

What's New in Hydroacoustics

The latest in equipment, policies, procedures, and
common issues

November 2014

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USGS Water Mission Area



What's New?

- Instruments and Methods
 - Moving Boat
 - Mid-section
 - Index Velocity
 - Field forms & database issues
 - Sediment Acoustics
- OSW Support
 - Web pages / Forums
 - Training

MOVING BOAT ADCP MEASUREMENTS

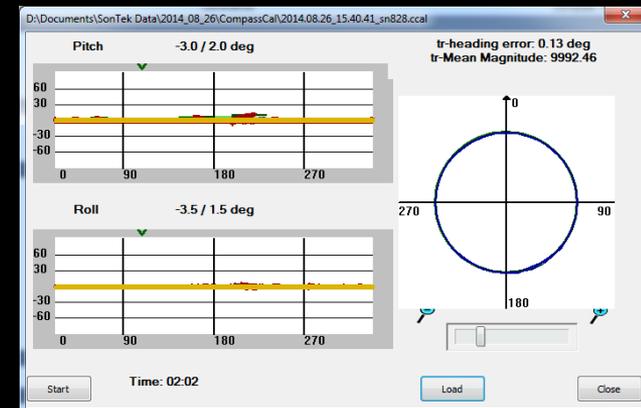
M9 Compass Modifications

- 2011-2013: USGS testing (>2 years) identified various compass calibration problems.
- Feb. – Aug. 2014: SonTek developed a solution that involved hardware (moving compass, new magnetometer) and software changes.
- Aug. 2014: Two USGS M9s modified and returned to USGS for testing
- USGS Testing Results
 - Calibration & user feedback is much improved.
 - Testing wasn't wholly conclusive; but seemed to support the stated compass accuracy (± 2 degrees).
- Oct. 2014: SonTek “released” M9 compass modification. Involves factory recall.
- Nov. 2014: OSW Note 2015.05.



M9 Compass Modifications Recall Process

1. Schedule return of M9 to SonTek
2. Run and record **RSMatrix** before repair
3. When M9 is returned, run **RSMatrix** again and collect a **comparison measurement**
4. **Submit RSMatrix results and comparison Qm to SharePoint site (see OSW Note 2015.05)**
5. A sample of repaired M9s will be tested at HIF. HIF will notify offices.
6. Webinar coming!



TRDI RiverRay Vertical Beam

- TRDI added a 600 kHz vertical beam to the RiverRay (for depth measurement only).
- Software modified to support vertical beam, 4-beam bottom-track depths, echo sounder or composite
- Test plan created for evaluating efficacy of VB (on web site)

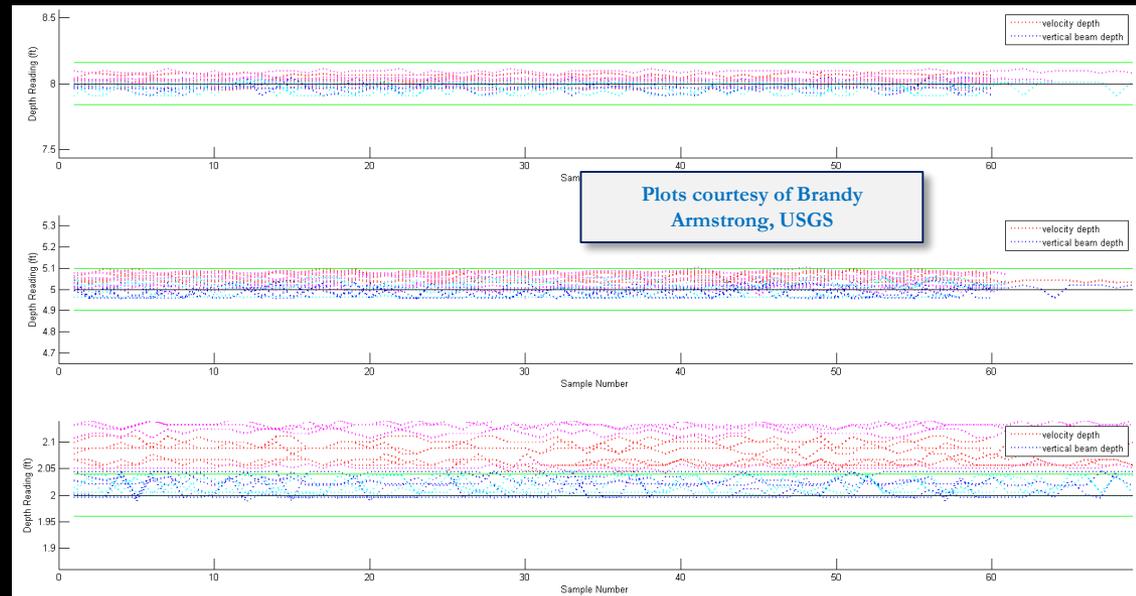
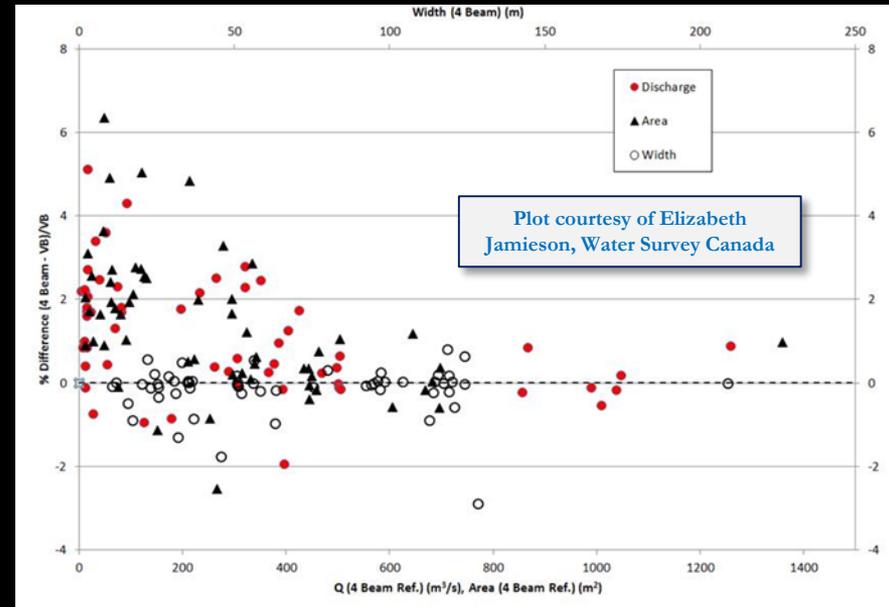
River Depth Source

<input checked="" type="radio"/> BT Depth	<input type="radio"/> Vertical Beam
<input type="radio"/> Depth Sounder	<input type="radio"/> Composite

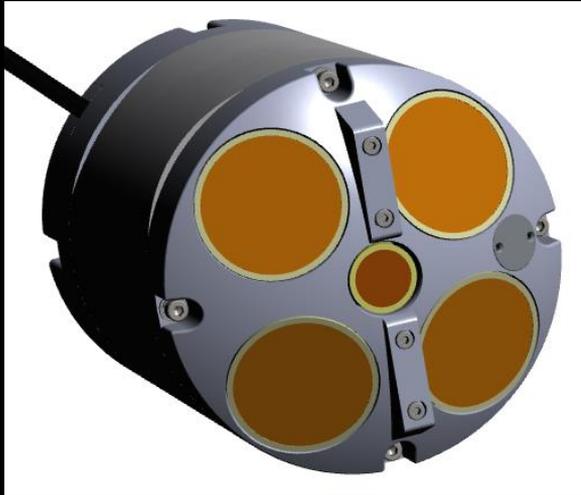


RiverRay Vertical Beam

- Some preliminary evidence of discharges computed with the VB are less than discharges computed using 4-beam weighted average. OSW is investigating!
- Submit comparison Qms to SharePoint!



TRDI RiverPro ADCP



- 5 acoustic beams; four 1200 kHz 20-degree beams and one 600 kHz vertical beam.
- Vertical beam: depth & velocity
- Auto-adaptive configuration
- Embedded GPS for geo-referencing data collected.
- Manual configuration for advanced users (\$\$)
- RSSI can be calibrated for use in sediment acoustics (\$\$)

TRDI RiverPro ADCP

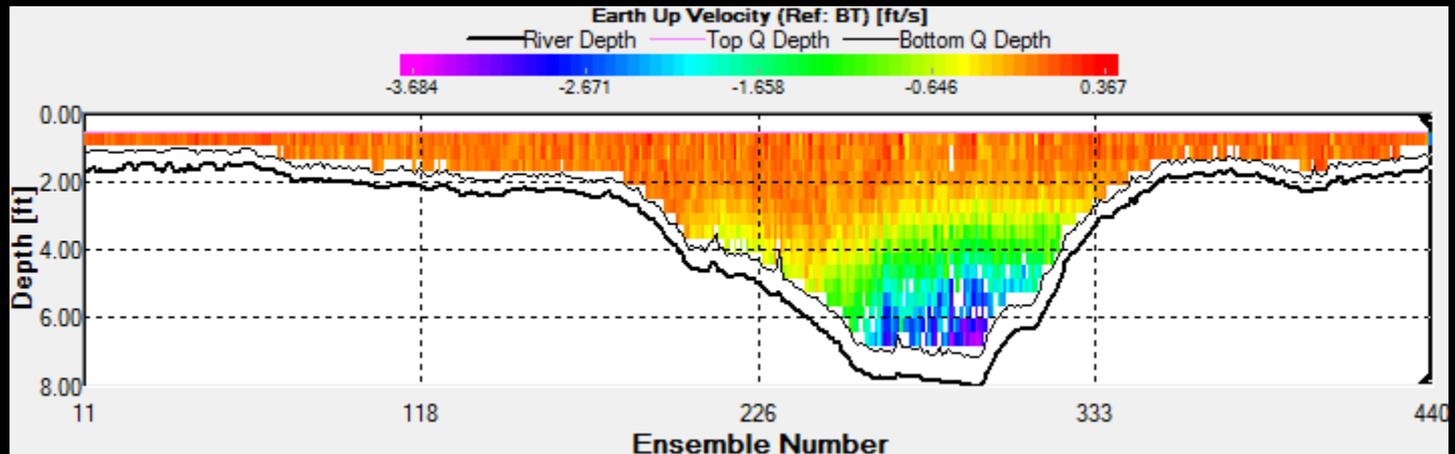


- The RiverPro will fit into the RiverRay float, allowing users to swap ADCPs, reducing the need to purchase and transport a second float.
- Possible Rio Grande conversion. No details yet.
- 1 RiverPro purchased by OSW (but not delivered); No formal test results yet.

StreamPro Site-specific Interference

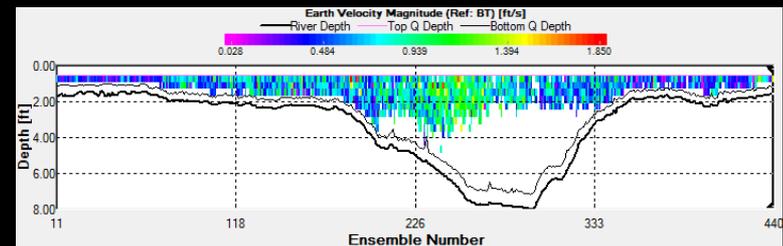
```
>PT3
Mag (%)   Lag Bm1 Bm2 Bm3 Bm4
          0 100 100 100 100
          1  78  71  72  76
          2  80  74  75  80
          3  88  83  81  86
          4  81  76  78  83
          5  84  80  80  81
          6  86  78  81  86
          7  82  78  79  81
Sin Duty(%) 46 45 48 46
Cos Duty(%) 49 49 49 46
RSSI (counts) 84 90 91 91
```

- USGS has evidence of site-specific electromagnetic interference (EMI).
 - PT3 test results: RSSI do not decrease to 15% or less by lag 3
 - Error and vertical velocities increase with depth and are larger than expected.



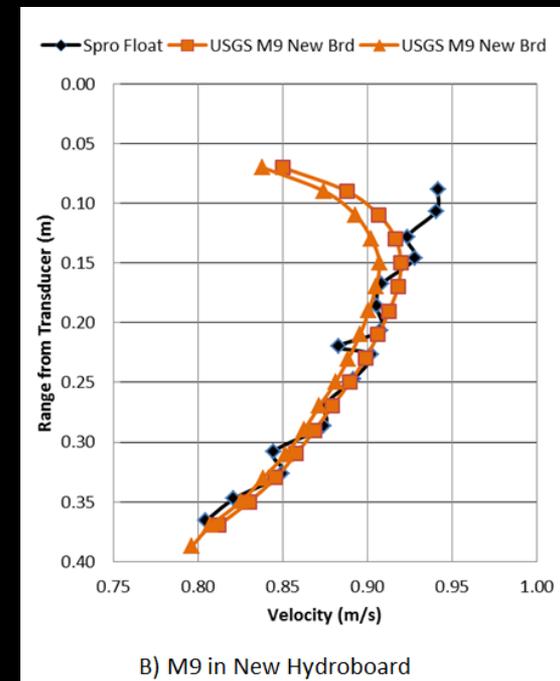
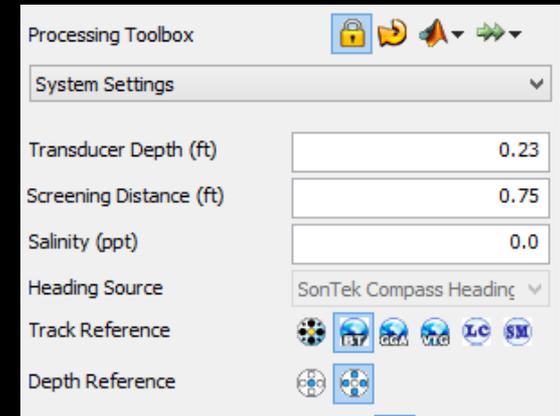
StreamPro Site-specific Interference

- StreamPro more susceptible because of cable between transducer and electronics
- Lower backscatter sites more susceptible
- Reasonable values for the WT Up and WT Error thresholds can usually screen out erroneous data – but may screen out a significant amount of data
- **Solutions:**
 - Move measuring section (substantial distance). If still present, don't use StreamPro
 - TRDI working on hardware shielding for new and existing StreamPros



Identification of Flow Disturbance Bias

- OSW Tech Memo 2014.01 requires use of 16 cm screening distance. **In RSLive, must enter value = (ADCP depth + 16 cm).**
 - Analysis by OSW of comparison measurements submitted by WSCs indicated a velocity bias in M9 data.
 - OSW used field experiments and 3-D numerical simulations to determine 16 cm distance and to confirm our findings.
- **New RSLive software will automatically screen data, provided a special file is loaded properly. Guidance coming!**



Moving-boat ADCP T&M Revised!!

