APPENDIX A

Work Plan

CWPPRA West Bay Sediment Diversion
Final Work Plan to
Evaluate the West Bay Sediment Diversion Effects on the Lower Mississippi River in the Vicinity of the Diversion and the West Bay Receiving Area

U.S. Army Corps of Engineers and the
Louisiana Coastal Protection and Restoration Authority (CPRA)

24 April 2009

Introduction

The West Bay CWPPRA project is the largest constructed sediment diversion in Louisiana and is affording an extraordinary opportunity to the CWPPRA program. Through partnering with Federal and State agencies, the private sector and academia this work plan will provide cutting edge science and the latest technical advances in riverine sediment transport on the lower Mississippi River. The unprecedented knowledge and insight that will be gained from this effort is absolutely crucial to conduct study and analysis as outlined in the January 21, 2009 Task Force motion. The main focus of the motion is to determine if the West Bay Sediment Diversion induces shoaling in the Pilottown anchorage area and if so, the quantity of shoaling being induced as well as to assist in planning future diversion projects in Louisiana.

In October 2008 a West Bay budget re-analysis was conducted by the Corps of Engineers and indicated that an additional $118.5 million would be needed to maintain elevations in the Pilottown anchorage area (PAA) through the project life to 2023. The Corps of Engineers initiated a request to increase the project budget by this amount at the October 9, 2008 CWPPRA Technical Committee Meeting. However, due to concerns that the CWPPRA project would be paying to dredge sediment from the PAA that shoals naturally (i.e., not induced by the project), and concern that the cost is beyond the CWPPRA Program capacity, the Technical Committee did not recommend approval of the total budget. The Technical Committee recommended funding $10.99 M of the $118.5 M request to fund the immediate dredging of the Pilot Town Anchorage Area (PAA).

In a public meeting on November 5, 2008, the federal members of the Louisiana Coastal Wetlands Conservation and Restoration Task Force (Task Force) voted unanimously on the following motion: *"To approve an O&M budget increase for the West Bay Sediment Diversion Project in the amount of $28,550,742, making the total approved budget through FY 12 for $50,863,503, and to approve incremental funding through FY 11 in the amount of $10,998,550. The incremental funding would be used to cover costs associated with dredging the Pilottown Anchorage Area in FY09. The remaining increased budget would be used in FY12 for possible closure of the diversion channel and/or dredging to restore the anchorage area. This motion includes a sunset clause requiring closure of the channel in FY12, unless alternative funding sources for anchorage maintenance are found. The motion also requires that the Corps develop a Work Plan with the Louisiana Coastal Protection and Restoration Authority (CPRA), Office of Coastal Protection and Restoration (OCPR) to address the overall induced shoaling issue; and that the project sponsors report on West Bay progress at each Technical Committee and Task Force meeting".*

On January 21, 2009 an additional motion was passed outlining specifically the purpose and guidelines for the West Bay work plan. The motion reads as follows:

"Motion to require the Corps of Engineers and State of Louisiana, with participation from the CWPPRA Technical Committee and consultation with the maritime industry, and other interested parties to finalize a work plan on river shoaling in the area of the CWPPRA West Bay Diversion Project by February 28, 2009. Provided Further, that the work plan include an analysis of current and historic bathymetry and other relevant data

on this region of the Mississippi River. Provided Further, that the work plan shall include a quantification of total historic and recent shoaling that has occurred in the area before and after the construction of the project. Provided Further, That the report resulting from the work plan shall include estimates on the volume of shoaling resulting from the project, shoaling from natural processes and an estimate of the volume of sediment that has been removed from the river resulting in a decrease in the dredging required in the vicinity of and down river from the West Bay diversion. Provided Further, that a final report resulting from the work plan be provided to the Task Force within six months. Provided Further, that the draft and final work plan and report be independently reviewed by a team of experts within 30 days of completion of each document. The independent review team should consist of the CWPPRA Academic Advisory Group and the LCA Science and Technology Program".

The following from the above motion "*an estimate of the volume of sediment that has been removed from the river resulting in a decrease in the dredging required in the vicinity of and down river from the West Bay diversion",* will require additional time and cost beyond the 12 month effort. Please see Task 7 titled "Task Management", under 'Not included in work plan", for more information. However, the geomorphic assessment and additional bed material samples will provide some understanding of the sediment relationships in this part of the river. Work can be initiated upon receipt of funds for the total scope of work or by task. The 6- month time frame will start upon receipt of funds. The final report will be peer reviewed within 30 days of the 6-month completion date.

This Work Plan will address several issues related to the West Bay Project. Scopes of work included in this document will outline numerical modeling, data collection and riverine geomorphic assessment needed to improve on shoaling estimates in the PAA and the Mississippi River navigation channel being directly induced by the project. In addition to the Mississippi River impacts, West Bay project performance in both the conveyance channel and the receiving area will be evaluated through analysis of biological and engineering monitoring data already collected as part of the project as part of the project monitoring plan. University studies (Andrus, 2007) and Alex Kolker's (Tulane University) West Bay sediment accretion analysis completed during the Spring 2008 flood will also be utilized as appropriate. In addition to the University studies, the Louisiana Office of Coastal Protection and Restoration (LAOCPR) is conducting an independent West Bay study that includes a limited scale geomorphic riverine analysis as well as 1D modeling. This study is being conducted by LAOCPR's contractor Brown Cunningham and Gannuch (BCG). The scope and results of the BCG data analysis will be assessed and integrated with the Work Plan as appropriate.

Background

Multiple river diversions are included in Louisiana's State master plan, CWPPRA's Coast 2050 plan, the Louisiana Coastal Area Plan (LCA), and the Louisiana Coastal Protection and Restoration (LACPR) plan as a method for delivering water, sediment and nutrients to Louisiana's fragile estuarine environments.

The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), West Bay Sediment Diversion Project (MR-03) is located on the west bank of the Mississippi River, in Plaquemines Parish, Louisiana, 4.7 miles above Head of Passes. The project was designed to restore and maintain approximately 9,831 acres of fresh to intermediate marsh in the West Bay area by diverting fresh water and sediment from the Mississippi River over the 20-year project life through 2023. The diversion project benefits were based on construction of a 50,000 cubic feet per second (cfs) conveyance channel at the 50% duration stage of the Mississippi River, and construction of sediment retention enhancement devices (SREDS) in the receiving area. The conveyance channel was initially constructed in 2003 to deliver 20,000 cfs. It was intended that the conveyance channel would be mechanically enlarged to increase the flow capacity to 50,000 cfs after two to three years if it was determined that the channel would not capture the thalweg of the Mississippi River. The conveyance channel enlargement to 50,000 cfs has not occurred and the Shreds have not yet been constructed to date. However, after conducting a current day discharge analysis of the project conveyance channel, it was observed that the channel has approximately doubled in cross sectional area and flow capacity (See Task 9 on page 26 for more detail). An Environmental Impact Statement was completed in March 2002. CWPPRA West Bay project Task Force approval was provided in 1991 as part of the first CWPPRA PPL list. Final project plans and specifications were approved in September 2002. Project construction began in September 2003 and was completed in November 2003.

The diversion channel discharge has averaged 19,336 cfs over the past five years since it was constructed (See page 22 Task 6 for the current discharge capacity of the diversion channel). The diversion discharge in May 2008, during extreme high river flow, was 51,270 cfs. To date, no emergent marsh has accreted as a direct result of the sediment diverted though the channel. However, various investigators have indicated that measurable accretion has occurred in the receiving area (Andrus 2007).

The West Bay Sediment Diversion Project induces shoaling in the federally maintained navigation channel and the PAA and <u>the extent of this induced shoaling will be reevaluated upon approval and execution of this work plan</u>. The PAA extends from river mile 1.5 to 6.7 in the Mississippi River. After thorough negotiations with the navigation industry, an agreement for maintaining the PAA was developed and executed. As stated in the Cost Sharing Agreement executed between the State of Louisiana and the Corps of Engineers and the budget approved by the Task Force in 2002: "Included as a Project feature is the maintenance of the outermost (eastern) 250-foot wide strip of the Pilottown Anchorage area and the entire width of the adjoining access area between this strip of the Pilottown Anchorage area and the Mississippi River navigation channel. Advanced maintenance of the Pilottown Anchorage area shall be undertaken to account for the anticipated shoaling induced by the Project. Below the conveyance channel, the anchorage and access areas shall be maintained at the depths existing at the time the Phase One interim conveyance channel is constructed. Above the cut, three 45-foot deep by 1,500 feet long anchorage berths shall be constructed and/or maintained." The project is responsible for this channel maintenance as a direct project cost through the project life, which ends in 2023 unless a new project cost sharing agreement is negotiated and signed by the State of Louisiana and the Corps of Engineers.

The Corps of Engineers is specifically authorized to operate and maintain navigable channel depths in the Mississippi River[i]; however it is not specifically authorized to dredge the Pilottown Anchorage Area except through CWPPRA. The Corps of Engineers agreed to absorb the cost of dredging shoaled material from the navigation channel induced by the West Bay Diversion Project using its authorized Operations and Maintenance appropriations.

Several numerical sediment transport and hydrodynamic models were developed during the planning phase of the West Bay project, prior to construction. The modeling effort that was used to develop West Bay project induced dredging quantities, in order to develop project dredging cost estimates, was a CH3D model developed in 2000. This model predicted that 1.65 M cy of project induced shoal material would accumulate in the Pilottown Anchorage Area every three years for a 50,000 cfs diversion. A 20,000 cfs diversion was not modeled. These models were useful to their specific intent of the original goals of their study, but had limited value in evaluation of the system-wide riverine response to the diversion.

Current West Bay Issues

Issues A: Is the diversion inducing shoaling in the Pilottown anchorage area and the Mississippi River Navigation Channel? If so by how much? At what rate? If so, how does the induced amount/rate vary with river stage, flow, temperature etc. (i.e. transporting power) and sediment load on the rising, peak and falling hydrograph? If so, how does the induced shoaling amount/rate vary along the anchorage area, and with position across the river? How does what has been observed since 2003 related to a longer term perspective (scale of 20-50 years?)

Issues B: Is there a large space scale, longer-time scale sediment transport-morphology change event taking place in the river that is creating the observed shoaling? If so, what is attributable to the diversion and what to the background larger-scale process? What is the time and space scale of such a background process/event? How do observations since 2003 relate to a longer term perspective (scale of 20-50 years?)

Issues C: How much sediment passes through the diversion? What are the characteristics of the flow and sediment passing through, as a function of river stage and rising/falling limb? What is the current flow carrying capacity of the conveyance channel?

Issues D: How much sediment is retained within West Bay? What are the amounts/characteristics of sediment entering West Bay compared those leaving West Bay? How does the velocity and deposition regime within West Bay change spatially (down the long axis and along the fringes)? What is the rate of accumulation within West Bay, and how does it vary spatially? How do observations since 2003 relate to a longer term perspective (scale of 20-50 years?)

Issues E: What is the current assessment of the ecological benefits of the West Bay project? How close is the area to depositing subaerial "land"? Are there benthic areas that are currently shallow that have moved into the photic zone, thus encouraging epiphytic algae production or other signs of primary productivity? Are there areas that,

though below the water surface now, can be expected to support emergent vegetation in the near future? How has the dredged material deposited in the area persisted? Is it now vegetated? Have the dredged material areas trapped more sediments and grown or have they eroded? How do these results fit within the anticipated receipt of environmental benefits used to justify the cost of the projects? Are there activities that need to take place to update the project projections?

Comprehensive Approach to Evaluate the West Bay Sediment Diversion Effects on the Lower Mississippi River in the Vicinity of the Diversion and the West Bay Receiving Area

TASK 1 - Field Data Collection & Analysis – Corps of Engineers Engineering Research Development Center (ERDC), University of Texas (Mead Allison) & Tulane University (Alex Kolker)

Data collection will serve as the primary foundation for increasing the usefulness of any additional modeling efforts. The new data will improve definition of boundary conditions for 1-dimensional and multi-dimensional models. The data will be essential for describing the ratio of diversion sediment to river sediment, which is critical information required for the 1-dimensional model. Also, the data are essential in calibrating and verifying the numerical model results. Without sufficient data for boundary conditions and calibration/verification, the confidence level of the model results will be significantly lower.

The main objective of the proposed data collection surveys is to determine the integrated transport of water and sediments through the non-controlled diversion at West Bay and the main channel of the Mississippi River in the region of the West Bay Diversion. The goal of integrated surveys is an understanding of the suspended and bed-load transport of sand and fines (silt and clay) through the structure and in the adjacent channel. Integrated surveys are needed 1) to ground-truth 1D and multidimensional modeling to determine the extent to which the diversion is influencing shoaling in adjacent navigational anchorages and 2) to determine sediment fluxes into the receiving basin (Barataria Bight). The later is necessary to ascertain if the diversion is operating as designed and to quantify the fraction of the total Mississippi River sediment load being diverted. Quantification of the diverted sediment load will also be valuable to future efforts to describe the model land building in the receiving basin.
The secondary objective is to calibrate historical West Bay discharge data collected by the Corps since 2003 to sediment sample data in an attempt to improve the sediment flux measurements for multiple hydrographs. These data will give a much better understanding of the historical performance of the diversion.

Data Collection Survey Design Considerations
Several issues impact how surveys should be conducted in this reach of the lower Mississippi River. The first involves the seasonal presence of a salt-water wedge, which enters the main stem at discharges below 8,500 m^3/s (Soileau et al., 1989). Recent observational studies have shown the wedge is an effective sediment trap for fine particulates in the channel thalweg of this reach, including adjacent to the West Bay

entrance channel (Galler and Allison, 2008). A second factor is the limited available observational data in this reach, either measurements of sediment transport or detailed bathymetry (multi-beam/swath) necessary to plan an observational grid. This data limitation extends to the absence of nearby monitoring stations for anything but river stage. The nearest real-time active monitoring station is at Belle Chasse (RM75.5), but the station record only extends to December 2007. Long-term monitoring data is unavailable below the station at Tarbert Landing (RM306.2), immediately below the Old River control structure. Given what has recently been learned about sediment storage and remobilization processes in the lower river due to a reduction in water surface slope in lower discharges, which extends upriver to the approximate tidal limit (at about Baton Rouge), predicting suspended sediment concentrations in the river at the diversion entrance is imprecise. This set of processes, and the likelihood that suspended sediment concentrations likely differ significantly from those at even Belle Chasse, mean a single integrated survey (combined with historical monitoring data) is unlikely to answer the objectives. Further, while bed-load measurements have recently been made in the lower river using modern techniques (Nittrouer and Allison, 2008), none of these measurements have been made at monitoring stations like Belle Chasse, making estimation of the bed-load component of sediment transport at West Bay difficult.

Survey Methods

Several one-time measurements are necessary to answer the objectives. In addition, other measurements are necessary at various river stages, given that sediment fluxes do not co-vary linearly with water discharge in the river adjacent to the diversion. At a minimum, we suggest 6 river surveys are necessary, preferably within a single flood year. However, hysteresis effects cause similar water discharges to have significantly different sediment fluxes during rising and falling limbs. A complete description of sediment fluxes in the study area, including seasonal variations and hysteresis effects, will require a long-term monitoring program outside of this scope of work.

Anecdotal information suggests bed material within the river above head of passes is primarily sand. If initial bed material sampling in areas of concern detects significant quantities of fine sediments, it may be necessary to obtain relatively undisturbed bed material cores and conduct Sedflume experiments to characterize credibility for proposed numerical model studies. Detailed sampling plans and cost estimates will be developed if required.

1. One-time Surveys

Multibeam Bathymetric Basemap A multi-beam (swath) bathymetric survey is proposed to extend bank-to-bank in the river channel for at least two river miles above and below the diversion entrance channel. This survey should extend through the diversion entrance channel and as far into the receiving basin as water depth allows—with overlap with any single-beam surveys being conducted in the receiving basin. This survey will serve twin purposes: to serve as a basemap for multidimensional numerical modeling of water and sediment processes in the vicinity of the structure (linked into the larger-scale USACE decadal navigational surveys) and will be used to select proper cross-section points for measuring water and sediment fluxes.

ERDC has just completed a survey for the lower portion of Southwest Pass that will be available for this work effort. The most recent condition/comprehensive survey data for

the remaining portions of Southwest Pass and Head of Passes will suffice for the needed bathymetry for the geomorphic analysis. There should not be any additional cost associated with these data.

2. Stage Survey Measurements

On each survey, integrated (suspended + bed-load) sediment and water flux should be measured at four localities including a river cross-section immediately upriver of the diversion. Other possible locations include important adjacent anchorages, downstream of the diversion, and at several points within the exit channel of the diversion. The following measurements are proposed (Figure 1).

ADCP 1200 KHz, vessel mounted RDI ADCP will be used to calculate water discharge, and, measure acoustic backscatter data. The backscatter data converted to TSM, Total Suspended Material, can be coupled with the velocity information to achieve 2D sediment flux measurements. The RD unit yields data in 25-50 cm depth bins. Standard USGS methods will be followed: four repetitions of the cross-section in immediate succession with discarding the outlier if it falls outside statistical limits. In addition to the discharge measurements a plan has been laid out to identify the 3D nature of flow as it enters the diversion (Figure 2). This data set is proposed to identify the ability of the numerical technique to simulate the flow patterns that exist at the site.

To obtain detailed discharge data in the West Bay Diversion including cross-sectional flow information as a time history, horizontal ADCP (Hadcp) units could be installed that could collect discharge data in real time. Those installations usually require two to three piles to be driven. Piles usually cost about $3,000 each plus the mobilization cost for a pile driving crew which is typically around $10,000. For a one year deployment, the instrument is about $15,000 to purchase and the data logger is about $10,000 with modem service for the year. This additional data would provide more definition as to the flow characteristics for the diversion throughout the entire hydrograph. However, the 6 or 12 proposed discharge measurements in the diversion plus discharge data previously measured since the diversion was opened should be adequate to accurately define the discharge characteristics into the diversion, especially if the 6 or 12 discharge measurements can be obtained over a wide range of flows on the Mississippi River as described in this work plan.

P-61 Isokinetic Point Sampler A P-61 point sampler obtained from, and calibrated by the Federal Interagency Sedimentation Project (FISP) will be used to collect suspended sediment concentration samples from 0.1, 0.3, 0.5, 0.7, and 0.9 water depths at 3 or more verticals along each ADCP cross-section. Sediment will be filtered onto pre-weighed 0.4 μm filters after pre-sieving the sand (>63 μm) fraction. After drying at 60°C, samples will be weighed and % sand and fines (silt and clay) calculated. Suspended sediment flux (total and sand) will be calculated for each cross-section using the P-61 data and ADCP velocity profiles.

Sediment Sampling and Analysis

Bottom samples will be taken each service trip over the entire site to quantify the seasonal changes due to the varying hydrograph. Figure 3 shows the approximate

locations of the samples. The methods of collection will vary depending upon the depth of water and the method of laboratory analysis to be used on the resulting sample. The types of equipment to be employed are described below along with some of the methods of analysis. Presently the sampling scheme stops at the southern most limit of the anchorage area. Additional samples will be added to the bed material sampling scheme to cover the region from the lower end of the Anchorage area through South West Pass all the way to the end of the Jetties. These samples will be collected on a one mile increment on either side of the channel. This will add almost three days to the sampling effort for the additional 50 samples.

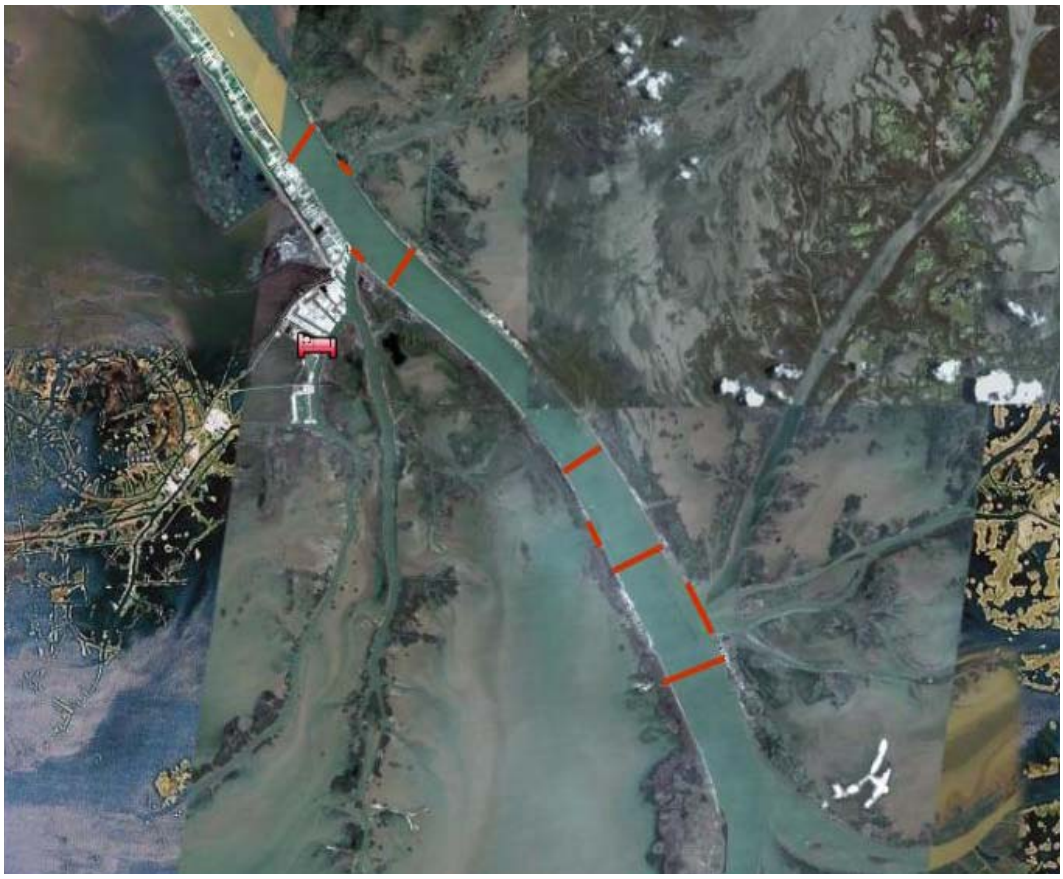


Figure 1 - Sediment Flux Measurement Cross-sections

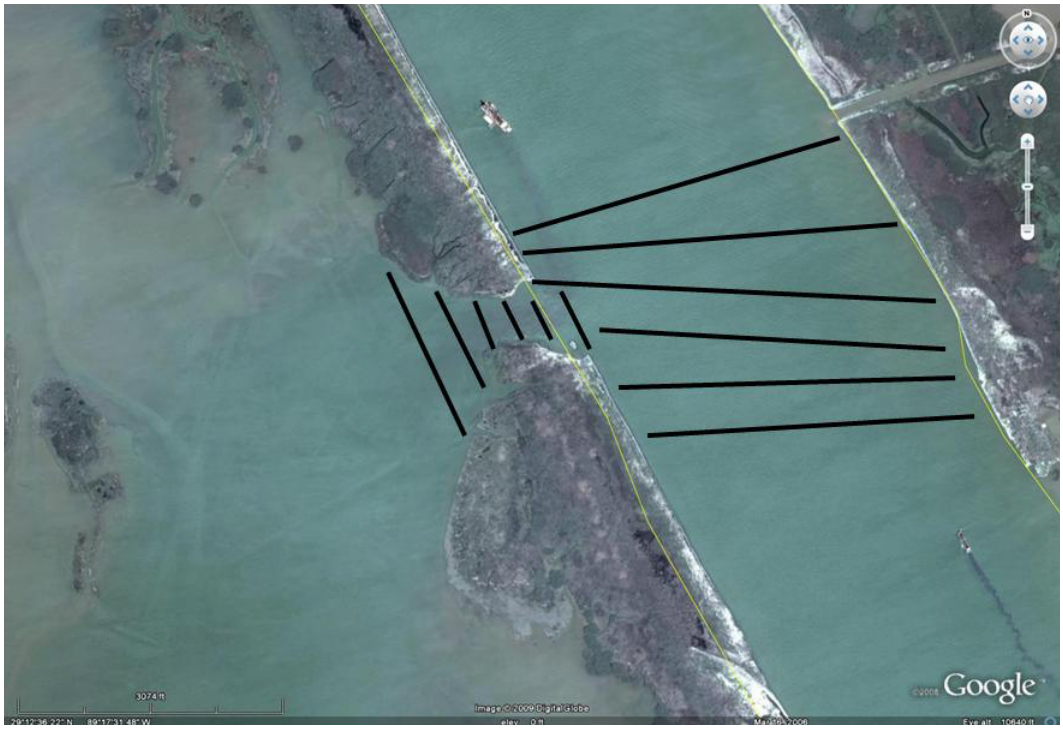


Figure 2 - 3D Velocity Mapping Measurements

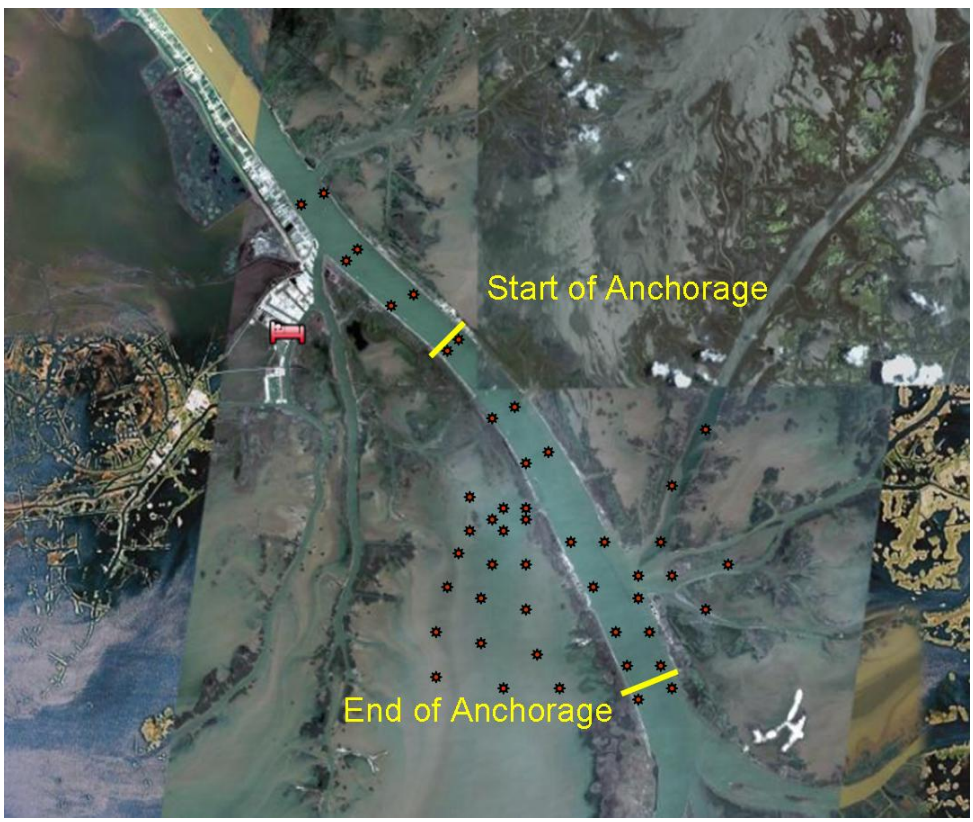


Figure 3- Approximate bed material sample locations

Push-core sampler
Bottom sediments are obtained using a push-core type sampler. The sampler consists of a 1.5-in.-diam PVC pipe, 18 in. in length. Attached to this is a smaller section of pipe with a valve attached at the upper end. The purpose of the valve is to create a reduced pressure holding the sample in the larger-diameter pipe. The samples are then brought to the surface and classified by visual inspection or transported back to ERDC for more detailed analysis. The push-core sampler is displayed in Figure 4. This sampling method is only good for water depths less than 15 feet in material that have a high clay/silt content. If the sample has a high sand content then it will not maintain integrity in the sampler as it is pulled out of the water.

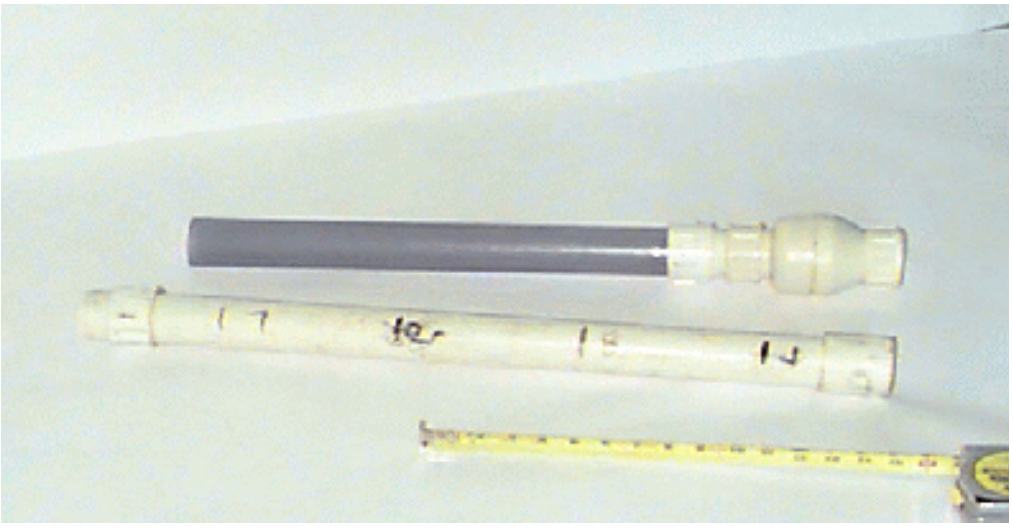


Figure 4 - Push-core sampler

Box- core samplers
The box-core sampler is very similar to the petite Ponar in its triggering mechanism and sampling technique. The main difference in the two samplers is where the sample is trapped. The box-core has clam-shell jaws that scoop the sediment into a clear plastic square tube. When the sampler is opened at the surface, the sample is visible from a top door on the sampler. From this top door, the trapped sample can be sub-sampled for more detailed analysis. Figure 5 is a picture of the box-core sampler. Our method of sub-sampling would be to scrape only the surface material for analysis each sampling trip because it will be the material recently deposited for the time between sampling efforts.

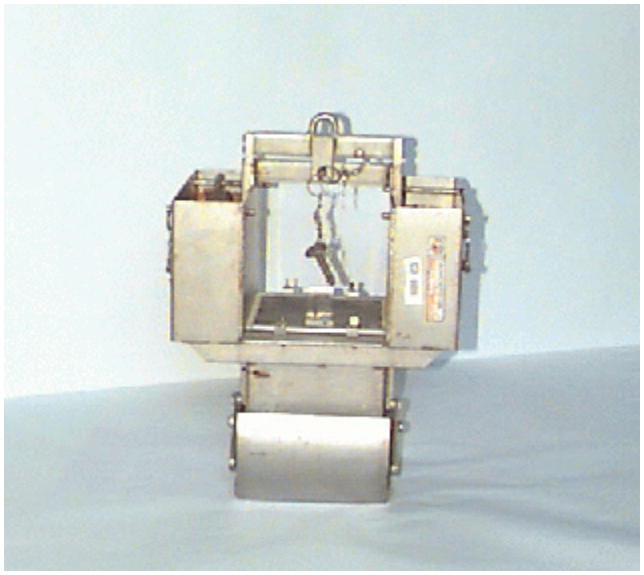


Figure 5 - Box-core sampler

Laboratory analysis for total suspended materials

Total suspended materials (TSM) are determined by filtration of samples. Nuclepore (Registered Trademark) polycarbonate filters with 0.40 micron pore size are used. They are desiccated and pre-weighed, and then a vacuum system (8-lb vacuum maximum) is used to draw the sample through the filter. After the filters and holders are washed with distilled water, the filters are dried at 60 °C for 1 hr and reweighed. The TSM are calculated based on the weight of the filter and the volume of the filtered sample.

Density analysis

A density analysis is done using wide-mouth, 25-cm constant-volume pycnometers. They are calibrated for tare weight and volume. A pycnometer is partially filled with sediment and weighed, then topped off with distilled water. Care is taken to remove any bubbles before the pycnometer is reweighed. The bulk density (BSG) of the sediment is then calculated by the equation:

BSG = { {(Δ) } {(sed wt - tare wt)} } OVER { { (Δ) } {(vol pyc) } + { (sed wt) } - { (sed + water wt) } }

Where:

D = density of water at temperature of analysis

sedwt = Total weight of pycnometer and sediment

tarewt = tare weight of pycnometer

volpyc = volume of pycnometer

sed + waterwt = Total weight of pycnometer, sediment, and water

CTD/Transmissometer/OBS/ The seasonal presence of the salt wedge in the vicinity of the diversion requires salinity mapping. A conductivity-temperature-depth (CTD) profiler will be deployed on each ADCP cross-section to determine vertical stratification.

In addition to profiles of water column salinity and temperature, the Seabird is equipped to make several supplementary measurements. Optical profiles of turbidity will be made with an optical backscatter sensor (OBS).

Bed-load (sand) Transport Bed-load transport measurements should be made along each ADCP transect using repeated multi-beam bathymetric methods. This measurement requires the base-map survey for proper site selection. The resulting bed-load flux measurement will be integrated with suspended measurements for an integrated total and sand flux along each cross-section. This is a one time effort that has been included in the cost of the first survey trip and funded by the LCA Science and Technology (S&T) program. Cost estimates can be provided for additional bed-load transport measurements for each of the return trips should they be deemed necessary.

ADCP Backscatter Calibration for Historical Data since 2003

This effort addresses the long term performance of the West Bay diversion. It will show how much suspend sediment load actually passed through the main channel and through the diversion. The one ongoing discharge measurement has been conducted at West Bay as part of its monitoring plan. (both before and after construction) Acoustic Doppler current profiling (ADCP) above, below, and across the entrance channel have been collected periodically since 2003. While designed to measure water transport through the diversion, the backscatter information captured by the acoustic sensor can be calibrated to yield cross-sections of suspended sediment flux. Previous work has shown that this calibration is very specific to a sensor, sediment type and grain size. This means that the exact sensor used in these ongoing surveys needs to be calibrated against isokinetic samples of suspended sediment concentration at various levels in the water column. Given that isokinetic sampling is proposed for each survey, it should be possible to borrow this ADCP unit to run on with the stage surveys. Although a calibration can be done on a single survey, the limited range of concentration variability in the river at any given stage, suggests that this calibration should be ideally conducted over a range of river discharges to accurately derive a calibration curve. This calibration of the ADCP data for historical surveys is not figured in the costs but ERDC suggests that it should be done. ERDC plans to calibrate the ADCP data collected during the funded effort to suspended sediment concentrations samples. The longer term historical ADCP data collected by the District did not have suspended sediment samples associated with it to calibrate the acoustic backscatter. Our only choice would be to use the same instrument that they used when collecting the historical data and perform a back calibration based upon the current samples. ERDC discussed this approach with Meade Allison but while this would be useful and should be funded it has not been included in this work plan.

Data Collection Cost Estimate

This cost estimate includes the costs for the additional sediment samples. It does not include the historical ADCP calibration nor does it include the multiple bed-load transport measurements.

West Bay Data Collection Estimate				
	1 trip	**3 trips**	**6 trips**	**12 trips**
Labor in Field	36,907.88	95,723.64	191,447.28	382,894.56
Management	12,070.81	24,987.65	47,014.18	91,067.26
Mob/Demob & Planning	5,739.60			
Pd/Travel	9,720.00	29,160.00	58,320.00	116,640.00
Vehicle Expense	4,374.00	13,122.00	26,244.00	52,488.00
Contracts	0.00	0.00	0.00	0.00
Data Processing	22,136.80	33,205.20	66,410.40	132,820.80
Sample Analysis	9,676.80	29,030.40	58,060.80	116,121.60
Supplies/Equipment	0.00	0.00	0.00	0.00
Report writing	26,919.20	26,919.20	26,919.20	26,919.20
Report publishing	0.00	0.00	0.00	0.00
	127,545.09	**252,148.09**	**474,415.86**	**918,951.42**

Please note that the 6-month effort includes 6 data collection trips. If a multi-dimensional analysis that includes silts and clays is required at the end of the initial 6-month effort, then ERDC recommends collecting an additional 6 trips to support this effort.

A detailed data collection time line is difficult to develop as it is dependent on the stage of the river and funding. ERDC personnel can be mobilized as needed to accomplish this work plan.

TASK 2 - Large-Scale/Longer-Term Geomorphic Analysis – ERDC, LAOCPR Significant Engineering Activities on the Lower Mississippi River – MVN

LAOCPR, through its contractor BCG, is completing a limited scope geomorphic assessment that will support the below detailed assessment to evaluate the West Bay Sediment Diversion Effects on the Lower Mississippi River in the Vicinity of the Diversion and the West Bay Receiving Area. The ERDC large-scale/longer-term detailed geomorphic assessment proposal includes an analysis of channel geometry, stage and flow data, dredging records, natural and anthropogenic influences and sediment data which evaluates changes in sediment loads, sources, and sizes. Changes in sediment characteristics are an important part of a geomorphic assessment. The integration of the analyses of all these geomorphic assessment data will provide the basis for the determination of both long term and short term sedimentation trends in the anchorage

area. Often times the analysis results of an individual dataset may conflict with the results of other analyses. Therefore, it is important to interpret all results in the context of the entire system and all data and events (natural and manmade) in order to make the most accurate description of the dominate processes that have influenced sedimentation in the study area. It is also important to remember that a geometric analysis of this nature focuses on observed data which gives a description of conditions at specific times. An observed change from one time period to another is a cumulative response resulting from all influencing forces acting on the system during that span of time. Careful engineering judgment must be exercised when attributing an observed system response to a specific cause or event, because the response may be due to multiple factors with varying degrees of influence.

For geomorphic assessments, both temporal and spatial limits are important. Analysis of channel geometry, stage and flow data, dredging records, sediment data, and natural and anthropogenic influences should be over a sufficiently long enough period of time and over a sufficiently large enough reach of river to determine long term, large scale geomorphic trends. Initial channel geometry analysis by the LAOCPR included annual channel condition surveys from 1997 through 2008 which extended a few miles upstream and a few miles downstream of the West Bay Diversion. In our opinion, this data does not have adequate temporal or spatial limits to determine if any long term, large scale geomorphic changes are impacting sediment deposition rates and patterns in the vicinity of the West Bay Diversion.

Geomorphic Assessment Description of Work

<u>Task 2, Proposal #1, Lower Study Limit at Head of Passes</u>

A detailed geomorphic assessment will be conducted for the lower Mississippi River from Belle Chase (RM 75) to Head of Passes (RM 0). Although the limits of this assessment will focus from Belle Chase to Head of Passes, it is anticipated that discharge and sediment data from Tarbert Landing (RM 306) will be included where relevant. The overall objective of the assessment is to utilize all available data to document the historic trends and changes in hydrology, sedimentation, and channel geometry for the lower Mississippi River, to summarize the local changes observed in the Pilottown anchorage since the opening of the West Bay diversion, and to evaluate the changes at Pilottown with regard to the documented historic trends. It is anticipated that the assessment will focus on the time period from 1960 to the present. The tasks required to accomplish this geomorphic assessment include, but are not limited to, the following:

1. *Data Compilation*. A comprehensive search of available data will be conducted, and pertinent data for the geomorphic assessment will be collected and assembled. Data to be collected will include river stage and discharge, suspended sediment measurements, bed material gradations, comprehensive hydrographic surveys and channel maintenance surveys, aerial photography, dredge records and previous study reports. MVN support with determination of availability and collection of data will be required.
2. *Geometric Data Analysis*. An analysis of channel geometry for the study reach will be conducted with the data from the hydrographic and channel maintenance surveys. Data from sequential surveys will be used to develop

comparisons of river channel form, pattern and profile. These comparisons will be used to determine sedimentation rates and patterns for the overall river reach and for the specific area of the anchorage. The results of the geometric data analysis will help determine the historic sedimentation trends at the Pilottown anchorage area for the pre- and post-construction time periods of the West Bay diversion.

3. *Gage and Discharge Data Analysis*. Data from gage stations within the study reach will be analyzed to determine hydrologic trends and to assess the effects of historic floods on the system morphology. This effort will utilize the historic stage and discharge data from the gage stations (including Tarbert Landing) as well as post-construction data at the West Bay diversion collected by MVN, and additional diversion data collected as part of this comprehensive study.
4. *Dredge Records Analysis*. Dredging records for the study reach will be used to construct a picture of deposition patterns and rates. These results will be used with results of the geometric data assessment to determine a more complete understanding of the sedimentation trends at the anchorage area for pre- and post- West Bay construction time periods. Characteristics of the sediment in the dredged areas will be evaluated dependent on available data.
5. *Sediment Data Analysis*. Suspended sediment measurements and bed material gradations will be analyzed to determine the characteristics of the sediment regime of the study reach. The results of this analysis will be used to assess the characteristics of the shoal material in the anchorage for pre- and post-construction periods and in comparison to the historic sediment load in the river.
6. *Events Timeline Analysis*. An understanding of the chronology of natural flood and storm events as well as anthropogenic (i.e., hopper dredge disposal at Pass a Loutre and South Pass, and normal dredging activities) influences for the study reach is important in the proper and accurate interpretation of the results of the geomorphic assessment. Therefore, an events timeline (see second paragraph below) will be developed documenting all significant events relative to the study reach.
7. *Integration of Results*. This task will integrate the results from all of the analyses conducted as part of the geomorphic assessment, and will form the basis for the comprehensive understanding of the study reach. The results from each analysis will be combined to establish the trends in river morphology and sedimentation from a historic perspective as well as for the post-West Bay construction time period. The integrated results will be evaluated to determine if observed shoaling trends in the Pilottown anchorage are within the influence of the large-scale, long-term morphological changes occurring within the study reach, or a specific result of the impact of West Bay diversion.

The estimated time required to complete Task 2 - Proposal #1 is 5 months. The estimated cost to complete the proposal is $84,500.

Task 2- Proposal #2 - Lower Study Limit at East Jetty on Southwest Pass

An alternative proposal involves extending the lower study limit of the geomorphic assessment to the east jetty on Southwest Pass (RM -20). Extending the lower study limit will allow evaluation of the sedimentation trends in Southwest Pass with regard to the impacts of the West Bay Diversion. The general sub-task requirements for this proposal will be the same as Proposal #1, with the primary change being the gathering of additional existing survey data and gage/discharge data for Southwest Pass. Additional bed material samples will be collected in Southwest Pass as part of Task #1, Field Data Collection and Analysis, to support this proposal.

The estimated time required to complete Proposal #2 is 5 months. The estimated cost to complete the proposal is $105,500.

Significant Engineering Activities on the Lower Mississippi River

The scope of work will include outlining the history of significant events that have occurred along the Mississippi River between Belle Chase, LA and the Gulf of Mexico between 1960 and present. This effort will include a file search at MVN, as well as other sources of reference to summarize the various phased development of the Mississippi River navigation system. Research will include the compilation of O&M data during this period, including reaches dredged through O&M, as well as construction (i.e. channel deepening events), and quantities of material removed (as available); method(s) of dredging performed and disposition of dredged materials; and cost information associated with said dredging contracts.

In addition to O&M data, data will be gathered and will summarize various channel improvement features installed along the river during this time frame. This could include a summary of revetment work performed along the river; channel training improvements in the Mississippi River – South West Pass, including but not necessarily limited to 1) lateral pile dikes, 2) foreshore dikes, 3) headland dikes, 4) borrow from portions of the Mississippi River below Venice, LA that were used as dedicated dredging borrow sources for bank nourishment behind foreshore dikes, and 5) other known Corps borrow and/or fill performed in the river. (i.e. the salt water barrier sill initial construction and maintenance) Will also present a brief summary of the developments/changes within the river between Venice, LA and Head of Passes during the 1990 – 2003 period (prior to Construction of the West Bay Diversion) as well post –West Bay

This information will be provided in report format that will also include any necessary plates and tables.

The estimated time to complete the **Significant Engineering Activities on the Lower Mississippi River** portion of Task 2 is 1 month at a cost of $15,000.

TASK 3 - 1D Sedimentation Modeling – ERDC, Corps of Engineers - Mississippi Valley Division (MVD) Vicksburg District (MVK) and LAOCPR

LAOCPR contractor Brown Cunningham and Gannuch (BCG) has developed a 1D computational analysis study. The Corps' has conducted an initial assessment of the

LAOCPR 1D model. The modeler, Mr. Tony Thomas, states that this model only provides the relative impact that different combinations of the alternatives would have on the volume of sediment that has been dredged in the study reach. Mr. Thomas also points out that this effort is not a study to compute the volumes of dredging. The results are presented as percentages of a base value. Therefore, the study is not classified as a Computational Model Study but it is classified as a Computational Analysis Study. It appears that a detailed calibration was not conducted for sediment.

Use of this model to quantify sediment deposition and dredging will require a detailed sediment calibration. The BCG 1D model will be further assessed and integrated with the Work Plan as appropriate, upon receipt of the model and supporting information.

Background

One-dimensional (1D) sediment routing modeling provides the opportunity of evaluating long-term channel changes and delivery of sediments at a regional spatial scale. One dimensional modeling also provides boundary condition input for multi dimensional modeling. The Vicksburg District is currently developing a HEC-6T model of the lower Mississippi River. The Vicksburg, Mississippi to the Gulf reach is scheduled for completion during February 2009. This model will contain sand size sediment only and does not include distributaries. The Vicksburg District has plans to incorporate silts and clays into the model. This work is scheduled for completion in April 2009. The model currently being developed by the Vicksburg District will allow for the evaluation of sediment deposition and scour trends through the reach of the Mississippi River that is impacted by the diversion of flow and sediment at West Bay. The anchorage areas along the Mississippi River channel experience varying rates of sediment deposition and require varying degrees of dredging. A 1D sediment routing model can be used to predict sediment deposition trends with and without the West Bay Diversion. These trends can be compared to determine the impacts of the West Bay Diversion.

Need For 1D Modeling

(Raphelt and Letter, 2003) state that a major deficiency of three of the previous West Bay Studies was the lack of a long-term multi year analysis of the system. Some previous 1D modeling has been conducted on the lower Mississippi River. However, this modeling did not include the West Bay Diversion. These modeling efforts are summarized in ERDC/CHL CHETN-VII-9, "River Diversions and Shoaling" by Joseph Letter, Fred Pinkard, and Nolan Raphelt, dated November 2008. In 1991, ERDC developed a TABS-1 1D model to evaluate dredging alternatives in the Cubits Gap and Head of Passes reaches. The study included evaluating several alternatives including over-depth dredging (advance maintenance), an in-channel sediment trap, and reduced outflow through Cubits Gap by some structural means. Model results indicated that reduced dredging at Cubits Gap and Head of Passes resulted from reducing flow through Cubits Gap. The report concluded that the shoal downstream from Cubits Gap is due primarily to reduced transport potential created by the distributary. Reducing the impact of the distributary by reducing its outflow also reduces the shoaling problem downstream. In 1992, ERDC developed a 1D TABS-1 model to evaluate long-term aggradation and degradation trends, the effect of various flow diversion schemes on dredging in Southwest Pass, the washout of a sediment sill at River Mile 63, and preliminary dike field schemes for Redeye Crossing at River Mile 224. In general, the model results for the major diversion schemes indicate that the effect of diverting water and sediment will

be increased deposition and dredging downstream because the reduced discharge will not be able to maintain the existing sediment concentration. No sediment data for the modeled diversions was available for either of these modeling efforts. The developers used a range of concentrations for the sand load exiting the river through the diversions. The currently proposed 1D modeling effort includes a sediment data collection program at the West Bay Diversion over a range of flow conditions. This measured data will be used in the model which should greatly improve the models capability to accurately predict sediment aggradation / degradation trends downstream.

1D Model Input Requirements

1. Channel Geometry – One-dimensional models require channel geometry which is obtained from hydrographic surveys plus channel bank and overbank topographic data. The HEC-6T model currently being developed by the Vicksburg District includes the channel geometry obtained from the New Orleans District's 1991-1992 comprehensive hydrographic survey. The most recent New Orleans District's comprehensive hydrographic survey was obtained in 2003-2004. By using the 1991-1992 channel geometry, the 1991 through 2004 hydrograph can be run through the model to calibrate the model to channel geometry contained in the 2003-2004 hydrographic survey.

2. Flow Data (Main Stem) – Sediment capabilities in HEC-6 are based on quasi-unsteady hydraulics. The quasi-unsteady approach approximates a flow hydrograph by a series of steady flow profiles associated with corresponding flow durations. An advantage of 1D modeling is that long term simulations can be run. A gage station with complete, long term stage and discharge data is required to develop the simulation hydrograph.

3. Sediment Data (Main Stem) – Sediment rating curves are required for the upstream boundary. These curves provide sediment loads for a range of flows. The model utilizes these loads with the flow hydrograph to determine sediment transport capacity and expected deposition / scour. HEC-6 calculates sediment loads based on grain size. Therefore, the sediment rating curves must be provided for each grain size. Also, bed material gradation is a model input parameter. Previous studies have shown that the bed material becomes finer on the Mississippi River the farther downstream you go. Therefore, bed material gradations and the locations where bed material gradations change are required.

4. Flow and Sediment Data (Through Diversion) – For each flow in the hydrograph, the model needs to know the amount of the total flow that is diverted through West Bay. Likewise, the model has to know the sediment load passing through the diversion.

5. Time Step - In general, the time step in HEC-6 is variable (usually correlated to flow) and dependent on stability considerations in the sedimentation computations and spatial resolution. For example, computed bed change during a single time step should not be large enough to significantly influence the flow field. As a practical matter when modeling long reaches of large rivers, it is often convenient to set the time step to 1 day and use mean daily flows in the boundary condition histogram (stepped hydrograph) for low to moderate flows with shorter time steps employed during periods of intense sediment transport during periods of high flow.

Changes in mainstem sediment concentrations at the diversion are a major factor in determining downstream sediment impacts. To date, sediment loads passing through the diversion have not been collected. The data collection program proposed by ERDC will provide this required information. Flow and sediment data are required for a wide range of flow conditions to develop a diversion rating curve.

1D Model Calibration

The HEC-6T model requires a calibration of water surface profiles as well as calibration of erosion/depositional trends. The water surface calibration is accomplished by running flow through the model to compute water surface profiles for known flow events. The erosion/depositional calibration is accomplished by running a known hydrograph through the model for the time period between the survey used for the model's channel geometry (1991-1992) and more recent channel surveys (2003-2004). Once the model is calibrated, a typical hydrograph which represents probable future hydrologic events can be run to predict future aggradational or degradational trends. A typical hydrograph is one that can reasonably be expected to occur within the model simulation period based on historical observations and known changes within the basin that would alter the magnitude of historical flows. A typical hydrograph usually includes a wide range of flow including low water and high water years. The length of the typical hydrograph varies but should be representative of conditions expected to occur in the future. Typical hydrographs are usually run several times to create a long term hydrograph.

1D Model Limits

The model for the evaluation of the West Bay Diversion should extend upstream to a location that has good data to develop boundary conditions. This includes historic flow and sediment data so that a good sediment rating curve can be developed. Also, the upstream boundary should be a sufficient distance upstream of the area of concern to allow the model to stabilize prior to reaching this area. The model currently being developed by the Vicksburg District extends from Vicksburg, Mississippi to East Jetty. We would propose to utilize the Belle Chase to Head of Passes reach of this model to evaluate the West Bay Diversion. The Vicksburg District model is a regional model that does not include distributaries. Therefore, a detailed model of the West Bay reach would include the addition of the major distributaries at Cubits Gap (RM 3.2), Grand Pass (RM 10.4) and Baptiste Colette Bayou (RM 11.4).

1D Model Simulations

HEC-6T allows for long term simulations. We propose to run a 50 year simulation. We would expect to have at a minimum, one low water year and one high water year within each 10 year period within the 50 year simulation. HEC-6T provides sediment deposition or scour trends for each time step in the hydrograph at each cross section. From this data, sediment deposition or scour trends can be determined for a given reach. By specifying the flow and sediment passing through the diversion, the impact of the diversion on downstream deposition trends can be identified. A simulation would be run without the West Bay Diversion to determine the deposition/scour trends that would be expected if the diversion had never been constructed. Another simulation would be run with the

West Bay Diversion to determine the deposition/scour trends that is expected to occur with the diversion in operation. A comparison of these simulations would provide an estimate of the impact of the diversion over the long term simulation period. HEC-6T contains a dredging option. Whenever and where ever dredging is required, a dredging template can be inserted into the model. At that point, the model will dredge the channel cross sections to the specified dimensions. This dredging option can be repeated as frequently as needed. Each time the dredging option is used, the model uses the dredged channel geometry to determine future scour and deposition.

The Vicksburg District is currently developing a HEC-6T model from Vicksburg, Mississippi to East Jetty. The model is scheduled to be completed and calibrated for the sand size sediment by the end of February 2009. For the West Bay Diversion reach, we believe a model that includes sand, silt, and clay size fractions is very important to accurately determine future deposition/scour trends.

Vicksburg District completed and calibrated model including sands, silts, and clays. With this model, we would run simulations for with and without West Bay Diversion. These simulations would include specified dredging requirements in the anchorage areas. Results would include a comparison between with and without diversion sedimentation rates throughout the Belle Chase to Head of Passes reach. Results would also identify both temporal and spatial changes in the sedimentation rates for both with and without diversion alternatives. These simulations would include a best estimate of sea level rise and subsidence over the 50 year simulation period. An extra $6,500 and 3 weeks will be required for this effort above the 10 week required for the 1D modeling effort.

This effort would require adding the distributaries at Cubits Gap, Grand Pass, and Baptiste Colette Bayou, inserting the measured water and sediment outflow through these distributaries and the West Bay Diversion into the model, model runs, analyses of model results, and report preparation. The location and extent of the shoaling will also be presented pictorially using a GIS format. A draft report would be produced at this time with a published final report to follow. The Mississippi Valley Division, the Vicksburg District, the LCA S&T Office and the CWPPRA Academic Advisory Group, will provide technical review mechanism.

The estimated time required to complete Task 3 is 5 months. The estimated cost to complete the proposal is $54,000 and an additional $9,600 for Vicksburg District (MVK) input, and $5,000 for Tony Thomas' input.

TASK 4 - 2D/3D Modeling – ERDC, LSU

Several studies have been conducted concerning sediment processes at West Bay using the CH3D sediment transport model. These studies have yielded valuable information concerning the impacts of the implementation of the West Bay diversion. However, model specific limitations and constraints, associated primarily with grid resolution and boundary condition specifications, have contributed to the limited usefulness of these modeling results.

The ADH sediment transport model (Berger and Stockstill, 1999) is equipped with several features that can serve to mitigate the limitations inherent in the previous efforts. These include the following:

- The model is a fully unstructured model, which allows very dense model resolution to be focused only in areas of interest. This means that the model mesh can be highly resolved in the study area, to capture local vortices and other flow features at the diversion site, and also extended well beyond the study area to cover a very large spatial domain. This spatial extent is important because model boundaries that are too close in proximity to the study area can essentially prescribe the results, if extreme caution is not taken in the selection and implementation of these boundaries.
- The sediment model is based on the CH3D sediment model, except that it is equipped with some improvements to more accurately simulate sediment processes. These include the ability to armor the bed more effectively, and the ability to include gravitational forcing in the direction and magnitude of bedload transport. This latter feature could be of significance with respect to determining how much (if any) bedload transport passes through the diversion.
- The model can simulate fine sediment as well as coarse sediment. This will enable the model to simulate sediment loads passing though the diversion, as well as the fate and transport of fine sediment within West Bay.

Each of these features fills a gap in the previous CH3D efforts, and hence each is desirable for the current effort. However, the ADH model is currently available only in a 2D depth-averaged modeling framework. Although 3D capability is currently being developed, it is not available at this time.

In general, the flow and sediment transport characteristics at a diversion exhibit decidedly 3-dimesional behavior. However, the further question of whether, and to what degree, the behavior at a specific diversion is characterized by the 3-dimeinsional nature of the flow is a question that cannot be answered from first principles. Rather, the question can be addressed via 2 different modes of analysis.

- Careful field data collection and analysis, to determine the nature of the observed flow and transport patterns in 3 dimensions.
- Comparative model studies, simulating the system with both 2D and 3D models simultaneously, to determine the relative impacts of the 3-dimesional processes.

With this in mind, it is proposed that we conduct simulations using both CH3D and ADH, in order to take advantage of the combined capabilities of each model.

- The ADH model can be used to provide more accurate boundary conditions to the CH3D model (since the ADH boundary will extend far beyond the study area)

- Comparison of the results from both models will provide quantitative and qualitative insights into the need for 3D modeling at West Bay diversion, by demonstrating what a 2D model can and cannot provide.

- Both models can provide insight into the dominant processes governing sediment deposition in the anchorage area, and can be used in conjunction to provide the best possible answers.

This effort will be done in partnership with LSU. Their modeling experience with ADH and West Bay and their corporate knowledge concerning sediment processes in the lower Mississippi make them an ideal partner for this effort.

The initial effort (Task 4 - Proposal 1) will be focused exclusively on shoaling in the anchorage area, and hence will be primarily focused on coarse-grained sediment transport processes. The further effort (Task 4 - Proposal 2) will also address the fine-grained sediment processes associated with sediment diversion, distribution, and retention within West Bay.

The modeling effort will include simulations of several different boundary conditions, each run both with and without the West Bay diversion included in the domain.

Task 4 - Proposal 1

Refinement of existing ADH mesh and CH3D grids. The existing ADH mesh and CH3D grid will be revisited and refined where necessary. The mesh/grid will be updated with the best available bathymetric data.

Development of boundary condition data sets using available data and 1D model output. Boundary condition data sets for both the CH3D and ADH models will be developed from both observed data and data taken from the 1D modeling effort.

Calibration and verification of models using existing data and data collected in 2009. The models will be calibrated and verified using existing and/or recently collected data, These data will include the observed current patterns at the division. The current patterns will be compared to model predictions to determine to what extent the models are able to simulate the complexities of the flow field at the diversion location. Sediment data to be used in the calibration/verification process include dredging records and grain size analyses. For Task 4 - Proposal 1, this calibration/verification will only include coarse grained sediment.

Simulation scenarios. Once the models are calibrated and verified, the models will be run for several different simulation scenarios. Each of these scenarios will involve 2 separate model runs for each model: one with the West Bay diversion in place, and one without it in place. The first 3 scenarios will be run using both the ADH and CH3D models, the 4th scenario will be run for ADH only.

- *Scenarios 1 and 2: Steady state runs.* These runs are designed to give general insight into the steady state processes that govern the sediment dynamics at the diversion. The models will be run for 2 separate flow rates. These flow rates will be energetic enough to mobilize the sediment in the study area. They will be run to an equilibrium bed condition.

- *Scenario 3: slug test.* This scenario is designed to investigate the possibility that an excess of sediment from some antecedent river condition is slowly migrating downriver, and is responsible for the increased shoaling in the anchorage area. One of the steady state flow rates will be chosen, and a "slug" of sediment will be added to the models upstream of the diversion site. They will be run until the slug reaches the diversion site, and the effect of the slug on sediment deposition will be investigated.

- *Scenario 4: Hydrograph.* A spring hydrograph (6 months) will be run though the ADH model, to determine how the disequilibrium conditions resulting from the passage of a flood hydrograph may affect shoaling and transport in the anchorage area and at the diversion site.

At this point the product will be a draft report with a finial report to follow.

The estimated time required to complete Task 4 Proposal 1 is 6 months. The estimated cost to complete Proposal 1 is $80,000.

Task 4 - Proposal 2

This proposal includes all of Task 4 - Proposal 1, with additional tasks to address issues associated with sediment passing through the diversion. The tasks outlined below will only be performed with ADH.

<u>Calibration and verification of ADH model for fine sediment diversion</u>. The calibration and verification of fine sediments will require extensive data collection in West Bay. These data will be used to determine the properties and distribution of the sediment, which in turn will be used to adjust parameters for the calibration and verification process.

<u>Simulation of hydrograph to determine fine sediment transport and retention in West Bay.</u> A year-long hydrograph will be run in ADH, together with a year long records of other boundary forcings (such as wind and tide). These will be used to determine the extent of sediment redistribution and retention within West Bay.

At this point the product will be a draft report with finial report to follow. ERDC will be in a better position to determine if Task 4 - Proposal 2 will be necessary as data is collected and analyzed.

The estimated time required to complete Task 4 Proposal 2 is 12 months. The estimated cost to complete the Proposal 2 is $60,000.

Task 5 - Sediment Budget - ERDC

Development of a sediment budget for the West Bay receiving area is beyond the scope of the 6 month Work Plan. An additional ERDC task is proposed for development of a sediment budget for the receiving area. Development of the sediment budget would

require additional sediment data collection in the receiving area along with the post-West Bay bathymetric survey scheduled to be conducted by OCPR. These data are required to determine the volume of sediment retained in the receiving area and to estimate the flux of sediment leaving the receiving area. Data collected as part of *Task #1, Field Data Collection and Analysis* will be used to determine the percentage of water and sediment diverted through the West Bay diversion channel. Additional bed core samples will be required throughout the receiving area in order to determine the history of sediment deposition/scour within the area (cost to be determined). Results from *Task #4, 2D/3D Numerical Modeling* will be used to estimate sediment flux leaving the receiving area.

The estimated time to complete the sediment budget for the West Bay receiving area is an additional 6 weeks over the 6 month work plan effort, at a cost of $25,500.

Task 6 – Sensitivity Analysis

Note that these scenarios described in Task 4 - Proposals 1 and 2 and in Task 3 do not include sensitivity runs, which could be used to correlate estimate of uncertainty in the boundary conditions and assumptions used in the modeling with uncertainty in the results. This type of analysis is necessary for a complete understanding of the results, since it can be used to quantify the accuracy that can be expected from the available tools and data. This analysis can be completed by utilizing analytic and statistical techniques to identify the uncertainty in the relevant forcing terms and process descriptions, and then using both the 1D and multidimensional models to ascertain the impacts of these variations on the model results. At a minimum, variations in Mississippi River sediment inflows, estimates of subsidence and sea level rise, and estimates of the sediment diversion ratio would be considered.

This work would require an additional 8 weeks over the 6 months outlined in the work plan and cost $39,200 to complete.

Task 7 – Task Management – MVN, ERDC and LAOCPR

MVN – The management of this involved work plan effort over such a short period of time will require a near full time effort of the MVN Project Manager. Tasks include: Gathering and providing existing data. Organizing and coordinating team meetings. Developing and providing updates at all CWPPRA meetings. Responding to general requests from partnering agencies. Coordinating all peer review. Travel for meetings with ERDC and other partnering agencies. Report writing. Ensuring that project remains on task and budget. Senior Project manager oversight.

Cost $100,000 for 6 months and $140,000 for 12 months

ERDC - A one person overall task manager and POC will be needed for this scope of work due to the number of branches within the Coastal and Hydraulics Laboratory involved, Division, Districts and academic institutions.

Cost $10,000 for 6 months and $16,000 for 12 months.

The completion of this work plan within the allotted 6 month time frame will be a difficult task. However, data acquisition has already started with funding provided by the LCA S&T office. The team will initiate the development of the 1D and 2D models as soon as funds become available. Some input assumptions will be made in the development of these models. As the new data is collected, it will be evaluated and changes to the models can be made at that time. This method of development provides the best chance of having the work completed within the 6 months.

ERDC regards the 6 month time frame as starting upon receipt of funds.

Not included in work plan

Southwest Pass: To the best of our knowledge, sedimentation processes in Southwest Pass, below Head of Passes, are strongly influenced by fine sediment flocculation, salinity, vertical mixing, and other physical processes that are not reproduced in the 1D model. In particular, the location of the saltwater wedge varies with Mississippi River discharge and is believed to influence the longitudinal distribution of fine sediment deposition within the Pass. For this reason, we do not recommend the application of the 1D model as the primary tool for evaluating the potential impacts of the West Bay Diversion on dredging in Southwest Pass.

A three-dimensional cohesive sediment model is required to properly represent the hydrodynamic and sedimentation processes believed to be occurring in Southwest Pass. Application of a suitable model, such as TABS-MDS or the 3D version of ADH currently under development, along with a significant expansion of the field data collection task to characterize hydrodynamics, salinity, and sedimentation in Southwest Pass is not considered feasible within the 6 or 12 month effort.

Adaptive Management: Various adaptive management options that would either limit sediment deposition in the anchorage area or capture greater amounts of sediment in the diversion could be evaluated. However, identifying, developing, and evaluating these options would increase the cost contained in the work plan and be in addition to the 6 month time frame for the work plan. Specific time and cost could vary significantly depending on the number and complexity of the options evaluated. If engineering analysis conducted during this study indicates that viable alternatives may exist, then appropriate study modifications will be recommended to the Technical Committee.

TASK 8 – Aerial and Bathymetric Spatial Change Analysis of West Bay Receiving Area – Corps of Engineers - Mobile District

Background and Problem Statement

The West Bay Sediment Diversion consists of a conveyance channel for large-scaled uncontrolled diversion of freshwater and sediments from the Mississippi River. The diversion site is located on the west bank of the Mississippi River, in Plaquemines Parish, Louisiana, 4.7 miles above Head of Passes. The project diverts Mississippi River water and sediments into West Bay. Marshes along the lower Mississippi River are subsiding

and converting to open water because of a lack of riverine sediment inputs and fresh water. An updated aerial and bathymetric pre and post project analysis is needed to determine the land gain both aerial and subaqueous for the receiving basin.

