

FISP Technical Committee Meeting Minutes

**October 24-25, 2012
USDA Forest Service
Stream Systems Technology Center
Natural Resources Research Center (NRRC)
2150 Centre Ave., Bldg. A, Conference Room 122
Fort Collins, Colorado**

Members Present

- Jim Selegean (US Army Corps Engineers)
- John Gray (US Geological Survey)
- Roger Kuhnle (USDA-Agricultural Research Service)
- Dan Cenderelli (USDA-Forest Service)
- Rob Hilldale (Bureau of Reclamation)

FISP Chief (Present)

- Mark Landers (USGS)

Guests present

- Joe Schubauer-Berigan (EPA) (entire meeting)
- Amanda Cox (CO-WRRI, SOS Committee Member) (first morning)
- Sandra Ryan (FS, RMRS) (parts of meeting)

Wednesday – October 24, 2012

- Meeting agenda approved by TC
- Spring 2012 minutes approved by TC
- Rob Hilldale (BOR) will rotate to TC chair Jan. 1, 2013 (replacing Roger Kuhnle), Jim Selegean (USACE) to rotate to co-chair Jan. 1, 2013 (replacing Rob Hilldale).

Agency monitoring activities

Each agency, and SOS representative (Amanda Cox) provided a synopsis of their respective sediment related activities. Those are attached to the end of this document (Attachment #1).

FISP research plan and call for proposals

Mark Landers reviewed the FISP research plan and call for proposals for 2013. There was a motion to announce the call for proposals 6 weeks prior to each fall meeting, with a deadline of 2 weeks prior to each fall meeting. This motion was approved by the committee.

FISP funded projects – progress and results

1. USGS IL WSC – Acoustic and LISST and SSC results
2. USGS WA WSC – Acoustic and LISST and SSC results

- a. These two research projects were presented by John Czuba, Tim Straub, Marian Damanski, and Chris Curran))
3. NCPA – Acoustic surrogates for fine grained SSC (presented by Brian Carpenter)
4. USGS ID WSC – Bedload by ADCP (presented by Mark Landers for Molly Wood)
5. USGS CVO – Digital Imaging for Particle Analysis and Characterization (DIPAC) (presented by Kate Norton)

These presentations can be accessed on the FISP website at (<http://water.usgs.gov/fisp/research.htm>)

HIF-FISP Activities

- FY 2012 HIF total sales were \$260,365
 - Top selling samplers were (in order) DH-95 (16), D-96 (5), D-95 (7), D-96-A1 (2) (number sold)
- USGS Office of Water Quality ordered 2: D-99 samplers to be staged at various geographic locations across the country to be used in the event of a flood. The HIF will retain 2: D-99's for purchase or rental.
- Purchase of 2 of the new P-6 samples has been initiated.

FISP budget

- The TC agreed to budget a \$20k carry-over 2013 → 2014. This will cover any potential short falls in the budget due to unforeseen circumstances.
- The 2013 budget is attached as approved by the committee (Attachment #2).

FISP membership

- USFWS – **ACTION ITEM** – Mark Landers to contact Paul Bakke regarding potential membership
- NOAA-NMFS – Brian Cluer and Matt Collins have been contacted (Summer 2012) by Rob Hilldale regarding potential FISP membership. Both responded positively, stating potential interest in membership on the committee. Mark Landers followed up on the initial communication, inviting them to the fall meeting. No further communication took place from either person; neither was present at the meeting.
- BLM – Mark Landers tried to enlist a replacement for Craig Goodwin. Met a dead end. John Gray to talk with Bob Boyd, formerly BLM-Washington, D.C.
- EPA – Joe Schubauer-Berigan will continue to assist Mark Landers to find an appropriate Program Office representative to discuss funded membership by EPA.

FISP Terms of Reference

- This document replaces the informational objectives of the former MOU. Roger Kuhnle wanted the last three paragraphs stricken from the document. Feared that it was confusing and might represent objection by management in some agencies. John Gray preferred retaining the wording as is. After looking into the source of the wording, it was discovered that these paragraphs were carried over from the previous draft MOU (2006) and may contain important legal terms. The TC decided to retain the paragraphs as-is.
- The TC agreed to take a vote on the Terms of Reference on Thursday, Oct. 25. Some minor edits needed to be made and not all TC members present had an opportunity to read the terms of reference.

Update on Sediment Acoustics Leadership Team (SALT)

Mark Landers reviewed the activities of the SALT committee. Chief among the activities is an effort to create a standard methodology for processing SSC with single and dual frequency ADVMS. A draft version of these standards is expected by March, 2013.

Presentation and discussion of LISST approval memo

- Interim guidance to be issued rather than approval. The TC will wait for outstanding FISP projects to provide finalized reports (WA and IL WSC) prior to releasing the memo.
- **ACTION ITEM** – Mark Landers to draft the memo in by Dec. 31.
- FISP will review draft LISST guidance memo when provided by FISP Chief.