Watch the Webinar!!
Read the Report!!

<http://hydroacoustics.usgs.gov/training/webinars.shtml>
<http://pubs.usgs.gov/tm/3a22/>



Measuring Discharge with Acoustic Doppler Current Profilers from a Moving Boat

Chapter 22 of
Section A, Surface-Water Techniques
Book 3, Applications of Hydraulics



Techniques and Methods 3-A22
Version 2.0, December 2013

U.S. Department of the Interior
U.S. Geological Survey

Significant Updates and Changes

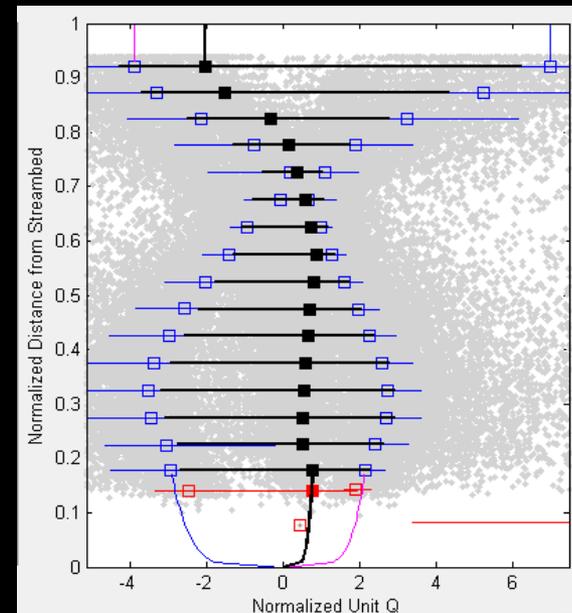
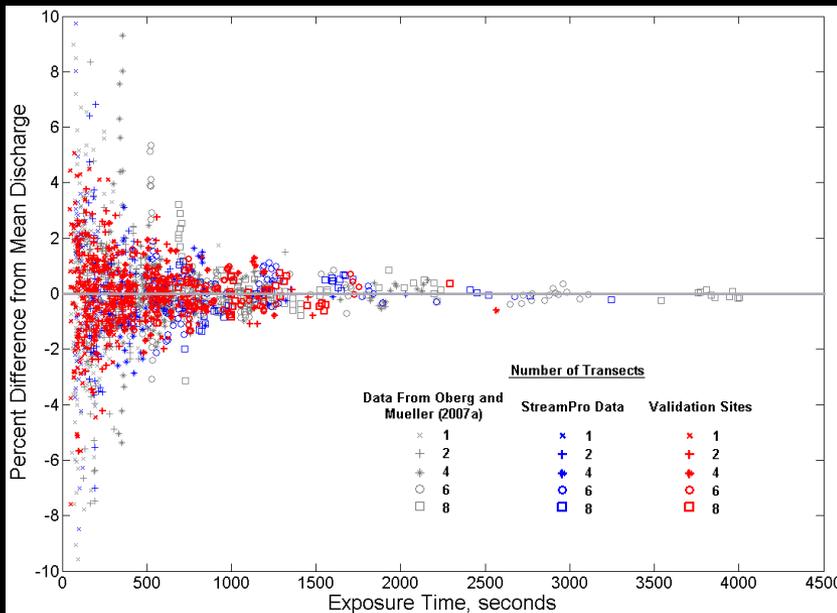
Significant Updates and Changes

The list below contains information on the important updates and changes in this revision when compared to the original publication (2009). The list is not exhaustive, but is intended to highlight differences of interest to the majority of those that perform moving-boat ADCP discharge measurements.

- Discussion of Instruments – Updated descriptions of instruments including signal processing, frequency, and transducers (p. 2).
- Data Management – Added that all aspects of data management must follow agency policy and be documented in the office's surface-water quality-assurance plan. Encourages scanning of paper measurement notes to an electronic file (p. 3).
- Training – Added that training must comply with agency required training standards and highly encourages additional training in order to stay current (p. 4).
- Unmeasured Areas in a Profile – Added discussion of blanking distances for additional instruments (p. 6).
- Configuration and Characteristics – Added characteristics for additional instruments (p. 7).
- Testing Requirements and Procedures – Added section describing when an instrument must be tested and a matrix of quality-assurance test requirements (p. 10).
- Transformation Matrix Check – Added description of methods for verifying that the correct transformation matrix is stored in the ADCP (p. 11).
- Instrument History Log – Added a discussion on the importance of logging instrument quality-assurance tests (p. 12).
- GPS Requirements and Specifications – Added specific precision requirements needed for the GPS data output and a discussion of VTG limitations (p. 12).
- Manned Boats – Added discussions of tethered boats used from a manned boat (p. 13).
- Tethered Boats – Added discussions about why to avoid wading with a tethered boat across the stream, recommendations of unmanned cableways, safety considerations, and use of tethered boats in high velocity situations (p. 14).
- Remote-Controlled Boats – Added concern of potential effect of motors and batteries on the compass (p. 18).
- Other Equipment – Added electronic field notes (p. 18).
- Variation in Speed of Sound with Depth – Added discussion that some software can correct the vertical velocity or depth for changes in the speed of sound, but array ADCPs horizontal velocities are unaffected by changes in speed of sound. Vertical velocity and depth are still dependent on correcting the speed of sound (p. 18).
- Water Temperature – Clarified that ADCP temperature comparisons are for quality assurance only and should not be released to the public when not using a method that meets USGS water temperature field measurement standards (p. 22).
- Salinity – Set minimum bounds when salinity is expected to be sampled to within a thousand (p. 22).

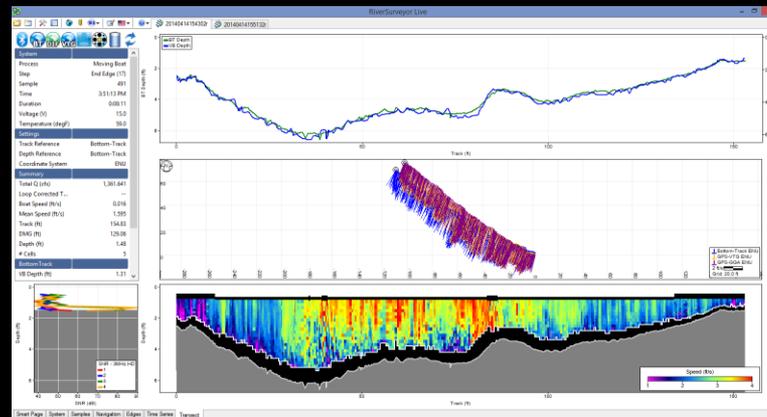
Exposure Time – Review Policy

- Applies to steady flow conditions only!!
- Best practice: Obtain more transects – may reduce uncertainty. (Rating of ADCP Qms)
- More transects at a faster, but more uniform boat speed may yield better measurements.



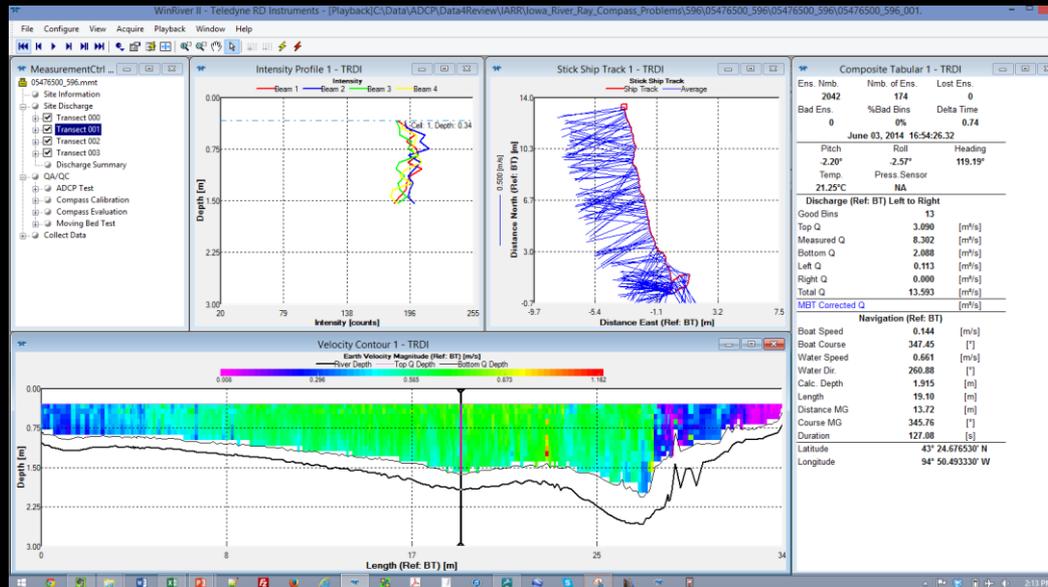
RS Live Updates

- RiverSurveyor Live Versions to use:
 - M9s with compass retrofit will require version 3.80+
 - M9s with new PCMs require version 3.70+
 - For everyone else, version 3.60 is recommended for now.
 - Once we get more broad experience with 3.80, might recommend it to all, assuming it is stable and works well.



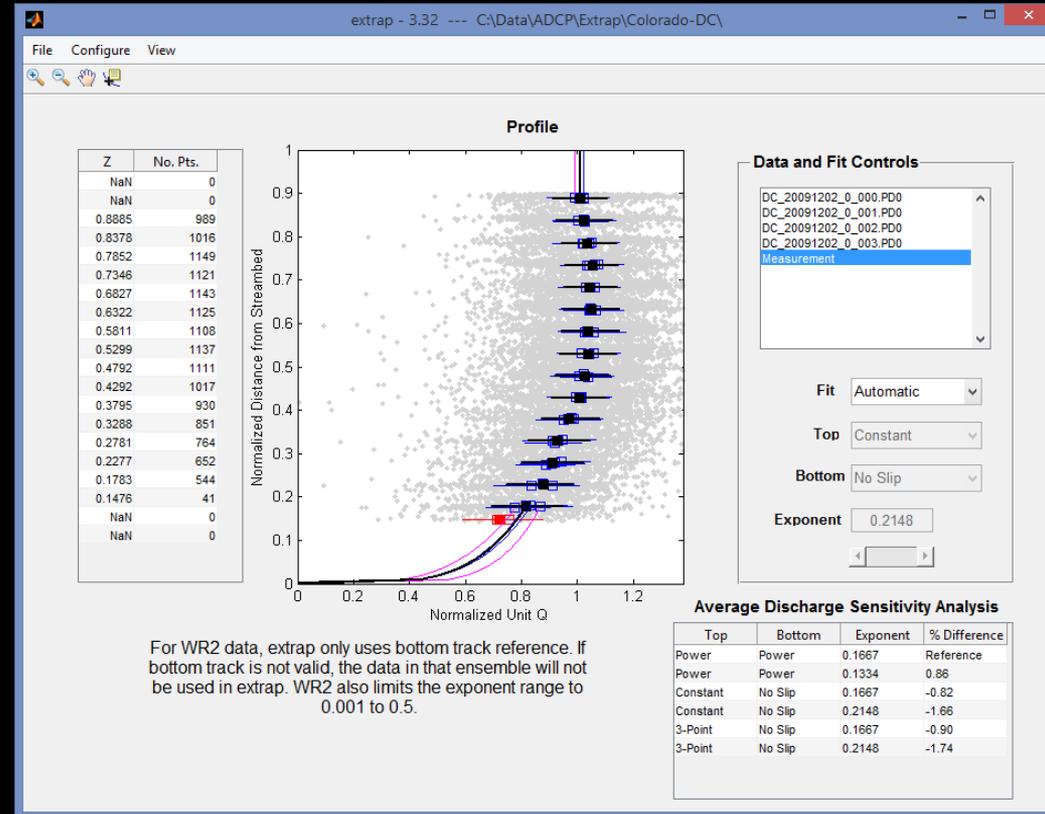
WinRiverII Updates

- WRII was updated to support Loop and Stationary MBTs some time ago.
- **Recommended version is 2.12.** Version 2.15 will be required when RiverPro begins to be used.