Objectives

The objective of this proposal is to provide New Orleans District project management team: 1) an updated aerial analysis of land/water change both pre and post construction to include historical and present land loss rates, 2) a bathymetric survey comparison of pre construction and a pending new survey taken in FY09, 3) a historic assessment of subsidence, and 4) assess whether any historic topographic and/or bathymetric lidar exists for the project area in which analysis could be made for comparison.

Approach

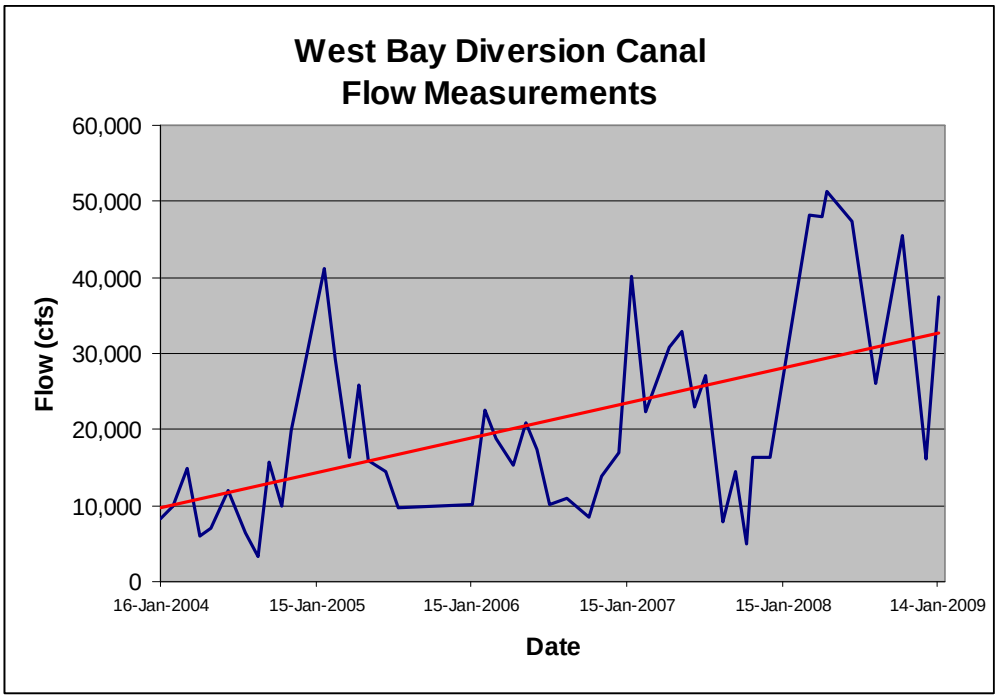
The approach for the aerial analysis will be to compare all land/water data available back to 1956 to the present and record/display the land gain/loss rates at appropriate intervals pre and post construction. Using professional knowledge and expertise, data will be displayed relevant to major events (i.e., construction, storms, etc). The bathymetric survey comparison will be generated using a custom survey tool application to display the subaqueous land contours and profile. The historic assessment of subsidence will be documented for this area and the Mississippi Delta using existing published or professional knowledge. The Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) data and other's data will be mined for appropriate topographic and/or bathymetric lidar.

The estimated time to complete Task 8 is 3 months at a cost of $40,000. This cost is not included in this work plan but is part of the routine West Bay monitoring project costs.

TASK 9 – Current West Bay Conveyance Channel Discharge Analysis – Corps of Engineers - New Orleans District – **Please note that the information presented below is a completed technical analysis for information purposes and not a scope of work.

Since the completion of construction of the West Bay Diversion Channel in December 2003, there has been a noticeable difference in the channel morphology and its effect has been an increase in flows. There are many parameters that play a part in the amount of flow that is carried through the channel. Channel size, Mississippi River flows, the ability of the receiving area to hold or pass what comes through, the bathymetry of the river at the mouth of the channel and the unknown or unexpected. It is even more difficult to quantify the actual flow capacity at the 50% exceedance of the Mississippi River, since that's a moving target as time goes on. The original design criteria from the Land Loss and Marsh Creation, St. Bernard, Plaquemines, and Jefferson Parishes, LA Feasibility Study, Volume 2, Appendixes A-F, April 1990, Page B-46, Table B-3-5, the Typical Hydrologic and Hydraulic Parameters for Large-Scale Uncontrolled Sediment Diversions at River Mile 7.5L above Head of Passes (at Venice), the 50% exceedance stage on the Mississippi is 2.48 ft NGVD, values are from Mississippi River at Venice (1964-1987) and Breton Sound near Gardner Island (1960-1987).

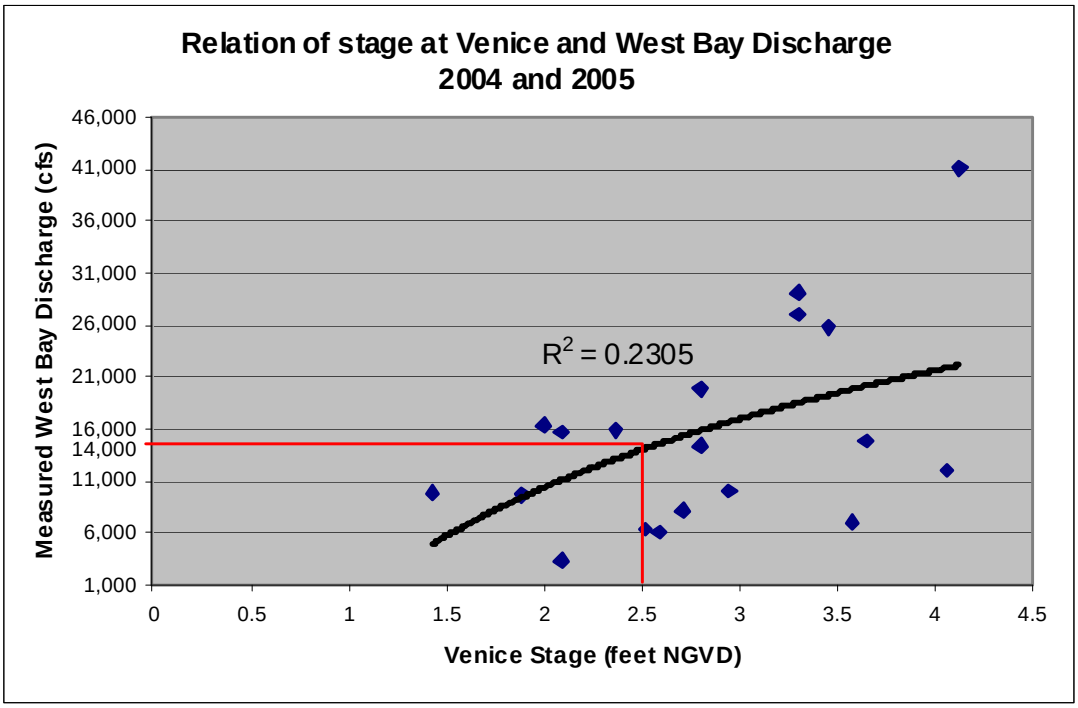
A linear look at the overall trend (see graph below) of all the flow measurements in the diversion channel taken since completion of construction to January 2009 shows a continued increase in flows through the diversion channel.



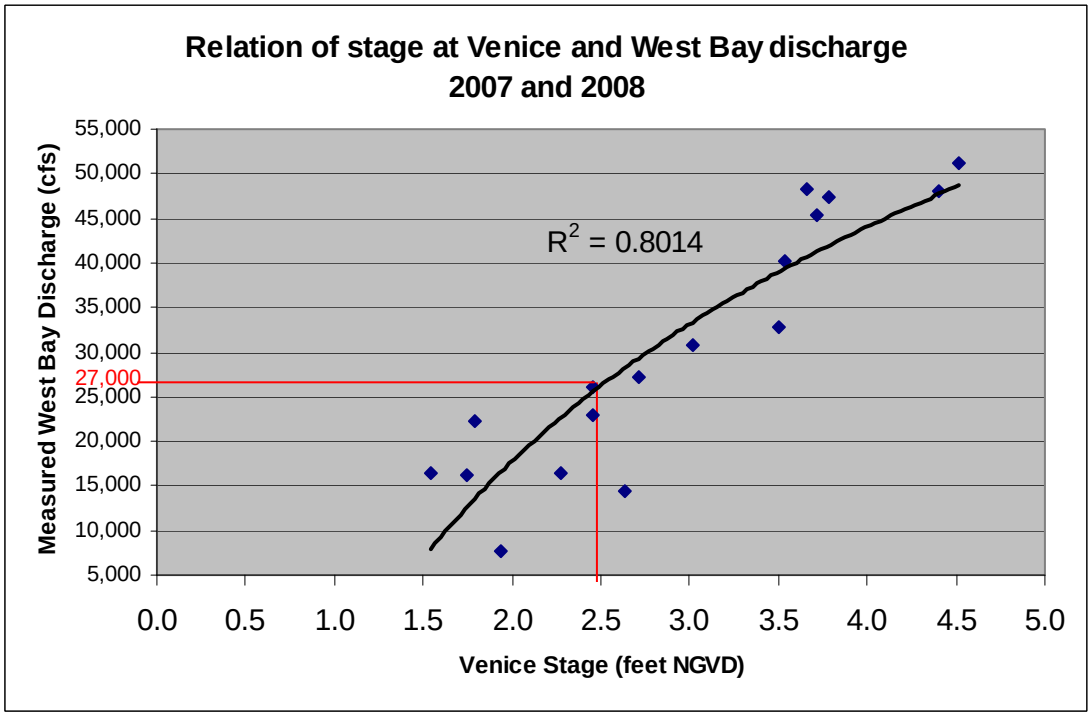
As part of the West Bay monitoring effort, MVN collects flow data monthly at the entrance of the West Bay Diversion Canal and processes the data. Using that data, a relationship was developed between the measured discharges in the diversion canal and the stage at Venice.

In 2004 and 2005 there was significant growth in the diversion channel, over the 2 years, the value was approximately 14,000 cfs. Two years were used because there were not enough points in 2004 to create a relationship. Although an R^2 of 0.2305 is not a good approximation, it is enough, when using the same methodology, to show a significant growth of the diversion channel since its conception.

It is concluded after completion of the discharge analysis, that the conveyance channel has approximately doubled in cross sectional area and flow capacity.



The R^2 for the 2007 and 2008 relationship is 0.8014 and shows the channel almost doubling in capacity with a 27,000 cfs average at the correlated 50% exceedance stage (graphs above and below).



TASK 10 – External Peer Review - CWPPRA Academic Advisory Group and the LCA Science and Technology Office

Preliminary review of this work plan and subsequent work will be organized in conjunction with the CWPRRA Academic Advisory Group (AAG) and the LCA Science and Technology Office's Science Board (See detailed scopes below). It is our initial understanding that the AAG is primarily composed of ecologists, so that we would recommend the addition of a local hydrodynamic modeler, who is currently also involved with developing a larger scale regional water and sediment model for the lower Mississippi River. The LCA S&T modelers are of national reputation from outside of Louisiana but have familiarity with Louisiana issues. It is also recommended that we conduct a "close-in review" which would convene the review group to review the workplan, and then "assign" individual reviewers to participate with particular aspect of the work that they are well-trained in as the project moves along, so that the review is concurrent with project execution, thus avoiding a long period of review at the end of the project. This methodology was employed in the IPET project and was highly successful. In addition, Peer review of final report and recommendations will be provided.

CWPPRA AAG

This review expects the reviewers to work closely with the Corps of Engineers research teams on each Task. The effort is expected to include two meetings as the task is developed, a review of the draft report and one meeting before the final report. The reviewers' responsibility is to provide constructive review.

TASK 1 - Field Data Collection & Analysis

The main objective of the proposed data collection surveys is to determine the integrated transport of water and sediments through the non-controlled diversion at West Bay and the main channel of the Mississippi River in the region of the West Bay Diversion.

Embedded reviewer assigned: Erick M. Swenson, coastal hydrologist, LSU.

TASK 2 - Large-Scale/Longer-Term Geomorphic Analysis/ Significant Engineering Activities on the Lower Mississippi River

This task documents the history of significant events that have occurred along the Mississippi River between Belle Chase, LA and the Gulf of Mexico between 1960 and present.

Embedded reviewer assigned: Erick M. Swenson, coastal hydrologist, LSU.

The overall objective of the assessment is to utilize all available data to document the historic trends and changes in hydrology, sedimentation, and channel geometry for the lower Mississippi River, to summarize the local changes observed in the Pilottown anchorage since the opening of the West Bay diversion, and to evaluate the changes at Pilottown with regard to the documented historic trends.

Embedded reviewer assigned: Erick M. Swenson, coastal hydrologist, LSU.

TASK 3 - 1D Sedimentation Modeling

One-dimensional (1D) sediment routing modeling provides the opportunity of evaluating long-term channel changes and delivery of sediments at a regional spatial scale.

Embedded reviewer assigned: Larry Rouse, coastal oceanographer, LSU.

TASK 4 - 2D/3D Modeling

Embedded reviewer assigned: NONE no appropriate reviewer available from AAG

TASK 8 – Aerial and Bathymetric Spatial Change Analysis of West Bay Receiving Area

This task evaluates the ability of the project to provide the expected ecological benefits and estimates the amount of sediments captured in the receiving area.

Embedded reviewer assigned: Charles E. Sasser, coastal ecologist, LSU.

Budget

5 Reviewer Tasks ($6000 per task)	30,000
LUMCON overhead (10%)	3,000
Total	33,000

Science Board, LCA Science and Technology Program

At the request of the Director of the LCA Science and Technology Program, the following Scope of Services has been developed for the purpose of providing constructive review of the proposed CWPPRA-funded study to Evaluate the Effects of the West Bay Sediment Diversion. Members of the Science Board will be involved in reviewing six tasks that were identified in the Draft Work Plan:

TASK 1: Field data collection and analysis to determine the integrated transport of water and sediments through the non-controlled diversion at West Bay and the main channel of the Mississippi River in the region of the West Bay Diversion.

TASK 2: Large-scale and longer-term geomorphic analysis to document the historic trends and changes in hydrology, sedimentation, and channel geometry for the lower Mississippi River that may affect the Pilottown anchorage. Documentation of significant engineering activities on the lower Mississippi River between 1960 and present, including channel improvements from dredging and construction.

TASK 3: 1D sedimentation modeling to provide evaluation of long-term channel changes and delivery of sediments at a regional spatial scale, and to provide boundary condition input for multi-dimensional modeling.

TASK 4: 2D/3D modeling to define model grids, develop boundary conditions, calibrate and verify models using existing data since 2009, and run simulation scenarios including simulation of hydrograph to determine fine sediment transport and retention in West Bay.

TASK 8: Spatial analysis of aerial and bathymetric change in the West Bay region that compares all land/water data back to 1956 using a custom survey tool to display subaqueous land contours and profile.

The Science Board review will be accomplished by working closely with project teams as they develop final plans for the observational work and the modeling. At least one trip to Vicksburg of 2-3 days' duration is anticipated early in the project and a site visit to the field site is desirable. The review will also include examination of, and comments on, the results as they are being acquired, and the interpretations and conclusions as they are being developed.

Review Team

Three members of the Science Board will participate in the review. Level of effort will vary among the participants and be determined at initiation of the project. Based on composition of the Science Board and the above Scope of Services, we anticipate the review team will include three of the following four members: Dr. Robert Dean, Professor Emeritus, Department of Civil and Coastal Engineering, University of Florida (Coastal Engineering; Hydraulics); Dr. Joseph Fernando, Director, Center for Environmental Fluid Dynamics, Arizona State University (Sediment Transport Processes; Modeling); Dr. Peter Goodwin, Professor, Center for Ecohydraulics Research, University Idaho (Hydraulic Engineering; Modeling); and, Dr. John Wells, Director of the Virginia Institute of Marine Science, College of William and Mary (Sedimentation; River Processes; Delta Morphology).

Budget

3 Reviewers from Science Board	$30,000
Travel to Vicksburg and to West Bay	$6,000
USGA Overhead for contract processing (12%)	$4,320
	$40,320

<u>Add On -</u>

<u>Review by AAG and the LCA S&T Office of the BCG 1D sedimentation modeling - $10,000</u>

How Do The Tasks Address The Issues?

Address Issues A:
Issue A: Is the diversion inducing shoaling in the Pilottown anchorage area and the Mississippi River Navigation Channel ? If so by how much? At what rate? If so, how does the induced amount/rate vary with river stage (i.e. transporting power) and sediment load on the rising, peak and falling hydrograph? If so, how does the induced shoaling amount/rate vary along the anchorage area, and with position across the river? How do observations since 2003 relate to a longer term perspective (scale of 20-50 years?)

The increased shoaling observed in the anchorage area could result from any of several causes, such as

- Sediment deposition induced by the recent flood events on the river
- Transport of existing sediment depositional loads from further upstream (i.e. "legacy" events from previous floods and/or changes to the configuration of the river
- Shoaling induced by local changes to the river configuration (i.e. West Bay diversion)

To investigate the relative contributions of each of these potential causes to the observed shoaling in the anchorage area, it is necessary to first interrogate the available data. Where does the shoaling occur? What types of sediment are present? What are the antecedent stage, flow, and sediment loading conditions? What historical conditions and/or changes to the river configuration might have resulted in the development of a slug of sediment in the river? These and other questions can be used to infer likely candidates for the sources of the sediment, which in turn can inform the process of ascertaining the cause of the deposition.

Next a multi-dimensional sediment transport model will be used to gain specific insight into the role of the West Bay division itself in causing deposition. The model can be run for various sediment loading conditions, both with and without the division included. These simulations can be used to provide qualitative insight into the expected changes in erosional and/or depositional trends in the anchorage area that result from the West Bay diversion. The model can also be used to yield quantitative insight into the expected sediment deposition in the anchorage areas as a function of observable parameters (i.e. stage, discharge, sediment load).

Address Issues B
Issues B: Is there a large space scale, longer-time scale sediment transport-morphology change event taking place in the river that is creating the observed shoaling? If so, what is attributable to the diversion and what to the background larger-scale process? What is the time and space scale of such a background process/event? How do observations since 2003 relate to a longer term perspective (scale of 20-50 years?)
The dominant morphological processes that drive the observed changes in the lower Mississippi River and delta system can operate over very large spatial and temporal scales. There are many factors, both natural and man induced, that can contribute to these processes. The effects of large floods and storms, changing sediment loads and

characteristics, channel maintenance activities, dredging practices, diversions (natural and man-made), subsidence and relative sea level rise are just a few such factors, but are not a comprehensive list. In terms of temporal scales that are typically associated with river morphology, the diversion at West Bay has been operating for a very short time period. The question must be asked to what degree the observed shoaling at the Pilottown anchorage is a result of large-scale, long-term river morphology, or a direct result of the impacts of the West Bay diversion. It is therefore important to establish the long-term morphological trends that are occurring in this reach of the river and to evaluate the observed shoaling at the Pilottown anchorage with regard to these trends. These morphological trends are determined by means of a geomorphic assessment.

A geomorphic assessment brings together all the known information about a river reach, and provides an understanding of how the river works and has responded to changes in a historical perspective. Methods and tools typically used in a geomorphic assessment can include analysis of discharge and sediment data, specific gage records, and analysis of channel geometry including form, pattern and profile. Each part of the geomorphic assessment provides additional clarity to the overall understanding of the dominant processes that have shaped and formed the system. Insight derived from this analysis can often be used to predict and assess future conditions. In addition, the geomorphic assessment can provide information of baseline conditions necessary for development, application and interpretation of numerical models.

A geomorphic assessment provides a qualitative evaluation of the factors that impact channel morphology. This type of assessment answers the "why" are changes occurring questions. However, water and sediment routing models provide a quantitative evaluation which answers the "how much" questions. A 1D sediment routing model provides for a long term simulation of sedimentation impacts. These models can simulate both with and without diversion conditions which allows for a comparison of the direct impact of a particular diversion over an extended period of time. However, utilizing a 1D model in a 3-dimensional environment does not allow for the site specific, detailed quantitative analysis available through the use of multi –dimensional analysis. While the geomorphic assessment provides the morphologic changes required as input for 1D modeling, the 1D model output provides the boundary conditions required for the more detailed multi-dimensional modeling effort.

Address Issues C

Issues C: How much sediment passes through the diversion? What are the characteristics of the flow and sediment passing through, as a function of river stage and rising/falling limb?

Previous 1D modeling of the lower Mississippi River has included various diversions. These models require the user to specify the concentration of sediment passing through the diversion. To date, no sediment load measurements have been acquired in the diversions. Therefore, the previous efforts were more sensitivity evaluations with sediment concentrations of sand ranging from 100 percent of those in the Mississippi River to no sediment being diverted through the diversions. This range results in significant differences in the quantities and location of sediment deposition downstream. The current scope of work includes acquiring sediment measurements on the Mississippi River as well as at the diversion/distributary sites. These include West Bay, Cubits Gap, Grand Pass, and Baptiste Colette Bayou. Since sediment loads vary depending on the

flow, the scope of work includes measuring the sediment over a wide range of flows. This data collection effort will provide the sediment data required in the modeling effort to allow for a more accurate simulation of long term diversion impacts.

Address Issues D

Issues D: How much sediment is retained within West Bay? What are the amounts/characteristics of sediment into West Bay compared those leaving West Bay? How does the velocity and deposition regime within West Bay change spatially (down the long axis and along the fringes)? What is the rate of accumulation within West Bay, and how does it vary spatially? How do observations since 2003 relate to a longer term perspective (scale of 20-50 years?)

This effort requires the modeling of silts and clays through the multidimensional modeling effort outlined in Task 4. Because this effort will require 6 months alone, it will only be conducted upon completion of the initial 6 month work plan effort, if deemed necessary after the field data collection, and only if the project performance in the receiving area still requires additional analysis to determine future benefits. Further development of the modeling capabilities may be required to forecast the subsequent development of the delta, or the development can be modeled in conjunction with other analytic or empirical forecasts of channel bifurcation.

Sediment retention and redistribution within West Bay can be investigated using both available data and model predictions. The available data sets can be used to ascertain information about the governing processes that have impacted the West Bay diversion so far. These include:

- Sediment loads into the Bay
- Sediment deposition within the Bay
- Sediment deposition resulting from the 2008 storm event.
- Sediment sorting within the Bay
- Wind loads and wind wave conditions within the Bay
- Subsidence within the bay, and local values of relative sea level rise (both current and anticipated)

Using these process descriptions, anticipated trends for the West Bay can be developed. These trends can be investigated in a multi-dimensional numerical model, to determine how different forcings and conditions might alter the trends in the future, and to estimate the total sediment retention in the Bay (i.e. loading minus losses to wind wave resuspension and recirculation).
All of these insights can be used together to forecast the life cycle of the West Bay diversion.

Address Issues E

Issues E: What is the current assessment of the ecological benefits of the West Bay project? How close is the area to depositing subaerial "land"? Are there benthic areas that are currently shallow that have moved into the photic zone, thus encouraging epiphytic algae production or other signs of primary productivity? Are there areas that,

though below the water surface now, can be expected to support emergent vegetation in the near future? How has the dredged material deposited in the area persisted? Is it now vegetated? Have the dredged material areas trapped more sediments and grown or have they eroded? How do these results fit within the anticipated receipt of environmental benefits used to justify the cost of the projects? Are there activities that need to take place to update the project projections?

The initial attempts to address Issue E should be coordinated with the State of Louisiana by utilizing the existing CWPRRA monitoring plan. The planned "re-surveying" of the West Bay receiving area should more forward rapidly. However, some consideration needs to be given to the seasonality of this surveying. Is it possible that sediments are being deposited into the receiving area as suggested by Kolker et al., and then resuspended during storm events and low water events? Additionally a group can be developed to evaluate whether the rate at which ecological benefits are being accrued from the project has changed enough from the original project planning to require a re-calculation of the benefits.

Path Forward

Any additional studies that do not resolve previous modeling and analysis limitations will not ultimately add further insights and will remain vulnerable to debate. The goal of this work plan is to provide a comprehensive modeling approach using all of the tools in a carefully designed way that overcomes all previous limitations. Such an approach would serve to clarify the issue of the impacts of the diversion while removing flaws in the approach that reduce its defensibility.

Time and Cost Estimate for the Work Plan (Next Page)

Work can be initiated upon receipt of funds for the total scope of work or by task. The 6-month time frame will start upon receipt of funds. The final report will be peer reviewed within 30 days of the 6-month completion date.

Task		Duration	Cost
Task 1	Field Data Collection and Analysis (addition SWPass bedload samples/analysis included)	Dependent on the stages of the river. Could be as much as 5.5 month effort.	1 Trip $127,545 3 Trips $252,148 **6 Trips $474,416** 12 Trips $918,952
Task 2	Large-scale/longer-term geomorphic analysis – Proposal 1 – Head of Passes Large-scale/longer-term geomorphic analysis – Proposal 1 – East Jetty Significant Engineering Activities on the Lower Mississippi River	3.5 month effort. Duration 5 months 4.5 month effort. Duration 5 months 1 month	$84,500 **$105,500** **$15,000**
Task 3	1D modeling - Proposal 1 (additional sea level rise analysis included)	13 week effort. Duration 5 months (coordination needed with 2D/3D modeling)	**$54,000** (plus Tony Thomas input **($5,000**) (plus Districts/Ron's input **$9,600**)
Task 4	2D/3D modeling - Proposal 1 2D/3D modeling - Proposal 2	6 month effort 12 month effort	**$80,000** $60,000
Task 5	Sediment Budget – receiving area	6 weeks – this is in addition to the 6 month effort	$25,500 plus data collection
Task 6	Sensitivity analysis (1D and 2D/3D effort)	2 months – this is in addition to the 6 month effort	$39,300
Task 7	Task Management 6 month effort – MVN, ERDC and LAOCPR 12 month effort	6 months 12 months	**$110,000** $156,000
Task 8	Aerial and Bathymetric Spatial Change Analysis of West Bay Receiving Area	3 months	-
Task 9	Current West Bay Conveyance Channel Discharge Analysis	Complete	-
Task 10	Peer Review	Ongoing	**$83,320**
Total Option 1 – Original 6 month plan With Peer Review			**$642,465**
Total Option 2 – Original 12 month plan With Peer Review			**$812,465**
Total Option 3 – Revised After Comments - 6 month plan – Add Bolded Costs in Tasks 1-10			**$936,836**
Total Option 4 – Revised After Comments – Costs for a 12 Month Plan (With 12 Data Collection Trips) – Add Underlined Costs in Tasks 1-10			**$1,,552,172**

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Soileau, C.W., Garrett, B.J., and Thibodeaux, B.J., 1989. Drought induced saltwater intrusion on the Mississippi River, *in* Magoon, O.T., et al., eds., Proceedings of the sixth symposium in coastal and ocean management: New York, *Proceedings, 6th Symposium on Coastal Zone Management, American Society of Civil Engineers*, p. 2823–2836

[i] The Corps of Engineers is authorized to operate and maintain navigable channel depths in the Mississippi River, Baton Rouge to the Gulf of Mexico through the River and Harbor Acts of 1945, Sec 2 (PL 79-14) and 1962, Sec 101; (PL 87-874); Supplemental Appropriations Act of 1985, (PL 99-88); and WRDA of 1986, Sec 201 (PL 99-662) The Pilottown anchorage area dredging is authorized through CWPPRA (PL 101-646)

APPENDIX B

ADCP Survey Transects

Table B1. ADCP transects during Trip 1a on March 10 and 11, 2009.
Table B2. ADCP transects during Trip 1b on April 23, 2009
Table B3. ADCP transects during Trip 1b on April 22 and 23, 2009
Table B4. ADCP transects during Trip 1b on April 22, 2009
Table B5. ADCP transects during Trip 1b on April 23, 2009
Table B6. ADCP transects during Trip 1c on May 5 and 6, 2009
Table B7. ADCP transects during Trip 2 on May 30, 2009
Table B8 ADCP transects during Trip 2 on May 29 and 30, 2009
Table B9 ADCP transects during Trip 3 on June 17, 2009
Table B10. ADCP transects during Trip 3 on June 16 and17, 2009

Table B1. ADCP transects during Trip 1a on March 10 and 11, 2009.

Trip 1a – Figure 7			
Date	Line Designation	Transect Number in Figure 7	ADCP File Name
3-10-2009	none	1	WBAY_001r.000
3-10-2009	none	2	WBAY_004r.000
3-10-2009	none	3	WBAY_005r.000
3-10-2009	none	4	WBAY_006r.000
3-10-2009	none	5	WBAY_007r.000
3-10-2009	none	6	WBAY_008r.000
3-10-2009	none	7	WBAY_009r.000
3-10-2009	none	8	WBAY_010r.000
3-10-2009	29	9	WBAY_011r.000
3-10-2009	39	10	WBAY_012r.000
3-11-2009	R-4.9	11	WBAY_013r.000
3-11-2009	R-4.9	12	WBAY_014r.000
3-11-2009	none	13	WBAY_015r.000
3-11-2009	none	14	WBAY_016r.000
3-11-2009	none	15	WBAY_017r.000
3-11-2009	none	16	WBAY_018r.000
3-11-2009	CGMP	17	WBAY_019r.000
3-11-2009	CGMP	18	WBAY_020r.000
3-11-2009	CGMP	19	WBAY_021r000
3-11-2009	CGOP	20	WBAY_024r.000
3-11-2009	CGOP	21	WBAY_024r.000
3-11-2009	CGOP	22	WBAY_024r.000
3-11-2009	CGBB	23	WBAY_027r.000
3-11-2009	CGBB	24	WBAY_028r.000
3-11-2009	CGBB	25	WBAY_029r.000
3-11-2009	CGRP	26	WBAY_030r.000
3-11-2009	CGRP	27	WBAY_031r.000
3-11-2009	CGRP	28	WBAY_032r.000
3-11-2009	none	29	WBAY_033r.000
3-11-2009	none	30	WBAY_034r.000
3-11-2009	none	31	WBAY_035r.000
3-11-2009	CG	32	WBAY_036r.000
3-11-2009	CG	33	WBAY_037r.000
3-11-2009	CG	34	WBAY_038r.000
3-11-2009	R-2.6	35	WBAY_039r.000
3-11-2009	R-2.6	36	WBAY_040r.000
3-11-2009	R-2.6	37	WBAY_041r.000

Table B2. ADCP transects during Trip 1b on April 23, 2009

Trip 1b – Figure 9			
Date	Line Designation	Transect Number in Figure 9	ADCP File Name
4-23-2009	none	38	WBAY_107r.000
4-23-2009	A	39	WBAY_108r.000
4-23-2009	A	40	WBAY_109r.000
4-23-2009	BCB	41	WBAY_110r.000
4-23-2009	BCB	42	WBAY_111r.000
4-23-2009	BCB	43	WBAY_112r.000
4-23-2009	C	44	WBAY_113r.000
4-23-2009	C	45	WBAY_114r.000
4-23-2009	C	46	WBAY_115r.000
4-23-2009	D	47	WBAY_116r.000
4-23-2009	D	48	WBAY_117r.000
4-23-2009	D	49	WBAY_118r.000

Table B3. ADCP transects during Trip 1b on April 22 and 23, 2009

Trip 1b – Figure 10			
Date	Line Designation	Transect Number in Figure 10	ADCP File Name
4-22-2009	WBD-MR	50	WBAY_044r.000
4-22-2009	WBD-MR	51	WBAY_045r.000
4-22-2009	R-5.2	52	WBAY_046r.000
4-22-2009	R-5.2	53	WBAY_047r.000
4-22-2009	R-4.5	54	WBAY_048r.000
4-22-2009	R-4.5	55	WBAY_049r.000
4-22-2009	40	56	WBAY_050r.000
4-22-2009	39	57	WBAY_051r.000
4-22-2009	38	58	WBAY_052r.000
4-22-2009	37	59	WBAY_053r.000
4-22-2009	36	60	WBAY_054r.000
4-22-2009	35	61	WBAY_055r.000
4-22-2009	34	62	WBAY_057r.000
4-22-2009	33	63	WBAY_058r.000
4-22-2009	32	64	WBAY_059r.000
4-22-2009	31	65	WBAY_060r.000
4-22-2009	30	66	WBAY_061r.000
4-22-2009	29	67	WBAY_062r.000
4-22-2009	28	68	WBAY_063r.000
4-22-2009	27	69	WBAY_064r.000

Table B3 continued.

Date	Line Designation	Transect Number in Figure 10	ADCP File Name
4-22-2009	26	70	WBAY_065r.000
4-22-2009	25	71	WBAY_066r.000
4-22-2009	none	72	WBAY_069r.000
4-22-2009	none	73	WBAY_070r.000
4-22-2009	25	74	WBAY_071r.000
4-22-2009	24	75	WBAY_072r.000
4-22-2009	R-5.2	76	WBAY_073r.000
4-23-2009	WBD-MR	77	WBAY_094r.000
4-23-2009	WBD-MR	78	WBAY_095r.000
4-23-2009	R-4.5	79	WBAY_096r.000
4-23-2009	WBD-MR	80	WBAY_097r.000
4-23-2009	WBD-MR	81	WBAY_098r.000
4-23-2009	R4.5	82	WBAY_099r.000
4-23-2009	R-4.5	83	WBAY_100r.000
4-23-2009	R-5.2	84	WBAY_101r.000
4-23-2009	R-5.2	85	WBAY_102r.000
4-23-2009	WBD-MR	86	WBAY_103r.000
4-23-2009	WMD-MR	87	WBAY_104r.000
4-23-2009	none	88	WBAY_105r.000
4-23-2009	none	89	WBAY_106r.000

Table B4. ADCP transects during Trip 1b on April 22, 2009

Trip 1b – Figure 11			
Date	Line Designation	Transect Number in Figure 11	ADCP File Name
4-22-2009	21	90	WBAY_074r.000
4-22-2009	20	91	WBAY_075r.000
4-22-2009	19	92	WBAY_076r.000
4-22-2009	18	93	WBAY_077r.000
4-22-2009	17	94	WBAY_078r.000
4-22-2009	16	05	WBAY_079r.000
4-22-2009	15	96	WBAY_080r.000
4-22-2009	14	97	WBAY_081r.000
4-22-2009	13	98	WBAY_082r.000
4-22-2009	12	99	WBAY_083r.000
4-22-2009	11	100	WBAY_084r.000
4-22-2009	none	101	WBAY_085r.000
4-22-2009	10	102	WBAY_086r.000
4-22-2009	9	103	WBAY_088r.000
4-22-2009	8	104	WBAY_089r.000

Table B4 continued.

Date	Line Designation	Transect Number in Figure 11	ADCP File Name
4-22-2009	7	105	WBAY_090r.000
4-22-2009	6	106	WBAY_091r.000
4-22-2009	5	107	WBAY_092r.000
4-22-2009	WBD	108	WBAY_093r.000
4-22-2009	none	109	WBAY_087r.000

Table B5. ADCP transects during Trip 1b on April 23, 2009

Trip 1b – Figure 12			
Date	Line Designation	Transect Number in Figure 12	ADCP File Name
4-23-2009	R-6.5-LB	110	WBAY_119r.000
4-23-2009	R-6.5-LB	111	WBAY_121r.000
4-23-2009	R-6.5-LB	112	WBAY_123r.000
4-23-2009	R-6.4-RB	113	WBAY_124r.000
4-23-2009	R-6.4-RB	114	WBAY_125r.000
4-23-2009	R-6.4-RB	115	WBAY_126r.000
4-23-2009	R-6.4-RB	116	WBAY_127r.000
4-23-2009	8	117	WBAY_128r.000
4-23-2009	8	118	WBAY_130r.000
4-23-2009	8	119	WBAY_131r.000
4-23-2009	28	120	WBAY_132r.000
4-23-2009	R-4.9	121	WBAY_133r.000
4-23-2009	R-4.9	122	WBAY_134r.000
4-23-2009	28	123	WBAY_135r.000
4-23-2009	28	124	WBAY_136r.000
4-23-2009	R-5.2	125	WBAY_137r.000
4-23-2009	R-4.5	126	WBAY_139r.000
4-23-2009	R-4.5	127	WBAY_140r.000
4-23-2009	R-4.5	128	WBAY_141r.000
4-23-2009	R-3.5-RB	129	WBAY_142r.000
4-23-2009	R-3.5-RB	130	WBAY_143r.000
4-23-2009	R-3.5-RB	131	WBAY_144r.000
4-23-2009	R-2.8-RB	132	WBAY_145r.000
4-23-2009	R-2.8-RB	133	WBAY_146r.000
4-23-2009	R-2.8-RB	134	WBAY_147r.000
4-23-2009	R-2.8-RB	135	WBAY_148r.000
4-23-2009	R-2.6	136	WBAY_149r.000
4-23-2009	R-2.6	137	WBAY_150r.000
4-23-2009	R-2.6	138	WBAY_151r.000
4-23-2009	R-2.6	139	WBAY_152r.000

Table B5 continued.

Date	Line Designation	Transect Number in Figure 12	ADCP File Name
4-23-2009	CG-27	140	WBAY_153r.000
4-23-2009	CG-27	141	WBAY_154r.000
4-23-2009	CG-27	142	WBAY_155r.000
4-23-2009	CG-19	143	WBAY_156r.000
4-23-2009	CG-20	144	WBAY_157r.000
4-23-2009	CG-21	145	WBAY_158r.000
4-23-2009	CG-22	146	WBAY_159r.000
4-23-2009	CG-23	147	WBAY_160r.000
4-23-2009	CG-24	148	WBAY_161r.000
4-23-2009	CG-25	149	WBAY_162r.000
4-23-2009	CG-26	150	WBAY_163r.000

Table B6. ADCP transects during Trip 1c on May 5 and 6, 2009

Trip 1c – Figure 13			
Date	Line Designation	Transect Number in Figure 13	ADCP File Name
5-6-2009	R-5.2	151	WBAY_185r.000
5-6-2009	R-5.2	152	WBAY_186r.000
5-6-2009	R-5.2	153	WBAY_193r.000
5-6-2009	R-5.2	154	WBAY_194r.000
5-5-2009	WBD-MR	155	WBAY_178r.000
5-5-2009	WBD-MR	156	WBAY_179r.000
5-5-2009	WBD-MR	157	WBAY_183r.000
5-5-2009	WBD-MR	158	WBAY_184r.000
5-6-2009	WBD-MR	159	WBAY_195r.000
5-6-2009	WBD-MR	160	WBAY_196r.000
5-6-2009	WBD-MR	161	WBAY_200r.000
5-6-2009	WBD-MR	162	WBAY_201r.000
5-5-2009	R-4.5	163	WBAY_166r.000
5-5-2009	R-4.5	164	WBAY_167r.000
5-5-2009	R-4.5	165	WBAY_176r.000
5-5-2009	R-4.5	166	WBAY_177r.000

Table B7. ADCP transects during Trip 2 on May 30, 2009

Trip 2 – Figure 14			
Date	Line Designation	Transect Number in Figure 14	ADCP File Name
5-30-2009	R-12.1	167	WBAY_073r.000
5-30-2009	R-12.1	168	WBAY_074r.000
5-30-2009	BCB	169	WBAY_070r.000
5-30-2009	BCB	170	WBAY_071r.000
5-30-2009	GG	171	WBAY_067r.000
5-30-2009	GG	172	WBAY_068r.000
5-30-2009	R-9.5	173	WBAY_065r.000
5-30-2009	R-9.5	174	WBAY_066r.000

Table B8 ADCP transects during Trip 2 on May 29 and 30, 2009

Trip 2 – Figure 15			
Date	Line Designation	Transect Number in Figure 15	ADCP File Name
5-29-2009	R-4.5	175	WBAY_010r.000
5-29-2009	R-4.5	176	WBAY_011r.000
5-29-2009	WBD-MR	177	WBAY_019r.000
5-29-2009	WBD-MR	178	WBAY_020r.000
5-29-2009	R-5.2	179	WBAY_024r.000
5-29-2009	R-5.2	180	WBAY_025r.000
5-30-2009	R-2.6	181	WBAY_033r.000
5-30-2009	R-2.6	182	WBAY_034r.000
5-30-2009	R-2.8-RB	183	WBAY_035r.000
5-30-2009	R-2.8-RB	184	WBAY_036r.000
5-30-2009	R-3.5-RB	185	WBAY_037r.000
5-30-2009	R-3.5-RB	186	WBAY_038r.000
5-30-2009	CGRP	187	WBAY_039r.000
5-30-2009	CGRP	188	WBAY_040r.000
5-30-2009	CGBB	189	WBAY_042r.000
5-30-2009	CGBB	190	WBAY_043r.000
5-30-2009	CGOP	191	WBAY_045r.000
5-30-2009	CGOP	192	WBAY_046r.000
5-30-2009	CGMP	193	WBAY_048r.000
5-30-2009	CGMP	194	WBAY_049r.000
5-30-2009	R-4.5	195	WBAY_051r.000
5-30-2009	R-4.5	196	WBAY_052r.000
5-30-2009	9	197	WBAY_053r.000
5-30-2009	9	198	WBAY_054r.000
5-30-2009	R-4.9	199	WBAY_056r.000

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Table B8 continued.

Trip 2 – Figure 15			
Date	Line Designation	Transect Number in Figure 15	ADCP File Name
5-30-2009	R-4.9	200	WBAY_057r.000
5-30-2009	R-5.2	201	WBAY_059r.000
5-30-2009	R-5.2	202	WBAY_060r.000
5-30-2009	R-6.5-LB	203	WBAY_061r.000
5-30-2009	R-6.5-LB	204	WBAY_062r.000
5-30-2009	R-6.4-RB	205	WBAY_063r.000
5-30-2009	R-6.4-RB	206	WBAY_064r.000

Table B9 ADCP transects during Trip 3 on June 17, 2009

Trip 3 – Figure 16			
Date	Line Designation	Transect Number in Figure 16	ADCP File Name
6-17-2009	R-12.1	207	WBAY-061709036r.000
6-17-2009	R-12.1	208	WBAY-061709037r.000
6-17-2009	BCB	209	WBAY-061709033r.000
6-17-2009	BCB	210	WBAY-061709034r.000
6-17-2009	GG	211	WBAY-061709029r.000
6-17-2009	GG	212	WBAY-061709030r.000
6-17-2009	R-9.5	213	WBAY-061709026r.000
6-17-2009	R-9.5	214	WBAY-061709027r.000

Table B10. ADCP transects during Trip 3 on June 16 and17, 2009

Trip 3 – Figure 17			
Date	Line Designation	Transect Number in Figure 17	ADCP File Name
6-17-2009	R-6.5-LB	215	WBAY-061709024r.000
6-17-2009	R-6.5-LB	216	WBAY-061709025r.000
6-17-2009	R-6.4-RB	217	WBAY-061709022r.000
6-17-2009	R-6.4-RB	218	WBAY-061709023r.000
6-16-2009	R-5.2	219	WBAY-061609021r.000
6-16-2009	R-5.2	220	WBAY-061609022r.000
6-17-2009	8	221	WBAY-061709016r.000
6-17-2009	8	222	WBAY-061709018r.000
6-16-2009	6	223	WBAY-061609012r.000
6-16-2009	6	224	WBAY-061609014r.000
6-16-2009	6	225	WBAY-061609018r.000
6-16-2009	6	226	WBAY-061609019r.000

Table B10 continued.

Trip 2 – Figure 17			
Date	Line Designation	Transect Number in Figure 17	ADCP File Name
6-16-2009	R-4.5	227	WBAY-061609005r.000
6-16-2009	R-4.5	228	WBAY-061609006r.000
6-17-2009	R-3.5-RB	229	WBAY-061709013r.000
6-17-2009	R-3.5-RB	230	WBAY-061709015r.000
6-17-2009	CGMP	231	WBAY-061709010r.000
6-17-2009	CGMP	232	WBAY-061709011r.000
6-17-2009	CGOP	233	WBAY-061709007r.000
6-17-2009	CGOP	234	WBAY-061709008r.000
6-17-2009	CGBB	235	WBAY-061709004r.000
6-17-2009	CGBB	236	WBAY-061709005r.000
6-17-2009	CGRP	237	WBAY-061709001r.000
6-17-2009	CGRP	238	WBAY-061709002r.000
6-17-2009	R-2.6	239	WBAY-061709000r.000
6-17-2009	R-2.6	240	WBAY-000r.000

Appendix C

OBS and Salinity Measurements

R4.5-A – 29.20888° N, 89.28672° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
15:58	1.10	53403.8	22.60	0.11
15:50	3.24	53263.8	22.65	0.17
15:52	3.38	53299.1	22.63	0.17
15:53	8.20	53324.4	22.62	0.17
15:55	8.12	53353.6	22.62	0.17
15:57	13.00	53376.0	22.62	0.17
15:58	13.23	53389.9	22.61	0.17
16:00	18.18	53408.1	22.61	0.17
16:02	18.18	53420.3	22.61	0.17

R4.5-B – 29.20992° N, 89.28452° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
16:25	1.11	53462.0	22.14	0.05
16:22	7.44	53427.9	22.63	0.17
16:24	7.52	53437.8	22.63	0.17
16:25	16.93	53447.1	22.60	0.17
16:27	17.05	53455.7	22.60	0.17
17:07	17.18	53384.0	22.61	0.17
17:09	16.81	53409.2	22.62	0.17
17:10	27.16	53423.2	22.61	0.17
1712	26.49	53436.1	22.62	0.17
17:14	36.09	53445.6	22.62	0.17
17:15	36.66	53456.6	22.61	0.18
17:17	36.66	53465.4	22.61	0.18

R4.5-C – 29.21107° N, 89.28220° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)

17:34	0.65	53504.9	21.52	0.04
17:29	9.66	53461.5	22.64	0.17
17:31	19.22	53476.1	22.63	0.17
17:32	20.89	53478.2	22.64	0.17
17:34	21.19	53484.0	22.64	0.17
17:35	32.64	53490.0	22.63	0.17
17:37	33.11	53493.0	22.63	0.17
17:39	43.98	53497.6	22.63	0.17
17:41	44.38	53501.9	22.63	0.17

R4.5-D – 29.21208^{o} N, 89.28028^{o} W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (^{o}C)	Salinity (PSU)
17:51	0.92	53514.7	21.91	0.06
17:47	10.10	53491.9	22.68	0.17
17:49	10.10	53496.7	22.68	0.17
17:50	22.22	53500.1	22.66	0.17
17:52	22.45	53505.0	22.66	0.17
18:01	34.32	53497.2	22.67	0.17
18:03	34.31	53505.0	22.66	0.18
18:05	46.20	53510.1	22.68	0.17
18:07	46.33	53514.7	22.66	0.17

R4.5-E – 29.21305^{o} N, 89.27835^{o} W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (^{o}C)	Salinity (PSU)
18:16	0.43	53516.2	22.01	0.05
18:15	5.31	53495.3	22.77	0.17
18:17	5.67	53501.8	22.82	0.17
18:19	5.65	53507.7	22.80	0.17
18:21	13.08	53509.9	22.81	0.17
18:23	13:06	53513.5	22.83	0.17
18:24	20.06	53514.4	22.79	0.18
18:26	20.42	53516.4	22.79	0.17
18:28	20.37	53516.7	22.79	0.18
18:30	27.76	53513.0	22.79	0.17
18:32	28.06	53513.3	22.78	0.18

WBD-A – 29.21207° N, 89.29088° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
19:06	0.94	53455.4	22.12	0.04
19:02	5.37	53392.3	22.81	0.17
19:04	5.38	53413.6	22.83	0.17
19:05	13.01	53430.7	22.81	0.17
19:07	13.16	53443.2	22.80	0.16
19:13	13.17	53431.0	22.79	0.17
19:14	20.03	53441.8	22.78	0.17
19:16	20.12	53455.1	22.78	0.17
19:18	27.74	53464.0	22.78	0.18
19:19	27.43	53471.7	22.79	0.17

WBD-B – 29.21168° N, 89.29070° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
19:25	0.67	53469.0	21.64	0.05
19:26	7.96	53449.4	22.82	0.18
19:28	8.28	53457.5	22.79	0.18
19:29	17.38	53469.0	22.77	0.17
19:31	17.14	53479.4	22.77	0.18
19:33	17.62	53483.7	22.76	0.17
19:34	27.05	53490.8	22.73	0.17
19:36	27.17	53495.9	22.76	0.17
19:38	37.11	53496.3	22.74	0.18
19:40	37.02	53498.0	22.74	0.17

WBD-C – 29.21128° N, 89.29050° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)

19:47	1.29	53492.5	21.80	0.08
19:48	5.38	53470.3	22.77	0.17
19:50	5.40	53489.9	22.76	0.17
19:52	12.69	53491.6	22.75	0.17
19:53	12.74	53491.6	22.74	0.17
19:55	20.13	53491.5	22.75	0.18
19:56	20.15	53493.9	22.75	0.17
19:58	27.34	53493.2	22.74	0.17
20:00	27.30	53495.1	22.75	0.17
20:02	27.34	53498.2	22.74	0.17

R5.2-A – 29.21658^{o} N, 89.29120^{o} W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (^{o}C)	Salinity (PSU)
20:49	0.73	53484.4	22.76	0.10
20:42	5.48	53429.8	22.77	0.17
20:44	5.51	53446.6	22.77	0.18
20:45	5.50	53458.0	22.79	0.18
20:47	12.73	53462.3	22.79	0.18
20:49	12.69	53470.2	22.78	0.18
20:50	20.20	53473.1	22.77	0.18
20:52	20.23	53475.8	22.76	0.18
20:54	27.50	53486.4	22.75	0.17
20:55	27.45	53492.3	22.75	0.18

R5.2-B – 29.21755^{o} N, 89.28930^{o} W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (^{o}C)	Salinity (PSU)
21:07	1.35	53449.7	22.79	0.17
21:06	9.35	53439.2	22.74	0.17
21:07	9.39	53441.3	22.75	0.17
21:08	20.73	53458.2	22.74	0.17
21:10	20.79	53470.3	22.74	0.17
21:11	32.24	53482.6	22.73	0.17
21:13	32.65	53487.6	22.74	0.18
21:15	43.57	53494.6	22.73	0.17
21:16	42.08	53495.3	22.72	0.17

R5.2-C – 29.21855° N, 89.28733° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
21:22	0.68	53465.0	22.80	0.18
21:26	18.98	53447.1	22.74	0.18
21:27	9.31	53449.1	22.76	0.17
21:29	20.40	53452.2	22.73	0.18
21:30	20.00	53460.8	22.75	0.18
21:31	32.35	53475.4	22.73	0.17
21:33	30.67	53477.3	22.74	0.17
21:24	42.84	53479.8	22.72	0.18
21:36	43.08	53481.7	22.72	0.18

R5.2-D – 29.21950° N, 89.28532° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
21:43	1.18	53498.3	22.14	0.09
21:42	9.83	53469.8	22.76	0.17
21:44	10.06	53478.2	22.77	0.18
21:45	21.90	53480.4	22.75	0.17
21:47	22.01	53483.8	22.75	0.18
21:48	33.75	53497.0	22.76	0.17
21:50	33.83	53498.3	22.75	0.18
21:51	33.73	53504.6	22.75	0.18
21:53	34.49	53509.3	22.75	0.17
21:54	46.03	53512.4	22.74	0.17
21:56	45.89	53514.2	22.75	0.18
21:58	45.06	53516.8	22.75	0.17

R5.2-E – 29.22048° N, 89.28348° W – 5/29/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)

22:08	0.74	53517.1	21.96	0.09
22:05	5.72	53491.0	22.84	0.17
22:07	5.29	53504.3	22.84	0.17
22:09	12.44	53506.8	22.84	0.17
21:10	13.05	53511.0	22.82	0.17
22:12	13.09	53512.6	22.83	0.18
22:14	20.43	53518.6	22.83	0.17
22:17	20.15	53519.4	22.83	0.17
22:19	27.69	53520.6	22.82	0.15
22:21	27.66	53523.1	22.82	0.17

CGRP – 29.19032^o N, 89.25528^o W - 5/30/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (^{o}C)	Salinity (PSU)
15:35	0.44	53330.4	22.60	0.10
15:34	7.01	53301.0	22.96	0.17
15:35	6.73	53331.4	22.93	0.17
15:37	15.71	53356.8	22.92	0.17
15:39	15.82	53380.5	22.93	0.17

CGBB – 29.19352^o N, 89.25445^o W - 5/30/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (^{o}C)	Salinity (PSU)
16:00	1.21	53368.4	22.95	0.11
16:00	6.75	53340.7	22.94	0.18
16:02	6.74	53368.6	22.94	0.18
16:04	6.65	53382.0	22.95	0.17
16:05	6.84	53396.7	22.97	0.18
16:07	15.62	53413.3	22.94	0.17
16:08	15:75	53425.0	22.94	0.17

CGOP – 29.20005^o N, 89.25468^o W – 5/30/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (^{o}C)	Salinity (PSU)

16:30	1.02	53369.4	22.22	0.07
16:30	5.38	53325.7	23.01	0.17
16:31	5.23	53345.3	23.00	0.17
16:32	12.53	53369.6	22.98	0.17
16:33	12.75	53389.1	22.98	0.17

CGMP – 29.20313° N, 89.25855° W – 5/30/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
17:00	0.62	53450.2	22.14	0.07
16:59	6.83	53423.9	22.99	0.17
17:00	6.91	53438.4	22.99	0.17
17:02	15.50	53449.7	22.98	0.18
17:03	15.66	53458.1	22.99	0.17

R4.9– 29.21810° N, 89.27822° W – 5/30/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
18:53	0.67	53277.6	22.73	0.06
18:51	3.47	53200.8	23.22	0.18
18:52	3.64	53225.7	23.24	0.17
18:53	7.65	53254.5	23.23	0.17
18:54	7.77	53277.0	23.26	0.18

GP – 29.26660° N, 89.35117° W – 5/30/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
21:06	0.83	53311.5	22.69	0.08
21:01	11.55	53195.7	23.09	0.17
21:03	11.79	53234.5	23.09	0.17
21:04	25.18	53263.6	23.09	0.18
21:06	25.47	53296.0	23.10	0.17
21:09	3.23	53359.2	23.10	0.17

BCB – 29.29130° N, 89.34967° W – 5/30/2009				
Time (GTM)	Depth (ft)	OBS-2 (ppm)	Temperature (°C)	Salinity (PSU)
21:31	1.07	53291.4	22.44	0.09
21:32	18.05	53309.5	23.05	0.17

21:33	18.54	53332.6	23.04	0.17
21:35	38.92	53369.7	23.03	0.17
21:39	38.45	53403.0	23.04	0.17

R-2.6 – 29.1875° N, 89.2667° W- July 21, 2009			
Time (GTM)	Depth (ft)	Temperature (°C)	Salinity (PSU)
22:31	2.01	28.96	0.22
22:34	24.21	28.52	1.88
22:35	47.91	23.78	29.12

R-5.2 – 29.2192° N, 89.2857° W- July 21, 2009			
Time (GTM)	Depth (ft)	Temperature (°C)	Salinity (PSU)
22:47	1.49	28.82	0.25
22:48	24:42	28.80	0.49
22:49	46.74	23.73	28.71

R-12.1 – 29.2946° N, 89.3627° W- July 22, 2009			
Time (GTM)	Depth (ft)	Temperature (°C)	Salinity (PSU)
23:09	2.01	28.96	0.22
23:10	29.85	28.68	0.24
23:11	59.94	28.69	0.25

R4.5-A- 29.20888° N, 89.28672° W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
13:44	2.88	21.6	27.59	0.89
13:46	8.05	21.3	27.54	0.93
13:48	13.16	21.3	27.49	1.08
13:50	18.11	21.9	27.46	7.82

R4.5-B- 29.20992° N, 89.28452^0 W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
14.06	2.82	24.7	27.57	1.22
14:06	6.35	24.7	27.53	6.35
14:13	9.46	21.1	27.50	4.08

14:06	12.09	23.0	27.48	5.22
14:07	18.09	20.3	27.52	7.82
14:08	20.02	20.2	27.53	8.65
14:09	28.13	18.9	27.57	12.16
14:11	36.38	19.5	27.57	15.73

R4.5-C- 29.21107^{o} N, 89.28220^{o} W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
14:19	1.69	22.0	27.45	0.73
14:19	8.06	22.2	27.45	3.48
14:20	10.47	22.4	27.42	4.52
14:21	14.20	22.6	27.42	6.13
14:21	22.09	20.9	27.47	9.54
14:23	34.23	16.8	27.54	14.81
14:25	42.77	10.6	27.97	18.72

R4.5-D- 29.21208^{o} N, 89.28028^{o} W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
14:36	4.60	23.4	27.62	1.98
14:37	10.70	23.9	27.62	4.62
14:38	17.52	23.9	27.62	7.56
14:39	23.29	23.4	27.63	10.06
14:40	35.57	15.4	27.76	15.40
14:41	42.61	8.4	28.17	18.66

R4.5-E- 29.21305^{o} N, 89.27835^{o} W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)

14:46	1.51	24.4	27.62	0.65
14:47	5.98	24.9	27.60	2.58
14:49	13.26	26.5	27.59	5.72
14:50	20.81	26.7	27.59	8.98
14:51	28.11	16.9	27.70	12.17

R5.2-E- 29.22048° N, 89.28348° W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
16:11	5.20	27.9	28.79	2.24
16:13	8.39	27.6	28.51	3.62
16:14	13.06	28.3	28.41	5.63
16:15	16.99	28.5	28.32	7.33
16:16	20.46	29.2	28.22	8.83
16:17	27.91	29.3	28.19	12.08

R5.2-D- 29.21950° N, 89.28532° W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
16:22	6.37	23.0	27.96	2.75
16:22	10.55	24.5	27.83	4.55
16:23	16.16	24.9	27.76	6.97
16:24	22.88	25.1	27.75	9.89
16:26	35.48	18.0	27.81	15.38
16:27	47.02	38.2	28.17	20.62

R5.2-A- 29.21658° N, 89.29120° W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
16:37	5.37	23.4	27.80	5.37
16:38	7.26	23.6	27.76	3.13
16:39	13.25	22.5	27.69	5.72
16:39	16.05	22.2	27.66	6.93
16:40	20.37	22.4	27.65	8.80

16:41	27.67	23.8	27.68	11.98

R5.2-B- 29.21755° N, 89.28930° W – September 23, 2009

Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
16:48	5.23	22.9	27.66	2.26
16:49	10.30	23.4	27.54	4.44
16:51	21.97	23.1	27.54	9.49
16:52	33.44	16.4	27.67	14.89
16:54	39.52	12.8	27.78	17.16

R5.2-C- 29.21855° N, 89.28733° W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
16:59	3.21	22.9	27.61	3.21
17:00	10.65	23.4	27.53	4.60
17:01	17.10	23.5	27.52	7.38
17:02	21.80	23.5	27.51	9.41
17:04	33.63	15.8	27.64	14.57
17:04	40.31	15.1	27.65	17.47
17:06	44.08	17.2	28.02	19.28

WBD-A- 29.21207° N, 89.29088° W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
17:23	5.65	24.7	28.05	2.44
17:25	13.25	25.3	28.00	5.72
17:26	20.52	24.8	27.96	8.85
17:27	27.83	24.1	27.89	12.01

WBD-B- 29.21168° N, 89.29070° W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)

17:34	2.44	24.6	27.88	1.06
17:34	10.70	25.9	27.81	4.62
17:35	20.33	24.9	27.77	8.78
17:37	23.44	25.2	27.75	10.12
17:37	28.16	25.0	27.73	12.17
17:38	35.67	24.9	27.71	15.42
17:39	39.94	24.2	27.66	17.26
17:40	43.26	24.3	27.65	18.70

R4.9- 29.21810^{o} N, 89.27822^{o} W – September 23, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
17:57	3.95	25.3	28.50	1.70
17:59	8.01	26.1	28.34	3.46

CGMP- 29.20313^{o} N, 89.25855^{o} W – September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
14:01	1.39	21.7	28.83	1.39
14:01	6.14	21.1	28.74	1.93
14:02	4.72	21.0	28.61	2.15
14:03	15.44	20.7	28.52	2.41

CGOP- 29.20313^{o} N, 89.25855^{o} W – September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
14:14	4.94	21.6	27.99	1.51
14:15	12.80	23.2	27.90	1.55

CGBB- 29.19352^{o} N, 89.25445^{o} W - September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)

14:31	4.24	22.8	27.80	1.25
14:32	6.68	22.8	27.79	1.25
14:33	10.65	23.0	27.77	1.26
14:33	15:78	22.8	27.75	1.28

CGRP- 29.19032° N, 89.25528° W - September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
14:42	3.81	22.7	27.75	1.12
14:42	2.88	23.1	27.71	1.14
14:43	15.95	24.1	27.68	1.14

BCB- 29.29130° N, 89.34967° W – September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
15:49	2.44	27.0	28.27	0.90
15:49	8.49	27.2	28.25	1.00
15:50	18.49	26.9	28.18	1.28
15:51	21.83	26.6	28.08	1.27
15:51	28.85	26.6	28.07	1.37
15:52	35.54	22.7	27.97	2.26
15:52	39.97	22.5	28.04	2.71

GP - 29.26660° N, 89.35117° W – September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
16:17	0.56	26.7	27.93	0.46
16:17	8.79	26.7	27.93	0.45
16:18	11.62	26.4	27.86	1.20
16:19	22.65	25.7	27.81	2.56
16:20	26.09	27.6	27.79	2.82

R-2.6- 29.1875° N, 89.2667° W- September 24, 2009				
Time	Depth	OBS-2	Temperature	Salinity

(GTM)	(ft)	(NTU)	(°C)	(PSU)
17:23	9.51	24.4	28.28	0.92
17:24	22.57	26.0	28.10	1.35
17:24	35.55	26.1	28.07	2.99
17:25	47.10	15.2	28.70	23.93

R-3.5- 29.1985° N, 89.2747° W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
17:32	2.19	24.0	28.09	0.50
17:32	17.15	22.9	28.26	1.24
17:31	22.46	25.6	27.86	1.58
17:31	29.07	25.3	27.84	2.72
17:32	46.79	31.1	28.46	23.04

R-4.5- 29.21107° N, 89.28220° W – September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
17:40	3.62	24.5	27.78	0.48
17:40	11.67	25.1	27.75	0.80
17:41	19.45	18.1	28.12	1.63
17:40	22.42	24.9	27.73	2.02
17:41	34.66	17.3	28.30	4.77
17:41	44.99	16.7	28.13	21.23

R-5.2- 29.21855° N, 89.28733° W – September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)
17:47	3.13	26.7	27.91	0.66
17:47	18.66	26.7	28.07	0.82
17:46	22.56	27.4	27.64	0.87
17:46	25.51	27.2	27.64	1.49
17:47	33.79	28.2	28.26	5.49
17:46	46.33	33.3	28.06	22.68

R-6.2- 29.2324° N, 89.2980° W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (°C)	Salinity (PSU)

17:54	6.76	20.3	27.64	0.46
17:53	8.64	25.3	27.58	0.50
17:53	19:35	26.3	27.55	0.75
17:53	22.27	29.1	27.50	0.85
17:53	32.05	28.3	27.50	6.56
17:54	37.92	14.1	27.74	7.77
17:54	45.88	17.2	27.68	8.64

R-7.2- 29.2440^{o} N, 89.3095^{o} W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
18:00	3.58	25.8	27.52	0.42
18:01	8.77	23.2	27.66	0.45
18:00	13.24	26.1	27.50	0.49
18:00	22.72	27.7	27.44	0.70
18:01	35.55	33.3	27.42	5.57
18:01	39.88	14.5	27.89	9.50
18:01	47.19	17.3	27.78	18.49

R8.2- 29.2530^{o} N, 89.3193^{o} W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
18:07	4.96	26.0	27.46	0.42
18:09	7.16	25.8	27.55	0.42
18:07	13.76	26.3	27.45	0.44
18:07	20.63	26.6	27.44	0.45
18:07	22.55	27.4	27.44	0.43
18:09	26.17	22.5	27.76	0.47
18:09	29.07	22.5	27.76	0.63
18:08	31.76	27.5	27.44	0.52
18:08	40.35	27.4	27.44	1.55
18:09	42.78	17.7	28.04	14.65
18:08	51.42	19.8	27.95	21.70

R-9.5- 29.669^{o} N, 89.3367^{o} W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
18:18	4.31	26.7	27.67	0.38
18:20	13.99	25.3	27.73	0.38

18:18	15.13	27.2	27.65	0.39
18:18	22.73	29.2	27.58	0.50
18:20	29.01	23.4	27.82	0.50
18:19	31.22	29.6	27.58	0.50
18:19	46.24	29.6	27.58	1.02
18:19	48.47	23.2	27.76	8.85

R-10.5- 29.2809^{o} N, 89.3508^{o} W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
18:26	0.94	29.4	27.57	0.33
18:24	2.61	28.1	27.63	0.32
18:25	12.38	28.8	27.63	0.36
18:25	16.29	29.1	27.57	0.39
18:25	22.66	29.9	27.59	0.41
18:26	32.25	28.6	27.57	0.69
18:26	47.05	29.8	27.58	3.17
18:26	52.09	29.7	27.58	4.39

R-11.2- 29.2873^{o} N, 89.3552^{o} W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)
18:31	0.72	25.8	27.63	0.24
18:32	11.09	26.7	27.62	0.32
18:32	22.72	36.5	27.49	0.34
18:32	29.14	37.1	27.50	0.45
18:32	41.65	38.8	27.49	0.62
18:33	52.04	36.6	27.52	4.38

R-12.1- 29.2952^{o} N, 89.3629^{o} W- September 24, 2009				
Time (GTM)	Depth (ft)	OBS-2 (NTU)	Temperature (^{o}C)	Salinity (PSU)

18:37	1.32	25.6	27.60	0.24
18:39	12.37	39.8	27.47	0.34
18:37	14.97	27.2	27.59	0.33
18:37	22.98	36.3	27.46	0.37
18:39	28.74	38.4	27.47	0.39
18:38	37.98	40.4	27.45	0.41
18:39	44.72	34.6	27.48	0.68
18:38	52.12	34.9	27.47	2.56

Appendix D

Bed Material Sample Locations and D50 Values

Table D1. March 10-12, 2009.
Table D2. July 23, 2009.
Table D3. September 23, 2009.

