention pond (owned by the City) near eastbound SR101 offramp at RM 2.7*	Suburban, via detention ponds	Existing: shallow swale Needed: maintenance
Overflow from the Highland ditch at or west of S. Brown Ave. at RM 1.85	Suburban	Needed: retention/infiltration facility
Street runoff from E. Washington at RM 1.8	Urban	Needed: infiltration facility with treatment appropriate for pollution-generating hard surface
Discharge from storm drain on N. Brown Ave. next to Les Schwab at RM 1.75	Urban	Needed: infiltration facility with treatment appropriate for pollution-generating hard surface
Tailwater from the Highland ditch behind old Staples (east of Les Schwab) at RM 1.7*	Suburban (same source as RM 1.85)	Needed: detention facility
Location on Johnson Creek	**Runoff Type**	
Tailwater from the Highland Irrigation main canal at RM 1.6*	Suburban, from Bell Hill	Needed: detention and metering; energy dissipation
Tailwater from Highland irrigation lateral at RM 1.4	Suburban, from Bell Hill	Needed: detention and metering; energy dissipation
Tailwater from Highland irrigation lateral at RM 0.8*	Suburban, from Bell Hill via wetlands	Needed: detention and metering; energy dissipation
SR 101 culvert at RM 0.7	Highway	Needed if not already installed by WS DOT: retention/detention facility
Tailwater from Highland irrigation lateral/roadside ditch at RM 0.1	Suburban, from eastern City limits	Needed: detention and metering; energy dissipation

*potentially more than 2 cfs

The City encourages use of project results in additional ways:

- As an educational tool for the general public.
- By City and neighboring water managers for the purpose of prioritizing water quality, flooding, erosion, and other mutual concerns.

- Potentially by water quality managers in the Sequim-Dungeness Clean Water District to assess surface flow volumes as they compare with other flow and water quality data.
- By the City in roughly estimating rainfall-to-runoff relationships in certain key drainages.
- By Clallam County in its stormwater management planning.
- By the City in roughly comparing current flow conditions with stormwater studies conducted by Clallam County in 2008-11 which included some sites within the City of Sequim.

REFERENCES

Grant agreement for "Stormwater Stewardship: Sequim Stormwater Management Plan and Program," WQC-2015-SequPW-00008, with WA Dept. of Ecology.

City of Sequim, 2014, *Stormwater Management Needs Assessment*

City of Sequim, 2015, *Quality Assurance Project Plan: Sequim-Area Surface Flow Monitoring*

City of Sequim and Herrera Environmental, Inc., 2016, *Storm & Surface Water Master Plan*

Streamkeepers, 2011, *Quality Assurance Project Plan for Streamkeepers of Clallam County Environmental Monitoring Program*

APPENDIX A: SITE LIST

APPENDIX B1 and 2: ILLUSTRATIONS OF SUMMER AND WINTER FLOWS (11x17)

APPENDIX C: DATA AND ANALYSIS (8.5x14)

APPENDIX A. 2015 Sequim Flow Monitoring SITE LIST

Site name	EIM_Location_ID	Feature @ General location	Flow measurement method (alternate method)	Stream height observation	Discharge Type	Jurisdiction	Frequency	Comments	# months observed
Bell 0.2	BELL_CR	Bell Cr. @ Schmuck Road	Wade-across	Staff Gage (existing since 2010)	Stormwater enters via irrigation system and near Schmuck Rd in extreme events	UGA	Ambient, Storm		11
Bell 1.4 (discontinued)	CCWR_00193	Bell Cr. Just east of Rhodefer Rd	Wade-across	Staff Gage (new)		City	Discontinued	Channel too vegetated for wade-across; use Bell 1.4a	3
Bell 1.4a	CCWR_00800	Bell Cr. @ E end Carrie Blake ponds	Wade-across (floating object)	Staff Gage (new)	Overland from Carrie Blake Park (possibly from dog park?)	City	Ambient, Storm if possible		7
Bell 1.5	CCWR_00288	Bell Cr. @ Blake Rd just up from Friendship pond	Floating object	Staff gage (since 2014)	Runoff from various points upstream	City	Ambient, Storm if possible	Need flow measurements to calibrate staff	8
Bell 1.8A	CCWR_01029	Bell Cr. @ E Washington St culvert & S. Brown	Floating object	Tape-down from E. Wash. Culvert	Creek flow, road drainage from E. Wash., irrigation ditch overflow	City	Ambient, Storm	Multiple culverts; correct measurement point misunderstood	11
Bell 2.8	CCWR_00902	Bell Cr. @ Brownfield Rd	Wade-across	Tape-down from mark on culvert	Baseflow site	City	Ambient, Storm	Difficult site for wade across except for moderate flow	10
Bell 3.8a	CCWR_01030	Bell Cr. @ N side Happy Valley Rd (E-W section)	Get tape down at mid-point of 4' dia pipe; single velocity reading if poss.	Tape-down	Rural runoff	UGA	Ambient, Storm if possible		12
Eureka-Domino's	CCWR_00093	Eureka main ditch behind Domino's, upstream of trash rack	Floating object (wade-across)	Staff gage (new)	Entrance to long culvert; two main ditches converge upstream of here	City	Ambient, if possible		13
Eureka-River	CCWR_01031	Irrigation main (Eureka) @ River Rd	Bucket method--half flow at a time	Staff Gage (existing)	Upland land uses not known	City	Ambient, Storm		13
Eureka-Silb	CCWR_01032	Irrigation ditch (Eureka) @ Silberhorn	Wade-across (floating object)	Staff Gage (existing since 2014)	Irrigation water in summer; stormwater from western Happy Valley	City	Ambient, Storm		13
HID-Bell-spill (optional)	CCWR_01033	HID spillway to Bell Creek, upstream of siphon	(No good way to measure flow)	Staff gage (existing)	Stormwater spills into Bell freely in wet season (gate left open), or when siphon clogs	UGA	Ambient, if possible	No good flow method for spillway	2
HID-East HV	CCWR_00894	Irrigation ditch (Highland) @ x-ing of east end Happy Valley Rd at Huffman Heights	Wade-across (floating object)	Staff gage (existing)	Irrigation water in summer; stormwater from eastern Bell Hill	County	Ambient, Storm if possible	Irrigation managers monitoring this site; should have flow history, calibration info	12
HID-E-Wash	CCWR_01034	Highland @ former Staples parking lot	Floating object (wade-across)	Tape-down	Irrigation ditch tailwater; stormwater when flowing	City	Ambient, if possible	No flow measurements taken	12

APPENDIX A. 2015 Sequim Flow Monitoring SITE LIST

Site name	EIM_Location_ID	Feature @ General location	Flow measurement method (alternate method)	Stream height observation	Discharge Type	Jurisdiction	Frequency	Comments	# months observed
HID-H1-lateral (discontinued)	CCWR_00153	Irrigation weir (Highland H1 lateral) @ upper River Rd, above road	Floating object, in channel below staff	Staff gage (existing)	Irrigation in summer; stormwater in winter	County	Ambient, Storm if possible	"Lateral1" staff above road; not very accessible. Switched to Lateral2 mid-year.	10
HID-H1-lateral2	CCWR_01056	Irrigation weir (Highland H1 lateral) @ upper River Rd, along road next to DNR drive	Floating object, in channel above staff	Staff gage (existing)	Irrigation in summer; stormwater in winter	County	Ambient, Storm if possible	"Lateral2" staff downstream; read regularly by irrigation managers	13
HID-main-H1	CCWR_01035	Highland main canal @ H1 headgate	Wade-across	Staff gage (new)	Irrigation in summer; stormwater in winter	County	Ambient, Storm if possible		12
HID-main-Spor	CCWR_01036	Highland main canal @ Sporseen	Wade-across	Staff gage (new)	Irrigation in summer; stormwater in winter	County	Ambient, Storm if possible		12
HID-S-7th	CCWR_01037	Highland main @ S. 7th Ave	Floating object (wade-across)	Staff gage (new)	Irrigation in summer; stormwater in winter	City	Ambient, Storm if possible		12
HID-Spath (optional)	CCWR_01054	Highland lateral @ Spath (former) (West Sequim Bay Rd, north side)	Floating object	No	Irrigation in summer; stormwater in winter	City	Ambient, if possible	No measurements	0
HID-West-WSB	CCWR_01038	Irrigation (Highland) @ west end West Sequim Bay Rd (aka "Bike Shop")	Floating object	Staff Gage (new)	Flow comes from various directions (S, W, E)	City	Ambient, Storm	Irrigation conveyance may take street runoff as well	9
Indep-Priest	CCWR_00204	Independent @ Priest Rd.	Floating object (wade-across)	Staff gage (new)	a.k.a., ID07; Sequim Prairie Main Canal (M3); minor rural runoff	City-Co limit	Ambient, if possible		13
Johnson 0.0	CCWR_00032	Johnson Cr. @ John Wayne Marina, just downstream of West Sequim Bay Rd.	Wade-across	Tape-down from downstream side of culvert under driveway.	Creek flow and road drainage, irrigation tailwater far upstream	City	Ambient, Storm if possible		13
Road-Brownfield (optional)	CCWR_01049	Roadside ditch @ Brownfield, draining to Burrowes (at property line; culvert under Brownfield goes to CB)	Single point or floating object	Tape-down (if poss.)	Road runoff, some vicinity runoff	City-UGA limit	Ambient, Storm if possible	Very few measurements done due to lack of good measurement points	3
Road-Hammond-Brown	CCWR_01039	Roadside ditch @ E Hammond & S Brown	Floating object	Staff gage (new)	Overland flow converges in roadside ditch via Burrowes (orig. from Bell Hill)	City	Ambient, Storm if possible		11

APPENDIX A. 2015 Sequim Flow Monitoring SITE LIST

Site name	EIM_Location_ID	Feature @ General location	Flow measurement method (alternate method)	Stream height observation	Discharge Type	Jurisdiction	Frequency	Comments	# months observed
Road-Miller	CCWR_01040	Roadside ditch @ Miller Rd, close to City limit	Floating object (single point velocity?)	Tape-down	Runoff from County (Bell Hill)	City-Co limit	Ambient, Storm		13
Road-Reservoir-Ditch/Spring	CCWR_01041	Roadside ditch heading into north Dominion Terrace, west end (Jan-Aug). Springflow ditch heading north mid-block (Sept-Dec).	Bucket	Tape-down if poss.	Spring flow from hillside above, on City reservoir property.	City	Ambient, if possible	Ditch dry Jan. thru Aug. 2015. Switched to spring flow location in Sept.	7 + 4
Road-Silb	CCWR_01042	Roadside ditch @ E Silberhorn, east of Eureka ditch (behind Cherry Blossom fence)	Wade-across or floating object (depends on flow)	No	Originates on private property south of Home Development, receiving from western Happy Valley	City	Ambient, Storm if possible		11
Road-Simdars	CCWR_01043	Roadside ditch @ S Simdars	Try bucket method	Tape-down	Water originates from west—poss. County (Bell Hill area)	City	Ambient, if possible		12
Road-WSB	CCWR_01044	Roadside ditch @ West Sequim Bay Rd, drains to Johnson Cr	Bucket method, if poss.	Tape-down	(discharges into Johnson) still carries irrigation tailwater	City	Ambient, Storm if possible		12
SP-Evans	CCWR_01045	Sequim Prairie at pipe outlet to open ditch (Evans Rd just N of Covington Ct)	Bucket or floating object	Tape-down	Irrigation, some local runoff poss.	UGA-Co limit	Ambient, Storm if possible		12
SP-Grant	CCWR_01046	Sequim Prairie downstream of @ Grant Rd siphon	Floating object	Tape-down	Irrigation, very little stormwater	City-Co limit	Ambient, if possible		12
SP-Hend	CCWR_00201	SPTI @ Hendrickson, west of Sequim Ave	Floating object	Tape-down	a.k.a. ID04; Sequim Prairie Main Canal (M-2); runoff input way upstream	City	Ambient, if possible		12
SPTI-Booth (optional)	CCWR_01055	Irrigation (Sequim Prairie) ditch @ Sequim Ave near Booth	Bucket method, from driveway culvert	Staff gage (existing downstream, read by Graysmarsh)	Irrigation; stormwater originates far to the south	City	Ambient, Storm if possible	Very few measurements	2
WHV	CCWR_01047	West Happy Valley runoff @ Sporseen; measure above irr. ditch x-ing	Floating object	Tape-down from downstream side of culvert over irrigation ditch	Drainage from western Happy Valley and Burnt Hill	County	Ambient, Storm	Drainage ditch overflows into irrigation ditch when culvert blocked or overwhelmed	12

APPENDIX B1

Summer Flows: Typical and Storm Flows from April to September, Sequim Area, 2015

Stormwater Stewardship Project

WA Dept. of Ecology Centennial Clean Water Grant
No. WQC-2015-SequPW-00008

SP-Evans
*(*stage in ft.)*

Gierin Creek

Gierin Hill

SP-Booth

SP-Hend

Indep-Priest

Dungeness River

Eureka-Domino's

SP-Grant
*(*stage in feet)*

Bell 1.5
*(*stage in ft.)*

Bell 1.4a
*(*stage in ft.)*

Bell 0.2

Bell Creek

Bell 1.8a

HID-E-Wash
*(*stage in ft.)*

Road-Hammond-Brown

HID-West-WSB

Road-Brownfield

Bell 2.8

Eureka-Silb

Road-Silb

Road-Reservoir-Spring

Road-Reservoir-ditch

Road-Miller
*(*stage in ft.)*

SR 101

Road-WSB
*(*stage in ft.)*

Road-Simdars
*(*stage in ft.)*

Johnson Creek

Johnson 0.0

Eureka-River

HID-S-7th

Bell 3.8a

Bell Hill

HID-East-HV
*(*stage in ft.)*

HID-H1-lateral

WHV

HID-main-Sporseen

HID-main-at H1

Sources: USGS, ESRI, TANA, AND

Bell 2.8
Site name (number indicates River Mile)

SUMMER FLOWS—TYPICAL (cubic feet per second *OR* **water level in feet)

TYPE	No Flow	0-3 cfs	3-10 cfs	10-20 cfs
Stream/spring				
Irrigation ditch				
Roadside ditch				

SUMMER FLOWS—STORM

None
+0-1 cfs
+1-2 cfs
? Not enough storm data

 # Observations

- n >= 12
- 6 < n < 11
- 1 < n < 5

APPENDIX B2

Winter Flows: Typical and Storm Flows from October to March, Sequim Area, 2015

Stormwater Stewardship Project

WA Dept. of Ecology Centennial Clean Water Grant
No. WQC-2015-SequPW-00008

SP-Evans
*(*stage in ft.)*

Gierin Creek

Gierin Hill

SP-Booth

SP-Hend

Indep-Priest

Eureka-Domino's

SP-Grant

Bell 1.5
*(*stage in ft.)*

Bell 1.4a
*(*stage in ft.)*

Bell 0.2

Bell Creek

Bell 1.8a

HID-E-Wash
*(*stage in ft.)*

Road-Hammond-Brown

HID-West-WSB

Road-Brownfield

Bell 2.8

Eureka-Silb

Road-Silb

Road-Reservoir-Spring

Road-Reservoir-ditch

Road-Miller

SR 101

Road-WSB
*(*stage in ft.)*

Road-Simdars
*(*stage in ft.)*

Johnson 0.0

Johnson Creek

Eureka-River

HID-S-7th

Bell 3.8a

Bell Hill

HID-East-HV
*(*stage in ft.)*

HID-H1-lateral

WHV

HID-main-Sporseen

HID-main-at H1

Sources: USGS, ESRI, TANA, AND

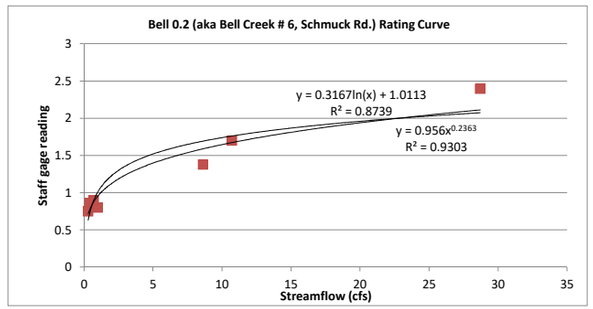
Bell 2.8 Site name (number indicates River Mile)	**WINTER FLOWS—TYPICAL** (cubic feet per second *OR* *water level in feet)				**WINTER FLOWS—STORM**	**# Observations**
	TYPE	**No Flow**	**0-1or2 cfs**	**1-5 cfs**	**5-10 cfs**	None	n >= 12
	Stream/spring					+0-1 cfs	6 < n < 11
	Irrigation ditch					+1-5 cfs	1 < n < 5
	Roadside ditch					+5-10+ cfs	? Not enough storm data

APPENDIX C: DATA ANALYSIS

Site Name: Bell 0.2

Date	Flow (cfs)	Stage	Log	Logest	Power
12/12/2014	10.7	1.7	8.80	7.37	11.43
2/6/2015	8.6	1.38	3.20	3.05	4.73
3/15/2015	28.7	2.4	80.23	50.86	49.17
5/27/2015	0.4	0.86	0.62	0.73	0.64
6/26/2015	1	0.8	0.51	0.62	0.47
7/22/2015	0.3	0.75	0.44	0.54	0.36
8/29/2015	0.7	0.9	0.70	0.81	0.77

3/15/15 since stage was rising during the flow measurement; those two stage readings averaged to 2.40.

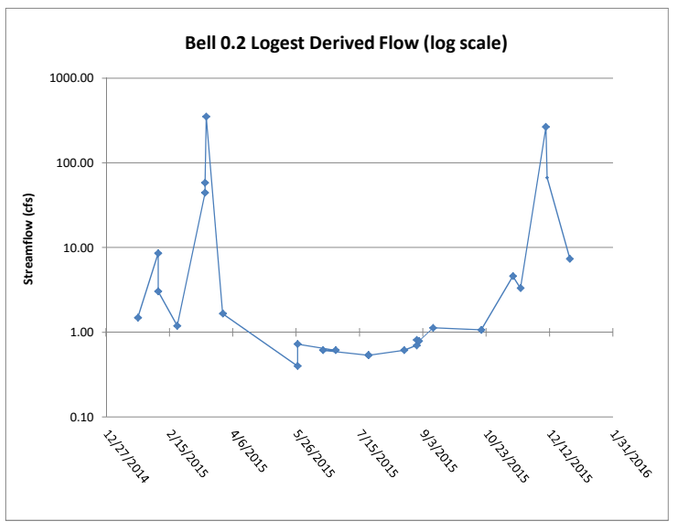


Curve	
Formula:	y = b*m^x
b =	15.78779
m =	0.06767

15.7878 0.0676706

Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment		
1/21/2015	08:50		1.12		STAGE-SG		ft	
2/6/2015	13:29	8.6	8.6		SWFMC	Storms were through. Nerver rained and	cfs	
2/6/2015	13:29		1.38		STAGE-SG	Storms were through. Nerver rained and	ft	0.3167
2/6/2015	14:00		1.38		STAGE-SG	Storms were through. Nerver rained and	ft	1.0113
2/21/2015	11:20		1.04		STAGE-SG		ft	
3/15/2015	17:00	28.7	28.7		SWFMC	storm-related sample	cfs	
3/15/2015	17:00		2.35		STAGE-SG	storm-related sample	ft	
3/15/2015	17:30		2.45		STAGE-SG	storm-related sample	ft	
3/16/2015	08:40		3.1		STAGE-SG	storm-related sample	ft	
3/29/2015	09:10		1.16		STAGE-SG		ft	
5/27/2015	09:05	0.4	0.4		SWFMC		cfs	
5/27/2015	09:05		0.86		STAGE-SG		ft	
5/27/2015	09:55		0.86		STAGE-SG		ft	
6/26/2015	08:40	1	1		SWFMC		cfs	
6/26/2015	08:40		0.8		STAGE-SG		ft	
6/26/2015	09:32		0.8		STAGE-SG		ft	
7/22/2015	08:01	0.3	0.3		SWFMC		cfs	
7/22/2015	08:01		0.75		STAGE-SG		ft	
7/22/2015	08:16		0.75		STAGE-SG		ft	
8/19/2015	08:20		0.8		STAGE-SG		ft	
8/29/2015	08:08	0.7	0.7		SWFMC	storm-related sample	cfs	
8/29/2015	08:08		0.9		STAGE-SG	storm-related sample	ft	
8/29/2015	08:29		0.9		STAGE-SG	storm-related sample	ft	
8/31/2015	14:43		0.89		STAGE-SG	storm-related sample	ft	
9/11/2015	09:05		1.02		STAGE-SG		ft	
10/19/2015	13:00		1		STAGE-SG		ft	
11/13/2015	11:40		1.53		STAGE-SG	storm-related sample	ft	
11/19/2015	09:10		1.41		STAGE-SG		ft	
12/9/2015	12:13		3		STAGE-SG	storm-related sample	ft	
12/10/2015	11:25		2.5		STAGE-SG	-Raining - - - storm-related sample	ft	
12/28/2015	11:30		1.7		STAGE-SG		ft	

Date reentered	Date	Time	Flow rate cfs	Stage height	Derived flow from Log curve	Derived Flow using Excel's Logest function	Derived flow from Power curve
1/21/2015	1/21/2015	08:50		1.12	1.41	1.49	1.95
2/6/2015	2/6/2015	13:29	8.6		8.60	8.60	8.60
2/6/2015	2/6/2015	14:00		1.38	3.20	3.05	4.73
2/21/2015	2/21/2015	11:20		1.04	1.09	1.19	1.43
3/15/2015	3/15/2015	17:00	28.7	2.35	68.51	44.31	44.98
3/15/2015	3/15/2015	17:30		2.45	93.95	58.38	53.66
3/16/2015	3/16/2015	08:40		3.10	731.58	350.91	145.24
3/29/2015	3/29/2015	09:10		1.16	1.60	1.66	2.27
5/27/2015	5/27/2015	09:05	0.4		0.40	0.40	0.40
5/27/2015	5/27/2015	09:55		0.86	0.62	0.73	0.64
6/26/2015	6/26/2015	08:40	1		0.51	0.62	0.47
6/16/2015	6/26/2015	09:32		0.80	0.51	0.62	0.47
7/22/2015	7/22/2015	08:01	0.3		0.44	0.54	0.36
7/22/2015	7/22/2015	08:16		0.75	0.44	0.54	0.36
8/19/2015	8/19/2015	08:20		0.80	0.51	0.62	0.47
8/29/2015	8/29/2015	08:08	0.7		0.70	0.70	0.70
8/29/2015	8/29/2015	08:29		0.90	0.70	0.81	0.77
8/31/2015	8/31/2015	14:43		0.89	0.68	0.79	0.74
9/11/2015	9/11/2015	09:05		1.02	1.03	1.13	1.32
10/19/2015	10/19/2015	13:00		1.00	0.96	1.07	1.21
11/13/2015	11/13/2015	11:40		1.53	5.14	4.61	7.32
11/19/2015	11/19/2015	09:10		1.41	3.52	3.31	5.18
12/9/2015	12/9/2015	12:13		3.00	533.49	266.30	126.43
12/10/2015	12/10/2015	11:25		2.50	110.02	67.02	58.44
12/28/2015	12/28/2015	11:30		1.70	8.80	7.37	11.43



APPENDIX C: DATA ANALYSIS

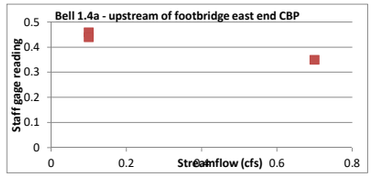
Site Name: Bell 1.4a

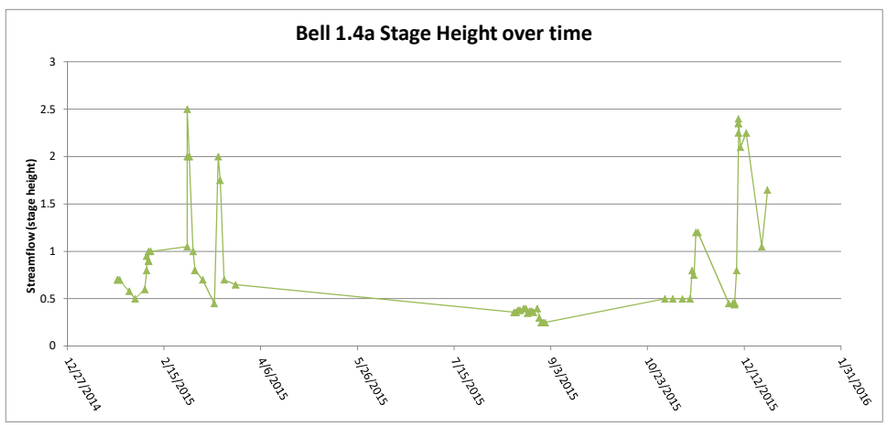
Date	Flow (cfs)	Stage
12/16/2014	0.7	0.35
12/7/2015	0.1	0.46
12/7/2015	0.1	0.44