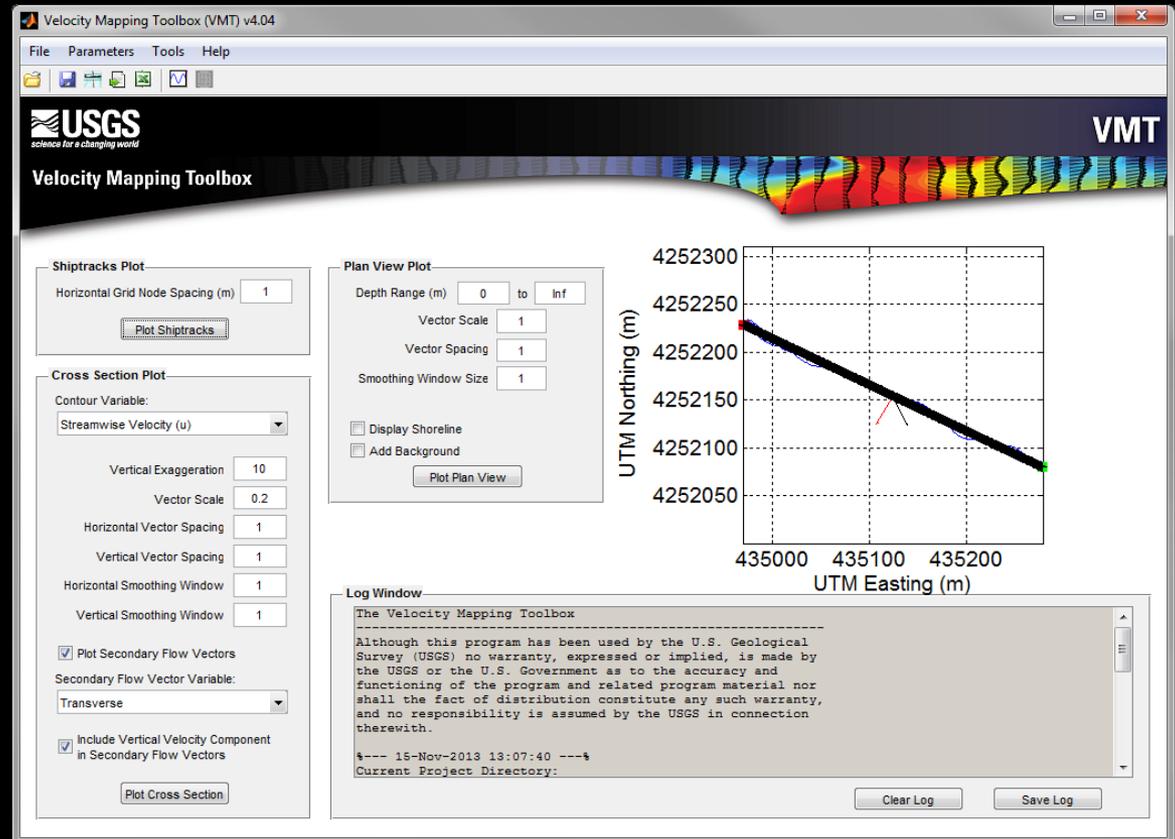
Extrap

- Make sure that you are using it!
- Watch the podcast/online training!!
- Some possibility that it will find it's way into vendor software.



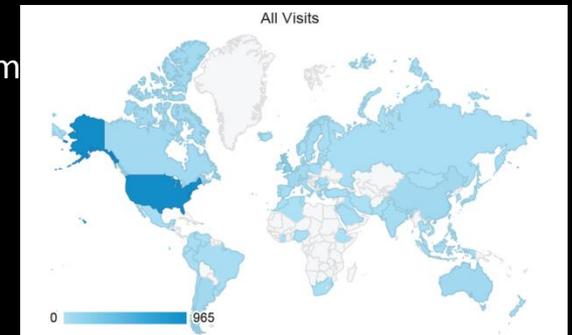
Velocity Mapping Toolbox (VMT)

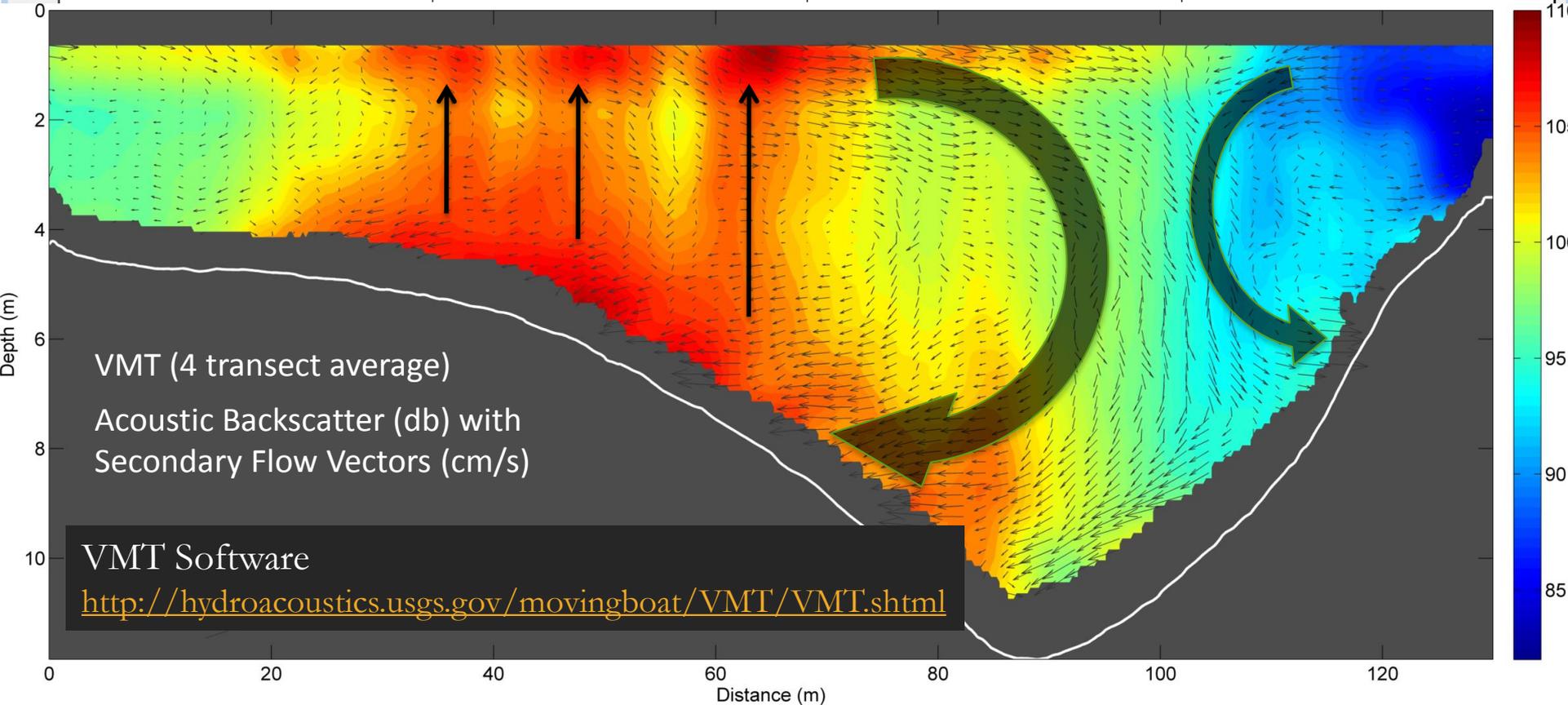
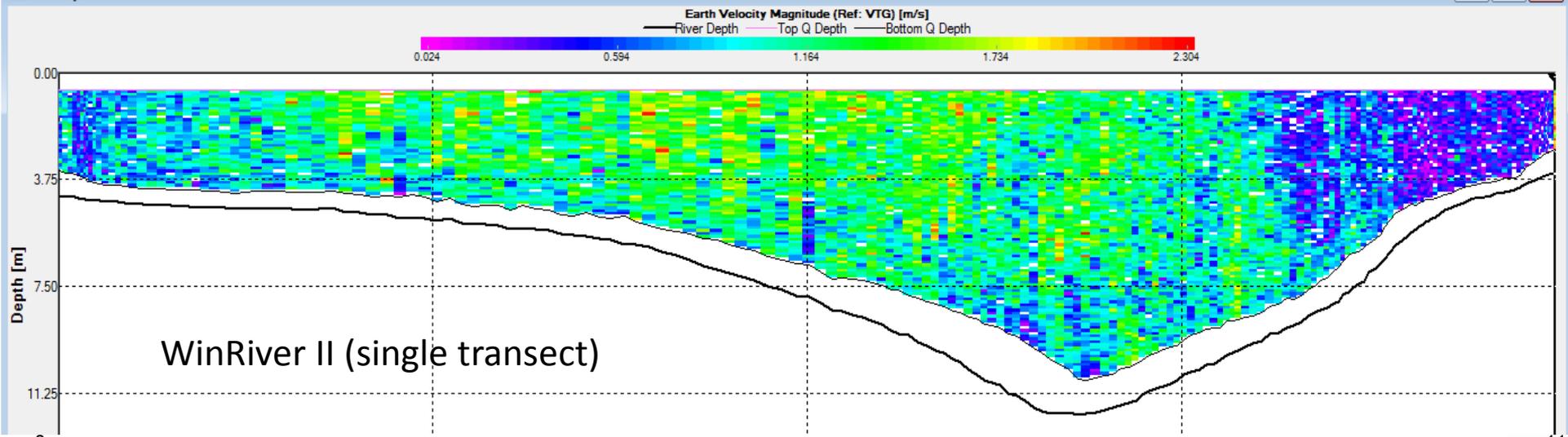
- Makes powerful post-processing and visualization tools accessible to ADCP users
- Generates figures that effectively communicate our data to cooperators and the public
- Is freely available



Currently VMT has over 690 users from numerous countries
(based on downloads from Nov. 2012 to Dec. 2013)

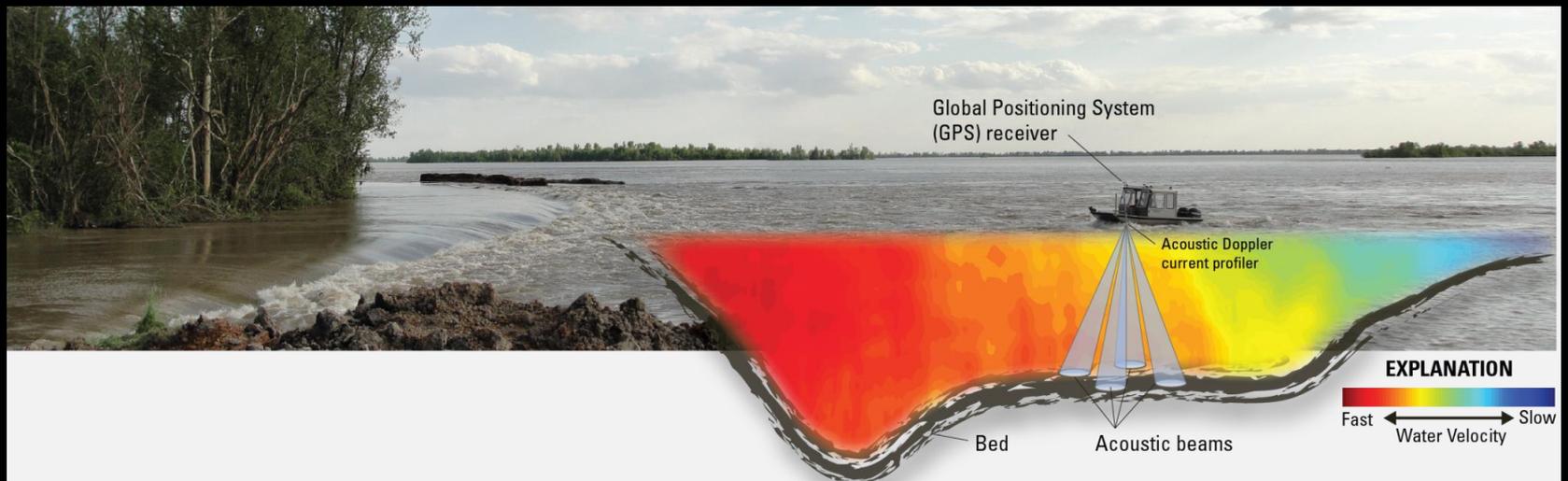
We currently average 20-30 downloads per day
(1-2 per day until Nov. 2013)





VMT Updates

- Support for RiverRay ADCP added
- Limited support for M9
- Routines to compute longitudinal dispersion coefficients
- Batch processing and custom file builder tools



MID-SECTION MEASUREMENTS

Midsection ADCP Measurements

- When to use it
 - Check measurements
 - When bottom track is invalid
 - GPS data are unavailable or invalid
 - Ice-covered streams
- Teledyne-RDI
 - ~~WinRiver II SxS~~ | ~~StreamPro Handheld SxS~~
 - SxS Pro
- SonTek M9 and S5
 - RiverSurveyor Stationary Live
 - RiverSurveyor Stationary Live Mobile (On phone w/Bluetooth PCMs)

Ice Qms

- Past 3 winters, data from SiteVisit indicate that as many as 60% of ice Qms were made with acoustics devices.
- Interim techniques for flow measurements under ice have been drafted by Water Survey Canada with USGS input. USGS is recommending following their guidelines