Table D1. March 10-12, 2009.

Sample site number	Type	Latitude °N	Longitude °W	D50 10^{-6}m
1	Drag	29.36224	89.45258	201.6
2	Drag	29.36462	89.45344	35.3
3	Drag	29.33152	89.39416	194.1
4	Drag	29.33309	89.39225	6.1
5	Drag	29.28005	89.35243	178.5
6	Drag	29.28195	89.34960	208.8
7	Drag	29.26989	89.34275	193.7
8	Drag	29.27230	89.33975	58.5
9	Drag	29.26176	89.33284	183.0
10	Drag	29.26393	89.33081	250.5
11	Drag	29.25262	89.32132	10.5
12	Drag	29.25460	89.31854	164.2
13	Drag	29.24315	89.31103	7.4
14	Drag	29.24491	89.30836	37.2
15	Drag	29.23353	89.30281	7.2
16	Drag	29.23592	89.29894	185.1
17	Drag	29.22179	89.29296	15.2
18	Drag	29.22408	89.28861	184.4
19	Drag	29.20525	89.28163	213.3
20	Drag	29.20692	89.27813	175.9
21	Drag	29.19337	89.27475	179.7
22	Drag	29.19526	89.26945	48.4
23	Drag	29.18498	89.27013	175.5
24	Drag	29.19201	89.26708	31.5
25	Drag	29.17983	89.26696	169.6
26	Drag	29.18670	89.26419	19.8
27	Drag	29.17575	89.26423	138.8
28	Drag	29.18198	89.26232	14.7

Table D1 continued.

29	Drag	29.17119	89.26207	148.8
30	Drag	29.17792	89.26043	12.3
31	Drag	29.17278	89.25847	9.2
32	Push core	29.19318	89.25749	120.3
33	Push core	29.19679	89.24137	25.87
34	Push core	29.20374	89.25915	21.1
35	Push core	29.21888	89.25349	33.0
36	Push core	29.23447	89.24538	27.5
37	Push core	29.21214	89.29493	49.0
38	Push core	29.21133	89.29499	
39	Push core	29.20413	89.29559	152.8
40	Push core	29.19602	89.29654	153.6
41	Push core	29.18572	89.29287	27.3
42	Push core	29.17686	89.28739	11.9
43	Push core	29.17022	89.28063	176.8
44	Push core	29.17171	89.30215	15.0
45	Push core	29.18109	89.30606	24.5
46	Push core	29.19266	89.30637	21.3
47	Push core	29.20313	89.30595	150.2
48	Push core	29.20908	89.30244	8.5
49	Push core	29.21667	89.30147	
50	Push core	29.21532	89.30677	
51	Push core	29.17375	89.31908	17.3
52	Push core	29.18720	89.32237	18.0
53	Push core	29.20090	89.31993	12.0
54	Push core	29.21187	89.31653	40.9
55	Push core	29.21794	89.31749	18.8
56	Push core	29.22400	89.32315	40.4
57	Push core	29.20057	89.25176	24.7
996	Push core	29.21283	89.29812	24.5
997	Push core	29.20700	89.29561	12.0
998	Push core	29.21189	89.29997	48.3
999	Push core	29.20935	89.29871	44.8
58	Drag	29.16739	89.25701	152.9

Table D1 continued.

59	Drag	29.13794	89.25696	8.6
60	Drag	29.11110	89.26922	179.1
61	Drag	29.08515	89.28369	182.5
62	Drag	29.06283	89.30719	woody debris
63	Drag	29.03783	89.32471	woody debris
64	Drag	29.01454	89.34453	woody debris
65	Drag	28.99111	89.36416	woody debris
66	Drag	28.96730	89.38402	131.2
67	Drag	28.94245	89.40312	woody debris
68	Drag	28.91897	89.41983	48.0
69	Drag	28.90579	89.43147	42.7
70	Drag	29.12196	89.26121	5.6
71	Drag	29.07820	89.29226	10.0
72	Drag	29.02693	89.33222	11.3
73	Drag	28.95541	89.39098	49.9
74	Drag	28.91495	89.42609	16.4

Table D2. July 23, 2009.

Sample site number	Type	Latitude ^{o}N	Longitude ^{o}W	D50 10^{-6}m
CGMP	Drag	29.20313	89.25855	14.3
CGOP	Drag	29.20005	89.25468	11.6
CGRP	Drag	29.19032	89.25528	6.0
CGBB	Drag	29.19352	89.25445	175.6
5	Drag	29.28005	89.35243	122.4
6	Drag	29.28195	89.34960	213.8
7	Drag	29.26989	89.34275	140.7
8	Drag	29.27230	89.33975	237.6
9	Drag	29.26176	89.33284	7.7
10	Drag	29.26393	89.33081	230.9
11	Drag	29.25262	89.32132	8.0
12	Drag	29.25460	89.31854	8.9
13	Drag	29.24315	89.31103	9.0
14	Drag	29.24491	89.30836	9.7

Table D2 continued.

15	Drag	29.23353	89.30281	174.6
16	Drag	29.23592	89.29894	128.0
17	Drag	29.22179	89.29296	18.3
18	Drag	29.22408	89.28861	14.9
19	Drag	29.20525	89.28163	196.4
20	Drag	29.20692	89.27813	12.9
21	Drag	29.19337	89.27475	169.2
22	Drag	29.19526	89.26945	11.4
23	Drag	29.18498	89.27013	174.4
24	Drag	29.19201	89.26708	14.6
25	Drag	29.17983	89.26696	168.8
26	Drag	29.18670	89.26419	26.7
27	Drag	29.17575	89.26423	107.9
28	Drag	29.18198	89.26232	11.5
29	Drag	29.17119	89.26207	176.3
30	Drag	29.17792	89.26043	23.6
31	Drag	29.17278	89.25847	13.4
58	Drag	29.16739	89.25701	13.1
59	Drag	29.13794	89.25696	72.1
60	Drag	29.11110	89.26922	53.9
61	Drag	29.08515	89.28369	26.4
62	Drag	29.06283	89.30719	13.2
63	Drag	29.03783	89.32471	13.4
64	Drag	29.01454	89.34453	100.4
65	Drag	28.99111	89.36416	61.9
66	Drag	28.96730	89.38402	99.7
67	Drag	28.94245	89.40312	93.3
70	Drag	29.12196	89.26121	12.4
71	Drag	29.07820	89.29226	26.8
72	Drag	29.02693	89.33222	22.0
73	Drag	28.95541	89.39098	93.2

Table D3. September 23, 2009.

Sample site number	Type	Latitude °N	Longitude °W	D50 10^{-6}m
CGBP-32	Drag	29.19318	89.25749	187.4
CGBP-33	Drag	29.19679	89.24137	176.3
CGBP-34	Drag	29.20374	89.25915	75.9
CGBP-57	Drag	29.20057	89.25176	10.4
5	Drag	29.28005	89.35243	15.1
6	Drag	29.28195	89.34960	217.8
7	Drag	29.26989	89.34275	193.0
8	Drag	29.27230	89.33975	14.6
9	Drag	29.26176	89.33284	8.8
10	Drag	29.26393	89.33081	238.1
12	Drag	29.25460	89.31854	15.3
13	Drag	29.24315	89.31103	11.5
14	Drag	29.24491	89.30836	9.8
15	Drag	29.23353	89.30281	9.7
16	Drag	29.23592	89.29894	14.9
17	Drag	29.22179	89.29296	107.4
18	Drag	29.22408	89.28861	14.7
19	Drag	29.20525	89.28163	117.4
20	Drag	29.20692	89.27813	13.1
21	Drag	29.19337	89.27475	178.6
22	Drag	29.19526	89.26945	32.0
23	Drag	29.18498	89.27013	171.8
24	Drag	29.19201	89.26708	129.8
25	Drag	29.17983	89.26696	141.5
26	Drag	29.18670	89.26419	13.2
27	Drag	29.17575	89.26423	171.7
28	Drag	29.18198	89.26232	110.5
29	Drag	29.17119	89.26207	169.4
30	Drag	29.17792	89.26043	16.5
31	Drag	29.17278	89.25847	11.4
58	Drag	29.16739	89.25701	142.7
59	Drag	29.13794	89.25696	37.1

Table D3 continued.

60	Drag	29.11110	89.26922	26.6
61	Drag	29.08515	89.28369	32.2
62	Drag	29.06283	89.30719	98.4
63	Drag	29.03783	89.32471	15.0
64	Drag	29.01454	89.34453	47.2
65	Drag	28.99111	89.36416	21.2
66	Drag	28.96730	89.38402	66.7
67	Drag	28.94245	89.40312	64.0
68	Drag	28.91897	89.41983	42.8
70	Drag	29.12196	89.26121	40.3
71	Drag	29.07820	89.29226	27.3
72	Drag	29.02693	89.33222	32.5
73	Drag	28.95541	89.39098	27.5
74	Drag	28.91495	89.42609	15.9

Appendix E

ADCP 3-D Current Measurements

Current velocity cross sections are displayed with northeast on the left side of the plot and southwest on the right, except where noted as being different.

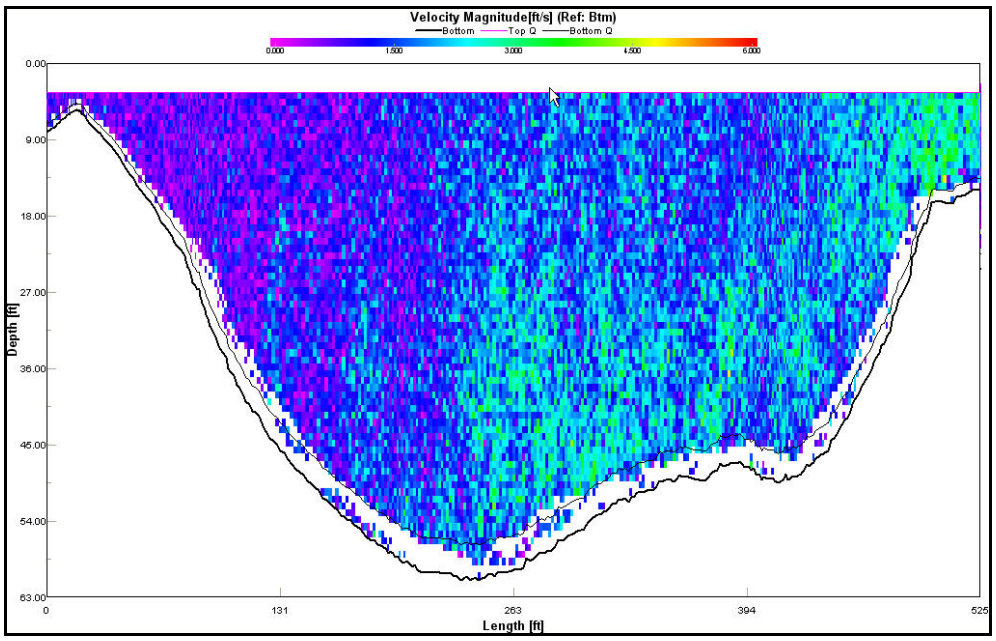


Figure E1. Transect 1 current velocity cross section, 10 March 2009, 1753 GMT. Display is from the north (left) to the south (right).

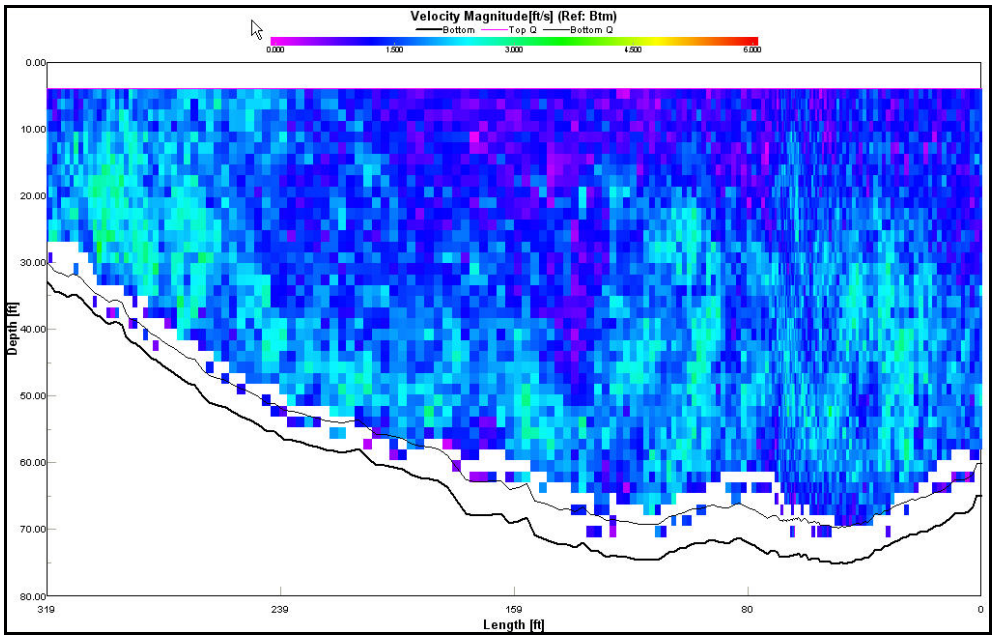


Figure E2. Transect 2 current velocity cross section, 10 March 2009, 1803 GMT. Display is from the southwest (left) to the northeast (right).

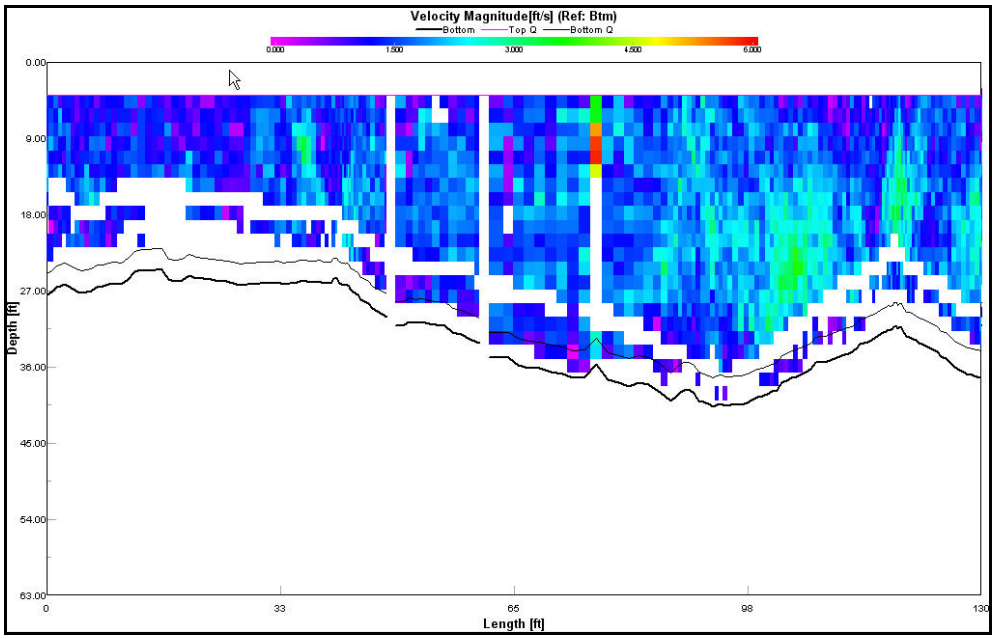


Figure E3. Transect 3 current velocity cross section, 10 March 2009, 1804 GMT. Display begins at the location of the beginning of the track, which is the point furthest south, and proceeds along the track.

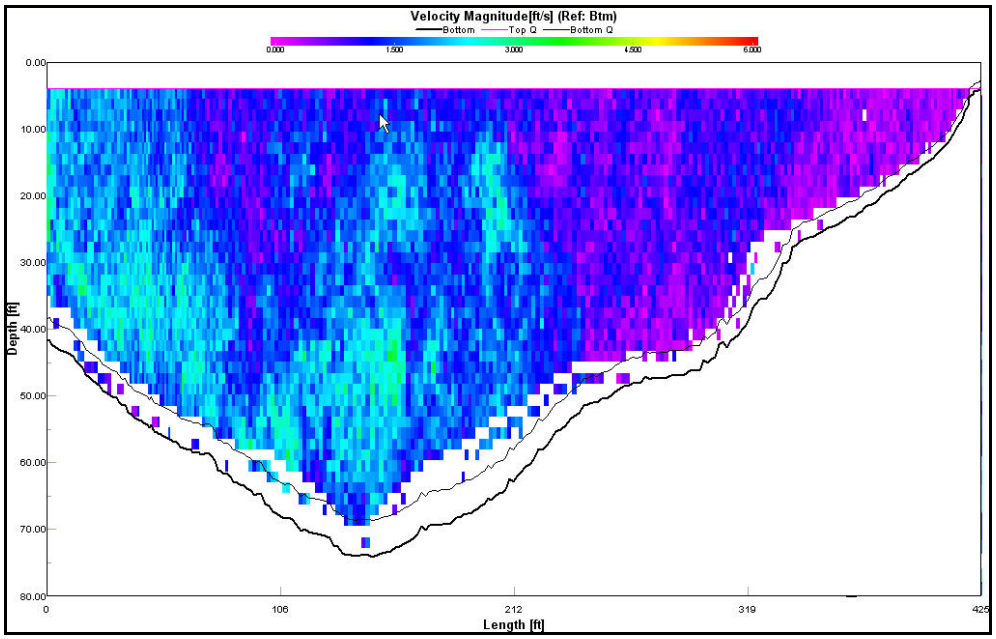


Figure E4. Transect 4 current velocity cross section, 10 March 2009, 1806 GMT. Display is from the south (left) to the north (right).

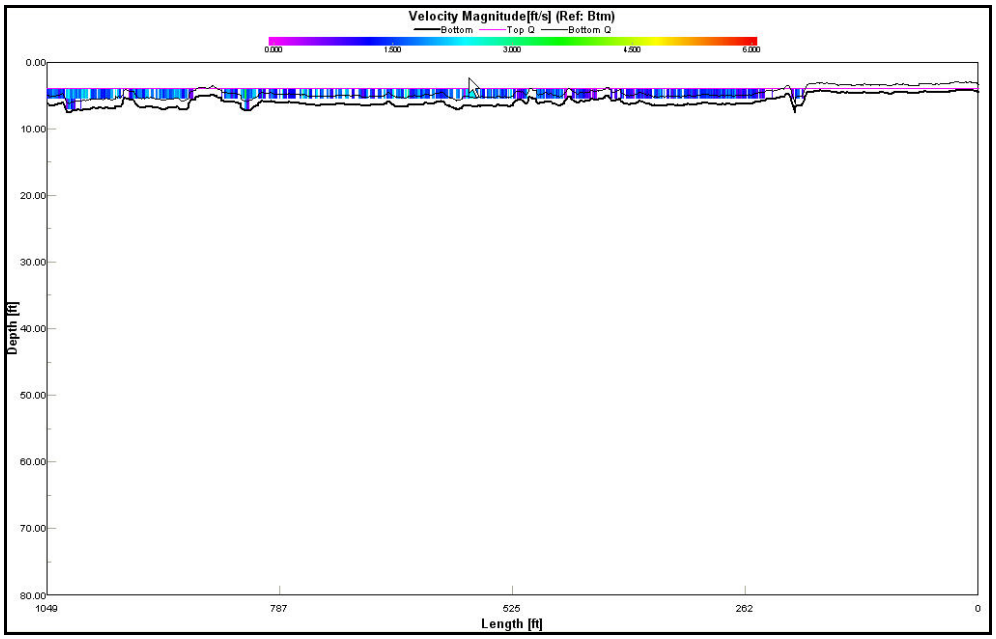


Figure E5.1. Western section of Transect 5 current velocity cross section, 10 March 2009, 2021 GMT. Display is from the west (left) to the east (right).

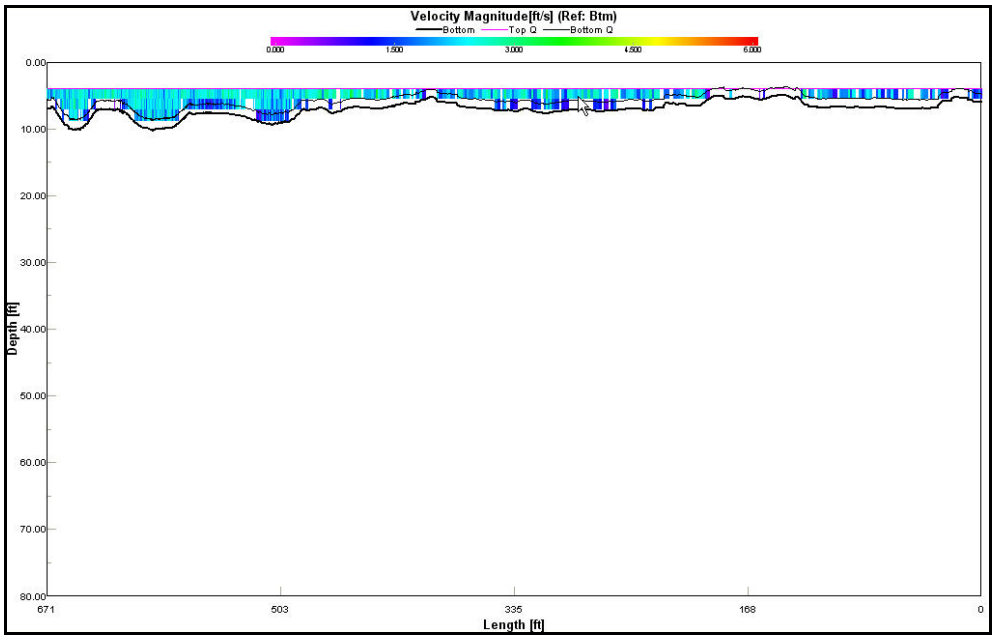


Figure E5.2. Eastern section of Transect 5 current velocity cross section, 10 March 2009, 2021 GMT. Display is from the west (left) to the east (right).

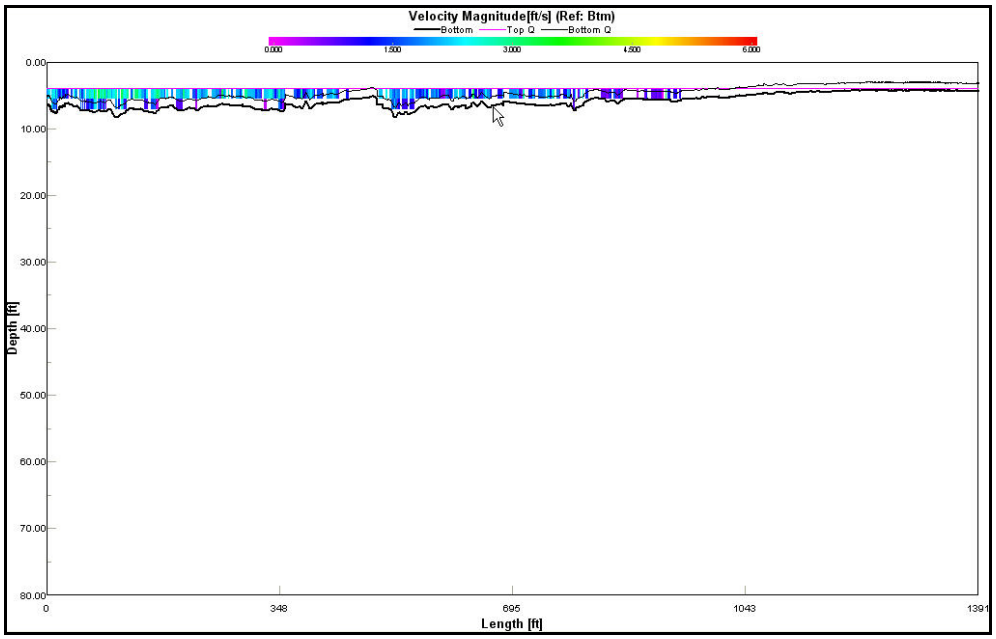


Figure E6.1. Western section of Transect 6 current velocity cross section, 10 March 2009, 2033 GMT. Display begins at the location of the beginning of the track, which is at the point Transect 5 ends, and proceeds along the track.

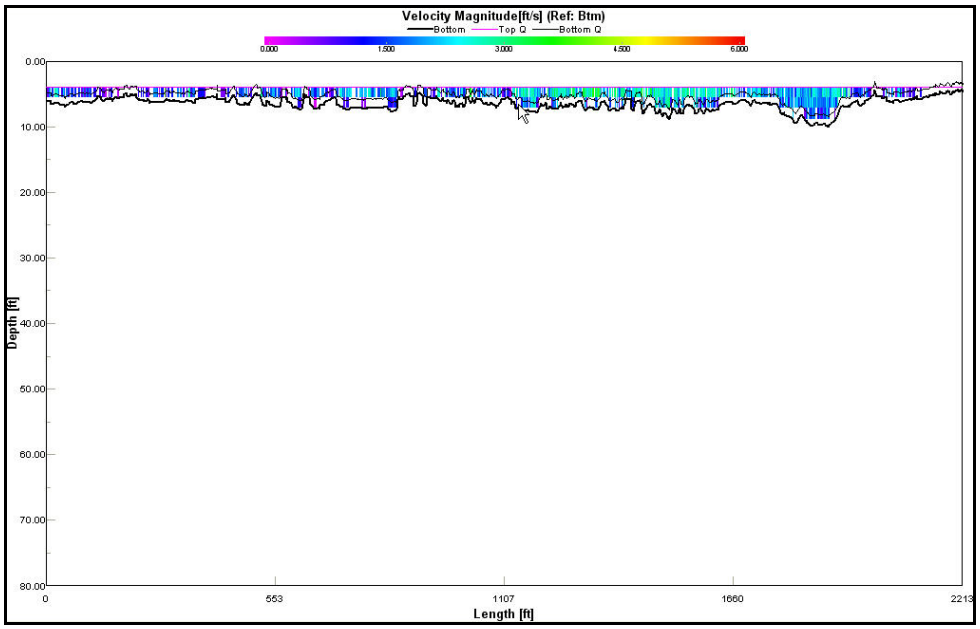


Figure E6.2. Eastern section of Transect 6 current velocity cross section, 10 March 2009, 2033 GMT. Display proceeds along the track to its end to the east of the start of the track.

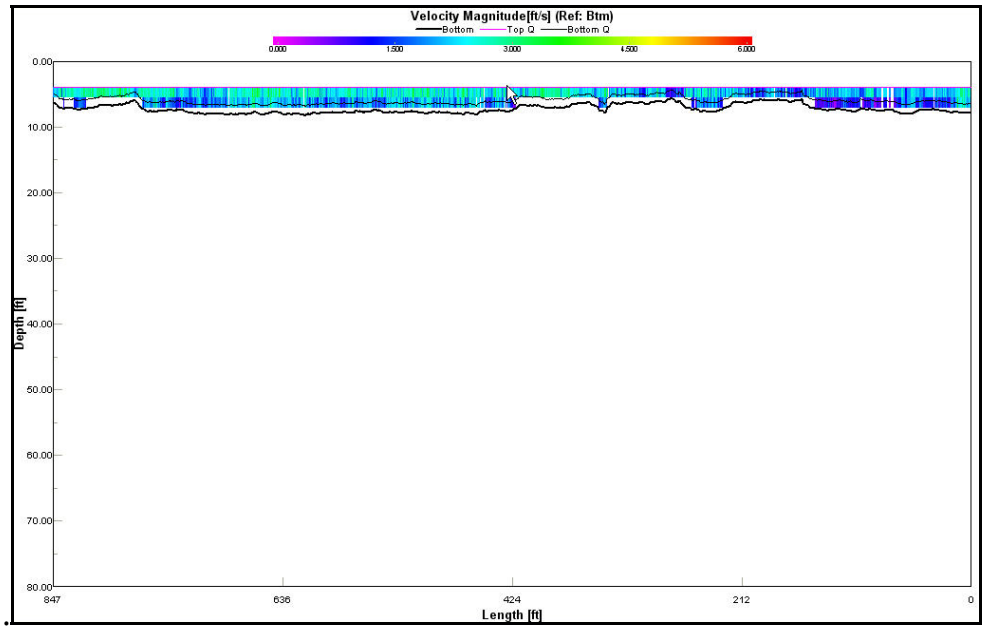


Figure E7.1. Northwestern section of Transect 7 current velocity cross section, 10 March 2009, 2059 GMT. Display is from the northwest (left) to the southeast (right).

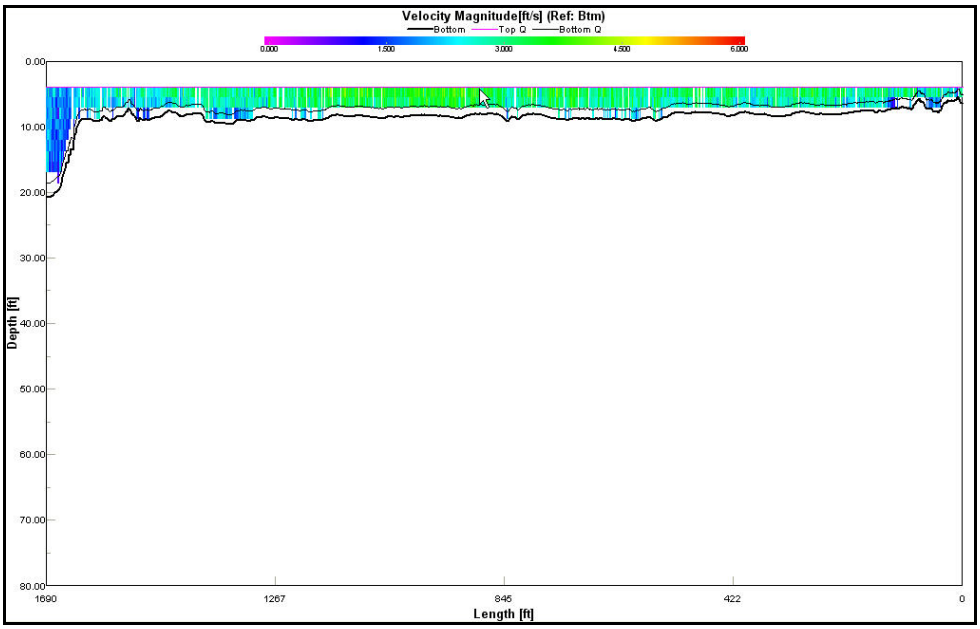


Figure E7.2. Next section of Transect 7 current velocity cross section, 10 March 2009, 2059 GMT. Display is from the northwest (left) to the southeast (right).

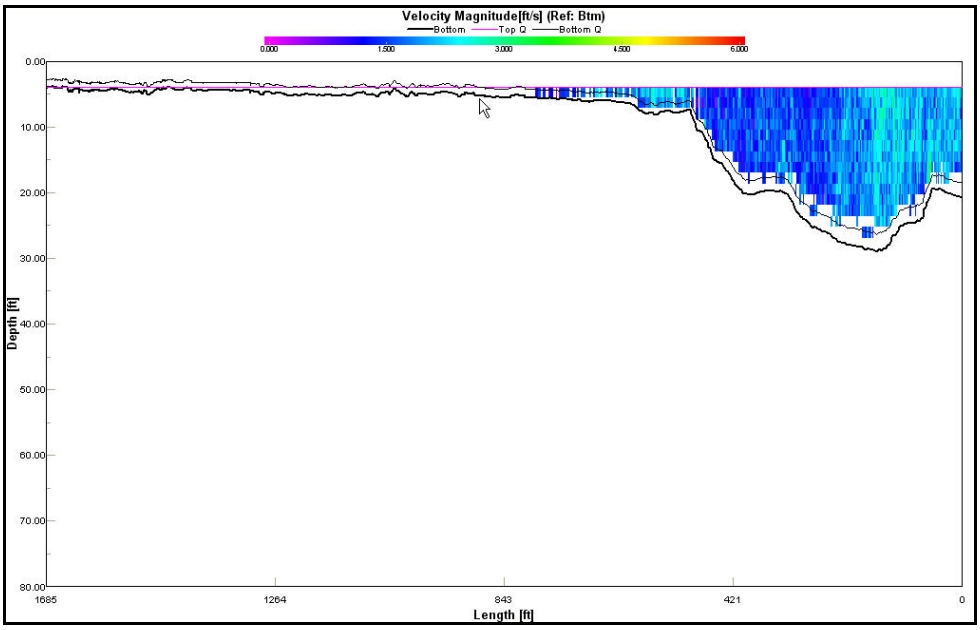


Figure E7.3. Next section of Transect 7 current velocity cross section, 10 March 2009, 2059 GMT. Display is from the northwest (left) to the southeast (right).

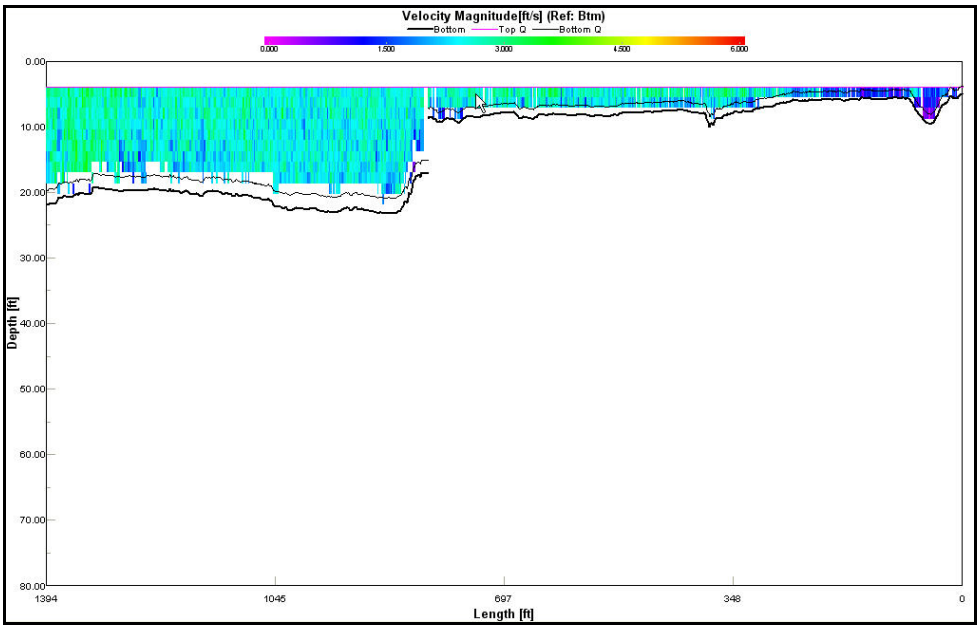


Figure E7.4. Southeastern section of Transect 7 current velocity cross section, 10 March 2009, 2059 GMT. Display is from the northwest (left) to the southeast (right).

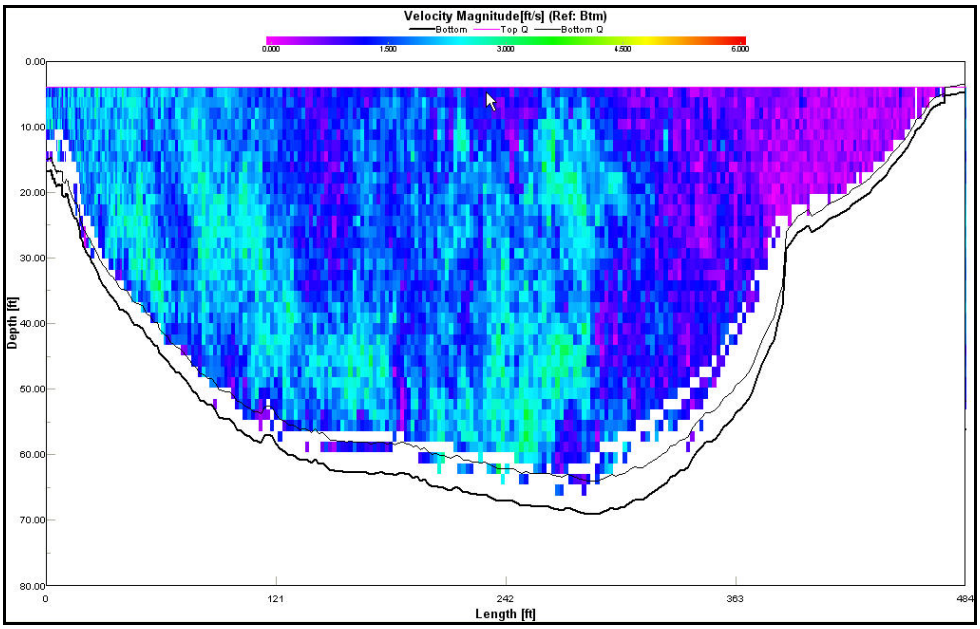


Figure E8. Transect 8 current velocity cross section, 10 March 2009, 2132 GMT. Display is from the south (left) to the north (right).

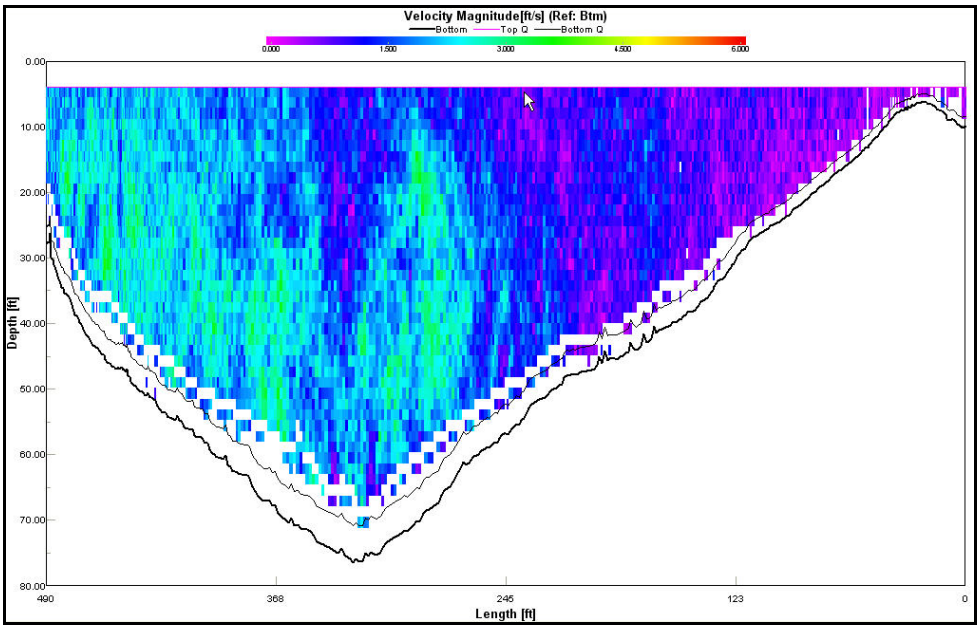


Figure E9. Transect 9 current velocity cross section, 10 March 2009, 2136 GMT. Display is from the south (left) to the north (right).

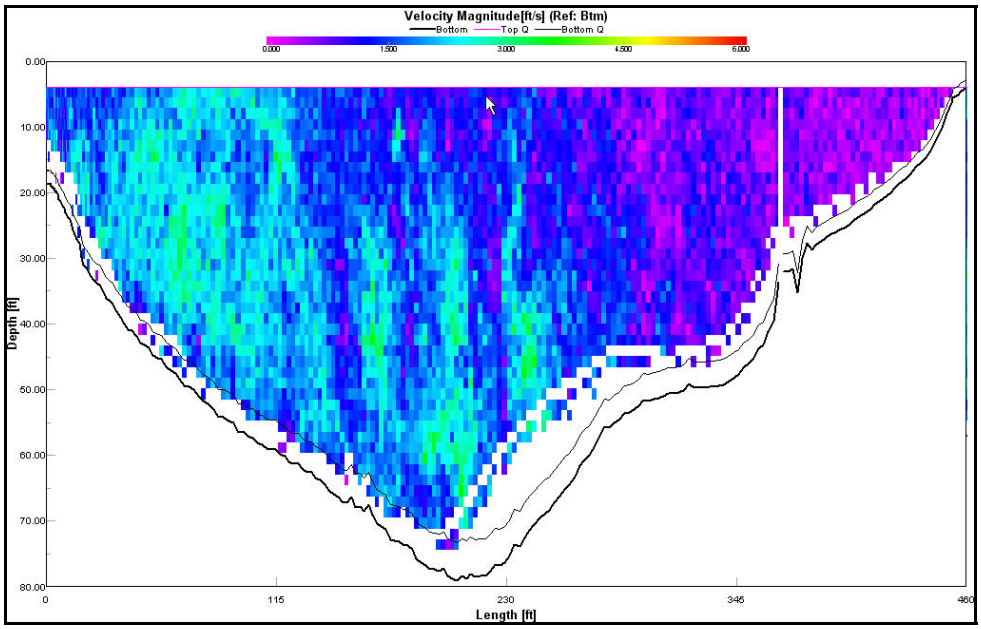


Figure E10. Transect 10 current velocity cross section, 10 March 2009, 2136 GMT. Display is from the south (left) to the north (right).

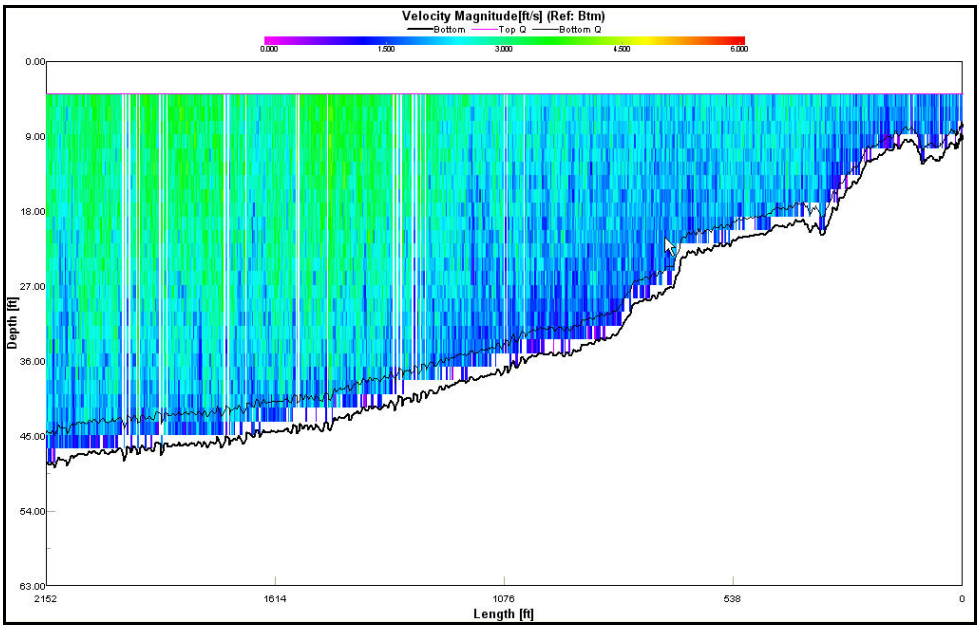


Figure E11.1. Eastern section of Transect 11 current velocity cross section, 10 March 2009, 2150 GMT.

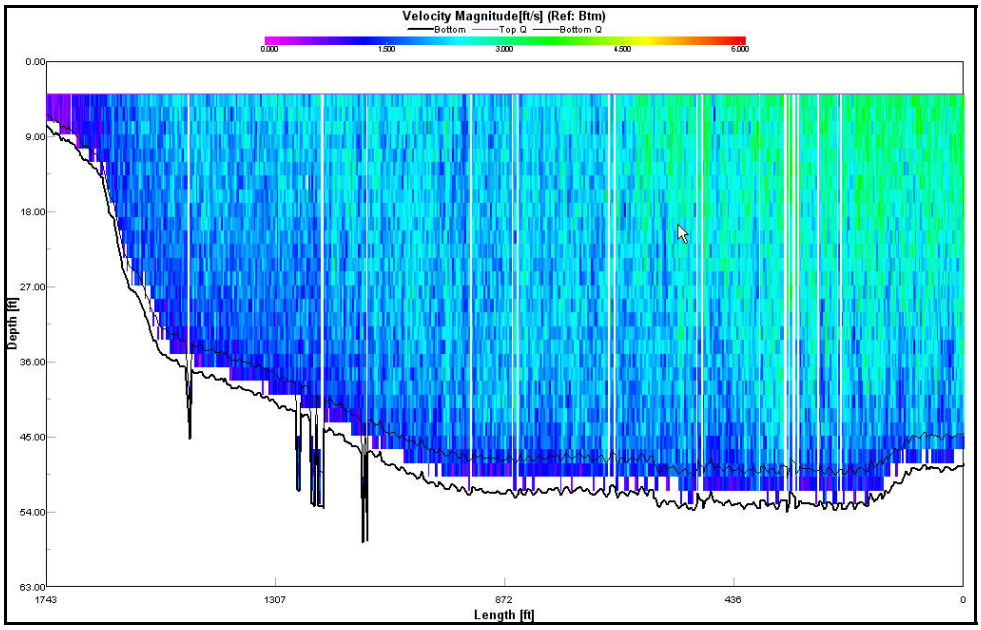


Figure E11.2. Western section of Transect 11 current velocity cross section, 10 March 2009, 2150 GMT.

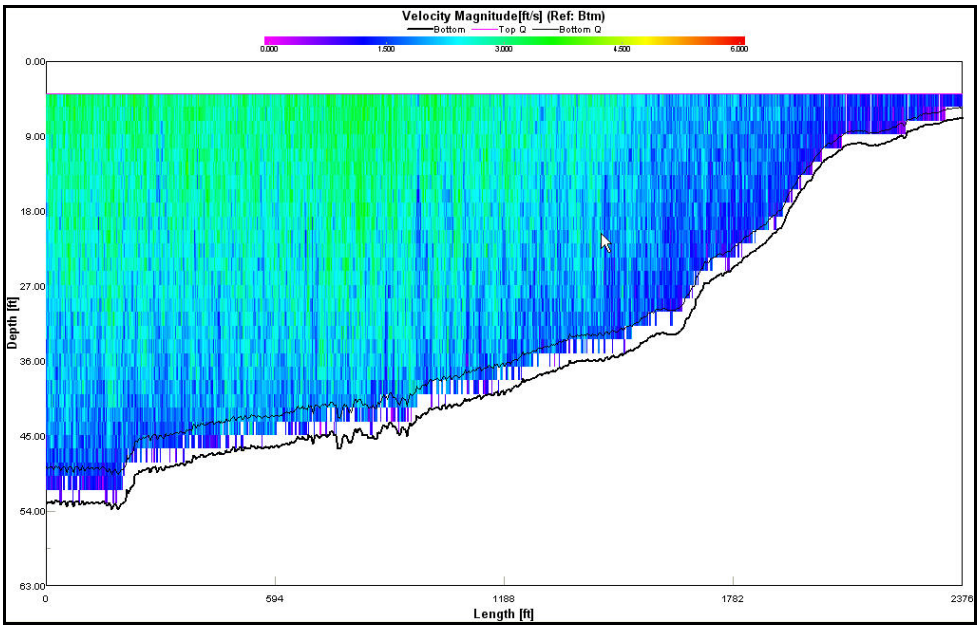


Figure E12.1. Eastern section of Transect 12 current velocity cross section, 10 March 2009, 2214 GMT.

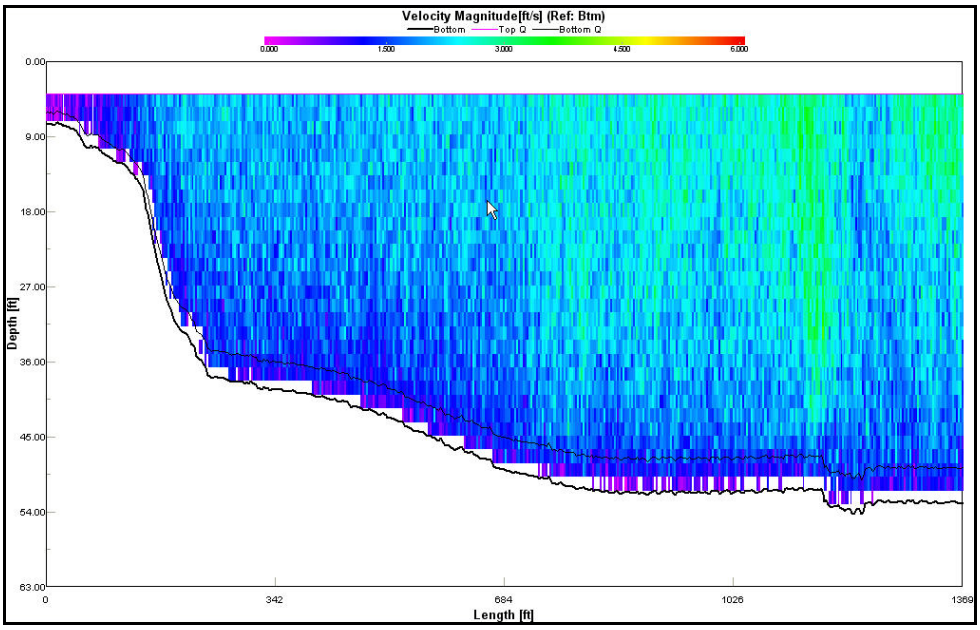


Figure E12.2. Western section of Transect 12 current velocity cross section, 10 March 2009, 2214 GMT.

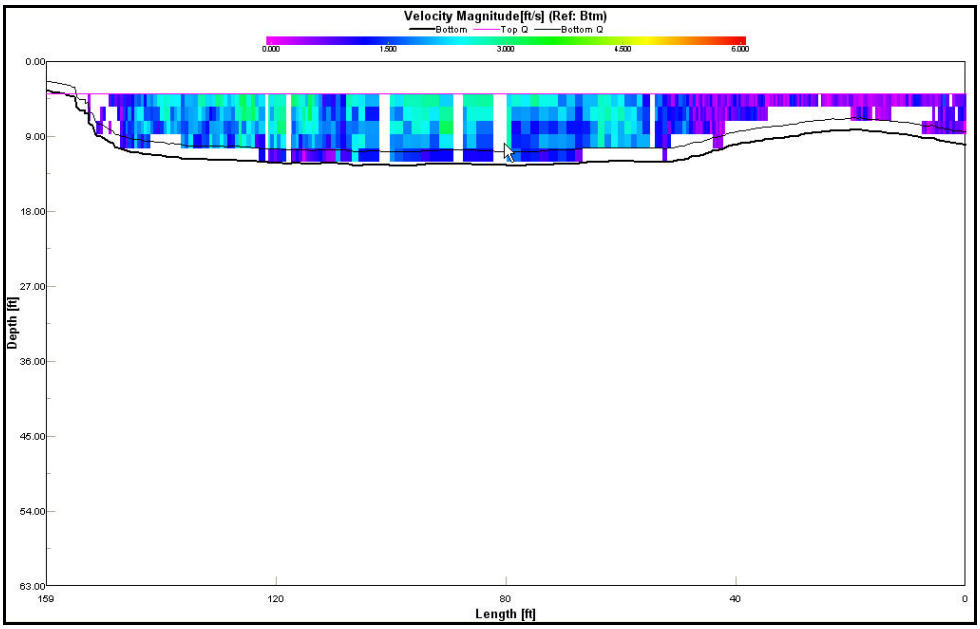


Figure E13. Transect 13 current velocity cross section, 11 March 2009, 1738 GMT. Display is from the south (left) to the north (right).

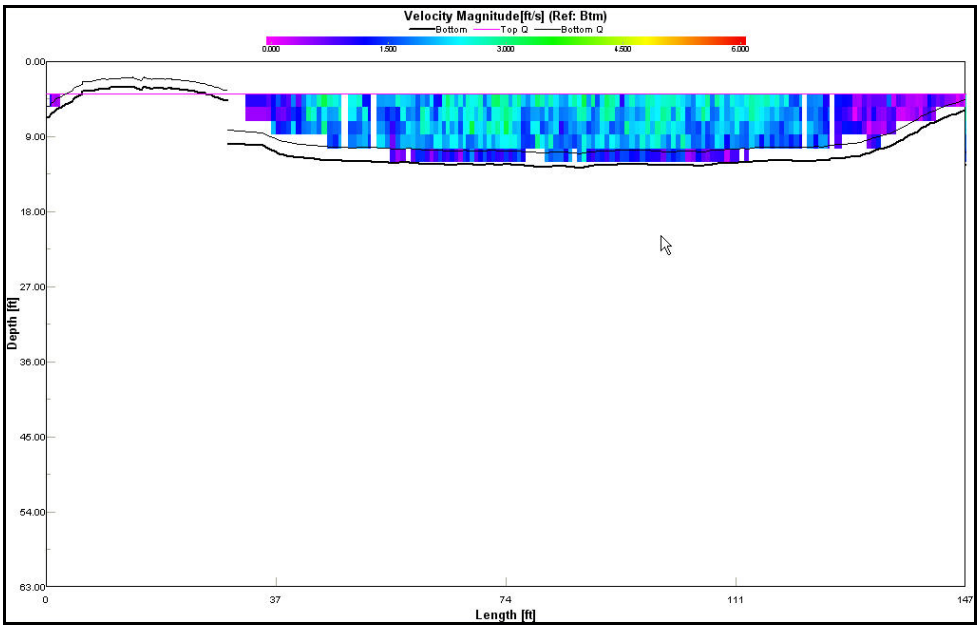


Figure E14. Transect 14 current velocity cross section, 11 March 2009, 1743 GMT. Display is from the north (left) to the south (right).

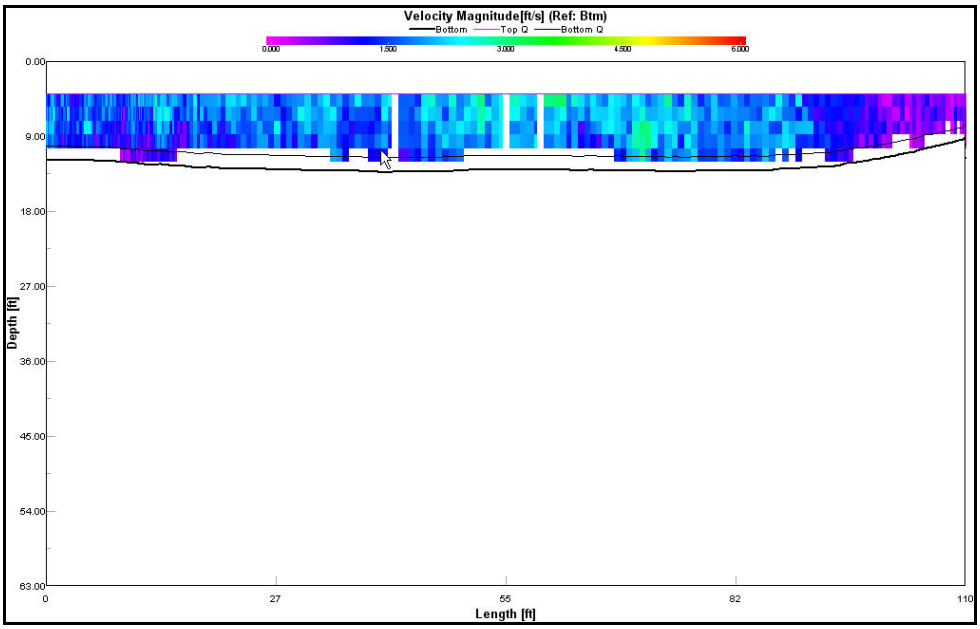


Figure E15. Transect 15 current velocity cross section, 11 March 2009, 1754 GMT. Display is from the north (left) to the south (right).

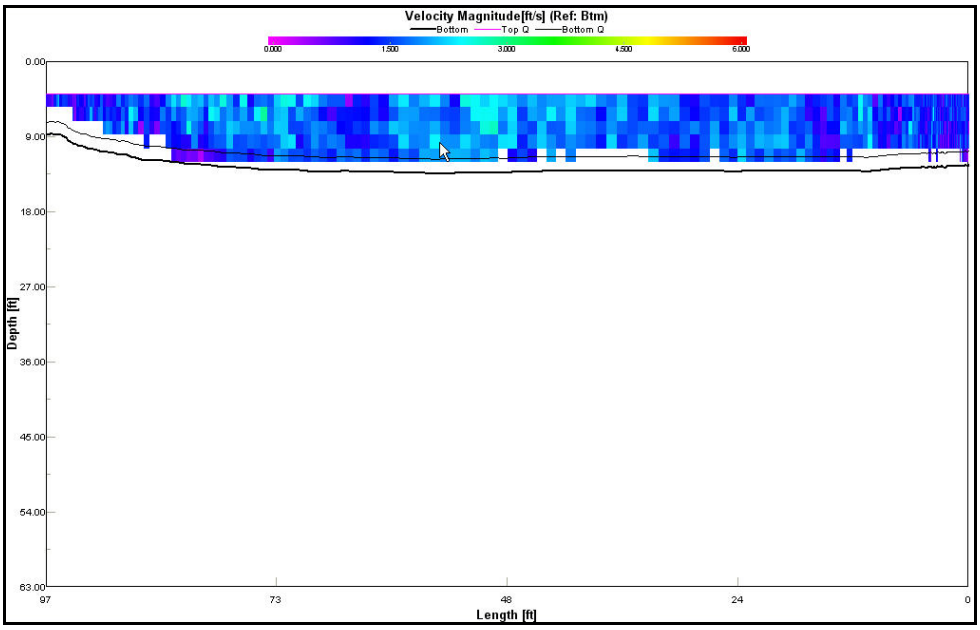


Figure E16. Transect 16 current velocity cross section, 11 March 2009, 1757 GMT. Display is from the north (left) to the south (right).

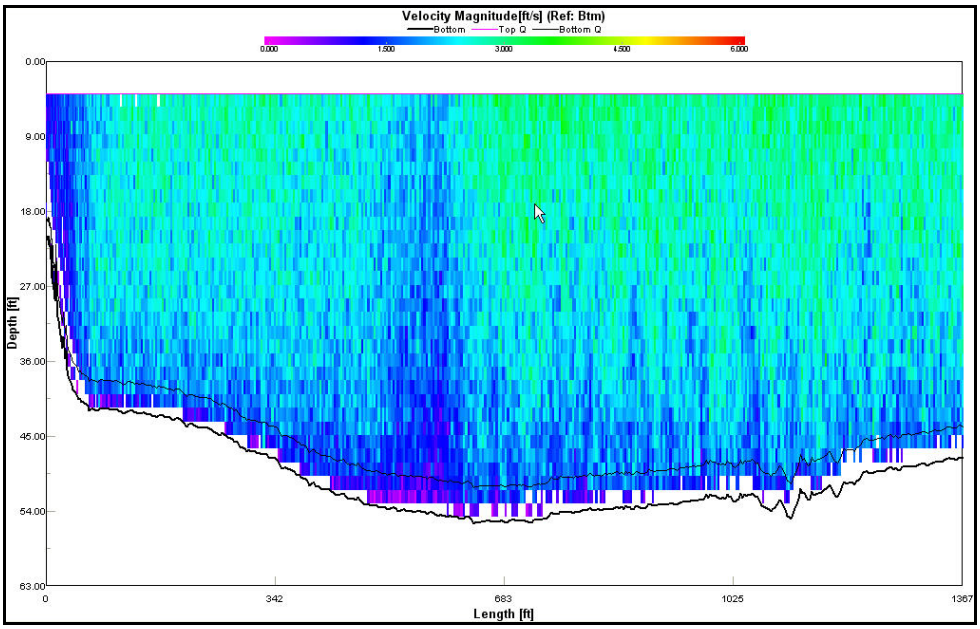


Figure E17.1. Eastern section of Transect 17 current velocity cross section, 11 March 2009, 1822 GMT.

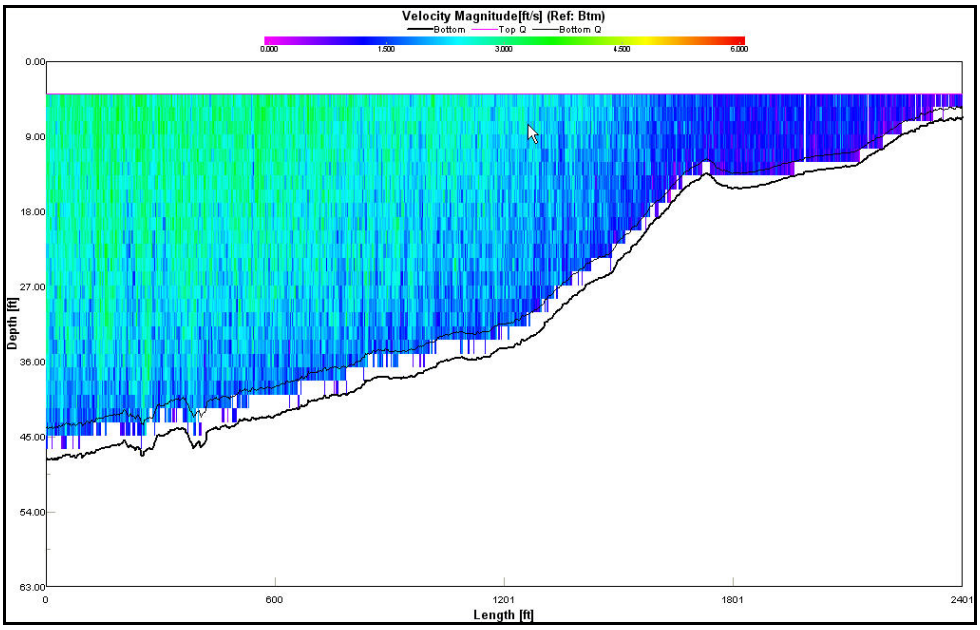


Figure E17.2. Western section of Transect 17 current velocity cross section, 11 March 2009, 1822 GMT.

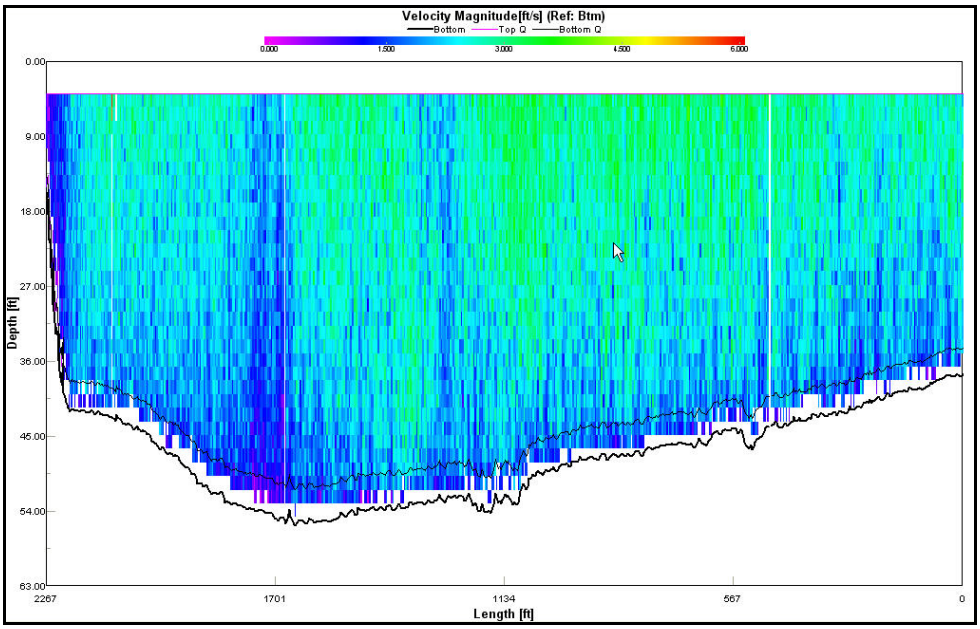


Figure E18.1. Eastern section of Transect 18current velocity cross section, 11 March 2009, 1840 GMT.

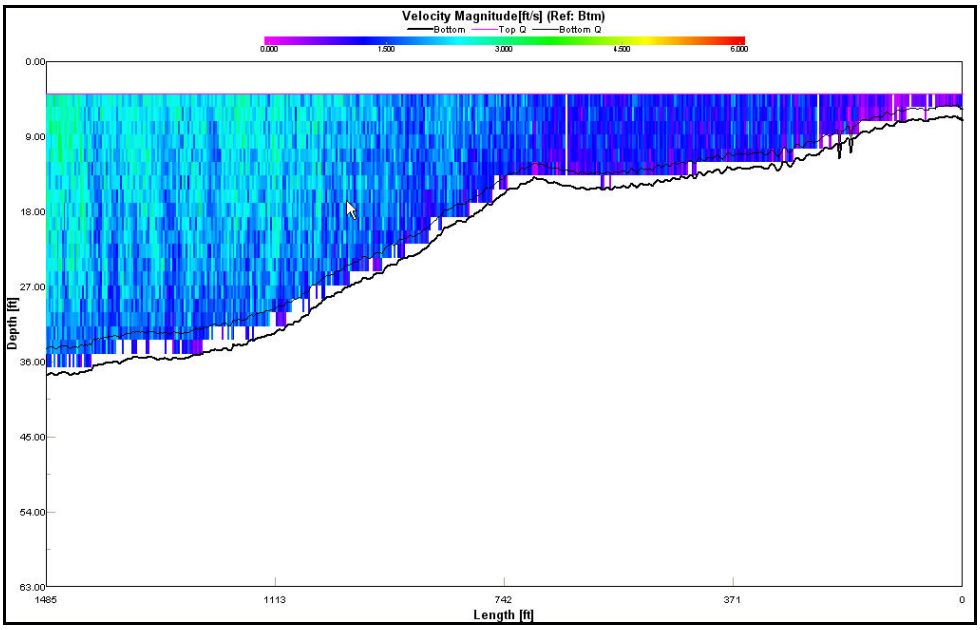


Figure E18.2. Western section of Transect 18current velocity cross section, 11 March 2009, 1840 GMT.