Flow calculated with one data point, 0.1 cfs flow for a stage height of 0.45

Flow data not used, stage height charted

Note: Does not make sense that stage reading would increase but flow decrease

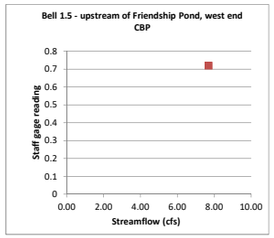


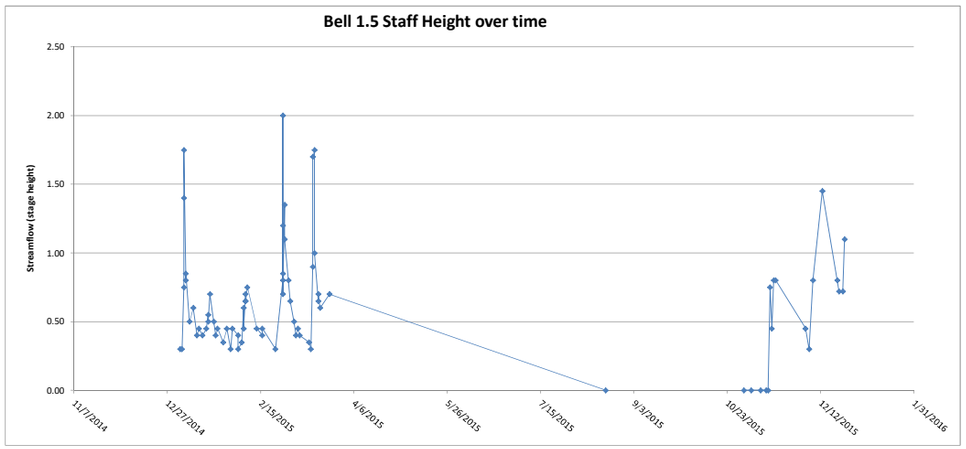


	Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment		Flow, calculated cfs, not used
1/22/2015	1/22/2015	15:25		0.7		STAGE-SG	- - -	ft	0.16
1/22/2015	1/22/2015	15:25		0.7		STAGE-SG	- - -	ft	0.16
1/22/2015	1/22/2015	16:00		0.7		STAGE-SG	- - -	ft	0.16
1/23/2015	1/23/2015	07:55		0.7		STAGE-SG	- - -	ft	0.16
1/28/2015	1/28/2015	08:20		0.58		STAGE-SG	- - -	ft	0.13
1/31/2015	1/31/2015	07:52		0.5		STAGE-SG	- - -	ft	0.11
2/5/2015	2/5/2015	17:48		0.6		STAGE-SG	- - -	ft	0.13
2/6/2015	2/6/2015	07:26		0.8		STAGE-SG	- - -	ft	0.18
2/6/2015	2/6/2015	13:50		0.95		STAGE-SG	- - -	ft	0.21
2/7/2015	2/7/2015	07:16		0.9		STAGE-SG	- - -	ft	0.20
2/7/2015	2/7/2015	13:06		0.9		STAGE-SG	- - -	ft	0.20
2/7/2015	2/7/2015	18:01		1		STAGE-SG	- - -	ft	0.22
2/8/2015	2/8/2015	07:18		1		STAGE-SG	- - -	ft	0.22
2/27/2015	2/27/2015	07:44		1.05		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	0.23
2/27/2015	2/27/2015	13:11		2		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	0.44
2/27/2015	2/27/2015	16:07		2.5		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	0.56
2/28/2015	2/28/2015	07:20		2		STAGE-SG	- - -	ft	0.44
3/2/2015	3/2/2015	16:25		1		STAGE-SG	- - -	ft	0.22
3/3/2015	3/3/2015	07:58		0.8		STAGE-SG	- - -	ft	0.18
3/3/2015	3/3/2015	18:26		0.8		STAGE-SG	- - -	ft	0.18
3/7/2015	3/7/2015	09:04		0.7		STAGE-SG	- - -	ft	0.16
3/13/2015	3/13/2015	08:50		0.45		STAGE-SG	- - -	ft	0.10
3/15/2015	3/15/2015	19:25		2		STAGE-SG	- - - - storm-related sample	ft	0.44
3/16/2015	3/16/2015	08:36		1.75		STAGE-SG	- - - - storm-related sample	ft	0.39
3/18/2015	3/18/2015	08:58		0.7		STAGE-SG	- - -	ft	0.16
3/24/2015	3/24/2015	08:39		0.65		STAGE-SG	- - -	ft	0.14
8/15/2015	8/15/2015	07:42		0.36		STAGE-SG	- - -	ft	0.08
8/16/2015	8/16/2015	07:52		0.36		STAGE-SG	- - -	ft	0.08
8/17/2015	8/17/2015	18:21		0.38		STAGE-SG	- - -	ft	0.08
8/18/2015	8/18/2015	09:36		0.38		STAGE-SG	- - -	ft	0.08
8/20/2015	8/20/2015	10:18		0.4		STAGE-SG	- - -	ft	0.09
8/21/2015	8/21/2015	08:35		0.4		STAGE-SG	- - -	ft	0.09
8/22/2015	8/22/2015	08:03		0.35		STAGE-SG	- - -	ft	0.08
8/23/2015	8/23/2015	06:51		0.37		STAGE-SG	- - -	ft	0.08
8/24/2015	8/24/2015	08:58		0.37		STAGE-SG	- - -	ft	0.08
8/25/2015	8/25/2015	07:33		0.36		STAGE-SG	- - -	ft	0.08
8/27/2015	8/27/2015	13:30		0.4		STAGE-SG	- - - - storm-related sample	ft	0.09
8/28/2015	8/28/2015	07:51		0.3		STAGE-SG	- - - - storm-related sample	ft	0.07
8/29/2015	8/29/2015	12:47		0.25		STAGE-SG	- - - - storm-related sample	ft	0.06
8/30/2015	8/30/2015	15:34		0.25		STAGE-SG	- - - - storm-related sample	ft	0.06
8/31/2015	8/31/2015	18:49		0.25		STAGE-SG	- - - - storm-related sample	ft	0.06
11/1/2015	11/1/2015	09:20		0.5		STAGE-SG	- - -	ft	0.11
11/5/2015	11/5/2015	07:26		0.5		STAGE-SG	- - -	ft	0.11
11/10/2015	11/10/2015	06:37		0.5		STAGE-SG	- - -	ft	0.11
11/14/2015	11/14/2015	07:39		0.5		STAGE-SG	- - -	ft	0.11
11/15/2015	11/15/2015	08:18		0.8		STAGE-SG	- - -	ft	0.18
11/16/2015	11/16/2015	13:55		0.75		STAGE-SG	- - -	ft	0.17
11/17/2015	11/17/2015	19:00		1.2		STAGE-SG	- - -	ft	0.27
11/18/2015	11/18/2015	07:52		1.2		STAGE-SG	- - -	ft	0.27
12/4/2015	12/4/2015	08:13		0.45		STAGE-SG	- - -	ft	0.10
12/6/2015	12/6/2015	08:10		0.45		STAGE-SG	- - -	ft	0.10
12/7/2015	12/7/2015	10:00	0.1	0.45		SWFMC	- - -	cfs	0.10
12/7/2015	12/7/2015	10:00		0.46		STAGE-SG	- - -	ft	0.10
12/7/2015	12/7/2015	10:25		0.44		STAGE-SG	- - -	ft	0.10
12/8/2015	12/8/2015	17:56		0.8		STAGE-SG	- - -	ft	0.18
12/9/2015	12/9/2015	07:21		2.25		STAGE-SG	- - -	ft	0.50
12/9/2015	12/9/2015	08:46		2.35		STAGE-SG	- - -	ft	0.52
12/9/2015	12/9/2015	09:12		2.35		STAGE-SG	- - -	ft	0.52
12/9/2015	12/9/2015	14:48		2.4		STAGE-SG	- - -	ft	0.53
12/10/2015	12/10/2015	08:09		2.1		STAGE-SG	- - -	ft	0.47
12/13/2015	12/13/2015	07:49		2.25		STAGE-SG	- - -	ft	0.50
12/21/2015	12/21/2015	15:55		1.05		STAGE-SG	- - -	ft	0.23
12/24/2015	12/24/2015	07:21		1.65		STAGE-SG	- - -	ft	0.37

Date	Flow (cfs)	Stage
12/22/2015	**7.70**	**0.72**

Only one Flow measurement available; graph stage readings only.





For chart

	Date	Stage height
1/3/2015	1/3/2015	**0.30**
1/4/2015	1/4/2015	**0.30**
1/5/2015	1/5/2015	**0.75**
1/5/2015	1/5/2015	**1.40**
1/5/2015	1/5/2015	**1.75**
1/6/2015	1/6/2015	**0.80**
1/6/2015	1/6/2015	**0.85**
1/8/2015	1/8/2015	**0.50**
########	1/10/2015	**0.60**
########	1/12/2015	**0.40**
########	1/13/2015	**0.45**
########	1/15/2015	**0.40**
########	1/17/2015	**0.45**
########	1/18/2015	**0.55**
########	1/18/2015	**0.50**
########	1/19/2015	**0.70**
########	1/21/2015	**0.50**
########	1/22/2015	**0.40**
########	1/23/2015	**0.45**
########	1/26/2015	**0.35**
########	1/28/2015	**0.45**
########	1/30/2015	**0.30**
########	1/31/2015	**0.45**
2/3/2015	2/3/2015	**0.40**
2/3/2015	2/3/2015	**0.30**
2/5/2015	2/5/2015	**0.35**
2/6/2015	2/6/2015	**0.60**
2/6/2015	2/6/2015	**0.45**
2/7/2015	2/7/2015	**0.70**
2/7/2015	2/7/2015	**0.65**
2/7/2015	2/7/2015	**0.65**
2/7/2015	2/7/2015	**0.65**
2/8/2015	2/8/2015	**0.75**
########	2/13/2015	**0.45**
########	2/16/2015	**0.40**
########	2/16/2015	**0.45**
########	2/23/2015	**0.30**
########	2/27/2015	**0.80**
########	2/27/2015	**0.85**
########	2/27/2015	**1.20**
########	2/27/2015	**2.00**
########	2/27/2015	**0.70**
########	2/28/2015	**1.35**
########	2/28/2015	**1.10**
3/2/2015	3/2/2015	**0.80**
3/3/2015	3/3/2015	**0.65**
3/5/2015	3/5/2015	**0.50**
3/6/2015	3/6/2015	**0.40**
3/7/2015	3/7/2015	**0.45**
3/8/2015	3/8/2015	**0.40**
########	3/13/2015	**0.35**
########	3/14/2015	**0.30**
########	3/15/2015	**0.90**
########	3/15/2015	**1.70**
########	3/16/2015	**1.75**
########	3/16/2015	**1.00**
########	3/18/2015	**0.65**
########	3/18/2015	**0.70**
########	3/19/2015	**0.60**
########	3/24/2015	**0.70**
########	8/19/2015	**0.00**
	Sept	**0.00**
	Oct	**0.00**
########	11/1/2015	**0.00**
########	11/5/2015	**0.00**
########	11/10/2015	**0.00**
########	11/13/2015	**0.00**
########	11/14/2015	**0.00**
########	11/15/2015	**0.75**
########	11/16/2015	**0.45**
########	11/17/2015	**0.80**
########	11/18/2015	**0.80**
########	12/4/2015	**0.45**
########	12/6/2015	**0.30**
########	12/8/2015	**0.80**
########	12/13/2015	**1.45**
########	12/21/2015	**0.80**
########	12/22/2015	**0.72**
########	12/22/2015	**0.72**
########	12/24/2015	**1.10**

All data

	Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment	
1/3/2015	1/3/2015	10:15		**0.30**		STAGE-SG	- - Rain. 42 degrees.Clear. -	**ft**
1/4/2015	1/4/2015	07:36		**0.30**		STAGE-SG	- - -	**ft**
1/5/2015	1/5/2015	07:19		**0.75**		STAGE-SG	- - -	**ft**
1/5/2015	1/5/2015	12:10		**1.40**		STAGE-SG	- - heavy rain 48 degrees -	**ft**
1/5/2015	1/5/2015	14:32		**1.75**		STAGE-SG	- - -	**ft**
1/6/2015	1/6/2015	10:15		**0.80**		STAGE-SG	- - Lighjt rain. 49 degrees. -	**ft**
1/6/2015	1/6/2015	17:35		**0.85**		STAGE-SG	- - -	**ft**
1/8/2015	1/8/2015	08:30		**0.50**		STAGE-SG	- - Clear. 45 degrees. -	**ft**
########	1/10/2015	10:00		**0.60**		STAGE-SG	- - Misty-40 degrees. -	**ft**
########	1/12/2015	10:15		**0.40**		STAGE-SG	- - Clear. 44 degrees -	**ft**
########	1/13/2015	08:13		**0.45**		STAGE-SG	- - -	**ft**
########	1/15/2015	12:00		**0.40**		STAGE-SG	- - Clear. 42 degrees. -	**ft**
########	1/17/2015	07:55		**0.45**		STAGE-SG	- - -	**ft**
########	1/18/2015	07:20		**0.55**		STAGE-SG	- - -	**ft**
########	1/18/2015	10:00		**0.50**		STAGE-SG	- - Rainy. 48 degrees. -	**ft**
########	1/19/2015	07:52		**0.70**		STAGE-SG	- - -	**ft**
########	1/21/2015	17:24		**0.50**		STAGE-SG	- - -	**ft**
########	1/22/2015	10:15		**0.40**		STAGE-SG	- - Overcast. 46 degrees. -	**ft**
########	1/23/2015	07:55		**0.45**		STAGE-SG	- - -	**ft**
########	1/26/2015	10:00		**0.35**		STAGE-SG	- - Clear. 48 degrees. -	**ft**
########	1/28/2015	08:20		**0.45**		STAGE-SG	- - -	**ft**
########	1/30/2015	10:15		**0.30**		STAGE-SG	- - Clear. 45 degrees. -	**ft**
########	1/31/2015	07:52		**0.45**		STAGE-SG	- - -	**ft**
2/3/2015	2/3/2015	07:55		**0.40**		STAGE-SG	- - -	**ft**
2/3/2015	2/3/2015	11:15		**0.30**		STAGE-SG	- - -	**ft**
2/5/2015	2/5/2015	17:48		**0.35**		STAGE-SG	- - -	**ft**
2/6/2015	2/6/2015	07:26		**0.60**		STAGE-SG	- - -	**ft**
2/6/2015	2/6/2015	10:15		**0.45**		STAGE-SG	- - -	**ft**
2/7/2015	2/7/2015	07:16		**0.70**		STAGE-SG	- - -	**ft**
2/7/2015	2/7/2015	12:00		**0.65**		STAGE-SG	- - -	**ft**
2/7/2015	2/7/2015	13:06		**0.65**		STAGE-SG	- - -	**ft**
2/7/2015	2/7/2015	18:01		**0.65**		STAGE-SG	- - -	**ft**
2/8/2015	2/8/2015	07:18		**0.75**		STAGE-SG	- - -	**ft**
########	2/13/2015	10:30		**0.45**		STAGE-SG	- - -	**ft**
########	2/16/2015	09:30		**0.40**		STAGE-SG	- - -	**ft**
########	2/16/2015	16:10		**0.45**		STAGE-SG	- - -	**ft**
########	2/23/2015	09:15		**0.30**		STAGE-SG	- - -	**ft**
########	2/27/2015	07:44		**0.80**		STAGE-SG	Steady rain and lightning - - - - storm-related sample	**ft**
########	2/27/2015	09:30		**0.85**		STAGE-SG	Steady rain and lightning - - - - storm-related sample	**ft**
########	2/27/2015	13:11		**1.20**		STAGE-SG	Steady rain and lightning - - - - storm-related sample	**ft**
########	2/27/2015	16:07		**2.00**		STAGE-SG	Steady rain and lightning - - - - storm-related sample	**ft**
########	2/27/2015	16:20		**0.70**		STAGE-SG	Steady rain and lightning - - - - storm-related sample	**ft**
########	2/28/2015	07:20		**1.35**		STAGE-SG	- - -	**ft**
########	2/28/2015	13:40		**1.10**		STAGE-SG	- Small amount of rain last 12 hours - Small amount of rain in la	**ft**
3/2/2015	3/2/2015	16:02		**0.80**		STAGE-SG	- - -	**ft**
3/3/2015	3/3/2015	18:26		**0.65**		STAGE-SG	- - -	**ft**
3/5/2015	3/5/2015	09:30		**0.50**		STAGE-SG	- - Clear sunny day. -	**ft**
3/6/2015	3/6/2015	09:15		**0.40**		STAGE-SG	- - Clear sunny day. -	**ft**
3/7/2015	3/7/2015	09:04		**0.45**		STAGE-SG	- - -	**ft**
3/8/2015	3/8/2015	09:30		**0.40**		STAGE-SG	- - Clear sunny day. -	**ft**
########	3/13/2015	08:50		**0.35**		STAGE-SG	- - -	**ft**
########	3/14/2015	10:15		**0.30**		STAGE-SG	- - Clear sunny day. -	**ft**
########	3/15/2015	11:10		**0.90**		STAGE-SG	- - Rain all day. -	**ft**
########	3/15/2015	19:25		**1.70**		STAGE-SG	- - - - storm-related sample	**ft**
########	3/16/2015	08:36		**1.75**		STAGE-SG	- - - - storm-related sample	**ft**
########	3/16/2015	11:10		**1.00**		STAGE-SG	- - Lite early morning rain -	**ft**
########	3/18/2015	08:58		**0.65**		STAGE-SG	- - -	**ft**
########	3/18/2015	10:15		**0.70**		STAGE-SG	- - No rain. -	**ft**
########	3/19/2015	11:45		**0.60**		STAGE-SG	- - -	**ft**
########	3/24/2015	08:39		**0.70**		STAGE-SG	- - -	**ft**
########	8/19/2015	08:31	**0.00**		FD	SWFMFLOAT	- - -	**cfs**
	Sept		**0.00**					
	Oct		**0.00**					
########	11/1/2015	09:20	**0.00**		FD	SWFMFLOAT	- - -	**cfs**
########	11/5/2015	07:26	**0.00**		FD	SWFMFLOAT	- - -	**cfs**
########	11/10/2015	06:37	**0.00**		FD	SWFMFLOAT	- - -	**cfs**
########	11/13/2015	11:53	**0.00**		FD	SWFMFLOAT	- - - - storm-related sample	**cfs**
########	11/14/2015	07:39	**0.00**		FD	SWFMFLOAT	- - -	**cfs**
########	11/15/2015	08:18		**0.75**		STAGE-SG	- - -	**ft**
########	11/16/2015	13:55		**0.45**		STAGE-SG	- - -	**ft**
########	11/17/2015	19:00		**0.80**		STAGE-SG	- - -	**ft**
########	11/18/2015	07:52		**0.80**		STAGE-SG	- - -	**ft**
########	12/4/2015	08:13		**0.45**		STAGE-SG	- - -	**ft**
########	12/6/2015	08:10		**0.30**		STAGE-SG	- - -	**ft**
########	12/8/2015	17:56		**0.80**		STAGE-SG	- - -	**ft**
########	12/13/2015	07:21		**1.45**		STAGE-SG	- - -	**ft**
########	12/21/2015	15:55		**0.80**		STAGE-SG	- - -	**ft**
########	12/22/2015	10:27	**7.70**			SWFMC	- Dry, but lots of rain yesterday - -	**cfs**
########	12/22/2015	10:27		**0.72**		STAGE-SG	- Dry, but lots of rain yesterday - -	**ft**
########	12/22/2015	10:33		**0.72**		STAGE-SG	- Dry, but lots of rain yesterday - -	**ft**

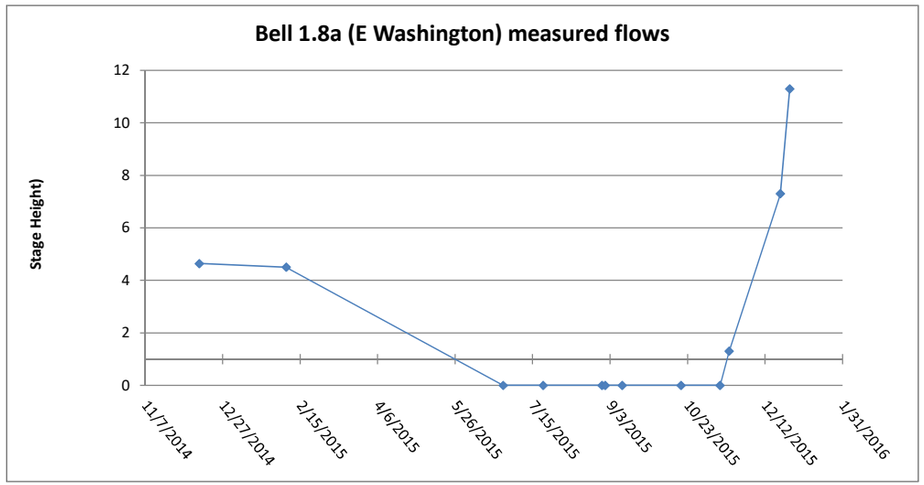
APPENDIX C: DATA ANALYSIS

Site Name: Bell 1.8a

Date	Flow (cfs)	Stage
12/12/2014	4.64	*(exact location of stage readings not always known)*
2/6/2015	4.5	
6/26/2015	0	
7/22/2015	0	
8/29/2015	0	
8/31/2015	0	
9/11/2015	0	
10/19/2015	0	
11/13/2015	0	
11/19/2015	1.3	
12/22/2015	7.3	
12/28/2015	11.3	

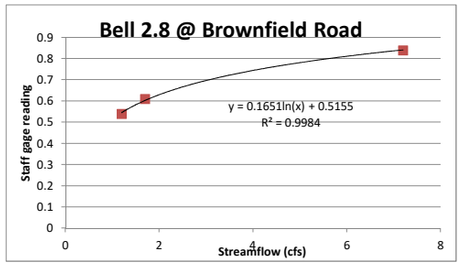
This site is very problematic due to confusion
by field teams which culvert to measure top-down.
And which place to measure flow.

Results probably not usable without careful
study of "batch comments" to determine which stage
readings and flow meas. are comparable to others.



Date	Time	Flow rate cfs	Stage height (ft)	Data Qualifier	Result Method	Field comment	EXACT LOCATION
12/12/2014	11:45	4.64			Flow Meter	Training run but data valid	Between E Wash and driveway
12/12/2014	11:45	7.9			Floating	Training run but data valid	
1/21/2015	09:10		-1.7		STAGE-SG	- - -	
2/6/2015	12:38	4.5			SWFMC	Storms were through. Nerver rained and it was sunny. - -	Between E Wash and driveway
2/21/2015	11:10		-1.8		STAGE-SG	- - -	
3/16/2015	10:00		-0.5		STAGE-SG	- - - - storm-related sample	
3/29/2015	09:25		-1.68		STAGE-SG	- - -	
6/26/2015	08:30	0		FD	SWFMFLOAT	- - -	
7/22/2015	07:35	0		FD	SWFMFLOAT	- - -	
8/29/2015	08:51	0		FD	SWFMFLOAT	- - - - storm-related sample	
8/31/2015	14:31	0		FD	SWFMFLOAT	- - - - storm-related sample	
9/11/2015	08:58	0		FD	SWFMFLOAT	- - -	
10/19/2015	12:45	0		FD	SWFMFLOAT	- - -	
11/13/2015	11:52	0		FD	SWFMFLOAT	- - - - storm-related sample	
11/19/2015	09:20	1.3			SWFMC	- - -	Upstream of driveway culvert (probably--meaning it wouldn't be catching all the flow)
11/19/2015	09:20		-2.33		STAGE-SG	- - -	
11/19/2015	09:22		-1.19		STAGE-SG	- - -	
12/9/2015	11:25		-1.4		STAGE-SG	- - - - storm-related sample	
12/10/2015	11:36		-1.78		STAGE-SG	- Raining - - - storm-related sample	
12/22/2015	09:33		-2.98		STAGE-SG	- Dry, but lots of rain yesterday - -	
12/22/2015	09:47	7.3		PM, BP	SWFMC	- Dry, but lots of rain yesterday - -	Between E Wash and driveway
12/28/2015	10:00	11.3		JB, LB	SWFMC	- - -	Between E Wash and driveway, probably
12/28/2015	10:45		-3.1		STAGE-SG	- - -	
12/28/2015	10:50		-1.9		STAGE-SG	- - -	
12/28/2015	10:50		-1.5		STAGE-SG	- - -	
12/28/2015	10:50		-3.1		STAGE-SG	- - -	

Date	Flow (cfs)	Stage	Log equation From Chart	Power equation
11/13/2015	1.7	0.61	1.77	1.77
11/25/2015	1.2	0.54	1.16	1.16
12/22/2015	7.2	0.84	7.14	7.13



Curve	
Formula: y = b*m^x	
b =	423.29156
m =	0.04433

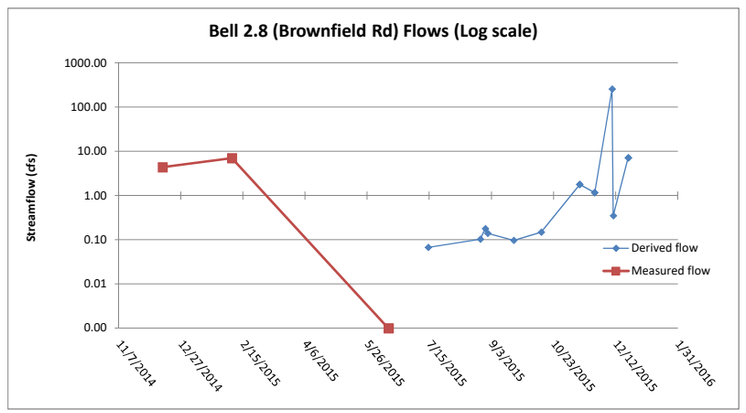
423.2916 **0.044325123**

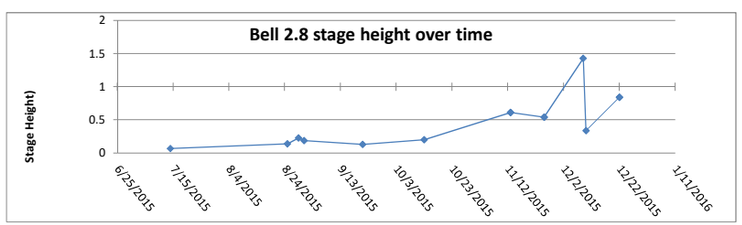
0.1651
0.5155

For charting

	Date	Time	Flow rate cfs	Stage height*	Data Qualifier	Result Method	Field comment		**Not used** Using log equation from graph	**Not used** Using Power equation
12/12/2014			4.39							
2/6/2015			7							
6/12/2015			0.001							
7/14/2015	7/14/2015	11:10		0.07		STAGE-SG	- - -	ft	0.07	0.07
8/25/2015	8/25/2015	12:05		0.14		STAGE-SG	- No rain within 12 hours. - -	ft	0.10	0.10
8/29/2015	8/29/2015	09:15		0.23		STAGE-SG	- - - - storm-related sample	ft	0.18	0.18
8/31/2015	8/31/2015	14:06		0.19		STAGE-SG	- - - - storm-related sample	ft	0.14	0.14
9/21/2015	9/21/2015	14:15		0.13		STAGE-SG	- - -	ft	0.10	0.10
10/13/2015	10/13/2015	10:28		0.2		STAGE-SG	- - -	ft	0.15	0.15
11/13/2015	11/13/2015	12:10	1.7	0.61		SWFMC	- - - - storm-related sample	cfs	1.77	1.77
11/13/2015	11/13/2015	12:10		0.61		STAGE-SG	- - - - storm-related sample	ft	1.77	1.77
11/25/2015	11/25/2015	13:20	1.2	0.54		SWFMC	- - -	cfs	1.16	1.16
11/25/2015	11/25/2015	13:20		0.54		STAGE-SG	- - -	ft	1.16	1.16
12/9/2015	12/9/2015	09:12		1.43		STAGE-SG	- - - - storm-related sample	ft	254.44	252.78
12/10/2015	12/10/2015	10:44		0.34		STAGE-SG	- Raining - - - storm-related sample	ft	0.35	0.35
12/22/2015	12/22/2015	12:00	7.2	0.84		SWFMC	- Dry, but lots of rain yesterday - -	cfs	7.14	7.13
12/22/2015	12/22/2015	12:27		0.84		STAGE-SG	- Dry, but lots of rain yesterday - -	ft	7.14	7.13

*Logs indicate the bottom of the strea is 4.61, these readings are adjusted to a stage height from a top down measuremen
Later measurement confirms that max height from channel bottom to MP is 4.6-4.7 ft.