Standard Operating Procedures for under-ice discharge measurements using ADCPs

Water Survey of Canada

P Campbell, Water Survey of Canada, Environment Canada, Ottawa, 2014

Version 1.1



Mid-section Reminders

- Flowtracker ADVs
 - View the Flowtracker webinar – available at hydroacoustics.gov.
- Training for mid-section measurements
 - Using ADCPs for Open Water Mid-Section Measurements
 - Using ADCPs Under Ice (Podcast)

ADCP Mid-section Podcast (00:04 / 25:32)

Nick Stasulis
Hydrologic Technician

Outline Thumbnails Notes Search

- Using ADCPs for Open Water Mid-se
- Overview
- What is the Mid-section Method?
- What should I know about selecting a cross
- Do ADCPs work the same way with Mid-se
- Do I need to do anything different with my A
- Don't take the software for granted.
- Extrapolation
- TRDI - Enabling an ADCP
- TRDI - Starting a Measurement
- TRDI - Starting a Measurement
- TRDI - Collecting data
- TRDI - Water Depth Source
- TRDI - Processing Settings
- TRDI - Good ens. in cell
- SonTek - Enabling an ADCP
- SonTek - Starting a Measurement
- SonTek - Accounting for Angles
- SonTek - Accounting for Angles
- SonTek - Accounting for Angles
- SonTek - Collecting Data

Using ADCPs for Open Water Mid-section Measurements

Hydroacoustic Work Group (HaWG) Podcast
Recorded May 2014 – Nick Stasulis, Maine Office

HydroAcoustics USGS

SLIDE 1 OF 25 PLAYING 00:04 / 00:25

ADCP Ice Podcast (00:13 / 24:35)

Nick Stasulis
Hydrologic Technician

Outline Thumbnails Notes Search

- Common Questions When Using ADCPs Und
- Overview
- Do I need to do a temperature comparison?
- Do I need to process the measurement on si
- is my ADCP going to work in the cold?
- How should I mount the ADCP?
- Slide 7
- Should I account for Angles?
- Should I enter ice information?
- How do I handle slush?
- Can I import SxS Qms into SWAMP?
- SonTek – How do I account for angles?
- SonTek – How do I account for angles?
- SonTek – Can I enter a manual station?
- SonTek – What version should I be using?
- TRDI – How do I account for angles?
- TRDI – Can I enter a manual station?
- TRDI – What can I do about that one bin?
- TRDI – Any other important settings?
- TRDI – What version should I be using?
- Could you summarize all of this?

Common Questions When Using ADCPs Under Ice

Hydroacoustic Work Group (HaWG) Podcast

Recorded February 2014 – Nick Stasulis, Maine Office

HydroAcoustics USGS

SLIDE 1 OF 22 PLAYING 00:13 / 00:20

INDEX VELOCITY METHOD

SonTek ADVMs - iQ series (iQ Plus)

Index Velocity



Internal Q computation



- Replacement for Argonaut SW
- Complete re-design; includes SmartPulse HD “mode”
- Two “streamwise” beams and two skewed beams
- One vertical beam for depth
- Tested conducted by HIF;
report in review.



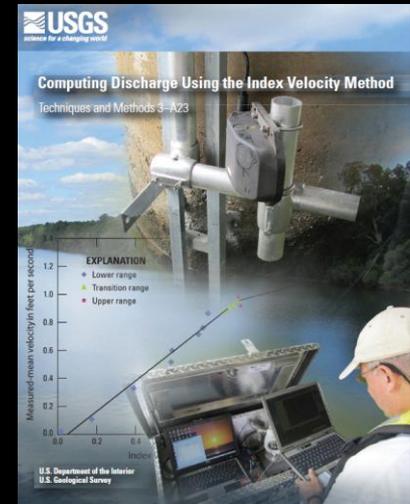
SonTek ADVMs - SonTek SL series (3G)

- Includes SmartPulse HD
- Same transducer configuration; electronics based on iQ
- New software for configuration
- Limited field evaluations in FL/ID WSCs
- HIF testing underway



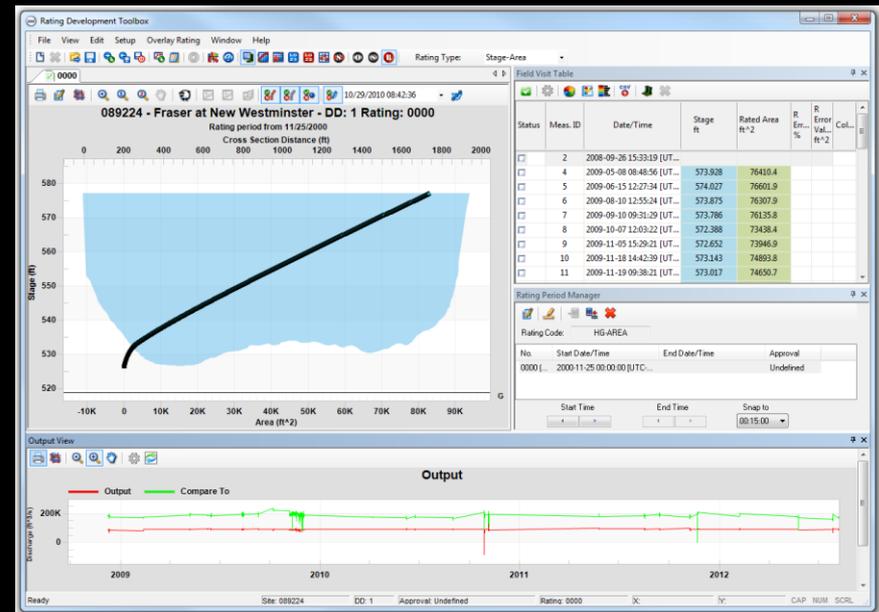
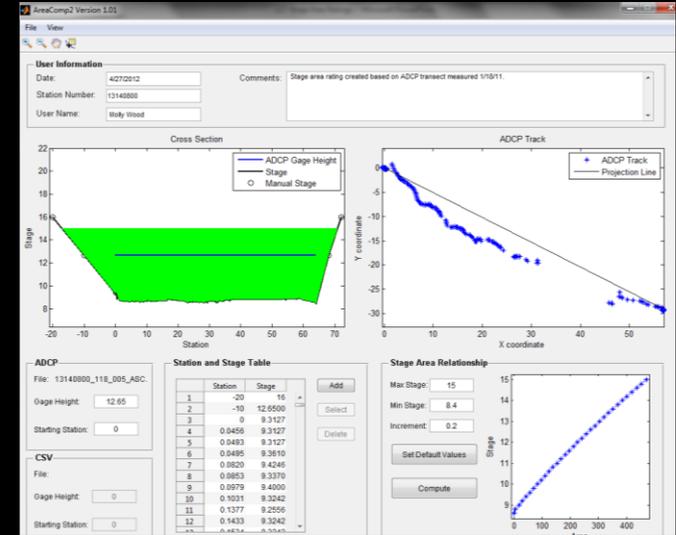
Index Velocity Methods

- Read and use the T&M
- Index-velocity rating template (on forum)
- TEL prereq for Index Velocity Class being developed
- OSW Memo 2014.08: **Requires that data gaps are “filled in”** in NWIS by loading the 1-minute data collected during Qms into NWIS.
- **Draft of an OSW memo on minimum requirements for documenting index-velocity and stage-area ratings**



Index Velocity Software

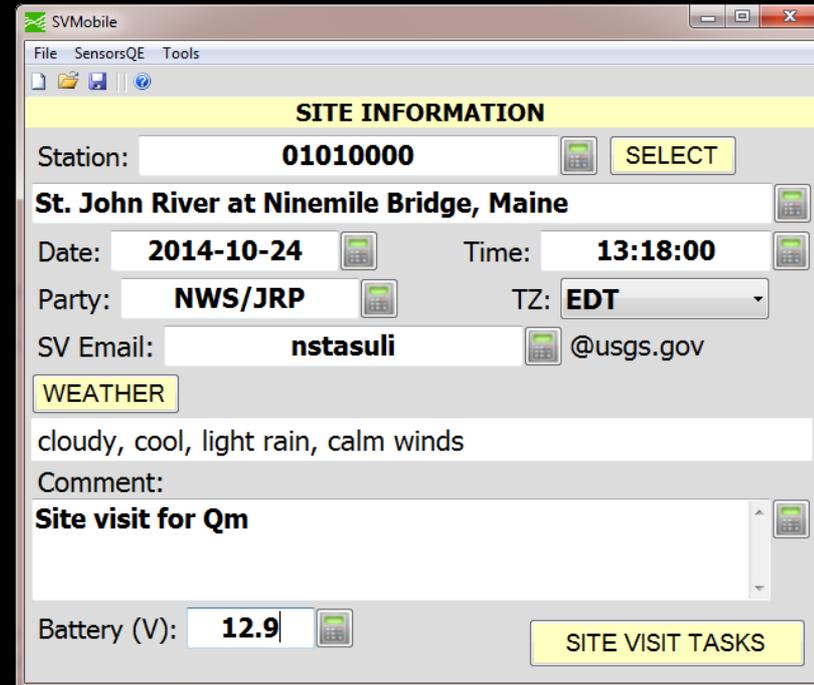
- AreaComp2 should be used for development of stage-area ratings.
- Working with Water Survey Canada (WSCa) and Aquatic Informatics to develop and test an Index Velocity Rating Tool



FIELD FORMS & DATABASE ISSUES

Electronic Notes - SVMobile

- OSW Memo 2014.07 requires the use of SWAMI/SVMobile
- SVMobile is used on PC for inspections, Qms and station levels
- Replaces SWAMI
- Can import measurement data

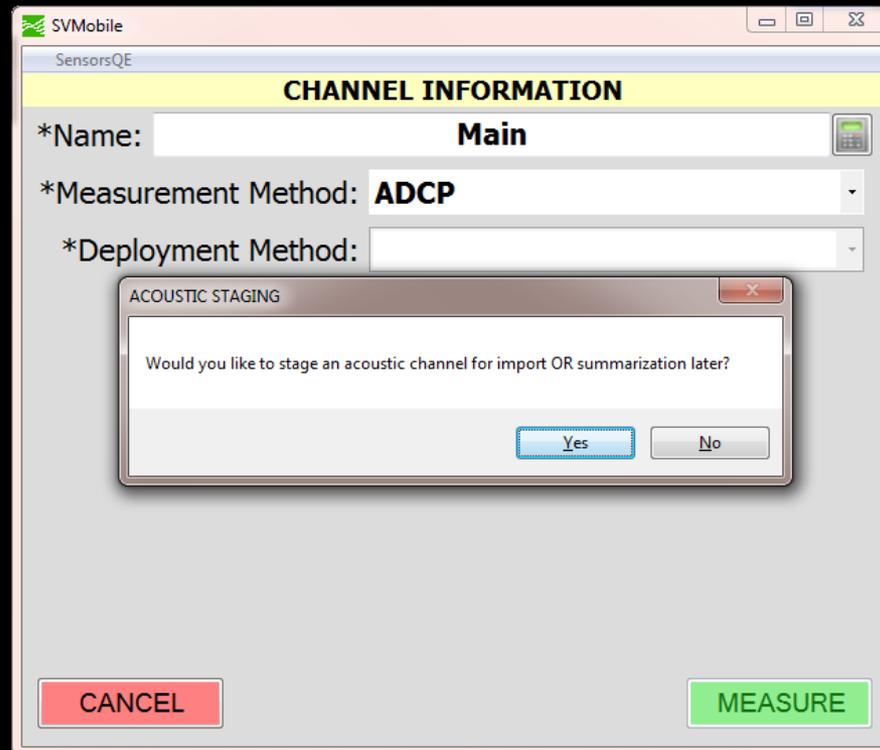


The screenshot displays the SVMobile application window. The title bar reads "SVMobile". The menu bar includes "File", "SensorsQE", and "Tools". The main content area is titled "SITE INFORMATION" and contains the following fields:

- Station: **01010000** (with a "SELECT" button)
- St. John River at Ninemile Bridge, Maine
- Date: **2014-10-24** (with a calendar icon) | Time: **13:18:00** (with a clock icon)
- Party: **NWS/JRP** (with a calendar icon) | TZ: **EDT** (dropdown menu)
- SV Email: **nstasuli** (with a calendar icon) | **@usgs.gov**

Below the site information is a "WEATHER" section with the text: "cloudy, cool, light rain, calm winds". A "Comment:" field contains the text: "Site visit for Qm". At the bottom left, the "Battery (V):" is shown as **12.9** (with a battery icon). A yellow "SITE VISIT TASKS" button is located at the bottom right.

SVMobile – Staging ADCP Measurements



- ‘Staging’ allows pre-measurement tests and notes during Qm to be documented before Qm is finished

SVMobile – Temperature Comparison

The screenshot shows two overlapping windows from the SVMobile application. The background window is titled 'SensorsQE' and has a yellow header 'ACOUSTIC IN'. The foreground window is also titled 'SensorsQE' and has a yellow header 'TEMPERATURE/SALINITY READINGS'. It contains several input fields: '*Reading Time: 13:36:00', 'Instrument Temperature: 45.0', 'Verification Temperature: 46.2', and 'Salinity:'. A 'Units:' dropdown menu is set to 'F'. A green 'ADD' button is located to the right of the input fields. Below the input fields is a 'Comment:' text area. At the bottom of the foreground window is a green 'DONE' button. A blue-bordered text box at the bottom of the foreground window contains the following text: 'ADCP temperature comparisons should be conducted before data collection begins. Comparisons must be documented in the Temperature/Salinity page in SVMobile.'

