Sontek RS5 Gauging Meter Quality Assurance Checking

Overview:

This procedure details the Quality Assurance of Sontek RS5 and M9 moving boat flow gaugings. It does not cover the process involved in gauging a stream using the RS5 or M9, or loading the gauging into hilltop.

When the quality assurance has been completed, the gauging is given to the data team to be archived.

Does the Gauging Contain?

- Gauging Card
- Hilltop Face card (i.e. QRev.xml style sheet)
- Digital File: \\ares\Hydrology\SiteName\Gaugings\Sontek\Gauging number_TIDEDAdate_Site code\
  Processed QRev files: .mat and .xml
- (Calculation of stage time – where applicable)

If not, please return to the Technician to complete.

Quality Code:

600	Total uncertainty <5% (QRev)
500	Total uncertainty 10%> x >5%
400	Total uncertainty >10% ; >10% flow in vertical ; Transects not reciprocal pairs
300	
200	Out of calibration ; no retrievable raw (reproducible) gauging files

1. Check Gauging File

Are all the digital files in their relevant location:

- Digital File: \\ares\Hydrology\SiteName\Gaugings\Sontek\Gauging number_TIDEDAdate_Site code\ including:
  - .riv (M9) or .RSQMB (RS5) files,
  - Matlab files (.mat)
  - Style sheet (.xml)
  - Moving bed test (Loop….riv),
  - CompassCal,
  - SystemTest folders and

2. Check Hilltop Face card

- Is all the information present? Is it correct? Dates, times, meter s/n are critical. Do edges have zero flow? Note: The date is in the American MM/DD/YYYY format.
- Check:
  - Transducer Depth *(currently as written on gauging card)*

Sontek RS5 Gauging Meter Quality Assurance Checking

- Magnetic Declination *(currently as written on gauging card)*
- Compass tab (*currently if loaded into the site folder assume correctly loaded into QRev*)
- Check Edges (should contain flow for both left and right)
- Check Traverses (they should be reciprocal pairs)
- Check Moving bed loop completed (to eliminate moving bed)
- Check exposure/duration time

- Are the 15 items consistent with QRev summary output?
- Check Messages for errors

(*Highlighted areas indicate what to check*)

If information is incomplete, missing or erroneous please return to the Technician to complete.

Station Number: 33502
Station Name: Kai Iwi at Handley Road

Date (mm/dd/yyyy): 04/15/2021

Measurement Summary	
Discharge (m^3/s)	0.711
Mean Velocity (m/s)	0.1178
Area (m^2)	6.04
Width (m)	6.07
Navigation Reference	BT
Extrapolation Method (Top/Bottom Exponent):	Constant/No Slip Exp:0.1667

ADCP Info/Settings	
ADCP Model	S5
Frequency	Multi
Serial Number	4931.0
Firmware	
Configuration	
Software	QRev 4.23

Measurement Statistics	
Total Duration (s)	924.00
Measured Q (%)	66
Left Edge Q (%)	0.90
Right Edge Q (%)	4.58
Mean Boat Speed (m/s)	0.0407
Invalid Bins (%)	1.47
Invalid Ensembles (%)	0.53
Uncertainty - COV	5.3
Uncertainty - Total %	**6.8**
Uncertainty - User Rating %	**Not Rated**

Measurement Setup / Tests	
Diagnostic Test Results	Pass
Compass Calibration Results	No
Magnetic Variation (°)	21.78
Moving Bed Test Type	Loop
Moving Bed Condition	No
Moving Bed Test Duration (s)	177.00
Moving Bed Percent (%)	2.07
Moving Bed Correction for Discharge (%)	
Moving Bed Message	WARNING: The water velocity is less than recommended minimum for this test and could cause the loop method to be inaccurate. CONSIDER USING A STATIONARY TEST TO CHECK MOVING-BED CONDITIONS; Moving-bed velocity < Minimum moving-bed velocity criteria -- No correction recommended; WARNING - Bottom track and GPS results differ by more than 2%.;