All data for site

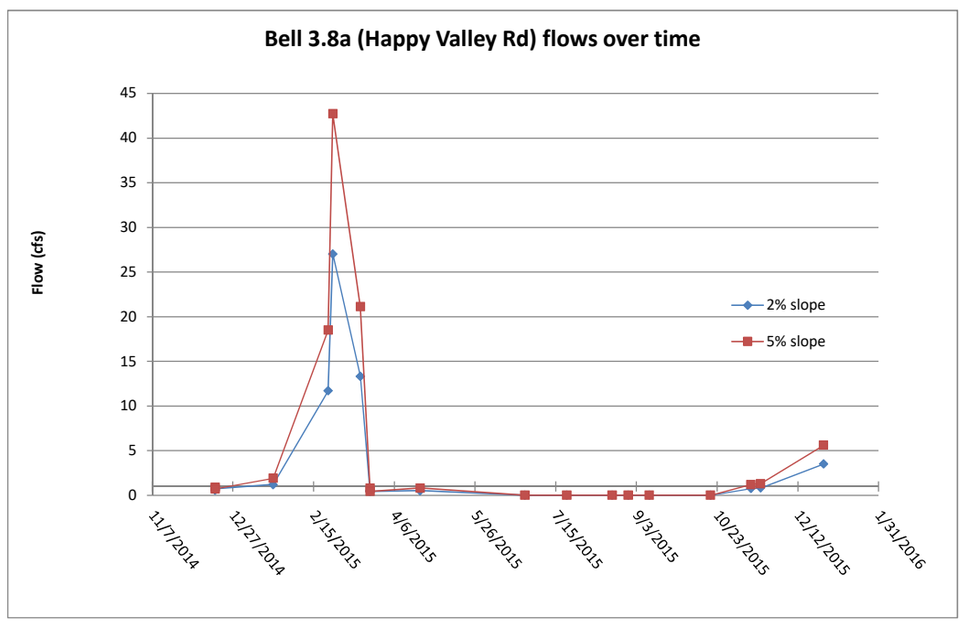
Date	Time	Flow rate cfm	Stage height	Data Qualifier	Result Method	Field comment			
12/12/2014	14:45	4.39			Flow meter	Training run but data still valid			
2/6/2015	12:00	7			SWFMC	Storms were through. Nerver rained and	cfs		
5/21/2015	10:12		-5.18		STAGE-SG	- - -	ft	← Data point deleted from graph, not measured in the same place as the rest of the data	0.57
6/12/2015	10:55	0	0	FD	SWFMFLOAT	- - -	cfs		
7/14/2015	11:10		-4.54		STAGE-SG	- - -	ft		0.07
8/25/2015	12:05		-4.47		STAGE-SG	- No rain within 12 hours. - -	ft	← Records at this date may indicate a bottom of the stream bed, value may be 4.61	0.14
8/29/2015	09:15		-4.38		STAGE-SG	- - - - storm-related sample	ft		0.23
8/31/2015	14:06		-4.42		STAGE-SG	- - - - storm-related sample	ft		0.19
9/21/2015	14:15		-4.48		STAGE-SG	- - -	ft		0.13
10/13/2015	10:28		-4.41		STAGE-SG	- - -	ft		0.2
11/13/2015	12:10	1.7	-4		SWFMC	- - - - storm-related sample	cfs		0.61
11/13/2015	12:10		-4		STAGE-SG	- - - - storm-related sample	ft		0.61
11/25/2015	13:20	1.2	-4.07		SWFMC	- - -	cfs		0.54
11/25/2015	13:20		-4.07		STAGE-SG	- - -	ft		0.54
12/9/2015	09:12		-3.18		STAGE-SG	- - - - storm-related sample	ft		1.43
12/10/2015	10:44		-4.27		STAGE-SG	- Raining - - - storm-related sample	ft		0.34
12/22/2015	12:00	7.2	-3.77		SWFMC	- Dry, but lots of rain yesterday - -	cfs		0.84
12/22/2015	12:27		-3.77		STAGE-SG	- Dry, but lots of rain yesterday - -	ft		0.84
12/22/2015	12:27		-4.62		STAGE-SG	- Dry, but lots of rain yesterday - -	ft	This reading from top/middle of culvert instead of usual/marked spot--ignore.	

Date	Flow (cfs)	Stage
3/22/2015	3.8	-3.8

Basically stage data only, which can be used with standard calculations to get flow for given (4' diameter) pipe.

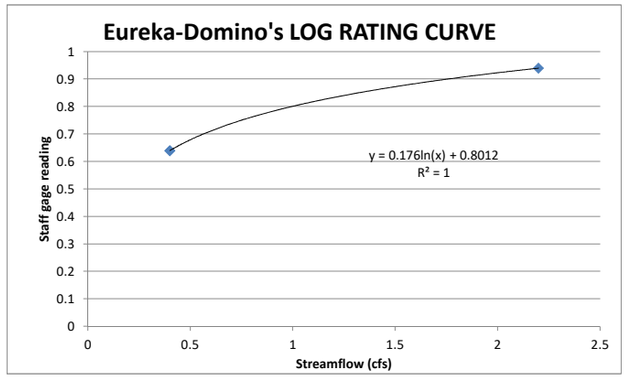
http://ponce.sdsu.edu/onlinechannel03.php
Below flows assume slope as given and Manning's roughness n = 0.025 for corrugated metal pipe

	Date	Time	Velocity - single (ft/sec)	Stage (ft)	Water height assuming 4' culvert	Flow from Manning's equation (cfs) 2% slope	Flow from Manning's equation (cfs) 5% slope	Result Method		
12/16/2014	12/16/2014	11:30			0.21	0.56	0.89	STAGE-SG	Training run but valid data	
12/16/2014	12/16/2014	11:30	2.83			0.71	0.71	MIDSECTION		http://ponce.sdsu.edu/onlinechannel03.php
1/21/2015	1/21/2015	14:45		-3.7	0.3	1.2	1.9	STAGE-SG	- - -	
2/24/2015	2/24/2015	11:30		-3.1	0.9	11.7	18.5	STAGE-SG	- Dry - -	
2/27/2015		13:05		-2.63	1.38	27	42.7	STAGE-SG	Storm sample	Data record NOT in SK spreadsheet!
3/16/2015	3/16/2015	09:10		-3.04	0.96	13.3	21.1	STAGE-SG	- - - - storm-related sample	
3/22/2015	3/22/2015	11:20		-3.8	0.2	0.51	0.8	STAGE-SG	- - -	
3/22/2015	3/22/2015	11:20	1.8			0.42	0.42	MIDSECTION	- - -	Flow calc's from Q=VA, via online calculator
4/22/2015	4/22/2015	10:25		-3.8	0.2	0.51	0.8	STAGE-SG	- - -	
6/26/2015	6/26/2015	11:50	0	0	0	0	0	SWFMFLOAT	- - -	
7/22/2015	7/22/2015	11:15	0	0	0	0	0	SWFMFLOAT	- - -	
8/19/2015	8/19/2015	09:02	0	0	0	0	0	SWFMFLOAT	- - -	
8/29/2015	8/29/2015	10:35	0	0	0	0	0	SWFMFLOAT	- - - - storm-related sample	
9/11/2015	9/11/2015	10:12	0	0	0	0	0	SWFMFLOAT	- - -	
10/19/2015	10/19/2015	14:05	0	0	0	0	0	SWFMFLOAT	- - -	
11/13/2015	11/13/2015	13:30		-3.76	0.24	0.75	1.2	STAGE-SG	- - - - storm-related sample	
11/19/2015	11/19/2015	11:12		-3.75	0.25	0.82	1.3	STAGE-SG	- - -	
12/28/2015	12/28/2015	12:45		-3.5	0.5	3.5	5.6	STAGE-SG	- - -	



Date	Time	Flow (cfs)	Stage (ft)	Log equation From Chart	Power equation
6/12/2015	11:33	2.2	0.94	2.20	0.72
8/25/2015	12:21	0.4	0.64	0.40	0.67

Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment
12/16/2014	14:45	0.7			Floating	Training/pre-QAPP approval
1/8/2015	11:10		0.58		STAGE-SG	
1/21/2015	09:28		0.48		STAGE-SG	
2/21/2015	12:00		0.39		STAGE-SG	
2/27/2015	09:39		1.06		STAGE-SG	- storm-related sample
2/27/2015	14:02		0.8		STAGE-SG	- storm-related sample
3/29/2015	09:45		0.42		STAGE-SG	
4/14/2015	13:50		0.52		STAGE-SG	
5/21/2015	10:18		0.78		STAGE-SG	
6/12/2015	11:15		0.94		STAGE-SG	
6/12/2015	11:33	2.2	0.94		SWFMC	
7/14/2015	11:18		1.12		STAGE-SG	
8/25/2015	12:21	0.4	0.64		SWFMC	
8/25/2015	12:21		0.68		STAGE-SG	
8/25/2015	12:21		0.64		STAGE-SG	
8/25/2015	12:40		0.64		STAGE-SG	
8/29/2015	09:27		0.74		STAGE-SG	- storm-related sample
8/31/2015	15:20		0.56		STAGE-SG	- storm-related sample
9/21/2015	14:27		0.32		STAGE-SG	
10/13/2015	10:21		0.6		STAGE-SG	
11/13/2015	12:44	0		FD		- storm-related sample
11/25/2015	09:35		0.46		STAGE-SG	
11/25/2015	13:58		0.42		STAGE-SG	
12/9/2015	11:12		0.74		STAGE-SG	- storm-related sample
12/10/2015	10:22		1.08		STAGE-SG	- storm-related sample
12/22/2015	12:41		0.74		STAGE-SG	



0.176
0.8012

Disregard 0.68 - data sheet for wade across says 0.64 before and after

Date	Time	Flow (cfs)	Stage (ft)	Using log equation	
12/16/2014	14:45	0.7	0.73	0.7	stage taken from curve
1/8/2015	11:10		0.58	0.285	
1/21/2015	09:28		0.48	0.16	
2/21/2015	12:00		0.39	0.10	
2/27/2015	09:39		1.06	4.35	
2/27/2015	14:02		0.8	0.99	
3/29/2015	09:45		0.42	0.11	
4/14/2015	13:50		0.52	0.20	
5/21/2015	10:18		0.78	0.89	
6/12/2015	11:33	2.2	0.94	2.20	
7/14/2015	11:18		1.12	6.12	
8/25/2015	12:21	0.4	0.64	0.40	
8/29/2015	09:27		0.74	0.71	
8/31/2015	15:20		0.56	0.25	
9/21/2015	14:27		0.32	0.06	
10/13/2015	10:21		0.6	0.32	
11/13/2015	12:44	0	0	0.01	
11/25/2015	09:35		0.46	0.14	
11/25/2015	13:58		0.42	0.11	
12/9/2015	11:12		0.74	0.71	
12/10/2015	12:10		1.08	4.87	
12/22/2015	12:41		0.74	0.71	

Curve	
Formula:	y = b*m^x
b =	1.23808
m =	0.58760

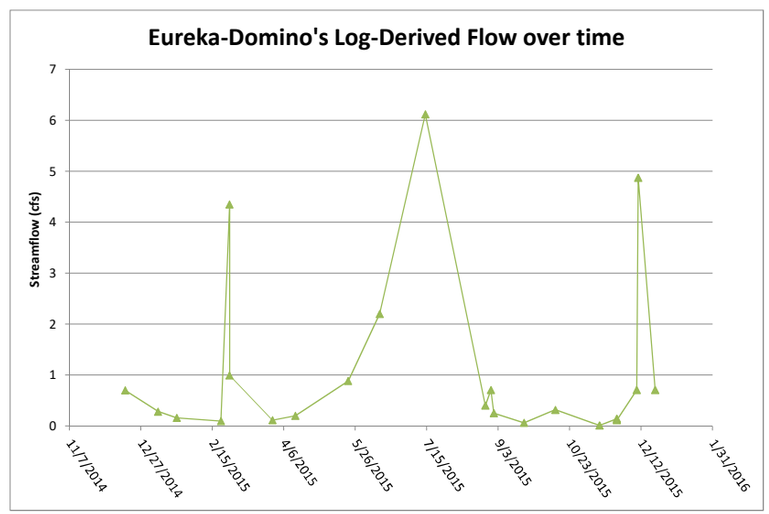
1.23808 0.58759818

Eureka-Domino's
Irrigation ditch upstream of culvert that carries water under S 7th and Washington, to Spruce St.
Staff gage installed late December 2014

With only two points, both of which are from the same season (irrigation season), this rating curve is very preliminary and will need to be updated if more data is available.

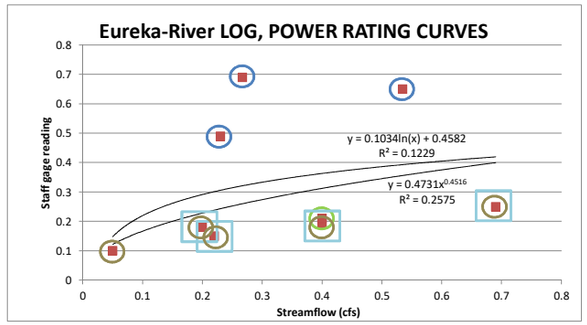
The relative difference between seasons can at least be estimated:
> On occasion in the winter, the site receives relatively high flows (probably until the 101 siphon overflows into the Bypass), but in 2015 they were't that different from typical irrigation flows.
> Shoulder season flow is very low, and dry in the fall.

Stormwater conclusion: this site has been known to back up and flood the 7th and Washington intersection; however, managing the siphon overflow can alleviate this runoff/pollution problem.



Date	Time	Flow (cfs) - Bucket	Stage (ft)	Log equation From Chart	Derived Flow using Excel's logest funtion	Samplers	
12/16/2014	13:30	0.69	0.25	0.12	0.68		
3/15/2015	18:39	0.4	0.19				
3/16/2015	9:40	0.2	0.18	0.07	0.28	Need to double check bucket flow calculations	
3/21/2015	10:30	0.4	0.21	0.09	0.41		
6/26/2015	9:53	0.5347	0.65	3.40	96.68		
5/27/2015	10:35	0.267	0.69	4.74	158.78		
7/22/2015	9:15	0.23	0.49	0.90	13.29		
12/9/2015	10:39	0.22	0.15	0.05	0.20		
12/29/2015	11:20	0.05	0.1	0.04	0.11		

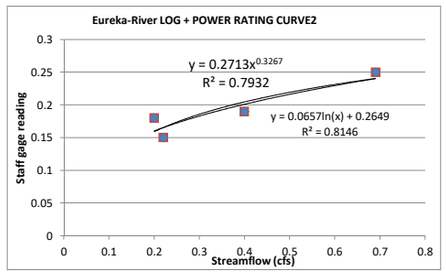
Use these bucket results for rating curve2:				Log	Excel Logest	Power	
12/16/2014	13:30	0.69	0.25	0.80	0.68	0.78	
3/15/2015	18:39	0.4	0.19	0.32	0.32	0.34	
3/16/2015	9:40	0.2	0.18	0.27	0.28	0.28	
12/9/2015	10:39	0.22	0.15	0.17	0.20	0.16	0.0657
							0.2649



Logest Curve 2

Formula: y = b*m^x
b = 243399.23833
m = 0.03049

243399.2383 0.030494674



Eureka-River
Irrigation ditch with weir and staff gage

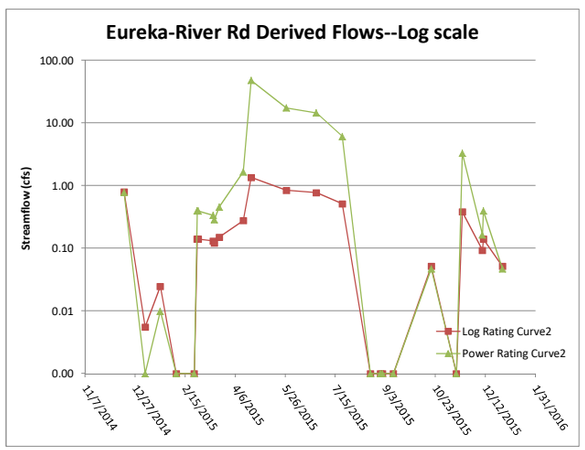
Bucket method was used for flows, without adequate consistency or precision. Data points are highly variable, probably only accurate to +/- 50%. Rating curve shows very low R squared value.

At most, estimates of seasonal flow ***ranges*** may be drawn:
> Irrigation season flows are highest, in the range from 0.25-1.5 cfs (or dry, when ditch was turned off late season)
> Winter and shoulder season flows are either nonexistent or low (up to 0.25-0.5 cfs); lack of consistent flow indicates this ditch is not supplying water for stock.

Stormwater conclusion: positive flows during fall and winter do not correlate with timing of storms, implying that the ditch received very little or no storm flow; periodic low flows may be inadvertent or for maintenance.

12/16/2014	13:30	0.69	0.25	SWFMB	Training/pre-QAPP approval	AS, PM, AP	bucket calcs checked
1/6/2015	13:00		0.04	STAGE-SG			
1/21/2015	14:05		0.06	STAGE-SG			
2/6/2015	11:43	0	FD	SWFMFLOAT	- storm-related sample		
2/24/2015	10:30	0	FD	SWFMFLOAT			
2/27/2015	9:43		0.2	STAGE-SG	- storm-related sample		
2/27/2015	13:34		0.2	STAGE-SG	- storm-related sample		
2/28/2015	15:40		0.2	STAGE-SG			
3/15/2015	18:39	0.4	0.19	STAGE-SG	- storm-related sample	AS, DS	
3/16/2015	9:40	0.2		SWFMB	- storm-related sample	AS, KD, SC	bucket calcs checked
3/16/2015	9:40		0.18	STAGE-SG	- storm-related sample		
3/21/2015	10:30	0.4		SWFMB		JB	bucket calcs checked
3/21/2015	10:30		0.21	STAGE-SG			
4/14/2015	12:55		0.32	STAGE-SG			
4/22/2015	10:00		0.96	STAGE-SG			
5/27/2015	10:35	0.267		SWFMB		JB, LW	bucket calcs checked
5/27/2015	10:35		0.69				Stage reading not entered to SKDB
6/26/2015	9:53	0.5347		SWFMB		JB, LW	bucket calcs checked
6/26/2015	9:53		0.65	STAGE-SG			
7/22/2015	9:15	0.23		SWFMB		JB, LW	bucket calc was wrong - gps entered instead of cfs
7/22/2015	9:15		0.49	STAGE-SG			
8/19/2015	8:40	0	FD	SWFMFLOAT			
8/29/2015	9:42	0	FD	SWFMFLOAT	- storm-related sample		
8/31/2015	15:41	0	FD	SWFMFLOAT	- storm-related sample		
9/11/2015	9:20	0	FD	SWFMFLOAT			
10/19/2015	13:16		0.1	STAGE-SG			Stage reading corrected from 1 ft. to 0.1 ft.
11/13/2015	14:42	0	FD	SWFMFLOAT	- storm-related sample		
11/19/2015	10:07		0.4	STAGE-SG			
12/9/2015	10:32	0.22		SWFMB	- storm-related sample	AS, PM, BP	bucket calc checked
12/9/2015	10:32		0.16	STAGE-SG	- storm-related sample		Use 0.15 (average) for graphing, above
12/9/2015	10:39		0.14	STAGE-SG	- storm-related sample		
12/10/2015	10:33		0.2	STAGE-SG	- storm-related sample		
12/29/2015	11:20	0.05		SWFMB		JB, BB	bucket calc checked - wrongly entered as 0.02
12/29/2015	11:20		0.1	STAGE-SG			

	Date	Time	Flow (cfs) - Bucket	Stage (ft)	Derived flow from Log Rating Curve2	Derived Flow using Excel's Logest function	Derived flow from Power Rating Curve2
12/16/2014	12/16/2014	13:30	0.69	0.25	0.80	0.68	0.78
1/6/2015	1/6/2015	13:00		0.04	0.01	0.05	0.00
1/21/2015	1/21/2015	14:05		0.06	0.02	0.06	0.01
2/6/2015	2/6/2015	11:43	0	0	0.00	0.00	0.00
2/24/2015	2/24/2015	10:30	0	0	0.00	0.00	0.00
2/27/2015	2/27/2015	9:43		0.2	0.14	0.36	0.39
2/28/2015	2/28/2015	15:40		0.2	0.14	0.36	0.39
3/15/2015	3/15/2015	18:30	0.4	0.19	0.13	0.32	0.34
3/16/2015	3/16/2015	9:40	0.2	0.18	0.12	0.28	0.28
3/21/2015	3/21/2015	10:30	0.4	0.21	0.15	0.41	0.46
4/14/2015	4/14/2015	12:55		0.32	0.28	1.61	1.66
4/22/2015	4/22/2015	10:00		0.96	1.35	4519.50	47.85
5/27/2015	5/27/2015	10:35	0.267	0.69	0.84	158.78	17.41
6/26/2015	6/26/2015	9:53	0.5347	0.65	0.77	96.68	14.50
7/22/2015	7/22/2015	9:15	0.23	0.49	0.51	13.29	6.11
8/19/2015	8/19/2015	8:40	0	0	0.00	0.00	0.00
8/29/2015	8/29/2015	9:42	0	0	0.00	0.00	0.00
8/31/2015	8/31/2015	15:41	0	0	0.00	0.00	0.00
9/11/2015	9/11/2015	9:20	0	0	0.00	0.00	0.00
10/19/2015	10/19/2015	13:16		0.1	0.05	0.11	0.05
11/13/2015	11/13/2015	14:42	0	0	0.00	0.00	0.00
11/19/2015	11/19/2015	10:07		0.4	0.38	4.35	3.28
12/9/2015	12/9/2015	10:32	0.22	0.15	0.09	0.20	0.16
12/10/2015	12/10/2015	10:33		0.2	0.14	0.36	0.39
12/29/2015	12/29/2015	11:20	0.05	0.1	0.05	0.11	0.05

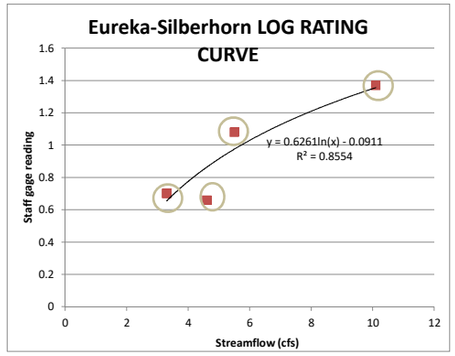


APPENDIX C: DATA ANALYSIS

Site Name: Eureka-Silberhorn

Date	Time	Flow (cfs)	Stage	Log equation From Chart	Derived Flow using Excel's logest funtion	Power curve	
12/12/2014	15:30	4.6	0.66	3.32	0.53	0.7911	Flow meas. Is floating method.
2/6/2015	14:25	3.3	0.7	3.54	0.53		Meter
2/6/2015	14:50	3.3	0.7	3.54	0.53		Float
3/15/2015	17:05	10.1	1.37	10.32	0.57		
3/16/2015	10:00	5.5	1.08	6.49	0.55		

Double check all floating object calcs



Curve	
Formula:	y = b*m^x
b =	1.10984
m =	0.49360

1.109842 0.49360266

Eureka-Silberhorn Rd
Irrigation ditch open channel with staff gage north of city street

[Flow meter calculation checked for 7/14/15, found that reported value was not corrected for rotor calibration. Puts in question all flow values reported when Swoffer meter calibration # was significantly different from actual calibration #.]

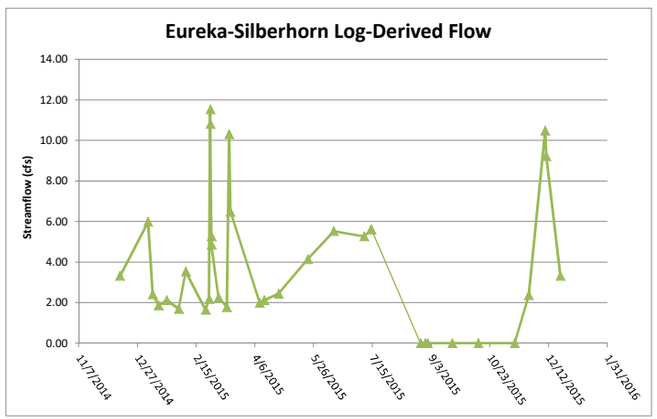
All flows available to generate rating curve are from winter season--making the curve less reliable. R-squared is reasonable for screening-level conclusions.