Presentation and discussion on the bag sampler memo

- The issue at hand is the lack of isokinetic efficiency under some turbulent, cool to cold water conditions of the D-96 and (discontinued) D-77 samplers. This issue is thoroughly documented in a soon-to-be-released report: by Sabol, T.A., and Topping, D.J., U.S. Geological Survey Scientific Investigations Report 2012-5208, 111 p., (not available as of Jan 2, 2013).
- Problems with the D-77 have been known for decades, and the sampler has had its approval revoked.
- The memo is intended to be a proactive action to address the operational limitations and to request users to conduct additional field tests for quality assurance and for use by FISP in further documenting operational limitations.
- Johnny Wheat will perform testing of the efficiency of the D-96 at the HIF in a tilting flume. This effort has been hindered by needed repairs to the head box in the flume. Johnny expects to be able to perform the tests in November 2012.
- Users will need to perform efficiency testing prior to data collection with bag samplers.
- **ACTION ITEM** – Mark Landers to draft a bag sampler memo by Nov. 30 and submit it to the TC for review/approval.
- Mark Landers to work on instrumenting the D-96 with pressure transducers toward elucidating effects of back-pressure on the bag while immersed.
- Mark Landers to look into contracting CFD modeling on the sampler using in-house research funds.

FISP response to Prof. Paper 1774 (pubs.usgs.gov/pp/1774/)

John Gray wrote a memo to David Topping stating that a decrease of 2% in uncertainty is not worth additional cross sections. The memo, and David's response, are included as attachment #4.

ACTION ITEM John Gray to write a memo stating the conclusions of Prof. Paper 1774 relating to the confidence and accuracy of the current methodology and the lack of appreciable decrease in uncertainty if more samples are taken.

Thursday, Oct 25, 2012

- The terms of reference were reviewed for minor edits put in by Mark Landers overnight. The timeline for the FISP to announce the call for proposals and the deadline for those proposals was set to 6 weeks and 2 weeks, respectively. The TC voted to approve the terms of reference.
- Dan Cenderelli raised the following issue regarding the bed load traps. Rickly is selling Bunte's bed load traps that aren't constructed to the specifications in RMRS-GTR-191. The committee discussed the merits of the HIF constructing and selling Bunte's bed load traps. There was a consensus that the HIF needs to at least consider constructing and selling these bed load traps.
ACTION ITEM Dan Cenderelli to get with Kristin for details on construction issues and demand for these bed load traps.
ACTION ITEM Mark Landers to contact HIF regarding sales of Bunte's bed load traps.
ACTION ITEM Mark Landers to place RMRS-GTR-191 on the FISP web site, or a link to the document on the RMRS web site.

Discussion and ranking of FY 2013 proposals

After approximately 2.5 hours of discussion and debate over 16 proposals received this year, the following three proposals were selected to be funded (in no specific order).

- *Analysis of densimetric measurements of stream water as a surrogate for suspended-sediment concentration in the Rio Puerco, New Mexico*, Jeb Brown, USGS - \$15,000 requested.
- *Sediment Acoustic Index Development (SAID) Tool Enhancement*, Tim Straub, USGS - \$9,000 requested.
- *Laboratory and field measurements of bed load using self-generated-noise*, James Rigby, ARS, \$30,200 requested.

The remaining funds (approximately \$21k) is to be used for in-house research.

ACTION ITEM Mark Landers is to move remaining 'contract research' funds to 'in-house research' funds.

ACTION ITEM Mark Landers (per his request) is to use in-house research funds to gather data on hydroacoustic attenuation due to sediment size to be used toward a publication on such.

ACTION ITEM – Joe Schubauer-Berigan, Sandra Ryan, Jim Selegean, Smokey Pittman, and John Gray An ad-hoc work group was formed to develop a plan for mounting a camera on a bed load sampler. Lighting is a concern in sediment laden water of appreciable depth. HIF may be asked to market this device.

Editorial note, GMA has already done this successfully (no affect to the sampler action) for shallower applications where light is not a concern.

Spring meeting

The TC agreed upon April 23 and 24 for the spring meeting. The location was not determined, although a few locations were proposed.

The incoming chair (Rob Hilldale) has proposed a meeting at the HIF facility, Stennis Space Center, Bay St. Louise, MS. This will provide an opportunity to view the HIF

facilities, witness the testing of the D-96, both for efficiency and perhaps an instrumented version.

Following the scheduled FISP activities, there was a field trip to the Cache la Poudre River fire-burn area (June-July 2012) to view a proposed bed load project – led by Sandra Ryan.

Attachment #1

Agricultural Research Sediment Related Activities

This summary will specifically only consider the National Sedimentation Laboratory (NSL) rather than the entirety of ARS. Studies of bed load transport on Goodwin Creek. Bed load transport is very difficult to study in the field on Goodwin Creek because of the difficulty of predicting the occurrence of runoff events and the preponderance of extreme and often dangerous conditions during events caused by thunderstorms. Yet knowledge of the rate of bed load is important information for determining the stability level of the channel boundaries. A model of a portion of the channel on Goodwin Creek has been constructed in a laboratory flume and has yielded important information as to how bed load is transported on the Goodwin Creek watershed and will allow improved predictions. *Transport of Sand over an Immobile Gravel Substrate*. This study was originally initiated with seed money and interest from researchers at the US Bureau of Reclamation. Some of the findings of previous work on this topic have been written up and accepted for publication by two Journals. Currently these experiments are continuing with improved flow velocity measurements provided by a new version of an ADV with profiling capability. The ultimate goal of these experiments will be to add sand to the system until the entire gravel substrate is covered and the gravel is not exposed at all during the experiments. These data will allow the transition from the transport relation of sand over non-mobile gravel to a more conventional transport relation for just sand and facilitate the calculation of transport of sand over immobile gravel beds. Modelling of Sediment Transport in Agricultural Watersheds. New routines in the AnnAGNPS watershed model to handle the erosion due to gully formation on crop and other lands are being developed. The erosion associated with the formation and migration of ephemeral and classical gullies has been shown to be a major contributor to sediment yields in many watersheds. Models which do not consider the sediment eroded from gully processes may grossly underestimate the sediment yield for many watersheds.