Messages

Edges: One or more transects have a right edge Q greater than 5%;GGA-All: Int. Q for invalid ensembles in a transect exceeds 25.0%;GGA-Original: Int. Q for consecutive invalid ensembles exceeds 5.0%;GGA-Original: Int. Q for invalid ensembles in a transect exceeds 25.0%;GGA-DGPS: Int. Q for invalid ensembles in a transect exceeds 25.0%;GGA-Altitude: Int. Q for consecutive invalid ensembles exceeds 5.0%;GGA-Altitude: Int. Q for invalid ensembles in a transect exceeds 25.0%;GGA-All: There are no valid data for one or more transects.;VTG-All: Int. Q for consecutive invalid ensembles exceeds 5.0%;VTG-All: Int. Q for invalid ensembles in a transect exceeds 25.0%;VTG-Original: Int. Q for consecutive invalid ensembles exceeds 5.0%;VTG-Original: Int. Q for invalid ensembles in a transect exceeds 25.0%;Compass: Calibration result > 0.2 deg;gga-HDOP: Int. Q for consecutive invalid ensembles exceeds 3.0%;Moving-Bed Test: The moving-bed test(s) has warnings, please review tests to determine validity;Moving-Bed Test: Bottom track and GPS results differ by more than 2%.Temperature: No independent temperature reading;vtg-HDOP: Int. Q for consecutive invalid ensembles exceeds 3.0%;vtg: Lag between BT and VTG > 2 sec

Transect Discharge Summary

File Name	Start Edge	Left Dist	Right Dist	Start Time	End Time	Top	Middle	Bottom	Left	Right	Total Q
02-Transect_20210415141656.mat	Left	0.5000	0.4000	14:17:04	14:19:49	0.045	0.5	0.159	0.007	0.028	0.739
03-Transect_20210415141952.mat	Right	0.5000	0.4000	14:20:02	14:22:37	0.044	0.423	0.167	0.007	0.009	0.65
04-Transect_20210415142240.mat	Left	0.5000	0.5000	14:22:51	14:25:24	0.049	0.501	0.145	0.006	0.059	0.76
05-Transect_20210415142526.mat	Right	0.5000	0.5000	14:25:38	14:28:06	0.048	0.46	0.158	0.005	0.041	0.712
06-Transect_20210415142809.mat	Left	0.5000	0.5000	14:28:19	14:30:43	0.045	0.486	0.138	0.004	0.038	0.71
07-Transect_20210415143046.mat	Right	0.5000	0.5000	14:30:57	14:33:36	0.047	0.447	0.172	0.01	0.02	0.696