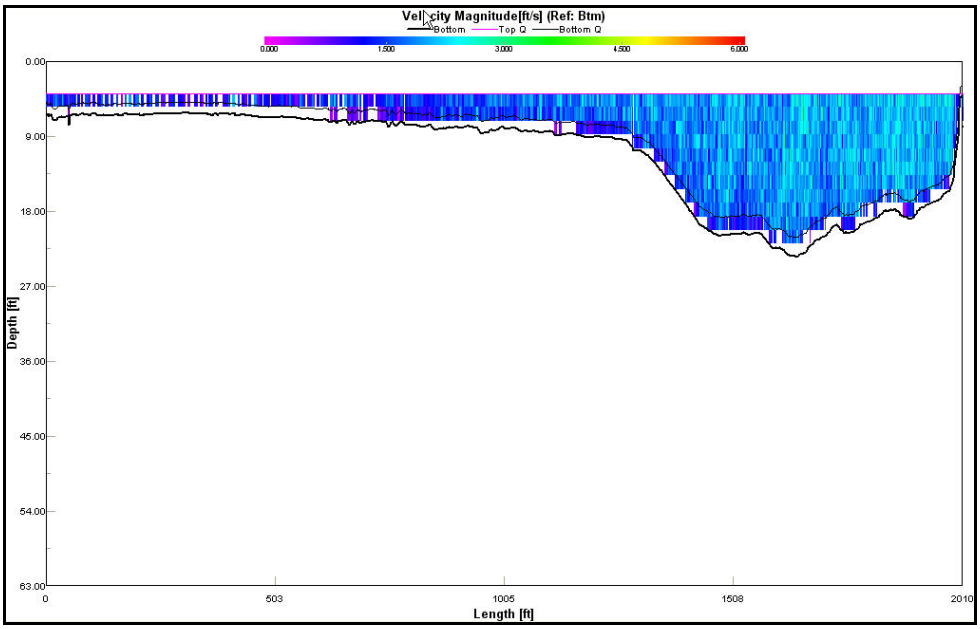


Figure E19. Transect 19 current velocity cross section, 11 March 2009, 1902 GMT. Display is from the northwest (left) to the southeast (right).

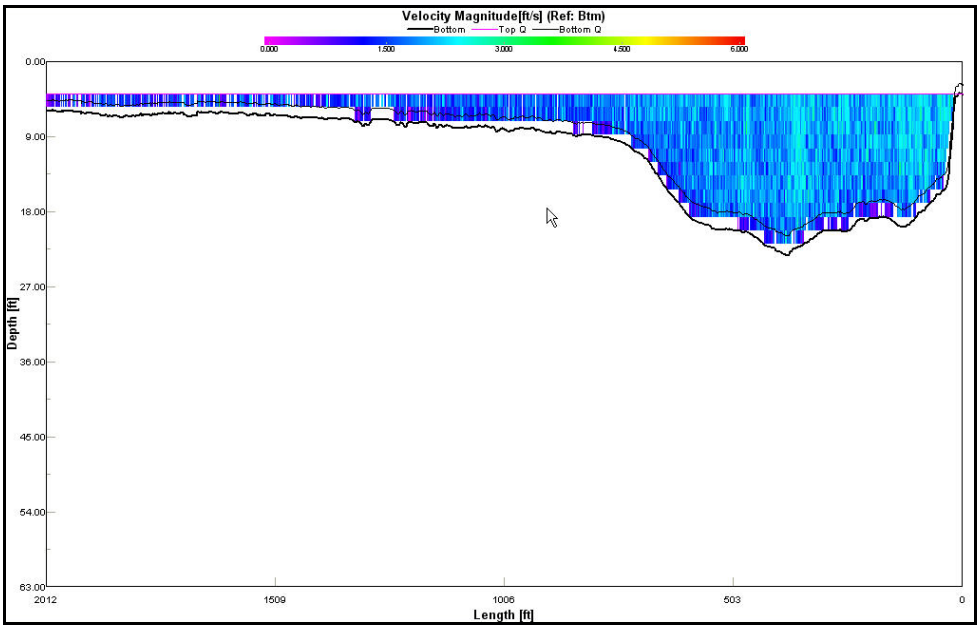


Figure E20. Transect 20 current velocity cross section, 11 March 2009, 1908 GMT. Display is from the northwest (left) to the southeast (right).

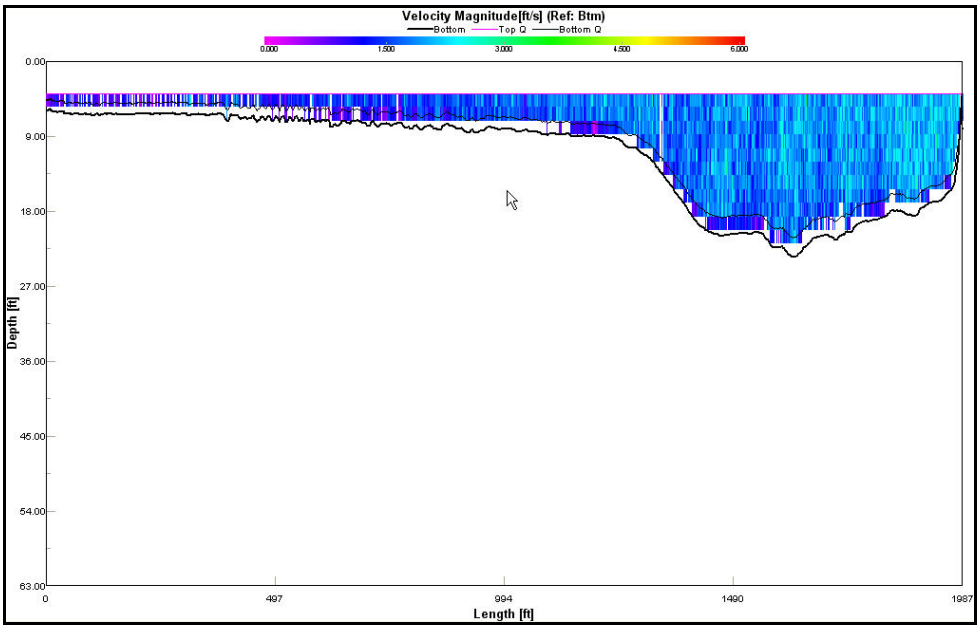


Figure E21. Transect 21 current velocity cross section, 11 March 2009, 1915 GMT. Display is from the northwest (left) to the southeast (right).

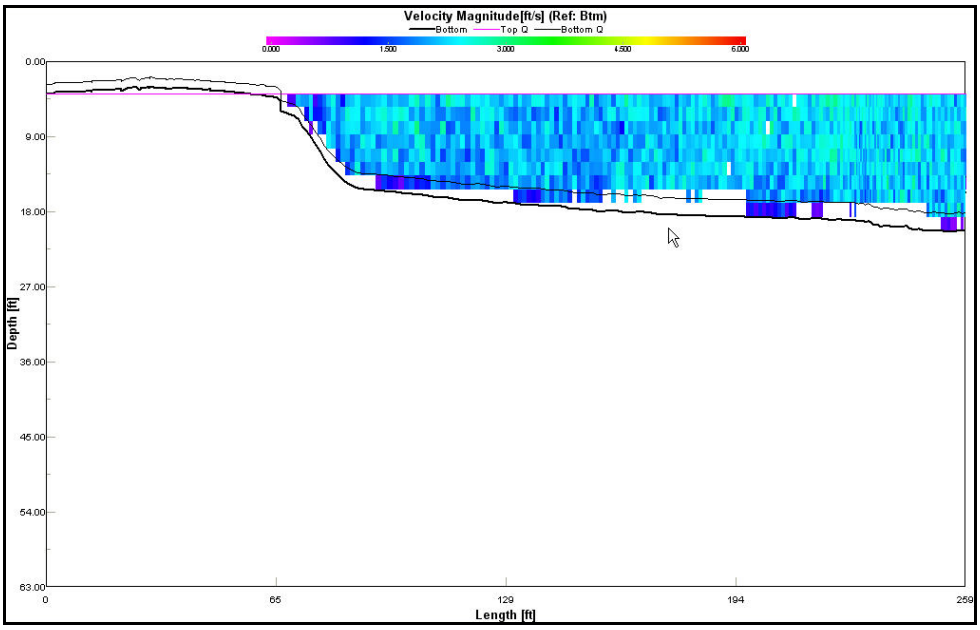


Figure E22. Transect 23 current velocity cross section, 11 March 2009, 1920 GMT. Display is from the south (left) to the north (right).

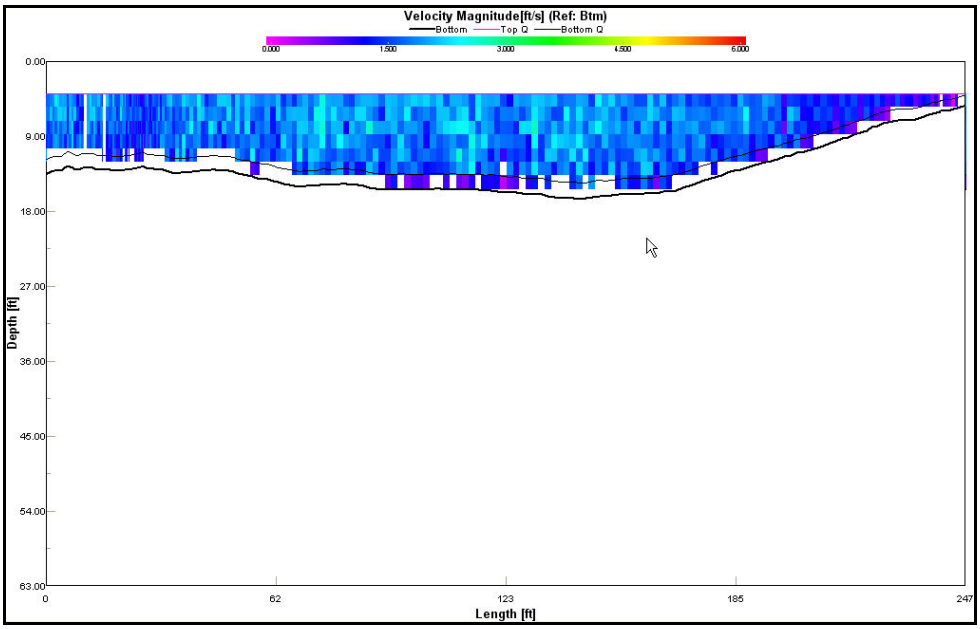


Figure E23. Transect 24 current velocity cross section, 11 March 2009, 1927 GMT. Display is from the northwest (left) to the southeast (right).

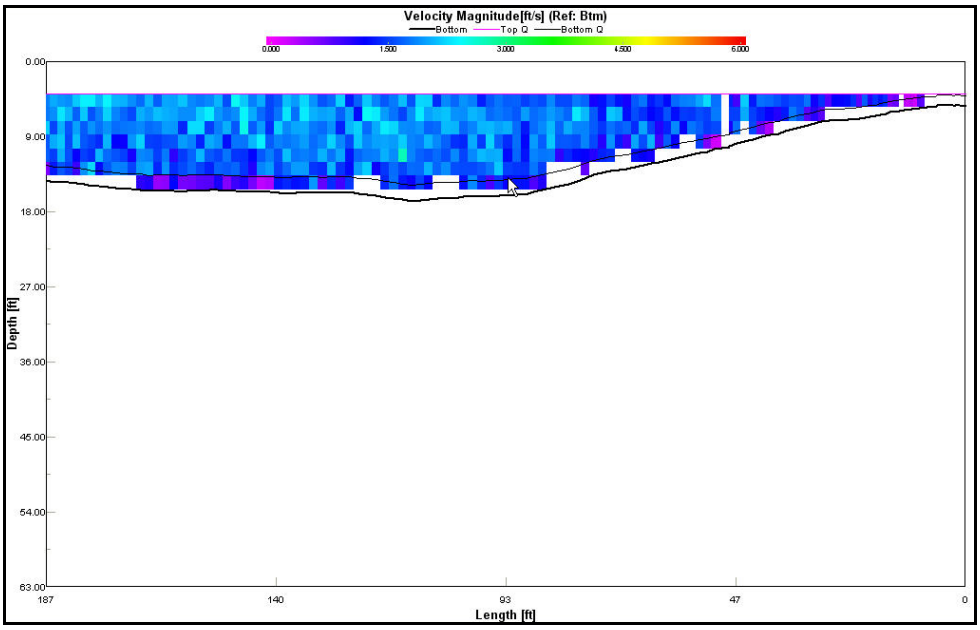


Figure E24. Transect 25 current velocity cross section, 11 March 2009, 1929 GMT. Display is from the northwest (left) to the southeast (right).

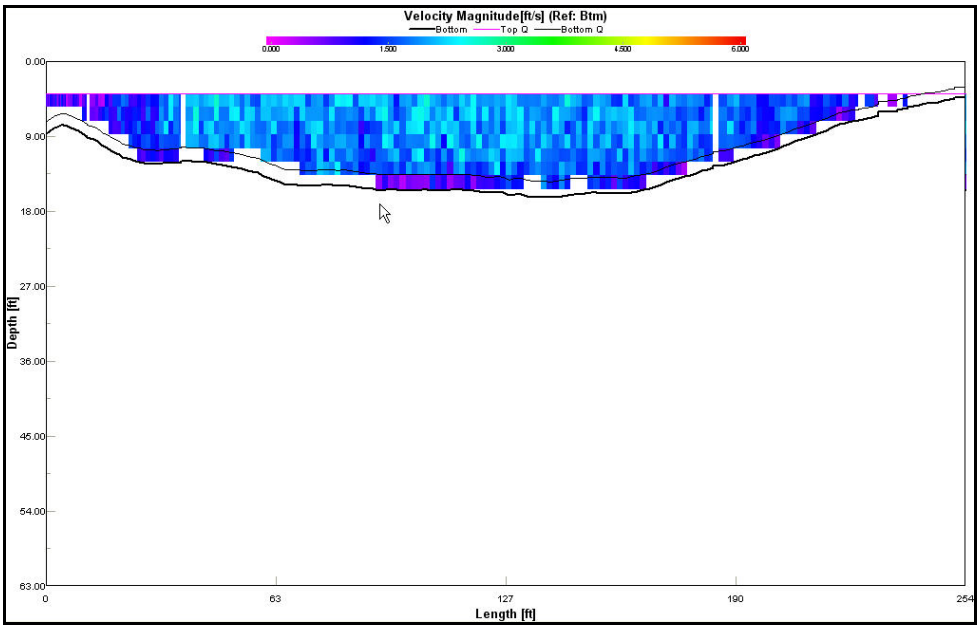


Figure E25. Transect 26 current velocity cross section, 11 March 2009, 1931 GMT. Display is from the northwest (left) to the southeast (right).

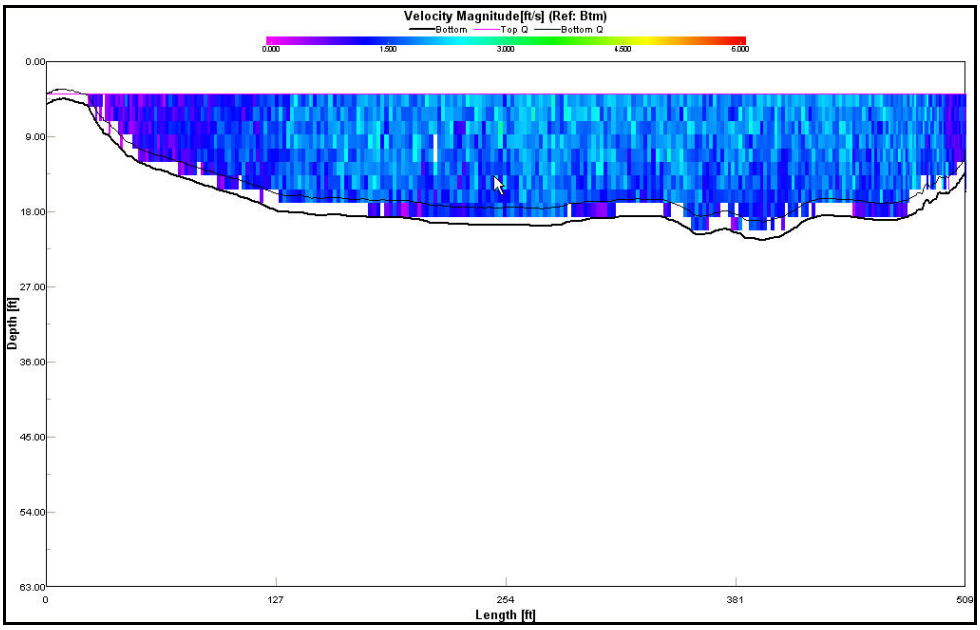


Figure E26. Transect 27 current velocity cross section, 11 March 2009, 1943 GMT. Display is from the northwest (left) to the southeast (right).

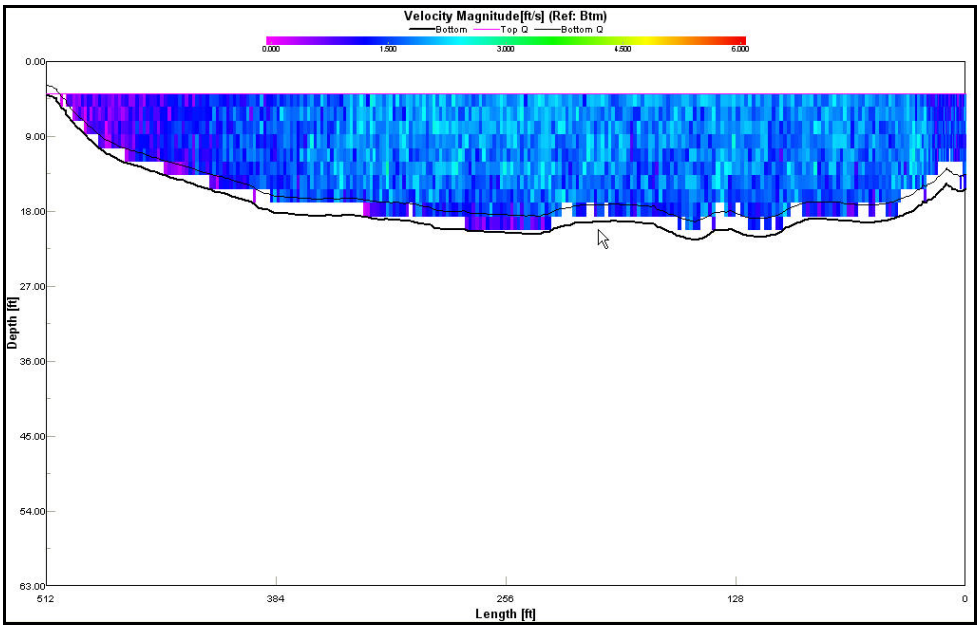


Figure E27. Transect 28 current velocity cross section, 11 March 2009, 1946 GMT. Display is from the northwest (left) to the southeast (right).

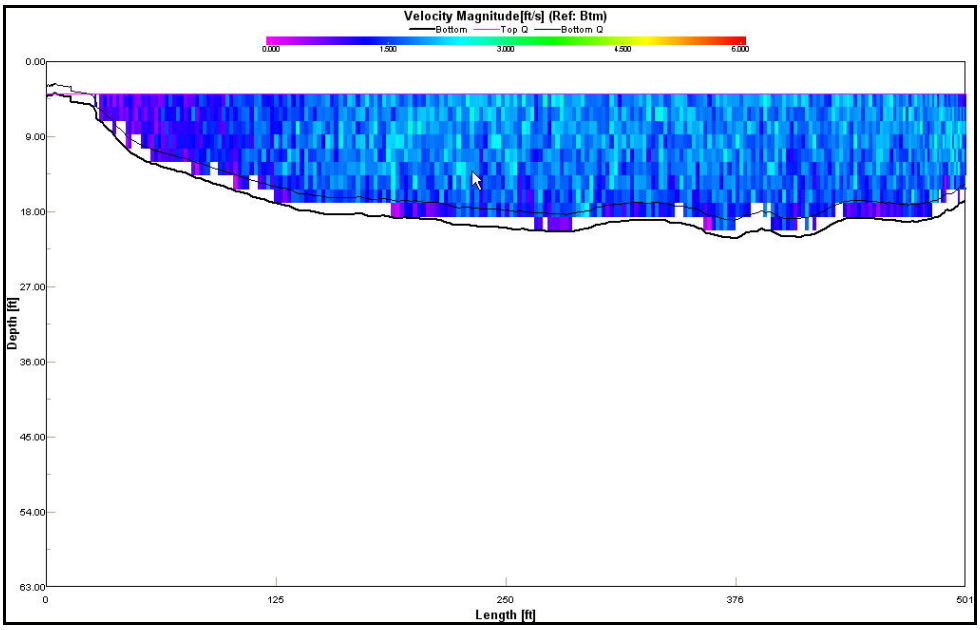


Figure E28. Transect 29 current velocity cross section, 11 March 2009, 1949 GMT. Display is from the northwest (left) to the southeast (right).

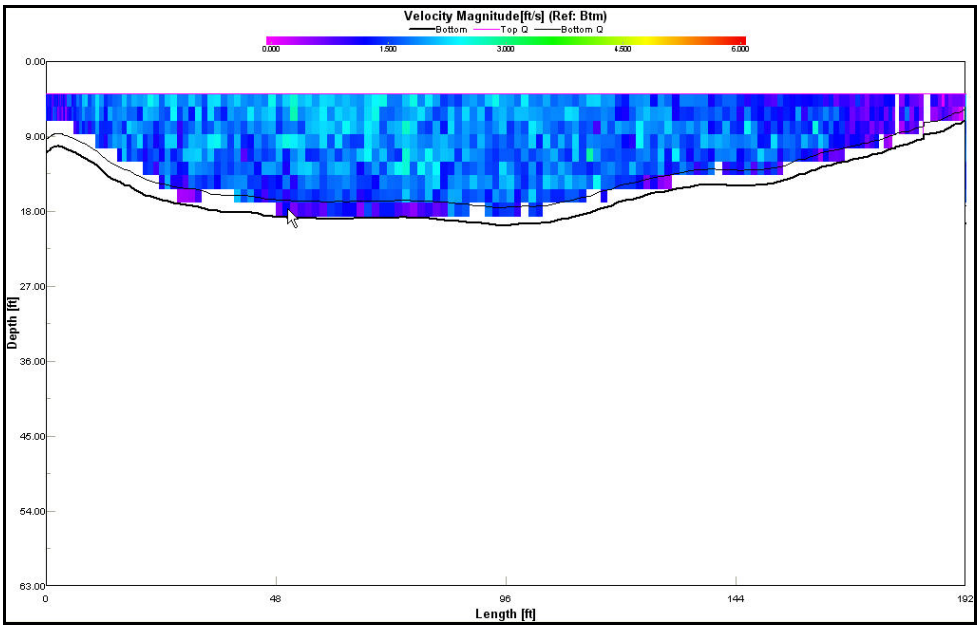


Figure E29. Transect 30 current velocity cross section, 11 March 2009, 1955 GMT.

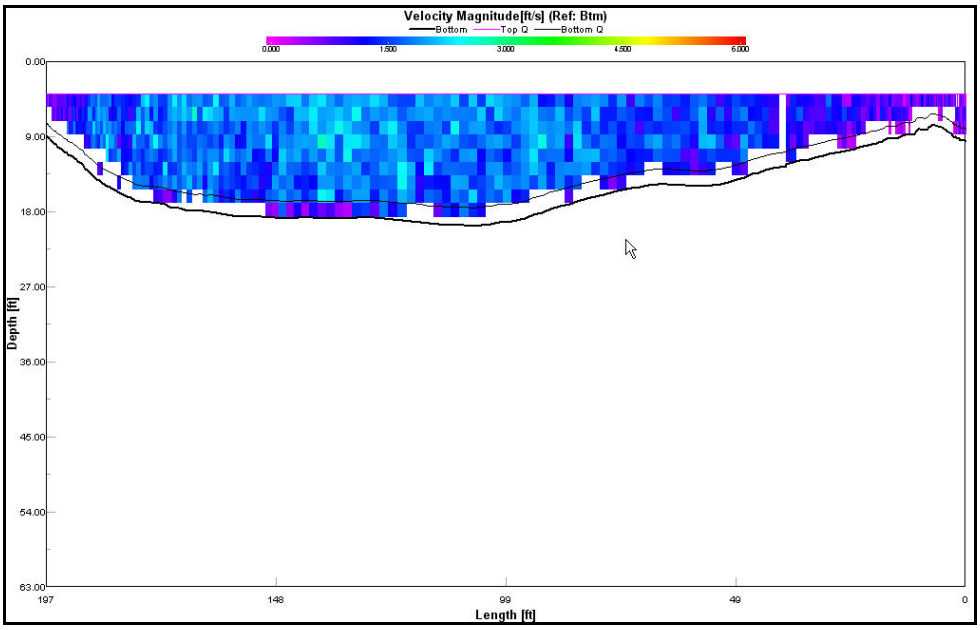


Figure E30. Transect 31 current velocity cross section, 11 March 2009, 1957 GMT.

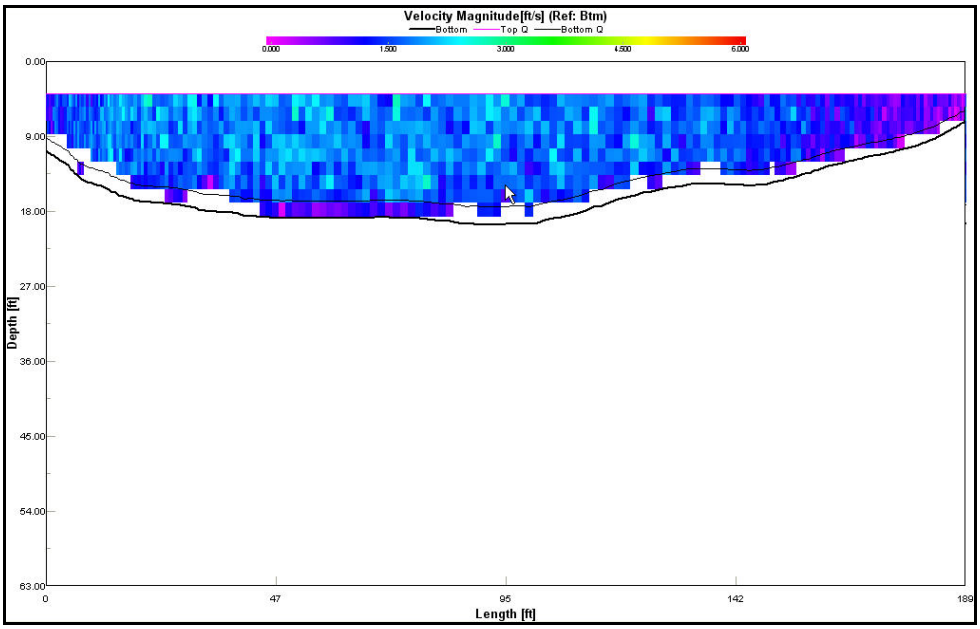


Figure E31. Transect 32 current velocity cross section, 11 March 2009, 1959 GMT.

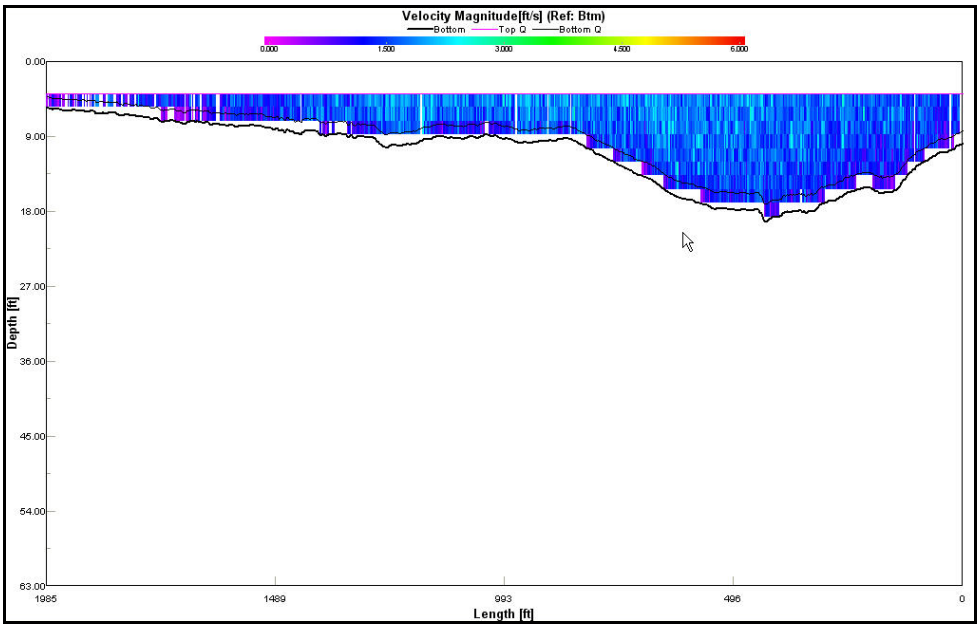


Figure E32.1. Western section of Transect 33 current velocity cross section, 11 March 2009, 2010 GMT. Display is from the northwest (left) to the southeast (right).

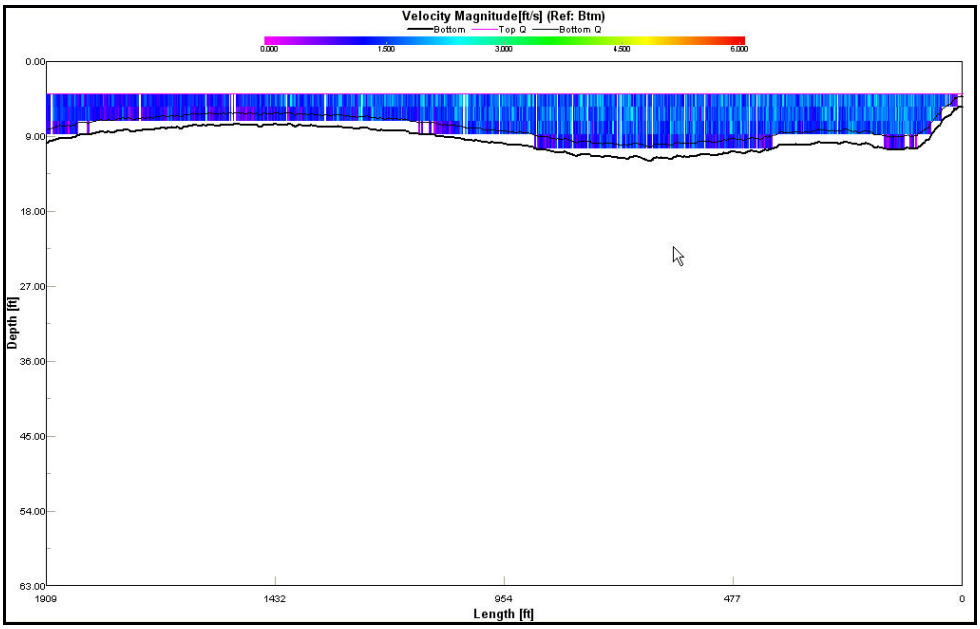


Figure E32.2. Eastern section of Transect 33 current velocity cross section, 11 March 2009, 2010 GMT. Display is from the northwest (left) to the southeast (right).

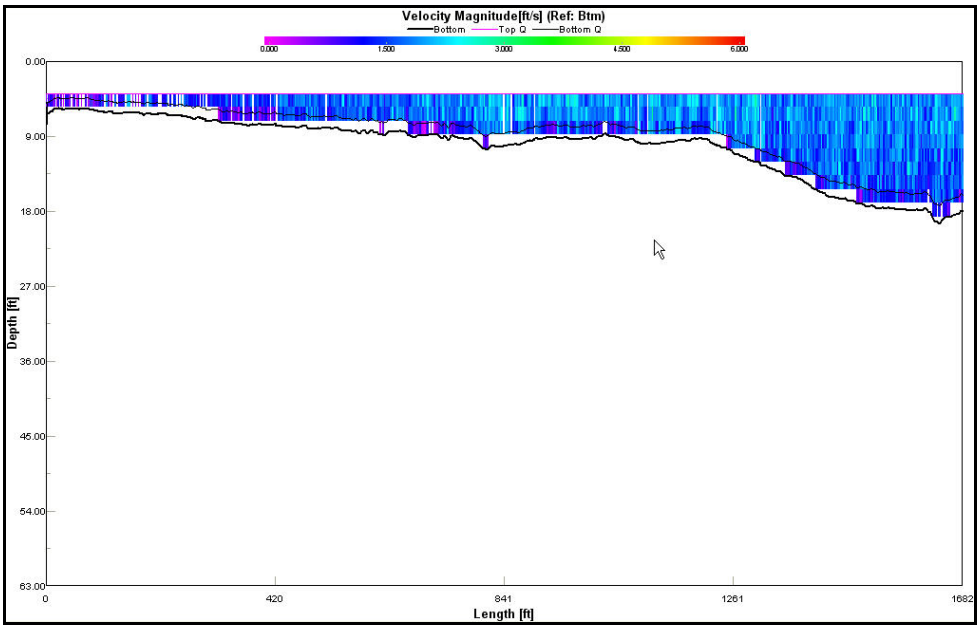


Figure E33.1. Western section of Transect 34 current velocity cross section, 11 March 2009, 2021 GMT. Display is from the northwest (left) to the southeast (right).

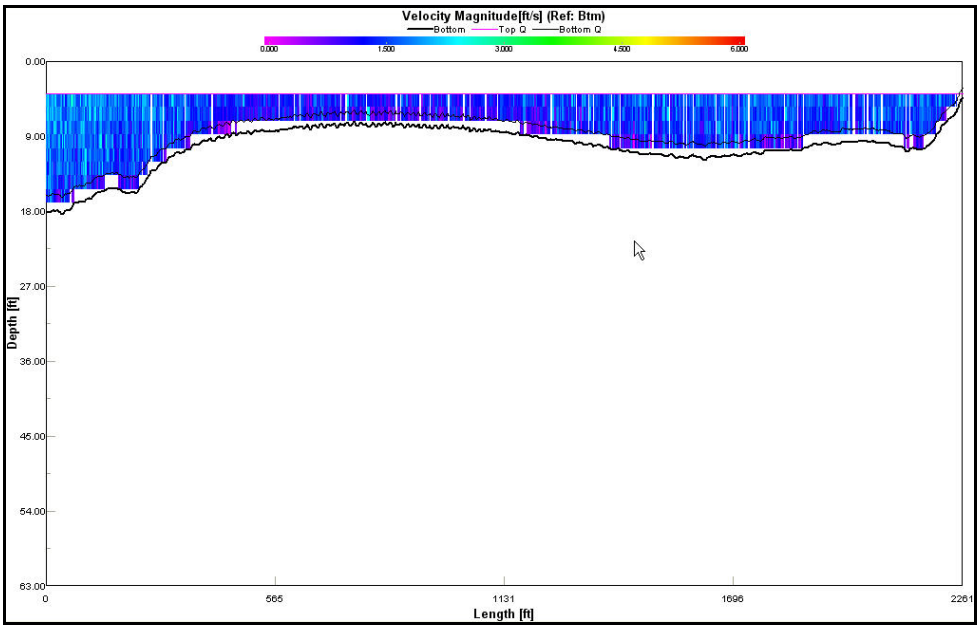


Figure E33.2. Eastern section of Transect 34 current velocity cross section, 11 March 2009, 2021 GMT. Display is from the northwest (left) to the southeast (right).

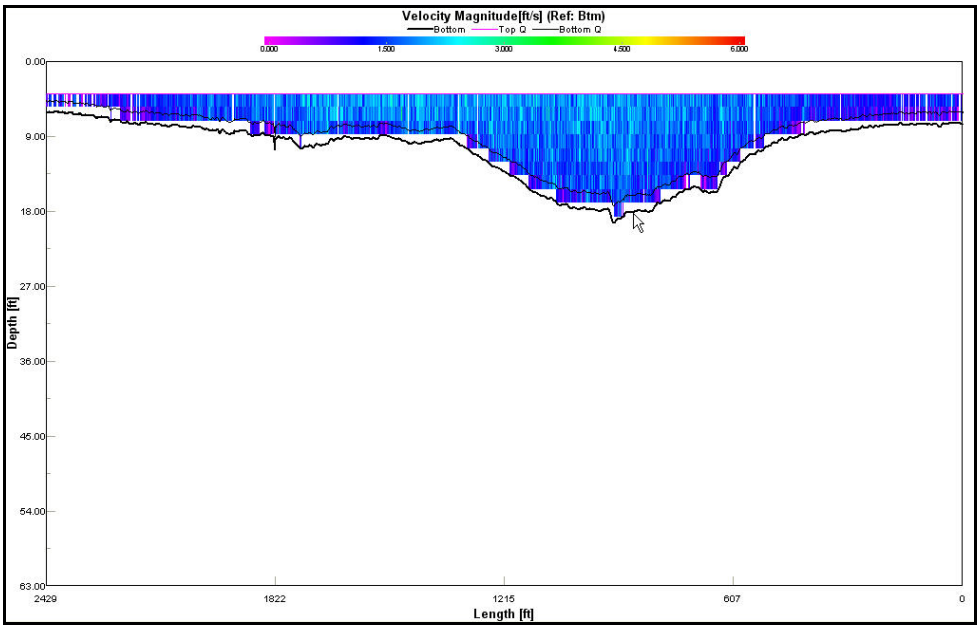


Figure E34.1. Western section of Transect 35 current velocity cross section, 11 March 2009, 2032 GMT. Display is from the northwest (left) to the southeast (right).

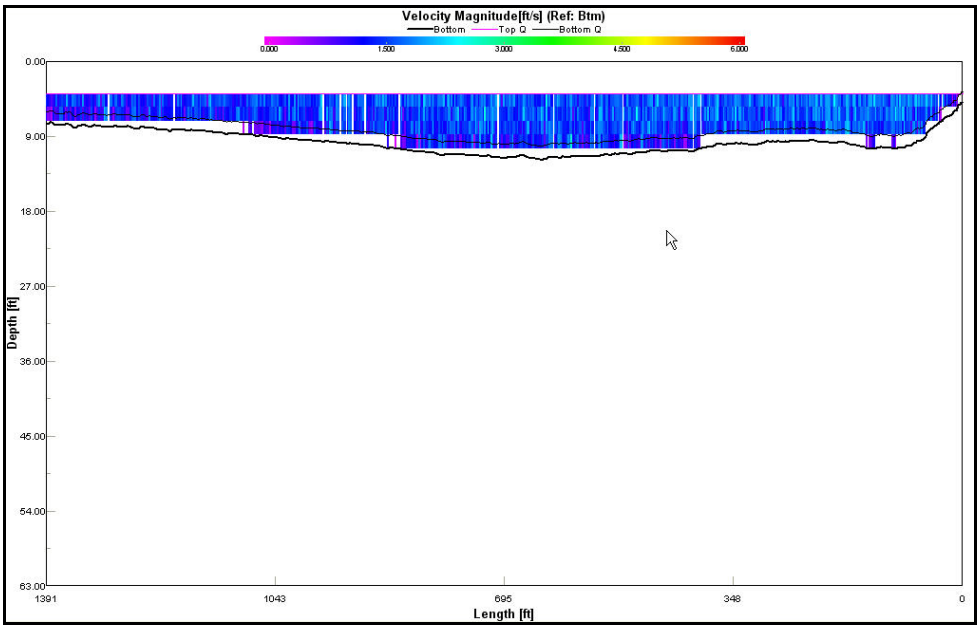


Figure E34.2. Eastern section of Transect 35 current velocity cross section, 11 March 2009, 2032 GMT. Display is from the northwest (left) to the southeast (right).

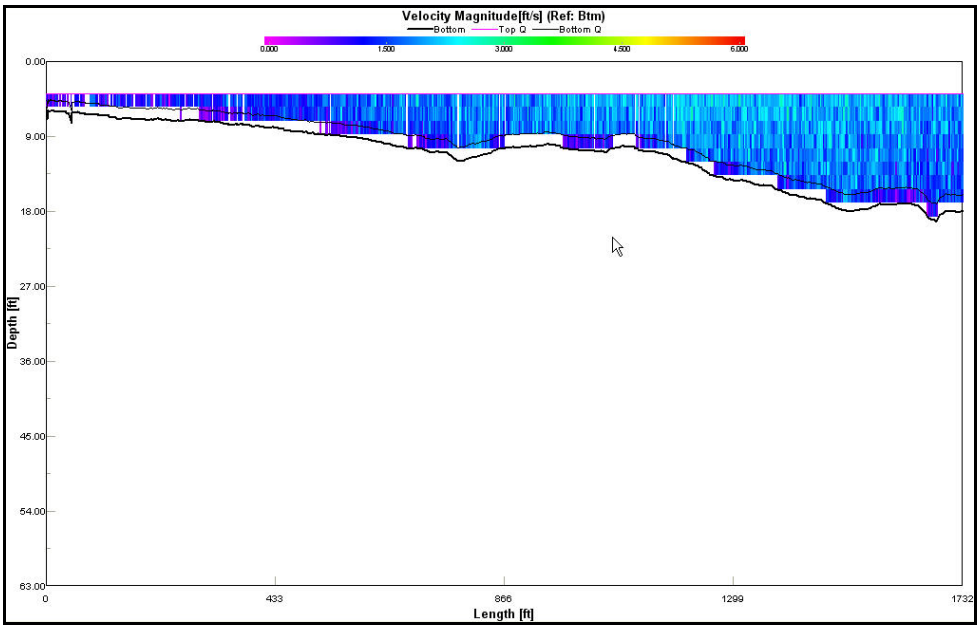


Figure E35.1. Western section of Transect 36 current velocity cross section, 11 March 2009, 2047 GMT. Display is from the northwest (left) to the southeast (right).

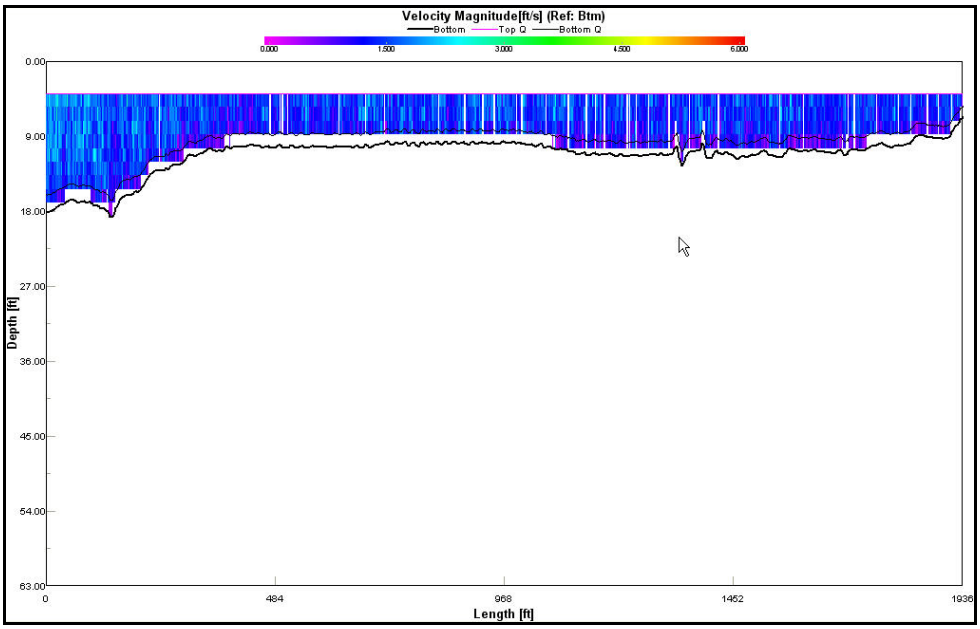


Figure E35.2. Eastern section of Transect 36 current velocity cross section, 11 March 2009, 2047 GMT. Display is from the northwest (left) to the southeast (right).

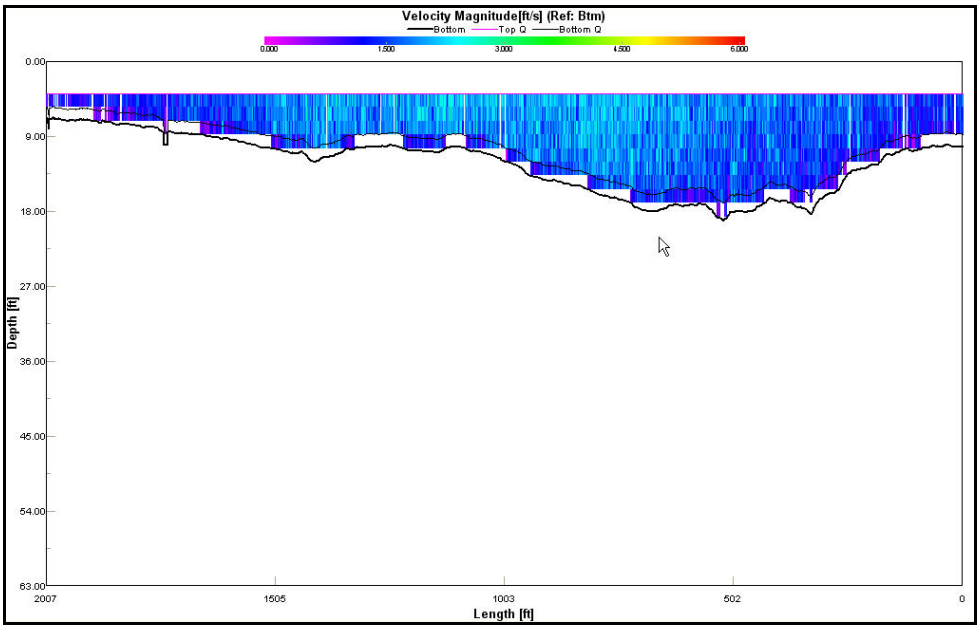


Figure E36.1. Western section of Transect 37 current velocity cross section, 11 March 2009, 2058 GMT. Display is from the northwest (left) to the southeast (right).

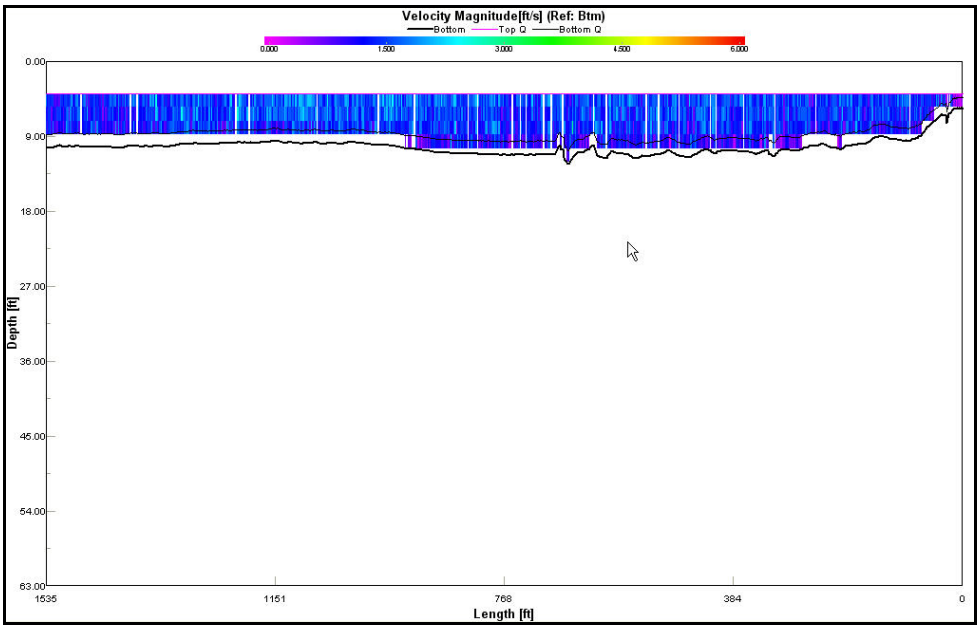


Figure E36.2. Eastern section of Transect 37 current velocity cross section, 11 March 2009, 2058 GMT. Display is from the northwest (left) to the southeast (right).

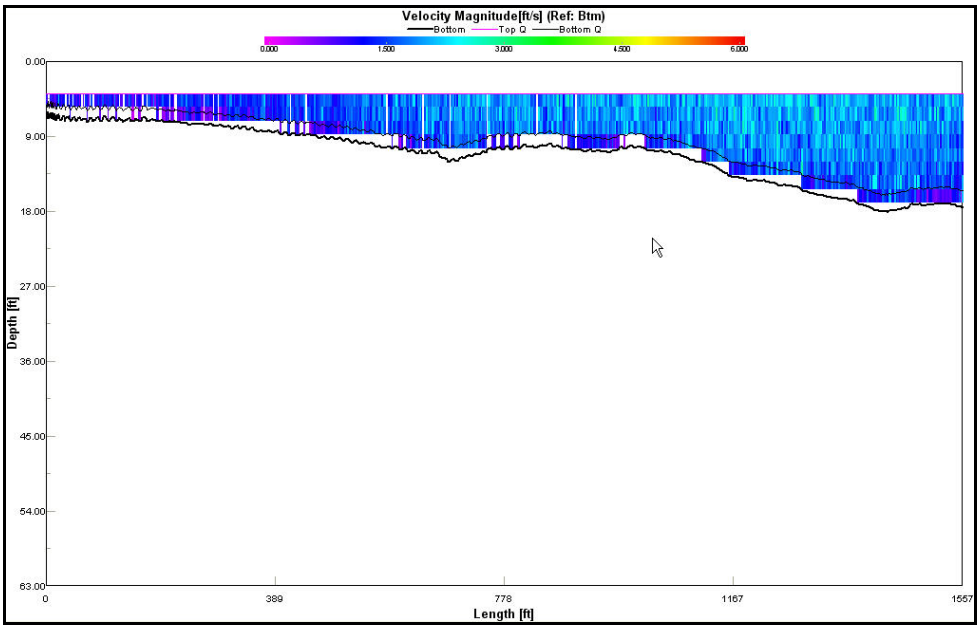


Figure E37.1. Western section of Transect 38 current velocity cross section, 11 March 2009, 2110 GMT. Display is from the northwest (left) to the southeast (right).

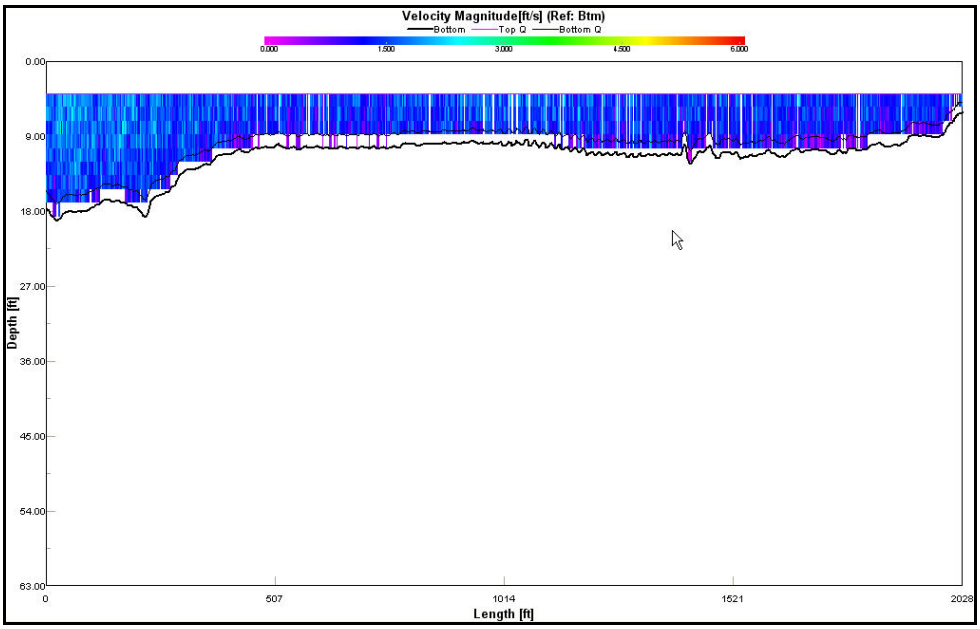


Figure E37.2. Eastern section of Transect 38 current velocity cross section, 11 March 2009, 2110 GMT. Display is from the northwest (left) to the southeast (right).

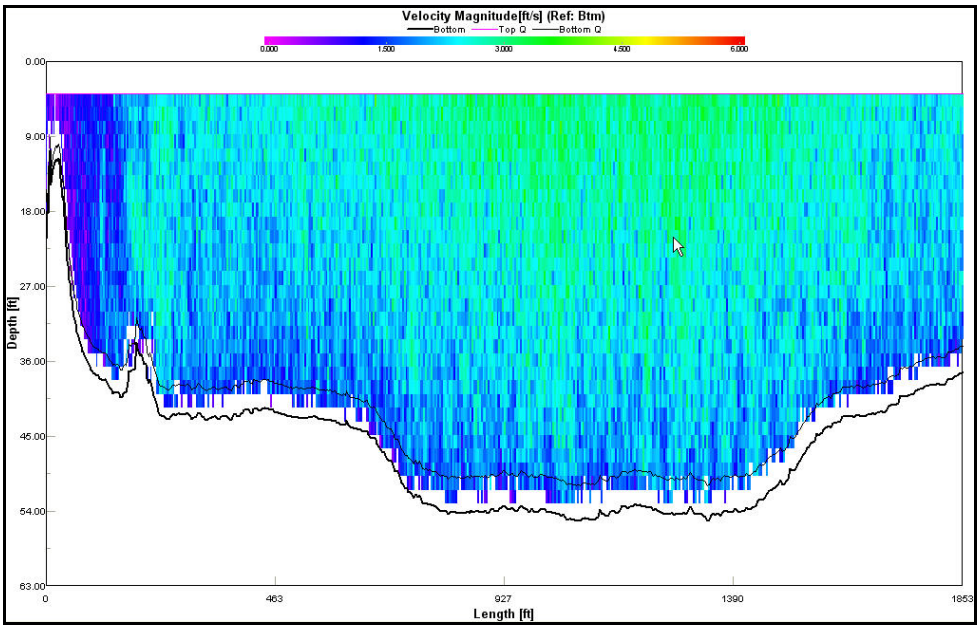


Figure E38.1. Eastern section of Transect 39 current velocity cross section, 11 March 2009, 2128 GMT.

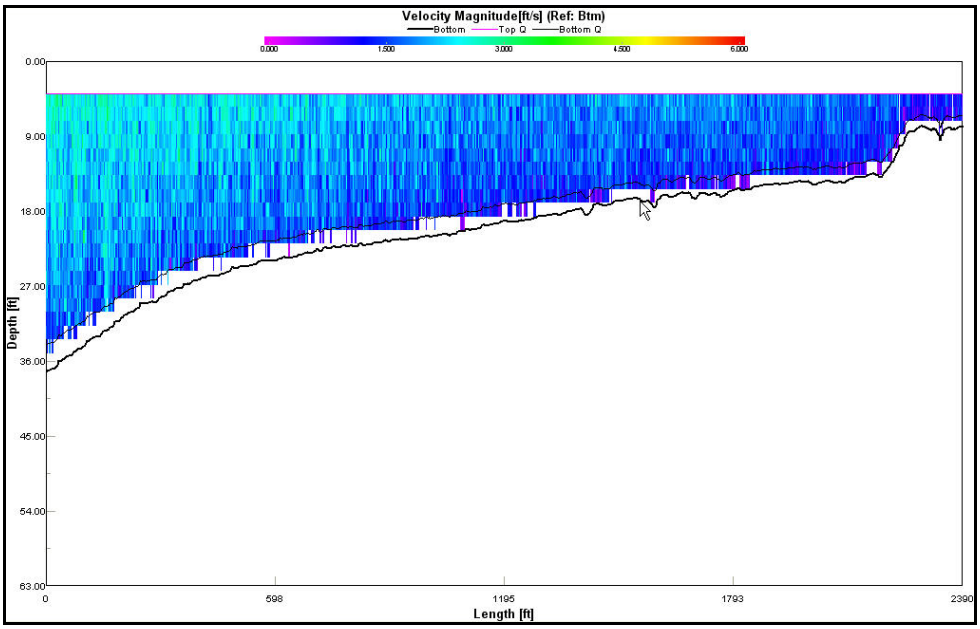


Figure E38.2. Western section of Transect 39 current velocity cross section, 11 March 2009, 2128 GMT.

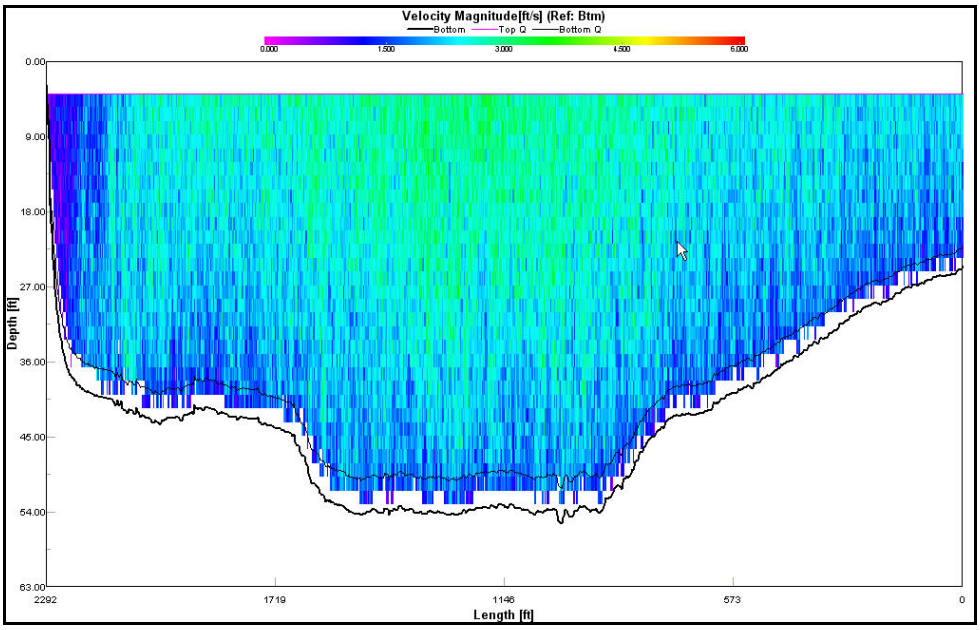


Figure E39.1. Eastern section of Transect 40 current velocity cross section, 11 March 2009, 2138 GMT.

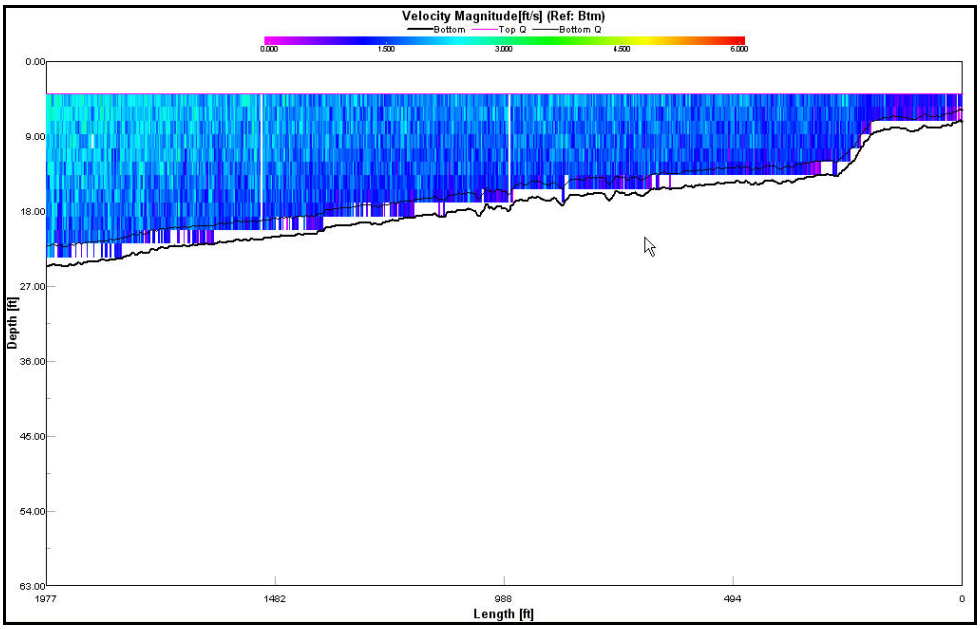


Figure E39.2. Western section of Transect 40 current velocity cross section, 11 March 2009, 2138 GMT.

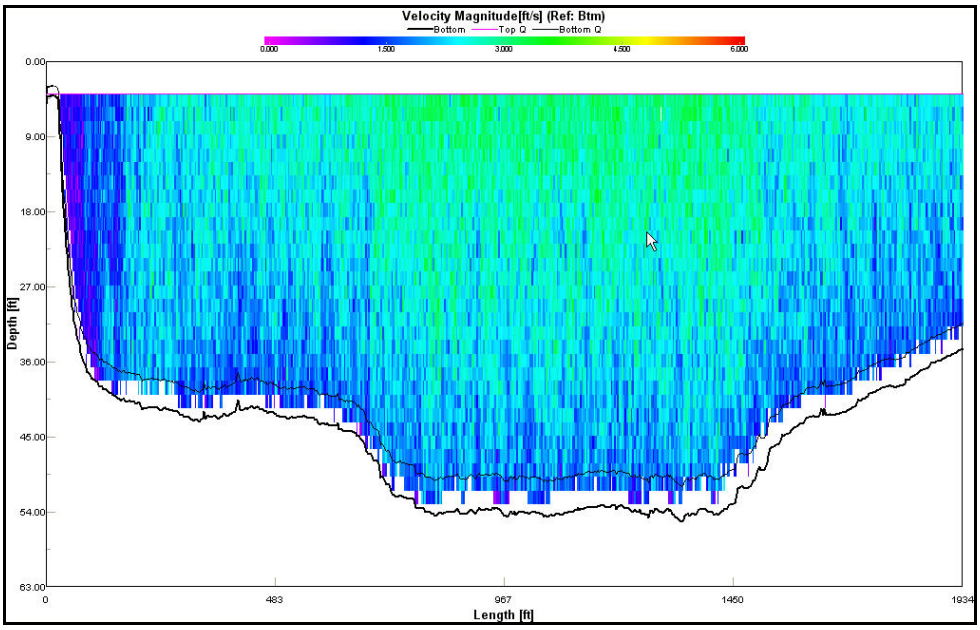


Figure E40.1. Eastern section of Transect 41 current velocity cross section, 11 March 2009, 2150 GMT.

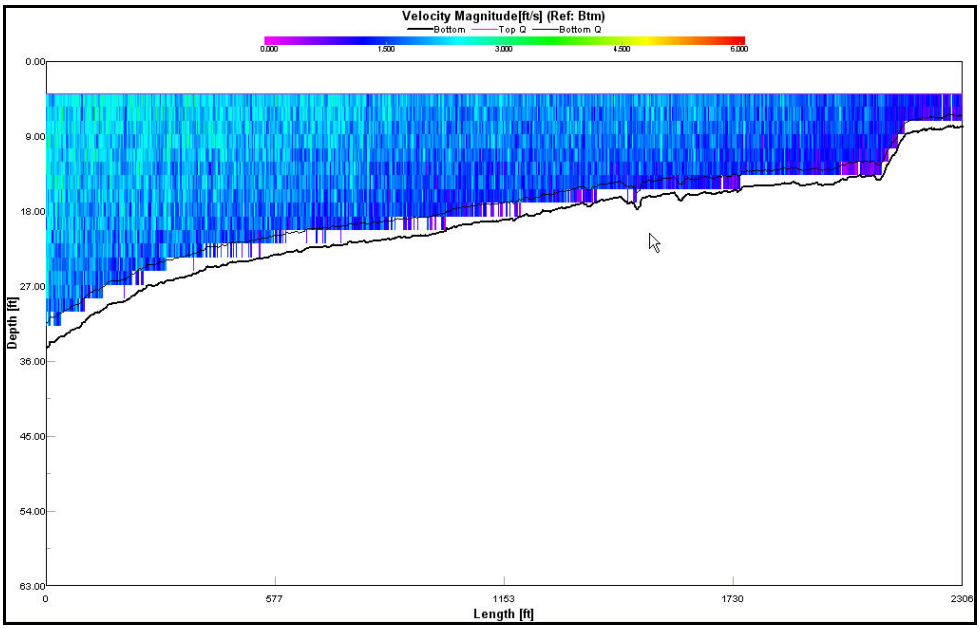


Figure E40.2. Western section of Transect 41 current velocity cross section, 11 March 2009, 2150 GMT.