Estimates for seasonal flows at this site:
> Winter season flows are highest of the year. Site never went dry; flow ranged from 0.5 to 11 cfs
> Irrigation season ranged from about 1.5 to 6 cfs (except when dry/turned off due to 2015 drought)
> Shoulder seasons: flowed in spring (around 1 cfs) but not in the fall (dry)

Stormwater conclusion: site carries substantial runoff coming from south, but not via Eureka weir at River Rd (dry in winter)

12/12/2014	15:30	4.6	0.66	SWFMFLOAT	Training data--use with caution	Float calcs checked
1/5/2015	08:30		1.03	STAGE-SG		
1/9/2015	10:15		0.46	STAGE-SG		
1/14/2015	10:30		0.30	STAGE-SG		
1/21/2015	12:25		0.38	STAGE-SG		
1/31/2015	12:05		0.24	STAGE-SG		
2/6/2015	14:25	3.3	0.70	SWFMC	- storm-related sample	
2/6/2015	14:50	3.3	0.70	SWFMFLOAT	- storm-related sample	Float method calc errors fixed
2/23/2015	16:50		0.22	STAGE-SG		
2/26/2015	11:14		0.40	STAGE-SG		
2/27/2015	13:50		1.44	STAGE-SG	- storm-related sample	
2/27/2015	16:30		1.4	STAGE-SG		
2/28/2015	15:10		0.95	STAGE-SG		
2/28/2015	16:50		0.9	STAGE-SG		
3/6/2015	13:40		0.42	STAGE-SG		
3/13/2015	10:53		0.27	STAGE-SG		
3/15/2015	17:05	10.1	1.37	SWFMC	- storm-related sample	Stage averaged; used for rating curve
3/15/2015	17:05		1.34	STAGE-SG	- storm-related sample	
3/15/2015	17:25		1.4	STAGE-SG	- storm-related sample	
3/16/2015	10:00	5.5	1.08	SWFMFLOAT	- storm-related sample	Float calcs checked
4/10/2015	13:21		0.34	STAGE-SG		
4/14/2015	13:40		0.38	STAGE-SG		
4/26/2015	14:55		0.47	STAGE-SG		
5/21/2015	10:29		0.8	STAGE-SG		
6/12/2015	12:00		0.98	STAGE-SG		
7/8/2015	06:45		0.95	STAGE-SG		
7/14/2015	11:40	1.1	0.99	SWFMC	REMOVING THESE FROM	Depth measurements don't square with stage height
7/14/2015	12:15	0.4	0.99	SWFMFLOAT	RATING CURVE CALCS!	Float calc checked; depth question persists
8/25/2015	12:49	0	FD			
8/29/2015	09:30	0	FD		- storm-related sample	
8/31/2015	15:22	0	FD		- storm-related sample	
9/21/2015	14:31	0	FD			
10/13/2015	10:13	0	FD			
11/13/2015	12:47	0	FD		- storm-related sample	
11/25/2015	09:45		0.45	STAGE-SG		
12/9/2015	10:51		1.38	STAGE-SG	- storm-related sample	
12/10/2015	10:28		1.3	STAGE-SG	- storm-related sample	
12/22/2015	12:47		0.66	STAGE-SG		

	Date	Time	Flow (cfs)	Stage	Derived flow-Log	Derived Flow using Excel's logest funtion
12/12/2014	##########	##########	4.6	0.66	3.32	0.53
1/5/2015	1/5/2015	08:30		1.03	5.99	0.55
1/9/2015	1/9/2015	10:15		0.46	2.41	0.52
1/14/2015	1/14/2015	10:30		0.30	1.87	0.51
1/21/2015	1/21/2015	12:25		0.38	2.12	0.51
1/31/2015	1/31/2015	12:05		0.24	1.70	0.51
2/6/2015	2/6/2015	14:25	3.3	0.70	3.54	0.53
2/23/2015	2/23/2015	16:50		0.22	1.64	0.51
2/26/2015	2/26/2015	11:14		0.40	2.19	0.51
2/27/2015	2/27/2015	13:50		1.44	11.54	0.57
2/27/2015	2/27/2015	16:30		1.4	10.82	0.57
2/28/2015	2/28/2015	15:10		0.95	5.27	0.54
2/28/2015	2/28/2015	16:50		0.9	4.87	0.54
3/6/2015	3/6/2015	13:40		0.42	2.26	0.52
3/13/2015	3/13/2015	10:53		0.27	1.78	0.51
3/15/2015	3/15/2015	17:05	10.1	1.37	10.32	0.57
3/16/2015	3/16/2015	10:00	5.5	1.08	6.49	0.55
4/10/2015	4/10/2015	13:21		0.34	1.99	0.51
4/14/2015	4/14/2015	13:40		0.38	2.12	0.51
4/26/2015	4/26/2015	14:55		0.47	2.45	0.52
5/21/2015	5/21/2015	10:29		0.8	4.15	0.54
6/12/2015	6/12/2015	12:00		0.98	5.53	0.55
7/8/2015	7/8/2015	06:45		0.95	5.27	0.54
7/14/2015	7/14/2015	11:40	1.1	0.99	5.62	0.55
7/14/2015	7/14/2015	12:15	0.4	0.99	5.62	0.55
8/25/2015	8/25/2015	12:49	0	0	0.00	0.49
8/29/2015	8/29/2015	09:30	0	0	0.00	0.49
8/31/2015	8/31/2015	15:22	0	0	0.00	0.49
9/21/2015	9/21/2015	14:31	0	0	0.00	0.49
10/13/2015	10/13/2015	10:13	0	0	0.00	0.49
11/13/2015	11/13/2015	12:47	0	0	0.00	0.49
11/25/2015	11/25/2015	09:45		0.45	2.37	0.52
12/9/2015	12/9/2015	10:51		1.38	10.48	0.57
12/10/2015	12/10/2015	10:28		1.3	9.22	0.57
12/22/2015	12/22/2015	12:47		0.66	3.32	0.53

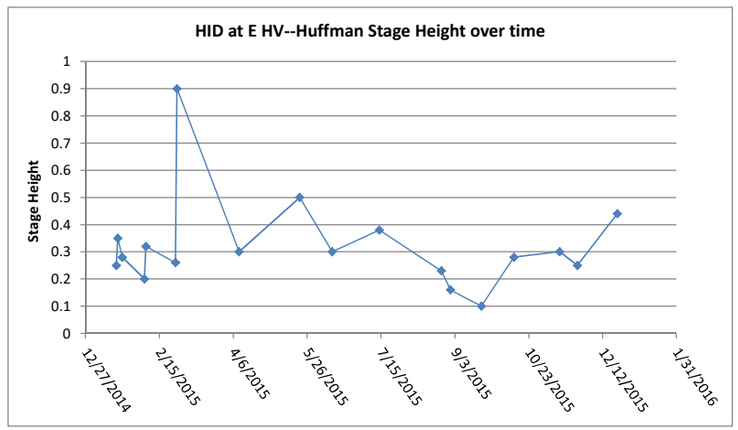


Date	Flow (cfs)	Stage

No flow data collected since volunteers found irrigation staff conducting flow measurements at site, with agreement to share information.

For Charting **negative numbers deleted (tape downs are not necessary since staff height data was obtained)**

	Date	Time	Flow rate c	Stage height	Data Quali	Result Metho	Field comment	
1/17/2015	1/17/2015	20:10		0.25		STAGE-SG	- - -	ft
1/18/2015	1/18/2015	15:30		0.35		STAGE-SG	- - -	ft
1/21/2015	1/21/2015	11:45		0.28		STAGE-SG	- - -	ft
2/5/2015	2/5/2015	08:30		0.2		STAGE-SG	- - -	ft
2/6/2015	2/6/2015	10:20		0.32		STAGE-SG	- - -	ft
2/26/2015	2/26/2015	10:45		0.26		STAGE-SG	- Dry and cool - -	ft
2/27/2015	2/27/2015	08:41		0.9		STAGE-SG	Steady rain and lightning - - - - Pre-storm sample, suitable for 303(d) assessme	ft
4/10/2015	4/10/2015	12:51		0.3		STAGE-SG	- - -	ft
5/21/2015	5/21/2015	09:39		0.5		STAGE-SG	- - -	ft
6/12/2015	6/12/2015	10:30		0.3		STAGE-SG	- - -	ft
7/14/2015	7/14/2015	10:03		0.38		STAGE-SG	- - -	ft
8/25/2015	8/25/2015	10:50		0.23		STAGE-SG	- No rain within 12 hours. - -	ft
8/31/2015	8/31/2015	15:06		0.16		STAGE-SG	- - - - storm-related sample	ft
9/21/2015	9/21/2015	13:40		0.1		STAGE-SG	- - Stagnant pool. Dry upstream of gage. Appears to be runoff from hillside. -	ft
10/13/2015	10/13/2015	10:57		0.28		STAGE-SG	- - -	ft
11/13/2015	11/13/2015	12:00		0.3		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	11/25/2015	12:32		0.25		STAGE-SG	- - -	ft
12/22/2015	12/22/2015	11:35		0.44		STAGE-SG	- Dry, but lots of rain yesterday - -	ft



All data for site

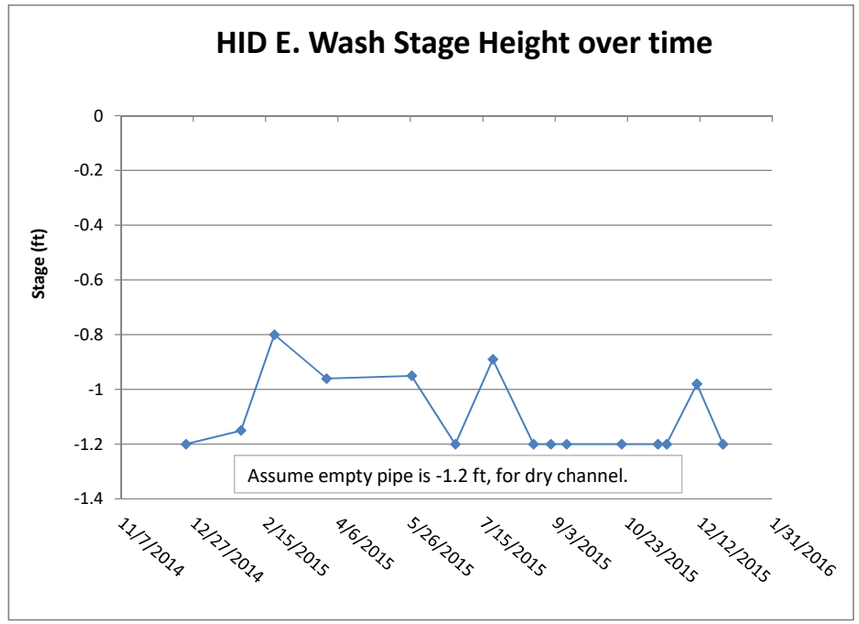
Date	Time	Flow rate c	Stage height	Data Quali	Result Metho	Field comment	
1/17/2015	20:10		0.25		STAGE-SG	- - -	ft
1/18/2015	15:30		0.35		STAGE-SG	- - -	ft
1/21/2015	11:45		0.28		STAGE-SG	- - -	ft
2/5/2015	08:30		0.2		STAGE-SG	- - -	ft
2/6/2015	10:20		0.32		STAGE-SG	- - -	ft
2/26/2015	10:45		0.26		STAGE-SG	- Dry and cool - -	ft
2/27/2015	08:41		0.9		STAGE-SG	Steady rain and lightning - - - - Pre-storm sample, suitable for 303(d) assessme	ft
3/13/2015	10:23		-2.15		STAGE-SG	- - -	ft
4/10/2015	12:51		0.3		STAGE-SG	- - -	ft
5/21/2015	09:39		0.5		STAGE-SG	- - -	ft
6/12/2015	10:30		0.3		STAGE-SG	- - -	ft
7/14/2015	10:03		0.38		STAGE-SG	- - -	ft
8/25/2015	10:50		0.23		STAGE-SG	- No rain within 12 hours. - -	ft
8/25/2015	10:50		-2.15		STAGE-SG	- No rain within 12 hours. - -	ft
8/31/2015	15:06		0.16		STAGE-SG	- - - - storm-related sample	ft
9/21/2015	13:40		0.1		STAGE-SG	- - Stagnant pool. Dry upstream of gage. Appears to be runoff from hillside. -	ft
9/21/2015	13:40		-2.38		STAGE-SG	- - Stagnant pool. Dry upstream of gage. Appears to be runoff from hillside. -	ft
10/13/2015	10:57		0.28		STAGE-SG	- - -	ft
10/13/2015	10:57		-2.05		STAGE-SG	- - -	ft
11/13/2015	12:00		0.3		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	12:32		0.25		STAGE-SG	- - -	ft
12/10/2015	11:00			FH	STAGE-SG	- Raining - - - Staff has been covered with water. No reading was taken. - storm-related sample	
12/22/2015	11:35		0.44		STAGE-SG	- Dry, but lots of rain yesterday - -	ft

for chart

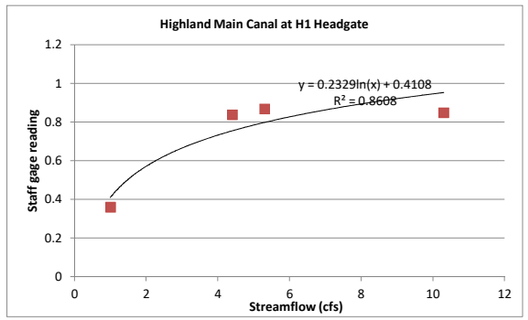
	Date	Time	Flow	Stage height	Data Qualifier	Result Method	Field comment	
12/22/2014	**12/22/2014**	11:00	0	-1.2			dry channel	
1/29/2015	1/29/2015	14:15		-1.15		STAGE-SG	- - -	ft
2/21/2015	2/21/2015	11:30		-0.8		STAGE-SG	- - -	ft
3/29/2015	3/29/2015	10:15		-0.96		STAGE-SG	- - -	ft
5/27/2015	5/27/2015	10:10		-0.95		STAGE-SG	Insuff. Flow to do floating	ft
6/26/2015	6/26/2015	08:32	0	**-1.2**	FD	SWFMFLOAT	- - -	**cfs**
7/22/2015	7/22/2015	07:40		-0.89		STAGE-SG	- - -	ft
8/19/2015	8/19/2015	08:33	0	**-1.2**	FD	SWFMFLOAT	- - -	**cfs**
8/31/2015	8/31/2015	14:33	0	**-1.2**	FD	SWFMFLOAT	- - - - storm-related sample	**cfs**
9/11/2015	9/11/2015	08:55	0	**-1.2**	FD	SWFMFLOAT	- - -	**cfs**
10/19/2015	10/19/2015	12:47	0	**-1.2**	FD	SWFMFLOAT	- - -	**cfs**
11/13/2015	11/13/2015	11:50	0	**-1.2**	FD	SWFMFLOAT	- - - - storm-related sample	**cfs**
11/19/2015	11/19/2015	08:55	0	**-1.2**	FD	SWFMFLOAT	- - -	**cfs**
12/10/2015	12/10/2015	11:41		-0.98		STAGE-SG	- Raining - - - storm-related sample	ft
12/28/2015	12/28/2015	11:20	0	**-1.2**	FD	SWFMFLOAT	- - -	**cfs**

All Data

12/22/2014	**12/22/2014**	11:00	0				dry channel	
1/29/2015	1/29/2015	14:15		**-1.15**		STAGE-SG	MP is pipe off E Wash.; BARELY flowing	**ft**
2/21/2015	2/21/2015	11:30		**-0.8**		STAGE-SG	- - -	**ft**
3/29/2015	3/29/2015	10:15		**-0.96**		STAGE-SG	- - -	**ft**
5/27/2015	5/27/2015	10:10		**-0.95**		STAGE-SG	Insuff. Flow to do floating method	**ft**
6/26/2015	6/26/2015	08:32	0		FD	SWFMFLOAT	- - -	**cfs**
7/22/2015	7/22/2015	07:40		**-0.89**		STAGE-SG	- - -	**ft**
8/19/2015	8/19/2015	08:33	0		FD	SWFMFLOAT	- - -	**cfs**
8/31/2015	8/31/2015	14:33	0		FD	SWFMFLOAT	- - - - storm-related sample	**cfs**
9/11/2015	9/11/2015	08:55	0		FD	SWFMFLOAT	- - -	**cfs**
10/19/2015	10/19/2015	12:47	0		FD	SWFMFLOAT	- - -	**cfs**
11/13/2015	11/13/2015	11:50	0		FD	SWFMFLOAT	- - - - storm-related sample	**cfs**
11/19/2015	11/19/2015	08:55	0		FD	SWFMFLOAT	- - -	**cfs**
12/10/2015	12/10/2015	11:41		**-0.98**		STAGE-SG	- Raining - - - storm-related sample	**ft**
12/28/2015	12/28/2015	11:20	0		FD	SWFMFLOAT	- - -	**cfs**



	Date	Flow (cfs)	Stage	Log equation From Chart	Power Logest equation
Current meter	3/22/2015	1	0.36	0.804	1.00
Current meter	5/27/2015	5.3	0.87	7.183	6.60
Current meter	6/26/2015	10.3	0.85	6.592	6.13
Current meter	7/22/2015	4.4	0.84	6.315	5.91

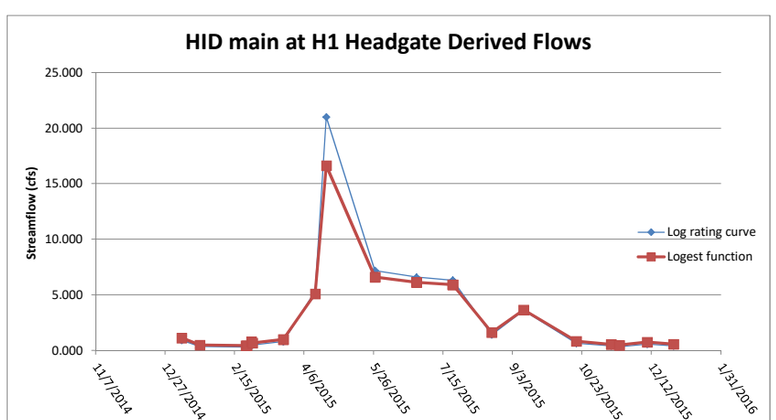


Curve	
Formula:	y = b*m^x
b =	40.27367
m =	0.26514

40.2736711 0.265140428

For chart

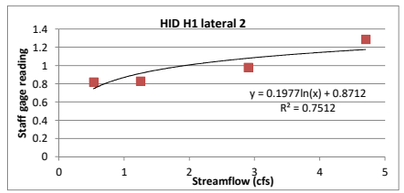
	Date	Time	Flow rate cfs	Stage height	Data Qualifier	From log equation in chart	From Excel Logest Function	
1/8/2015	1/8/2015	08:45		0.39		0.915	1.12	0.2329
1/21/2015	1/21/2015	14:20		0.17		0.356	0.50	0.4108
2/23/2015	2/23/2015	17:00		0.13		0.299	0.43	
2/24/2015	2/24/2015	10:42		0.13		0.299	0.43	
2/27/2015	2/27/2015	08:59		0.3		0.621	0.80	
2/28/2015	2/28/2015	16:00		0.25		0.501	0.67	
3/22/2015	3/22/2015	10:15		0.36		0.804	1.00	
3/22/2015	3/22/2015	11:00		0.36		0.804	1.00	
4/14/2015	4/14/2015	13:11		0.8		5.318	5.10	
4/22/2015	4/22/2015	10:08		1.12		21.012	16.64	
5/27/2015	5/27/2015	11:25		0.87		7.183	6.60	
5/27/2015	5/27/2015	12:00		0.87		7.183	6.60	
6/26/2015	6/26/2015	10:30		0.85		6.592	6.13	
6/26/2015	6/26/2015	10:52		0.85		6.592	6.13	
7/22/2015	7/22/2015	09:52		0.84		6.315	5.91	
7/22/2015	7/22/2015	10:16		0.84		6.315	5.91	
8/19/2015	8/19/2015	08:48		0.49		1.405	1.62	
9/11/2015	9/11/2015	09:45		0.71		3.613	3.66	
10/19/2015	10/19/2015	13:26		0.31		0.649	0.83	
11/13/2015	11/13/2015	14:35		0.2		0.404	0.56	
11/19/2015	11/19/2015	10:20		0.16		0.341	0.48	
12/9/2015	12/9/2015	09:54		0.28		0.570	0.75	
12/28/2015	12/28/2015	12:30		0.21		0.422	0.58	



All Data for this site

Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Met	Field comment		
1/8/2015	08:45		0.39		STAGE-SG	- - -	ft	
1/21/2015	14:20		0.17		STAGE-SG	- - -	ft	
2/23/2015	17:00		0.13		STAGE-SG	- Small am	ft	
2/24/2015	10:42		0.13		STAGE-SG	- Dry - -	ft	
2/27/2015	08:59		0.3		STAGE-SG	Steady rair	ft	
2/27/2015	13:28	0.16			RATING	Steady rair	cfs	??? Not sure where this comes from.
2/28/2015	16:00		0.25		STAGE-SG	- Small am	ft	
3/22/2015	10:15	1			SWFMC	- - -	cfs	Re-check the flow calc for this visit
3/22/2015	10:15		0.36		STAGE-SG	- - -	ft	
3/22/2015	11:00		0.36		STAGE-SG	- - -	ft	
4/14/2015	13:11		0.8		STAGE-SG	- - -	ft	
4/22/2015	10:08		1.12		STAGE-SG	- - -	ft	
5/27/2015	11:25	5.3			SWFMC	- - -	cfs	
5/27/2015	11:25		0.87		STAGE-SG	- - -	ft	
5/27/2015	12:00		0.87		STAGE-SG	- - -	ft	
6/26/2015	10:30	10.3			SWFMC	- - -	cfs	Re-checked the flow calc for this visit
6/26/2015	10:30		0.85		STAGE-SG	- - -	ft	
6/26/2015	10:52		0.85		STAGE-SG	- - -	ft	
7/22/2015	09:52	4.4			SWFMC	- - -	cfs	
7/22/2015	09:52		0.84		STAGE-SG	- - -	ft	
7/22/2015	10:16		0.84		STAGE-SG	- - -	ft	
8/19/2015	08:48		0.49		STAGE-SG	- - -	ft	
9/11/2015	09:45		0.71		STAGE-SG	- - -	ft	
10/19/2015	13:26		0.31		STAGE-SG	- - -	ft	
11/13/2015	14:35		0.2		STAGE-SG	- - - - sto	ft	
11/19/2015	10:20		0.16		STAGE-SG	- - -	ft	
12/9/2015	09:54		0.28		STAGE-SG	- - - - sto	ft	
12/28/2015	12:30		0.21		STAGE-SG	- - -	ft	

Date	Flow (cfs)	Stage	Log equation From Chart	Excel Logest function
3/21/2015	2.9	0.98	1.734	1.73
7/22/2015	4.7	1.29	8.317	5.63
12/9/2015	0.53	0.82	0.772	0.94
12/9/2015	1.25	0.83	0.812	0.98



NOT good correlation between floating object and meter, when both done.

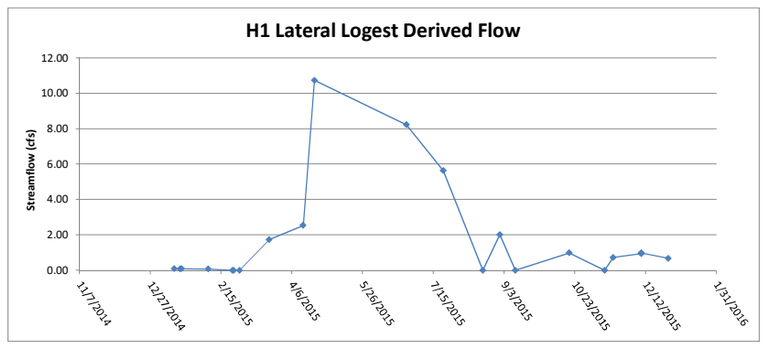
Curve	
Formula:	y = b*m^x
b =	44.66814
m =	0.04187

44.6681 0.04187188

0.1895
0.8731

For Charting

	Date	Time	Flow rate c	Stage height	Data Quali	Result Method	Field comment		Using log equation from graph	Using Logest
1/13/2015	1/13/2015	08:40		0.2		STAGE-SG	- - -	ft	0.034	0.09
1/17/2015	1/17/2015	19:57		0.18		STAGE-SG	- - -	ft	0.030	0.08
1/18/2015	1/18/2015	15:45		0.2		STAGE-SG	- - -	ft	0.034	0.09
2/6/2015	2/6/2015	10:51		0.14		STAGE-SG	- - -	ft	0.025	0.07
2/23/2015	2/23/2015	17:10	0	0	FD	SWFMFLOAT	- Small amount of rain l	cfs	0.012	0.00
2/24/2015	2/24/2015	10:50	0	0	FD	SWFMFLOAT	- Dry - -	cfs	0.012	0.00
2/28/2015	2/28/2015	15:45		0		STAGE-SG	- Small amount of rain l	ft	0.012	0.00
3/21/2015	3/21/2015	11:15		0.98		STAGE-SG	- - -	ft	1.734	1.73
4/14/2015	4/14/2015	13:05		1.08		STAGE-SG	- - -	ft	2.875	2.53
4/22/2015	4/22/2015	10:10		1.46		STAGE-SG	- - -	ft	19.653	10.74
6/26/2015	6/26/2015	11:03		1.39		STAGE-SG	- - -	ft	13.793	8.23
7/22/2015	7/22/2015	09:32		1.29		STAGE-SG	- - -	ft	8.317	5.63
8/19/2015	8/19/2015	08:49	0	0	FD	SWFMFLOAT	- - -	cfs	0.012	0.00
8/31/2015	8/31/2015	15:31		1.02		STAGE-SG	- - - - storm-related sa	ft	2.123	2.02
9/11/2015	9/11/2015	09:35	0	0	FS	SWFMFLOAT	- - -	cfs	0.012	0.00
10/19/2015	10/19/2015	13:22		0.83		STAGE-SG	- - -	ft	0.812	0.98
11/13/2015	11/13/2015	14:40	0	0	FD	SWFMFLOAT	- - - - storm-related sa	cfs	0.012	0.00
11/19/2015	11/19/2015	10:15		0.75		STAGE-SG	- - -	ft	0.542	0.72
12/9/2015	12/9/2015	09:58		0.82		STAGE-SG	- - - - storm-related sa	ft	0.772	0.94
12/9/2015	12/9/2015	10:20		0.83		STAGE-SG	- - - - storm-related sa	ft	0.812	0.98
12/28/2015	12/28/2015	12:20		0.73		STAGE-SG	- - -	ft	0.490	0.67



Full data for site Lateral 2--Steve Gaither read this staff gage more often than we read Lateral 1 (flow measurements correlate with both staffs)