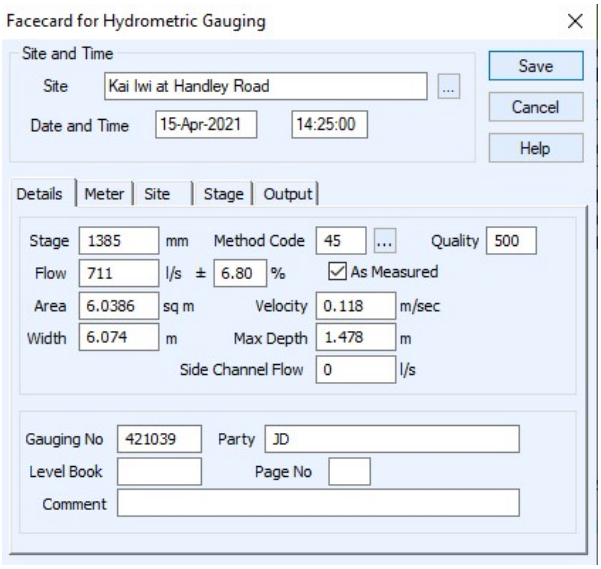
Transect Supplementary Data

File Name	L E Type	L E Coeff	R E Type	R E Coeff	Width (m)	Duration (s)	Invalid Depth Cells (%)	Invalid Ens (%)
02-Transect_20210415141656.mat	Rectangular	0.9100	Rectangular	0.9100	6.154	165	4.2	
03-Transect_20210415141952.mat	Rectangular	0.9100	Rectangular	0.9100	6.014	155	1.7	1.9
04-Transect_20210415142240.mat	Rectangular	0.9100	Rectangular	0.9100	5.94	153	4.4	2
05-Transect_20210415142526.mat	Rectangular	0.9100	Rectangular	0.9100	5.972	148	2.1	1.3
06-Transect_20210415142809.mat	Rectangular	0.9100	Rectangular	0.9100	6.16	144	3.1	3.5
07-Transect_20210415143046.mat	Rectangular	0.9100	Rectangular	0.9100	6.205	159	2.5	3.8

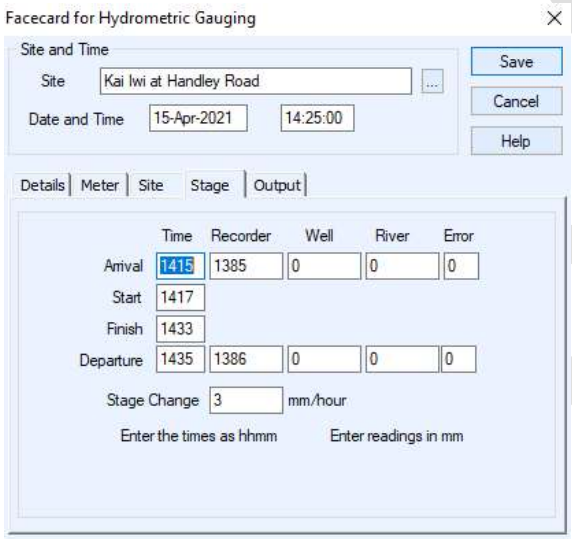
QRev Summary File: 20210419_092245_423_QRev || QRev Stylesheet Version: WSC v2.0 2017-02-14

QRev Measurement Review - Adapted for Water Survey of Canada

3. Check Hilltop Face card of Hydrometric Gauging



Details:
Stage (Hilltop Manager print out)
Method code – **45 for Sontek gaugings**
Gauging No
Party
Meter:
Current meter Serial No [meter, prop]
Calibration date:
Site: (depends on gauging)
Location
Water Temp – clear/discoloured
Origin on right bank? *– Check that this and the location/offset values are consistent. Hilltop sorts stations into ascending order regardless, so ensure that these match otherwise the cross-section will be reversed*