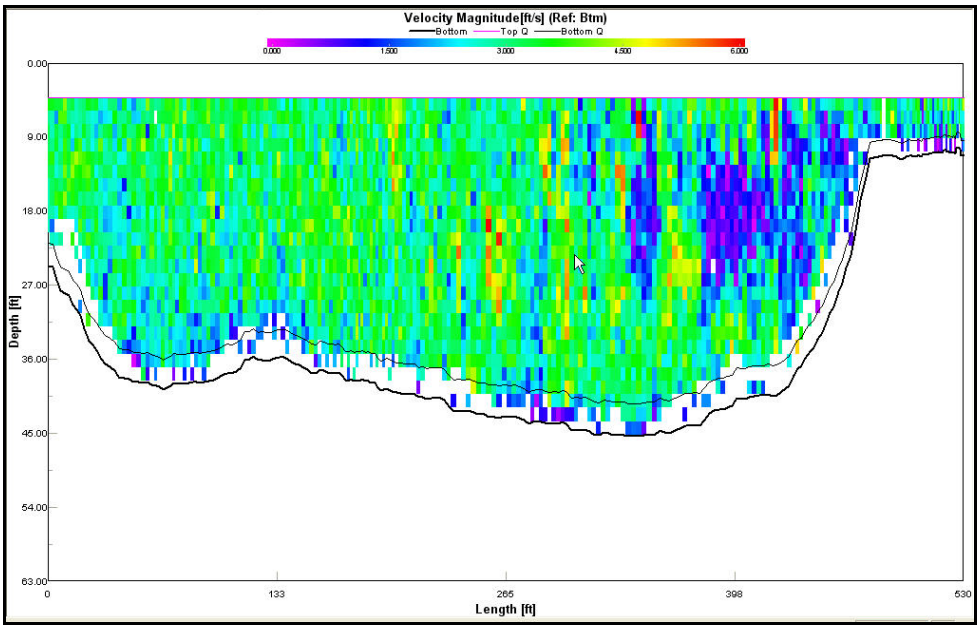


Figure E41. Transect 44 current velocity cross section, 22 April 2009, 1726 GMT. Display is from the northwest (left) to the southeast (right).

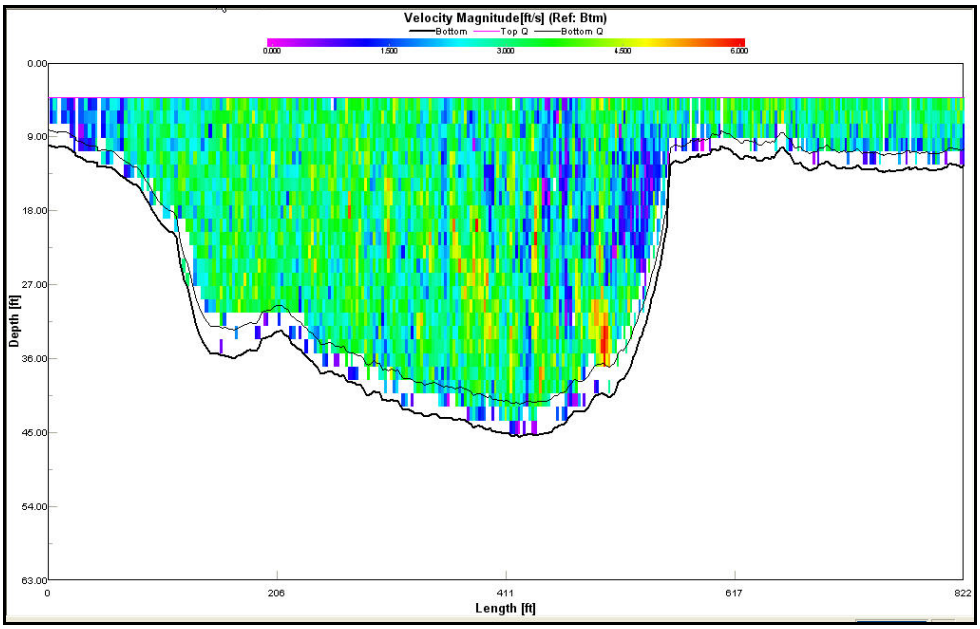


Figure E42. Transect 45 current velocity cross section, 22 April 2009, 1730 GMT. Display is from the northwest (left) to the southeast (right).

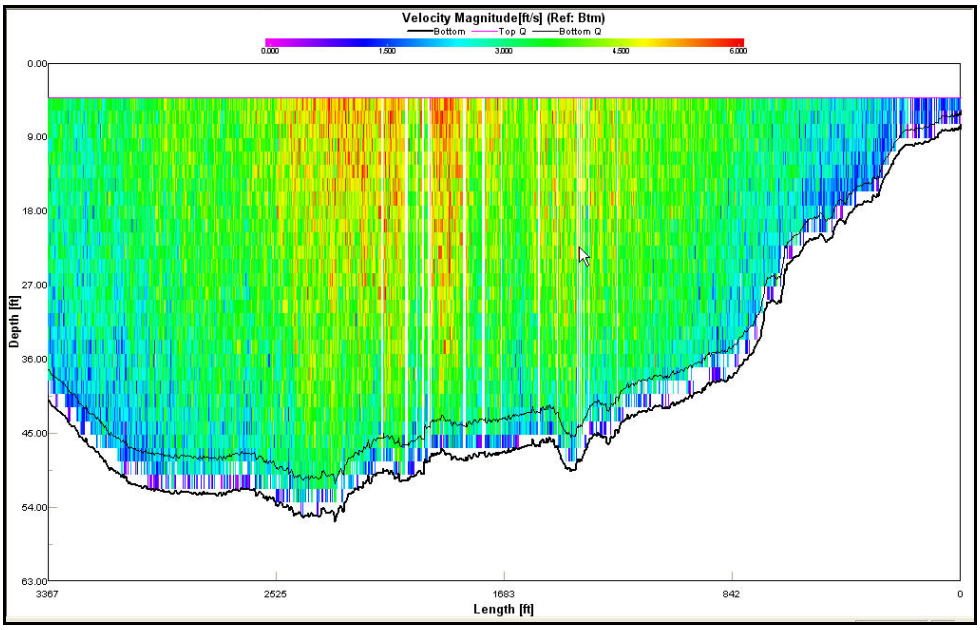


Figure E43.1. Eastern section of Transect 46 current velocity cross section, 22 April 2009, 1800 GMT

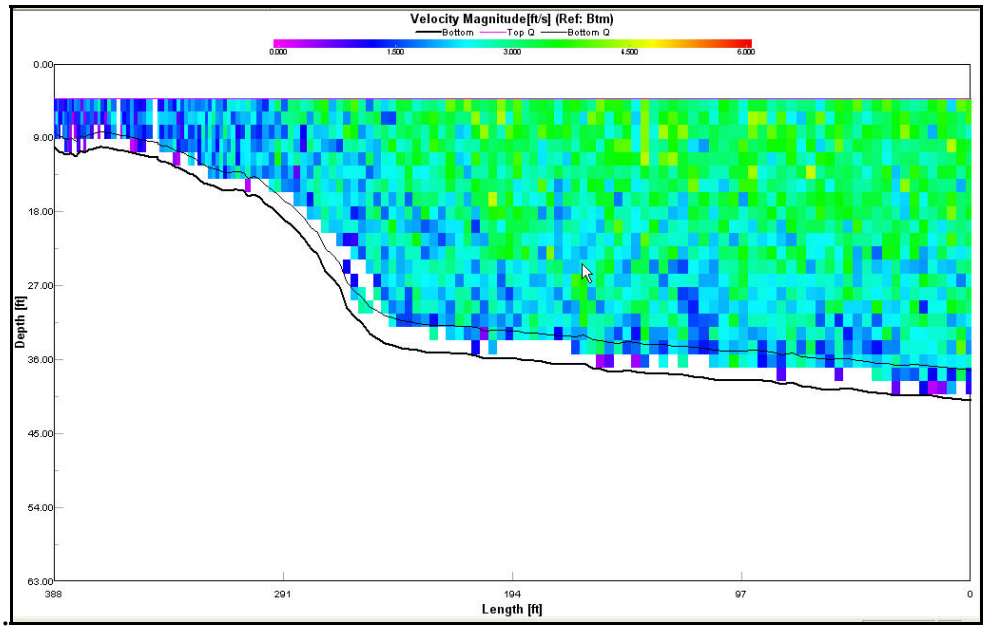


Figure E43.2. Western section of Transect 46 current velocity cross section, 22 April 2009, 1800 GMT.

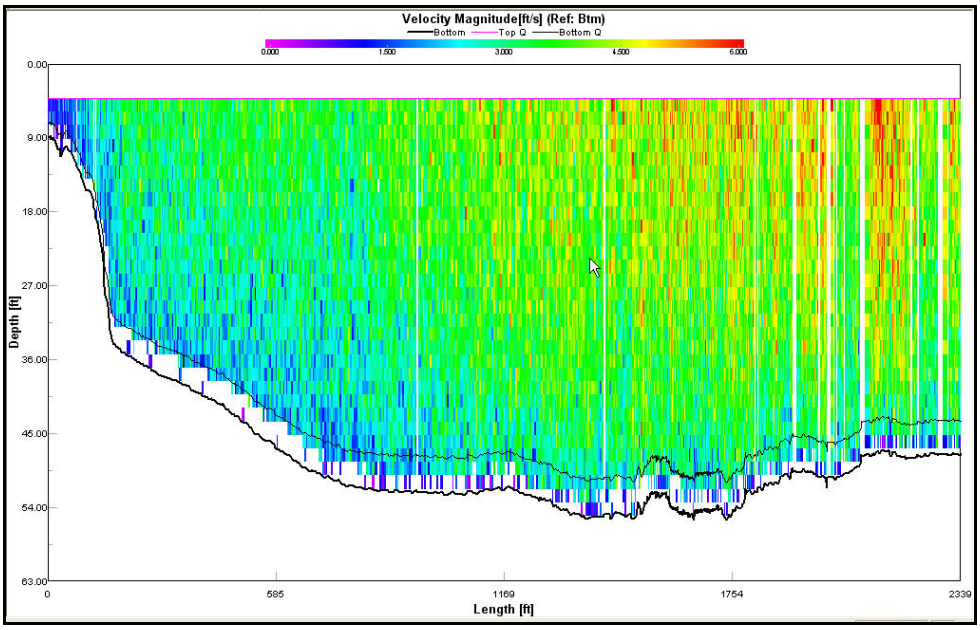


Figure E44.1. Eastern section of Transect 47 current velocity cross section, 22 April 2009, 1811 GMT.

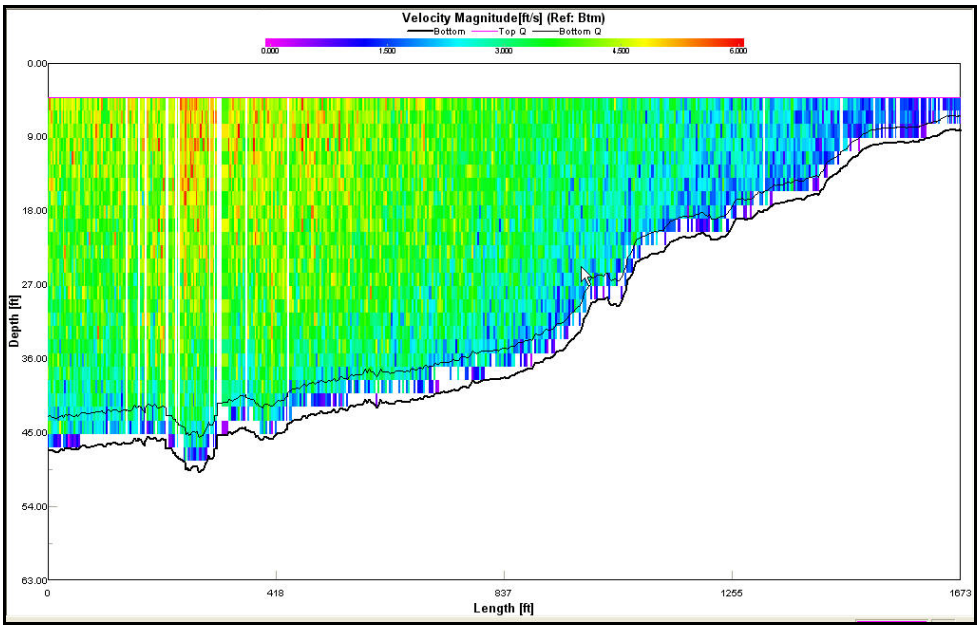


Figure E44.2. Western section of Transect 47 current velocity cross section, 22 April 2009, 1811 GMT.

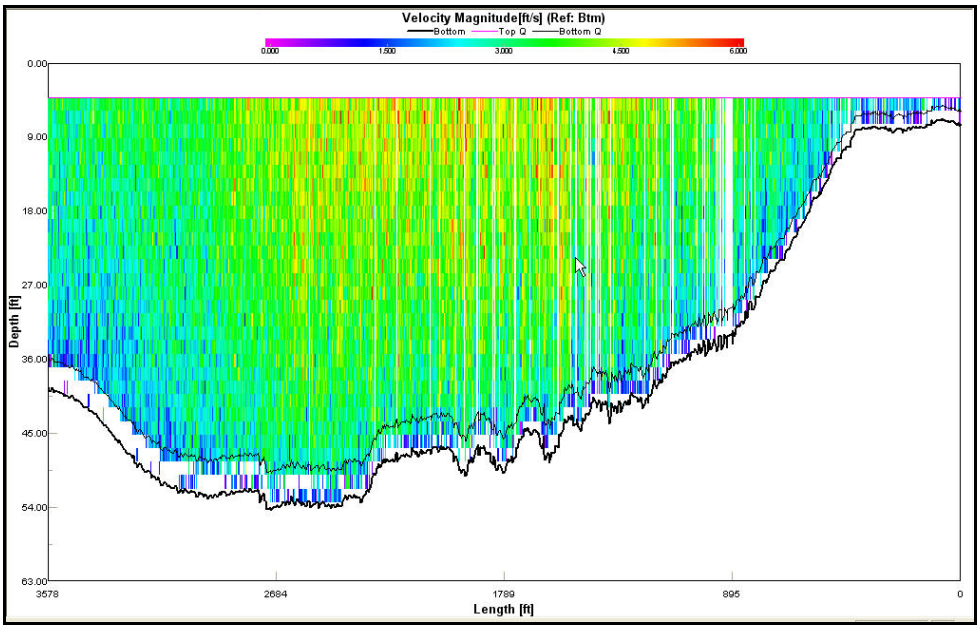


Figure E45.1. Eastern section of Transect 48 current velocity cross section, 22 April 2009, 1834 GMT.

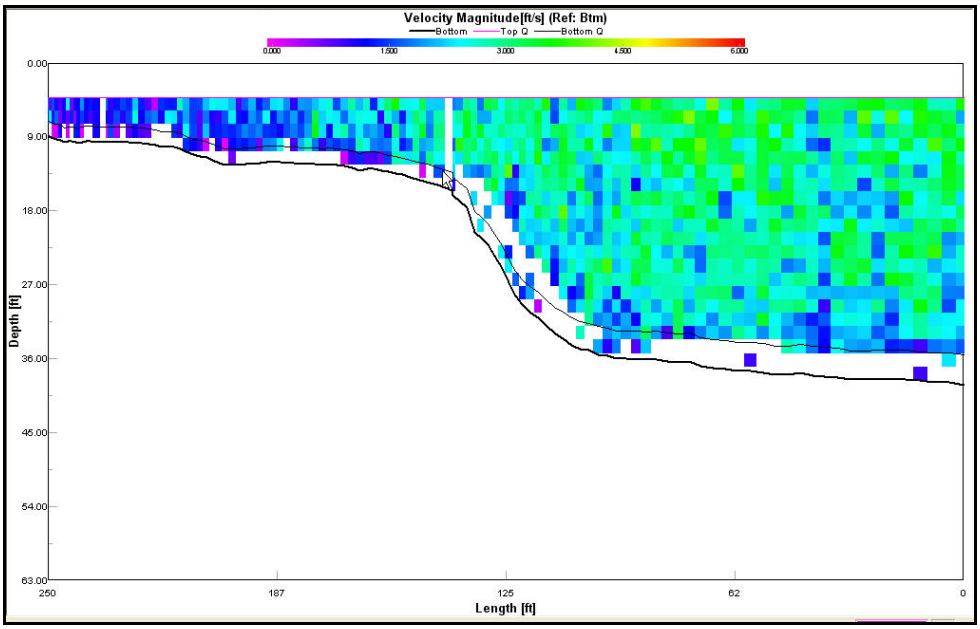


Figure E45.2. Western section of Transect 48 current velocity cross section, 22 April 2009, 1834 GMT.

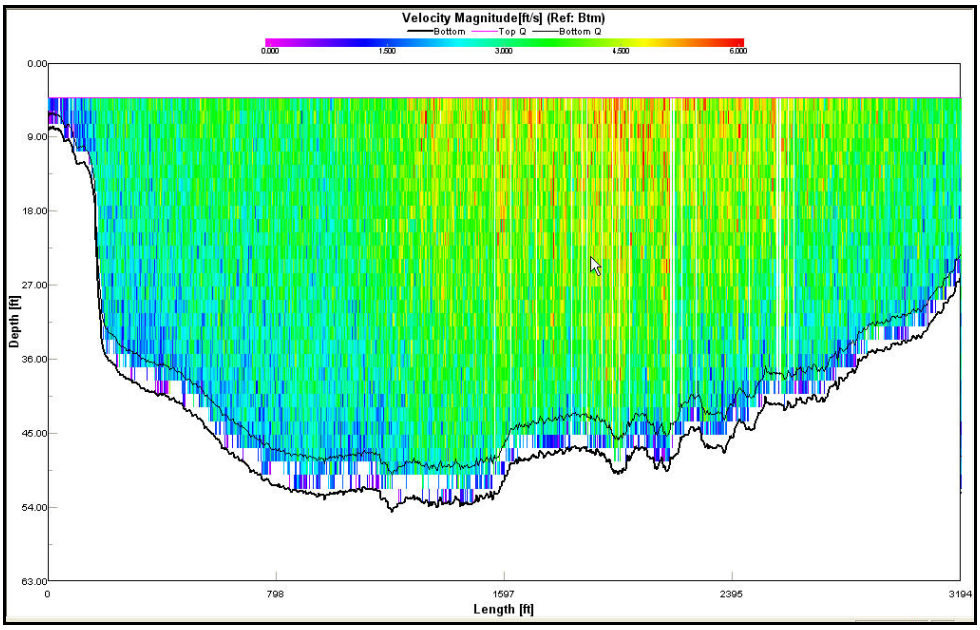


Figure E46.1. Eastern section of Transect 49 current velocity cross section, 22 April 2009, 1845 GMT.

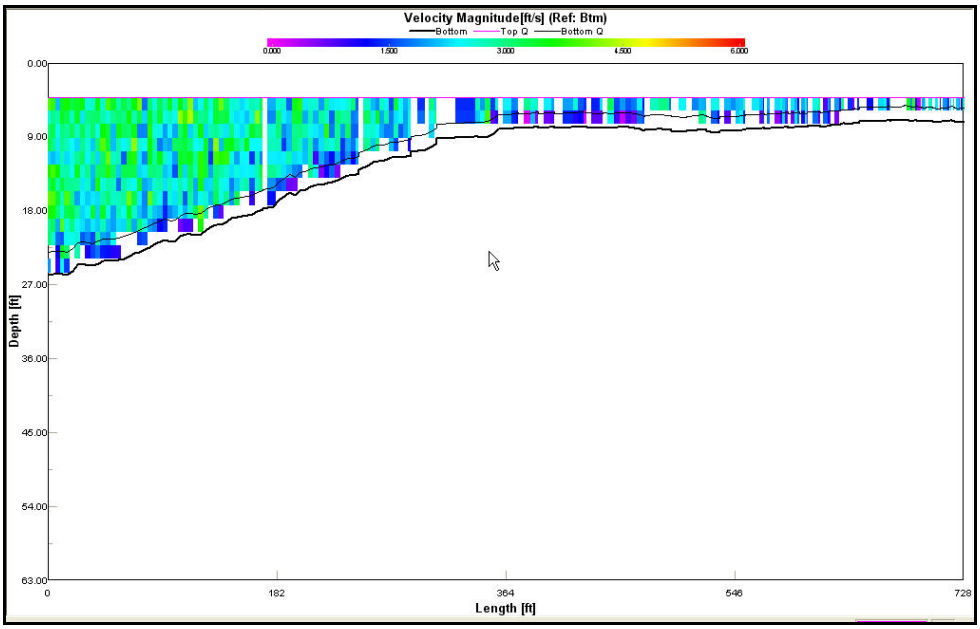


Figure E46.2. Western section of Transect 49 current velocity cross section, 22 April 2009, 1845 GMT.

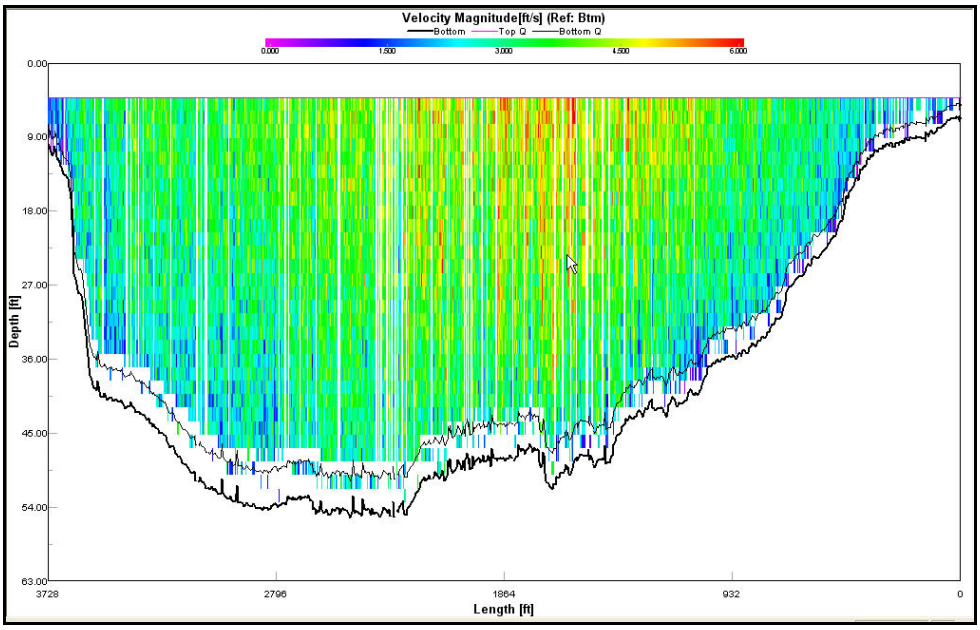


Figure E47. Transect 50 current velocity cross section, 22 April 2009, 1859 GMT.

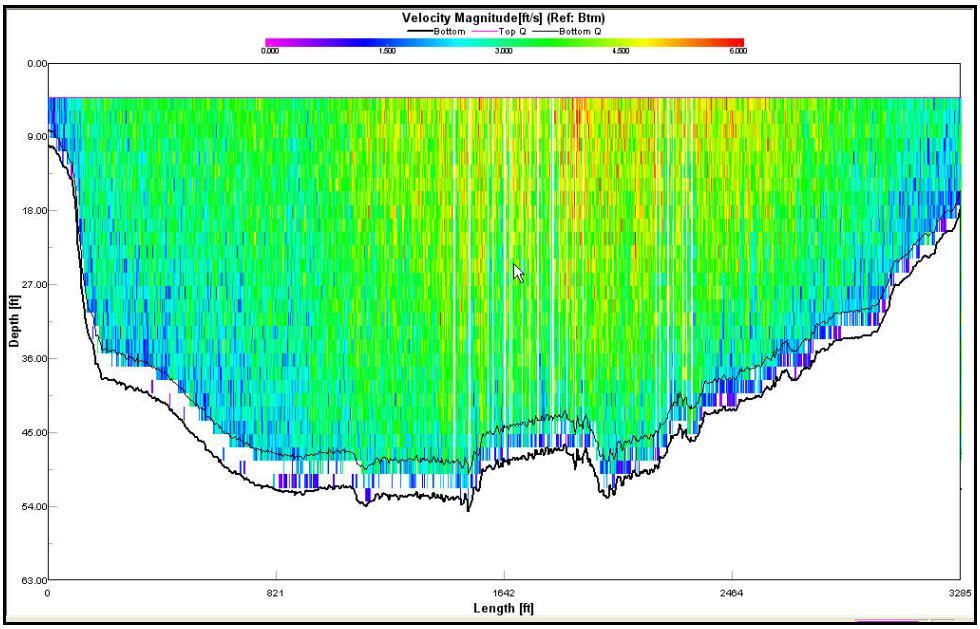


Figure E48. Transect 51 current velocity cross section, 22 April 2009, 1917 GMT.

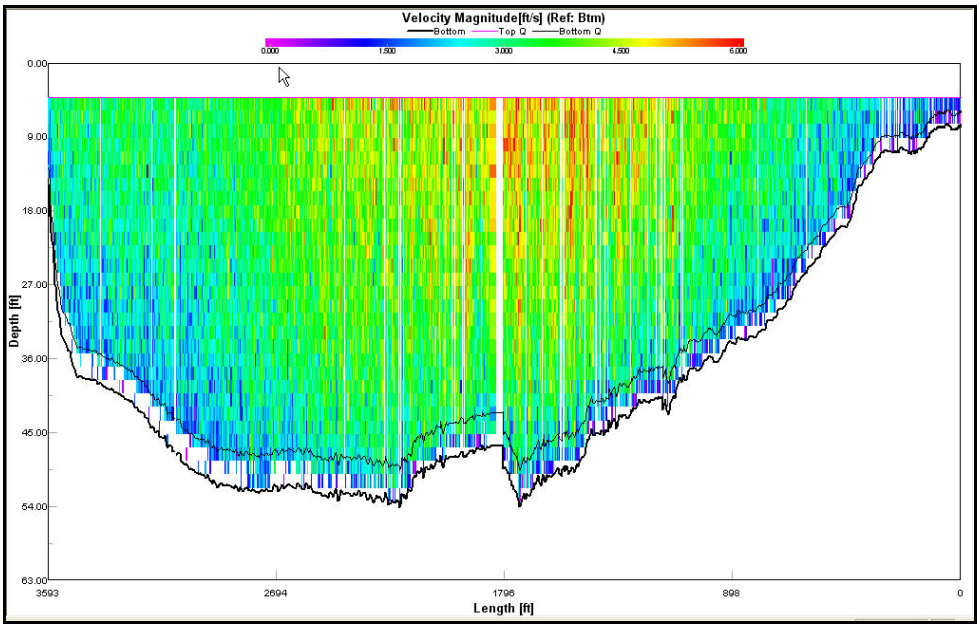


Figure E49. Transect 52 current velocity cross section, 22 April 2009, 1928 GMT.

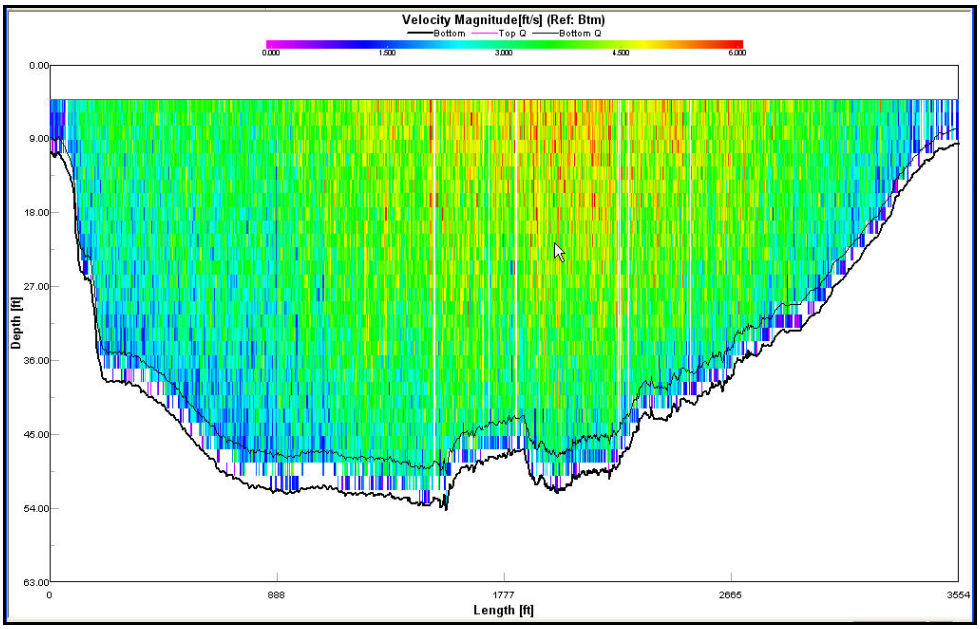


Figure E50. Transect 53 current velocity cross section, 22 April 2009, 1939 GMT.

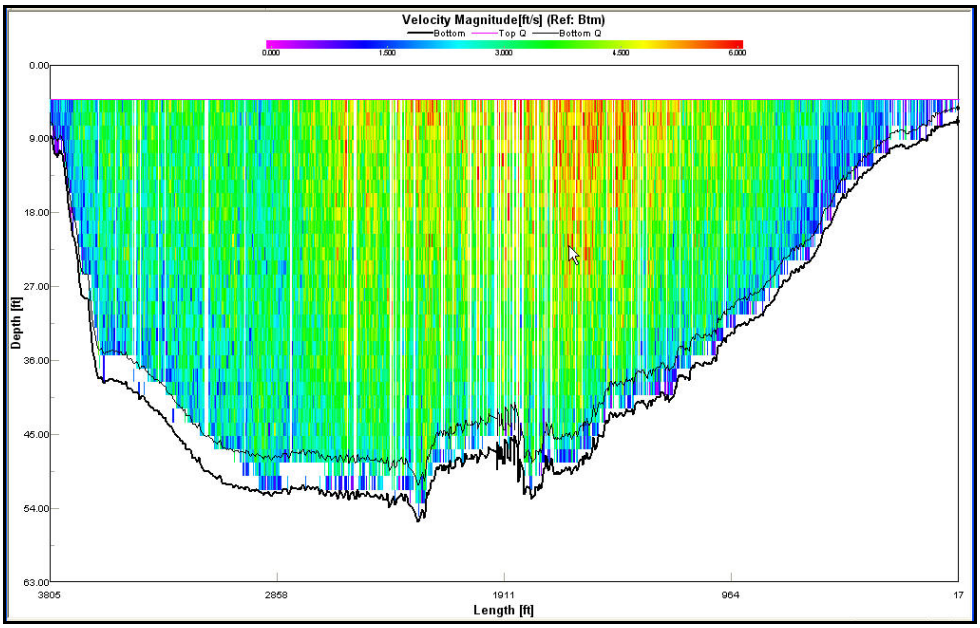


Figure E51. Transect 54 current velocity cross section, 22 April 2009, 1953 GMT.

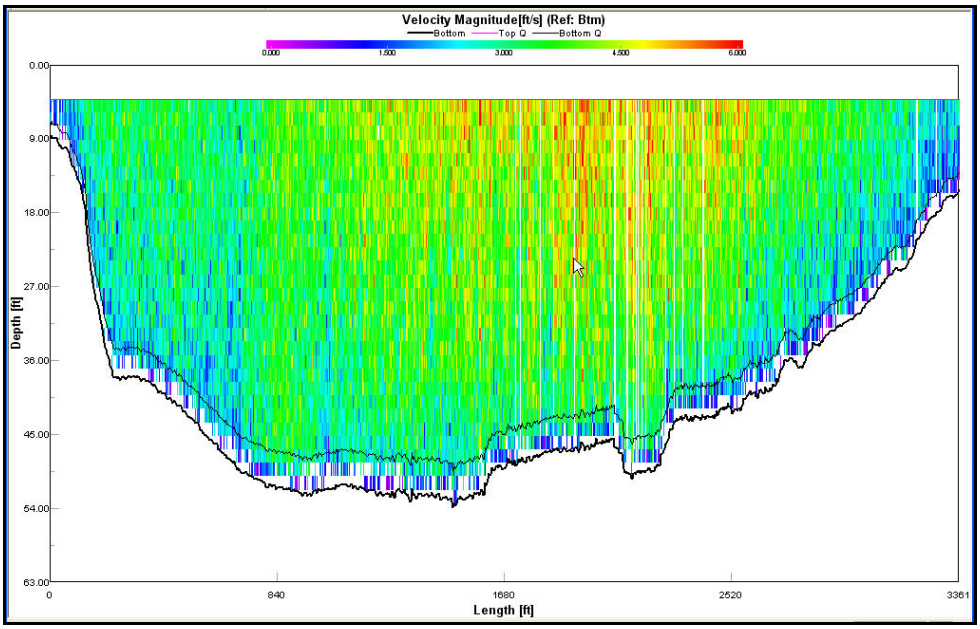


Figure E52. Transect 55 current velocity cross section, 22 April 2009, 2003 GMT.

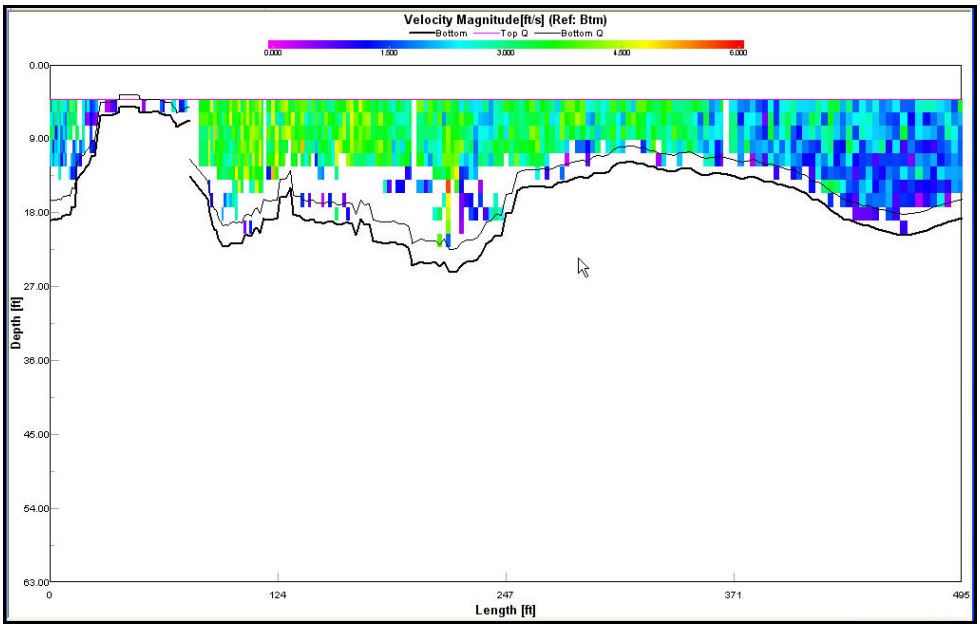


Figure E53.1. Eastern section of Transect 57 current velocity cross section, 22 April 2009, 2026 GMT.

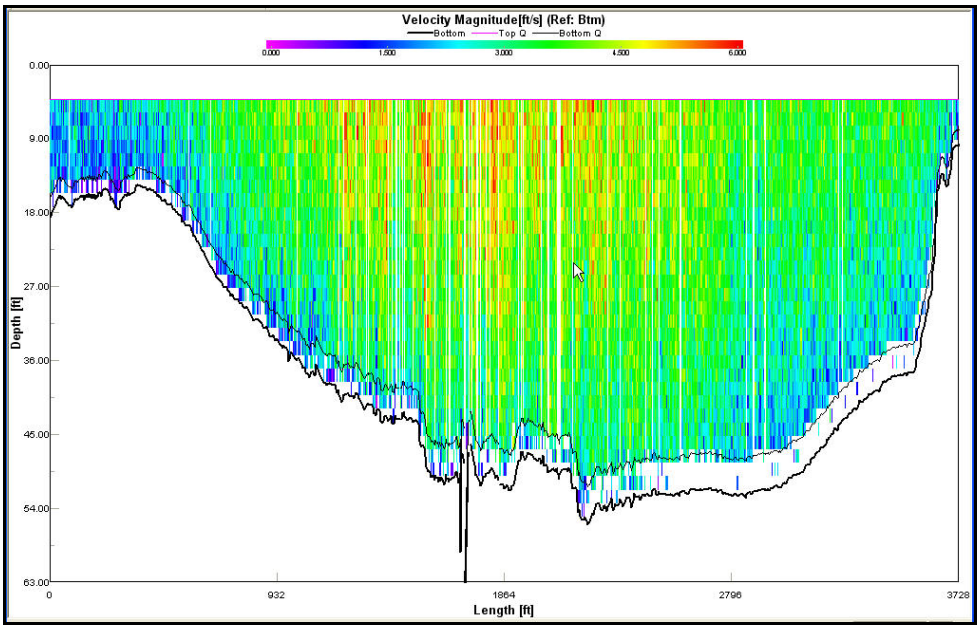


Figure E53.2. Western section of Transect 57 current velocity cross section, 22 April 2009, 2026 GMT.

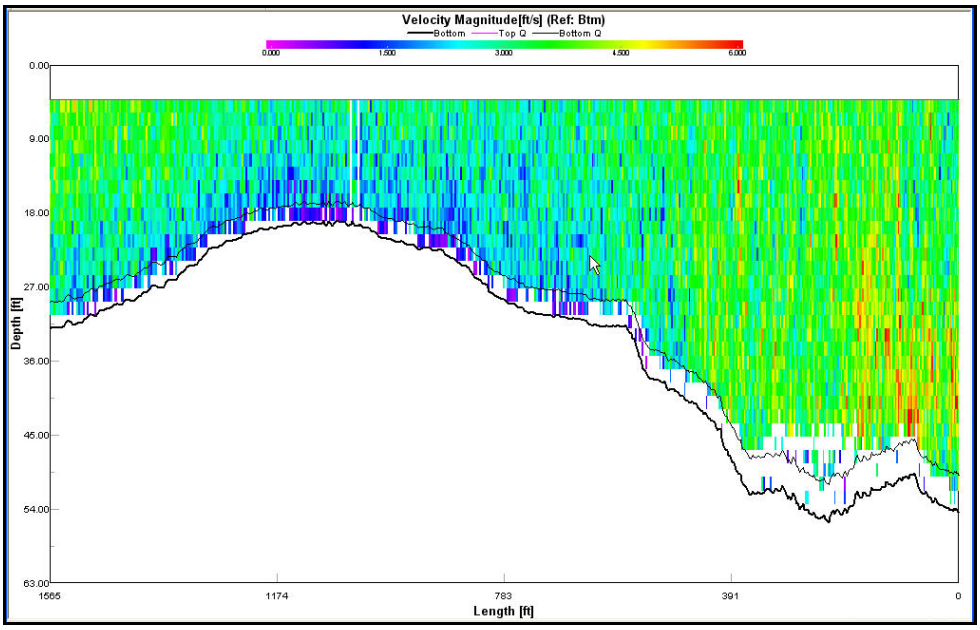


Figure E54.1. Eastern section of Transect 58 current velocity cross section, 22 April 2009, 2046 GMT.

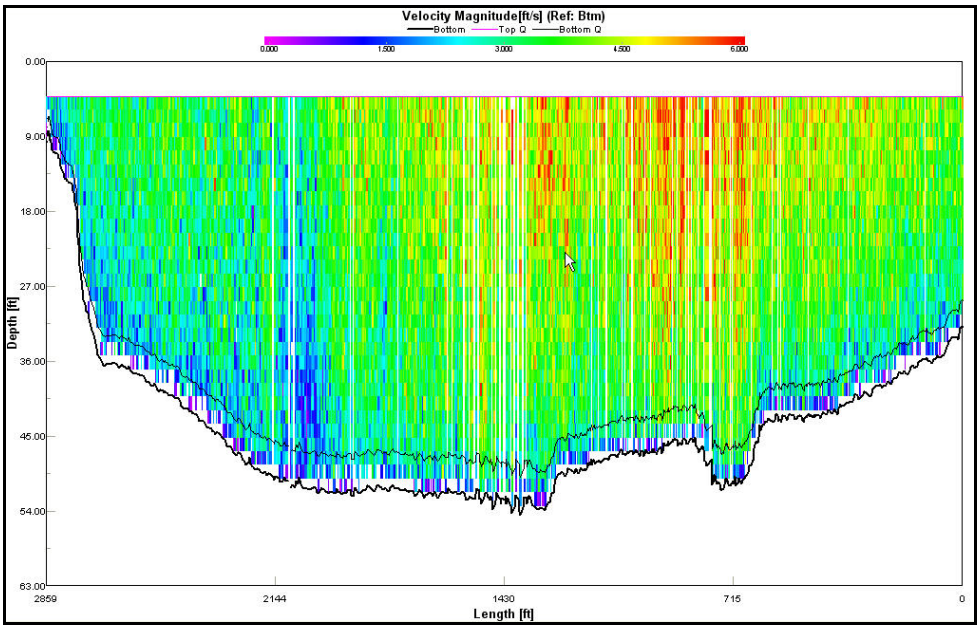


Figure E54.2. Western section of Transect 58 current velocity cross section, 22 April 2009, 2046 GMT.

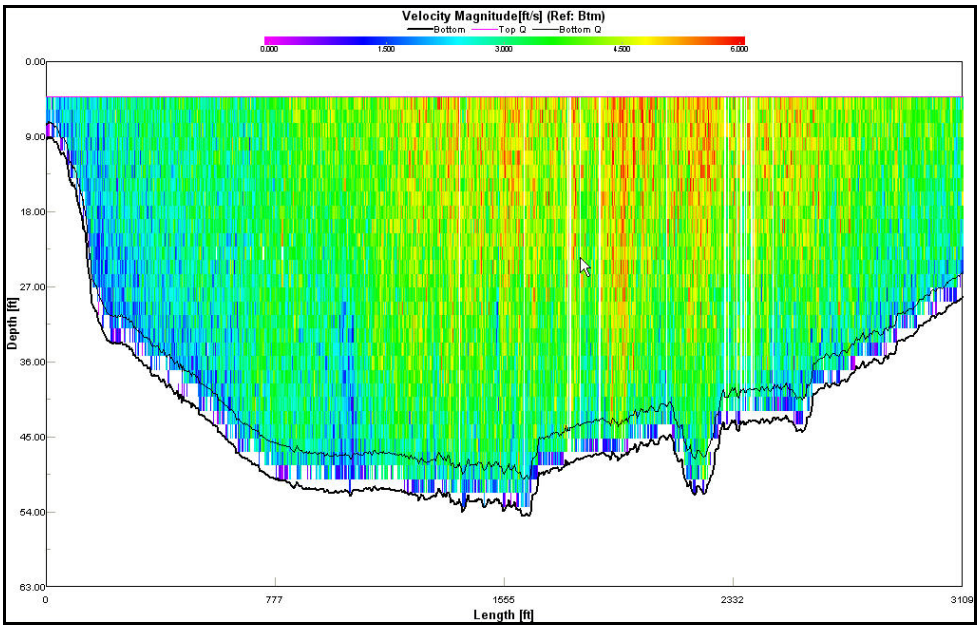


Figure E55.1. Eastern section of Transect 59 current velocity cross section, 22 April 2009, 2059 GMT.

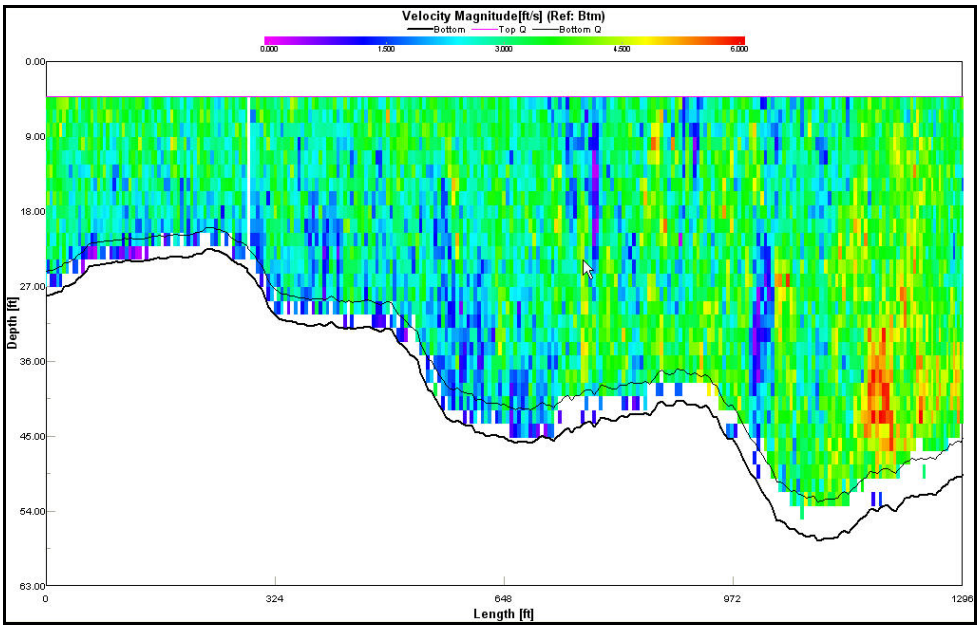


Figure E55.2. Western section of Transect 59 current velocity cross section, 22 April 2009, 2059 GMT.

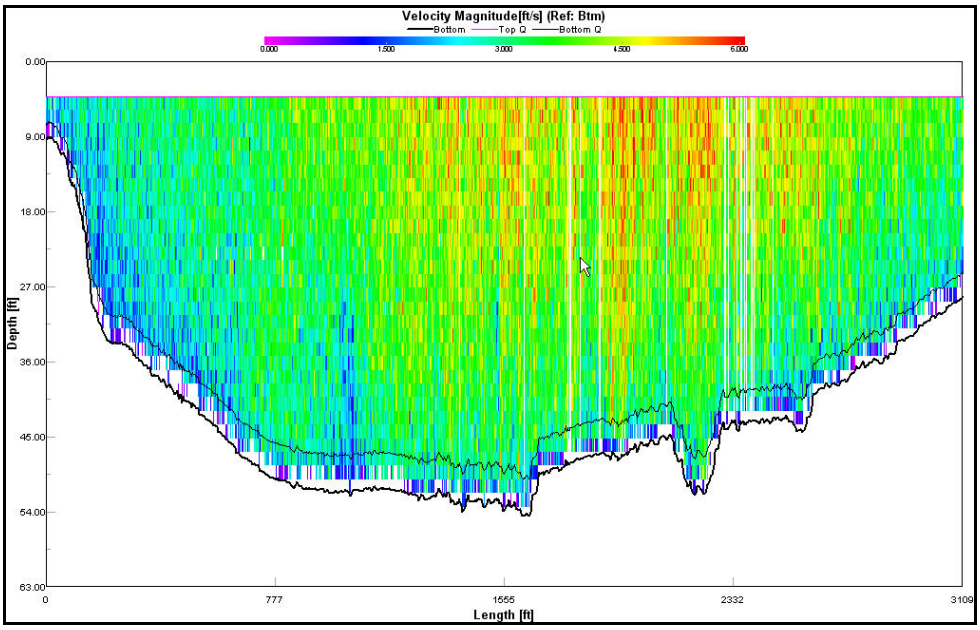


Figure E56.1. Eastern section of Transect 60 current velocity cross section, 22 April 2009, 2110 GMT.

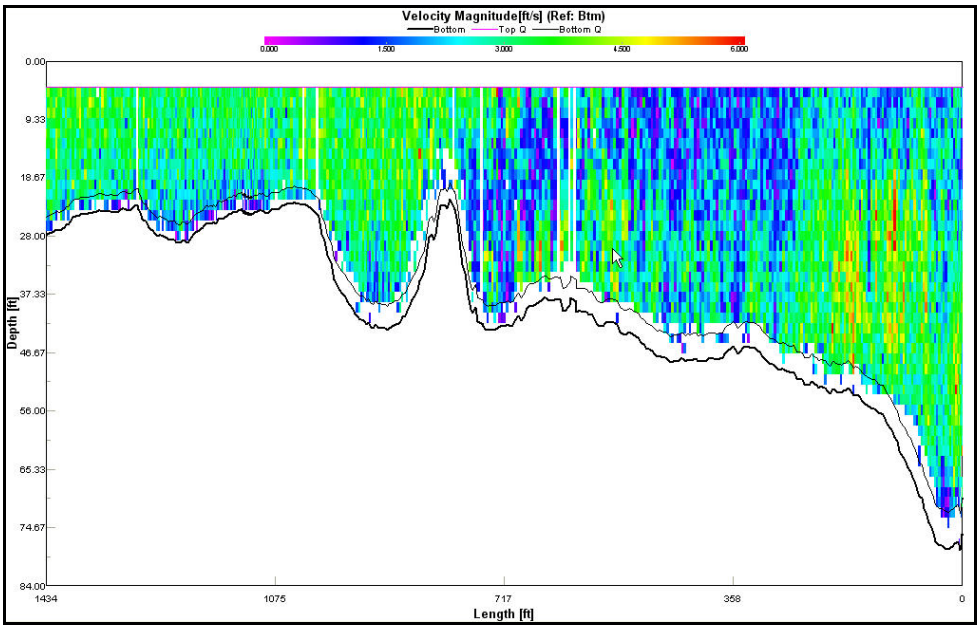


Figure E56.2. Western section of Transect 60 current velocity cross section, 22 April 2009, 2110 GMT.

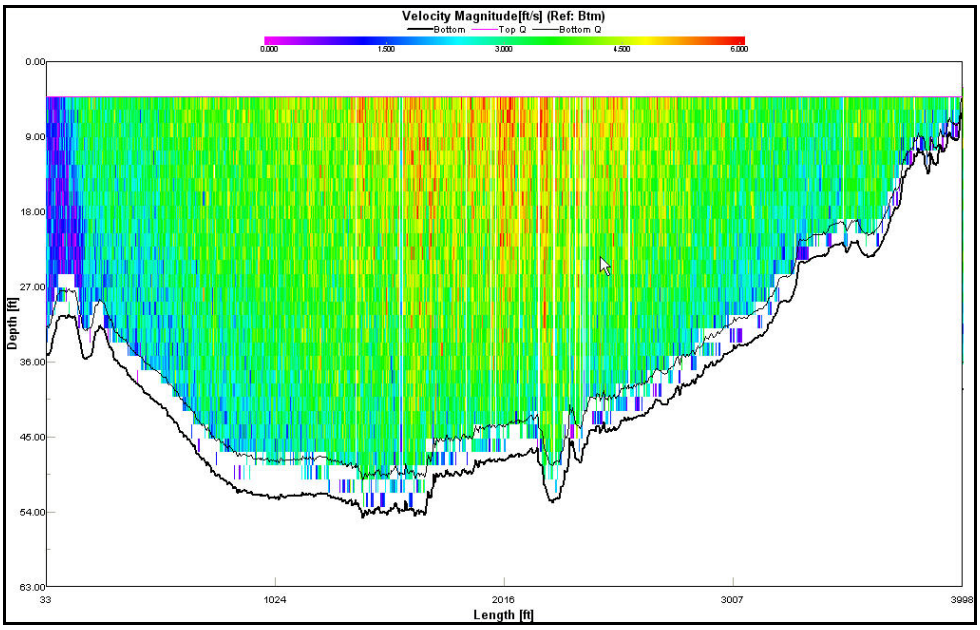


Figure E57. Transect 61 current velocity cross section, 22 April 2009, 2121 GMT.

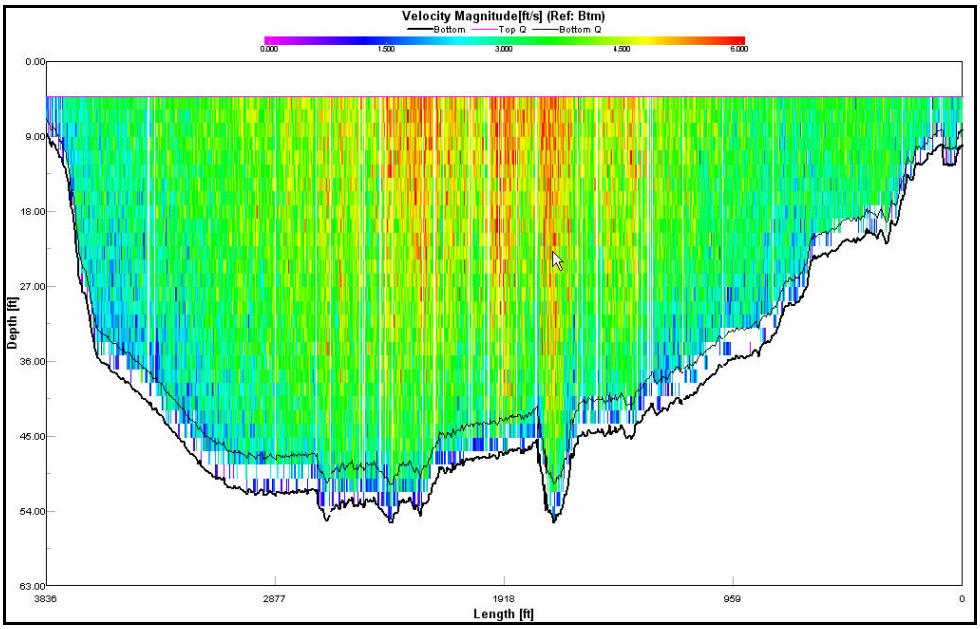


Figure E58. Transect 62 current velocity cross section, 22 April 2009, 2131 GMT.

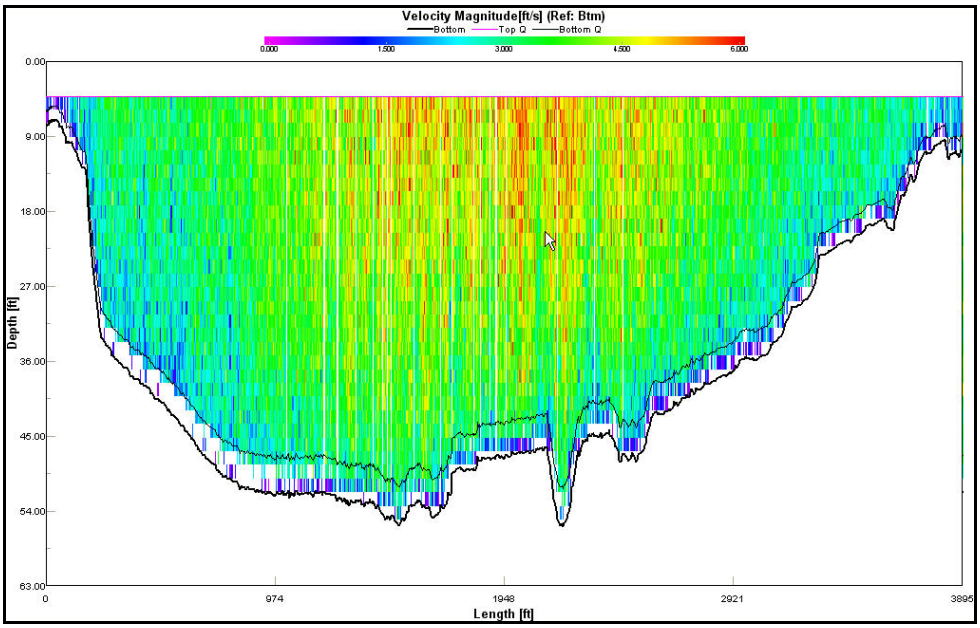


Figure E59. Transect 63 current velocity cross section, 22 April 2009, 2140 GMT.

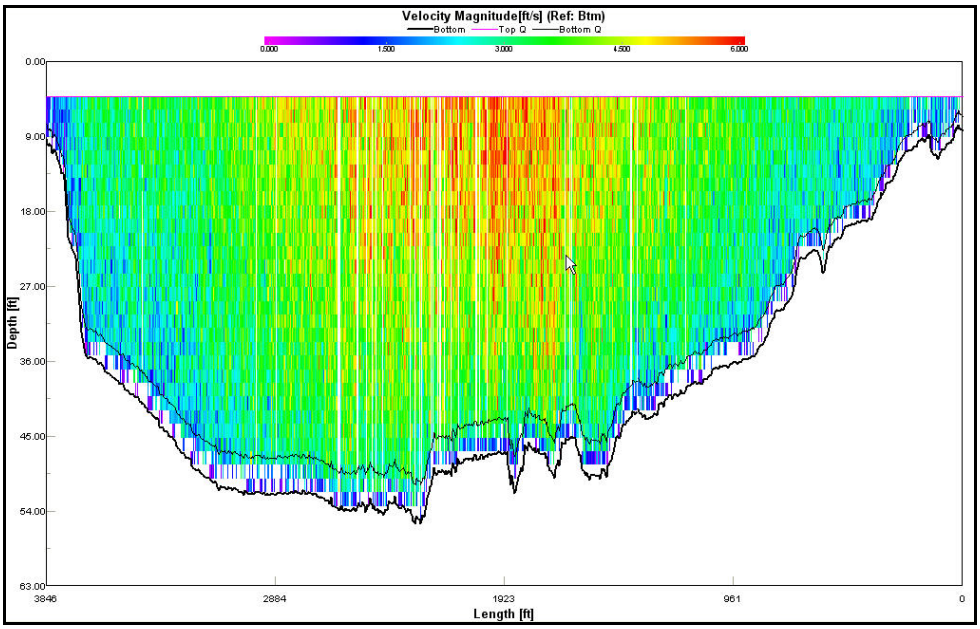


Figure E60. Transect 64 current velocity cross section, 22 April 2009, 2152 GMT.

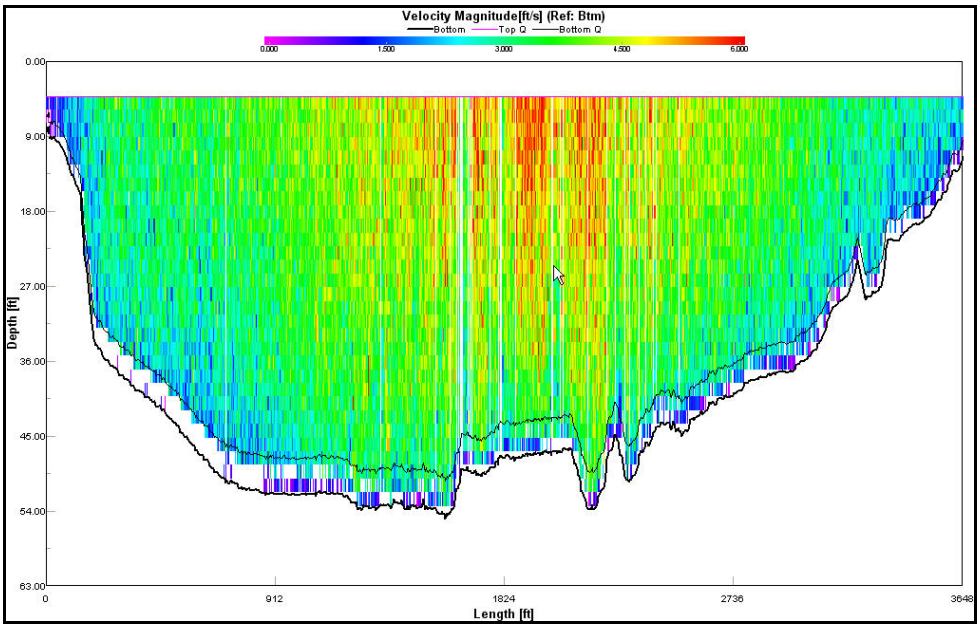


Figure E61. Transect 65 current velocity cross section, 22 April 2009, 2201 GMT.

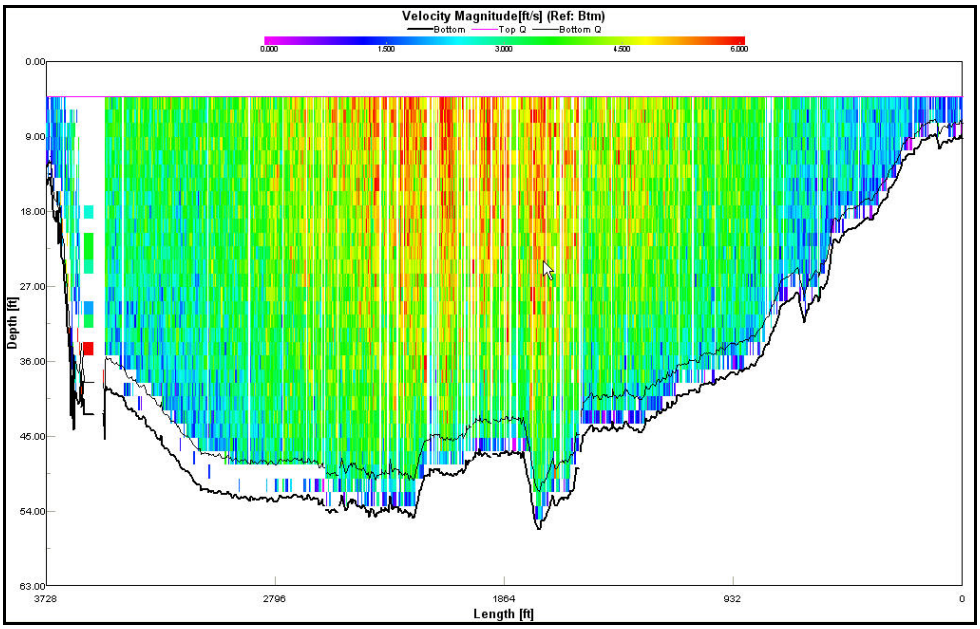


Figure E62. Transect 66 current velocity cross section, 22 April 2009, 2212 GMT.

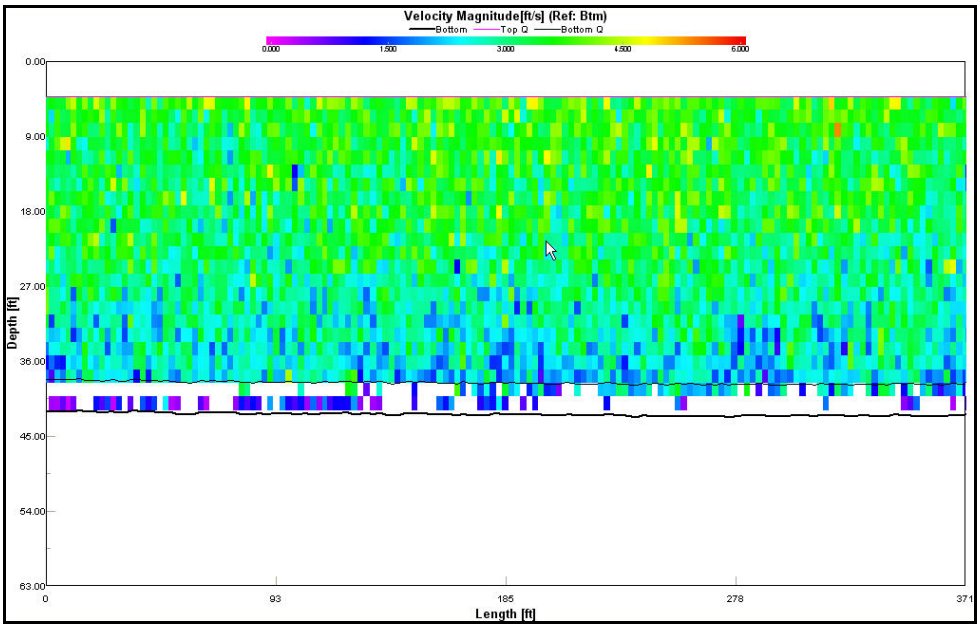


Figure E63. Transect 69 current velocity cross section, 22 April 2009, 2227 GMT. Display is from the northwest (left) to the southeast (right).

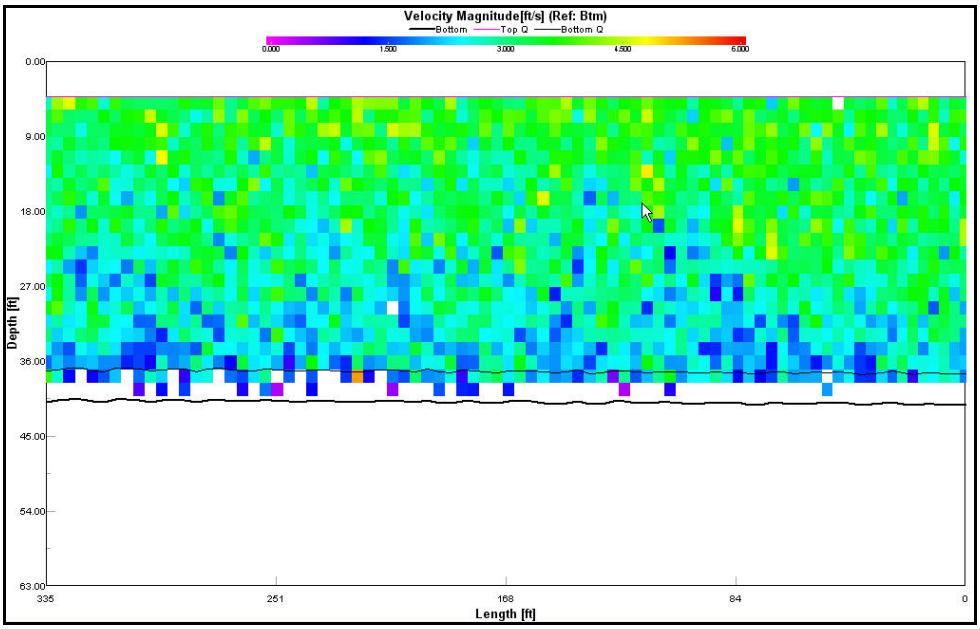


Figure E64. Transect 70 current velocity cross section, 22 April 2009, 2228 GMT. Display is from the northwest (left) to the southeast (right).