Date	Time	Flow rate c	Stage height	Data Quali	Result Method	Field comment	
12/16/2014	13:05	2.85			Floating	Training day	
1/13/2015	08:40		0.2		STAGE-SG	- - -	ft
1/17/2015	19:57		0.18		STAGE-SG	- - -	ft
1/18/2015	15:45		0.2		STAGE-SG	- - -	ft
2/6/2015	10:51		0.14		STAGE-SG	- - -	ft
2/23/2015	17:10	0		FD	SWFMFLOAT	- Small amount of rain l	cfs
2/24/2015	10:50	0		FD	SWFMFLOAT	- Dry - -	cfs
2/28/2015	15:45		0.9		STAGE-SG	- Small amount of rain l	ft
3/21/2015	11:15	2.9			SWFMFLOAT	- - -	cfs
3/21/2015	11:15		0.98		STAGE-SG	- - -	ft
4/14/2015	13:05		1.08		STAGE-SG	- - -	ft
4/22/2015	10:10		1.46		STAGE-SG	- - -	ft
5/27/2015	11:00	3.1			SWFMFLOAT	- - -	cfs
6/26/2015	10:16	4.5			SWFMFLOAT	- - -	cfs
6/26/2015	11:03		1.39		STAGE-SG	- - -	ft
7/22/2015	09:32		1.29		STAGE-SG	- - -	ft
7/22/2015	09:42	4.7			SWFMFLOAT	- - -	cfs
8/19/2015	08:49	0		FD	SWFMFLOAT	- - -	cfs
8/31/2015	15:31		1.02		STAGE-SG	- - - - storm-related sa	ft
9/11/2015	09:35	0		FS	SWFMFLOAT	- - -	cfs
10/19/2015	13:22		0.83		STAGE-SG	- - -	ft
11/13/2015	14:40	0		FD	SWFMFLOAT	- - - - storm-related sa	cfs
11/19/2015	10:15		0.75		STAGE-SG	- - -	ft
12/9/2015	09:54	0.5			SWFMC	- - - - storm-related sa	cfs
12/9/2015	09:58		0.82		STAGE-SG	- - - - storm-related sa	ft
12/9/2015	10:20		0.83		STAGE-SG	- - - - storm-related sa	ft
12/9/2015	10:25	1.4			SWFMFLOAT	- - - - storm-related sa	cfs
12/28/2015	12:20		0.73		STAGE-SG	- - -	ft

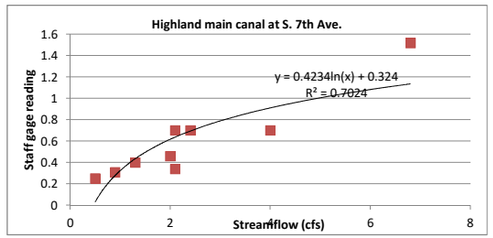
double checked flow meas.

double checked: floating method = 1.25 cfs

Full data for site Lateral 1--Ann's volunteers read this staff for part of the year, then switched to Lateral 2

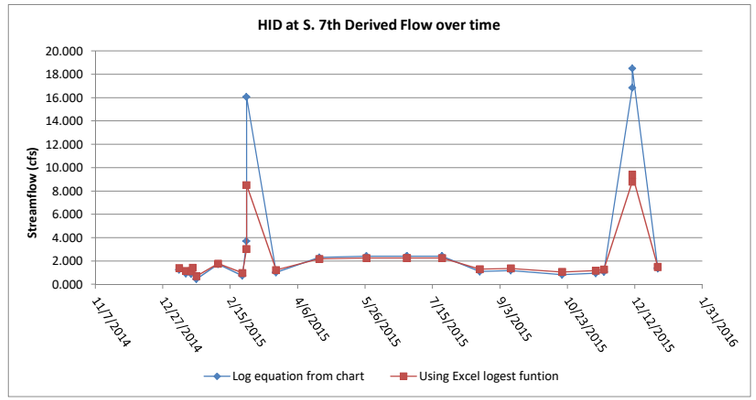
Date	Time	Flow rate c	Stage height	Data Quali	Result Method	Field comment	
12/16/2014	13:05	2.85	0.34		Floating	Training day	
1/8/2015	08:43		0.23		STAGE-SG	- - -	ft
1/21/2015	14:15	0		FD	SWFMFLOAT	- - -	cfs
2/23/2015	16:55	0		FD	SWFMFLOAT	- Small amount of rain last 12 hours - -	cfs
2/24/2015	10:40	0		FD	SWFMFLOAT	- Dry - -	cfs
2/28/2015	15:55		0.38		STAGE-SG	- Small amount of rain last 12 hours - -	ft
3/21/2015	10:45		0.3		STAGE-SG	- - -	ft
3/21/2015	11:00		0.3		STAGE-SG	- - -	ft
4/14/2015	13:10		0.3		STAGE-SG	- - -	ft
4/22/2015	10:05		0.93		STAGE-SG	- - -	ft
5/27/2015	11:00	3.1	3.1		SWFMFLOAT	- - -	cfs
5/27/2015	11:00		0.4		STAGE-SG	- - -	ft
6/26/2015	10:16	4.5	4.5		SWFMFLOAT	- - -	cfs
6/26/2015	10:16		0.39		STAGE-SG	- - -	ft
6/26/2015	10:29		0.39		STAGE-SG	- - -	ft
7/22/2015	09:42		0.38		STAGE-SG	- - -	ft
8/19/2015	08:45	0	0	FD	SWFMFLOAT	- - -	cfs
9/11/2015	09:40		0.17		STAGE-SG	- - -	ft

Method	Date	Flow (cfs)	Stage	Log equation From Chart	Logest Power equation
Float	3/21/2015	2.1	0.34	1.039	1.24
Float	5/27/2015	4	0.7	2.430	2.26
Float	6/26/2015	2.1	0.7	2.430	2.26
Float	7/22/2015	2.4	0.7	2.430	2.26
Float	9/11/2015	1.3	0.4	1.197	1.38
Float	10/19/2015	0.5	0.25	0.840	1.07
Float	11/13/2015	0.9	0.31	0.967	1.18
Current meter	12/10/2015	6.8	1.52	16.857	8.82
Float	12/29/2015	2	0.46	1.379	1.52



Curve	
Formula:	y = b*m^x
b =	5.25389
m =	0.70817

5.25389 0.70817



0.4234
0.324

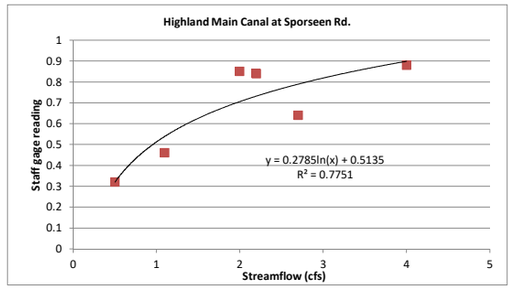
For Charting

Date		Time	Flow rate	Stage heig	Data Quali	Result Me	Field comment		From log equation in chart	From Excel Logest function
1/8/2015	1/8/2015	09:18		**0.42**		STAGE-SG	- - -	ft	1.254	1.42
1/13/2015	1/13/2015	08:50		**0.3**		STAGE-SG	- - -	ft	0.945	1.16
1/17/2015	1/17/2015	19:45		**0.28**		STAGE-SG	- - -	ft	0.901	1.13
1/18/2015	1/18/2015	15:55		**0.43**		STAGE-SG	- - -	ft	1.284	1.45
1/21/2015	1/21/2015	15:05	**0**	**0**	FD	SWFMFLOAT	- - -	cfs	0.465	0.71
2/6/2015	2/6/2015	10:31		**0.56**		STAGE-SG	- - -	ft	1.746	1.79
2/24/2015	2/24/2015	11:55		**0.2**		STAGE-SG	- Dry - -	ft	0.746	0.99
2/27/2015	2/27/2015	08:49		**0.88**		STAGE-SG	and lightning -	ft	3.718	3.05
2/27/2015	2/27/2015	13:14		**1.5**		STAGE-SG	and lightning -	ft	16.079	8.53
3/21/2015	3/21/2015	12:45		**0.34**		STAGE-SG	- - -	ft	1.039	1.24
4/22/2015	4/22/2015	10:20		**0.68**		STAGE-SG	- - -	ft	2.318	2.19
5/27/2015	5/27/2015	03:15		**0.7**		STAGE-SG	- - -	ft	2.430	2.26
6/26/2015	6/26/2015	12:05		**0.7**		STAGE-SG	- - -	ft	2.430	2.26
6/26/2015	6/26/2015	12:10		**0.7**		STAGE-SG	- - -	ft	2.430	2.26
7/22/2015	7/22/2015	11:05		**0.7**		STAGE-SG	- - -	ft	2.430	2.26
8/19/2015	8/19/2015	08:55		**0.37**		STAGE-SG	- - -	ft	1.115	1.31
9/11/2015	9/11/2015	09:59		**0.4**		STAGE-SG	- - -	ft	1.197	1.38
10/19/2015	10/19/2015	13:49		**0.25**		STAGE-SG	- - -	ft	0.840	1.07
11/13/2015	11/13/2015	13:55		**0.31**		STAGE-SG	related sample	ft	0.967	1.18
11/19/2015	11/19/2015	10:56		**0.36**		STAGE-SG	- - -	ft	1.089	1.29
12/10/2015	12/10/2015	11:01		**1.52**		STAGE-SG	storm-related	ft	16.857	8.82
12/10/2015	12/10/2015	11:28		**1.56**		STAGE-SG	storm-related	ft	18.527	9.42
12/29/2015	12/29/2015	12:20		**0.46**		STAGE-SG	- - -	ft	1.379	1.52
12/29/2015	12/29/2015	12:45		**0.46**		STAGE-SG	- - -	ft	1.379	1.52

All data for site

Date	Time	Flow rate	Stage heig	Data Quali	Result Method	Field comment	
1/8/2015	09:18		**0.42**		STAGE-SG	- - -	ft
1/13/2015	08:50		**0.3**		STAGE-SG	- - -	ft
1/17/2015	19:45		**0.28**		STAGE-SG	- - -	ft
1/18/2015	15:55		**0.43**		STAGE-SG	- - -	ft
1/21/2015	15:05	**0**		FD	SWFMFLOAT	- - -	cfs
2/6/2015	10:31		**0.56**		STAGE-SG	- - -	ft
2/24/2015	11:55		**0.2**		STAGE-SG	- Dry - -	ft
2/27/2015	08:49		**0.88**		STAGE-SG	suitable for 303(d) assessment.	ft
2/27/2015	13:14		**1.5**		STAGE-SG	sample	ft
3/21/2015	12:45	**2.1**			SWFMFLOAT	- - -	cfs
3/21/2015	12:45		**0.34**		STAGE-SG	- - -	ft
4/22/2015	10:20		**0.68**		STAGE-SG	- - -	ft
5/27/2015	03:15		**0.7**		STAGE-SG	- - -	ft
5/27/2015	13:15	**4**			SWFMFLOAT	- - -	cfs
6/26/2015	12:05	**2.1**			SWFMFLOAT	- - -	cfs
6/26/2015	12:05		**0.7**		STAGE-SG	- - -	ft
6/26/2015	12:10		**0.7**		STAGE-SG	- - -	ft
7/22/2015	11:05	**2.4**			SWFMFLOAT	- - -	cfs
7/22/2015	11:05		**0.7**		STAGE-SG	- - -	ft
8/19/2015	08:55		**0.37**		STAGE-SG	- - -	ft
9/11/2015	09:59	**1.3**			SWFMFLOAT	- - -	cfs
9/11/2015	09:59		**0.4**		STAGE-SG	- - -	ft
10/19/2015	13:49	**0.5**			SWFMFLOAT	- - -	cfs
10/19/2015	13:49		**0.25**		STAGE-SG	- - -	ft
11/13/2015	13:55	**0.9**			SWFMFLOAT	- - - - storm-related sample	cfs
11/13/2015	13:55		**0.31**		STAGE-SG	- - - - storm-related sample	ft
11/19/2015	10:56		**0.36**		STAGE-SG	- - -	ft
12/10/2015	11:01	**6.8**			SWFMC	- Rain - - - storm-related sample	cfs
12/10/2015	11:01		**1.52**		STAGE-SG	- Rain - - - storm-related sample	ft
12/10/2015	11:28		**1.56**		STAGE-SG	- Rain - - - storm-related sample	ft
12/28/2015	12:20	**1.6**			SWFMC	- - -	cfs
12/29/2015	12:20		**0.46**		STAGE-SG	- - -	ft
12/29/2015	12:45	**2**			SWFMFLOAT	- - -	cfs
12/29/2015	12:45		**0.46**		STAGE-SG	- - -	ft

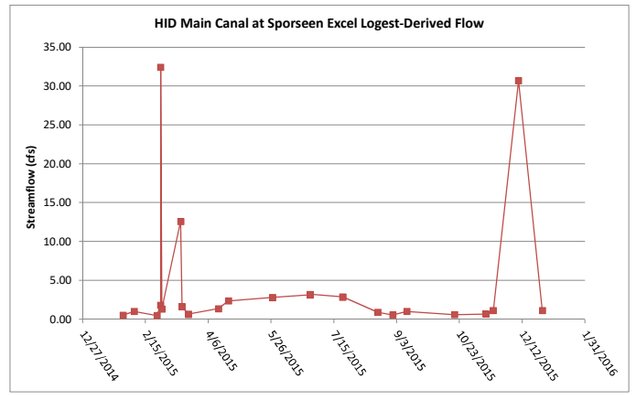
Date	Flow (cfs)	Stage	Log equation From Chart	Excel Logest function
3/16/2015	2.7	0.64	1.575	1.61
2/6/2015	1.1	0.46	0.825	0.97
3/21/2015	0.5	0.32	0.499	0.66
5/27/2015	2.2	0.84	3.230	2.80
6/26/2015	4	0.88	3.728	3.13
7/22/2015	2	0.85	3.348	2.88



Curve

Formula: y = b*m^x
b = 16.16557
m = 0.27070

16.16557 0.27070331



0.2785
0.5135

For charting

Date	Time	Flow rate cfs	Stage height	Data Quali	Result Metho	Field comment		From log equation in chart	Excel Logest function
1/28/2015	1/28/2015	12:50	0.25		STAGE-SG	- - -	ft	0.388	0.54
2/6/2015	2/6/2015	10:44	0.47		STAGE-SG	- - -	ft	0.855	1.00
2/24/2015	2/24/2015	11:15	0.2		STAGE-SG	- Dry - -	ft	0.324	0.47
2/27/2015	2/27/2015	08:53	0.68		STAGE-SG	Steady rain and lightning - - - - storm-rel	ft	1.818	1.80
2/27/2015	2/27/2015	13:20	1.72		STAGE-SG	Steady rain and lightning - - - - storm-rel	ft	76.107	32.45
2/28/2015	2/28/2015	16:05	0.57		STAGE-SG	- Small amount of rain last 12 hours - -	ft	1.225	1.32
3/15/2015	3/15/2015	18:50	1.38		STAGE-SG	- - - - storm-related sample	ft	22.450	12.60
3/16/2015	3/16/2015	09:30	0.64		STAGE-SG	- - - - storm-related sample	ft	1.575	1.61
3/16/2015	3/16/2015	09:40	0.64		STAGE-SG	- - - - storm-related sample	ft	1.575	1.61
3/21/2015	3/21/2015	11:25	0.32		STAGE-SG	- - -	ft	0.499	0.66
3/21/2015	3/21/2015	12:30	0.32		STAGE-SG	- - -	ft	0.499	0.66
4/14/2015	4/14/2015	13:15	0.58		STAGE-SG	- - -	ft	1.270	1.36
4/22/2015	4/22/2015	10:15	0.78		STAGE-SG	- - -	ft	2.604	2.37
5/27/2015	5/27/2015	12:15	0.84		STAGE-SG	- - -	ft	3.230	2.80
5/27/2015	5/27/2015	12:53	0.84		STAGE-SG	- - -	ft	3.230	2.80
6/26/2015	6/26/2015	11:10	0.88		STAGE-SG	- - -	ft	3.728	3.13
6/26/2015	6/26/2015	11:35	0.89		STAGE-SG	- - -	ft	3.865	3.22
7/22/2015	7/22/2015	10:30	0.85		STAGE-SG	- - -	ft	3.348	2.88
7/22/2015	7/22/2015	10:54	0.85		STAGE-SG	- - -	ft	3.348	2.88
8/19/2015	8/19/2015	08:50	0.43		STAGE-SG	- - -	ft	0.741	0.90
8/31/2015	8/31/2015	15:35	0.26		STAGE-SG	- - - - storm-related sample	ft	0.402	0.56
9/11/2015	9/11/2015	09:50	0.47		STAGE-SG	- - -	ft	0.855	1.00
10/19/2015	10/19/2015	13:34	0.28		STAGE-SG	- - -	ft	0.432	0.59
11/13/2015	11/13/2015	14:15	0.33		STAGE-SG	- - - - storm-related sample	ft	0.517	0.68
11/19/2015	11/19/2015	10:25	0.51		STAGE-SG	- - -	ft	0.988	1.12
12/9/2015	12/9/2015	09:40	1.7		STAGE-SG	- - - - storm-related sample	ft	70.833	30.70
12/28/2015	12/28/2015	12:35	0.51		STAGE-SG	- - -	ft	0.988	1.12

All data for site

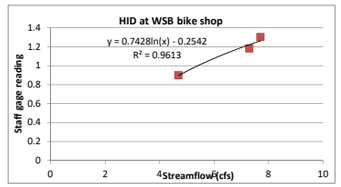
Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment		
12/16/2014	12:30 need to calc				Flow meter	Training day - data still valid. Original site but ok since just flow.		
1/8/2015	09:00		0.64		STAGE-SG	- - Original installation. Moved on 1/28/15. -	ft	Staff gage in vulnerable spot her
1/13/2015	08:30		0.26		STAGE-SG	- - Hard rain I week ago. One night of sporadic rain since. -	ft	
1/17/2015	19:50		0.44		STAGE-SG	- - -	ft	
1/18/2015	15:50		0.52		STAGE-SG	- - -	ft	
1/21/2015	14:25	0		FD	SWFMFLOAT	- - -	cfs	
1/28/2015	12:50		0.25		STAGE-SG	- - -	ft	New location for staff
2/6/2015	10:44		0.47		STAGE-SG	- - -	ft	
2/6/2015	11:55	1.1			SWFMC	Storms were through. Nerver rained and it was sunny. - - - - storm-relatec	cfs	
2/24/2015	11:15		0.2		STAGE-SG	- Dry - -	ft	
2/27/2015	08:53		0.68		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	
2/27/2015	13:20		1.72		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	
2/28/2015	16:05		0.57		STAGE-SG	- Small amount of rain last 12 hours - -	ft	
3/15/2015	18:50		1.38		STAGE-SG	- - - - storm-related sample	ft	
3/16/2015	09:30	2.7			SWFMFLOAT	- - - - storm-related sample	cfs	
3/16/2015	09:30		0.64		STAGE-SG	- - - - storm-related sample	ft	
3/16/2015	09:40		0.64		STAGE-SG	- - - - storm-related sample	ft	
3/21/2015	11:25	0.5			SWFMC	- - -	cfs	
3/21/2015	11:25		0.32		STAGE-SG	- - -	ft	
3/21/2015	12:30		0.32		STAGE-SG	- - -	ft	
4/14/2015	13:15		0.58		STAGE-SG	- - -	ft	
4/22/2015	10:15		0.78		STAGE-SG	- - -	ft	
5/27/2015	12:15		0.84		STAGE-SG	- - -	ft	
5/27/2015	12:45	2.2			SWFMC	- - -	cfs	
5/27/2015	12:53		0.84		STAGE-SG	- - -	ft	
6/26/2015	11:10	4			SWFMC	- - -	cfs	
6/26/2015	11:10		0.88		STAGE-SG	- - -	ft	
6/26/2015	11:35		0.89		STAGE-SG	- - -	ft	
7/22/2015	10:30	2			SWFMC	- - -	cfs	
7/22/2015	10:30		0.85		STAGE-SG	- - -	ft	
7/22/2015	10:54		0.85		STAGE-SG	- - -	ft	
8/19/2015	08:50		0.43		STAGE-SG	- - -	ft	
8/29/2015	10:00	0.5			SWFMC	- - - - storm-related sample	cfs	Flow calc checked. No staff readi
8/31/2015	15:35		0.26		STAGE-SG	- - - - storm-related sample	ft	
9/11/2015	09:50		0.47		STAGE-SG	- - -	ft	
10/19/2015	13:34		0.28		STAGE-SG	- - -	ft	
11/13/2015	14:15		0.33		STAGE-SG	- - - - storm-related sample	ft	
11/19/2015	10:25		0.51		STAGE-SG	- - -	ft	
12/9/2015	09:40		1.7		STAGE-SG	- - - - storm-related sample	ft	
12/28/2015	12:35		0.51		STAGE-SG	- - -	ft	

e - needed to move.

ing.

Date	Flow (cfs)	Stage	Log equation From Chart	From Excel Logest function
3/15/2015	7.3	1.18	7.195	6.88
3/16/2015*	4.7	0.9	5.959	4.79
12/9/2015	7.7	1.3	7.801	8.03

*Stage reading remembered at 0.90 per field sheets



Curve

Formula: y = b*m^x
b = 3.64776
m = 1.49309

3.64776178 1.493095

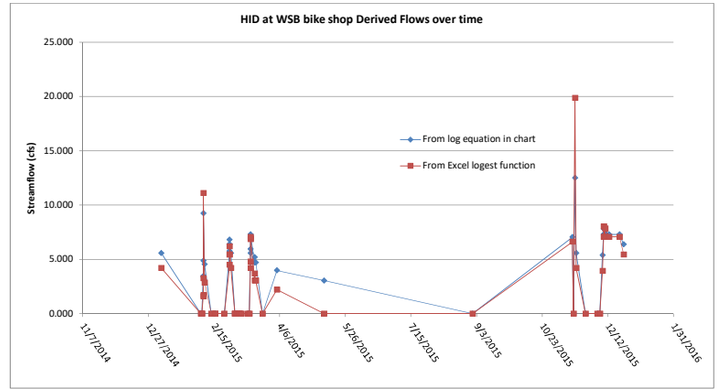
1.485
-1.7505

For Charting

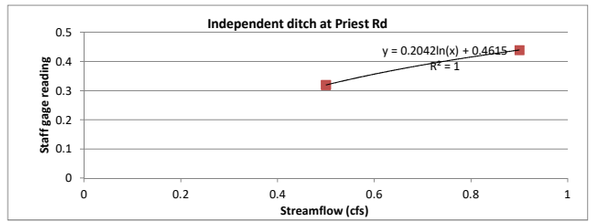
Date	Time	Flow rate cfm	Stage height	Data Qualifier		From log equation in chart	From Excel Logest function
1/6/2015	1/6/2015	11:00	0.8		ft	5.571	4.20
2/5/2015	2/5/2015	17:48	0	FD	cfs	0.000	0.00
2/6/2015	2/6/2015	07:26	0	FD	cfs	0.000	0.00
2/6/2015	2/6/2015	13:50	0	FD	cfs	0.000	0.00
2/7/2015	2/7/2015	07:16	0.1		ft	3.477	1.70
2/7/2015	2/7/2015	12:00	0.05		ft	3.362	1.59
2/7/2015	2/7/2015	13:06	0.6		ft	4.869	3.25
2/7/2015	2/7/2015	18:01	1.55		ft	9.231	11.10
2/8/2015	2/8/2015	07:18	0.5		ft	4.552	2.85
2/13/2015	2/13/2015	10:30	0	FD	cfs	0.000	0.00
2/16/2015	2/16/2015	09:30	0	FD	cfs	0.000	0.00
2/16/2015	2/16/2015	16:10	0	FD	cfs	0.000	0.00
2/23/2015	2/23/2015	09:15	0	FD	cfs	0.000	0.00
2/27/2015	2/27/2015	07:44	0.85		ft	5.761	4.49
2/27/2015	2/27/2015	09:30	1		ft	6.374	5.45
2/27/2015	2/27/2015	13:11	1		ft	6.374	5.45
2/27/2015	2/27/2015	16:07	1.1		ft	6.818	6.20
2/28/2015	2/28/2015	07:20	0.8		ft	5.571	4.20
3/3/2015	3/3/2015	07:58	0	FD	cfs	0.000	0.00
3/3/2015	3/3/2015	18:26	0	FD	cfs	0.000	0.00
3/5/2015	3/5/2015	09:30	0	FS	cfs	0.000	0.00
3/6/2015	3/6/2015	09:15	0	FS	cfs	0.000	0.00
3/7/2015	3/7/2015	09:04	0	FD	cfs	0.000	0.00
3/8/2015	3/8/2015	09:30	0	FD	cfs	0.000	0.00
3/13/2015	3/13/2015	08:50	0	FD	cfs	0.000	0.00
3/14/2015	3/14/2015	10:15	0	FD	cfs	0.000	0.00
3/15/2015	3/15/2015	11:10	0.8		ft	5.571	4.20
3/15/2015	3/15/2015	11:10	0.9		ft	5.959	4.79
3/15/2015	3/15/2015	18:00	1.18		ft	7.195	6.88
3/15/2015	3/15/2015	18:25	1.18		ft	7.195	6.88
3/15/2015	3/15/2015	19:25	1.2		ft	7.293	7.06
3/18/2015	3/18/2015	08:58	0.55		ft	4.708	3.04
3/18/2015	3/18/2015	10:15	0.7		ft	5.208	3.69
3/19/2015	3/19/2015	13:30	0.55		ft	4.708	3.04
3/24/2015	3/24/2015	08:39	0	FD	cfs	0.000	0.00
4/4/2015	4/4/2015	10:00	0.3		ft	3.978	2.20
5/10/2015	5/10/2015	10:15	-0.1		ft	3.039	0.00
8/31/2015	8/31/2015	14:35	0	FD	cfs	0.000	0.00
11/15/2015	11/15/2015	08:18	1.15		ft	7.051	6.61
11/16/2015	11/16/2015	13:55	0	FD	cfs	0.000	0.00
11/17/2015	11/17/2015	19:00	2		ft	12.498	19.87
11/18/2015	11/18/2015	07:52	0.8		ft	5.571	4.20
11/25/2015	11/25/2015	11:15	0	FD	cfs	0.000	0.00
12/4/2015	12/4/2015	08:13	0	FD	cfs	0.000	0.00
12/6/2015	12/6/2015	17:56	0	FD	cfs	0.000	0.00
12/8/2015	12/8/2015	17:56	0.75		ft	5.386	3.94
12/9/2015	12/9/2015	07:21	1.2		ft	7.293	7.06
12/9/2015	12/9/2015	09:12	1.2		ft	7.293	7.06
12/9/2015	12/9/2015	11:31	1.3		ft	7.801	8.03
12/9/2015	12/9/2015	11:45	1.3		ft	7.801	8.03
12/10/2015	12/10/2015	08:09	1.2		ft	7.293	7.06
12/10/2015	12/10/2015	11:30	1.28		ft	7.696	7.82
12/13/2015	12/13/2015	07:49	1.2		ft	7.293	7.06
12/21/2015	12/21/2015	15:55	1.2		ft	7.293	7.06
12/24/2015	12/24/2015	07:21	1		ft	6.374	5.45