TEMPERATURE/SALINITY READINGS

*Reading Time: 13:36:00

Instrument Temperature: 45.0

Verification Temperature: 46.2

Salinity:

Units: F

ADD

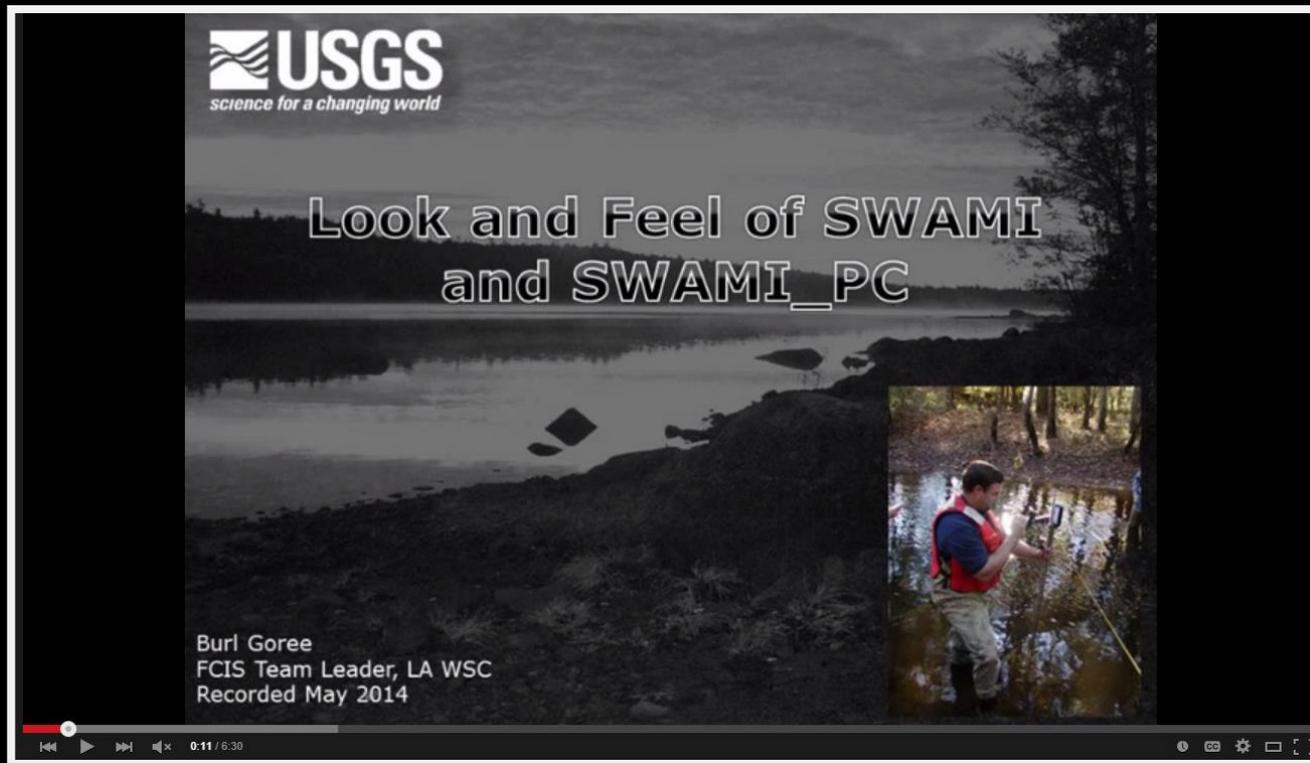
Comment:

Time	InstTemp	VerTemp	Units	Salinity	Comment
ADCP temperature comparisons should be conducted before data collection begins. Comparisons must be documented in the Temperature/Salinity page in SVMobile.					

DONE

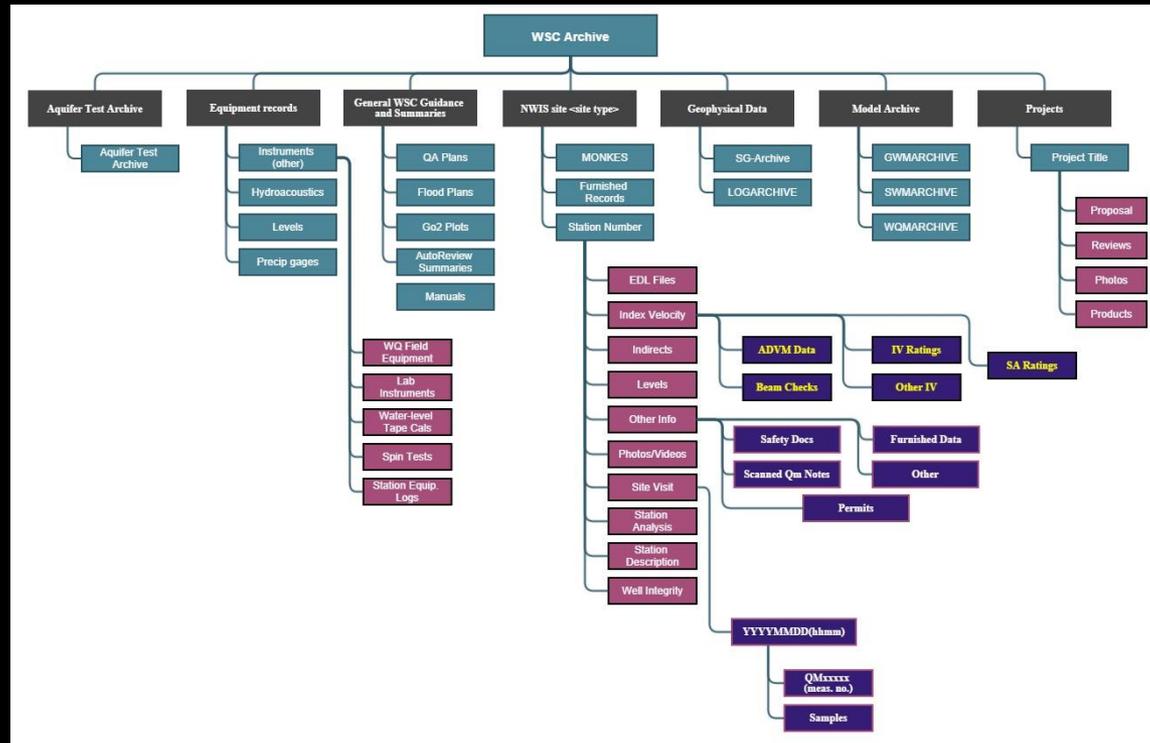
SVMobile and HA Measurements

- Watch videos available on USGS HydroTube:
<http://www.usgs.gov/humancapital/ecd/hydrotube/hydrotube-swami.html>



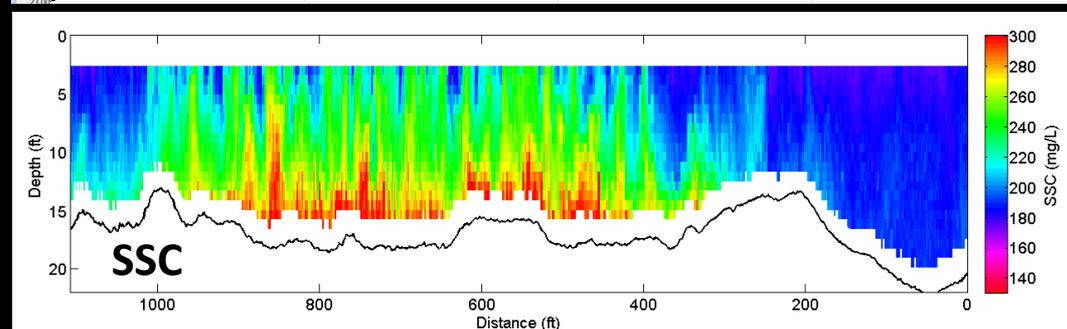
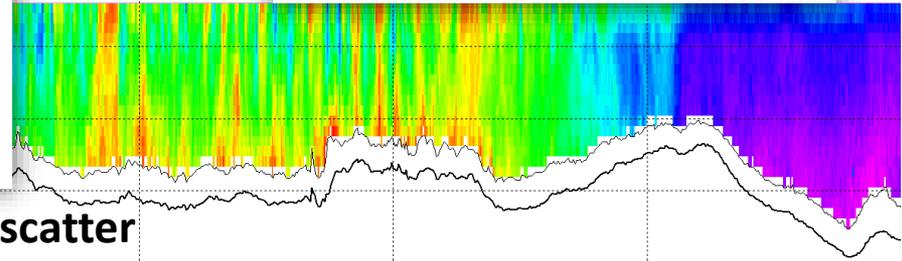
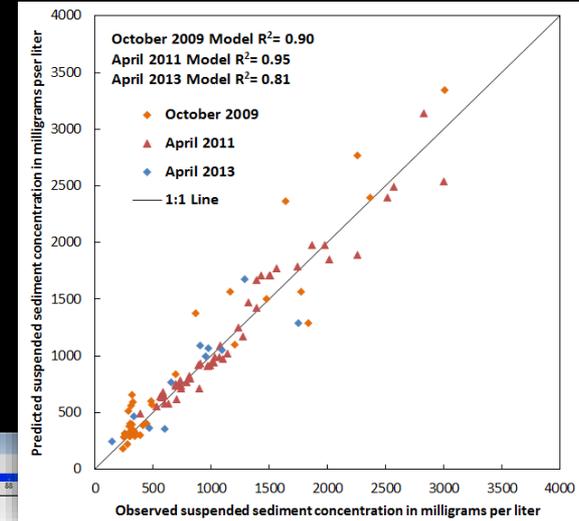
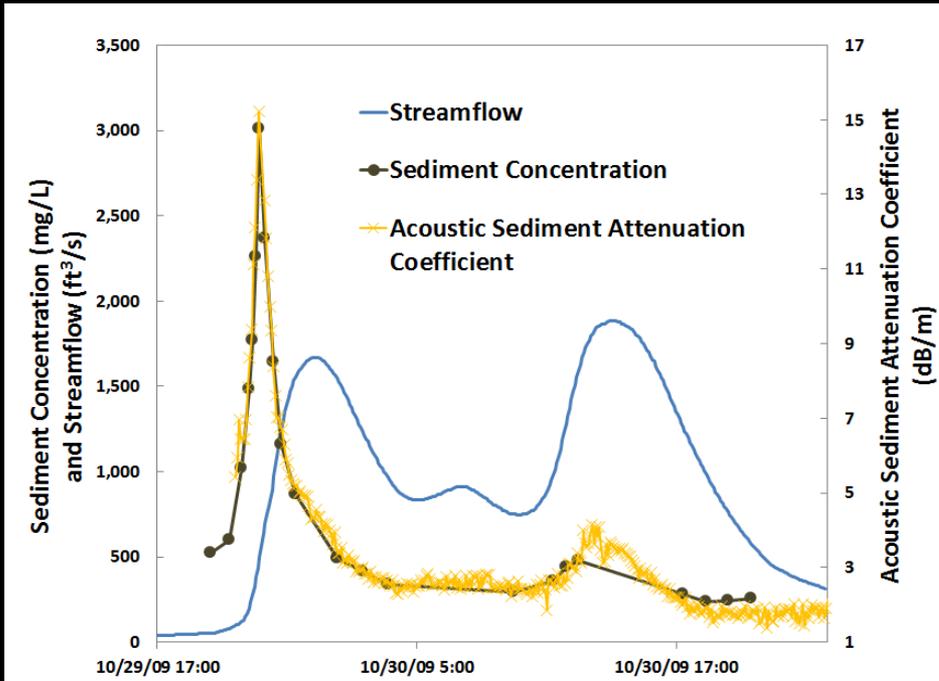
Electronic Data Archival

- Draft OSW Note has been prepared
- Final tweaks of “recommended” archival structure being made. **Contact: Jim Kolva, OSW**