Bureau of Reclamation Sediment Related Activities

Reclamation is continuing efforts on two bed load research activities: 1.) Bed load impact sensors using both geophones and accelerometers across the channel on the Elwha river. These sensors will be calibrated over the 2012/2013 winter and spring 2013. The system is currently operating with a less than sufficient laboratory calibration such that any information currently available is qualitative. Efforts will be made to retroactively provide quantitative bed load values for data collected prior to calibration once a calibration is obtained. The physical sampling will be done by GMA. Funding is in place. This is a cooperative effort with NCPA; 2.) Research using hydrophones to quantify bed load has been funded for the second year. This project is a cooperative effort among Reclamation, ARS, and NCPA. Deployments will take place on the Elwha River during bed load sampling by GMA and likely on the Trinity River provided a normal or wetter water year.

Reclamation; the Federal Advisory Committee on Watershed Information, SOS; and the U.S. Society on Dams sponsored a reservoir sustainability workshop July 10 – 12, 2012. Participants were: USACE, USDA – ARS, USDA-NRCS; DOI-BLM, DOI-BOR, DOI-USGS, DOI-NPS,

ASCE, CO-Water Resources Institute, USSD, North Fork Water Conservancy District, Los Angeles County Flood Control District, Brigham Young University, CO State University, OR State University, Stanford University, University of Illinois, Golder and Associates, Gregory L. Morris Engineering, and WEST Consultants. Reservoir sedimentation, impacts, and solutions were discussed. A draft white paper is being reviewed and will be published on Reclamation's web site (www.usbr.gov/pmts/sediment) within 6 months.

USGS Sediment Related Activities

John R. Gray and Mark Landers (the latter donning his USGS hat in lieu of his FISP hat for this talk) offered the following perspectives on selected USGS sediment activities:

USGS through Department of the Interior (via OMB Memorandum 92.01) is the only Federal agency directly tasked with collecting, storing, and disseminating water data, including sediment and water-quality data.

There is not and never has been a truly national sediment-monitoring program. There have been notable regional programs (Colorado River basin, 1920-30's; Missouri River Basin, 1940-50's). Most instantaneous monitoring (sample collection) is done as part of the USGS NAWQA and NASQAN programs. Most of the USGS daily monitoring sediment program is undertaken without network design on an ad hoc basis. According to database retrievals in 2011, the USGS is operating about 75 daily sediment stations, down from about 400 in 1981.

The USGS in conjunction with FISP and other organizations has made notable progress in the evaluation and use of sediment-surrogate technologies. USGS Techniques and Methods Report 3 C4 (<http://pubs.usgs.gov/tm/tm3c4/>) describes the USGS-approved means for converting turbidity and flow data to sediment-discharge data. Progress on sediment hydroacoustics is quite encouraging (see minutes on the Hydroacoustics Leadership Team (SALT) of these meeting minutes). The Technical Committee has proposed to issue interim guidance on use of laser diffraction for volumetric concentrations and size distributions. A pressure-difference method for concentration determinations in highly concentrated streamflows is showing considerable promise. Most or all provide time-series data on one or more characteristics of sediment.

A proposal for a National Sediment Monitoring Network piloted in the Mississippi River basin was co-authored by the USGS and USACE in 2010. The unfunded proposal is available in full length (18 pages) and synopsis form (6 pages) on the Subcommittee on Sedimentation website under the June 25, 2010 meeting minutes by following the link: <http://acwi.gov/sos/minutes/index.html> .

The USGS NAWQA project has initiated its third decadal phase and includes, for the first time, sediment as a focus parameter. The initial product will be an updated sediment database and related formal report to include substantial quantities of daily-value and instantaneous sediment data that – for one reason or another – had escaped access through the USGS National Water Information System. A spatial and statistical summary of the database should be available in FY2013.

USEPA Sediment Related Activities

EPA sediment activities continue to be focused primarily on the following: 1) fate and transport field and modeling studies of contaminated sediments to support mitigation and restoration of historically contaminated sites; 2) studies of legacy sediments and how they affect site restoration and mitigation; and 3) sediment TMDLs and watershed sediment management approaches.

Of particular note is a new EPA-USGS jointly funded 3 year sediment research project entitled “Validating a New Method for Sediment Source Identification and Tracking in the TMDL Process”. The study partners include: PI’s Allen Gellis, USGS, Baltimore and Faith Fitzpatrick, USGS, Wisconsin, and Joe Schubauer-Berigan and Paul Mayer ORD NRMRL; Regional participants: Ronald Landy-R3 SL, Richard Batiuk- R3 Chesapeake Bay Program, Maggie Passmore -R3 Environmental Assessment and Innovation Division, Bill Richardson and Gwen Supplee,- R3, Water Protection Division, (Office of Standards, Assessment and TMDLs), and Region 5, EPA’s National Air and Radiation Environmental Laboratory, Montgomery AL. The project promises to provide management tools for use by Regions in quantifying sediment sources, targeting source, and supporting mitigation within impacted watersheds. The project will conduct investigations in 3-6 selected watersheds to: 1) determine the appropriateness and degree of geographic applicability of selected geochemical tracers; 2) determine the effect of sediment grain size and 3) assess whether floodplain or streambed sediment can be used as a surrogate for suspended sediment. The results of this study will be used in the development of a guidance document and Web products for use by the Regions in identifying sediment sources.