All data for site

Date	Time	Flow rate cfm	Stage height	Data Qualifier	Result Method	Field comment		
########	10:45	1.6			Floating	Training but data still valid	cfs	Ann: Keep this flow in mind when interpreting.
1/6/2015	11:00		0.8		STAGE-SG	- - -	ft	
2/5/2015	17:48	0		FD	SWFMFLOAT	- - -	cfs	
2/6/2015	07:26	0		FD	SWFMFLOAT	- - -	cfs	
2/6/2015	13:50	0		FD	SWFMFLOAT	- - -	cfs	
2/7/2015	07:16		0.1		STAGE-SG	- - -	ft	
2/7/2015	12:00		0.05		STAGE-SG	- - -	ft	
2/7/2015	13:06		0.6		STAGE-SG	- - -	ft	
2/7/2015	18:01		1.55		STAGE-SG	- - -	ft	
2/8/2015	07:18		0.5		STAGE-SG	- - -	ft	
2/13/2015	10:30	0		FD	SWFMFLOAT	- - -	cfs	
2/16/2015	09:30	0		FD	SWFMFLOAT	- - -	cfs	
2/16/2015	16:10	0		FD	SWFMFLOAT	- - -	cfs	
2/23/2015	09:15	0		FD	SWFMFLOAT	- - -	cfs	
2/27/2015	07:44		0.85		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	
2/27/2015	09:30		1		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	
2/27/2015	13:11		1		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	
2/27/2015	16:07		1.1		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft	
2/28/2015	07:20		0.8		STAGE-SG	- - -	ft	
3/3/2015	07:58	0		FD	SWFMFLOAT	- - -	cfs	
3/3/2015	18:26	0		FD	SWFMFLOAT	- - -	cfs	
3/5/2015	09:30	0		FS	SWFMFLOAT	- - Clear sunny day. -	cfs	
3/6/2015	09:15	0		FS	SWFMFLOAT	- - Clear sunny day. -	cfs	
3/7/2015	09:04	0		FD	SWFMFLOAT	- - -	cfs	
3/8/2015	09:30	0		FD	SWFMFLOAT	- - Clear sunny day. -	cfs	
3/13/2015	08:50	0		FD	SWFMFLOAT	- - -	cfs	
3/14/2015	10:15	0		FD	SWFMFLOAT	- - Clear sunny day. -	cfs	
3/15/2015	11:10		0.8		STAGE-SG	- - Rain all day. -	ft	
3/15/2015	11:10		0.9		STAGE-SG	- - - - storm-related sample	ft	
3/15/2015	18:00	7.3			SWFMC	- - - - storm-related sample	cfs	
3/15/2015	18:00		1.18		STAGE-SG	- - - - storm-related sample	ft	
3/15/2015	18:25		1.18		STAGE-SG	- - - - storm-related sample	ft	
3/15/2015	19:25		1.2		STAGE-SG	- - - - storm-related sample	ft	
3/16/2015	08:55	4.7			SWFMC	- - - - storm-related sample	cfs	
3/18/2015	08:58		0.55		STAGE-SG	- - -	ft	
3/18/2015	10:15		0.7		STAGE-SG	- - No rain. -	ft	
3/19/2015	13:30		0.55		STAGE-SG	- - No rain. -	ft	
3/24/2015	08:39	0		FD	SWFMFLOAT	- - -	cfs	
4/4/2015	10:00		0.3		STAGE-SG	- - -	ft	
5/10/2015	10:15		-0.1		STAGE-SG	- - -	ft	
8/31/2015	14:35	0		FD	SWFMFLOAT	- - - - storm-related sample	cfs	
11/15/201	08:18		1.15		STAGE-SG	- - -	ft	
11/16/201	13:55	0		FD	SWFMFLOAT	- - -	cfs	
11/17/201	19:00		2		STAGE-SG	- - -	ft	
11/18/201	07:52		0.8		STAGE-SG	- - -	ft	
11/25/201	11:15	0		FD	SWFMFLOAT	- - -	cfs	
12/4/2015	08:13	0		FD	SWFMFLOAT	- - -	cfs	
12/6/2015	17:56	0		FD	SWFMFLOAT	- - -	cfs	
12/8/2015	17:56		0.75		STAGE-SG	- - -	ft	
12/9/2015	07:21		1.2		STAGE-SG	- - -	ft	
12/9/2015	09:12		1.2		STAGE-SG	- - -	ft	
12/9/2015	11:31	7.7		EST	SWFMFLOAT	- - - - storm-related sample	cfs	
12/9/2015	11:31		1.3		STAGE-SG	- - - - storm-related sample	ft	
12/9/2015	11:45		1.3		STAGE-SG	- - - - storm-related sample	ft	
12/10/201	08:09		1.2		STAGE-SG	- - -	ft	
12/10/201	11:30		1.28		STAGE-SG	- Raining - - - storm-related sample	ft	
12/13/201	07:49		1.2		STAGE-SG	- - -	ft	
12/21/201	15:55		1.2		STAGE-SG	- - -	ft	
12/24/201	07:21		1		STAGE-SG	- - -	ft	



Date	Flow (cfs)	Stage	Log equation From Chart	From Excel logest funtion
8/25/2015	0.9	0.44	0.900	0.90
9/21/2015	0.5	0.32	0.500	0.50
11/13/2015	0.5	0.32	0.500	0.50



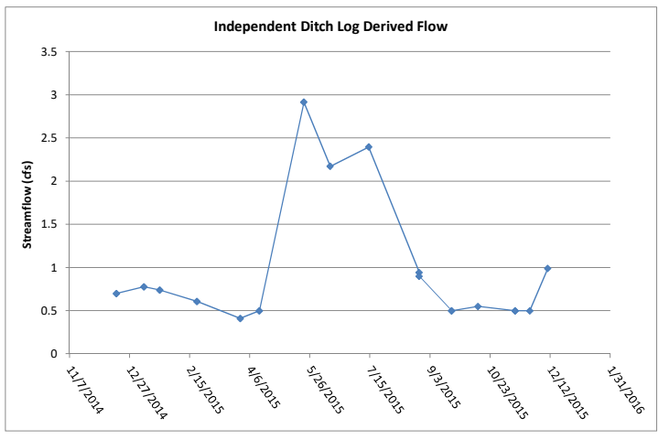
Curve	
Formula:	y = b*m^x
b =	134.05125
m =	0.10429

134.0513 0.10429016

0.2042
0.4615

For charting

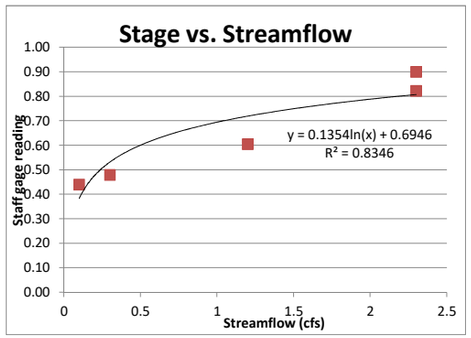
	Date	Time	Flow rate c	Stage height	Data Qualifie	Result Method	Field comment		From log equation in chart	From Excel logest funtion	
12/16/2014	12/16/2014	14:15	0.7						0.7		(no stage available)
1/8/2015	1/8/2015	10:50		0.41		STAGE-SG	- - -	ft	0.777	0.78	
1/21/2015	1/21/2015	09:35		0.4		STAGE-SG	- - -	ft	0.740	0.74	
2/21/2015	2/21/2015	12:30		0.36		STAGE-SG	- - -	ft	0.608	0.61	
3/29/2015	3/29/2015	10:05		0.28		STAGE-SG	- - -	ft	0.411	0.41	
4/14/2015	4/14/2015	12:40		0.32		STAGE-SG	- - 2 days ago flow lower; some streambead	ft	0.500	0.50	
5/21/2015	5/21/2015	10:46		0.68		STAGE-SG	- - -	ft	2.915	2.92	
6/12/2015	6/12/2015	12:23		0.62		STAGE-SG	- - -	ft	2.173	2.17	
7/14/2015	7/14/2015	12:34		0.64		STAGE-SG	- - -	ft	2.397	2.40	
8/25/2015	8/25/2015	13:05		0.45		STAGE-SG	- No rain within 12 hours. - -	ft	0.945	0.95	
8/25/2015	8/25/2015	13:35		0.44		STAGE-SG	- No rain within 12 hours. - -	ft	0.900	0.90	
9/21/2015	9/21/2015	14:43		0.32		STAGE-SG	- - -	ft	0.500	0.50	
9/21/2015	9/21/2015			0.32		STAGE-SG	- - -	ft	0.500	0.50	
10/13/2015	10/13/2015	10:05		0.34		STAGE-SG	- - -	ft	0.552	0.55	
11/13/2015	11/13/2015	13:00		0.32		STAGE-SG	- - - - storm-related sample	ft	0.500	0.50	
11/13/2015	11/13/2015	13:27		0.32		STAGE-SG	- - - - storm-related sample	ft	0.500	0.50	
11/25/2015	11/25/2015	10:00		0.32		STAGE-SG	- - -	ft	0.500	0.50	
12/10/2015	12/10/2015	10:07		0.46		STAGE-SG	- Raining - - - storm-related sample	ft	0.993	0.99	



All data for site

Date	Time	Flow rate c	Stage height	Data Qualifie	Result Method	Field comment	
12/16/2014	14:15	0.7			Floating	Training run but valid data	cfs
1/8/2015	10:50		0.41		STAGE-SG	- - -	ft
1/21/2015	09:35		0.4		STAGE-SG	- - -	ft
2/21/2015	12:30		0.36		STAGE-SG	- - -	ft
3/29/2015	10:05		0.28		STAGE-SG	- - -	ft
4/14/2015	12:40		0.32		STAGE-SG	- - 2 days ago flow lower; some streambead	ft
5/21/2015	10:46		0.68		STAGE-SG	- - -	ft
6/12/2015	12:23		0.62		STAGE-SG	- - -	ft
7/14/2015	12:34		0.64		STAGE-SG	- - -	ft
8/25/2015	13:05		0.45		STAGE-SG	- No rain within 12 hours. - -	ft
8/25/2015	13:09	0.9			SWFMC	- No rain within 12 hours. - -	cfs
8/25/2015	13:09		0.44		STAGE-SG	- No rain within 12 hours. - -	ft
8/25/2015	13:35		0.44		STAGE-SG	- No rain within 12 hours. - -	ft
9/21/2015	14:43	0.5			SWFMC	- - -	cfs
9/21/2015	14:43		0.32		STAGE-SG	- - -	ft
9/21/2015			0.32		STAGE-SG	- - -	ft
10/13/2015	10:05		0.34		STAGE-SG	- - -	ft
11/13/2015	13:00		0.32		STAGE-SG	- - - - storm-related sample	ft
11/13/2015	13:10	0.5			SWFMC	- - - - storm-related sample	cfs
11/13/2015	13:27		0.32		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	10:00		0.32		STAGE-SG	- - -	ft
12/10/2015	10:07		0.46		STAGE-SG	- Raining - - - storm-related sample	ft
12/22/2015	12:58	0		FD	SWFMFLOAT	- Dry, but lots of rain yesterday - -	cfs

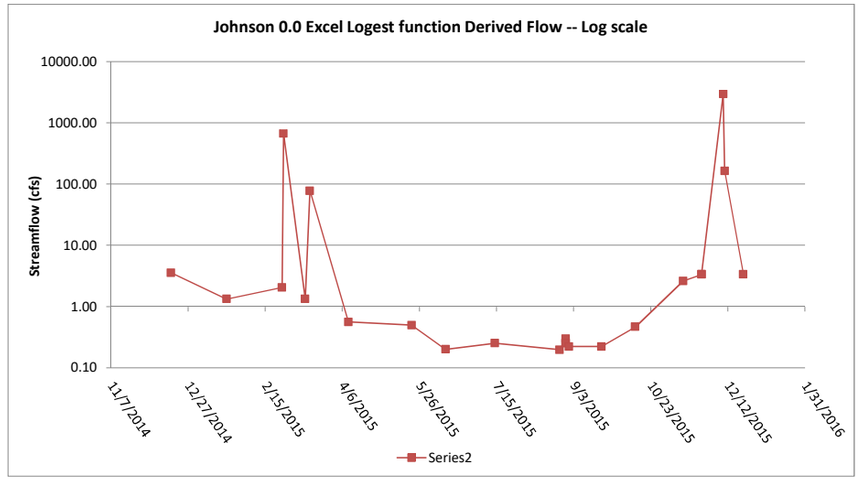
Date	Flow (cfs)	Stage STAFF	Log equation From Chart	From Excel logest funtion
2/26/2015	2.3	0.82	2.583	2.09
4/10/2015	1.2	0.61	0.518	0.55
8/25/2015	0.1	0.44	0.153	0.20
8/29/2015	0.3	0.48	0.205	0.25
11/25/2015	2.3	0.9	4.558	3.36



Curve	
Formula:	y = b*m^x
b =	475.22695
m =	0.01308

475.226945 0.0130826

0.1354
0.6946



For charting

	Date	Time	Flow rate cfs	Stage height	Data Qualifier		From log equation in chart	From Excel logest funtion
12/16/2014	12/16/2014	9:40	3.57				0.006	3.57
1/21/2015	1/21/2015	11:19		0.75	EST	ft	1.506	1.33
2/26/2015	2/26/2015	11:30	2.3	0.82		cfs	2.525	2.05
2/27/2015	2/27/2015	13:10		1.76	EST	ft	2613.741	673.04
3/13/2015	3/13/2015	10:13		0.75	EST	ft	1.506	1.33
3/16/2015	3/16/2015	10:45		1.41	EST	ft	197.079	77.83
4/10/2015	4/10/2015	12:05	1.2	0.61		cfs	0.535	0.56
5/21/2015	5/21/2015	09:31		0.59	EST	ft	0.462	0.50
6/12/2015	6/12/2015	09:41	0.2			cfs	0.200	0.20
7/14/2015	7/14/2015	09:56		0.48	EST	ft	0.205	0.25
8/25/2015	8/25/2015	10:27	0.1	0.44		cfs	0.153	0.20
8/29/2015	8/29/2015	11:20	0.3			cfs	0.300	0.30
8/29/2015	8/29/2015	11:20		0.48		ft	0.205	0.25
8/29/2015	8/29/2015	11:20		0.48		ft	0.205	0.25
8/31/2015	8/31/2015	14:56		0.46		ft	0.177	0.22
9/21/2015	9/21/2015	13:38		0.46		ft	0.177	0.22
10/13/2015	10/13/2015	11:03		0.58		ft	0.429	0.47
11/13/2015	11/13/2015	11:50		0.86		ft	3.392	2.62
11/25/2015	11/25/2015	11:50	2.3	0.9		cfs	4.558	3.36
11/25/2015	11/25/2015	11:50		0.9		ft	4.558	3.36
12/9/2015	12/9/2015	11:58		2		ft	15383.696	2954.58
12/10/2015	12/10/2015	11:12		1.53		ft	478.123	163.06
12/22/2015	12/22/2015	11:05		0.9		ft	4.558	3.36

All data for site

	Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment	
12/16/2014	12/16/2014	9:40	3.57			Flow meter	Training day but still valid	
1/21/2015	1/21/2015	11:19		0.75	EST	STAGE-SG	- - -	ft
1/26/2015	2/26/2015	09:40		0.05	EST	STAGE-SG	- Dry and cool - -	ft
2/26/2015	2/26/2015	11:30	2.3			SWFMC	- Dry and cool - -	cfs
2/27/2015	2/27/2015	13:10		1.76	EST	STAGE-SG	Steady rain and lightning - - - - storm-related	ft
3/13/2015	3/13/2015	10:13		0.75	EST	STAGE-SG	- - -	ft
3/16/2015	3/16/2015	10:45		1.41	EST	STAGE-SG	- - - - storm-related sample	ft
4/10/2015	4/10/2015	12:05	1.2			SWFMC	- - -	cfs
4/10/2015	4/10/2015	12:39		0.61	EST	STAGE-SG	- - -	ft
5/21/2015	5/21/2015	09:31		0.59	EST	STAGE-SG	- - -	ft
6/12/2015	6/12/2015	09:41	0.2			SWFMC	- - -	cfs
7/14/2015	7/14/2015	09:56		0.48	EST	STAGE-SG	- - -	ft
8/25/2015	8/25/2015	10:27	0.1			SWFMC	- No rain within 12 hours. - -	cfs
8/25/2015	8/25/2015	10:27		0.44		STAGE-SG	- No rain within 12 hours. - -	ft
8/25/2015	8/25/2015	10:27		0.44		STAGE-SG	- No rain within 12 hours. - -	ft
8/29/2015	8/29/2015	11:20	0.3			SWFMC	- - - - storm-related sample	cfs
8/29/2015	8/29/2015	11:20		0.48		STAGE-SG	- - - - storm-related sample	ft
8/29/2015	8/29/2015	11:20		0.48		STAGE-SG	- - - - storm-related sample	ft
8/31/2015	8/31/2015	14:56		0.46		STAGE-SG	- - - - storm-related sample	ft
9/21/2015	9/21/2015	13:38		0.46		STAGE-SG	- - -	ft
10/13/2015	10/13/2015	11:03		0.58		STAGE-SG	- - -	ft
11/13/2015	11/13/2015	11:50		0.86		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	11/25/2015	11:50	2.3			SWFMC	- - -	cfs
11/25/2015	11/25/2015	11:50		0.9		STAGE-SG	- - -	ft
11/25/2015	11/25/2015	11:50		0.9		STAGE-SG	- - -	ft
12/9/2015	12/9/2015	11:58		2		STAGE-SG	- - - - storm-related sample	ft
12/10/2015	12/10/2015	11:12		1.53		STAGE-SG	- Raining - - - storm-related sample	ft
12/22/2015	12/22/2015	11:05		0.9		STAGE-SG	- Dry, but lots of rain yesterday - -	ft

Date	Flow (cfs)	Stage
		N/A

No good measuring point for stage

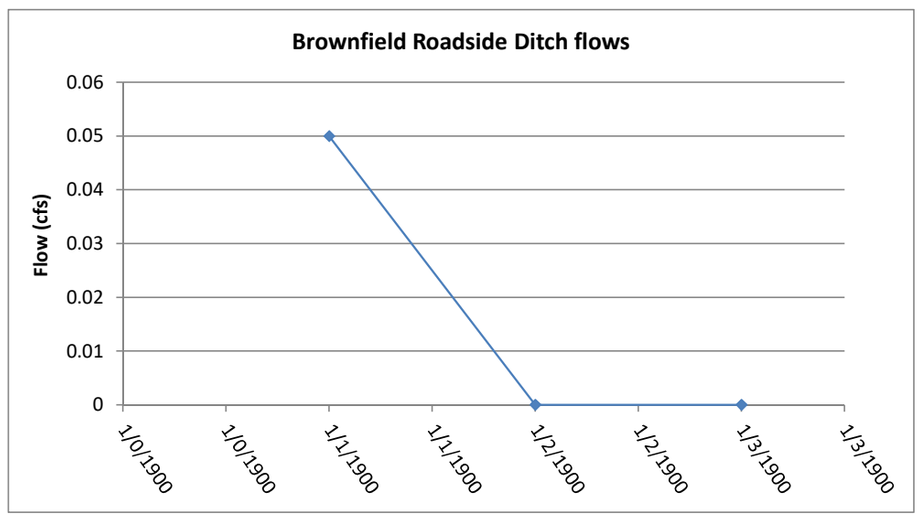
Very limited number of observations/measurements

For Charting

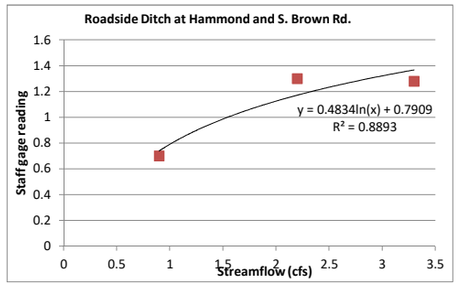
	Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment
12/16/2014	12/16/2014	10:30	0.05		est		single point velocity method
8/31/2015	8/31/2015		**0**				
11/13/2015	11/13/2015		**0**				

All data for site

Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment	
12/16/2014	10:30	0.05		est		single point velocity method	
8/31/2015	14:25	**0**		FD	SWFMFLOAT	- storm-related sample	**cfs**
11/13/2015	12:00	**0**		FD	SWFMFLOAT	- storm-related sample	**cfs**



Date	Flow (cfs)	Stage	Log equation From Chart	From Excel Logest function
3/16/2015	3.3	1.28	2.751	2.64
12/10/2015	2.2	1.3	2.867	2.73
12/28/2015	0.9	0.7	0.829	0.91



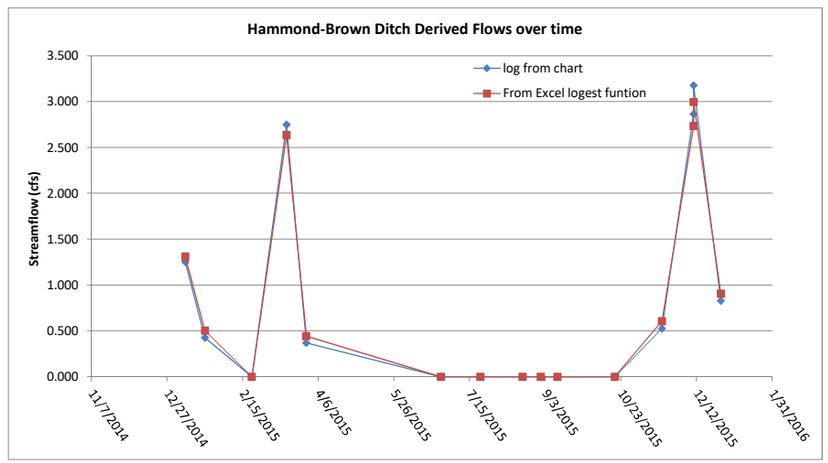
Curve	
Formula:	y = b*m^x
b =	6.29341
m =	0.25019

6.29341 0.25019

0.4834
0.7909

For Chart

Date	Time	Flow rate cfm	Stage height	Data Qualifier	Result Method	Field comment		From log equation in chart	From Excel Logest function
1/8/2015	1/6/2015 11:50		0.9		STAGE-SG	- - -	ft	1.253	1.31
1/21/2015	1/21/2015 09:12		0.38		STAGE-SG	- - -	ft	0.427	0.50
2/21/2015	2/21/2015 11:12	0		FD	SWFMFLOAT	- - -	cfs	0.000	0.00
3/16/2015	3/16/2015 10:36		1.28		STAGE-SG	- - - - storm-related sample	ft	2.751	2.64
3/29/2015	3/29/2015 09:20		0.31		STAGE-SG	- - -	ft	0.370	0.44
6/26/2015	6/26/2015 08:34	0		FD	SWFMFLOAT	- - -	cfs	0.000	0.00
7/22/2015	7/22/2015 07:36	0		FD	SWFMFLOAT	- - -	cfs	0.000	0.00
8/19/2015	8/19/2015 08:30	0		FD	SWFMFLOAT	- - -	cfs	0.000	0.00
8/31/2015	8/31/2015 14:32	0		FD	SWFMFLOAT	- - - - storm-related sample	cfs	0.000	0.00
9/11/2015	9/11/2015 09:00	0		FD	SWFMFLOAT	- - -	cfs	0.000	0.00
10/19/2015	10/19/2015 12:48	0		FD	SWFMFLOAT	- - -	cfs	0.000	0.00
11/19/2015	11/19/2015 10:00		0.48		STAGE-SG	- - -	ft	0.526	0.60
12/10/2015	12/10/2015 09:00		1.3		STAGE-SG	- Rain - - - storm-related sample	ft	2.867	2.73
12/10/2015	12/10/2015 09:35		1.35		STAGE-SG	- Rain - - - storm-related sample	ft	3.179	3.00
12/28/2015	12/28/2015 10:50		0.7		STAGE-SG	- - -	ft	0.829	0.91

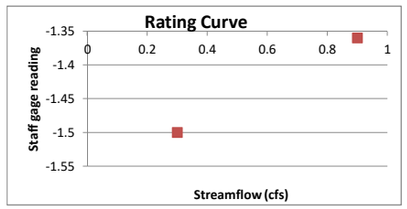


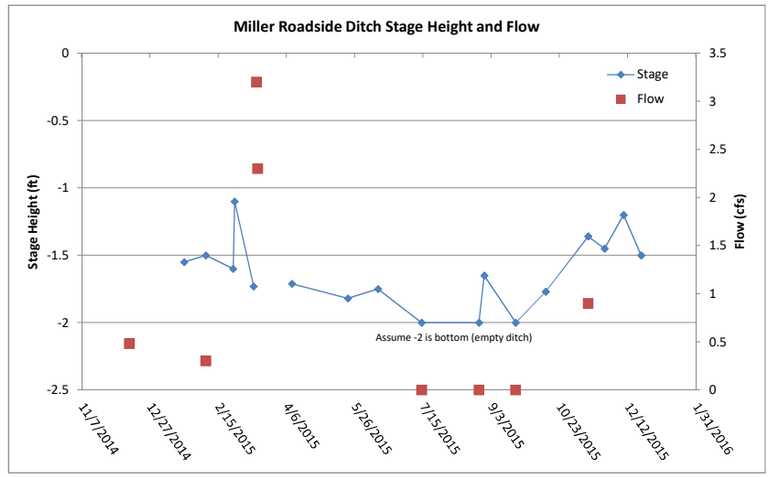
All data for site

Date	Time	Flow rat	Stage heig	Data Quali	Result Method	Field comment	
12/16/2014	10:05	0	0			No flow	
1/6/2015	11:50		0.9		STAGE-SG	- - -	ft
1/21/2015	09:12		0.38		STAGE-SG	- - -	ft
2/21/2015	11:12	0		FD	SWFMFLOAT	- - -	cfs
3/16/2015	10:15	3.3			SWFMC	- - - - storm-related sample	cfs
3/16/2015	10:36		1.28		STAGE-SG	- - - - storm-related sample	ft
3/29/2015	09:20		0.31		STAGE-SG	- - -	ft
6/26/2015	08:34	0		FD	SWFMFLOAT	- - -	cfs
7/22/2015	07:36	0		FD	SWFMFLOAT	- - -	cfs
8/19/2015	08:30	0		FD	SWFMFLOAT	- - -	cfs
8/31/2015	14:32	0		FD	SWFMFLOAT	- - - - storm-related sample	cfs
9/11/2015	09:00	0		FD	SWFMFLOAT	- - -	cfs
10/19/2015	12:48	0		FD	SWFMFLOAT	- - -	cfs
11/19/2015	10:00		0.48		STAGE-SG	- - -	ft
12/10/2015	09:00	2.2			SWFMC	- Rain - - - storm-related sample	cfs
12/10/2015	09:00		1.3		STAGE-SG	- Rain - - - storm-related sample	ft
12/10/2015	09:35		1.35		STAGE-SG	- Rain - - - storm-related sample	ft
12/28/2015	10:50	0.9			SWFMC	- - -	cfs
12/28/2015	10:50		0.7		STAGE-SG	- - -	ft
12/28/2015	11:40	0.72			RATING	- - -	cfs

Date	Flow (cfs)	Stage
2/6/2015	0.3	-1.5
11/13/2015	0.9	-1.36

Flows not derived due to lack of pairs to generate line equation.