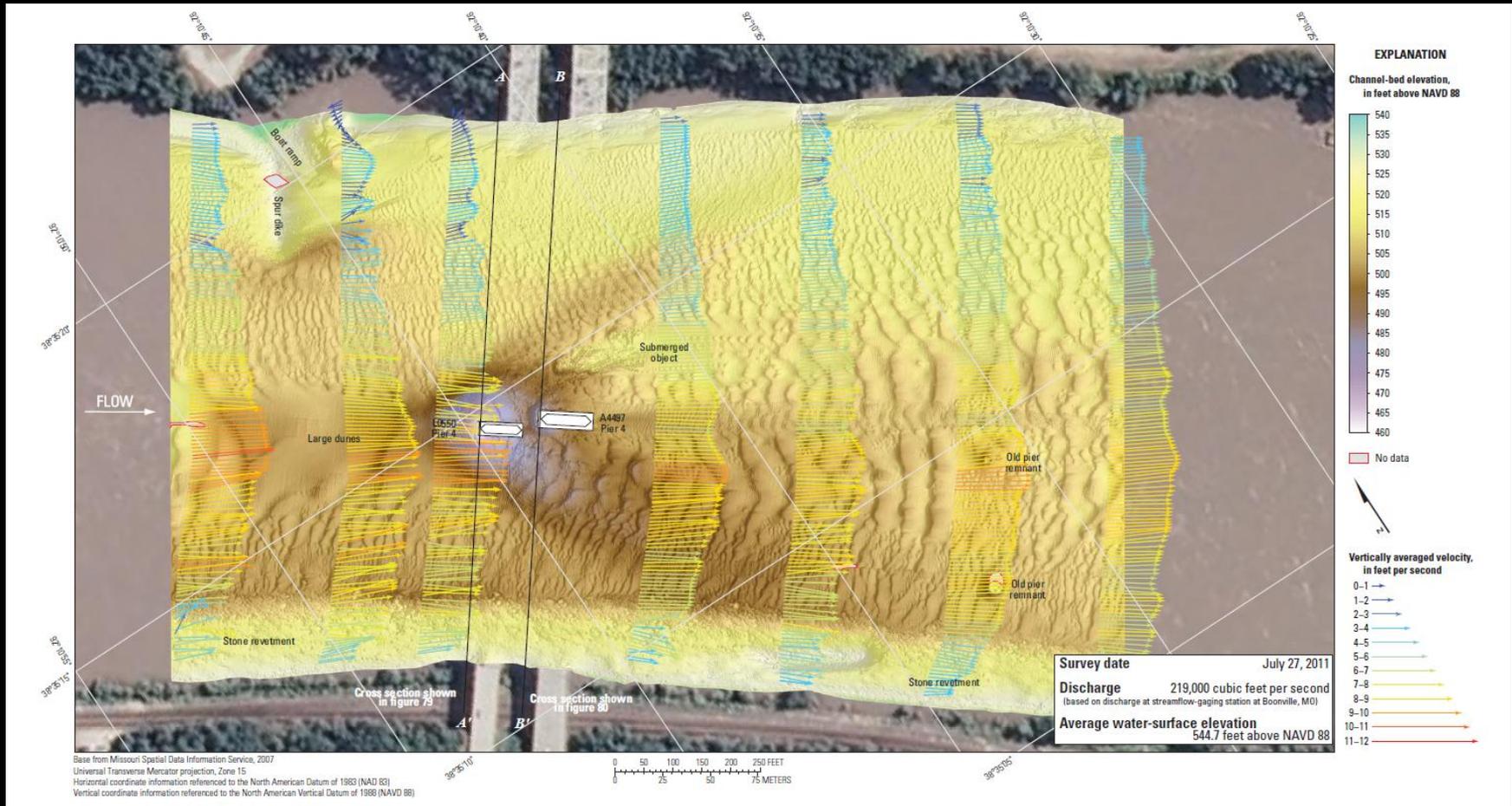
SEDIMENT ACOUSTICS

Estimating Suspended Sediment Concentrations



SALT
Sediment Acoustic
Leadership Team

MBES and ADCP: Missouri River at US Highway 54



From: USGS SIR 2012-5204; (R. Huizinga)

OSW SUPPORT ACTIVITIES

OSW Hydroacoustics Website

<http://hydroacoustics.usgs.gov>

- Moved to a new server. Had some ‘hiccups’. Most things working now.
- Mailing list is no longer working. Alternative???



The screenshot shows the OSW Hydroacoustics website home page. At the top left is the USGS logo with the tagline "science for a changing world". To the right is a banner image of people on a boat using hydroacoustic equipment. In the top right corner, there are links for "USGS Home", "Contact USGS", and "Search USGS".

The main heading is "OSW Hydroacoustics Home Page". Below this, there is a paragraph of introductory text: "The U.S. Geological Survey (USGS) has been collecting streamflow information for the Nation's streams since 1889. The USGS has been involved in developing and using acoustic flow measurement technology since the late 1960s to improve the accuracy of an efficiency of streamflow measurements. Since the early 1980s the USGS has worked cooperatively with manufactures to develop and enhance the use of acoustic Doppler instruments. ADCP performance and operational characteristics are changing frequently as hardware and software continue to improve. Frequent revisions of software, firmware, and documentation revisions are expected in the foreseeable future. The purpose of this website, supported by the Office of Surface Water, is to provide relevant information to hydroacoustic technology users in the USGS; however, most of the information provided herein is available to all users of hydroacoustic technology."

On the left side, there is a navigation menu with the following items:

- [Home](#)
- [Training](#)
 - [Classes](#)
 - [Webinars](#)
- [Memos](#)
- [Forums and Mailing List](#)
- [Contact the HAWG](#)
- [Moving-Boat Deployments](#)
 - [Instruments](#)
 - [Guidance](#)
 - [Software](#)
 - [Deployments](#)
 - [Tech Tips](#)
 - [References](#)
- [Velocity](#)
- [Mapping](#)
- [Hydrographic Surveying](#)

Below the navigation menu, there are sections for "Index Velocity" and "Mid-Section Measurements", each with a list of links:

- Index Velocity**
 - [Instruments](#)
 - [Guidance](#)
 - [Software](#)
 - [Deployments](#)
 - [Tech Tips](#)
 - [References](#)
- Mid-Section Measurements**
 - [Instruments](#)
 - [Guidance](#)
 - [Software](#)
 - [Deployments](#)
 - [Tech Tips](#)
 - [References](#)

On the right side, there is a section titled "Register for Hydroacoustic Webinars" with a paragraph of text: "The Office of Surface Water hosts webinars on various hydroacoustics topics. The proposed topics for upcoming webinars can be viewed at the new [OSW Hydroacoustics Webinar](#) page. As it is possible that the topic for a given month may change in response to scheduling conflicts or other problems, it is important to periodically check the above Web pages for any updates. We will make an effort to offer two different sessions for each Webinar and post a recording of one of the sessions on the [OSW Hydroacoustics Webinar](#) page. In addition, the OSW will send out an announcement for each Webinar with the dates and times and along with instructions for participating in the Webinar."

Below that is a section titled "What's New?" with a sub-section "USGS Fact Sheet" and a paragraph of text: "The Office of Surface Water has published a new fact sheet titled, [Acoustic Doppler Current Profiler Applications Used in Rivers and Estuaries by the U.S. Geological Survey](#). This fact sheet provides a overview of how ADCPs are being used in the USGS and how the technology can be applied to address various science problems."

Hydroacoustics OSW Forum

- Ask
- Search
- Read
- Answer
- Software

<http://hydroacoustics.usgs.gov/forum>

OSW Forum simplemachines forum

Hello Kevin Oberg
 Show unread posts since last visit.
 Show new replies to your posts.
 There are 3 members awaiting approval.
 November 17, 2014, 06:10:28 pm

News:

[Home](#) [Help](#) [Search](#) [Admin](#) [Moderate](#) [Profile](#) [My Messages](#) [Calendar](#) [Members](#) [Logout](#)

OSW Forum » Moving-Boat Deployments » General Discussion

Pages: [1] 2 3 ... 15 NEW TOPIC NEW POLL UNNOTIFY MARK READ

Subject / Started by	Replies / Views	Last post
Serial to USB Adapters... Started by Mike Rehmel	13 Replies 1113 Views	January 30, 2014, 10:23:59 pm by willsman
Remote Desktop in the field with portable devices... Started by Mike Rehmel	8 Replies 366 Views	May 10, 2013, 12:18:23 pm by Mike Rehmel
Using a Depth Sounder with WinRiver II Started by dmueller	4 Replies 171 Views	March 12, 2013, 03:56:50 pm by dmueller
Best Practices for Calibrating a TRDI RiverRay Compass Started by Nick Stasulis	8 Replies 225 Views	December 10, 2012, 09:47:31 am by jmays
Reasonable WinRiver thresholds for a StreamPro Started by Mike Rehmel	6 Replies 899 Views	November 28, 2012, 01:10:15 pm by Mike Clark
Best Practice for Calibrating SonTek RiverSurveyor Compass Started by dmueller	0 Replies 173 Views	August 30, 2012, 04:58:19 pm by dmueller
Hemisphere 101 versus Trimble 351 new Started by jgoodson	0 Replies 17 Views	November 03, 2014, 03:05:03 pm by jgoodson
Where is WinRiver II 2.12 download? Started by jberose	3 Replies 50 Views	October 23, 2014, 10:56:09 am by Kevin Oberg
Extrap suggestion exponent greater than allowed. Started by tblackio	10 Replies 200 Views	October 19, 2014, 08:20:22 pm by dmueller
Does anyone know more about TRDI's new RiverPro? Started by avander	2 Replies 76 Views	October 14, 2014, 05:40:17 pm by avander
Mismatching between Bottom Track and GPS track Started by s_meirelles	2 Replies 45 Views	October 12, 2014, 09:31:01 am by s_meirelles
Default RverRay thresholds are not useful Started by Isoderq	1 Replies 38 Views	October 10, 2014, 12:26:41 pm by Mike Rehmel
trouble accessing HA forum Started by avander	1 Replies 35 Views	September 18, 2014, 04:50:37 pm by Mike Clark

On Demand Section under Training



OSW Hydroacoustics

The transition to the new server is complete, however the mailing list is

Training

- [Classes](#) [Webinars](#)
- [On Demand](#)

Memos

Forums and Mailing List

The HaWG

Known Hydroacoustic Issues

Moving-Boat Deployments

- [Instruments](#) [Guidance](#)
- [Software](#) [Deployments](#)
- [Tech Tips](#) [References](#)

Index Velocity

- [Instruments](#) [Guidance](#)
- [Software](#) [Deployments](#)
- [Tech Tips](#) [References](#)

Mid-Section Measurements

- [Instruments](#) [Guidance](#)
- [Software](#) [Deployments](#)
- [Tech Tips](#) [References](#)

On Demand

This page is an organized index of select USGS OSW Hydroacoustic podcasts, recordings, and webinars that may be found other places on the OSW Hydroacoustic web pages.

Instructional podcast and recorded webinars are designed to offer convenient, on-demand presentations on instrumentation topics. The podcasts are typically video presentation that have been recorded.

Online training classes listed are typically longer in duration, with more in-depth content.

Moving-Boat ADCP Discharge Measurements

- [Measurement Issues You May Be Overlooking \(Podcast\)](#)
- [ADCP Communication Options \(Podcast\)](#)
- [Beam Alignment Test and Check 2013 \(Podcast\)](#)
- [SW1321 Streamflow Measurements Using ADCPs Prerequisite \(Online Training Class - also good refresher\)](#)
- [Introduction to extrap 3.x \(Podcast\)](#)
- [Mastering the WinRiver II Measurement Wizard with a Rio Grande \(Podcast\)](#)
- [Using ADCPs in Moving Bed Conditions \(Online Training Class\)](#)

Mid-Section Discharge Measurements

- [Using ADCPs for Open Water Mid-Section Measurements \(Podcast\) - NEW!](#)
- [Using ADCPs Under Ice \(Podcast\)](#)
- [Measurement of Stream Discharge by Wading \(Online Training Class SW1271, includes FlowTracker module\)](#)

Index Velocity

- [Selecting ADVM Measurement Volumes \(Podcast\)](#)
- [Programming SonTek ADVMs \(Podcast\)](#)
- [Programming a Sutron Satlink DCP when using a SonTek ADVM \(Podcast\)](#)

OSW Hydroacoustics

Training

- [Classes](#) [Webinars](#)
- [On Demand](#)

Field Support/Development – Training

- Week-long class schedule is on hydroacoustics.gov; Open for registration in **DOI Learn**.
- **2-day refresher ADCP class** offered in WSCs. If interested in class for 2015, Data Chief or Field Office Chief should contact Mike Rehmel
- Working to address increased demand for Index Velocity class
- Trained **311** students in 2014!!