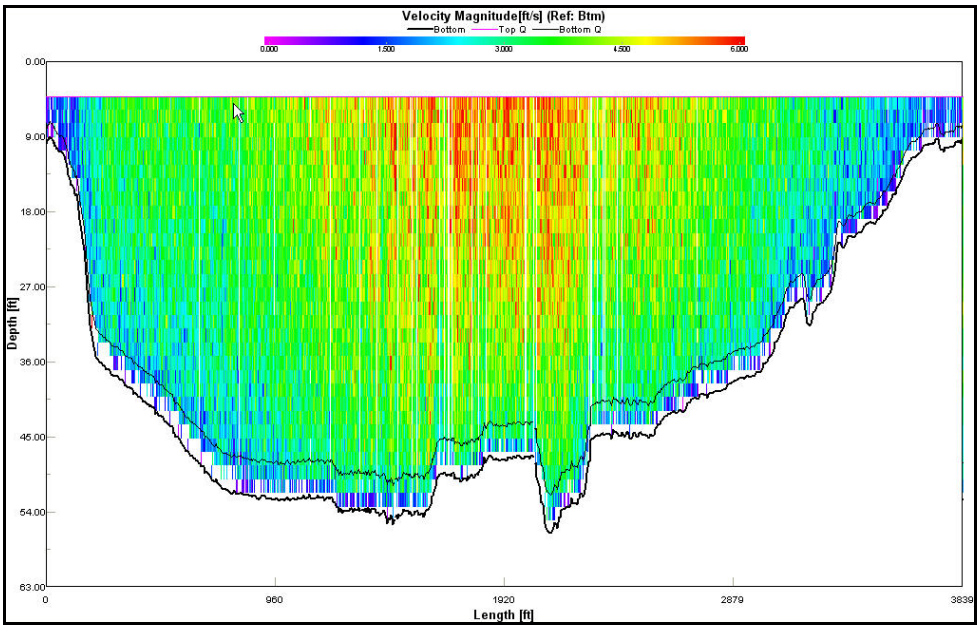


Figure E65. Transect 71 current velocity cross section, 22 April 2009, 2232 GMT.

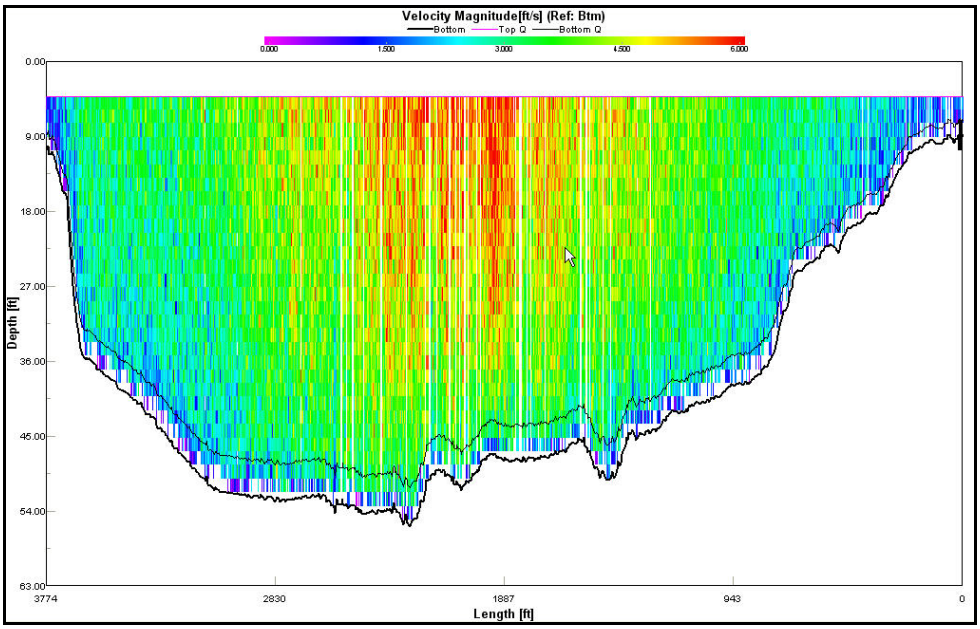


Figure E66. Transect 72 current velocity cross section, 22 April 2009, 2241 GMT.

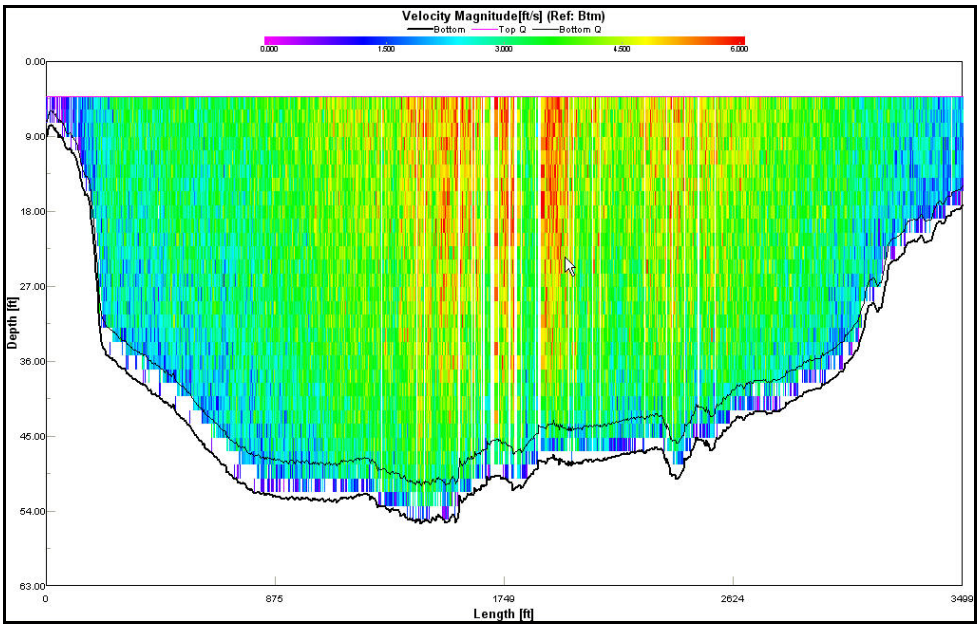


Figure E67. Transect 73 current velocity cross section, 22 April 2009, 2251 GMT.

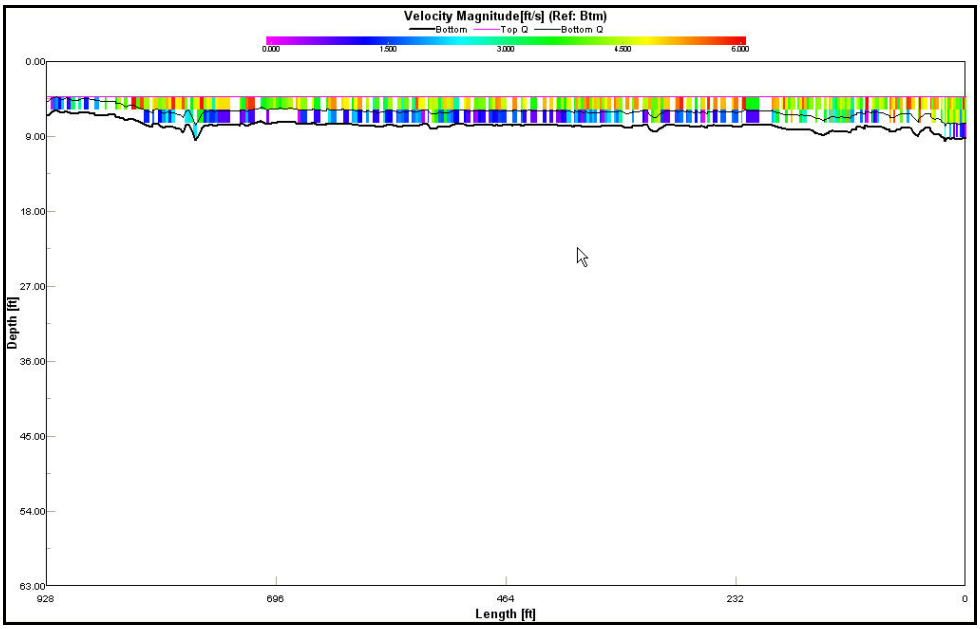


Figure E68. Transect 74 current velocity cross section, 22 April 2009, 2308 GMT. Display is from the northwest (left) to the southeast (right).

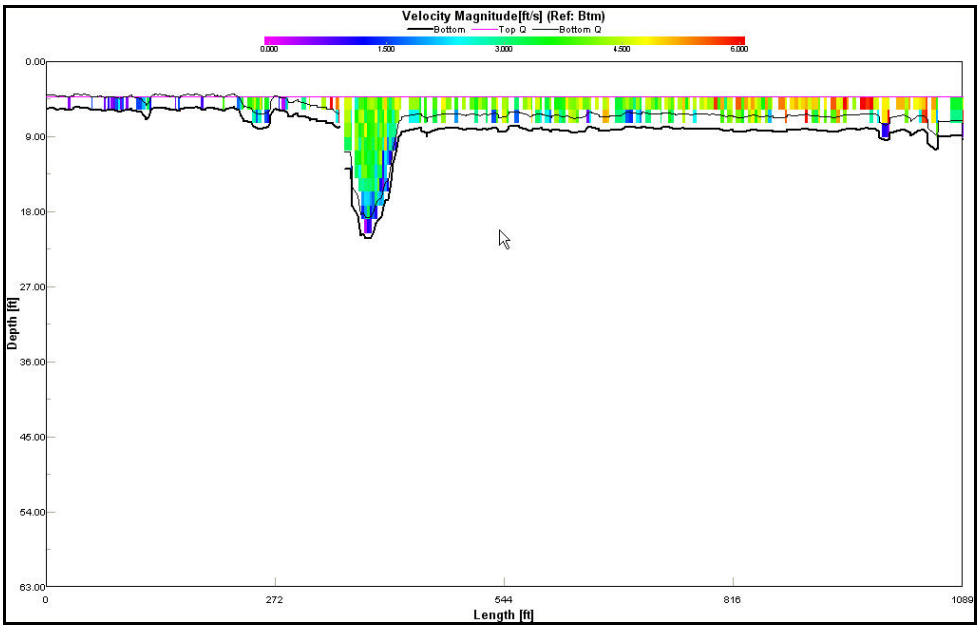


Figure E69. Transect 75 current velocity cross section, 22 April 2009, 2311 GMT. Display is from the northwest (left) to the southeast (right).

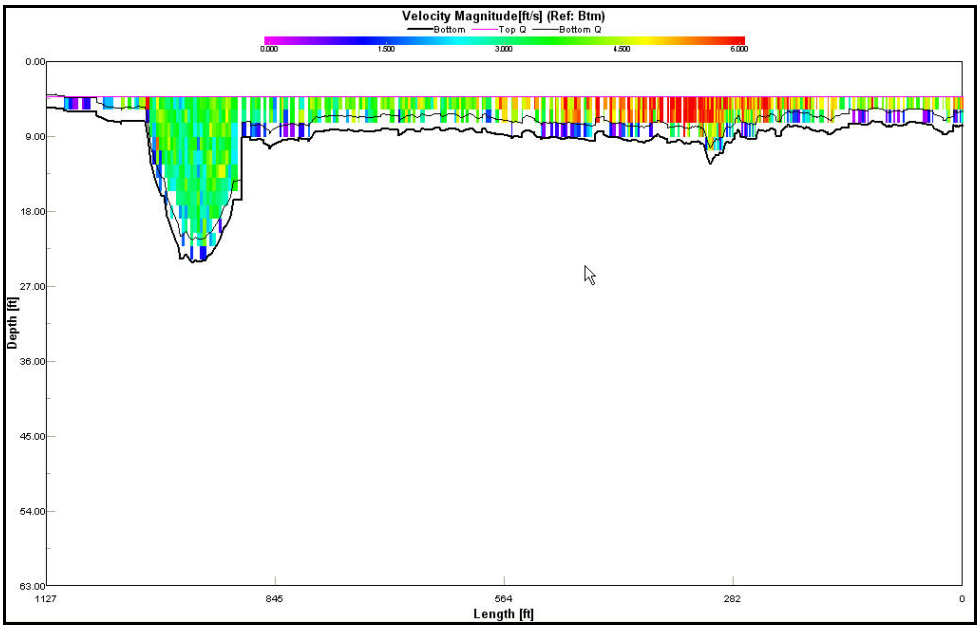


Figure E70. Transect 76 current velocity cross section, 22 April 2009, 2314 GMT. Display is from the northwest (left) to the southeast (right).

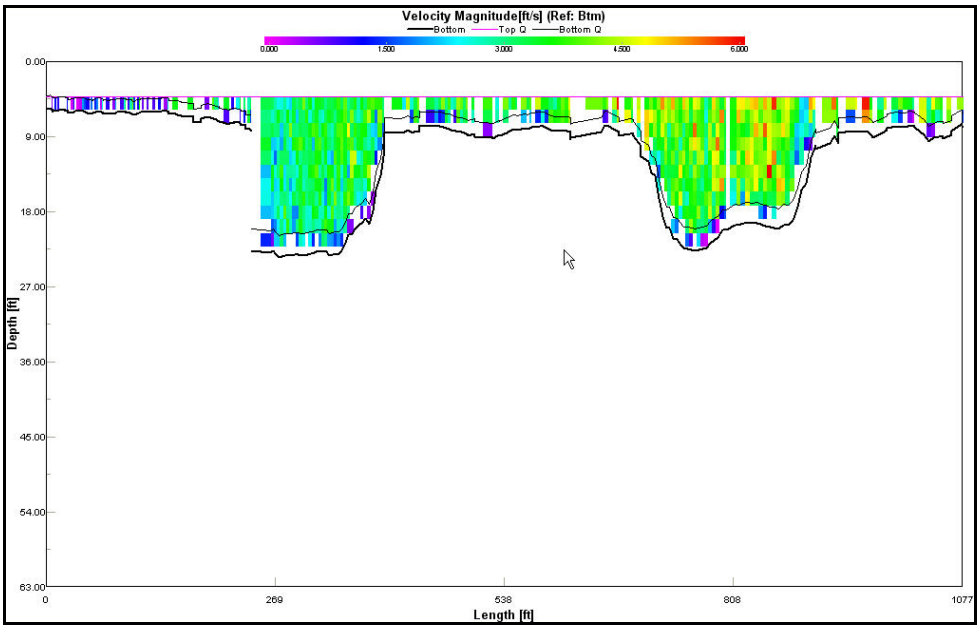


Figure E71. Transect 77 current velocity cross section, 22 April 2009, 2318 GMT. Display is from the northwest (left) to the southeast (right).

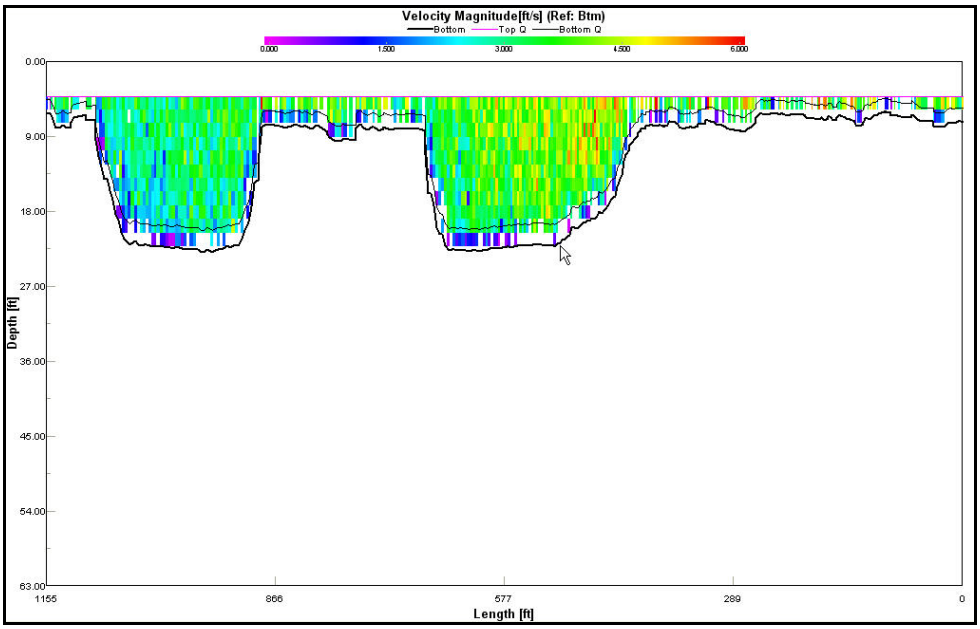


Figure E72. Transect 78 current velocity cross section, 22 April 2009, 2321 GMT. Display is from the northwest (left) to the southeast (right).

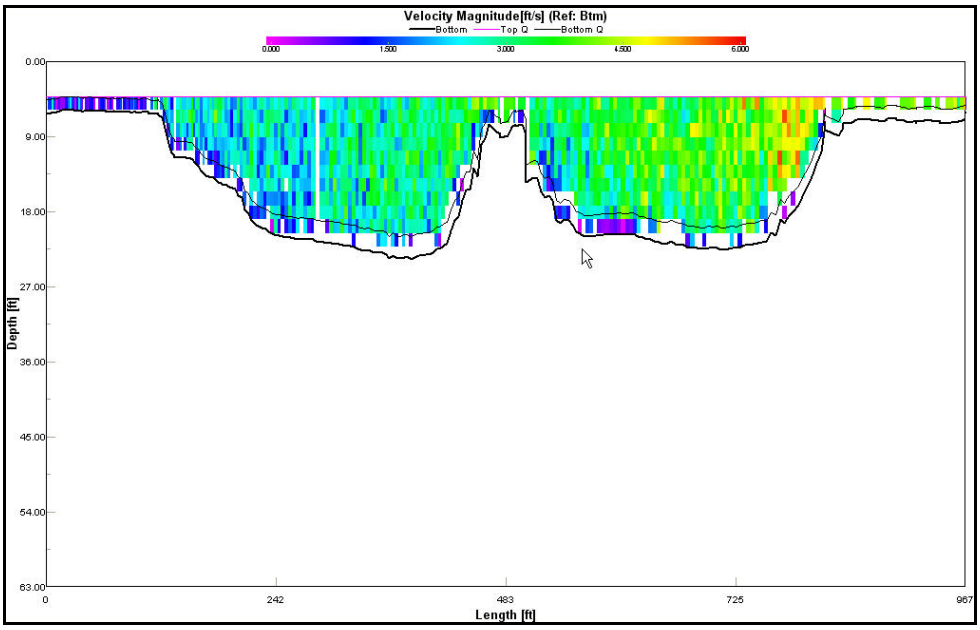


Figure E73. Transect 79 current velocity cross section, 22 April 2009, 2325 GMT. Display is from the northwest (left) to the southeast (right).

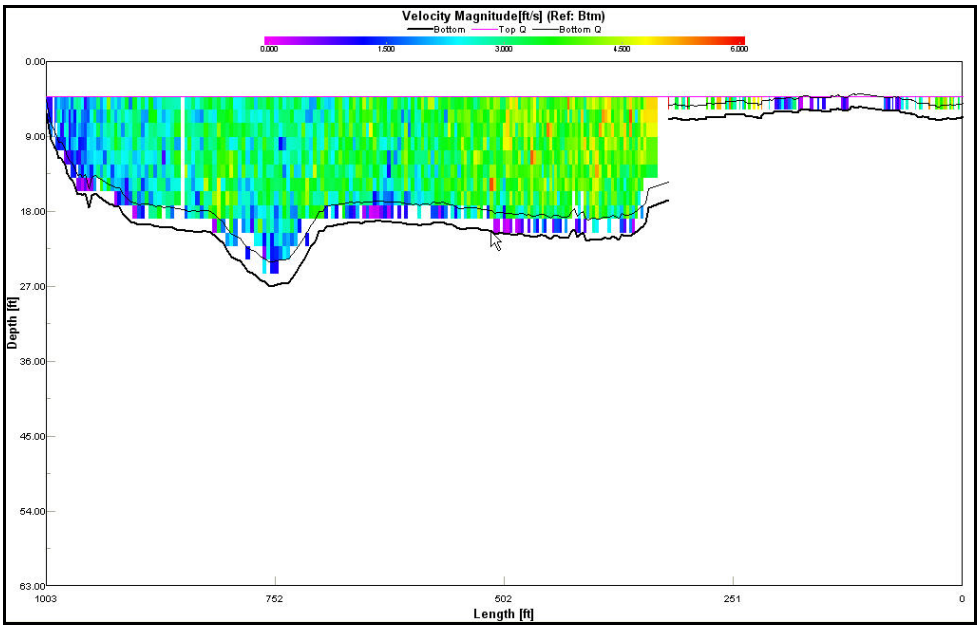


Figure E74. Transect 80 current velocity cross section, 22 April 2009, 2327 GMT. Display is from the northwest (left) to the southeast (right).

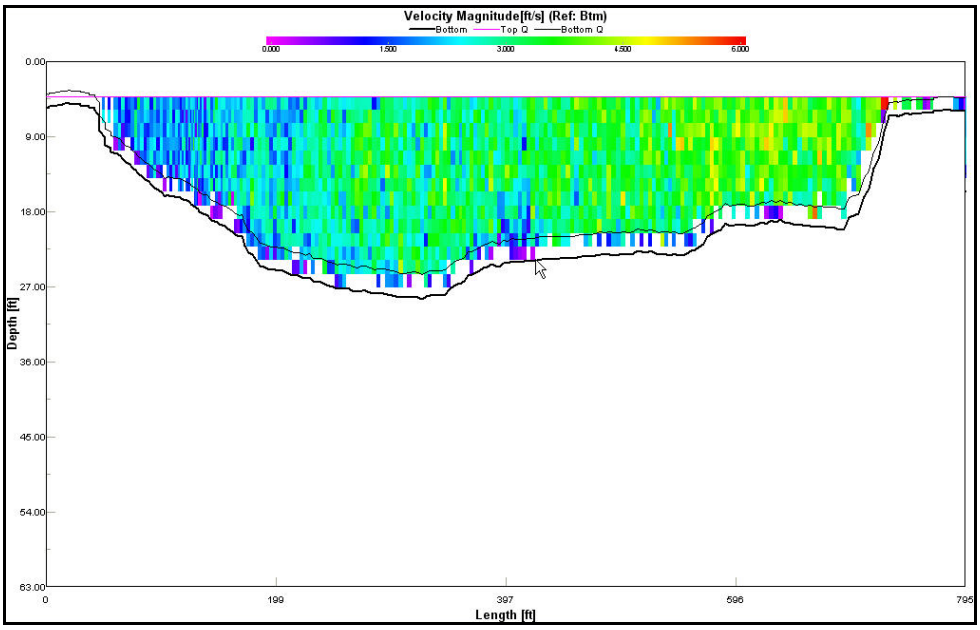


Figure E75. Transect 81 current velocity cross section, 22 April 2009, 2331 GMT. Display is from the northwest (left) to the southeast (right).

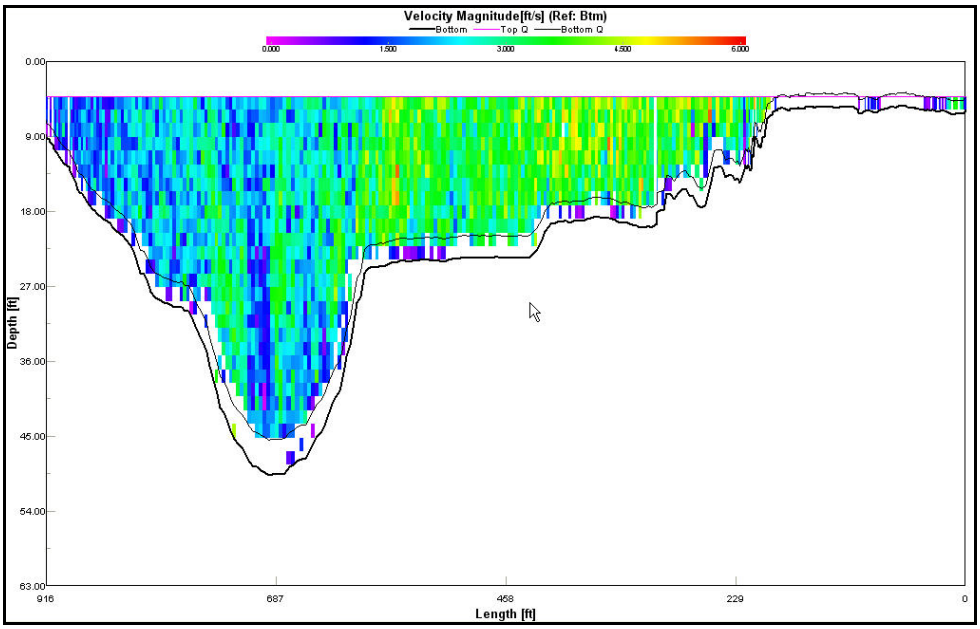


Figure E76. Transect 82 current velocity cross section, 22 April 2009, 2333 GMT. Display is from the northwest (left) to the southeast (right).

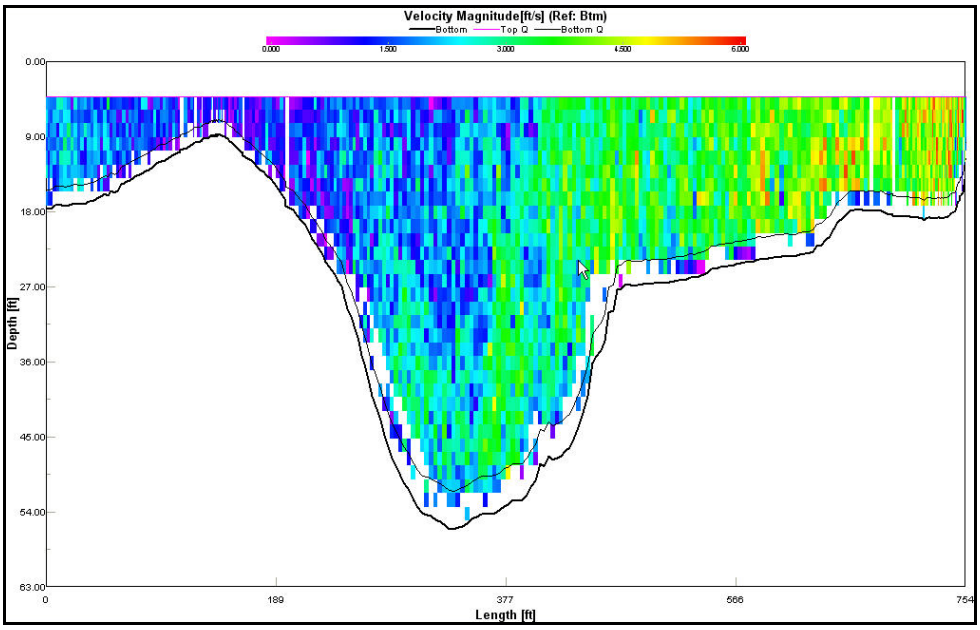


Figure E77. Transect 83 current velocity cross section, 22 April 2009, 2337 GMT. Display is from the northwest (left) to the southeast (right).

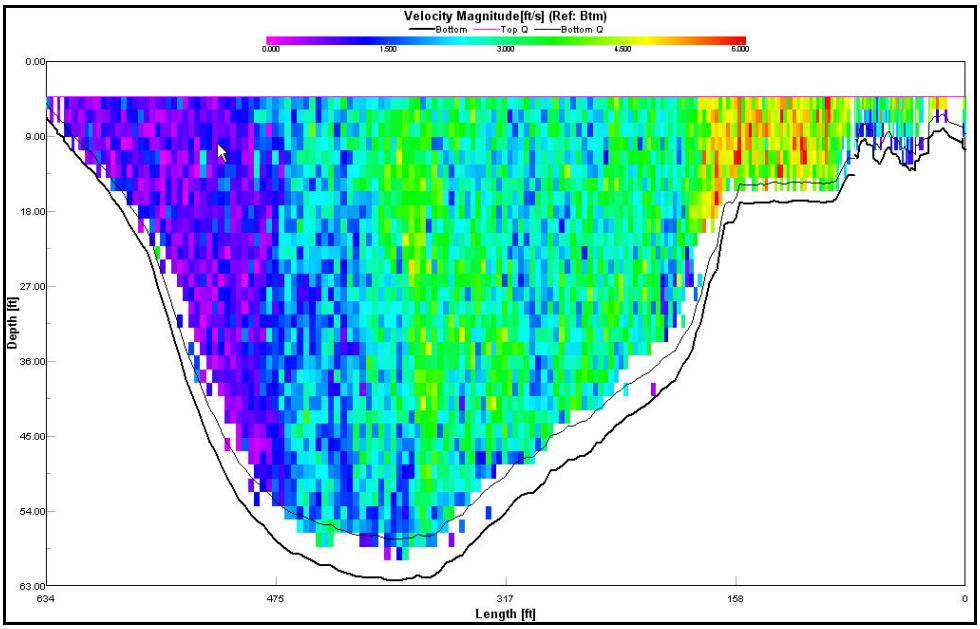


Figure E78. Transect 84 current velocity cross section, 22 April 2009, 2340 GMT. Display is from the northwest (left) to the southeast (right).

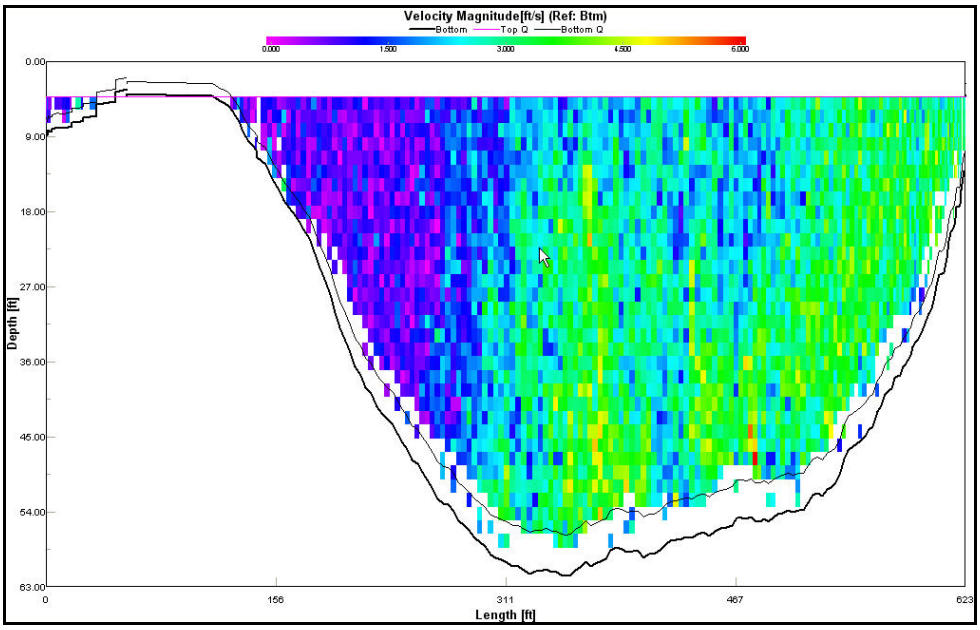


Figure E79. Transect 85 current velocity cross section, 22 April 2009, 2342 GMT. Display is from the northwest (left) to the southeast (right).

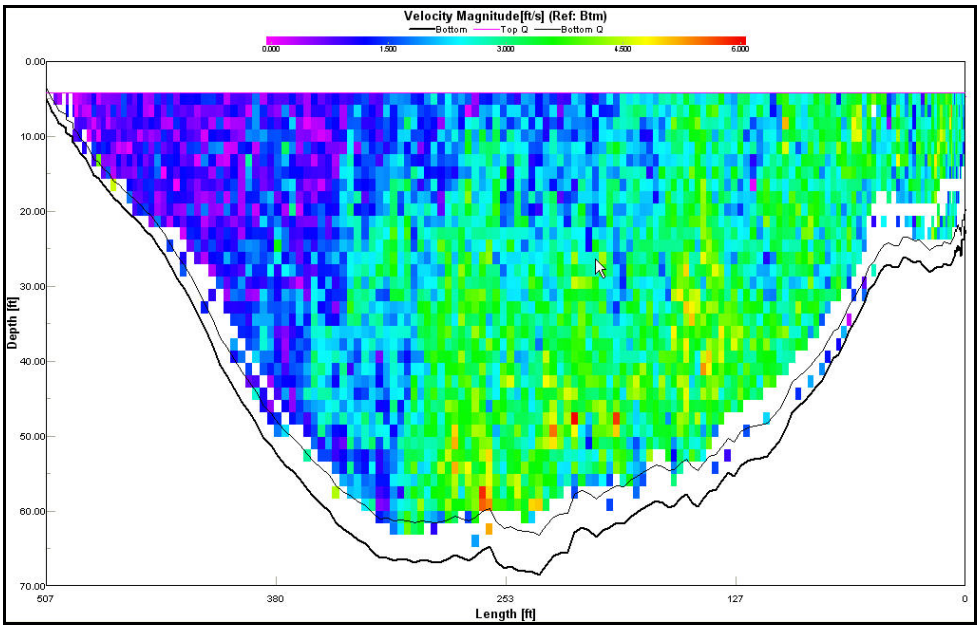


Figure E80. Transect 86 current velocity cross section, 22 April 2009, 2345 GMT. Display is from the northwest (left) to the southeast (right).

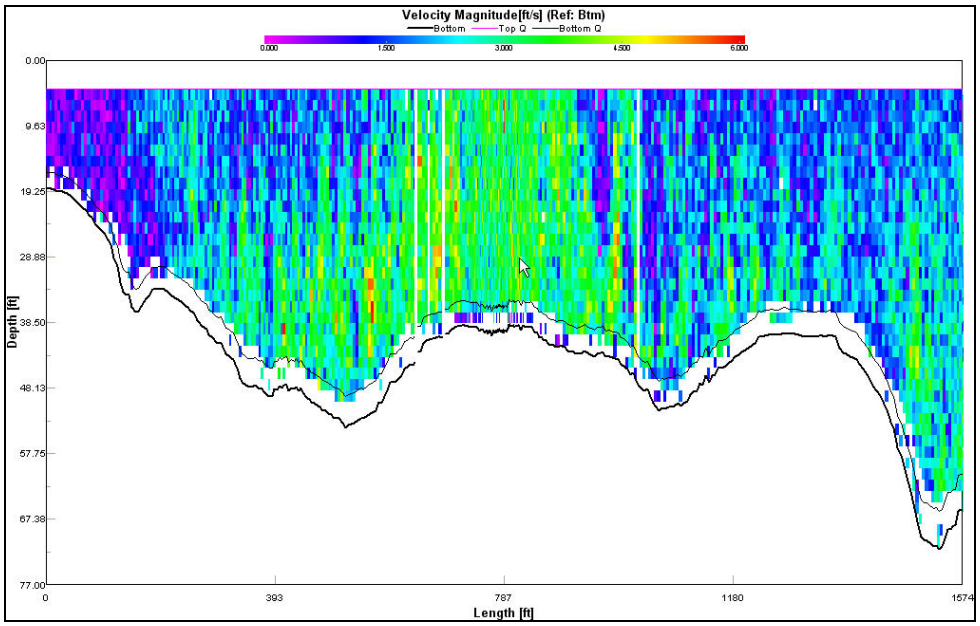


Figure E81. Transect 87 current velocity cross section, 22 April 2009, 2348 GMT. Display is from the northwest (left) to the east at 787 ft across and then back to the west (right).

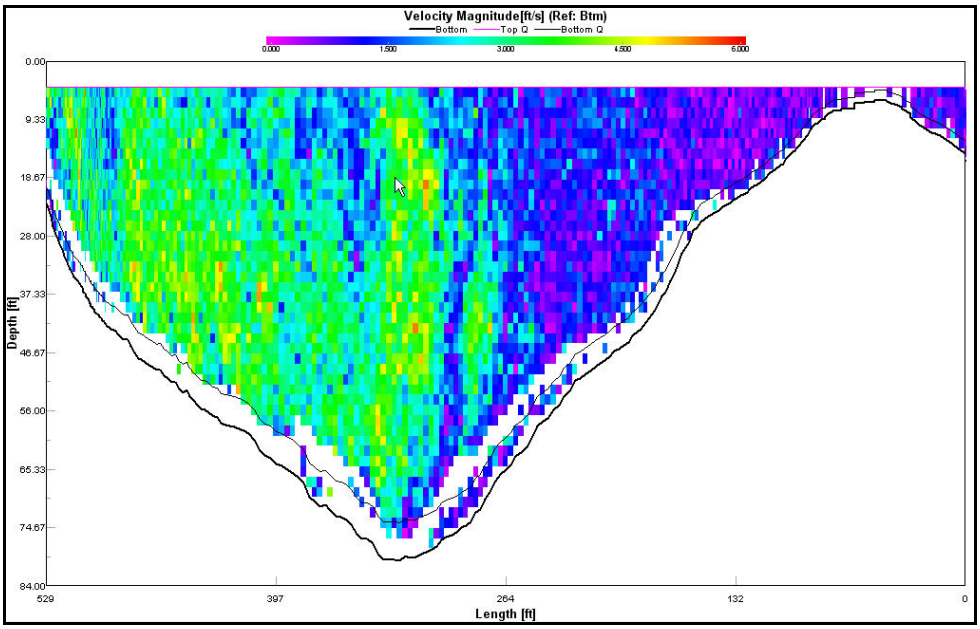


Figure E82. Transect 88 current velocity cross section, 22 April 2009, 2351 GMT. Display is from the northwest (left) to the southeast (right).

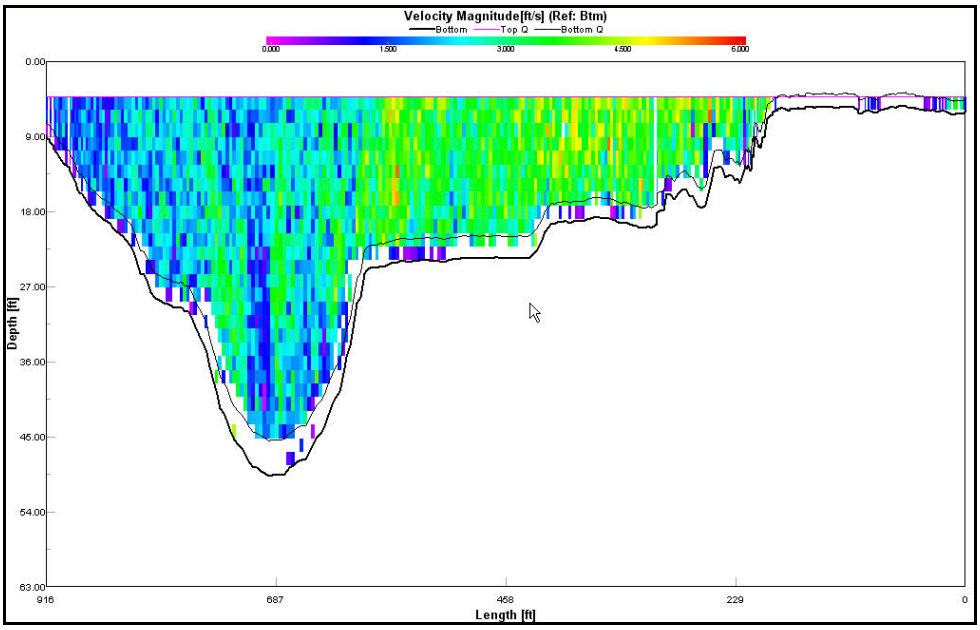


Figure E83. Transect 89 current velocity cross section, 22 April 2009, 2354 GMT. Display is from the northwest (left) to the southeast (right).

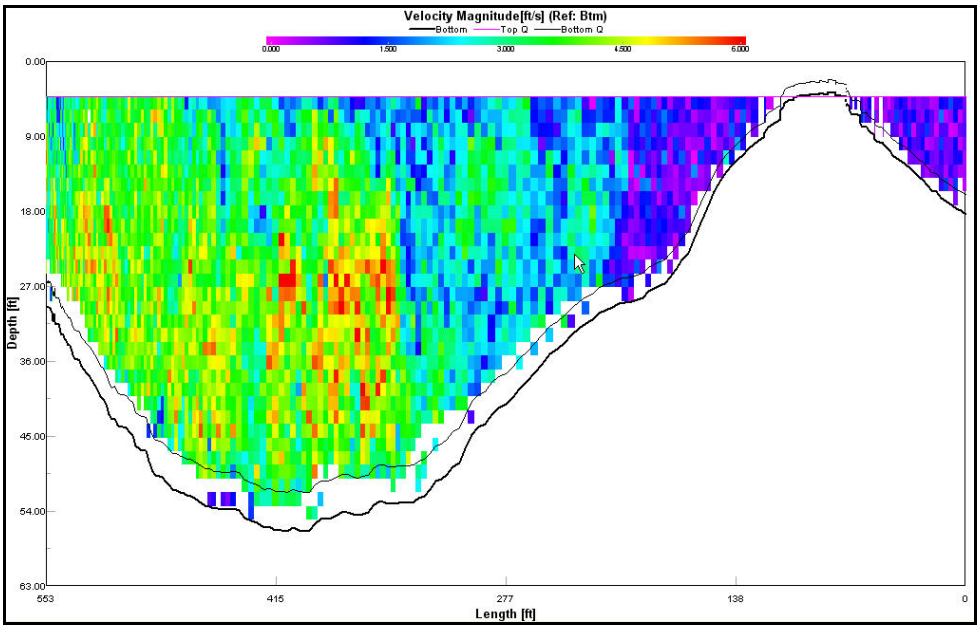


Figure E84. Transect 90 current velocity cross section, 22 April 2009, 2357 GMT. Display is from the northwest (left) to the southeast (right).

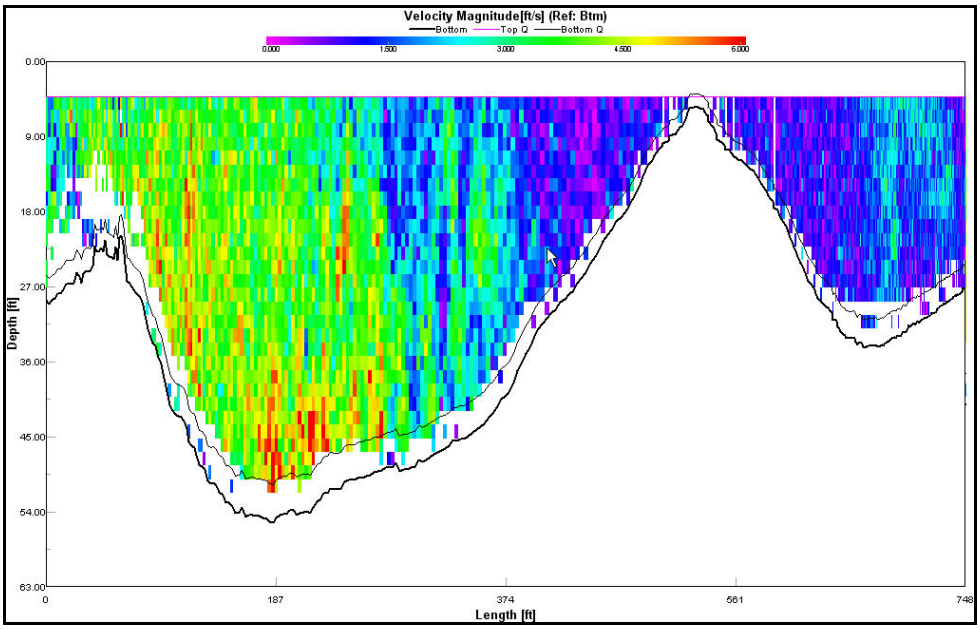


Figure E85. Transect 91 current velocity cross section, 22 April 2009, 2359 GMT. Display is from the northwest (left) to the southeast (right).

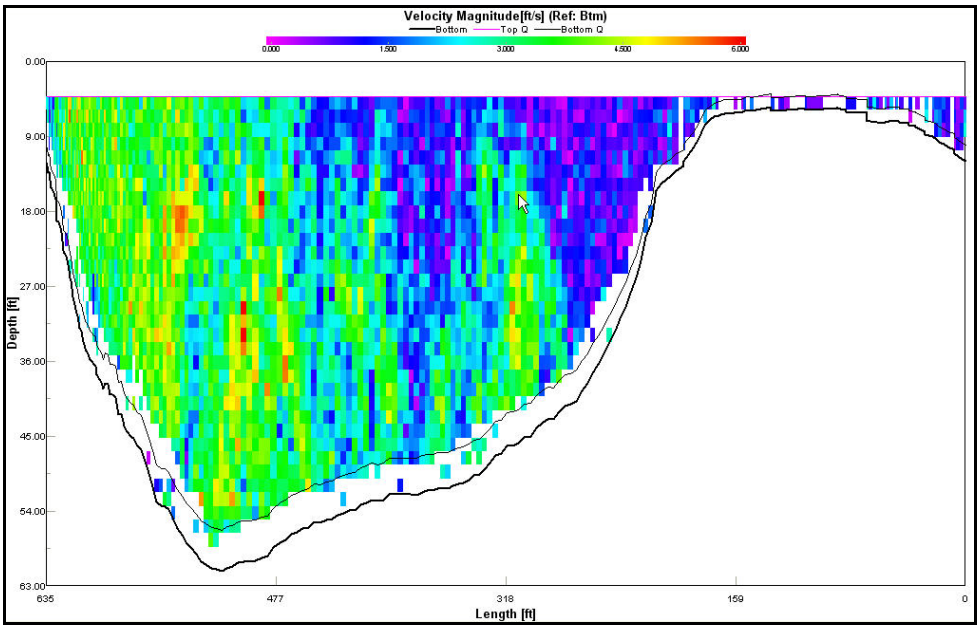


Figure E86. Transect 92 current velocity cross section, 23 April 2009, 0004 GMT. Display is from the northwest (left) to the southeast (right).

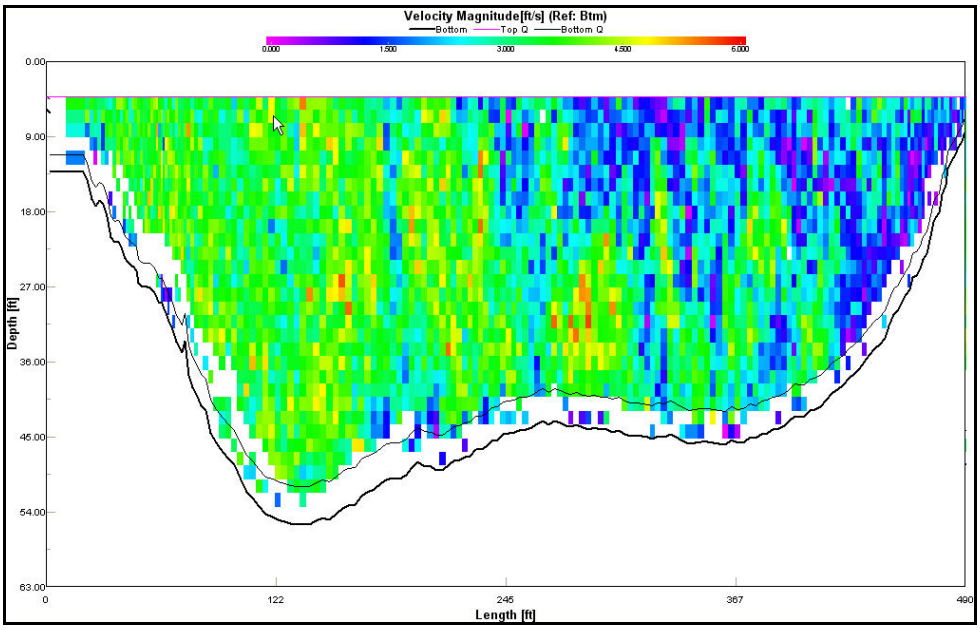


Figure E87. Transect 93 current velocity cross section, 23 April 2009, 0006 GMT. Display is from the northwest (left) to the southeast (right).

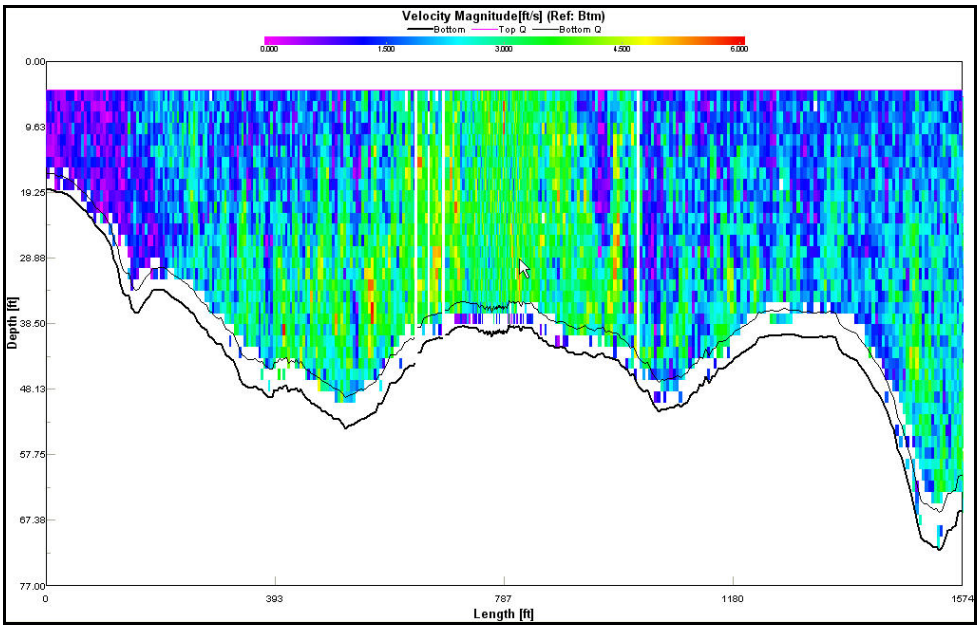


Figure E88. Transect 94 current velocity cross section, 23 April 2009, 0008 GMT. Display is from the northwest (left) to the southeast (right).

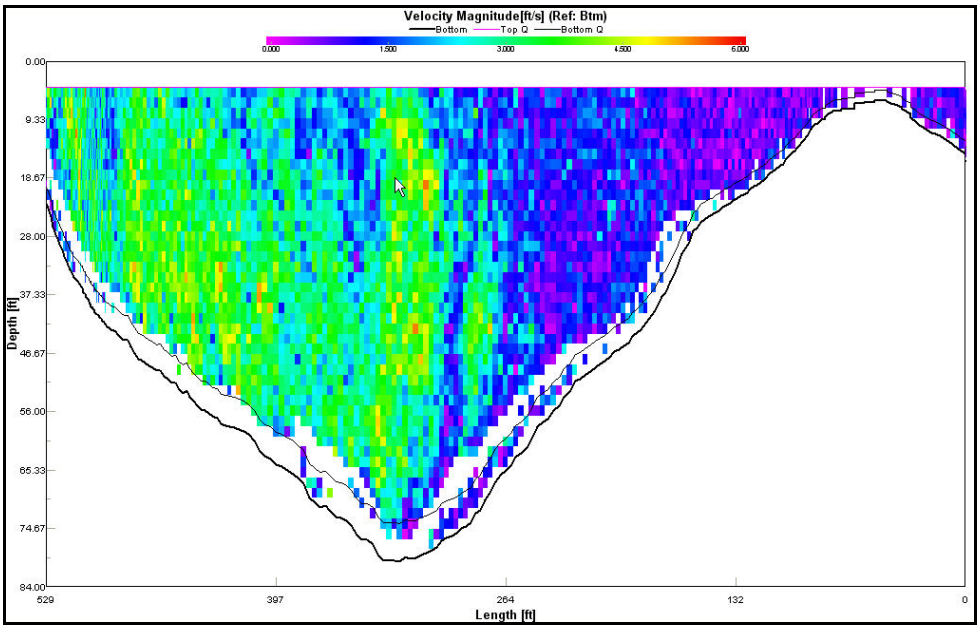


Figure E89. Transect 95 current velocity cross section, 23 April 2009, 0010 GMT. Display is from the northwest (left) to the southeast (right).

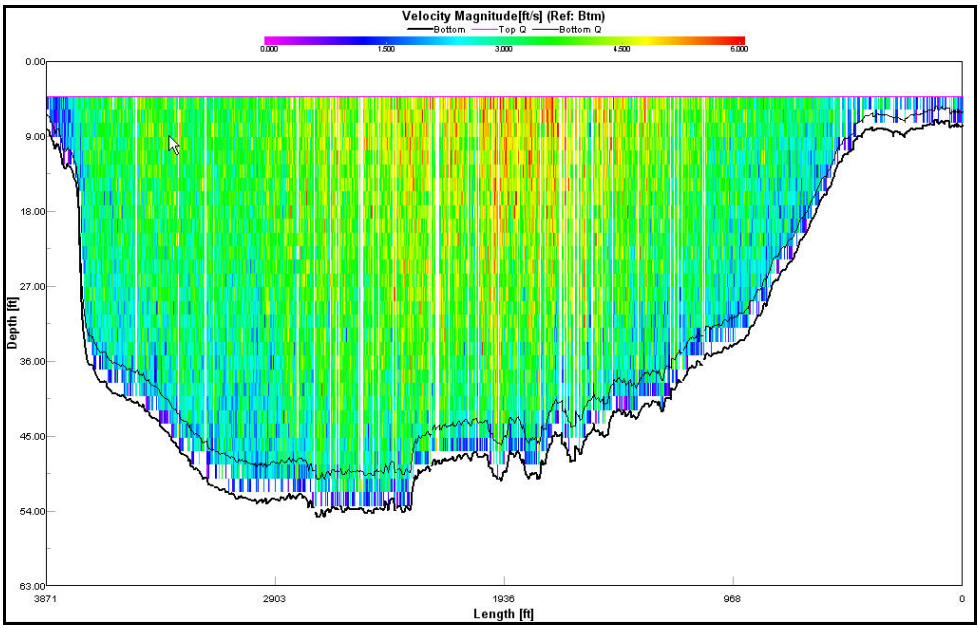


Figure E90. Transect 96 current velocity cross section, 23 April 2009, 0014 GMT.

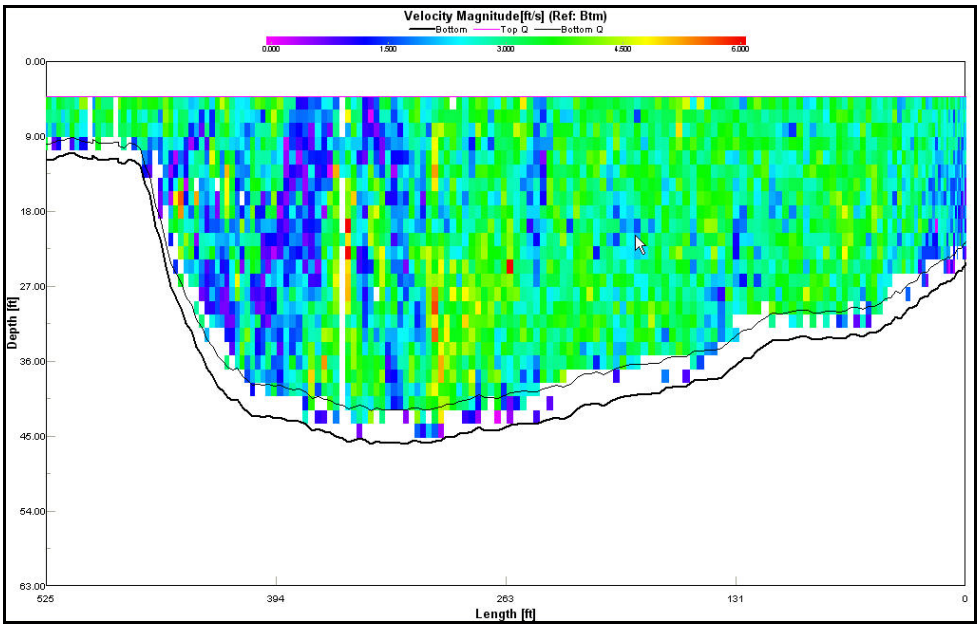


Figure E91. Transect 97 current velocity cross section, 23 April 2009, 1414 GMT. Display is from the northwest (left) to the southeast (right).

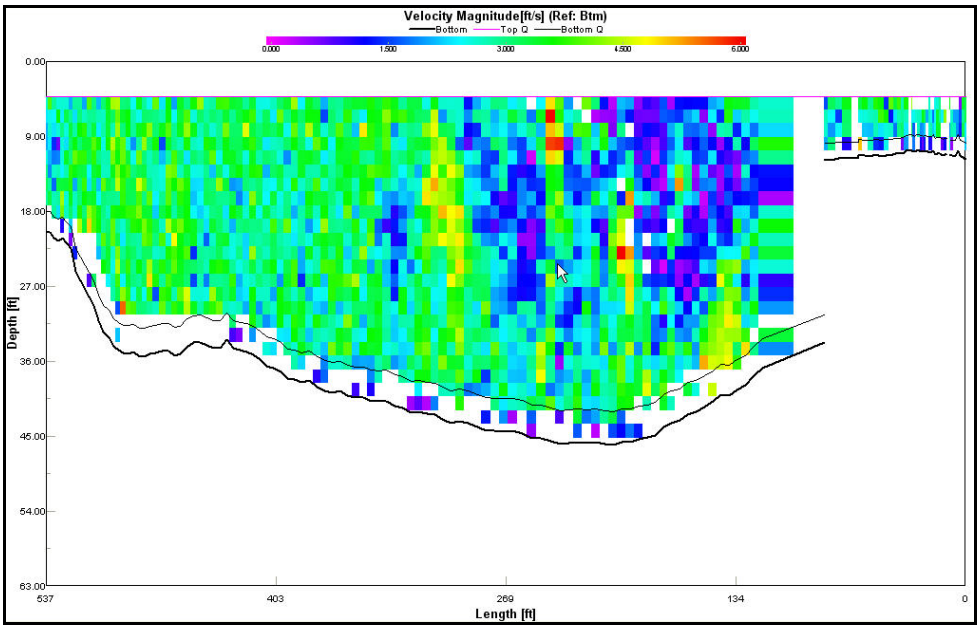


Figure E92. Transect 98 current velocity cross section, 23 April 2009, 1416 GMT. Display is from the southeast (left) to the northwest (right).

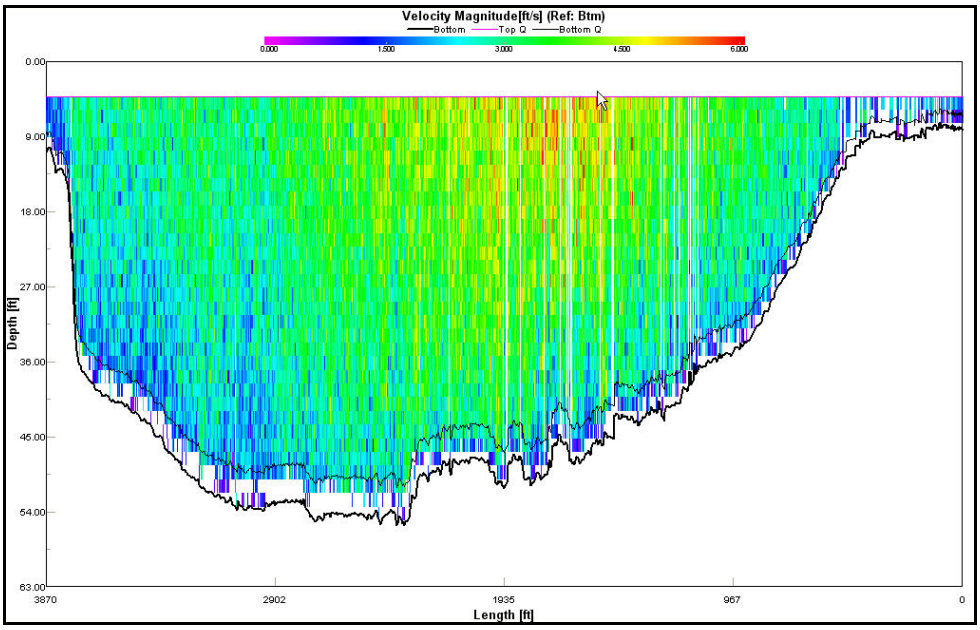


Figure E93. Transect 99 current velocity cross section, 23 April 2009, 1423 GMT.

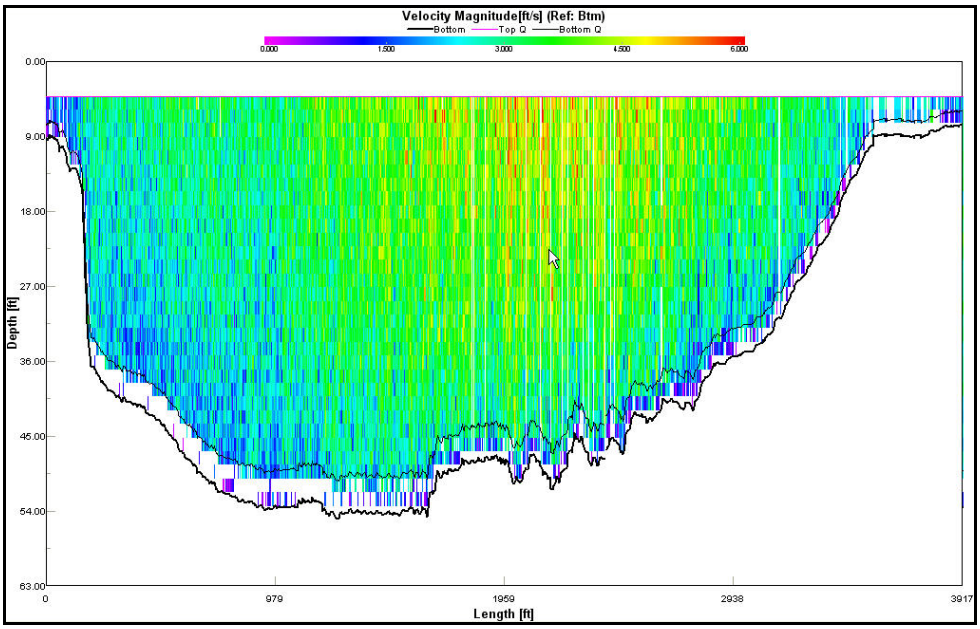


Figure E94. Transect 100 current velocity cross section, 23 April 2009, 1432 GMT.

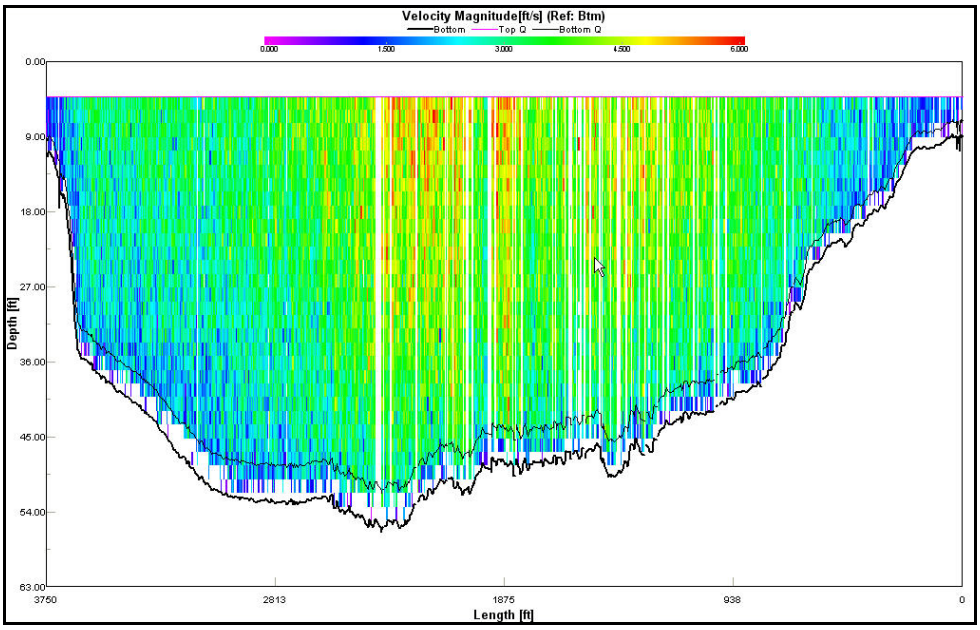


Figure E95. Transect 101 current velocity cross section, 23 April 2009, 1450 GMT.

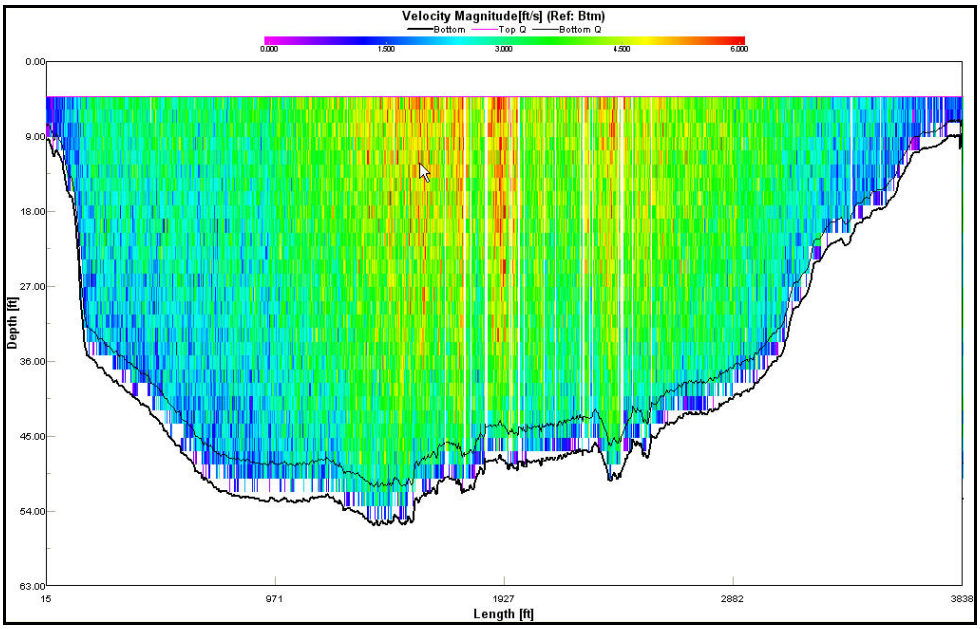


Figure E96. Transect 102 current velocity cross section, 23 April 2009, 1458 GMT.