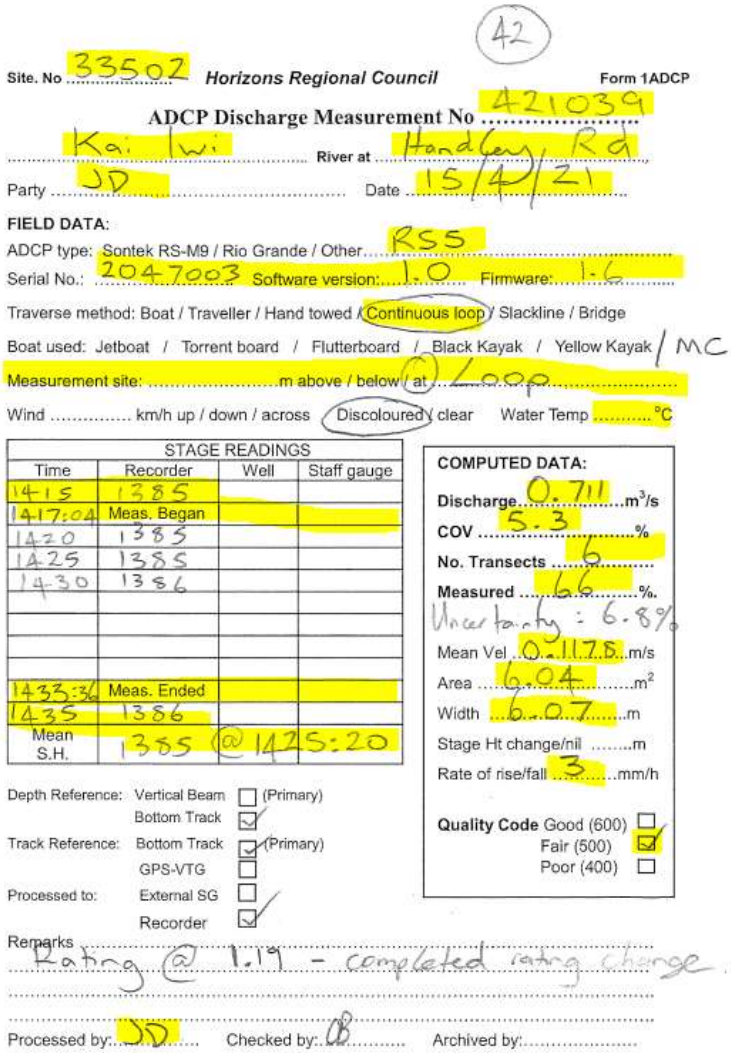
Stage:
Arrival (punch or time step before the start of the gauging) and Start (of gauging) and Finish (of gauging) and Departure (punch or time step following the end of the gauging)
Recorder: logger value (Public telemetry)
Well: Electronic Plumb Bob
River: External Staff Gauge (ESG)
Need ESG (*River* and *Error*, i.e. 2015 ±3) reading where applicable here
Stage change (mm/hr)

Comment:
The comment field is not long enough to store the network location of the tsv file, so this is **unnecessary,** but check that the file is located in the expected place on the network, if it is not, return the card to the technician so that they can find the file on their computer and put it in the required network location. **If the file cannot be located on the network drive or the technician's computer, then the gauging will have to be given QC200.**
Anything specific to the results of the gauging, e.g. control shifts, control for the gauging, digger upstream/on control, trees cut down etc.

5. Physical Face card

- Is this consistent to Hilltop output (hydrometric facecard)?
- Stage filed to the logged stage/External Staff Gauge? Provisional Ratings: logged stage

(*Highlighted areas indicate what to check*) *The card format is currently being updated so may look different.*



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Site. No 33502 *Horizons Regional Council* Form 1ADCP

ADCP Discharge Measurement No 421039

Kaiwi River at Hardgrave Rd

Party JD Date 15/4/21

FIELD DATA:

ADCP type: Sontek RS-M9 / Rio Grande / Other RS5

Serial No.: 2047003 Software version: 1.0 Firmware: 1.6

Traverse method: Boat / Traveller / Hand towed / Continuous loop / Slackline / Bridge

Boat used: Jetboat / Torrent board / Flutterboard / Black Kayak / Yellow Kayak / MC

Measurement site: m above / below / at Loop

Wind km/h up / down / across Discoloured / clear Water Temp °C

STAGE READINGS

Time	Recorder	Well	Staff gauge
1415	1385		
1417:04	Meas. Began		
1420	1385		
1425	1385		
1430	1386		
1433:36	Meas. Ended		
1435	1386		
Mean S.H.	1385 @ 1425:20		

COMPUTED DATA:

Discharge 0.711 m³/s

COV 5.3 %

No. Transects 6

Measured 66 %.