Summary of Hydroacoustics Reviews

- Scanned OSW Technical Review reports for two review cycles, 2007-2009 & 2010-2012;
 - Major recommendations
 - Recommendations in Hydroacoustics section(s)
 - “Important” HA issues identified or referred to throughout the report
- Findings summarized in report: *“Issues, Improvements, and Opportunities in Hydroacoustic Practices from OSW Technical Reviews, 2007-2012”*

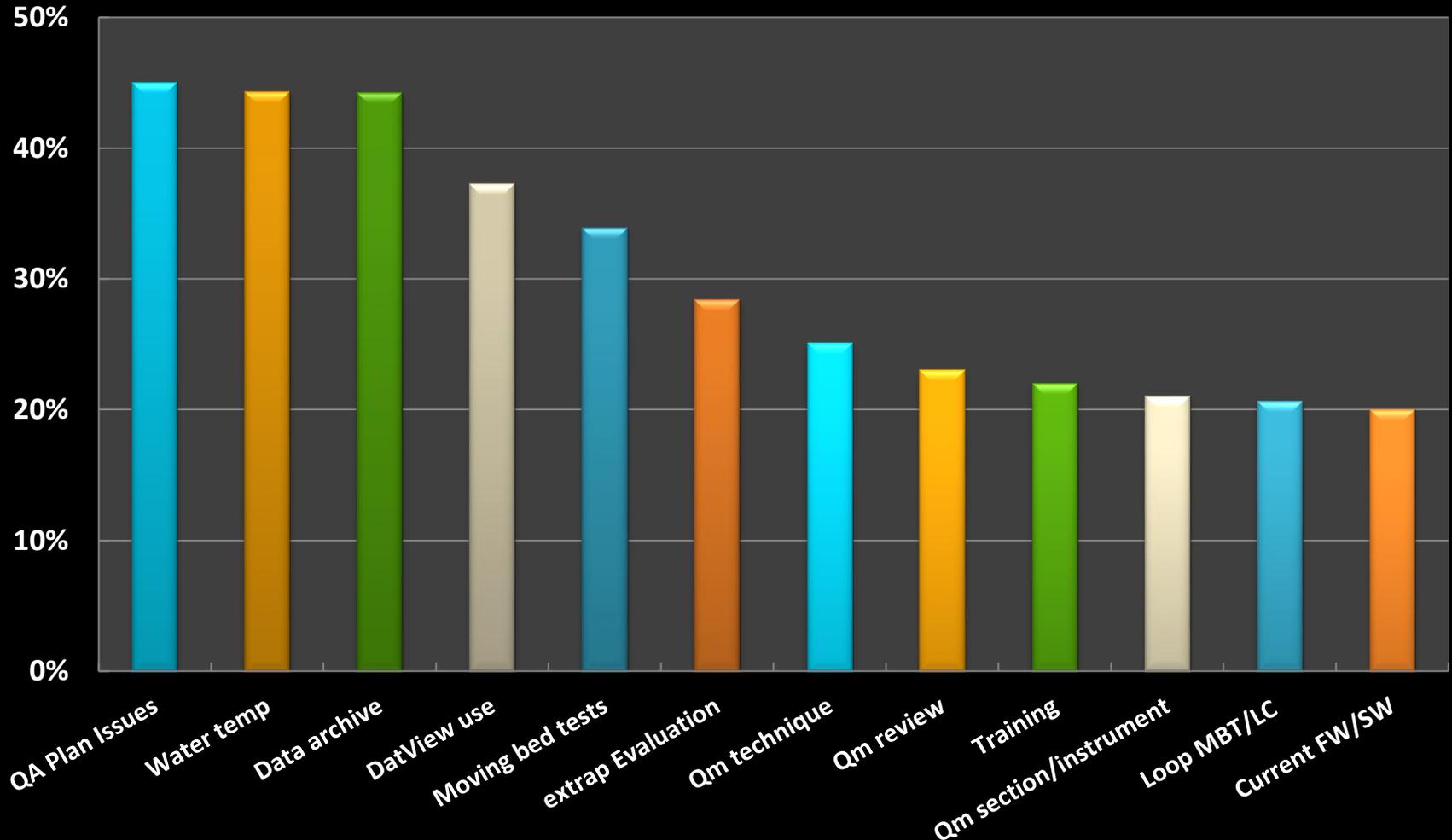
<http://water.usgs.gov/usgs/osw/dist.rev.html>

Categorized HA Issues

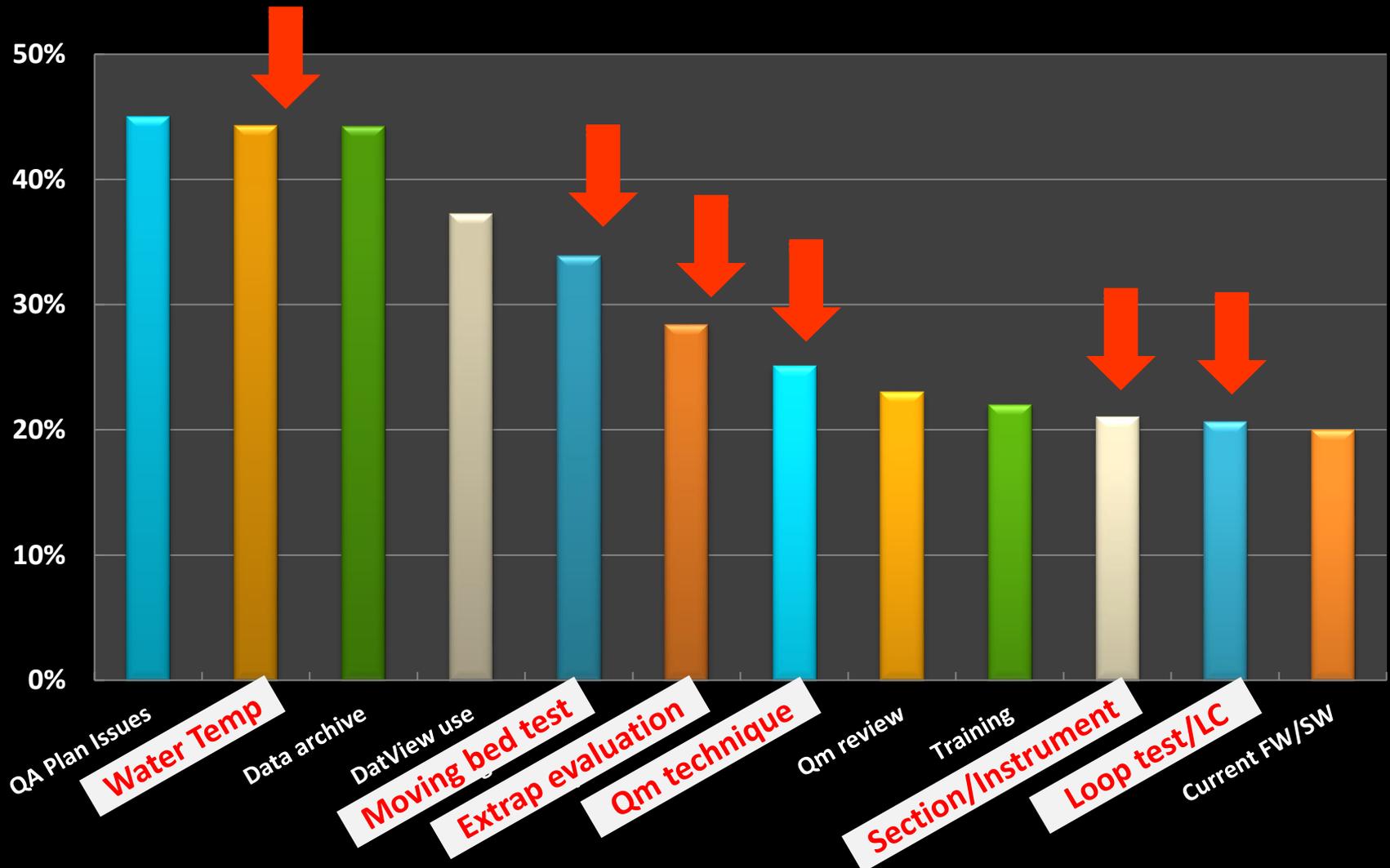
Issue	Category	Issue2	2012	2011	2010	To	49	2007-2009	2007-2010
Water temperature not being measured/recorded	General	Water temp	7	8	15	30	61%	14	
Problems with electronic data storage (no plan, inconsistent use, etc)	General	Data archive	9	10	9	28	57%	16	
Use DatView software for reviewing Flowtracker Qms	Flowtrackers	DatView use	6	8	11	25	51%	12	
Integration of Hydroacoustics into QA Plan or related QA plan issues (needs	General	QA Plan Issues	7	7	9	23	47%	22	
Evaluation of extrapoleation is lacking, not evident, or incorrect. Use of extra ADCPs	ADCPs	extrap Evaluation	9	6	5	20	41%	15	
Moving bed tests	ADCPs	Moving bed tests	7	6	6	19	39%		
Comparison Qms	ADCPs	Comparison Qms	5	5	7	17	35%		
Incomplete notes	General	Incomplete notes	2	5	9	16	33%		
Qm technique	General	Qm technique	2	7	6	15	31%		
Lock measurements	ADCPs	Lock measurements	5	4	4	13	27%		

Category	Issue2	2012	2011	2010	Total	49
General	Water temp	7	8	15	30	61%
General	Data archive	9	10	9	28	57%
Flowtrackers	DatView use	6	8	11	25	51%
General	QA Plan Issues	7	7	9	23	47%
ADCPs	extrap Evaluation	9	6	5	20	41%
ADCPs	Moving bed tests	7	6	6	19	39%
ADCPs	Comparison Qms	5	5	7	17	35%
General	Incomplete notes	2	5	9	16	33%
General	Qm technique	2	7	6	15	31%
ADCPs	Lock measurements	5	4	4	13	27%

Top Twelve Issues, 2007-2012



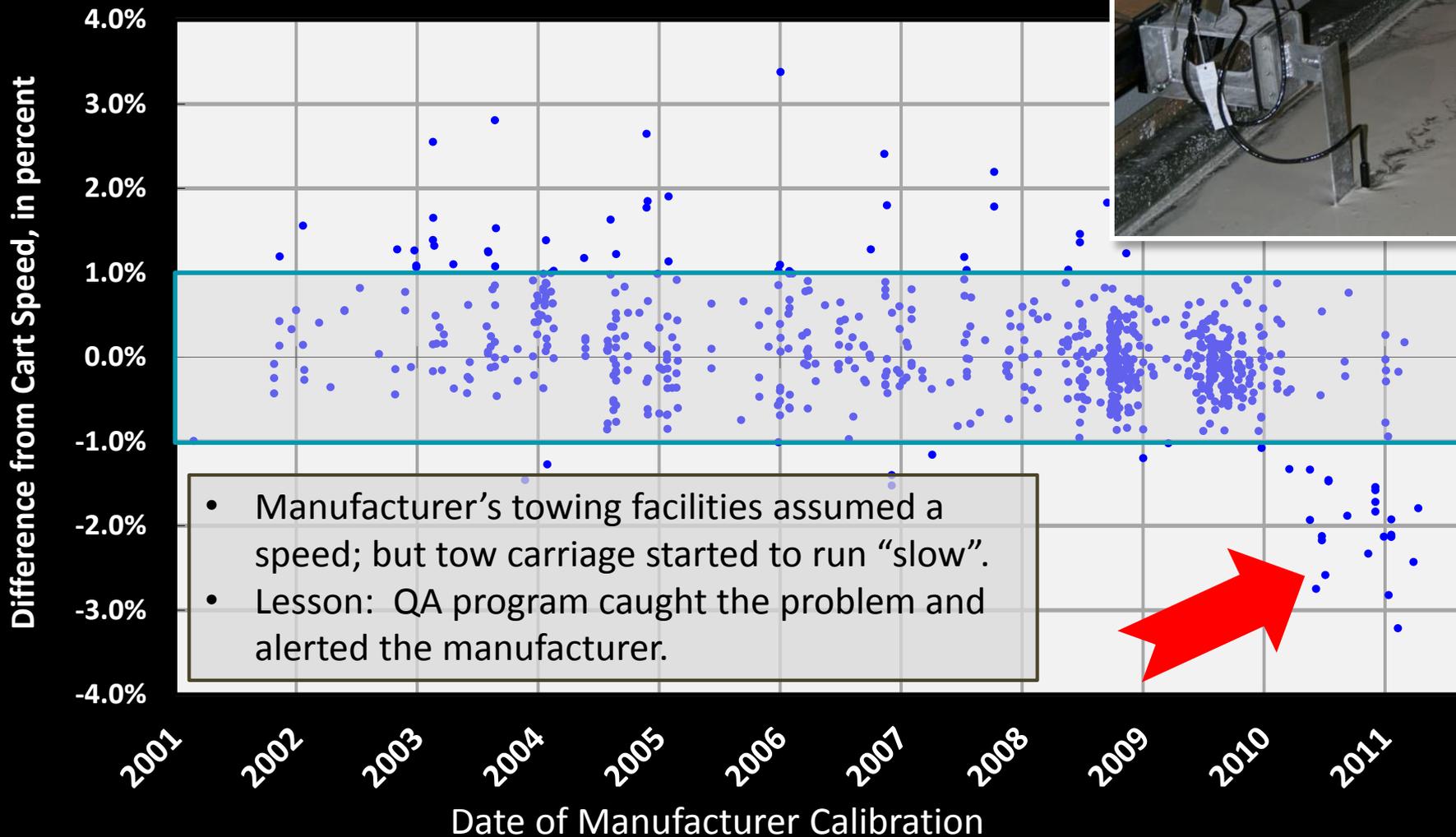
Top Twelve Issues, 2007-2012



Suggested actions

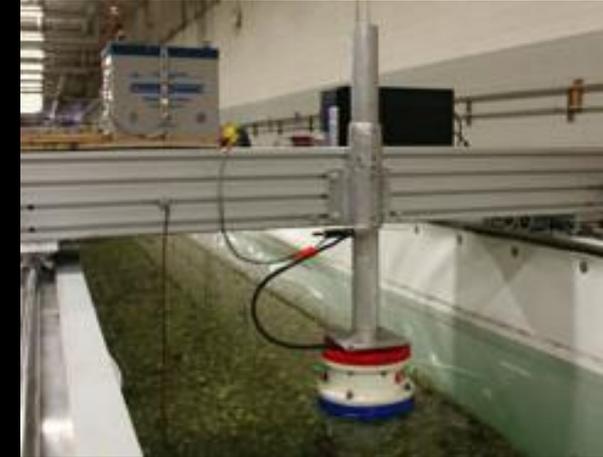
Review Issue	OSW Actions	WSC Actions
<p>Moving bed tests incorrect or not done</p>	<p>Encourage increased compliance in training, webinars, and OSW reviews.</p> <p>Consider development of tool for WSCs to periodically sweep and flag measurement files for absence of moving bed checks</p> <p>Continue to enhance QA checks in LC and SMBA</p>	<p>Remind staff of the requirement to do MBTs. Institute procedures (such as independent measurement review) to insure compliance.</p>
<p>Failure to consider proper choice of extrapolation method</p>	<p>Encourage increased use of extrap by means of podcasts, webinars, training classes, and OSW reviews.</p>	<p>Make extrap available to all users.</p> <p>Require use of extrap before leaving gage, after a discharge measurement.</p>