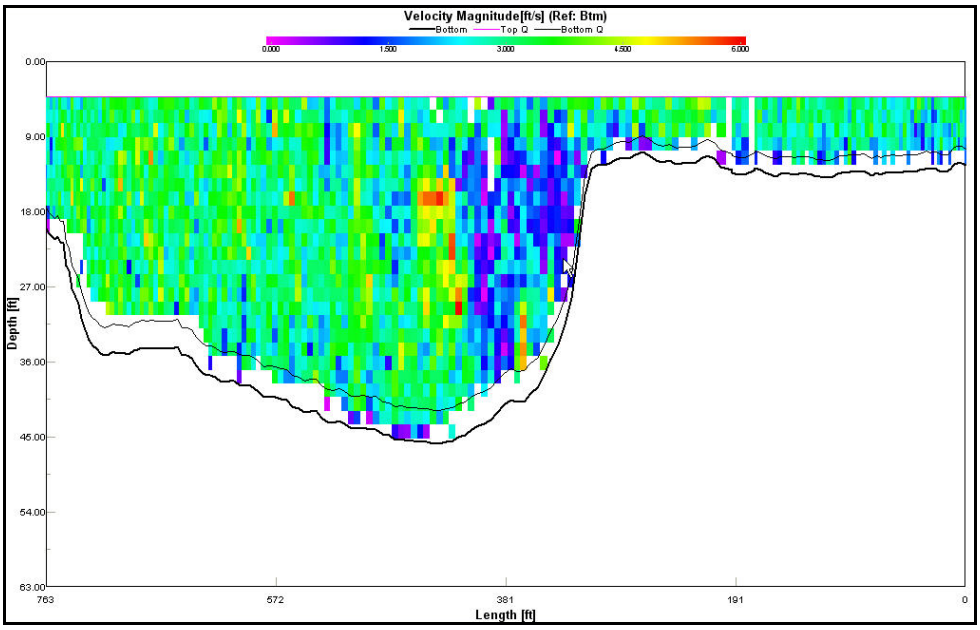


Figure E97. Transect 103 current velocity cross section, 23 April 2009, 1510 GMT. Display is from the northwest (left) to the southeast (right).

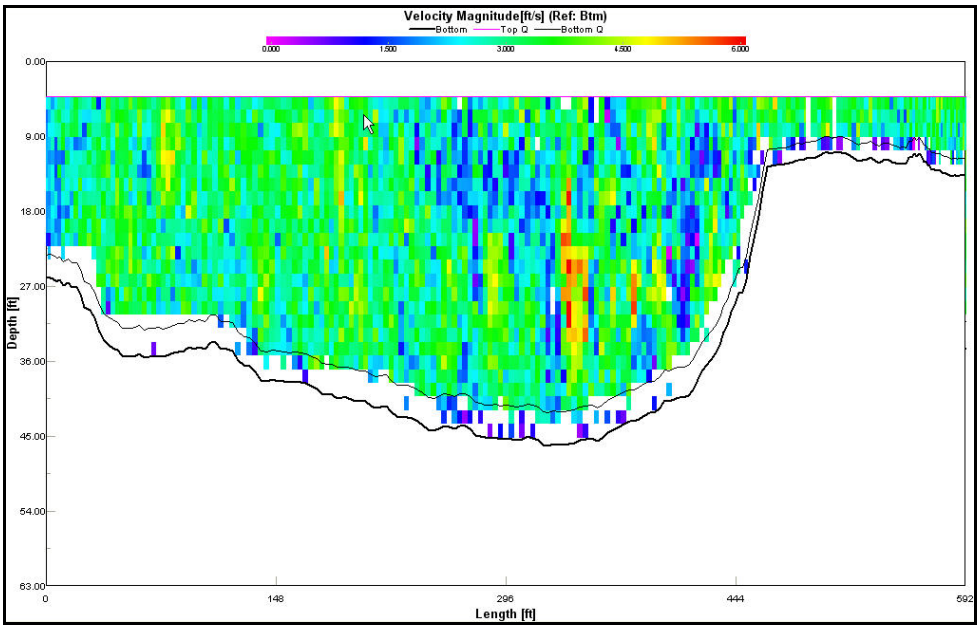


Figure E98. Transect 104 current velocity cross section, 23 April 2009, 1512 GMT. Display is from the northwest (left) to the southeast (right).

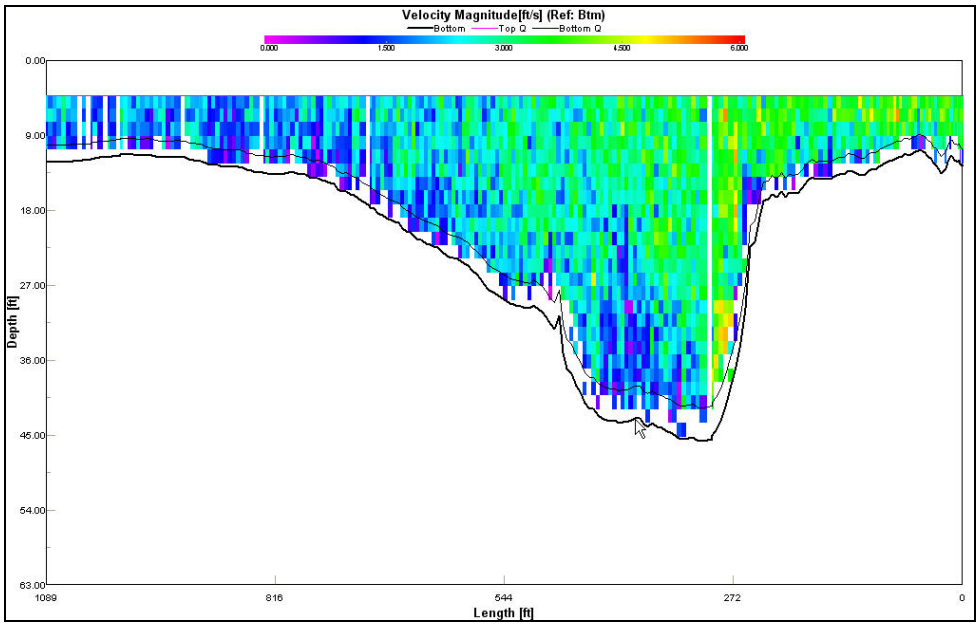


Figure E99. Transect 105 current velocity cross section, 23 April 2009, 1514 GMT. Display is from the northwest (left) to the southeast (right).

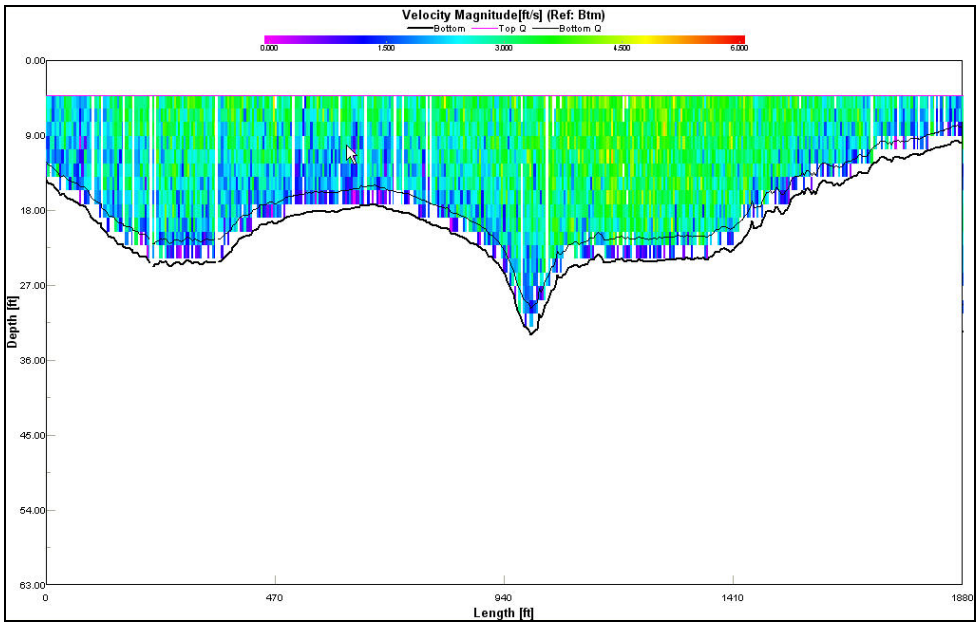


Figure E100. Transect 106 current velocity cross section, 23 April 2009, 1516 GMT. Display is from the northwest (left) to the southeast (right).

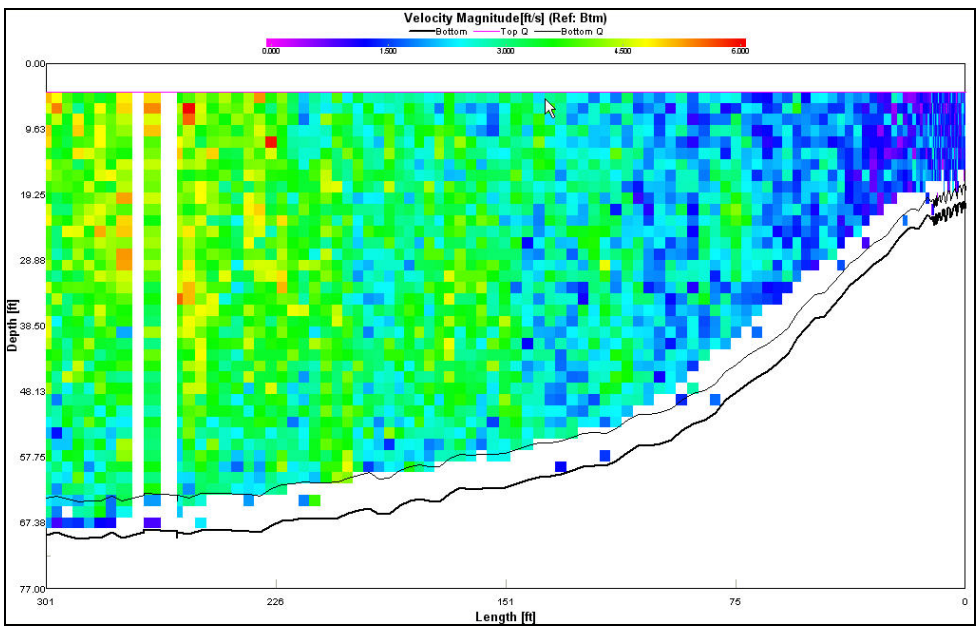


Figure E101. Western section of Transect 107 current velocity cross section, 23 April 2009, 1607 GMT.

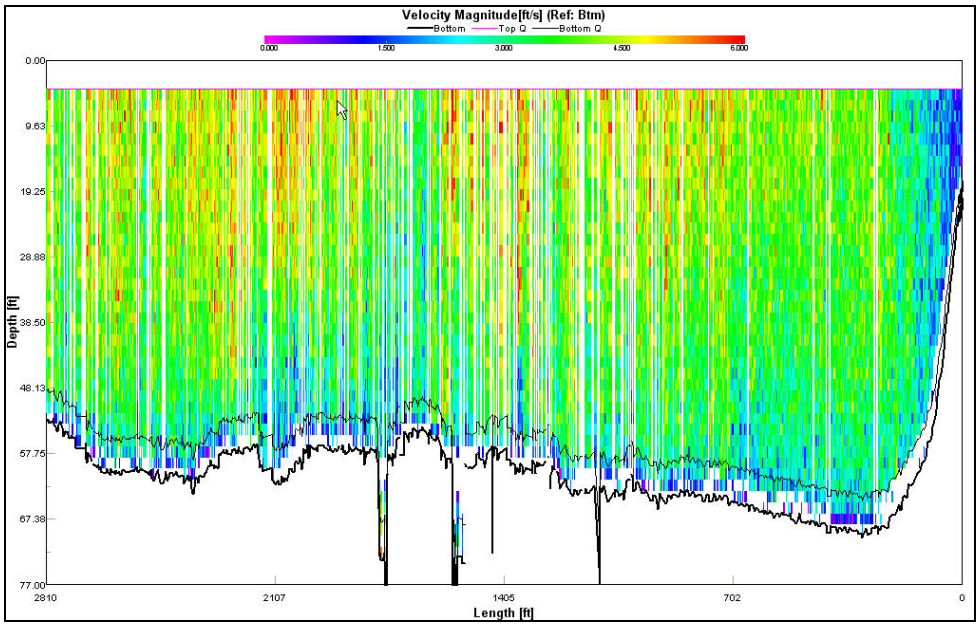


Figure E102. Eastern section of Transect 107 current velocity cross section, 23 April 2009, 1607 GMT.

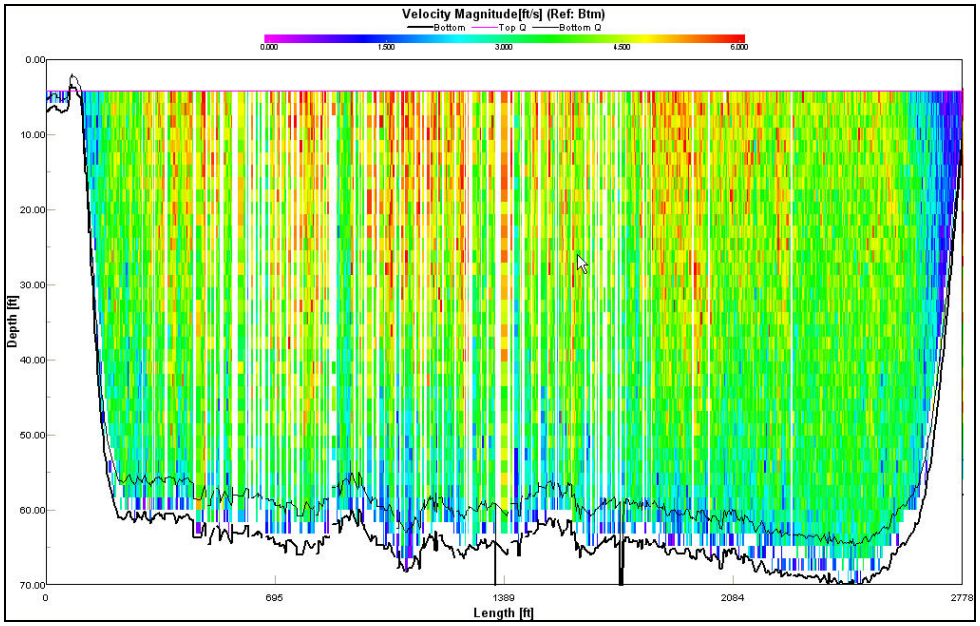


Figure E103. Transect 108 current velocity cross section, 23 April 2009, 1620 GMT.

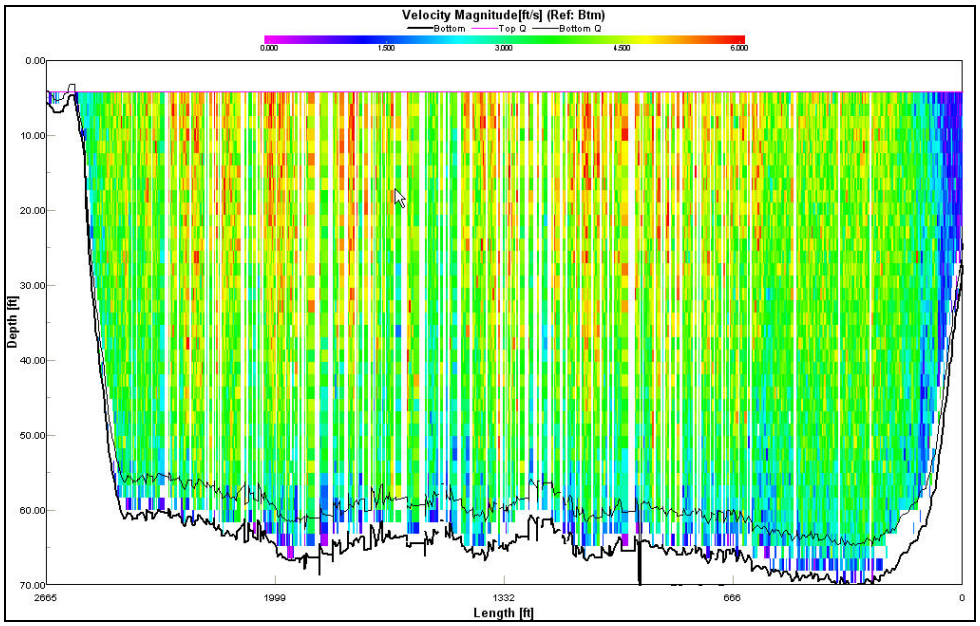


Figure E104. Transect 109 current velocity cross section, 23 April 2009, 1627 GMT.

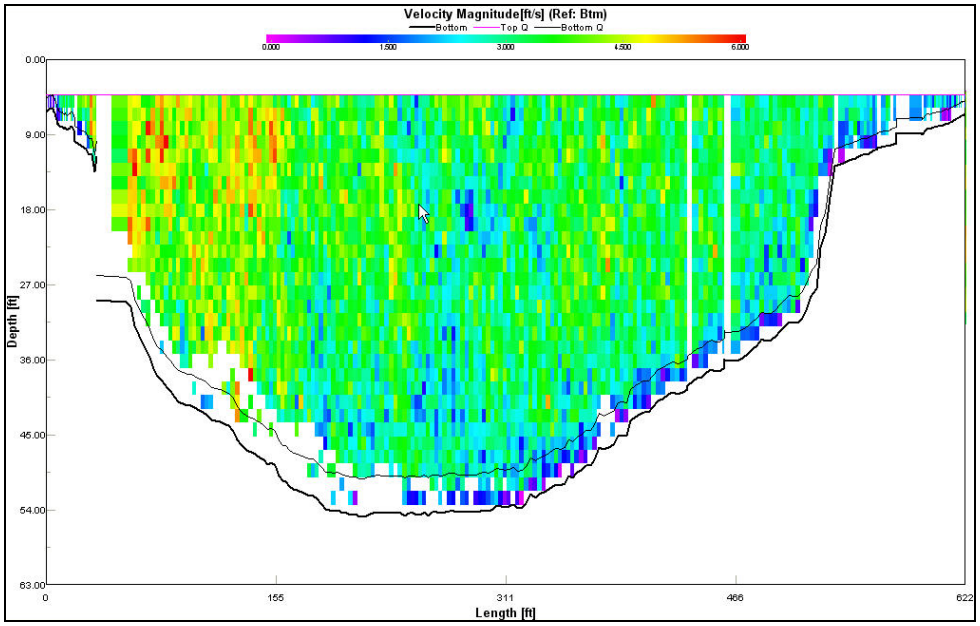


Figure E105. Transect 110 current velocity cross section, 23 April 2009, 1640 GMT. Display is from the northwest (left) to the southeast (right).

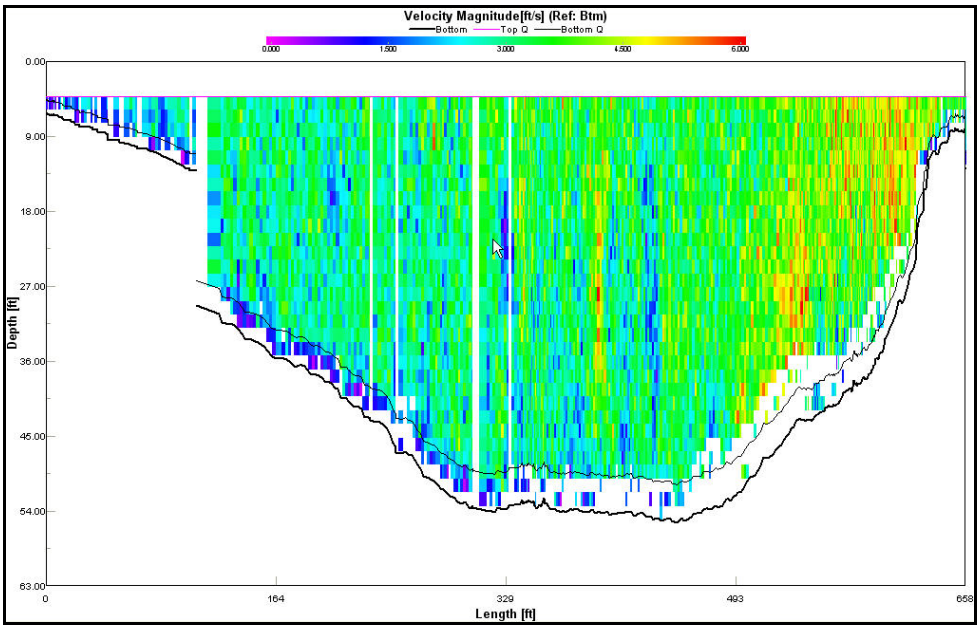


Figure E106. Transect 111 current velocity cross section, 23 April 2009, 1643 GMT. Display is from the northwest (left) to the southeast (right).

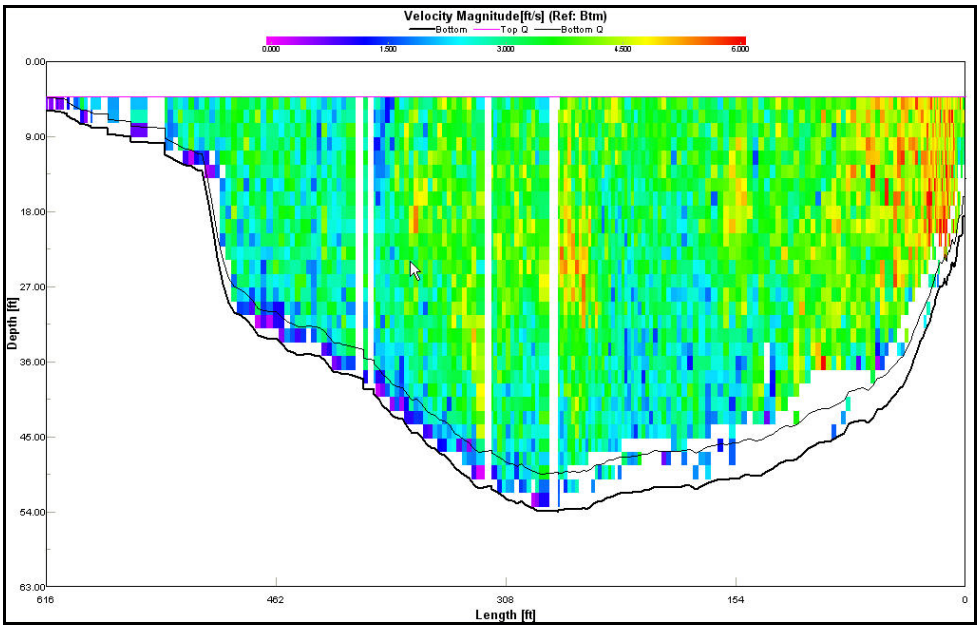


Figure E107. Transect 112 current velocity cross section, 23 April 2009, 1647 GMT. Display is from the northwest (left) to the southeast (right).

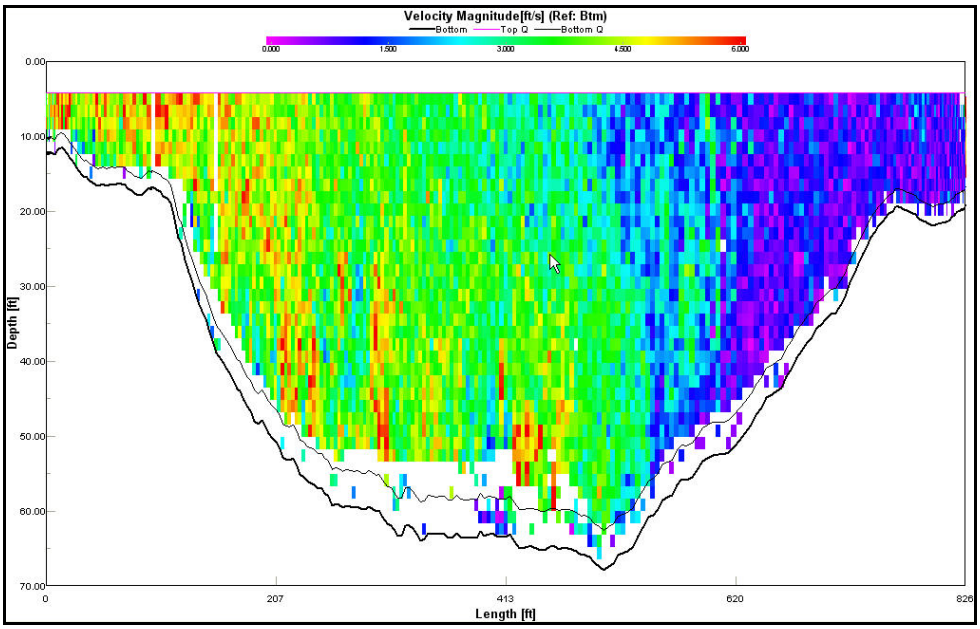


Figure E108. Transect 113 current velocity cross section, 23 April 2009, 1659 GMT. Display is from the northwest (left) to the southeast (right).

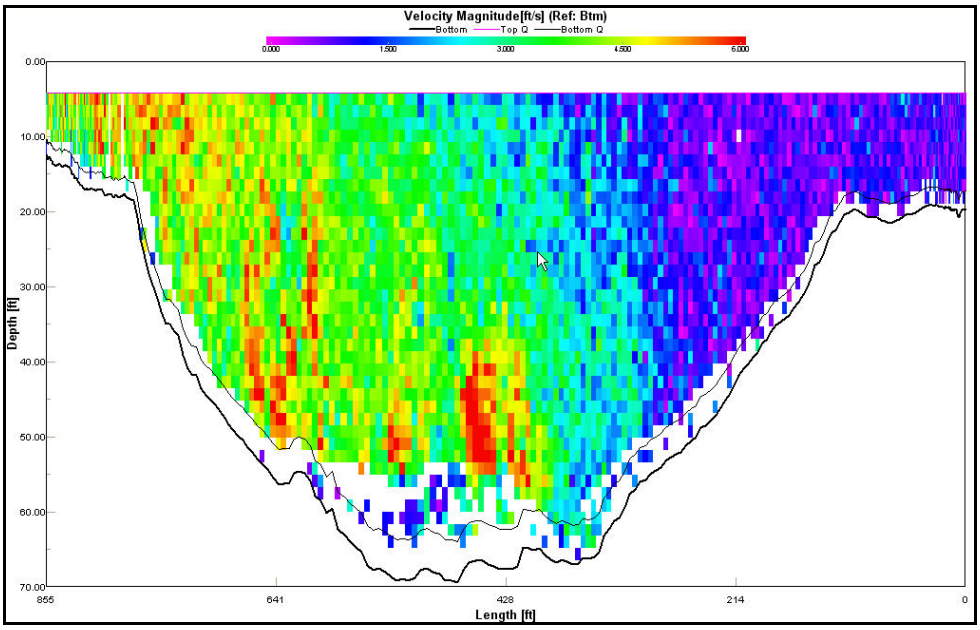


Figure E109. Transect 114 current velocity cross section, 23 April 2009, 1702 GMT. Display is from the northwest (left) to the southeast (right).

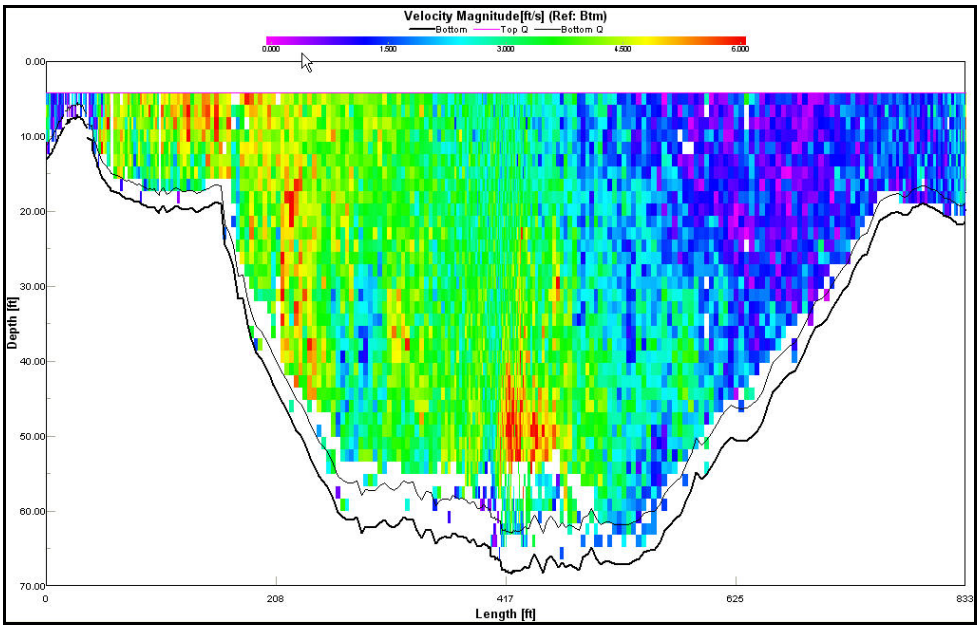


Figure E110. Transect 115 current velocity cross section, 23 April 2009, 1705 GMT. Display is from the northwest (left) to the southeast (right).

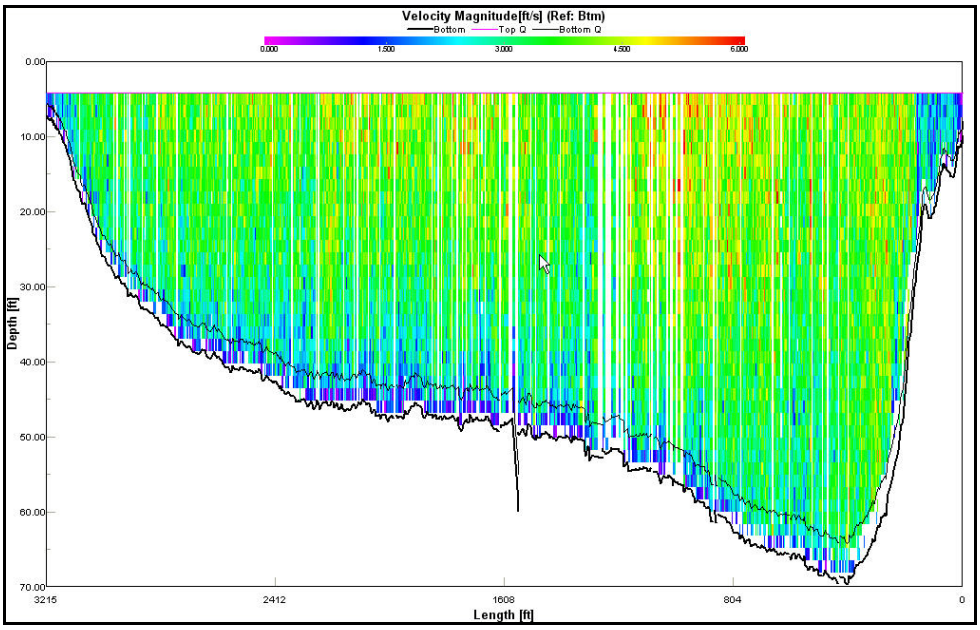


Figure E111. Transect 116 current velocity cross section, 23 April 2009, 1714 GMT.

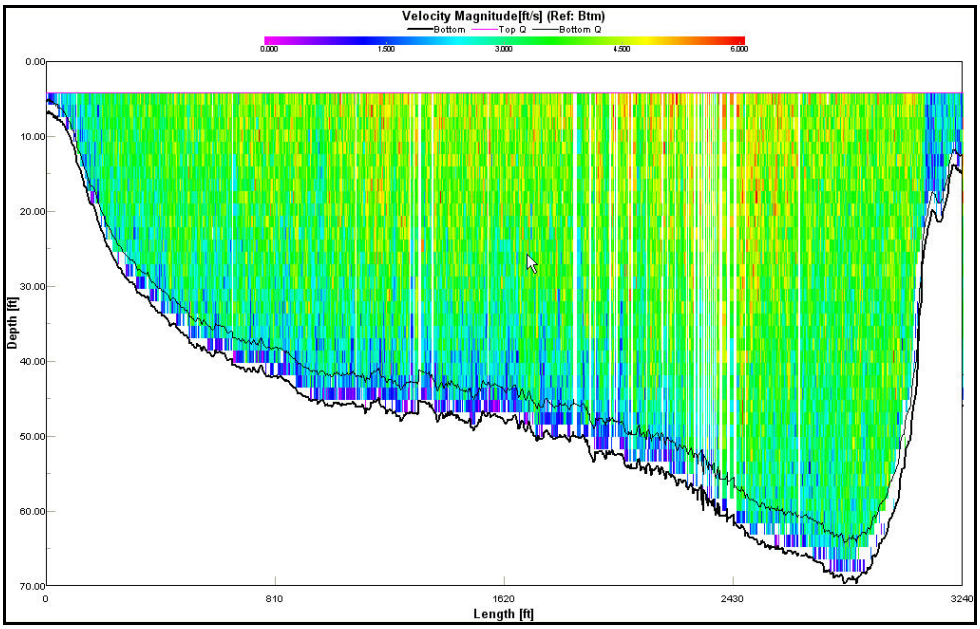


Figure E112. Transect 117 current velocity cross section, 23 April 2009, 1722 GMT.

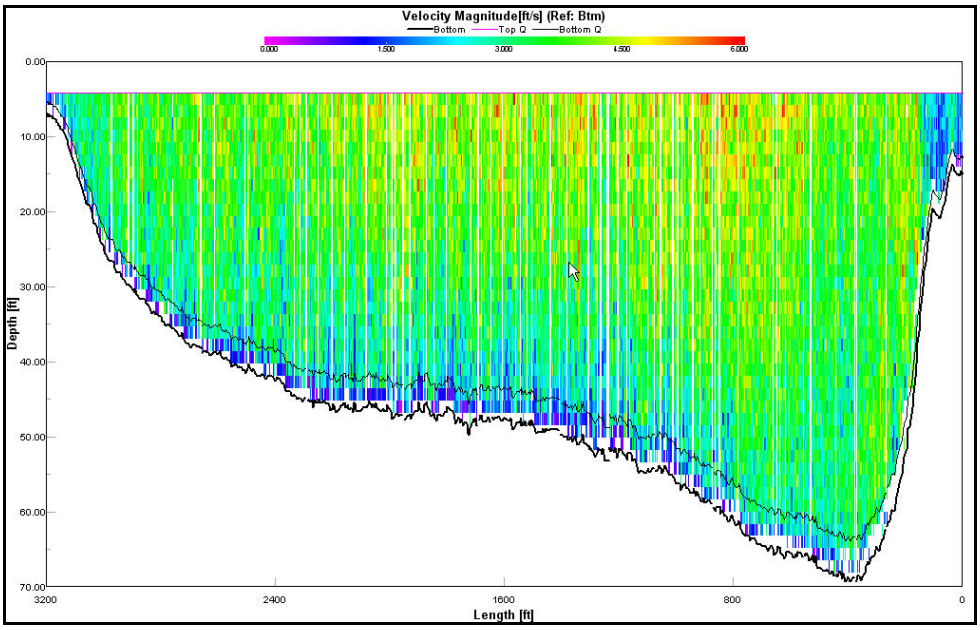


Figure E113. Transect 118 current velocity cross section, 23 April 2009, 1731 GMT.

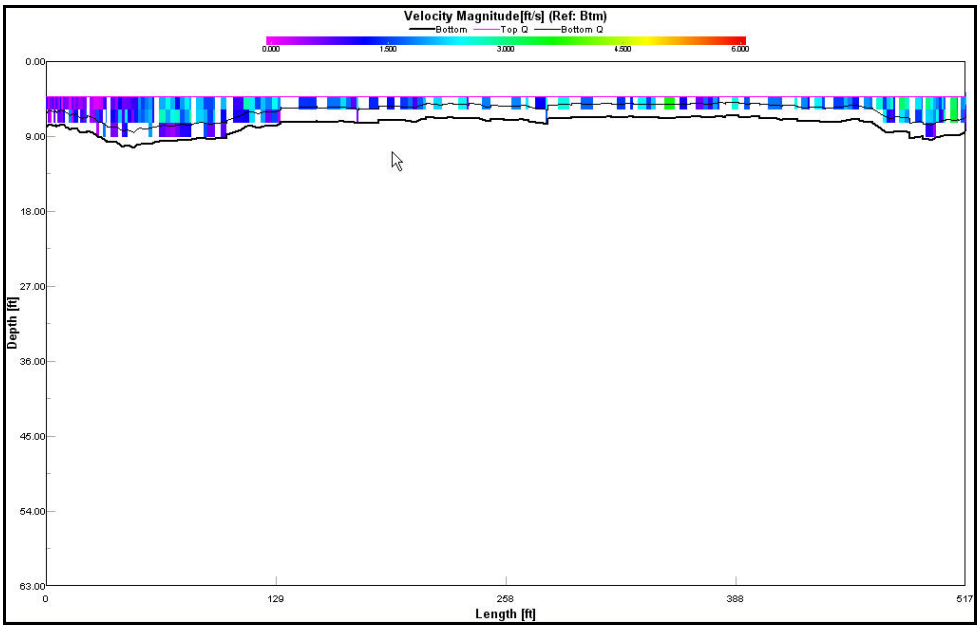


Figure E114. Transect 119 current velocity cross section, 23 April 2009, 1826 GMT. Display is from the northwest (left) to the southeast (right).

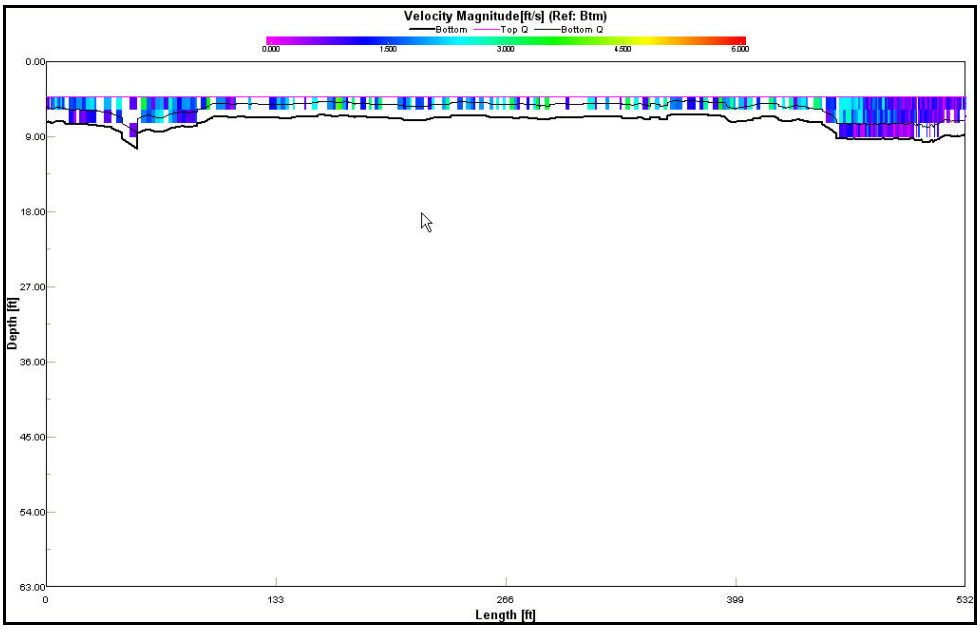


Figure E115. Transect 121 current velocity cross section, 23 April 2009, 1828 GMT. Display is from the northwest (left) to the southeast (right).

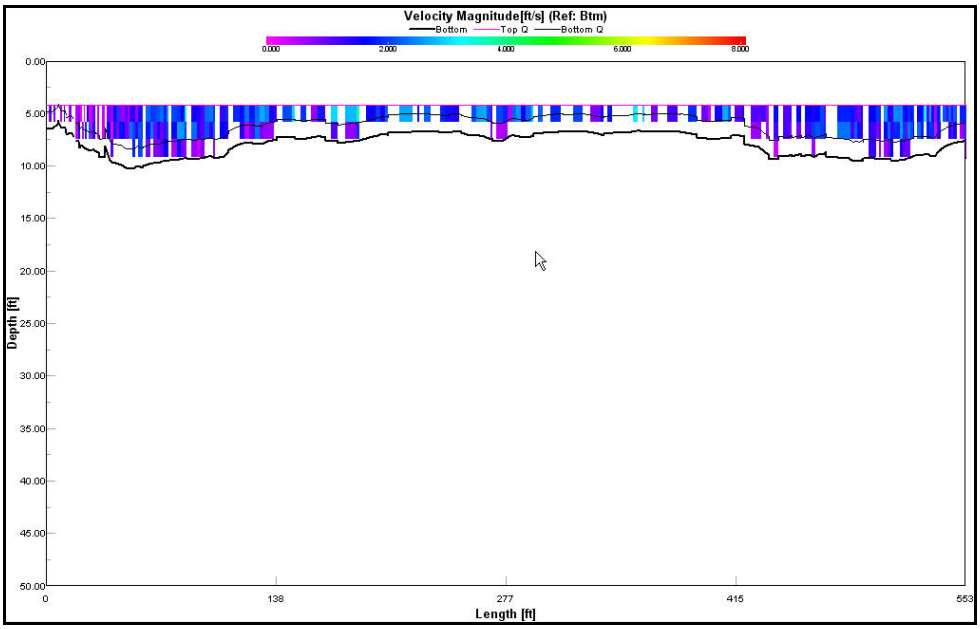


Figure E116. Transect 123 current velocity cross section, 23 April 2009, 1832 GMT. Display is from the northwest (left) to the southeast (right).

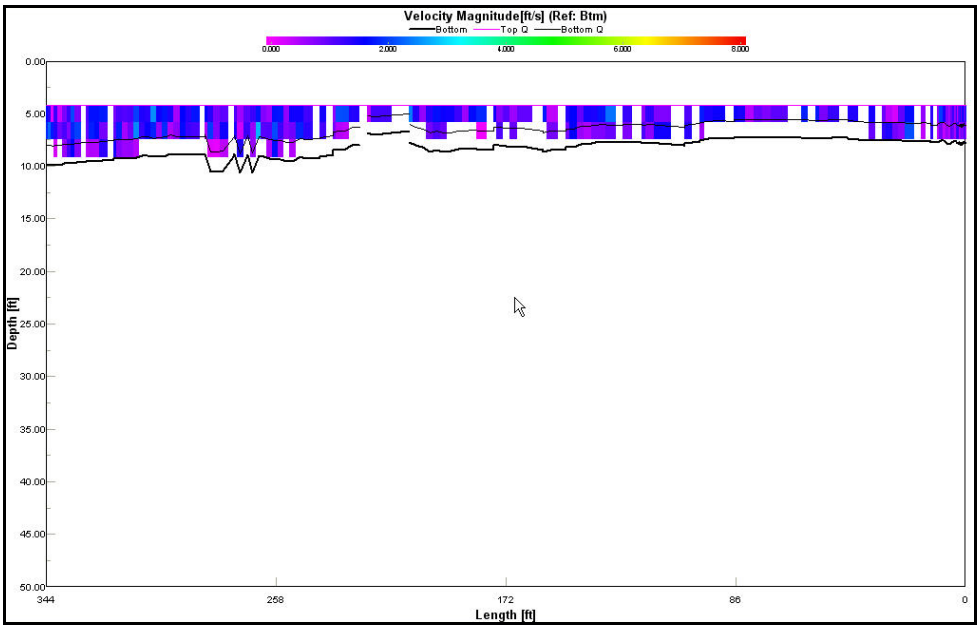


Figure E117. Transect 124 current velocity cross section, 23 April 2009, 1842 GMT. Display is from the southeast (left) to the northwest (right).

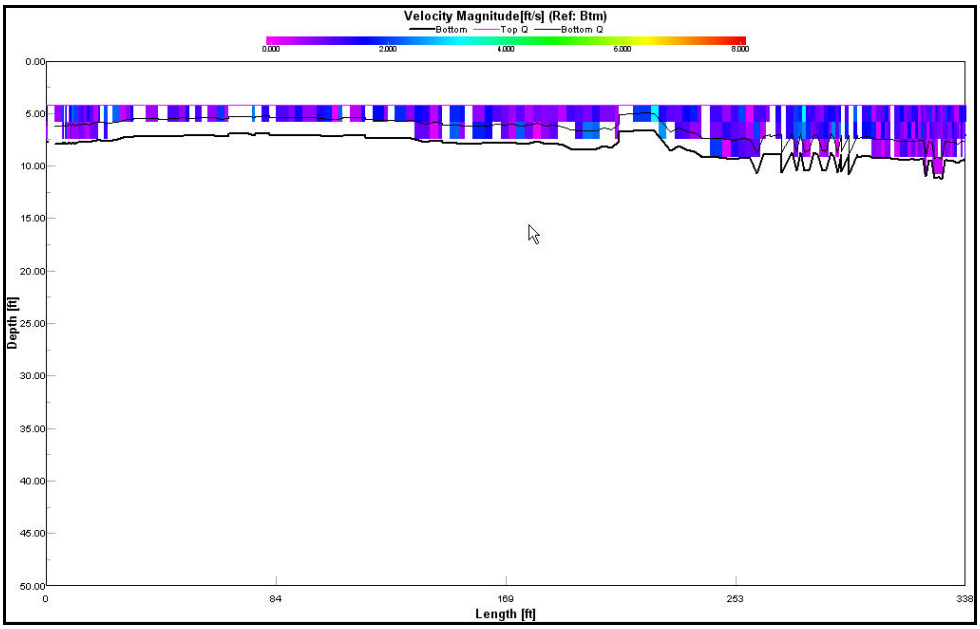


Figure E118. Transect 125 current velocity cross section, 23 April 2009, 1845 GMT. Display is from the southeast (left) to the northwest (right).

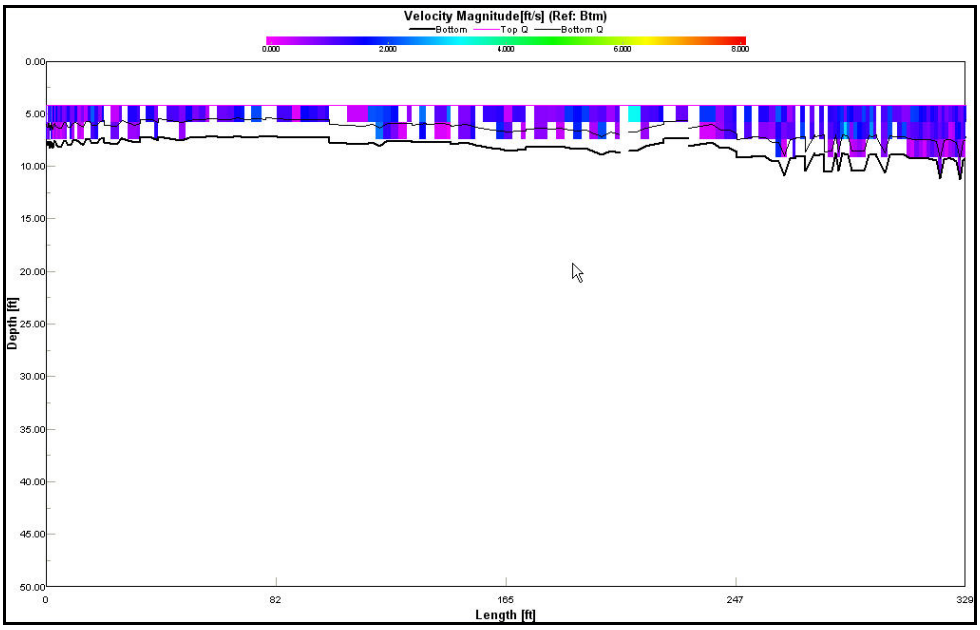


Figure E119. Transect 126 current velocity cross section, 23 April 2009, 1848 GMT. Display is from the southeast (left) to the northwest (right).

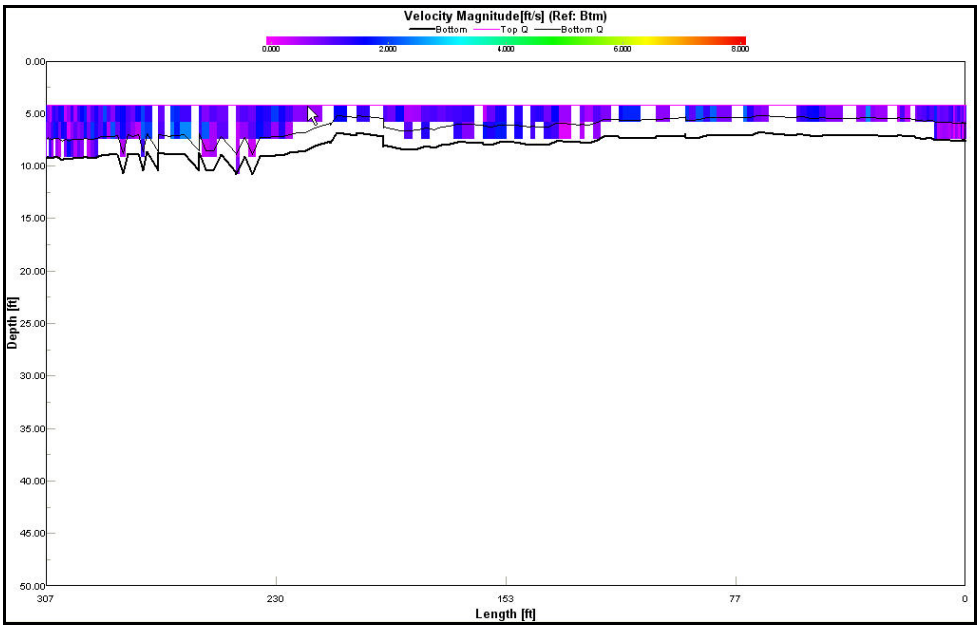


Figure E120. Transect 127 current velocity cross section, 23 April 2009, 1852 GMT. Display is from the northwest (left) to the southeast (right).

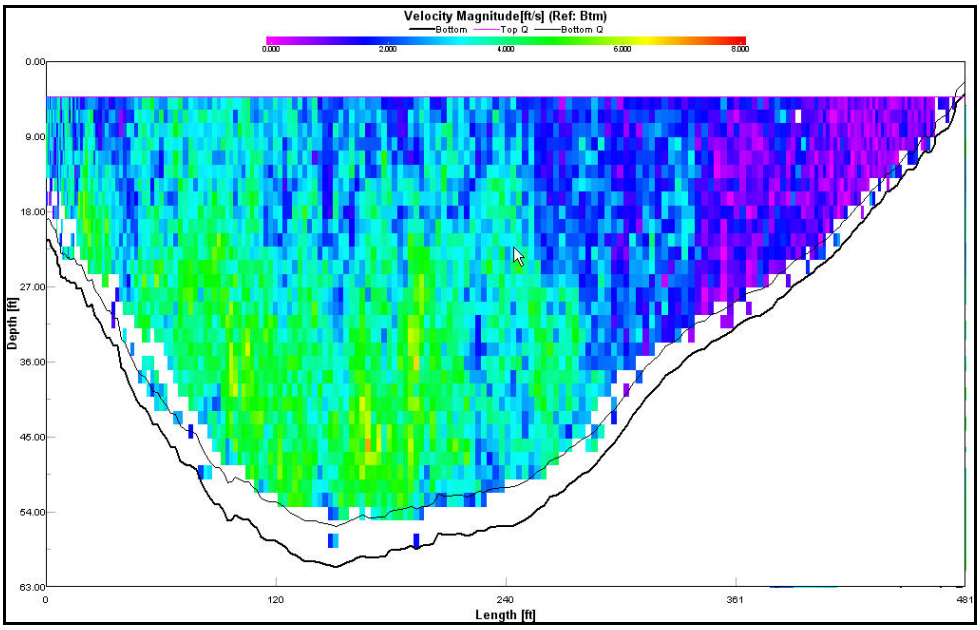


Figure E121. Transect 128 current velocity cross section, 23 April 2009, 1852 GMT. Display is from the southwest (left) to the northeast (right).

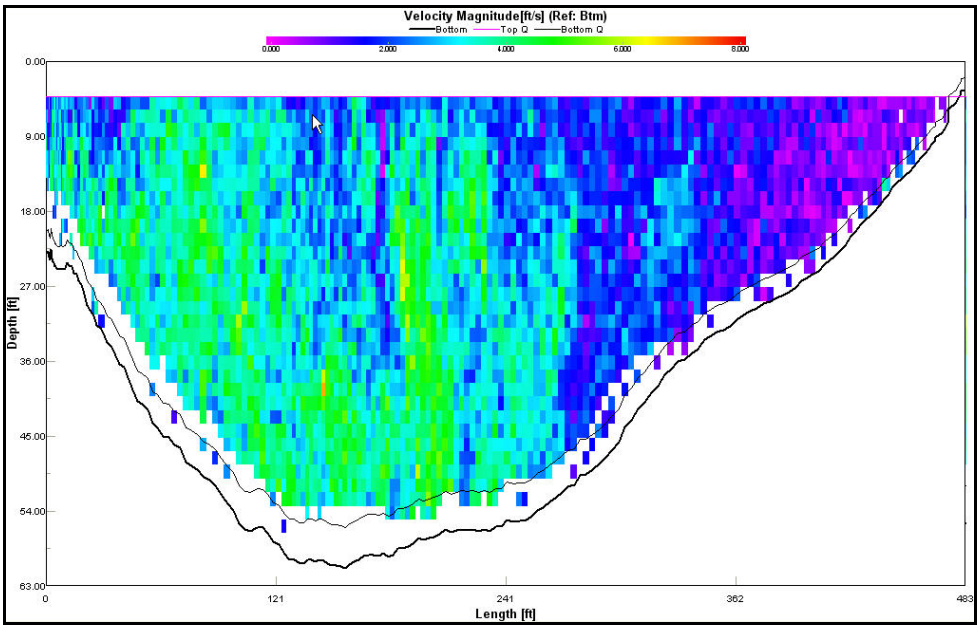


Figure E122. Transect 130 current velocity cross section, 23 April 2009, 1908 GMT. Display is from the southwest (left) to the northeast (right).

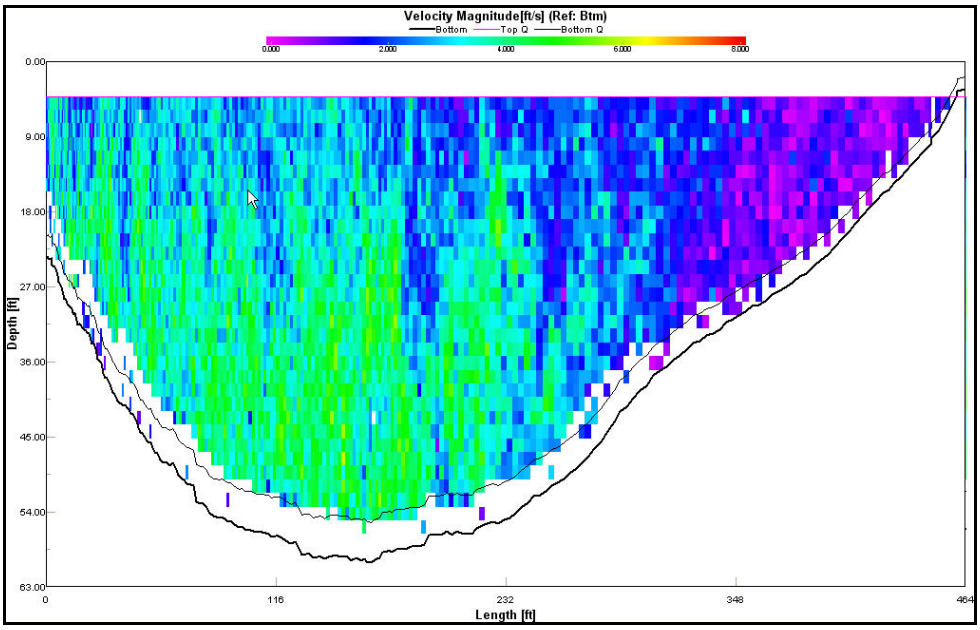


Figure E123. Transect 131 current velocity cross section, 23 April 2009, 1913 GMT. Display is from the southwest (left) to the northeast (right).

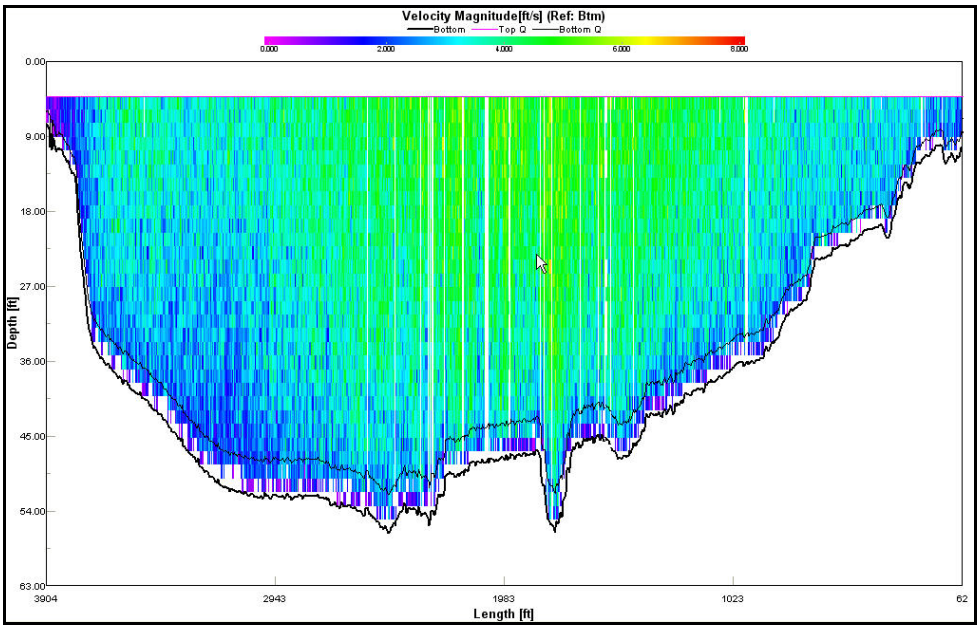


Figure E124. Transect 132 current velocity cross section, 23 April 2009, 1918 GMT.

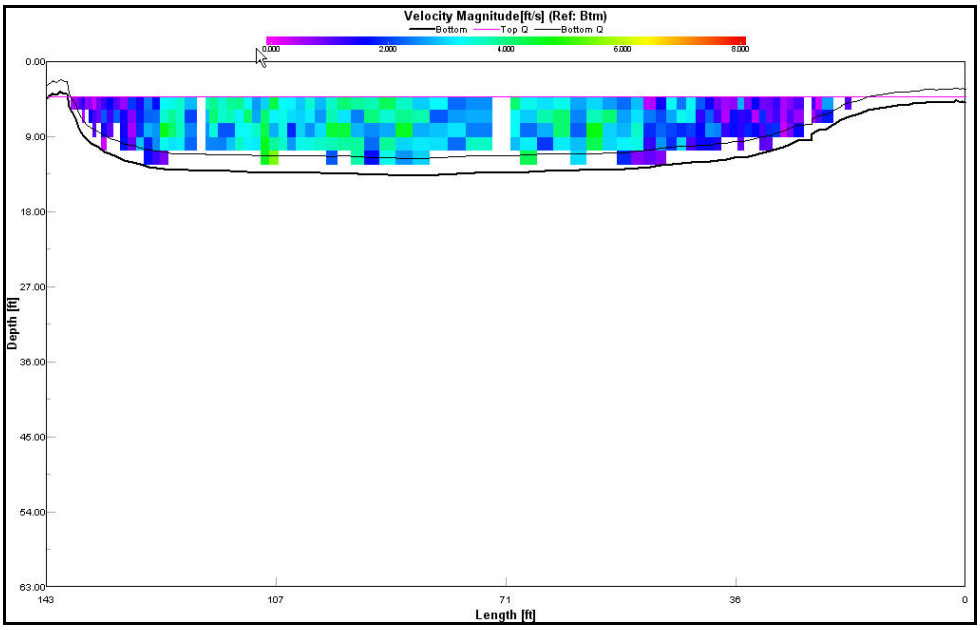


Figure E125. Transect 133 current velocity cross section, 23 April 2009, 1913 GMT. Display is from the north (left) to the south (right).

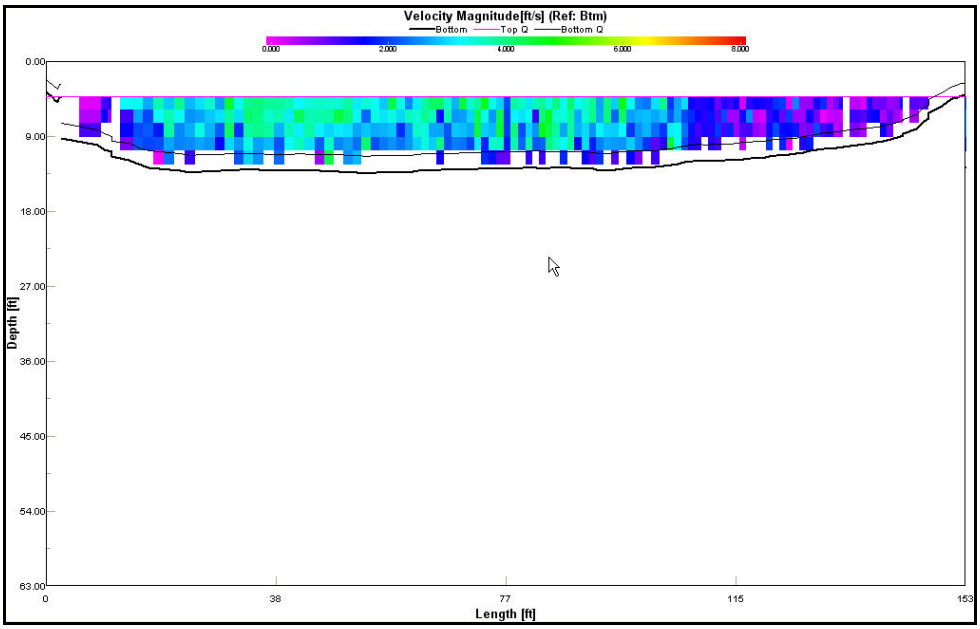


Figure E126. Transect 134 current velocity cross section, 23 April 2009, 1936 GMT. Display is from the north (left) to the south (right).

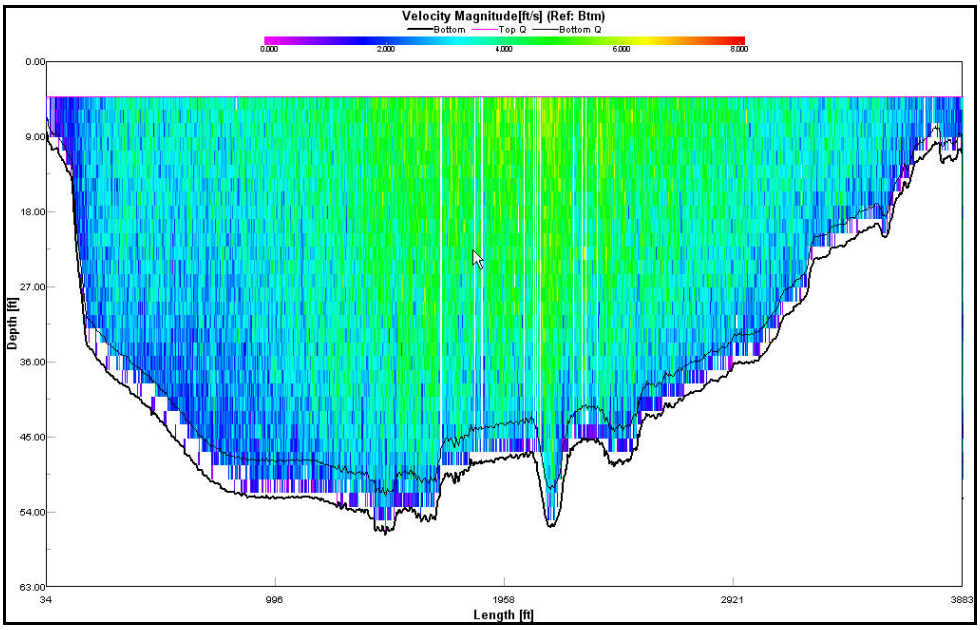


Figure E127. Transect 135 current velocity cross section, 23 April 2009, 1941 GMT.