USACE Sediment Related Activities

The Corps is involved in a wide variety of projects throughout the nation and the world. Nearly all of these projects have some issue that pertains to the collection, modeling, management or understanding of sediment in order to ensure a successful and sustainable project. As such, it is difficult to summarize the Corps sediment related activities in a paragraph. In the Great Lakes, however, much of our efforts related to sediment have revolved around a series of dam removals, the understanding of how sediment fluxes in the connecting channels of the Great Lakes (Detroit River, Niagara River and St. Marys River), a study of the sediment storage capacity remaining in reservoirs in the Great Lakes and a large bank erosion monitoring study that will ultimately provides equations for predicting bank erosion rates throughout the Great Lakes.

SOS – CO-WRRI Sediment Related Activities

SOS update given to the FISP by Amanda Cox (SOS Vice-Chair, Research Scientist at Colorado State University) on October 24, 2012

SOS Recent Activities

1. The National Stream Morphology Data Exchange (NSMD)
 - a. Data Exchange would include primarily channel and floodplain geometry and bed material size measurements.

- i. Workgroup created developed and a workshop held in April 2011
Workshop discussed and addressed the scope and scale of data exchange, potential data models, and administration
- b. The subgroup published a forum article in the American Geophysical Union's Eos newspaper titled "Developing a National Stream Morphology Data Exchange: Needs, Challenges, and Opportunities" (see: <http://acwi.gov/sos/2012EO-forum.pdf>).

A proposal to initiate project, submitted by workgroup member Marian Muste to the Water Resources Institutes Grants Program was not funded. No other sources of funding have been identified, although the aforementioned proposal might be revised and resubmitted in FY2013. Regardless, a plan has been developed and is ready for use if funding can be found. **SOS**

Sponsored Workshops:

1. **Sediment Hydro-Acoustics Workshop**
 - a. Joint USGS-CUAHSI Workshop on Sediment Hydroacoustic Techniques for Rivers and Streams
 - b. 3 day workshop March 20-22, 2012 (see: http://acwi.gov/sos/eos_landers_arrigo_gray_sed_hydroacoustics_6-26-12.pdf).
 - c. Addressed the following topics
 - i. technological advances
 - ii. calibration and uncertainty issues
 - iii. applications
 - iv. potential opportunities to use the technology to address new research questions
 - d. Approximately 60 participants, including approximately 30 participants from Federal agencies
2. **Reservoir Sustainability Workshop**
 - a. Co-sponsored by the U.S. Society on Dams, Hydraulics of Dams Committee
 - b. Held in Lakewood, Colorado on July 10-12, 2012
 - c. Objective was to develop and describe practical options for managing sediment for long-term reservoir sustainability in the US.
 - d. Intended to help raise awareness of reservoir sedimentation issues and present ideas for achieving reservoir sustainability.
 - e. Initial steps proposed from the workshop:
 - i. Formation of a National Reservoir Sedimentation Team
 - ii. Implementation of a national training program on reservoir science and management
 - iii. Development of web-based storage and retrieval protocols for high-density reservoir-sedimentation datasets
 - f. A white paper was produced that summarized discussions, conclusions, and recommendations: "Avoiding the Inevitable? Capacity Loss from Reservoir

Sedimentation”. The white paper is approved for publication in the American Geophysical Union's *Eos*, release likely in 2012.

Current Activities

1. The Reservoir Sedimentation Database (RESSED)
 - a. 1950's-era Soil Conservation Service (SCS) database based on SCS Form 34
 - b. Includes changes in storage capacities from bathymetric data
 - c. Old version of RESSED is available in three formats: Microsoft Access Database, interactive online map, and online master list of data sheets.
 - d. New RESSED version is available to federal agencies, but not currently available to the public
 - e. Includes 2,194 reservoirs and 8,974 surveys (as of August 31, 2012). Includes information for the following Federal reservoirs: SCS/NRCS, USBR, COE, and TVA.
 - f. There are approximately 80,000 dams in the National Inventory of Dams (NID) and approximately 6- to 9-million impoundments in the U.S. (USGS National Hydrography Dataset; Bill Renwick, Miami of Ohio University, written commun., 2010). Therefore, roughly 2% of dams in the NID are in RESSED, and about 0.03% of total impoundments are in RESSED.
 - g. Working towards making RESSED available to the public if appropriate funding is obtained.
 - h. Non-binding ACWI resolution from July 2011 encouraging USGS to “maintain RESSED” has been followed in FY2013 with \$75,000 USGS maintenance support to keep RESSED operational for SOS use in 2013, assuming Congress passes an adequate WaterSMART program budget for USGS. The USGS considers the \$75,000 r funding as seed money and would still like contributions from other agencies. The full RESSED-21st Century project is anticipated to require a 5-year effort and about \$1.66M (see page 6 at: http://acwi.gov/sos/minutes/4-5-2012_SOS_final_minutes_9-5-2012.pdf).
2. Joint Federal Interagency Sedimentation and Hydrology (SEDHYD)
 - a. Next conference to be held March 23-27, 2014, at the Peppermill Hotel in Reno, NV.
 - b. Name change from FISC to SEDHYD
 - c. Conference Chair, Technical Program Chairs, and other key positions have been filled by SOS and SOH volunteers
 - d. Additional volunteers are welcome, Example Positions:
 - i. Registration
 - ii. Web Page Uploading
 - iii. Short Courses
 - iv. Field Trips