Flowtracker Testing



ADCP QA Program

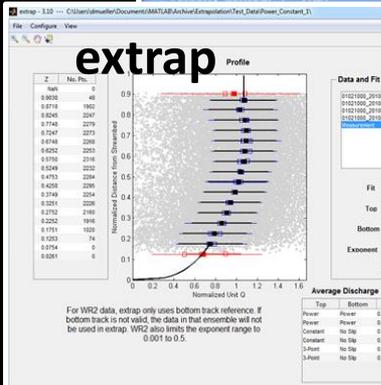
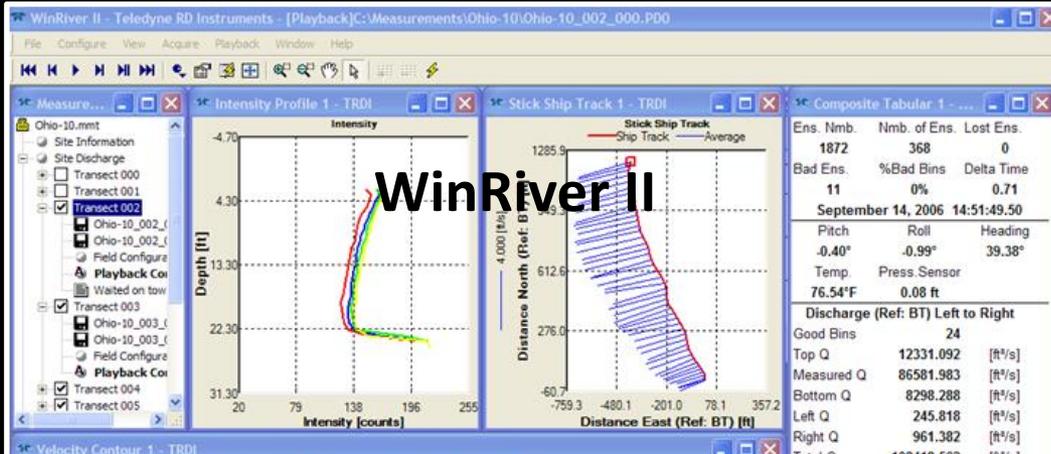
- OSW Technical Memo 2014.04
 - Established ADCP QA/QC Program
 - Every ADCP tested on 3-year cycle
 - Start with StreamPros
- What do initial testing results indicate?
 - 9% failure rate to date (54 SPros)
 - Incorrect beam transformation matrices?? Most older SPros



OSW 2014.04 States: *In addition to AQA checks on existing ADCPs, all new ADCPs purchased directly from the manufacturer and/or meters sent to the HIF or the manufacturer for repair, must be AQA checked in the HIF-HL before being placed into service for the first time or back in service. Meters purchased through the HIF will be AQA checked as part of the HIF's standard QA/QC process.*

Need to Standardize Qm Processing

- Sometimes USGS has waited years for enhancements or fixes.
- We would like to have ONE method for discharge computation that allows for standardized processing for all ADCPs



SWAMI

FILE: Sensors\Q: Trails

SITE INFORMATION

Station: 10141000

WEBER RIVER NEAR PLAIN CITY, UT

Date: 2011-05-26 Time: 09:34:00

Party: MLF/BMB TZ: MDT

SV Email: mfreeman@usgs.gov

WEATHER

mostly cloudy, cool, no precip, moderate-swirling/variable

Comment:

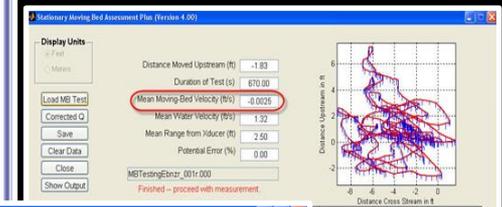
ESTABLISHED NEW RP ELEVATION FOR POTENTIAL HIGH WATER. RP IS TIP OF LADDER BRACKET RAILING PAINTED ORANGE. RP ELEVATION=33.00

Bat V: 13.5

TASKS

Navigation (Ref: BT)

Boat Speed	4.460	[ft/s]
Boat Course	16.86	[°]
Water Speed	3.658	[ft/s]
Water Dir.	253.00	[°]
Calc. Depth	24.79	[ft]
Length	1331.83	[ft]
Distance MG	1288.56	[ft]



LC

LC Version 1.60, September 26, 2008

Processed on: 29-Dec-2008

Loop File: 04LG004_20050518000_ASC.TXT

Distance Made Good	Loop Time (sec)	Moving Bed Velocity (m/s)	Moving Bed Direction (degrees)	Flow Direction (degrees)	Estimated Percent Correction
22.18	427.00	0.05	209.16	20.81	4.72

Percent Bad Bottom Track: 2.3

Difference in flow direction between out and back sections: 1.8 deg

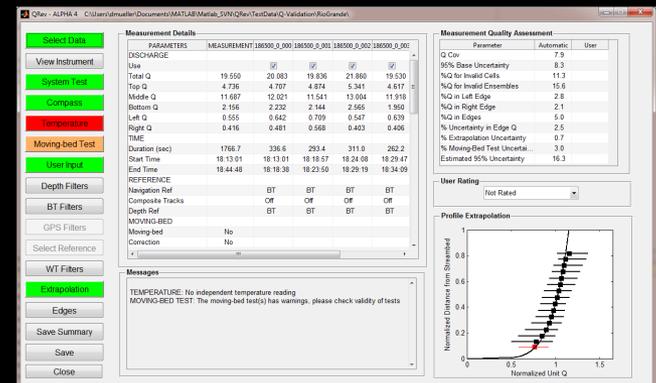
Loop Indicates a Moving Bed -- Select transects to be corrected

File Name	Original Discharge m ³ /s	Adjusted Discharge m ³ /s
04LG004_20050518001_ASC.TXT	1804.70	1890.72
04LG004_20050518002_ASC.TXT	1765.20	1855.92
04LG004_20050518004_ASC.TXT	1784.60	1869.81
04LG004_20050518005_ASC.TXT	1783.30	1876.64
Average	1784.45	1873.27



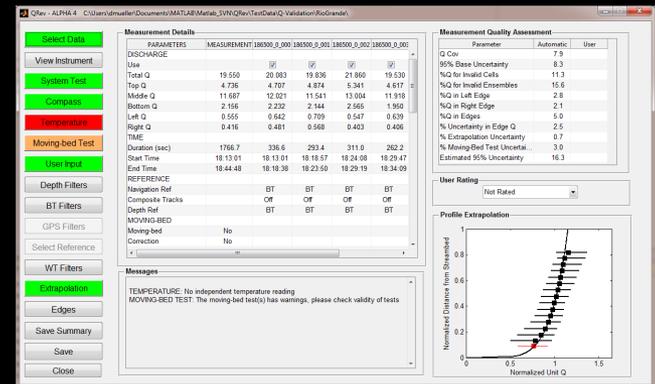
Solution? QRev Software

- USGS standard processing algorithms: **Apply the same algorithms to data, independent of ADCP manufacturer**
- Use the best interpolation methods with available data to estimate values for invalid data
- **Automate** data quality evaluation
- **Automate** data uncertainty estimation



QRev – Goals

- Process both SonTek and TRDI data
- Use consistent algorithms for discharge computation
- Use best available data
- Have a logical workflow
- Automate data quality review and feedback
- Provide manual overrides
- Issue specific dialog windows
- Feedback to user on uncertainty
- Make it “tablet friendly”



QRev (Alpha Testing)

QRev - ALPHA 4 C:\Users\dmueller\Documents\MATLAB\Matlab_SVN\QRev\TestData\Q-Validation\RioGrande\

Select Data

View Instrument

System Test

Compass

Temperature

Moving-bed Test

User Input

Depth Filters

BT Filters

GPS Filters

Select Reference

WT Filters

Extrapolation

Edges

Save Summary

Save

Close

Measurement Details

PARAMETERS	MEASUREMENT	186500_0_000	186500_0_001	186500_0_002	186500_0_003
DISCHARGE					
Use		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Total Q	19.550	20.083	19.836	21.860	19.530
Top Q	4.736	4.707	4.874	5.341	4.617
Middle Q	11.687	12.021	11.541	13.004	11.918
Bottom Q	2.156	2.232	2.144	2.565	1.950
Left Q	0.555	0.642	0.709	0.547	0.639
Right Q	0.416	0.481	0.568	0.403	0.406
TIME					
Duration (sec)	1766.7	336.6	293.4	311.0	262.2
Start Time	18:13:01	18:13:01	18:18:57	18:24:08	18:29:47
End Time	18:44:48	18:18:38	18:23:50	18:29:19	18:34:09
REFERENCE					
Navigation Ref		BT	BT	BT	BT
Composite Tracks		Off	Off	Off	Off
Depth Ref		BT	BT	BT	BT
MOVING-BED					
Moving-bed	No				
Correction	No				

Messages

TEMPERATURE: No independent temperature reading
 MOVING-BED TEST: The moving-bed test(s) has warnings, please check validity of tests

Measurement Quality Assessment

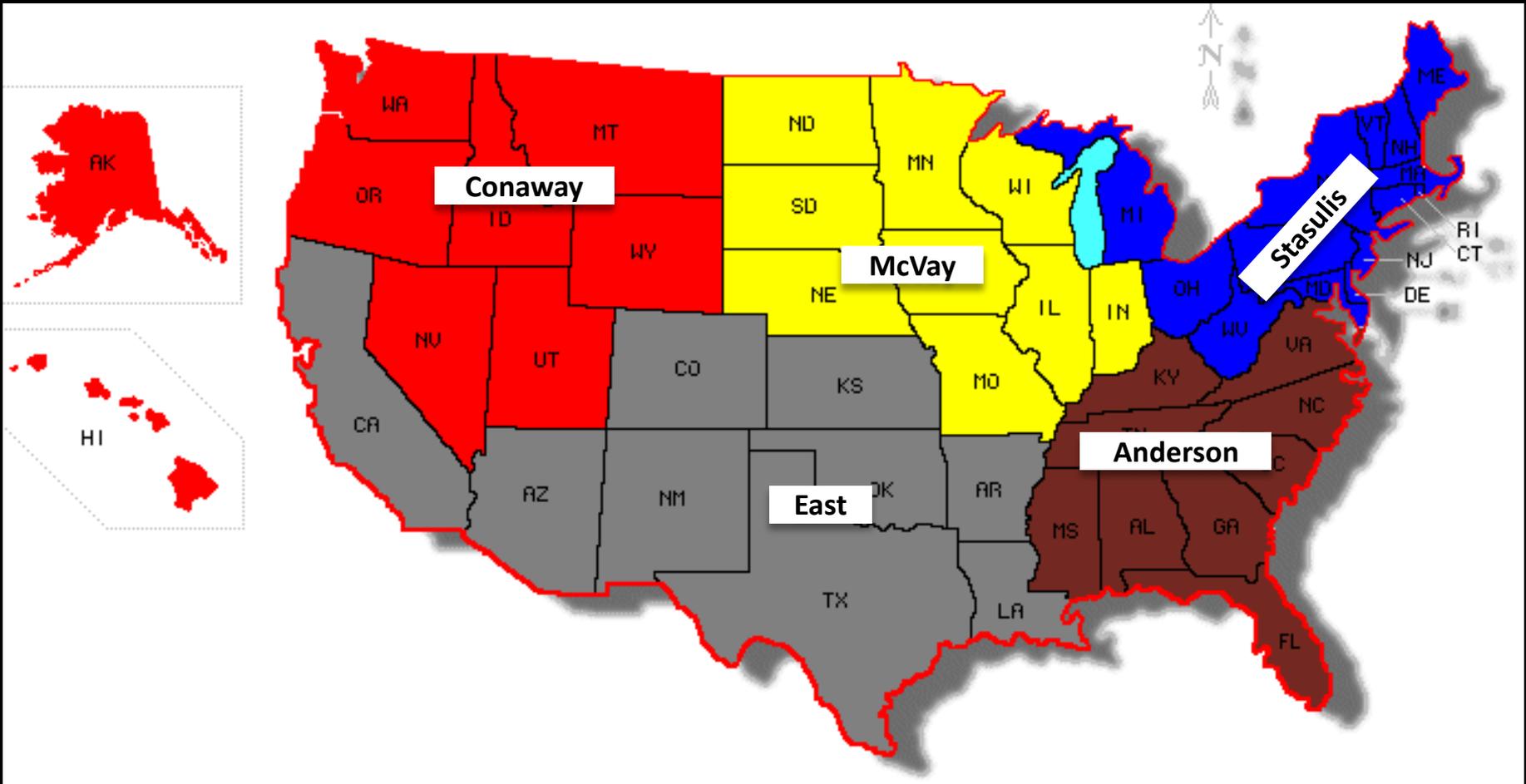
Parameter	Automatic	User
Q Cov	7.9	
95% Base Uncertainty	8.3	
%Q for Invalid Cells	11.3	
%Q for Invalid Ensembles	15.6	
%Q in Left Edge	2.8	
%Q in Right Edge	2.1	
%Q in Edges	5.0	
% Uncertainty in Edge Q	2.5	
% Extrapolation Uncertainty	0.7	
% Moving-Bed Test Uncertai...	3.0	
Estimated 95% Uncertainty	16.3	

User Rating

Not Rated

Profile Extrapolation

Hydroacoustic Work Group Rotational Members





Thanks!