For Charting

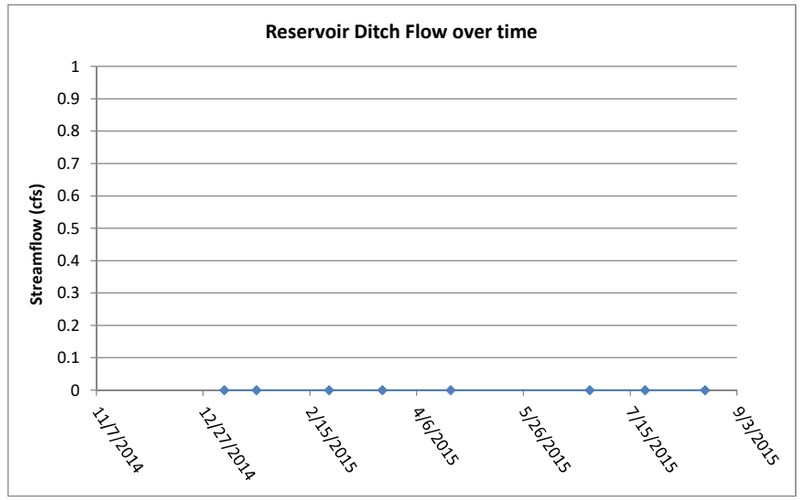
Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment	
12/12/2014		0.48					
1/21/2015	1/21/2015	12:05		-1.55		STAGE-SG	- - - ft
2/6/2015	2/6/2015		0.3	-1.5		STAGE-SG	Storms were through. Nerver rained and it was sunny. - - - - ft
2/26/2015	2/26/2015	11:02		-1.6		STAGE-SG	- Dry and cool - - ft
2/27/2015	2/27/2015	14:10		-1.1		STAGE-SG	Steady rain and lightning - - - - storm-related sample ft
3/13/2015	3/13/2015	10:40		-1.73		STAGE-SG	- - - ft
3/15/2015			3.2				
3/16/2015			2.3				
4/10/2015	4/10/2015	13:09		-1.71		STAGE-SG	- - - ft
5/21/2015	5/21/2015	09:59		-1.82		STAGE-SG	- - - ft
6/12/2015	6/12/2015	10:41		-1.75		STAGE-SG	- - - ft
7/14/2015	7/14/2015	10:21	0	-2	FD	SWFMFLOAT	- - - cfs
8/25/2015	8/25/2015	11:58	0	-2	FD	SWFMFLOAT	- No rain within 12 hours. - - cfs
8/29/2015	8/29/2015	09:06		-1.65		STAGE-SG	- - - - storm-related sample ft
9/21/2015	9/21/2015	14:05	0	-2	FD	SWFMFLOAT	- - - cfs
10/13/2015	10/13/2015	10:38		-1.77		STAGE-SG	- - - ft
11/13/2015	11/13/2015	12:20	0.9	-1.36		STAGE-SG	- - - - storm-related sample ft
11/25/2015	11/25/2015	13:12		-1.45		STAGE-SG	- - - ft
12/9/2015	12/9/2015	09:06		-1.2		STAGE-SG	- - - - storm-related sample ft
12/22/2015	12/22/2015	11:48		-1.5		STAGE-SG	- Dry, but lots of rain yesterday - - ft

All data for site

Date	Time	Flow rat	Stage heig	Data Quali	Result Method	Field comment	
12/12/2014	13:45	0.48			Flow meter	Training run but data still valid	
1/21/2015	12:05		-1.55		STAGE-SG	- - -	ft
2/6/2015	14:40	0.3			SWFMC	Storms were through. Nerver rained and it was sunny. - - - -	cfs
2/6/2015			-1.5		STAGE-SG	Storms were through. Nerver rained and it was sunny. - - - -	ft
2/26/2015	11:02		-1.6		STAGE-SG	- Dry and cool - -	ft
2/27/2015	14:10		-1.1		STAGE-SG	Steady rain and lightning - - - - storm-related sample	ft
3/13/2015	10:40		-1.73		STAGE-SG	- - -	ft
3/15/2015	14:30	3.2			SWFMFLOAT	- - - - storm-related sample	cfs
3/16/2015	08:45	2.3			SWFMFLOAT	- - - - storm-related sample	cfs
4/10/2015	13:09		-1.71		STAGE-SG	- - -	ft
5/21/2015	09:59		-1.82		STAGE-SG	- - -	ft
6/12/2015	10:41		-1.75		STAGE-SG	- - -	ft
7/14/2015	10:21	0		FD	SWFMFLOAT	- - -	cfs
8/25/2015	11:58	0		FD	SWFMFLOAT	- No rain within 12 hours. - -	cfs
8/29/2015	09:06		-1.65		STAGE-SG	- - - - storm-related sample	ft
9/21/2015	14:05	0		FD	SWFMFLOAT	- - -	cfs
10/13/2015	10:38		-1.77		STAGE-SG	- - -	ft
11/13/2015	12:05	0.9			SWFMFLOAT	- - - - storm-related sample	cfs
11/13/2015	12:20		-1.36		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	13:12		-1.45		STAGE-SG	- - -	ft
12/9/2015	09:06		-1.2		STAGE-SG	- - - - storm-related sample	ft
12/22/2015	11:48		-1.5		STAGE-SG	- Dry, but lots of rain yesterday - -	ft

Date	Flow (cfs)	Stage

Barely any flow in this ditch -- however, not checked during a storm, apparently.



For Charting

	Date	Time	Flow rate cfm	Stage height	Data Qualifier	Result Method	Field comment	
1/6/2015	1/6/2015	13:10	0		FD	SWFMFLOAT	- - Not flowing;standing water. -	cfs
1/21/2015	1/21/2015	15:25	0		FD	SWFMFLOAT	- - -	cfs
2/24/2015	2/24/2015	12:30	0		FD	SWFMFLOAT	- Dry - -	cfs
3/21/2015	3/21/2015	13:00	0		FD	SWFMFLOAT	- - -	cfs
4/22/2015	4/22/2015	10:30	0		FD	SWFMFLOAT	- - -	cfs
6/26/2015	6/26/2015	12:15	0		FD	SWFMFLOAT	- - -	cfs
7/22/2015	7/22/2015	11:20	0		FD	SWFMFLOAT	- - -	cfs
8/19/2015	8/19/2015	09:06	0		FD	SWFMFLOAT	- - -	cfs

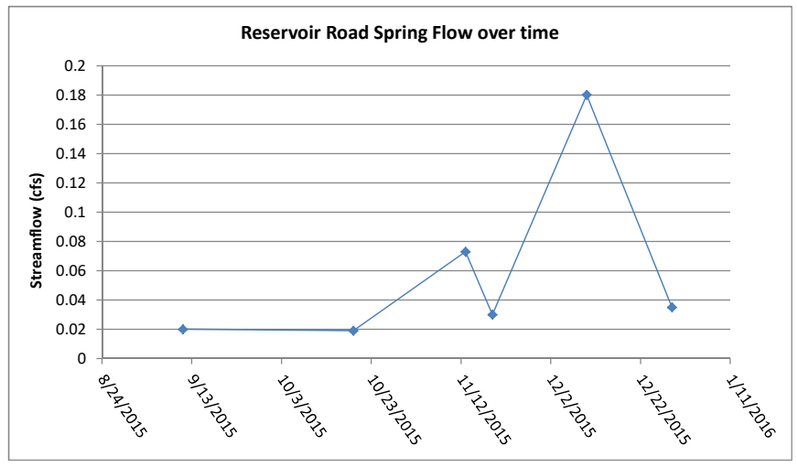
All data for site

Date	Time	Flow rate cfm	Stage heigl	Data Quali	Result Method	Field comment	
1/6/2015	13:10	0		FD	SWFMFLOAT	- - Not flowing;standing water. -	cfs
1/21/2015	15:25	0		FD	SWFMFLOAT	- - -	cfs
2/24/2015	12:30	0		FD	SWFMFLOAT	- Dry - -	cfs
3/21/2015	13:00	0		FD	SWFMFLOAT	- - -	cfs
4/22/2015	10:30	0		FD	SWFMFLOAT	- - -	cfs
6/26/2015	12:15	0		FD	SWFMFLOAT	- - -	cfs
7/22/2015	11:20	0		FD	SWFMFLOAT	- - -	cfs
8/19/2015	09:06	0		FD	SWFMFLOAT	Last record at original location (NOT spring flow)	cfs

Date	Flow (cfs)	Stage

Data collection started in Sept.

Data is flow not stage, this is plotted versus date.



For Charting

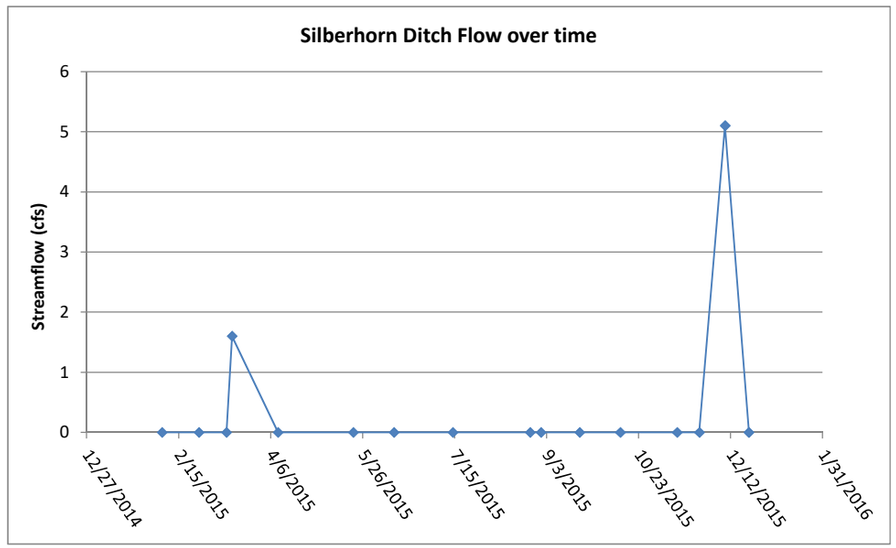
	Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment		
9/11/2015	9/11/2015	10:25	0.02			SWFMB	- - -	cfs	
10/19/2015	10/19/2015	14:15	0.02			SWFMB	- - -	cfs	
11/13/2015	11/13/2015	13:45	0.07			SWFMB	- - - - storm-related sample	cfs	
11/19/2015	11/19/2015	11:17	0.03			SWFMB	- - -	cfs	
12/10/2015	12/10/2015	10:40	0.18		EST	SWFMB	- Rain - - - storm-related sample	cfs	
12/29/2015	12/29/2015	13:00	0.04			SWFMB	- - -	cfs	

All data for site

Date	Time	Flow rate cfs	Stage heig	Data Quali	Result Method	Field comment		
9/11/2015	10:25	0.02			SWFMB	- - -	cfs	10 gpm
10/19/2015	14:15	0.019			SWFMB	- - -	cfs	
10/19/2015	14:15		-1.55		STAGE-SG	- - -	ft	
11/13/2015	13:45	0.073			SWFMB	- - - - storm-related sample	cfs	
11/19/2015	11:17	0.03			SWFMB	- - -	cfs	
12/10/2015	10:40	0.18		EST	SWFMB	- Rain - - - storm-related sample	cfs	
12/29/2015	13:00	0.035			SWFMB	- - -	cfs	

Date	Flow (cfs)	Stage

Data already in flow, this is plotted versus date.



For Chart

	Date	Time	Flow rate c	Stage heigl	Data Quali	Result Method	Field comment	
2/6/2015	2/6/2015	14:30	0		FD	SWFMFLOAT	Storms were through. Ne	cfs
2/26/2015	2/26/2015	11:17	0		FD	SWFMFLOAT	- Dry and cool - -	cfs
3/13/2015	3/13/2015	10:59	0		FD	SWFMFLOAT	- - -	cfs
3/16/2015	3/16/2015	10:25	1.6			SWFMFLOAT	- - - - storm-related san	cfs
4/10/2015	4/10/2015	13:26	0		FD	SWFMFLOAT	- - -	cfs
5/21/2015	5/21/2015	10:27	0		FD	SWFMFLOAT	- - -	cfs
6/12/2015	6/12/2015	11:56	0		FD	SWFMFLOAT	- - -	cfs
7/14/2015	7/14/2015	11:25	0		FD	SWFMFLOAT	- - -	cfs
8/25/2015	8/25/2015	12:48	0		FD	SWFMFLOAT	- No rain within 12 hours	cfs
8/31/2015	8/31/2015	15:24	0		FD	SWFMFLOAT	- - - - storm-related san	cfs
9/21/2015	9/21/2015	14:28	0		FD	SWFMFLOAT	- - -	cfs
10/13/2015	10/13/2015	10:16	0		FD	SWFMFLOAT	- - -	cfs
11/13/2015	11/13/2015	12:51	0		FD	SWFMFLOAT	- - - - storm-related san	cfs
11/25/2015	11/25/2015	09:43	0		FD	SWFMFLOAT	- - -	cfs
12/9/2015	12/9/2015	10:56	5.1		EST	SWFMFLOAT	- - - - storm-related san	cfs
12/22/2015	12/22/2015	12:45	0		FD	SWFMFLOAT	- Dry, but lots of rain yes	cfs

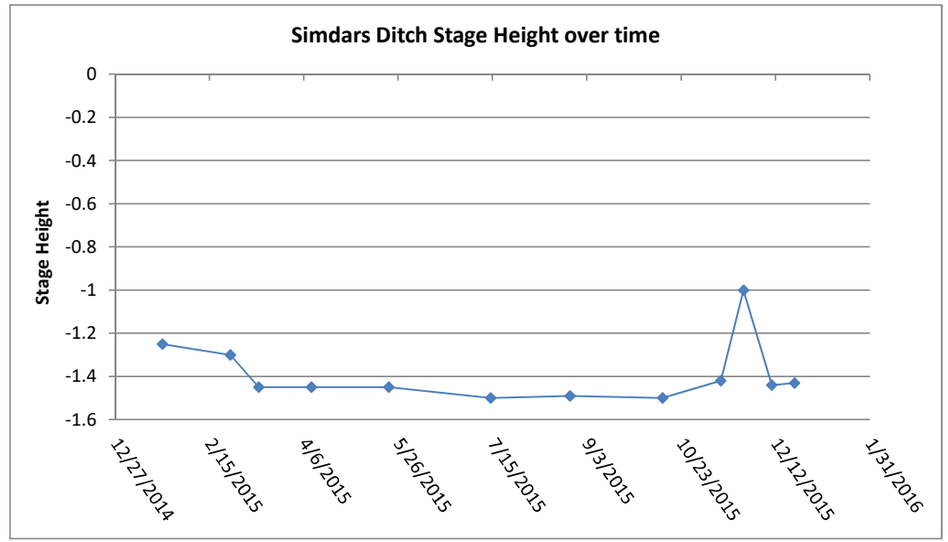
All data for site

Date	Time	Flow rate c	Stage heigl	Data Quali	Result Method	Field comment	
2/6/2015	14:30	0		FD	SWFMFLOAT	Storms were through. Ne	cfs
2/26/2015	11:17	0		FD	SWFMFLOAT	- Dry and cool - -	cfs
3/13/2015	10:59	0		FD	SWFMFLOAT	- - -	cfs
3/16/2015	10:25	1.6			SWFMFLOAT	- - - - storm-related san	cfs
4/10/2015	13:26	0		FD	SWFMFLOAT	- - -	cfs
5/21/2015	10:27	0		FD	SWFMFLOAT	- - -	cfs
6/12/2015	11:56	0		FD	SWFMFLOAT	- - -	cfs
7/14/2015	11:25	0		FD	SWFMFLOAT	- - -	cfs
8/25/2015	12:48	0		FD	SWFMFLOAT	- No rain within 12 hours	cfs
8/31/2015	15:24	0		FD	SWFMFLOAT	- - - - storm-related san	cfs
9/21/2015	14:28	0		FD	SWFMFLOAT	- - -	cfs
10/13/2015	10:16	0		FD	SWFMFLOAT	- - -	cfs
11/13/2015	12:51	0		FD	SWFMFLOAT	- - - - storm-related san	cfs
11/25/2015	09:43	0		FD	SWFMFLOAT	- - -	cfs
12/9/2015	10:56	5.1		EST	SWFMFLOAT	- - - - storm-related san	cfs
12/22/2015	12:45	0		FD	SWFMFLOAT	- Dry, but lots of rain yes	cfs

Date	Flow (cfs)	Stage

No flow readings

I would assume that anything around -1.5 is no flow or trace flow



For Charting

	Date	Time	Flow rate c	Stage height	Data Quali	Result Met	Field comment	
1/21/2015	1/21/2015	11:55		-1.25		STAGE-SG	- - -	ft
2/26/2015	2/26/2015	10:53		-1.3		STAGE-SG	- Dry and cool - -	ft
3/13/2015	3/13/2015	10:30		-1.45		STAGE-SG	- - -	ft
4/10/2015	4/10/2015	12:59		-1.45		STAGE-SG	- - -	ft
5/21/2015	5/21/2015	09:49		-1.45		STAGE-SG	- - -	ft
7/14/2015	7/14/2015	10:14		-1.5		STAGE-SG	- - -	ft
8/25/2015	8/25/2015	11:00		-1.49		STAGE-SG	- No rain within 12 hours. - -	ft
10/13/2015	10/13/2015	10:45		-1.5		STAGE-SG	- - -	ft
11/13/2015	11/13/2015	12:05		-1.42		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	11/25/2015	12:53		-1		STAGE-SG	- - -	ft
12/10/2015	12/10/2015	10:53		-1.44		STAGE-SG	- Raining - - - storm-related sa	ft
12/22/2015	12/22/2015	11:40		-1.43		STAGE-SG	- Dry, but lots of rain yesterda	ft

All data for site

	Date	Time	Flow rate c	Stage height	Data Quali	Result Met	Field comment	
	1/21/2015	11:55		-1.25		STAGE-SG	- - -	ft
	2/26/2015	10:53		-1.3		STAGE-SG	- Dry and cool - -	ft
	3/13/2015	10:30		-1.45		STAGE-SG	- - -	ft
	4/10/2015	12:59		-1.45		STAGE-SG	- - -	ft
	5/21/2015	09:49		-1.45		STAGE-SG	- - -	ft
	6/12/2015	10:30	0		FD	SWFMFLO	- - -	cfs
	7/14/2015	10:14		-1.5		STAGE-SG	- - -	ft
	8/25/2015	11:00		-1.49		STAGE-SG	- No rain within 12 hours. - -	ft
	9/21/2015	14:01	0		FS	SWFMFLO	- - Stagnant pool. -	cfs
	10/13/2015	10:45		-1.5		STAGE-SG	- - -	ft
	11/13/2015	12:05		-1.42		STAGE-SG	- - - - storm-related sample	ft
	11/25/2015	12:53		-1		STAGE-SG	- - -	ft
	12/10/2015	10:53		-1.44		STAGE-SG	- Raining - - - storm-related sa	ft
	12/22/2015	11:40		-1.43		STAGE-SG	- Dry, but lots of rain yesterda	ft

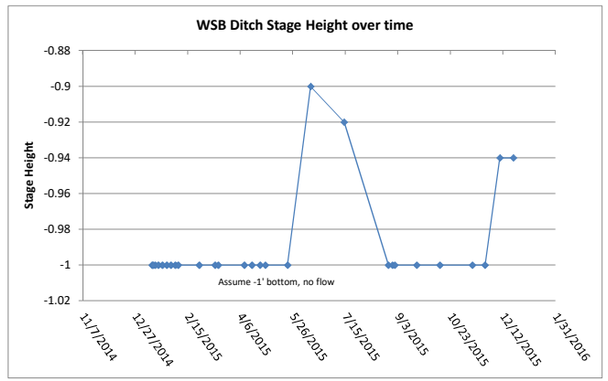
Assume 12" culvert so no flow is -1'

For Charting

	Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment	
1/12/2015	1/12/2015	10:15	0	-1	FD	SWFMFLOAT	- - -	cfs
1/15/2015	1/15/2015	12:00	0	-1	FD	SWFMFLOAT	- - -	cfs
1/13/2015	1/18/2015	10:00	0	-1	FD	SWFMFLOAT	- - -	cfs
1/18/2015	1/21/2015	11:23	0	-1	FD	SWFMFLOAT	- - -	cfs
1/22/2015	1/22/2015	10:15	0	-1	FD	SWFMFLOAT	- - -	cfs
1/26/2015	1/26/2015	10:00	0	-1	FD	SWFMFLOAT	- - -	cfs
1/30/2015	1/30/2015	10:15	0	-1	FD	SWFMFLOAT	- - -	cfs
2/3/2015	2/3/2015	11:15	0	-1	FD	SWFMFLOAT	- - -	cfs
2/6/2015	2/6/2015	10:15	0	-1	FD	SWFMFLOAT	- - -	cfs
2/26/2015	2/26/2015	09:35	0	-1	FD	SWFMFLOAT	- Dry and cool - -	cfs
3/13/2015	3/13/2015	10:32	0	-1	FD	SWFMFLOAT	- - -	cfs
3/16/2015	3/16/2015	11:00	0	-1	FD	SWFMFLOAT	- - - - storm-related sample	cfs
4/10/2015	4/10/2015	12:06	0	-1	FD	SWFMFLOAT	- - -	cfs
4/17/2015	4/17/2015	10:00	0	-1	FD	SWFMFLOAT	- - -	cfs
4/25/2015	4/25/2015	10:30	0	-1	FD	SWFMFLOAT	- - -	cfs
4/30/2015	4/30/2015	10:45	0	-1	FD	SWFMFLOAT	- - -	cfs
5/21/2015	5/21/2015	09:25	0	-1	FD	SWFMFLOAT	- - -	cfs
6/12/2015	6/12/2015	09:30		-0.9		STAGE-SG	- - -	ft
7/14/2015	7/14/2015	09:49		-0.92		STAGE-SG	- - -	ft
8/25/2015	8/25/2015	10:13	0	-1	FD	SWFMFLOAT	- No rain within 12 hours. - -	cfs
8/29/2015	8/29/2015	11:51	0	-1	FD	SWFMFLOAT	- - - - storm-related sample	cfs
8/31/2015	8/31/2015	14:52	0	-1	FD	SWFMFLOAT	- - - - storm-related sample	cfs
9/21/2015	9/21/2015	13:35	0	-1	FD	SWFMFLOAT	- - -	cfs
10/13/2015	10/13/2015	11:09	0	-1	FD	SWFMFLOAT	- - -	cfs
11/13/2015	11/13/2015	11:40	0	-1	FD	SWFMFLOAT	- - - - storm-related sample	cfs
11/25/2015	11/25/2015	11:22	0	-1	FD	SWFMFLOAT	- - -	cfs
12/9/2015	12/9/2015	11:54		-0.94		STAGE-SG	- - - - storm-related sample	ft
12/22/2015	12/22/2015	10:58		-0.94		STAGE-SG	- Dry, but lots of rain yesterday -	ft

All data for site

Date	Time	Flow rate c	Stage heigl	Data Quali	Result Method	Field comment	
1/12/2015	10:15	0		FD	SWFMFLOAT	- - -	cfs
1/15/2015	12:00	0		FD	SWFMFLOAT	- - -	cfs
1/18/2015	10:00	0		FD	SWFMFLOAT	- - -	cfs
1/21/2015	11:23	0		FD	SWFMFLOAT	- - -	cfs
1/22/2015	10:15	0		FD	SWFMFLOAT	- - -	cfs
1/26/2015	10:00	0		FD	SWFMFLOAT	- - -	cfs
1/30/2015	10:15	0		FD	SWFMFLOAT	- - -	cfs
2/3/2015	11:15	0		FD	SWFMFLOAT	- - -	cfs
2/6/2015	10:15	0		FD	SWFMFLOAT	- - -	cfs
2/26/2015	09:35	0		FD	SWFMFLOAT	- Dry and cool - -	cfs
3/13/2015	10:32	0		FD	SWFMFLOAT	- - -	cfs
3/16/2015	11:00	0		FD	SWFMFLOAT	- - - - storm-related sample	cfs
4/10/2015	12:06	0		FD	SWFMFLOAT	- - -	cfs
4/17/2015	10:00	0		FD	SWFMFLOAT	- - -	cfs
4/25/2015	10:30	0		FD	SWFMFLOAT	- - -	cfs
4/30/2015	10:45	0		FD	SWFMFLOAT	- - -	cfs
5/21/2015	09:25	0		FD	SWFMFLOAT	- - -	cfs
6/12/2015	09:30		-0.9		STAGE-SG	- - -	ft
7/14/2015	09:49		-0.92		STAGE-SG	- - -	ft
8/25/2015	10:13	0		FD	SWFMFLOAT	- No rain within 12 hours. - -	cfs
8/29/2015	11:51	0		FD	SWFMFLOAT	- - - - storm-related sample	cfs
8/31/2015	14:52	0		FD	SWFMFLOAT	- - - - storm-related sample	cfs
9/21/2015	13:35	0		FD	SWFMFLOAT	- - -	cfs
10/13/2015	11:09	0		FD	SWFMFLOAT	- - -	cfs
11/13/2015	11:40	0		FD	SWFMFLOAT	- - - - storm-related sample	cfs
11/25/2015	11:22	0		FD	SWFMFLOAT	- - -	cfs
12/9/2015	11:54		-0.94		STAGE-SG	- - - - storm-related sample	ft
12/22/2015	10:58		-0.94		STAGE-SG	- Dry, but lots of rain yesterday -	ft

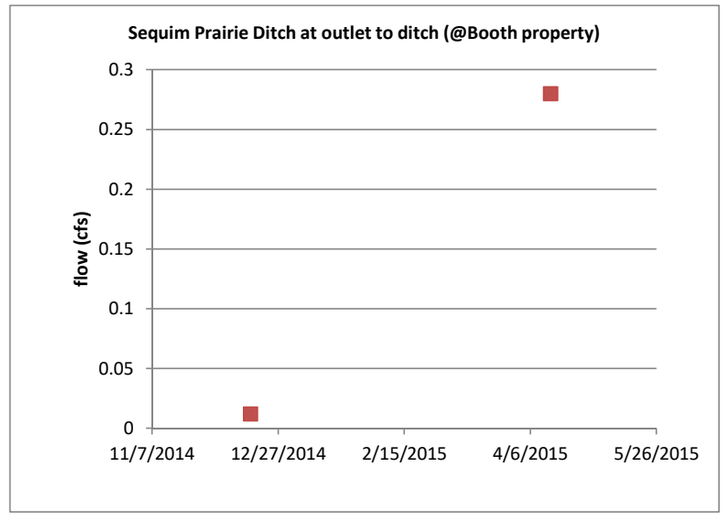


For Charting

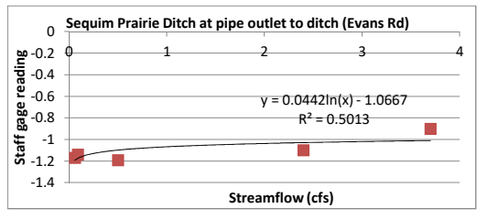
Date	Time	Flow rate gpm	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment
12/16/2014	15:15	5.5	0.012			Bucket	Training day but data still valid
4/14/2015	14:15	123.6	0.28	-0.87		Bucket	

All data for site

Date	Time	Flow rate gpm	Stage height	Data Qualifier	Result Method	Field comment
12/16/2014	15:15	5.5	0.012		Bucket	Training day but data still valid
4/14/2015	14:15	123.6	0.28	-0.87	Bucket	



Date	Flow (cfs)	Stage	From Chart log fit	From power fit
3/13/2015	0.5	-1.19	0.061	#REF!
4/14/2015	0.058	-1.17	0.097	#REF!
7/14/2015	3.7	-0.9	43.445	#REF!
9/21/2015	2.4	-1.1	0.471	#REF!
11/25/2015	0.09	-1.14	0.190	#REF!