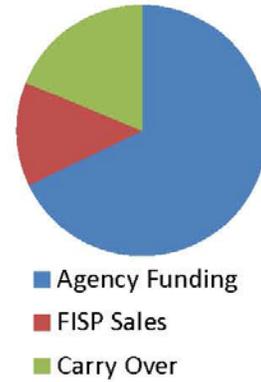
- v. Proceedings
- vi. Posters/Demos
- vii. Spousal Program Coordinators

Attachment #2

Budgeted and Actual FY 2013 Funding

Budgeted Income Source	Budgeted Income	Acutal Income
Carry Over	\$58,849	
US Bureau of Reclamation	\$24,000	
US Bureau of Land Management	?	
USACE	\$15,000	
USDA Forest Service	\$15,000	
ARS	\$18,800	
USGS	\$140,000	
FISP-HIF Sales 25%: Oct-Mar	\$21,000	
FISP-HIF Sales 25%: Apr-Sep	\$21,000	
Total	\$313,649	

FISP FY13 Funding



Budgeted and Actual FY 2013 Expenses

Budgeted Expense Category	Budgted Expense	Acutal Expenses
Carry Over	\$ 20,000	
Salary & Benefits	\$ 154,491	
Overhead	\$ 11,648	
Travel	\$ 14,000	
Conferences and Exhibits	\$ 500	
Supplies and Equipment	\$ 3,000	
Vehicles (Fuel and maintenance)	--	
Shipping and Communication	\$ 2,000	
In-house research	\$ 31,810	
Contract Research (prior obligations)	\$ 22,000	
Contract research	\$ 54,200	
	\$313,649	\$0
Balance	\$0	\$0

FISP FY13 Expenses



Attachment #3

Memorandum

Oct 09, 2012

To: Federal Interagency Sedimentation Project Technical Committee
From: Mark Landers, Federal Interagency Sedimentation Project Chief
Subject: Key Activities and Progress, Federal Interagency Sedimentation Project, October 2011 to September 2012

This memorandum is to provide a brief outline of progress and activities in the Federal Interagency Sedimentation Program (FISP) to the Technical Committee (TC) since our Fall 2011 meeting. This annual summary includes progress you have heard about at our Spring meeting and in various communications. I look forward to presenting these research results to the committee at our Fall 2012 meeting in Fort Collins, CO on October 24-25, 2012.

1.) Implementation of FISP-Funded Research

At our Fall 2011 meeting, we reviewed and ranked fifteen submitted research proposals. Each agency representative made a list of their top 5 proposal selections, with the first choice given a score of 5, second choice 4, etceteras. The group discussed all selected proposals individually and in comparison. All scores were summarized and the top 5 noted in the Fall meeting minutes. FISP was able to fund the following top three selected proposals (the IL and WA projects were submitted as a single proposal):

- >Acoustic, LISST, and SSC surrogate analysis and testing: USGS WA WSC, \$15K
- >Acoustic, LISST, and SSC surrogate analysis and testing: USGS IL WSC, \$15K
- > Multi-Frequency Acoustics as a Surrogate for Bedload Transport: USGS ID WSC, 27K
- >Digital Imaging for Particle Analysis & Characterization: USGS, CVO \$22K (*to be funded in FY13*)

No cost extensions and prior-year agreed on funding were provided to these prior year projects:

- >Acoustic Surrogates for Fine Grained Sediments: NCPA, U of Miss, \$19K
- >Depth-integrated sample arm for sediment sampling in urban systems: USGS, WI WSC \$8K

I have interacted with each of the project researchers and they are obtaining valuable results. Each project will present their progress and findings at our Fall 2012 meeting via WebEx. All of the projects have been fully funded except the digital particle imaging project with USGS, CVO, as they requested a one year extension and agreed for funds to be distributed in FY13. The period of performance for most of the projects runs through December 2012. Each project is expected to provide a report to FISP or in a separate publication, as well as a publically presentable slide presentation for the FISP Research web site, as well as relevant data.

2.) Conduct FISP Research

Ongoing research by the FISP Chief during FY12 focused on the following areas: **a)** evaluation of the accuracy and hydraulic efficiency of FISP SSC samplers; **b)** developing methods for computation of suspended sediment concentration and loads using normalized hydroacoustic backscatter and attenuation; **c)** evaluating the effects of sediment size on turbidity as indicated by turbidity-SSC hysteresis for single chemographs; and **d)** the correct understanding and usage of volumetric concentrations

from laser diffraction relative to mass concentration by gravimetric analysis. Substantial time has been committed to each of these topics, and the results have been described in past minutes and reports; and will be documented in future papers and memorandums.