Uncertainty : 6.8%

Mean Vel 0.1178 m/s

Area 6.04 m²

Width 6.07 m

Stage Ht change/nil m

Rate of rise/fall 3 mm/h

Quality Code Good (600) ☐
Fair (500) ☑
Poor (400) ☐

Depth Reference: Vertical Beam ☐ (Primary)
Bottom Track ☑

Track Reference: Bottom Track ☑ (Primary)
GPS-VTG ☐

Processed to: External SG ☐
Recorder ☑

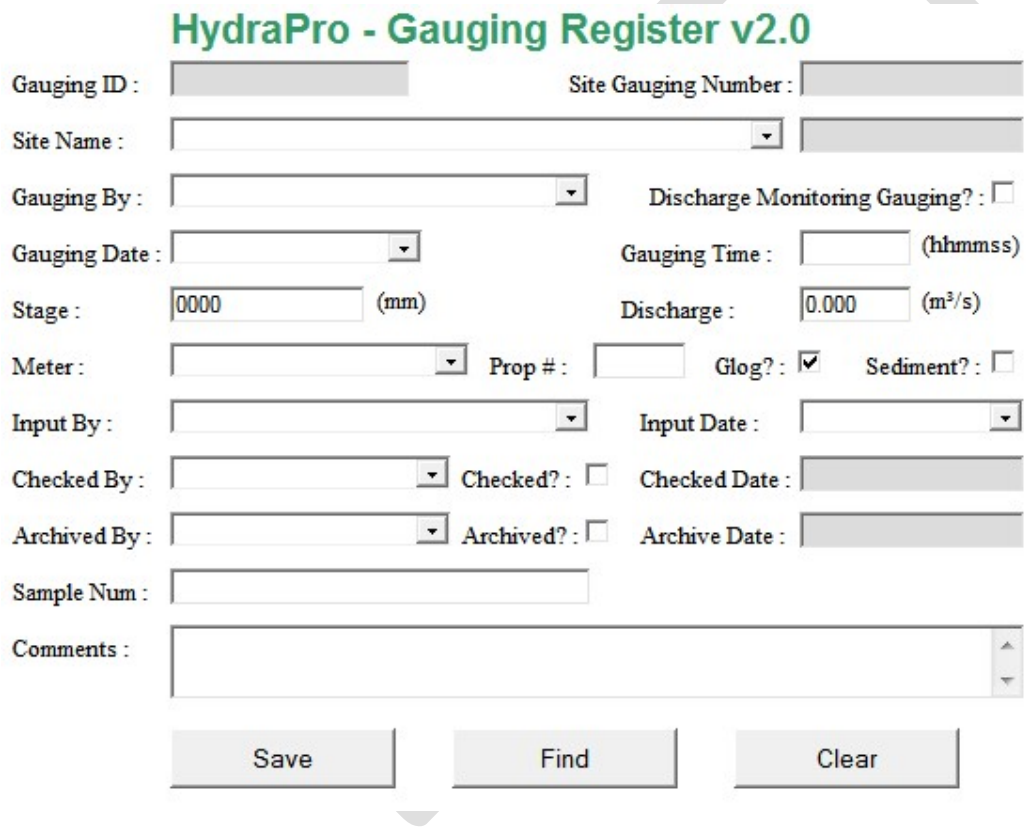
Remarks Rating @ 1.19 - completed rating change

Processed by: JD Checked by: CB Archived by:

-Gauging Number
-Site Number and Site Name
-Party and Date of gauging
-Meter Type, No.
-Method code (**method code for Sontek RS5 is 45**)
-Location of gauging
-Water temperature
-Recorder, well and river stage heights/time at beginning and end of gauging as well as on arrival and departure
-Computed flow **m3/s**
-Derived stage height and time for gauging
-Stage Height change (where applicable)
-Area
-Width
-Maximum depth
-Mean velocity
-Cov Q
-Total Uncertainty

6. Gauging Register

- Is the gauging number the same?
- Does it have a Site Number?
- Is this consistent with Hilltops output? Has the Register been completed?
- Does the filed stage height match?
- Does the Gauging Time match?
- Does the discharge measurement match the filed Hilltop discharge?
- Are the up-to-date gauging meter serial and prop numbers entered?
    - (note: for the RS5, the meter is *Sontek RS5*, and the serial number of the meter is entered in the 'prop' field)
- Has the Quality Code been added to the gauging comment? Are there any significant comments concerning the gauging?



If all the information is present and correct continue to complete quality assurance of the gauging *if not, please return to the Technician to complete*