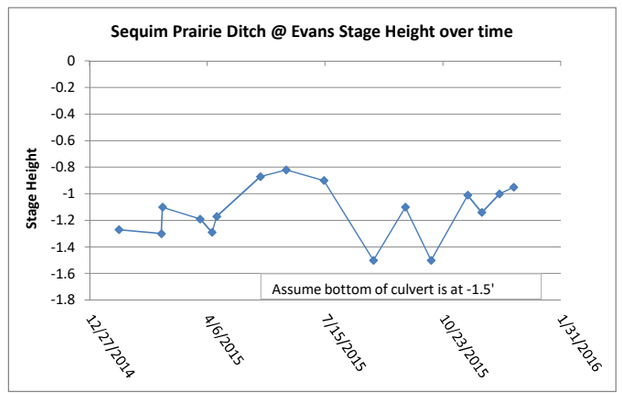


Stage height plotted
Rating curve too flat to use. Problems with consistency in tape down measurements?

0.0442
-1.0667

For Charting

	Date	Time	Flow rate	Stage height	Data Qualifier	Result Method	Field comment	
1/21/2015	1/21/2015	12:44		-1.27		STAGE-SG	- - -	ft
2/26/2015	2/26/2015	09:08		-1.3		STAGE-SG	- Dry and cool - -	ft
2/27/2015	2/27/2015	12:40		-1.1		STAGE-SG	Steady rain and lightning - - - - storm-related	ft
3/31/2015	3/13/2015	09:15		-1.19		STAGE-SG	- - -	ft
4/10/2015	4/10/2015	11:10		-1.29		STAGE-SG	- - -	ft
4/14/2015	4/14/2015	12:20		-1.17		STAGE-SG	- - -	ft
5/21/2015	5/21/2015	10:56		-0.87		STAGE-SG	- - -	ft
6/12/2015	6/12/2015	12:30		-0.82		STAGE-SG	- - -	ft
7/14/2015	7/14/2015	12:44		-0.9		STAGE-SG	- - -	ft
8/25/2015	8/25/2015	13:39	0	-1.5	FD	SWFMFLOAT	- No rain within 12 hours. - -	cfs
9/21/2015	9/21/2015	15:20		-1.1		STAGE-SG	- - -	ft
10/13/2015	10/13/2015	09:52		-1.5		STAGE-SG	Tape below culvert. Unmeasureable.	ft
11/13/2015	11/13/2015	13:51		-1.01		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	11/25/2015	10:07		-1.14		STAGE-SG	- - -	ft
12/10/2015	12/10/2015	09:39		-1		STAGE-SG	- Raining - - - storm-related sample	ft
12/22/2015	12/22/2015	13:09		-0.95		STAGE-SG	- Dry, but lots of rain yesterday - -	ft

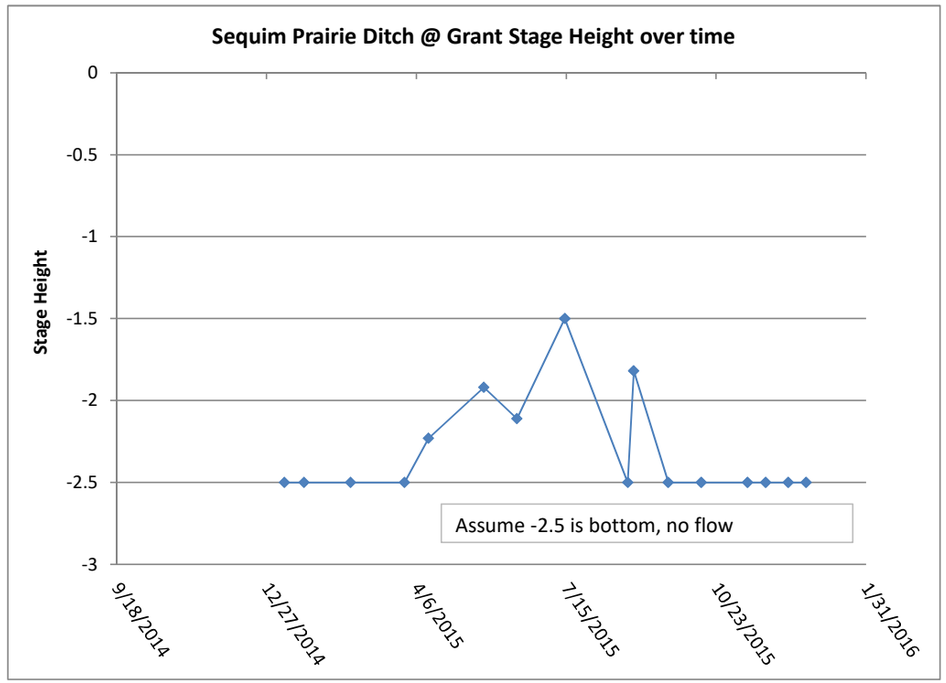


All data for site

Date	Time	Flow rate	Stage height	Data Qualifier	Result Method	Field comment	
1/21/2015	12:44		-1.27		STAGE-SG	- - -	ft
2/26/2015	09:08		-1.3		STAGE-SG	- Dry and cool - -	ft
2/27/2015	12:40		-1.1		STAGE-SG	Steady rain and lightning - - - - storm-related	ft
3/13/2015	09:15	0.5			SWFMFLOAT	- - -	cfs
3/13/2015	09:15		-1.19		STAGE-SG	- - -	ft
4/10/2015	11:10		-1.29		STAGE-SG	- - -	ft
4/14/2015	12:20		-1.17		STAGE-SG	- - -	ft
4/14/2015	12:25	0.058			SWFMB	- - -	cfs
5/21/2015	10:56		-0.87		STAGE-SG	- - -	ft
6/12/2015	12:30		-0.82		STAGE-SG	- - -	ft
7/14/2015	12:44		-0.9		STAGE-SG	- - -	ft
7/14/2015	12:50	3.7			SWFMFLOAT	- - -	cfs
8/25/2015	13:39	0		FD	SWFMFLOAT	- No rain within 12 hours. - -	cfs
9/21/2015	15:20	2.4			SWFMFLOAT	- - -	cfs
9/21/2015	15:20		-1.1		STAGE-SG	- - -	ft
10/13/2015	09:52		-1.6		STAGE-SG	Tape below culvert. Unmeasureable.	ft
11/13/2015	13:51		-1.01		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	10:07		-1.14		STAGE-SG	- - -	ft
11/25/2015	14:15	0.09			SWFMB	- - -	cfs
12/10/2015	09:39		-1		STAGE-SG	- Raining - - - storm-related sample	ft
12/22/2015	13:09		-0.95		STAGE-SG	- Dry, but lots of rain yesterday - -	ft

Date	Flow (cfs)	Stage
No flow data		

Stage height plotted



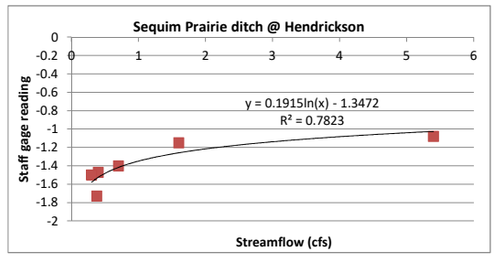
For Charting

	Date	Time	Flow rate c	Stage heigl	Data Quali	Result Method	Field comment	
1/8/2015	1/8/2015	11:00	0	-2.5	FD	SWFMFLOAT	- - -	cfs
1/21/2015	1/21/2015	09:31	0	-2.5	FD	SWFMFLOAT	- - No data. It was d	cfs
2/21/2015	2/21/2015	12:10	0	-2.5	FD	SWFMFLOAT	- - -	cfs
3/29/2015	3/29/2015	09:55	0	-2.5	FD	SWFMFLOAT	- - -	cfs
4/14/2015	4/14/2015	12:45		-2.23		STAGE-SG	- - Good flow. -	ft
5/21/2015	5/21/2015	10:39		-1.92		STAGE-SG	- - -	ft
6/12/2015	6/12/2015	12:10		-2.11		STAGE-SG	- - -	ft
7/14/2015	7/14/2015	12:23		-1.5		STAGE-SG	- - -	ft
8/25/2015	8/25/2015	12:58	0	-2.5	FD	SWFMFLOAT	- No rain within 12 h	cfs
8/29/2015	8/29/2015	12:10		-1.82		STAGE-SG	- - - - storm-relatec	ft
9/21/2015	9/21/2015	14:37	0	-2.5	FD	SWFMFLOAT	- - -	cfs
10/13/2015	10/13/2015	10:09	0	-2.5	FD	SWFMFLOAT	- - -	cfs
11/13/2015	11/13/2015	12:59	0	-2.5	FD	SWFMFLOAT	- - - - storm-relatec	cfs
11/25/2015	11/25/2015	09:50	0	-2.5	FD	SWFMFLOAT	- - -	cfs
12/10/2015	12/10/2015	10:12		-2.5	FD	STAGE-SG	- Raining - - - storm	ft
12/22/2015	12/22/2015	12:53	0	-2.5	FD	SWFMFLOAT	- Dry, but lots of rair	cfs

All data for site

Date	Time	Flow rate c	Stage heigl	Data Quali	Result Method	Field comment	
1/8/2015	11:00	0		FD	SWFMFLOAT	- - -	cfs
1/21/2015	09:31	0		FD	SWFMFLOAT	- - No data. It was d	cfs
2/21/2015	12:10	0		FD	SWFMFLOAT	- - -	cfs
3/29/2015	09:55	0		FD	SWFMFLOAT	- - -	cfs
4/14/2015	12:45		-2.23		STAGE-SG	- - Good flow. -	ft
5/21/2015	10:39		-1.92		STAGE-SG	- - -	ft
6/12/2015	12:10		-2.11		STAGE-SG	- - -	ft
7/14/2015	12:23		-1.5		STAGE-SG	- - -	ft
8/25/2015	12:58	0		FD	SWFMFLOAT	- No rain within 12 h	cfs
8/29/2015	12:10		-1.82		STAGE-SG	- - - - storm-relatec	ft
9/21/2015	14:37	0		FD	SWFMFLOAT	- - -	cfs
10/13/2015	10:09	0		FD	SWFMFLOAT	- - -	cfs
11/13/2015	12:59	0		FD	SWFMFLOAT	- - - - storm-relatec	cfs
11/25/2015	09:50	0		FD	SWFMFLOAT	- - -	cfs
12/10/2015	10:12		0	FD	STAGE-SG	- Raining - - - storm	ft
12/22/2015	12:53	0		FD	SWFMFLOAT	- Dry, but lots of rair	cfs

Date	Flow (cfs)	Stage	From Chart log fit	From Logest
3/13/2015	0.38	-1.73	0.135	0.20
4/10/2015	0.4	-1.47	0.527	0.58
6/12/2015	1.6	-1.15	2.800	2.14
7/14/2015	5.4	-1.08	4.036	2.84
8/25/2015	0.7	-1.4	0.759	0.77
10/13/2015	0.3	-1.5	0.450	0.51



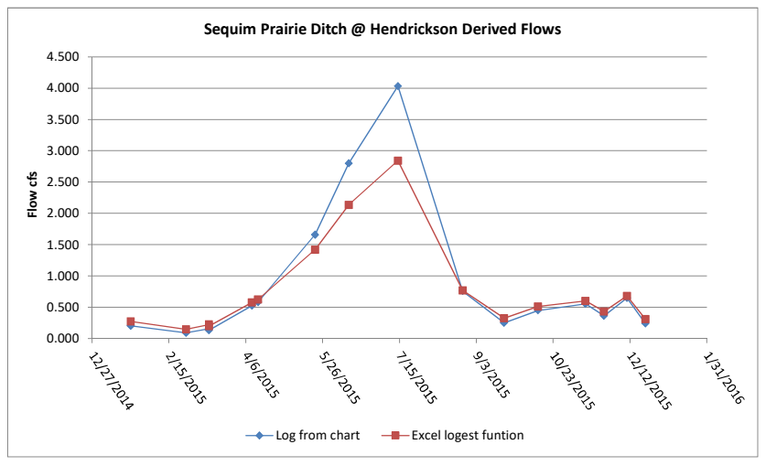
0.1915
-1.3472

Curve	
Formula:	y = b*m^x
b =	59.44474
m =	234.32769

59.44474 234.3276881

For Charting

Date	Time	Flow rate cfs	Stage height	Data Qualifier	Result Method	Field comment		From log equation in chart	From Excel Logest function
1/21/2015	1/21/2015	12:57	-1.65		STAGE-SG	- - -	ft	0.206	0.28
2/26/2015	2/26/2015	09:25	-1.8		STAGE-SG	- Dry and cool - -	ft	0.094	0.15
3/13/2015	3/13/2015	09:33	-1.7		STAGE-SG	- - -	m	0.158	0.23
3/13/2015	3/13/2015	09:55	-1.73		STAGE-SG	- - -	ft	0.135	0.20
4/10/2015	4/10/2015	11:22	-1.47		STAGE-SG	- - -	ft	0.527	0.58
4/14/2015	4/14/2015	14:10	-1.45		STAGE-SG	- - -	ft	0.585	0.63
5/21/2015	5/21/2015	11:03	-1.25		STAGE-SG	- - -	ft	1.661	1.42
6/12/2015	6/12/2015	15:45	-1.15		STAGE-SG	- - -	ft	2.800	2.14
7/14/2015	7/14/2015	13:00	-1.08		STAGE-SG	- - -	ft	4.036	2.84
8/25/2015	8/25/2015	13:43	-1.4		STAGE-SG	- No rain within 12 hours. - -	ft	0.759	0.77
9/21/2015	9/21/2015	15:39	-1.61		STAGE-SG	- - -	ft	0.254	0.33
10/13/2015	10/13/2015	09:19	-1.5		STAGE-SG	- - -	ft	0.450	0.51
11/13/2015	11/13/2015	14:00	-1.46		STAGE-SG	- - - - storm-related sample	ft	0.555	0.60
11/25/2015	11/25/2015	10:13	-1.54		STAGE-SG	- - -	ft	0.365	0.43
12/10/2015	12/10/2015	09:49	-1.43		STAGE-SG	- Raining - - - storm-related sample	ft	0.649	0.68
12/22/2015	12/22/2015	13:17	-1.62		STAGE-SG	- Dry, but lots of rain yesterday - -	ft	0.241	0.31

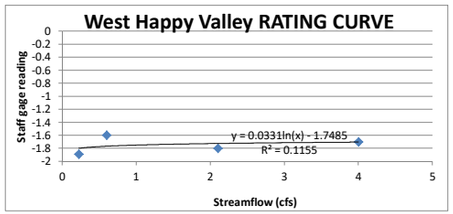


All data for site

Date	Time	Flow rate c	Stage heigh	Data Qualifie	Result Metho	Field comment	
12/16/2014	15:35				Floating	Training but data valid	
1/21/2015	12:57		-1.65		STAGE-SG	- - -	ft
2/26/2015	09:25		-1.8		STAGE-SG	- Dry and cool - -	ft
3/13/2015	09:33		-1.7		STAGE-SG	- - -	m
3/13/2015	09:55	0.38			MIDSECTION	- - -	cfs
3/13/2015	09:55		-1.73		STAGE-SG	- - -	ft
4/10/2015	11:22		-1.47		STAGE-SG	- - -	ft
4/10/2015	11:25	0.4			SWFMC	- - -	cfs
4/14/2015	14:10		-1.45		STAGE-SG	- - -	ft
5/21/2015	11:03		-1.25		STAGE-SG	- - -	ft
6/12/2015	12:42	1.6			SWFMC	- - -	cfs
6/12/2015	15:45		-1.15		STAGE-SG	- - -	ft
7/14/2015	13:00	5.4			SWFMFLOAT	- - -	cfs
7/14/2015	13:00		-1.08		STAGE-SG	- - -	ft
8/25/2015	13:43	0.7			SWFMC	- No rain within 12 hours. - -	cfs
8/25/2015	13:43		-1.4		STAGE-SG	- No rain within 12 hours. - -	ft
9/21/2015	15:39		-1.61		STAGE-SG	- - -	ft
10/13/2015	09:19	0.3			SWFMC	- - -	cfs
10/13/2015	09:19		-1.5		STAGE-SG	- - -	ft
11/13/2015	14:00		-1.46		STAGE-SG	- - - - storm-related sample	ft
11/25/2015	10:13		-1.54		STAGE-SG	- - -	ft
12/10/2015	09:49		-1.43		STAGE-SG	- Raining - - - storm-related sample	ft
12/22/2015	13:17		-1.62		STAGE-SG	- Dry, but lots of rain yesterday - -	ft

Date	Time	Flow (cfs)	Stage (Ft)
3/21/2015	12:35	4	-1.7
4/14/2015	13:20	0.23	-1.89
11/19/2015	10:45	2.1	-1.8
12/29/2015	12:15	0.6	-1.6

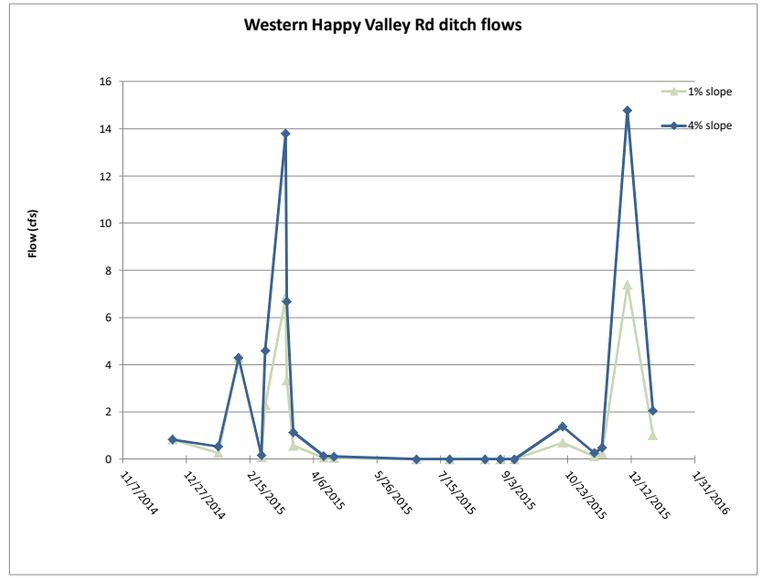
Rating curve not reliable at all, due to variable nature of getting flows as well as stages (tape downs) at this site.



West Happy Valley roadside ditch draining topography
Culvert over HID main canal used for Top Down stage readings

Flow and/or stage measurements are not reliable and won't be utilized for a rating curve.

Generalized findings from the data collected:
> Runoff is ephemeral (dry or nearly so between late May and September)
> Typical wet season levels seem consistent (roughly estimated at 0.2-2 cfs)
> Highest water levels in culvert from March and December storms (roughly estimated at 4-8 cfs)



For chart

http://ponce.sdsu.edu/onlinechannel03.php

Below flows assume slope as given and Manning's roughness n = 0.025 for corrugated metal

Date	Date	Time	Flow (cfs)	Stage (Ft)	Water height with 2' culvert	Calculated flow from Manning's: 1% slope	Calculated flow from Manning's: 4% slope (cfs)	Samplers	Double check floats, buckets, etc--done		
12/16/2014	12/16/2014	12:00	0.84			0.84	0.84	AS, GCB, AP	SWFMB	Training day - data still should be valid - tricky site, though	
1/21/2015	1/21/2015	14:35		-1.79	0.21	0.27	0.54	GCB	STAGE-SG		
2/6/2015	2/6/2015	12:55	4.3			4.3	4.3	RJP, PMM	SWFMFLOAT	- storm-related sample	corrected flow calc
2/24/2015	2/24/2015	11:20		-1.88	0.12	0.08	0.17	JIB	STAGE-SG		
2/27/2015	2/27/2015	12:55		-1.4	0.6	2.3	4.6	GCB, JIB		NOT in original data set	
3/15/2015	3/15/2015	14:20		-0.9	1.1	6.89	13.8	ACS, DKS	STAGE-SG	- storm-related sample	
3/16/2015	3/16/2015	09:30		-1.27	0.73	3.35	6.69	ACS, KD	STAGE-SG	- storm-related sample	
3/21/2015	3/21/2015	12:35	4	-1.7	0.3	0.57	1.14	JIB	SWFMFLOAT		
4/14/2015	4/14/2015	13:20	0.23	-1.89	0.11	0.07	0.14	ACS	SWFMB		
4/22/2015	4/22/2015	10:18		-1.9	0.1	0.06	0.11	JIB	STAGE-SG		
6/26/2015	6/26/2015	11:45	0	-3	0	0	0	JIB, LBW			
7/22/2015	7/22/2015	11:03	0	-3	0	0	0	JIB, LBW			
8/19/2015	8/19/2015	08:53	0	-3	0	0	0	JIB, LBW			
8/31/2015	8/31/2015	15:40	0	-3	0	0	0	ACS, PMM		- storm-related sample	
9/11/2015	9/11/2015	09:51	0	-3	0	0	0	JIB, LBW			
10/19/2015	10/19/2015	13:39		-1.67	0.33	0.7	1.39	JIB, LBW	STAGE-SG		
11/13/2015	11/13/2015	14:20		-1.85	0.15	0.13	0.27	ACS, PS	STAGE-SG	- storm-related sample	
11/19/2015	11/19/2015	10:45	2.1	-1.8	0.2	0.25	0.49	JIB, LBW	SWFMFLOAT		corrected friction factor
12/9/2015	12/9/2015	09:25		-0.85	1.15	7.4	14.79	ACS	STAGE-SG	- storm-related sample	Good % of runoff goes into HID canal, missing this MP
12/29/2015	12/29/2015	12:15	0.6	-1.6	0.4	1.03	2.06	JIB	SWFMFLOAT		corrected friction factor

All Data

	Field_Collection	Field_Collect	Flow	Stage	Result_Val	Result_Data_C	Result_Parameter_Name	Result_Method	Field_Collection_Comment_End
WHV	1/21/2015	14:35		-1.79	ft		Stream/River Stage	STAGE-SG	- - -
WHV	2/6/2015	12:55	4.3		cfs		Flow	SWFMFLOAT	Storms were through. Nerver rained and it was sunny. - - - - storm-related sample - Pre-storm sample, suitable for 303(d) assessment
WHV	2/24/2015	11:20		-1.88	ft		Stream/River Stage	STAGE-SG	- Dry - -
WHV	2/27/2015	12:55		-1.4	ft				
WHV	3/15/2015	14:20		-0.9	ft		Stream/River Stage	STAGE-SG	- - - - storm-related sample
WHV	3/16/2015	9:30		-1.27	ft		Stream/River Stage	STAGE-SG	- - - - storm-related sample
WHV	3/21/2015	12:20		-1.7	ft		Stream/River Stage	STAGE-SG	- - -
WHV	3/21/2015	12:35	4		cfs		Flow	SWFMFLOAT	- - -
WHV	4/14/2015	13:20	0.225		cfs		Flow	SWFMB	- - -
WHV	4/14/2015	13:20		-1.89	ft		Stream/River Stage	STAGE-SG	- - -
WHV	4/22/2015	10:18		-1.9	ft		Stream/River Stage	STAGE-SG	- - -
WHV	5/27/2015	13:05		-2.65	ft				Not in original data set--too low to measure flow. **Impossible result given 2' diameter pipe.
WHV	6/26/2015	11:45	0		cfs	FD	Flow	SWFMFLOAT	- - -
WHV	7/22/2015	11:03	0		cfs	FD	Flow	SWFMFLOAT	- - -
WHV	8/19/2015	8:53	0		cfs	FD	Flow	SWFMFLOAT	- - -
WHV	8/31/2015	15:40	0		cfs	FD	Flow	SWFMFLOAT	- - - - storm-related sample
WHV	9/11/2015	9:51	0		cfs	FD	Flow	SWFMFLOAT	- - -
WHV	10/19/2015	13:39		-1.67	ft		Stream/River Stage	STAGE-SG	- - -
WHV	11/13/2015	14:20		-1.85	ft		Stream/River Stage	STAGE-SG	- - - - storm-related sample
WHV	11/19/2015	10:45	2.1		cfs		Flow	SWFMFLOAT	- - -
WHV	11/19/2015	10:45		-1.8	ft		Stream/River Stage	STAGE-SG	- - -
WHV	12/9/2015	9:25		-0.85	ft		Stream/River Stage	STAGE-SG	- - - - storm-related sample
WHV	12/29/2015	11:50		-1.6	ft		Stream/River Stage	STAGE-SG	- - -
WHV	12/29/2015	12:15	0.6		cfs		Flow	SWFMFLOAT	- - -