- a) The FISP Research Plan for FY2012 as presented last Fall to the Technical Committee was focused almost exclusively on this topic. The scope was to evaluate sampler accuracy for a range of hydraulic, fluid, sediment, and sampler conditions for a bag sampler and if possible also a rigid body sampler. However, funding was not adequate to perform the laboratory testing nor the CFD modeling as proposed. In fact, the FISP in-house research budget line item was zeroed out for FY 2012 in order to meet the projected budget. This was discussed with the Technical Committee at our Spring 2012 meeting. The work done included literature review and the gathering of field data on hydraulic efficiency of bag samplers. These results will be presented at our Fall 2012 meeting. Further research to test and verify the estimated accuracy of FISP samplers remains an important area for investigation; however the cost for the laboratory and CFD analyses is substantial; and the multi-focused research objectives given the FISP Chief preclude more than part time work on this goal.
- b) To address this topic, the FISP conducted individual research, met with ADCP/ADV manufacturers at their headquarters, co-sponsored the CUAHSI sediment-acoustic workshop, and with USGS OSW formed the Sediment Acoustic Leadership Team (SALT). Results of meetings with manufacturers were presented at Spring TC meeting. The CHUASI workshop was a success and its presentations and summary are available at <http://www.cuahsi.org/ws-hydroacoustics.html>. An EOS article summarizing the workshop was published by Landers, Arrigo, and Gray (<http://www.agu.org/pubs/crossref/2012/2012EO260007.shtml>). The SALT charter and its membership were announced to the FISP Technical Committee. Two Webinar meetings have been held on June 18th and August 28th. An OSW Forum site has been established for Sediment Surrogates in general; and another for SALT members exclusively. Minutes of the SALT meetings were sent to FISP Technical Committee and Posted to the SALT Forum. A presentation on SALT's significant progress and plans will be provided to the FISP TC at our Fall meeting.
- c) This research shows how turbidity to SSC ratings can be affected by very small changes (less than 10 microns) in the particle size distribution of silt to very fine silt sizes. This is significant not only to computation of SSC from turbidity (the most commonly used surrogate) but to using surrogate data to indicate changes in the PSD, which can reflect changes in sediment transport and sediment sources. The results of this research are being submitted to a journal article for publication. A journal article describing the research has been completed by Landers and Sturm. The article has completed USGS colleague review and should go to the journal in November 2012.
- d) This research has been pursued in individual research by the FISP Chief, in the FISP-funded research for FY11 and FY12 (particularly that in IL and WA), in ongoing discussions and WebEx and presentations with the manufacturer and users of the

technology. The short-term goal is to provide a FISP memorandum (discussed below) discussing the value, use, and limitations of volumetric particle size distribution and concentration and its comparisons with mass SSC and PSC by traditional methods.

3.) Prepare Research Plan for 2013 and Announce Call for Proposals

Past and ongoing research and current needs and opportunities were considered to develop a research theme for the upcoming year. Although significant progress was made in some areas of research during FY12, the priority topics for FISP research for FY13 remain largely. These are listed in the draft FISP 2013 Research Plan, sent separately to the Technical Committee for their comments. The general topics also were communicated in the call for proposals for 2013.

4.) Prepare and manage FISP 2013 call for proposals and work with FISP TC Chair for FISP Spring and Fall 2012 meetings.

FISP proposals were organized and listed on a rating spreadsheet for the TC. The Spring meeting was held in Shepherdstown, WV at the NCTC in conjunction with the CUAHSI sediment-acoustic workshop; and the Fall meeting will be held at the USDA Forest Service Stream Systems Technology Center in Fort Collins, CO on October 24-25, 2012.

5.) Technical Support, Presentations, and Training

FISP Chief has provided technical support for sediment sampling, monitoring and computation. This technical support is provided in response to contacts, calls, and emails from federal, commercial, and academic sediment practitioners. In addition to providing leadership in planning and conducting the CUAHSI workshop, I planned and am chair of the Sediment Acoustic Leadership Team. Other activities include:

- Conducted meetings with **USACE** in Vicksburg ERDC Jan 11-12, 2012. Outcomes from this meeting included improved relationship with ERDC personnel; technical enhancement of their sediment surrogate research efforts; and initial plans to collaborate on field efforts. The August St. Clair work was the resulting field effort.

- Plan and Participate in Field data effort collecting detailed physical SSC and acoustic measurements on St Clair River with **USACE** Detroit District and ERDC personnel and USGS MI WSC in August 7-9, 2012.

- Present at **USACE-USGS** HQ meeting June 2012 (Joint presentation w/ Detroit Corps). As a follow up to this meeting, based on interest expressed by personnel at the meeting, sent email letter to several USACE leadership regarding relevance of FISP to USACE and need for support from USACE for FISP. No response as yet.

- Conducted a 3 day sediment-acoustic training workshop at Bur Reclamation in Denver Feb 21-23/2012. About 5 Reclamation employees and 1 USGS CO WSC employee attended.

Also conducted a 3 day workshop for USGS Midwest Area sediment and nutrient initiative in Dec 2011 in Iowa; helped teach the 1-week Sediment Field Data Techniques course in March in Castle Rock, WA; helped teach 1-day workshop at USGS Data Conference in September 2012; Set up and hosted FISP Booth at USGS Data Conference in September; made several conference presentations on FISP and sediment surrogate technologies; formally reviewed 5 journal/proceedings/standards articles; presented to

ACWI SOS (asked to provide regular FISP updates to SOS).

6.) Work in partnership with USGS Hydrologic Instrumentation Facility for Sampler Supply, repair, and QA. Sampler sales, repairs, and quality assurance testing is ongoing at the Hydrologic Instrumentation Facility which partners with FISP in these critical activities. I work with USGS HIF on sampler supply issues. I developed a detailed (more extensive test conditions) verification plan for new D-99 (3) and D-96 (12) bag samplers acquired in FY12. Arranged for order of 2 P-6 samplers from Carnett Technologies (after final testing); and placed P-6 in (online) FISP Sampler Catalog with Instruction Manual. Also, prepared the revised FISP-HIF Joint Operating Plan for signature by Chief of HIF and Chief of FISP.

7.) Preparation of Final Terms of Reference for FISP

The final, signed Terms of Reference (formerly the Memorandum of Understanding) between FISP and its supporting Federal Agencies has not been completed. This, despite significant effort by the FISP Chief and John Gray and other TC members. In 2011, we completed and circulated a revised MOU. We were then informed by USGS legal council that this document was not acceptable as such and should be an interagency agreement. We stripped the MOU language and revised it as an Interagency Agreement. This was also not acceptable. Current plan (action item from Spring 2012 meeting) is revision of this document as a “Terms of Reference” without any funds language. In July-August, I initiated revision of the Interagency Agreements between each agency and FISP with some success.

Preparation of guidance on use of environmental Laser-Diffraction measurements for SSC

The development of LISST technology by Sequoia Scientific Inc for in-situ deployment has provided major advances in environmental particle size distribution (PSD) measurement. PSD and concentration data at high spatial and/or temporal resolution will open new doors for research on sediment transport mechanics and watershed processes. The FISP is particularly interested in this tool, and has been involved in its development for over 10 years with FISP-funded research conducted in house and through external agreements. The technology is being more widely used in sediment studies and the instruments are becoming more robust. However, several important issues were discovered or highlighted in the summer/fall of 2011. FISP agreed in its Spring 2012 meeting to prepare a FISP technical memorandum that will recommend this technology for volumetric concentration and PSD, with limitations noted, and with some guidance on comparisons with mass SSC and PSD. This document will be presented to the FISP TC at the Fall meeting for their review.

8.) Investigation and Guidance on Bag-Sampler Hydraulic Efficiency

A draft FISP memorandum on bag samplers was prepared for the Spring 2012 FISP TC meeting. After that meeting, the FISP Chief went through physical files from FISP records, and pulled additional hydraulic efficiency (H.E.) test results for a range of conditions and from several field tests in AK, LA, and elsewhere. The FISP Chief also

requested additional H.E. test results from several users known to be operating bag samplers. As of the Fall 2012 FISP TC meeting, the bag-sampler memorandum has not been finalized. This will be a priority for the FISP for 2013. The following is from the introductory paragraph of the draft memorandum:

“This memorandum is to review and revise guidance on operation and limitations of Federal Interagency Sedimentation Project (FISP) bag-type samplers for water-quality and sediment monitoring. This memorandum supplements the FISP reports and operation manuals for the DH-2, D-96, D-96A1, and D-99 FISP bag-samplers (Davis 2001, 2005) and information in memorandum OWQ 99.02/OSW 99.01--Guidance for Collecting Discharge-Weighted Samples in Surface Water Using an Isokinetic Sampler (Oct 28, 1998). This memorandum revises operational limitations listed in these previous reports (D-96, D-96-A1 and D-99 only?) with respect to minimum stream velocity, where suspended sands are present, particularly for cold water conditions. This memorandum also directs USGS users of FISP bag samplers to perform field tests of sampler intake efficiency before each set of samples is collected, as recommended in memorandum OWQ 99.02/OSW 99.01; and requests results of these tests be transmitted to the FISP for further evaluation. Finally, this memorandum provides guidance on transfer of bag-samples to sediment laboratories.”

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Attachment #4

Memorandum from John R. Gray (April 19, 2012) and David Topping's response (July 13), re: key issues gleaned from USGS Professional Paper, "Field Evaluation of the Error Arising from Inadequate Time Averaging in the Standard Use of Depth-Integrating Suspended-Sediment Samplers."



DATE: April 19, 2012
TO: David W. Topping, Flagstaff Science Center, Arizona
FROM: John R. Gray, Office of Surface Water, Reston, Virginia
SUBJECT: Professional Paper 1774 and USGS Policy

The purpose of this memorandum is to articulate my tentative conclusions regarding the thrusts of and recommendations contained in Professional Paper 1774 (PP 1774), "Field Evaluation of the Error Arising from Inadequate Time Averaging in the Standard Use of Depth-Integrating Suspended-Sediment Samplers." It is my eventual goal to develop a policy statement as joint a technical memorandum (Offices of Surface Water, and Water Quality); and perhaps also a Federal Interagency Sedimentation Project (FISP) memorandum. I have copied your co-authors in case they wish to weigh in. It is my goal to obtain comments and recommendations from the report authors before drafting a policy memorandum on the subject.

I have shared PP 1774 – electronically and in print copy – with at least 30 colleagues representing a fairly broad spectrum of specialists and field users. This includes selected colleagues in the Offices of Surface Water, and Water Quality; instructors at the NTC course, "Sediment Data-Collection Techniques"; those holding the positions formerly referred to as the regional surface-water and water-quality specialists; and a number of others. Additionally, the Technical Committee, FISP, received their copies in November. Suffice it to write that the report has had ample opportunity to be reviewed by a large number of folks – technical sorts and managers – with a vested interest in isokinetic sampling issues. The report contains a large amount of meticulously gathered information (for which you and your co-authors are to be commended). However, for the purpose of policy development, the focus of many respondents centered on information provided on pages 42-45, with figure 15 (page 45) garnering the most attention and evaluation. I will try to 'cut to the quick' and provide what I believe to be the crux of the input that I have received.

The red line in Figure 15 – corresponding to two transits at each vertical – is essentially *informal* USGS policy for collecting suspended-sediment x-section samples, in which we collect an "a" and "b" cross-section, more or less independent of each other and (in the final analysis) reported as results of two mean sediment concentrations, and corresponding suspended-sediment discharges. When performing an Equal-Width Increment (EWI) cross-section, USGS policy for streams over 5 feet wide requires a minimum of 10 sampling verticals. Two cross-sections using 10 verticals each yields a total uncertainty (see y axis label) of 4%-5%. If one were to take 4 times more EWI cross-sections with dual transits, total uncertainty

would decrease to 2%-3%.

If, instead, we perform a 4-section Equal-Discharge Increment (EDI) measurement (USGS policy requires 4-9 EDI verticals) and two transits per vertical yields a total uncertainty of about 7%. Quadrupling the number of transits decreases the total uncertainty to about 5%.

These statistics are for suspended-sand concentrations, which, compared to suspended fines concentrations, should be a 'worst case scenario.' Truth be told, based on hydraulic theory and information in FISP Report #5, one might expect more divergent statistics from a system transporting a coarser fraction of sand than was measured and summarized in the report. Although that is an important observation, I will stick with the information-at-hand in the ensuing discussion.

In summary, given present protocols for sediment sampling (a) the maximum total uncertainties is about 7%, and (b) no more than about a 2% reduction in the total uncertainties is achieved by quadrupling the number of transits under any USGS-accepted operational scenario.

If I've summarized the essence of figure 15 correctly, and if there is no other salient considerations, here is the essence of what I have heard from colleagues, which match my own conclusions:

It is a statistical truism that the probability of obtaining "the true value" increases with the number of samples collected. The essence of the issue at hand is whether or not requiring extra transits will provide a sufficiently substantial decrease in the total uncertainty to warrant the extra time (and, in most cases, expense) expended. Given that maximum total uncertainties in correctly collected operational sediment cross-sections is 7% -- and that we can at best improve on this only by about 2% unless (presumably) we collect more than quadruple the number of transits from a minimum of two -- an obvious question to ask is whether we might be subject to diminishing returns for the extra cost and effort expended.

This conclusion is particularly germane to the EDI method for two reasons: First, we routinely collect 10+ EDI verticals. Second, the EDI method (as opposed to the EWV method) normally requires separate passes across the stream, which can be time-consuming (hence expensive), particularly if sampling from a superstructured bridge, very wide cross-section, etc.

On the other hand, taking extra transits using the EDI method might be more cost-effective, for two reasons. First, one only needs to traverse the cross-section once, collecting more than 2 transits per EDI section. Second, it makes more sense to augment the often smaller number of verticals with more transits. However, more transits will require more bottles which will increase time and cost (both in the field and lab) and, as we all know, one of the major reason for the decrease over the last two decade of daily sediment sites is the increasing costs of operating a sediment station. Also, the accuracy gained with additional transects assumes a stationary stream conditions, and could be more than offset by lost accuracy due to averaging under dynamic concentration conditions.

My sense is to write a technical memorandum summarizing the essence of PP 1774, including (and highlighting) the uncertainty statistics. It should provide a balanced discussion on reduced uncertainty versus time and effort. It might favor using the EDI method for sediment work, and to take more than two transits and perhaps up to 8 transits per vertical, and to encourage the hydrographer to collect more rather than less verticals (caveat -- we have to keep in mind the potential for added lab costs along with some increase in time/labor may result in field folks avoiding this option).

However, if this analysis is valid, I cannot imagine the OSW or OWQ articulating policy to require doubling or quadrupling transits when the maximum benefit of the policy would result in a 2% reduction in total uncertainty of suspended-sand concentrations.

Thanks for bearing with me in my attempt to summarize the relevance of PP 1774 to the USGS (and

others). If you beg to differ with these conclusions and suggested response – particularly if I and a number of others have misconstrued the essence of the report – I'd prefer to discuss this, but feel free to respond in writing.

David Topping's July 13, 2012 EMAIL response to the above April 19, 2012, memorandum:

“John,

I guess I would prefer to comment on your final error memo than the intermediate one, if possible. I have no major disagreements with your comments. Here are my main points:

- 1) The errors you calculate are for sand only.
- 2) The errors you calculate are 67% confidence-level (i.e., standard) errors
- 3) Although I am confident that our estimates of the "time-averaging" component of the error is correct and generally applicable, I am slightly less confident of PR Jordan's estimates of the spatial component of the error, especially for non-trapezoidal channels. As we suggest in the professional paper, more work should be done to determine if his Loup-River-based conclusions really hold up for all rivers.
- 4) Our paper provides the first estimates of the field errors in measuring suspended-silt-and-clay concentration.
- 5) If EDI or EWI measurements are made properly, the errors associated with these measurements are really small....much smaller than the typical 1-3 orders of magnitude of scatter in log-log space in sediment-rating-curve plots.

OK, I'll cut to the chase. Two main points.

- 1) This paper provides for the first time some simple equations with which to evaluate the combined temporal and spatial components of the field errors in EWI and EDI measurements of sand concentration and silt and clay concentration.
- 2) This paper shows that errors in EWI and EDI measurements are typically really small. Therefore the 1-3 orders of magnitude scatter in sediment-rating-curve plots IS NOT error and should not be treated as such. **BAN SEDIMENT RATING CURVES!!!!**

OK, I'm off to install three more multi-frequency acoustic sediment gages with Cory Williams and the park service.

All my best.

David”