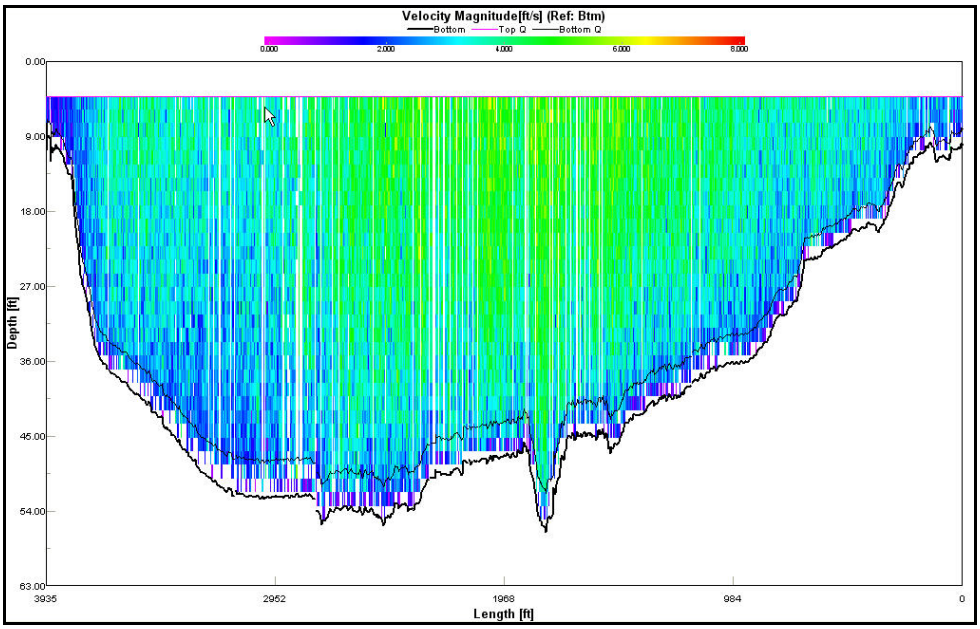


Figure E128. Transect 136 current velocity cross section, 23 April 2009, 1951 GMT.

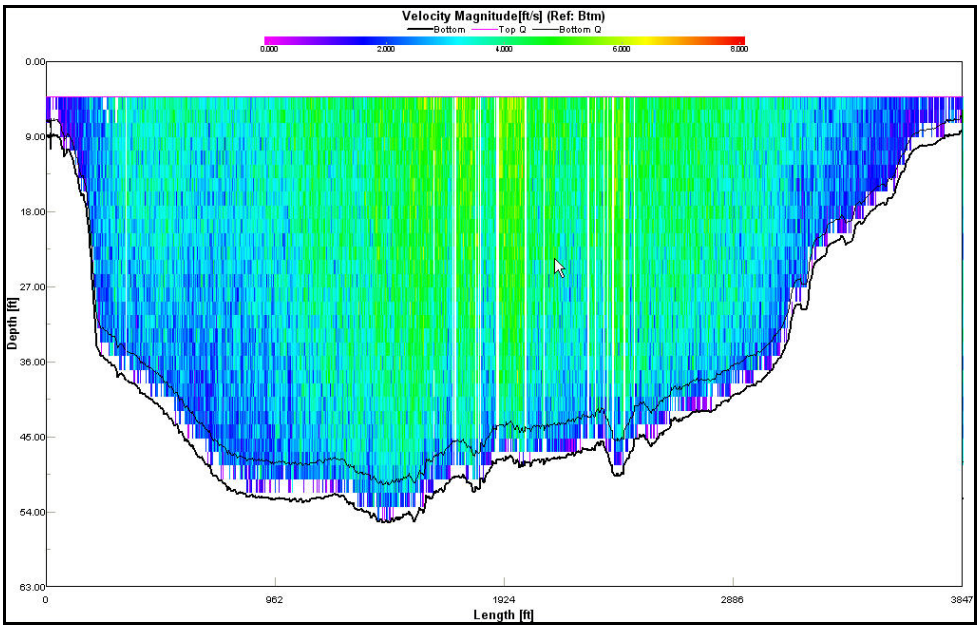


Figure E129. Transect 137 current velocity cross section, 23 April 2009, 2003 GMT.

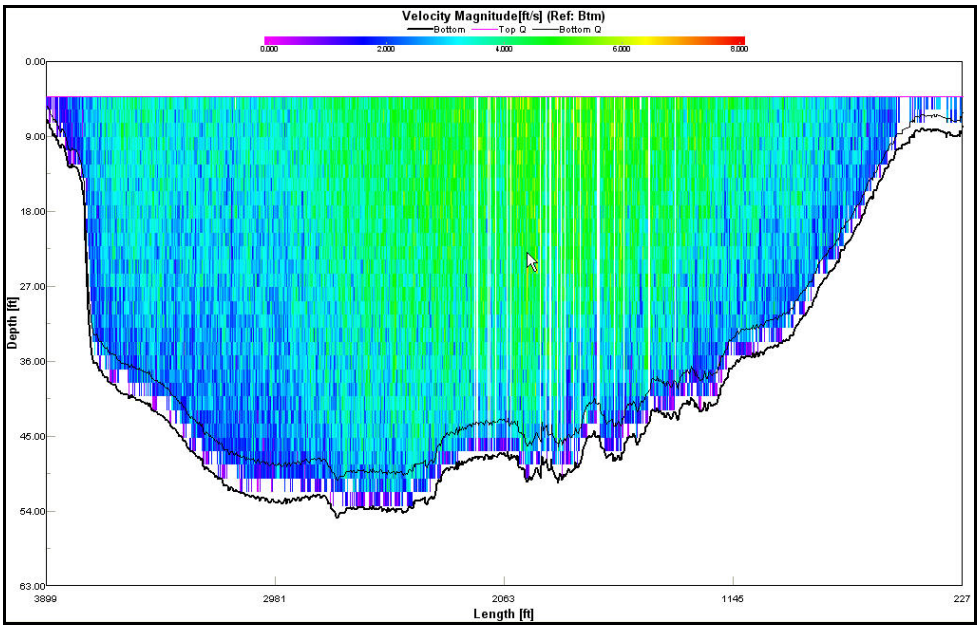


Figure E130. Transect 139 current velocity cross section, 23 April 2009, 2017 GMT.

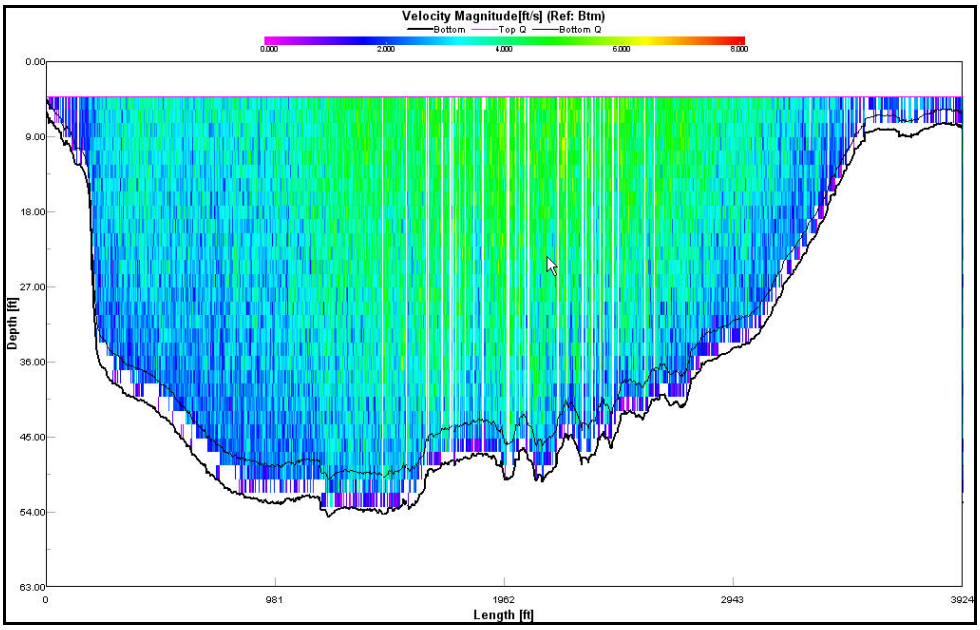


Figure E131. Transect 140 current velocity cross section, 23 April 2009, 2027 GMT.

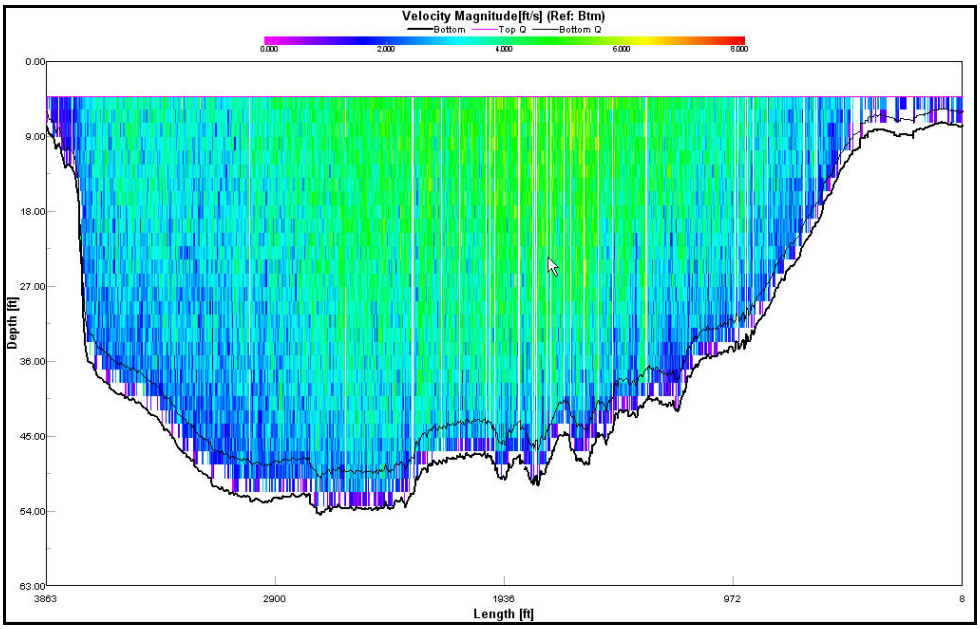


Figure E132. Transect 141 current velocity cross section, 23 April 2009, 2036 GMT.

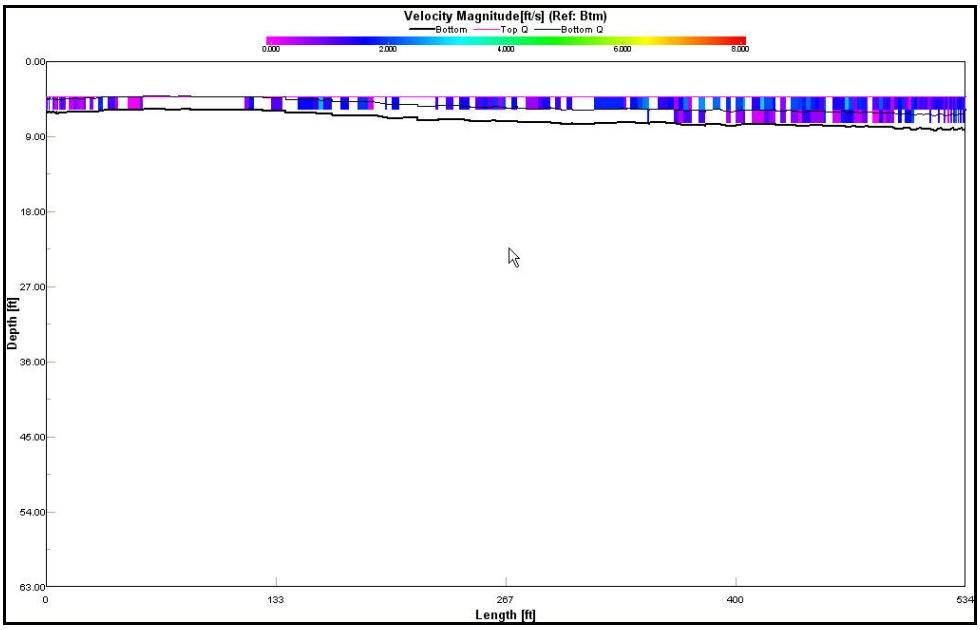


Figure E133. Transect 142 current velocity cross section, 23 April 2009, 2059 GMT. Display is from the southeast (left) to the northwest (right).

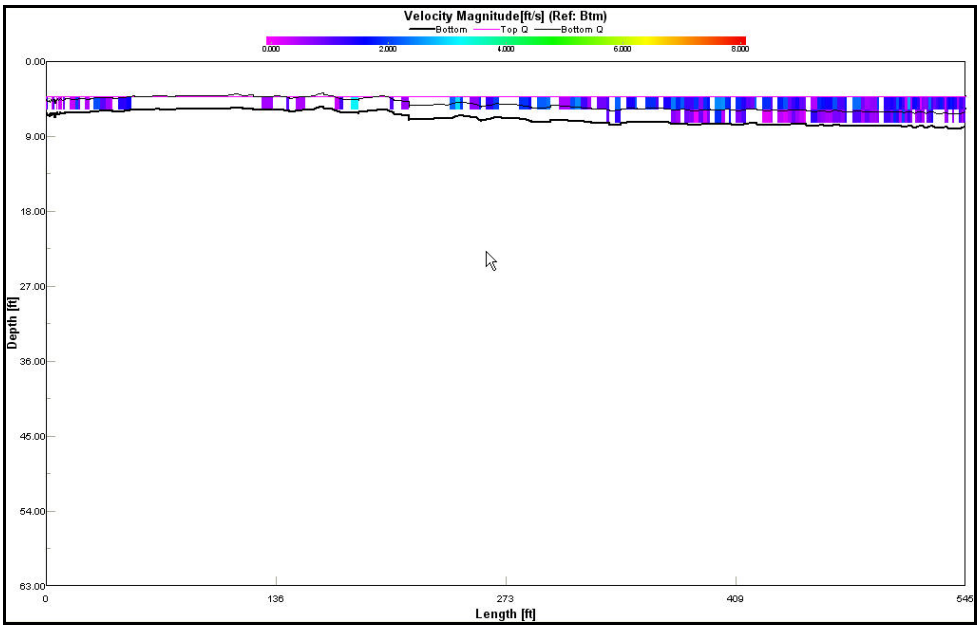


Figure E134. Transect 143 current velocity cross section, 23 April 2009, 2104 GMT. Display is from the southeast (left) to the northwest (right).

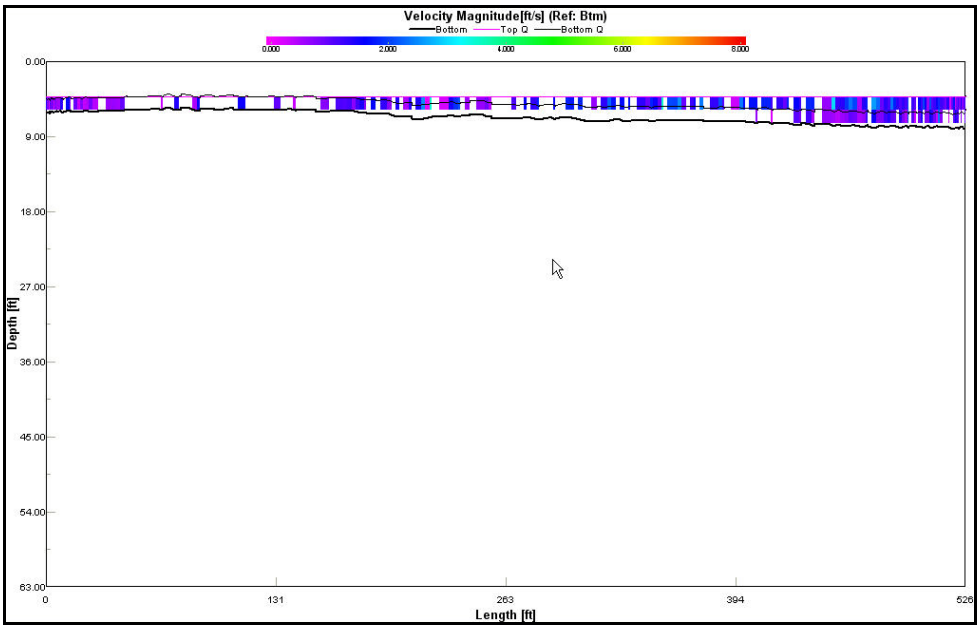


Figure E135. Transect 144 current velocity cross section, 23 April 2009, 2108 GMT. Display is from the southeast (left) to the northwest (right).

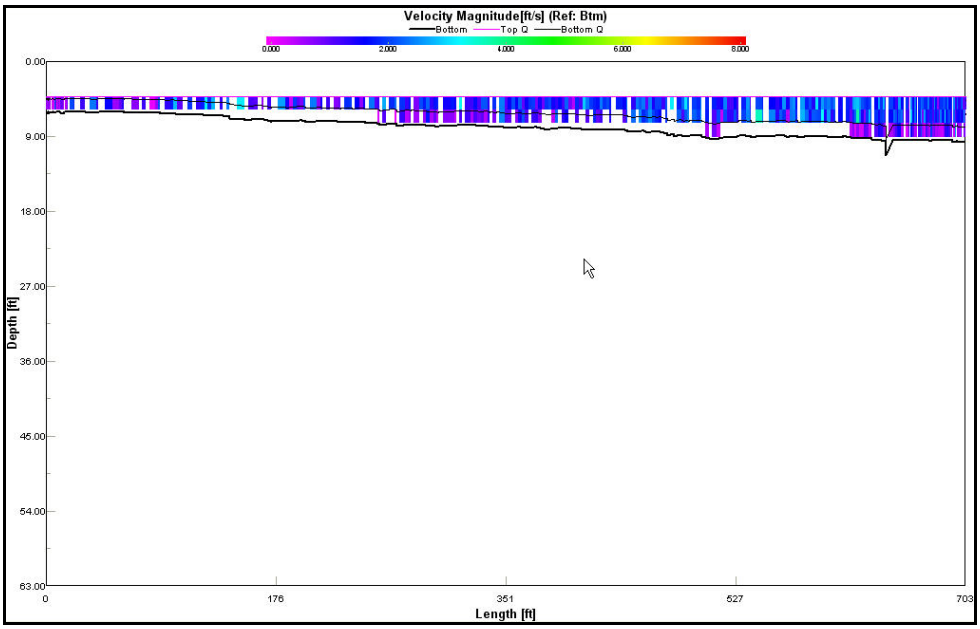


Figure E136. Transect 145 current velocity cross section, 23 April 2009, 2108 GMT. Display is from the south (left) to the north (right).

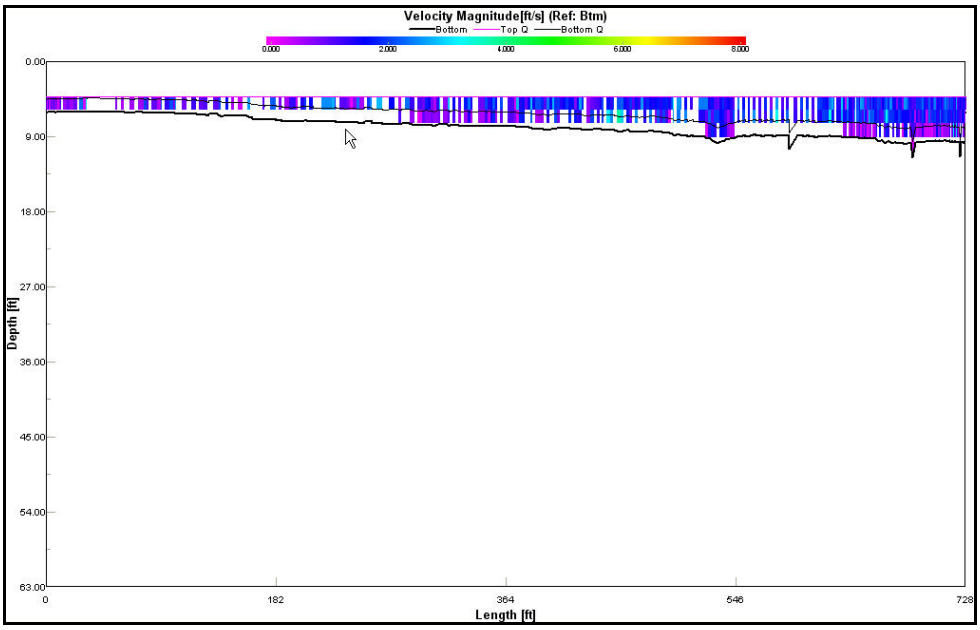


Figure E137. Transect 146 current velocity cross section, 23 April 2009, 2115 GMT. Display is from the south (left) to the north (right).

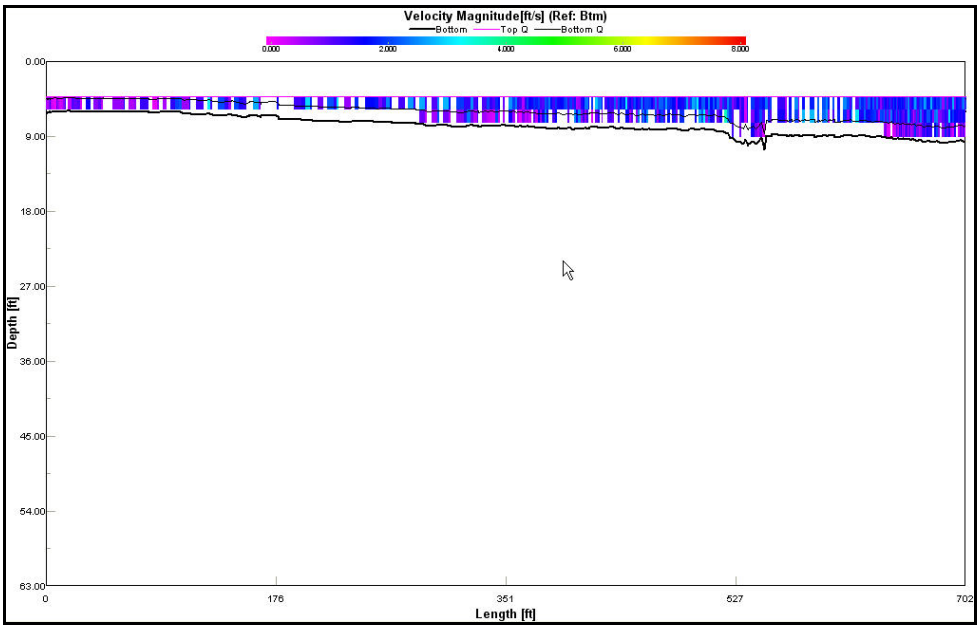


Figure E138. Transect 147 current velocity cross section, 23 April 2009, 2139 GMT. Display is from the south (left) to the north (right).

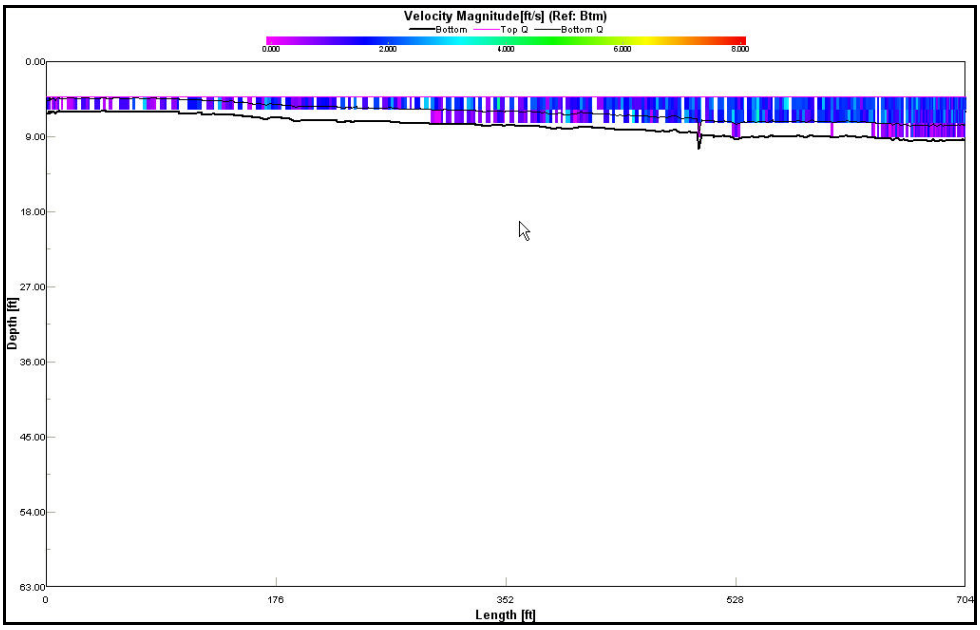


Figure E139. Transect 148 current velocity cross section, 23 April 2009, 2144 GMT. Display is from the south (left) to the north (right).

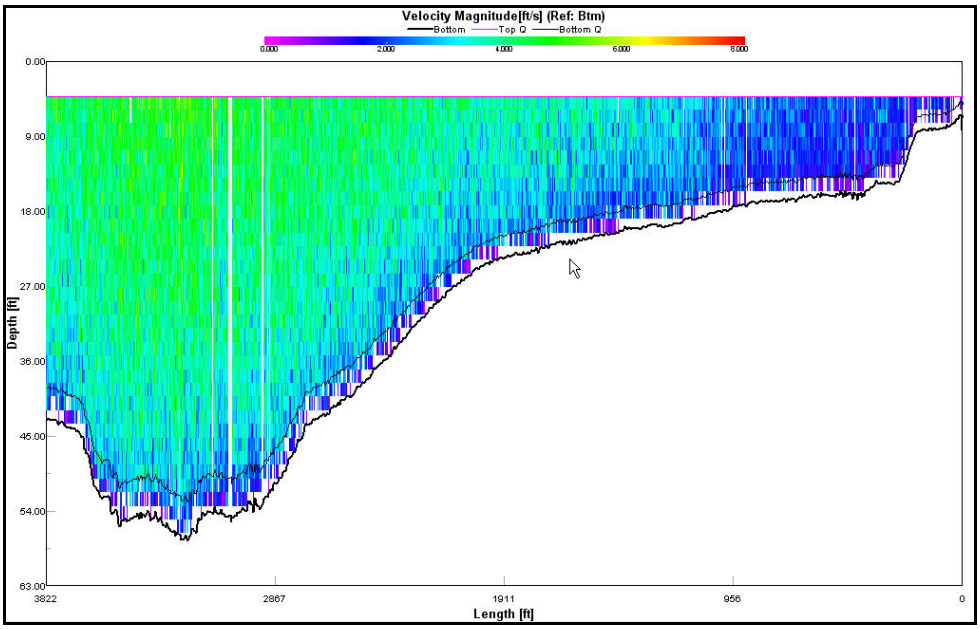


Figure E140. Transect 149 current velocity cross section, 23 April 2009, 2153 GMT.

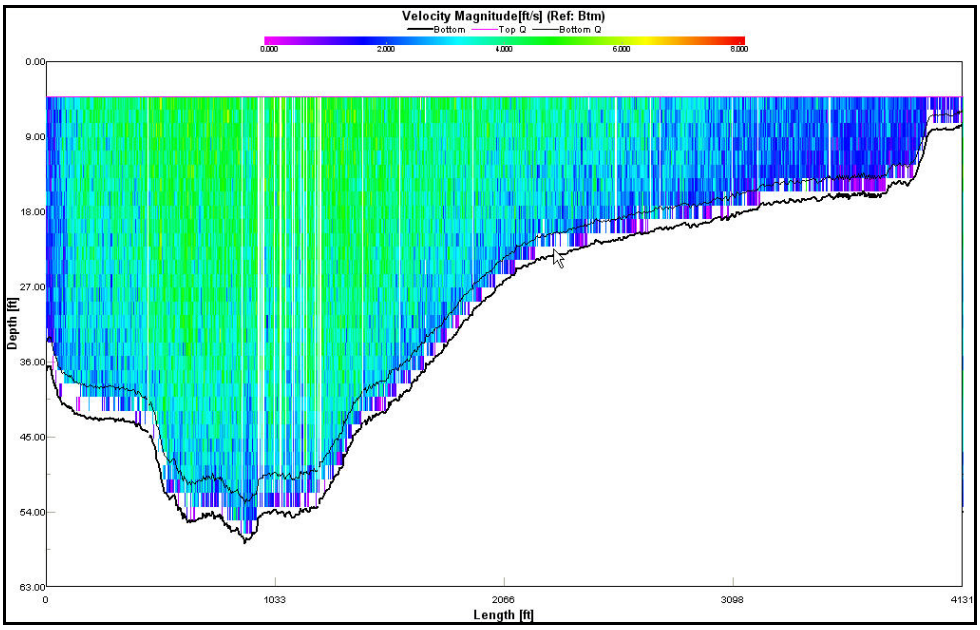


Figure E141. Transect 150 current velocity cross section, 23 April 2009, 2204 GMT.

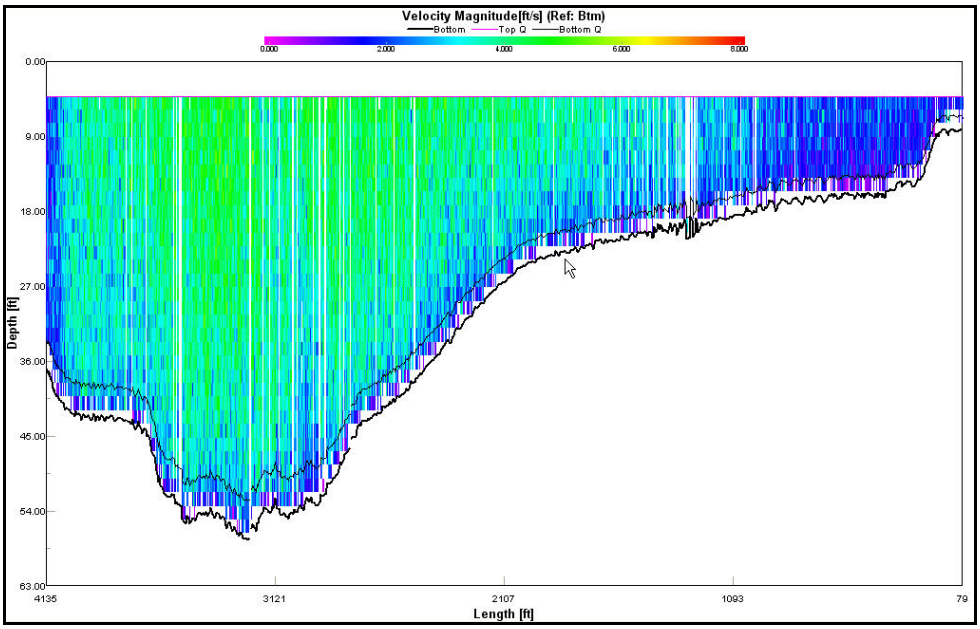


Figure E142. Transect 151 current velocity cross section, 23 April 2009, 2214 GMT.

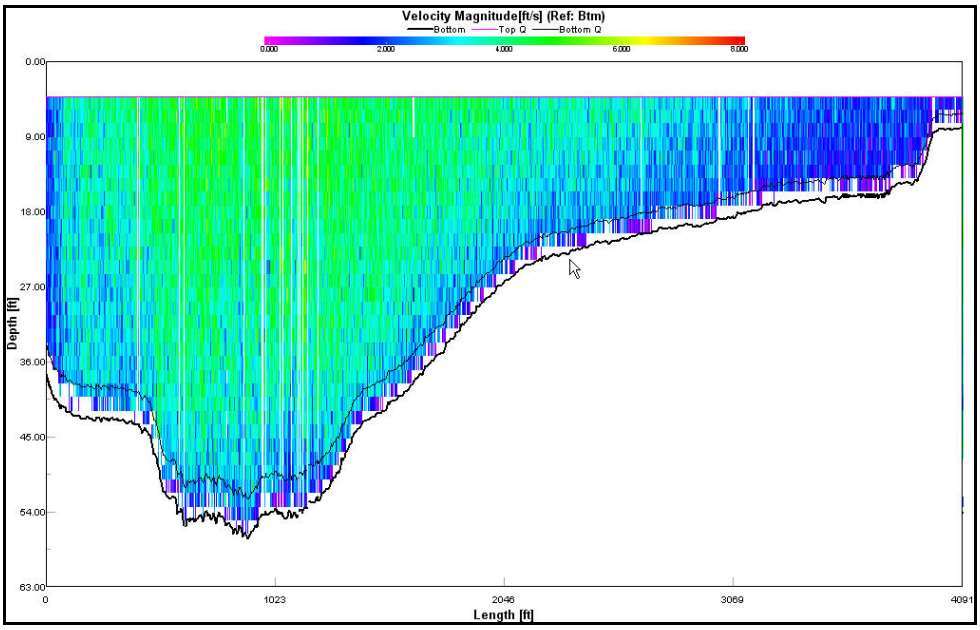


Figure E143. Transect 152 current velocity cross section, 23 April 2009, 2224 GMT.

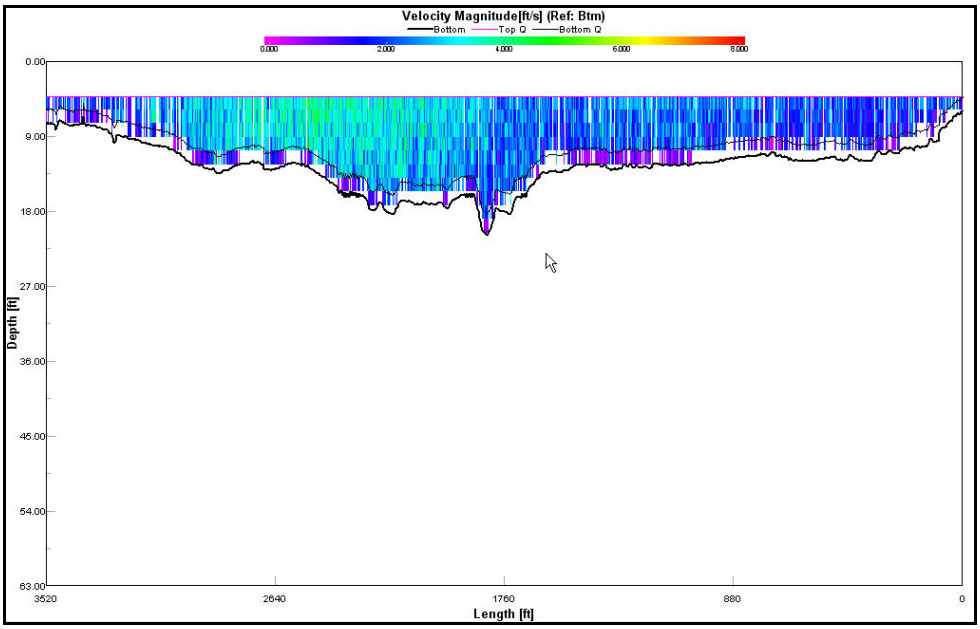


Figure E144. Transect 153 current velocity cross section, 23 April 2009, 2240 GMT. Display is from the northwest (left) to the southeast (right).

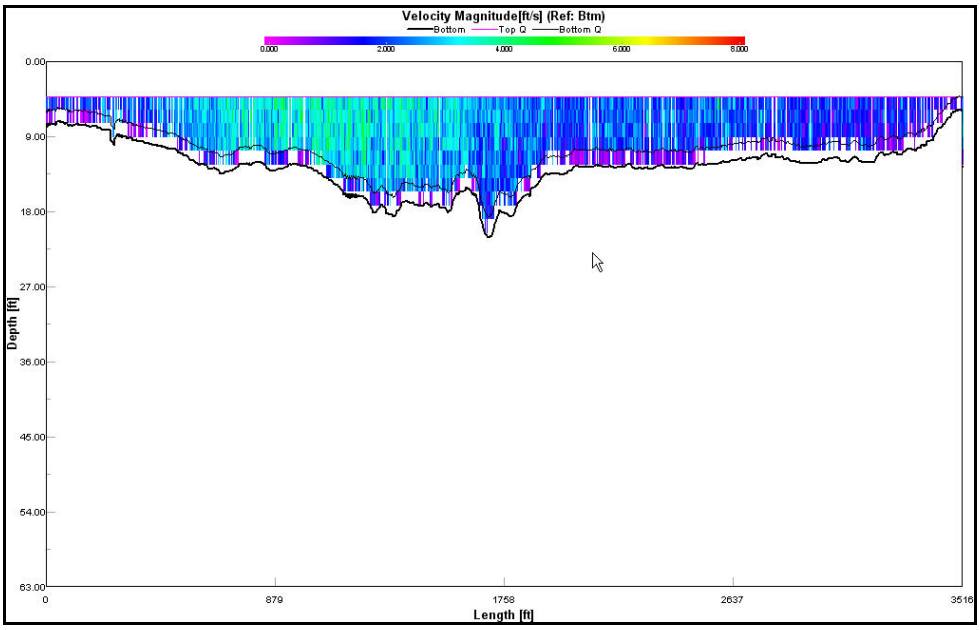


Figure E145. Transect 154 current velocity cross section, 23 April 2009, 2248 GMT. Display is from the northwest (left) to the southeast (right).

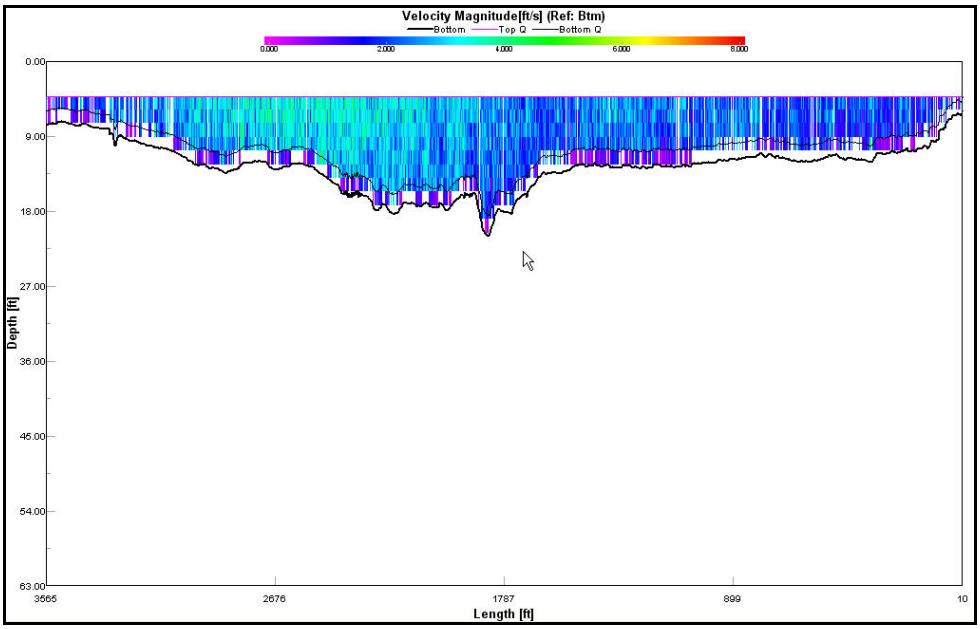


Figure E146. Transect 155 current velocity cross section, 23 April 2009, 2256 GMT. Display is from the northwest (left) to the southeast (right).

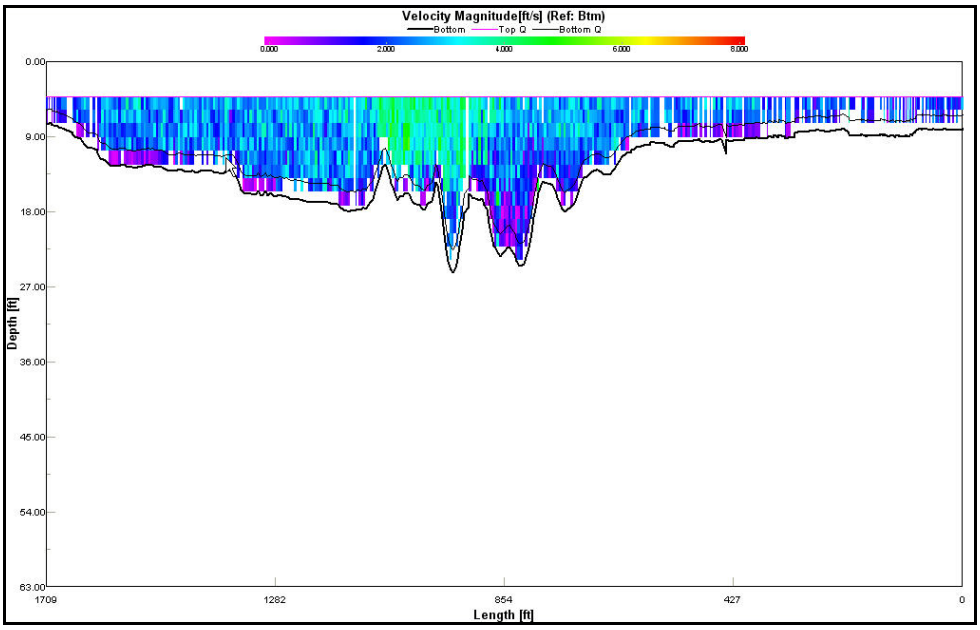


Figure E147. Transect 156 current velocity cross section, 23 April 2009, 2316 GMT. Display is from the southeast (left) to the northwest (right).

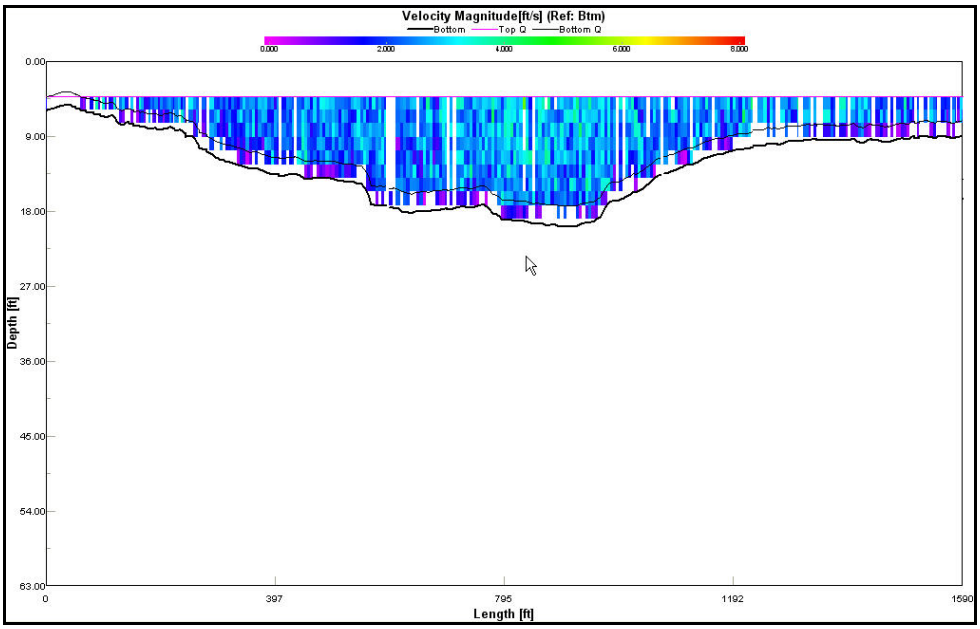


Figure E148. Transect 157 current velocity cross section, 23 April 2009, 2320 GMT. Display is from the southeast (left) to the northwest (right).

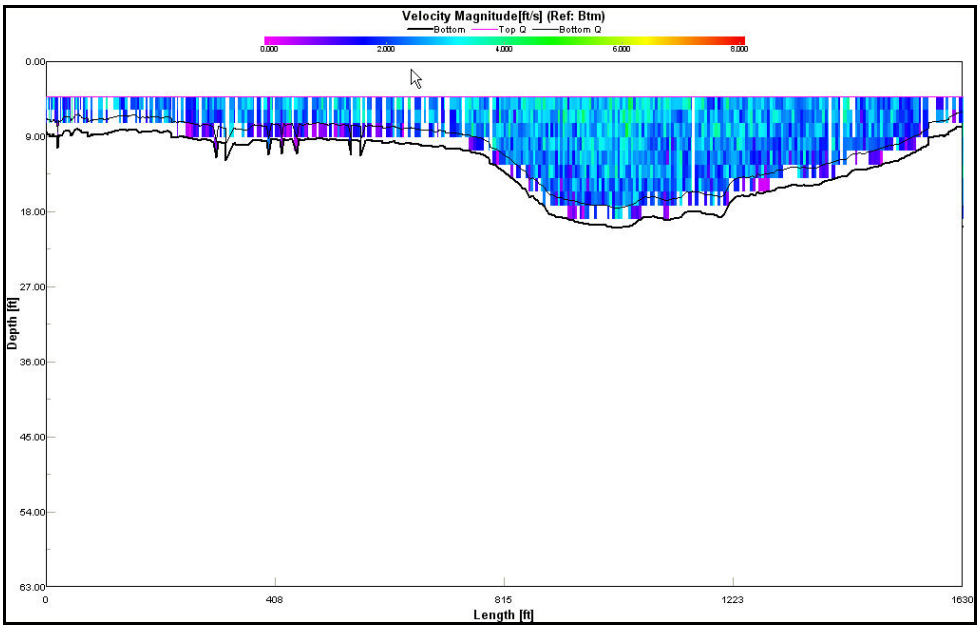


Figure E149. Transect 158 current velocity cross section, 23 April 2009, 2324 GMT. Display is from the northwest (left) to the southeast (right).

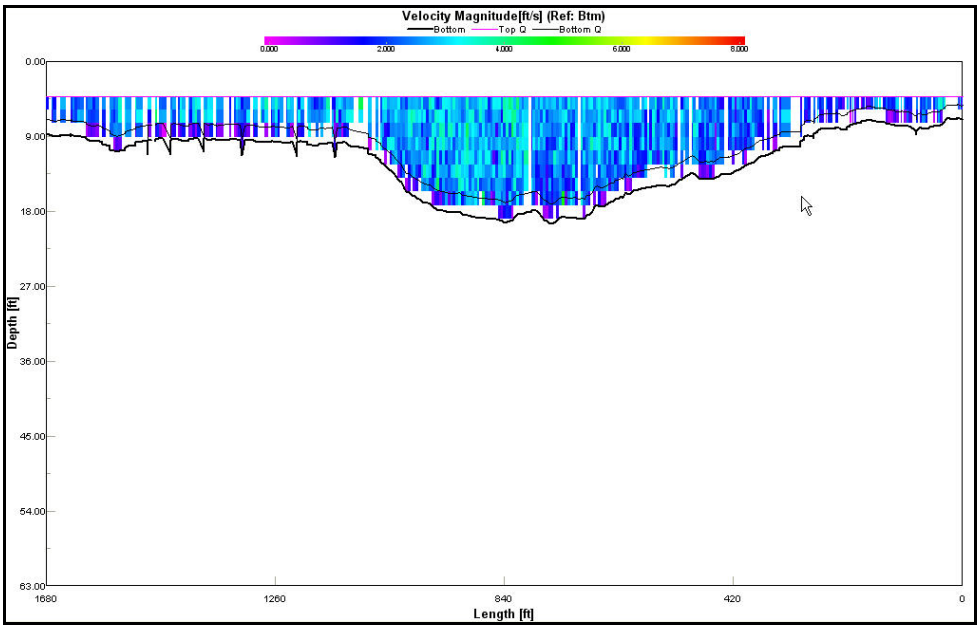


Figure E150. Transect 159 current velocity cross section, 23 April 2009, 2327 GMT. Display is from the northwest (left) to the southeast (right).

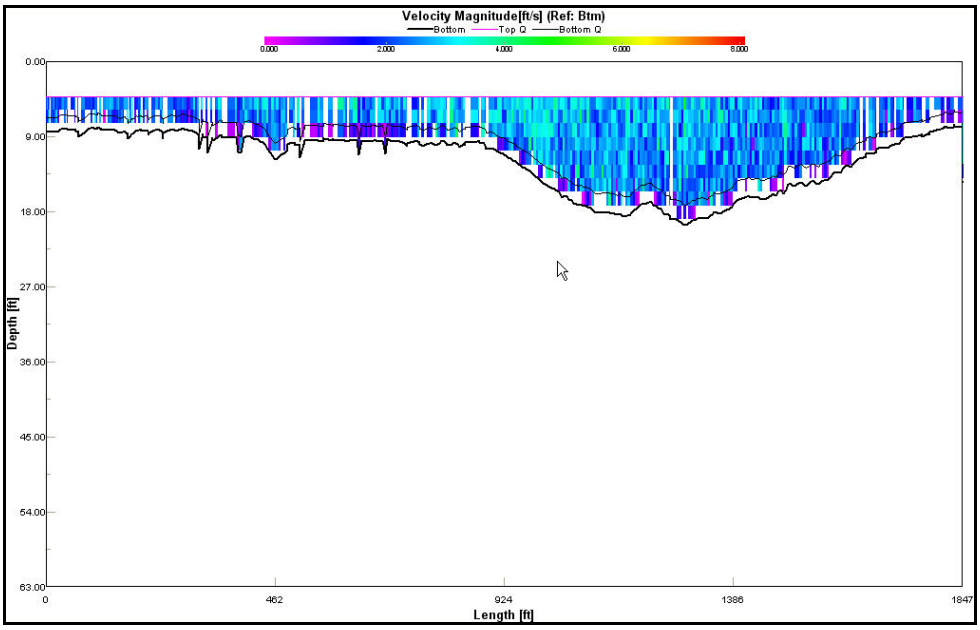


Figure E151. Transect 160 current velocity cross section, 23 April 2009, 2331 GMT. Display is from the northwest (left) to the southeast (right).

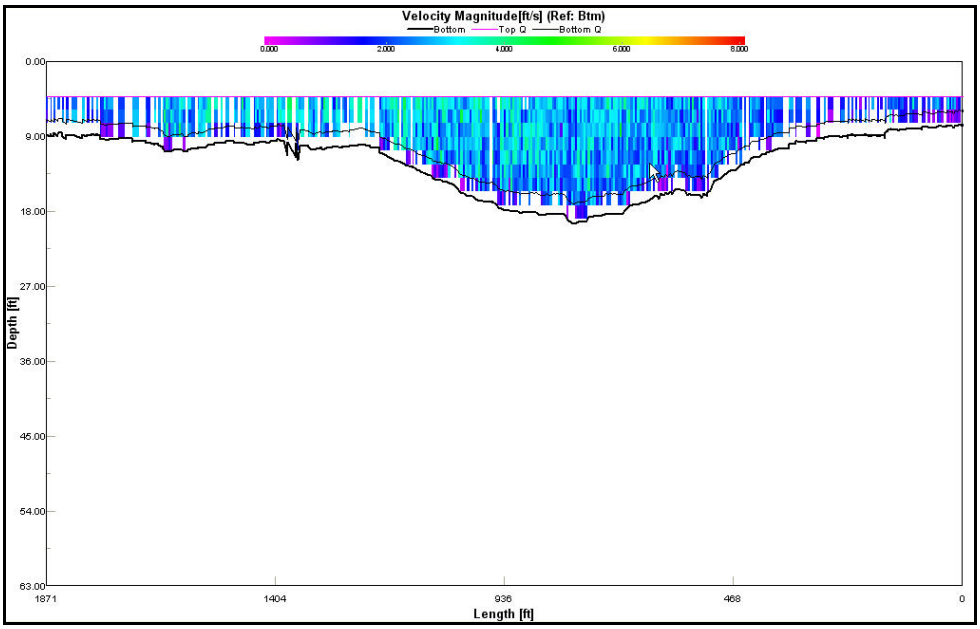


Figure E152. Transect 161 current velocity cross section, 23 April 2009, 2334 GMT. Display is from the northwest (left) to the southeast (right).

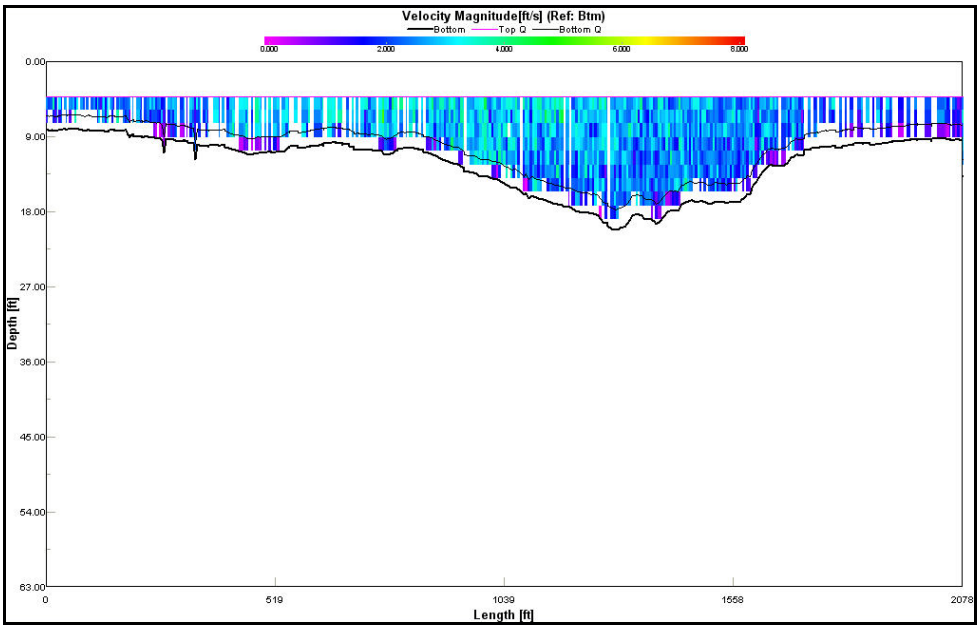


Figure E153. Transect 162 current velocity cross section, 23 April 2009, 2339 GMT. Display is from the northwest (left) to the southeast (right).

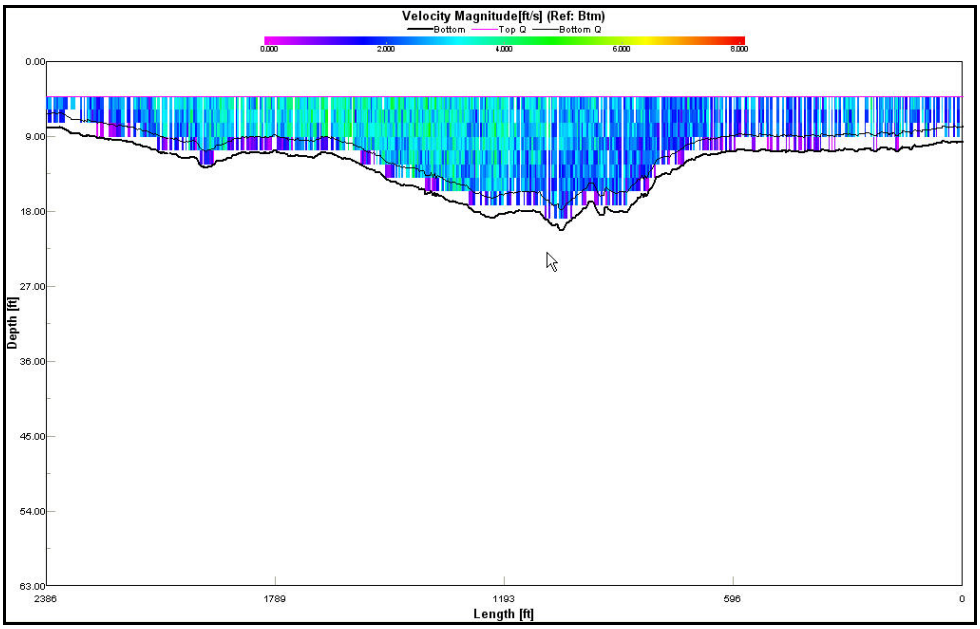


Figure E154. Transect 163 current velocity cross section, 23 April 2009, 2343 GMT. Display is from the northwest (left) to the southeast (right).

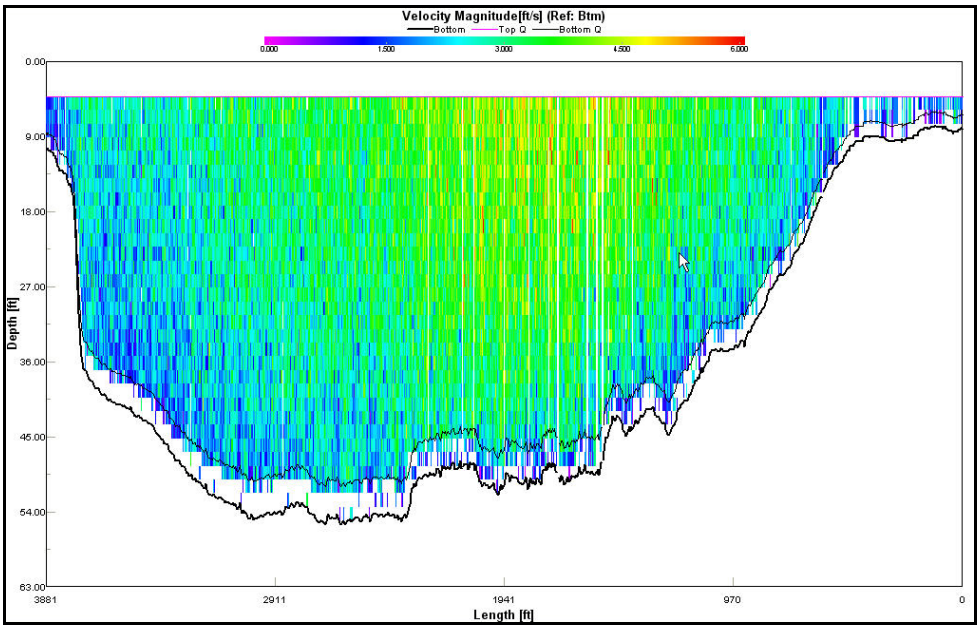


Figure E155. Transect 166 current velocity cross section, 5 May 2009, 1522 GMT.

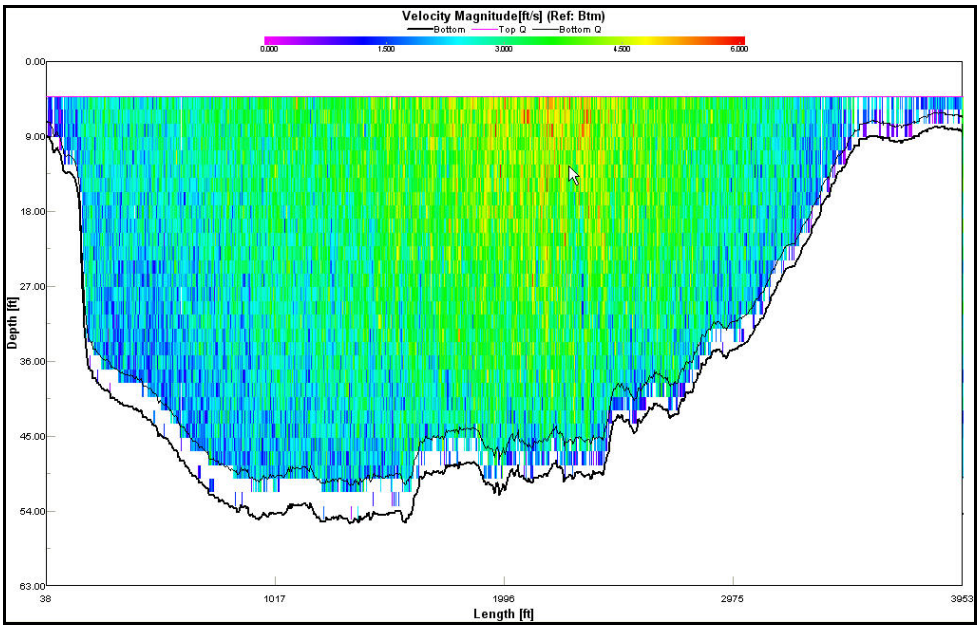


Figure E156. Transect 167 current velocity cross section, 5 May 2009, 1531 GMT.

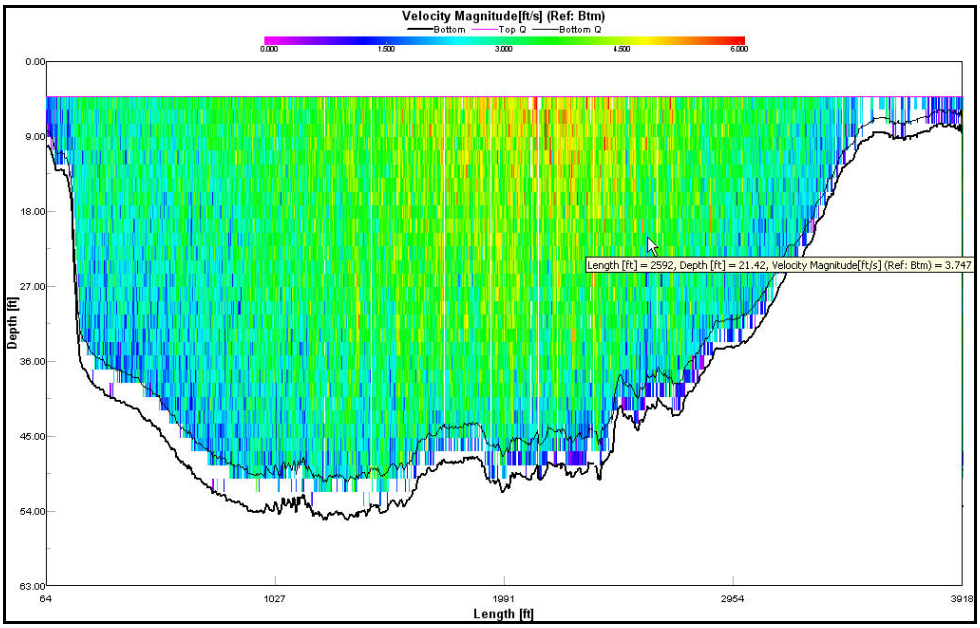


Figure E157. Transect 176 current velocity cross section, 5 May 2009, 2104 GMT.

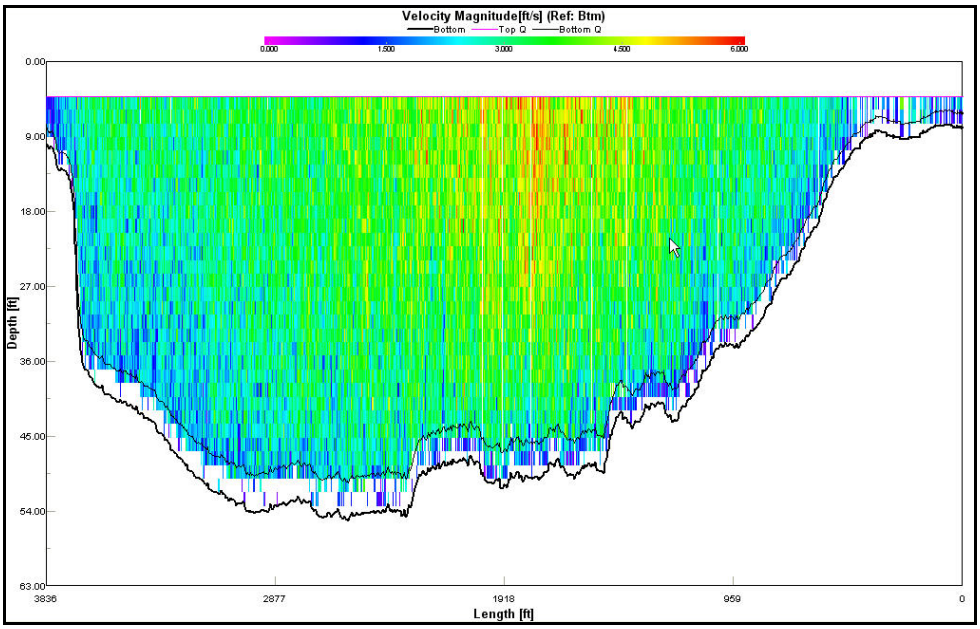


Figure E158. Transect 177 current velocity cross section, 5 May 2009, 2114 GMT.

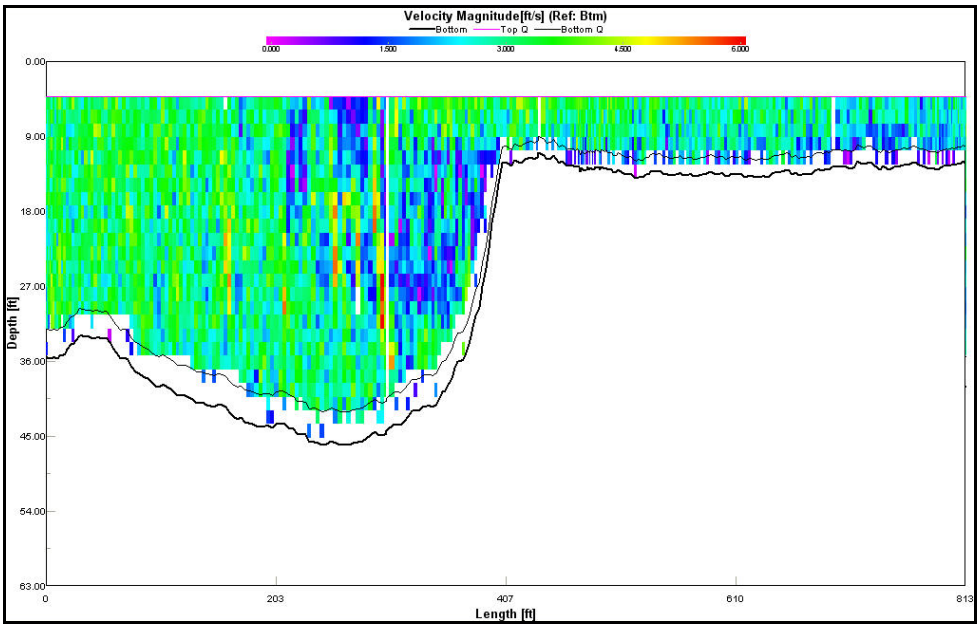


Figure E159. Transect 178 current velocity cross section, 5 May 2009, 2135 GMT. Display is from the southeast (left) to the northwest (right).

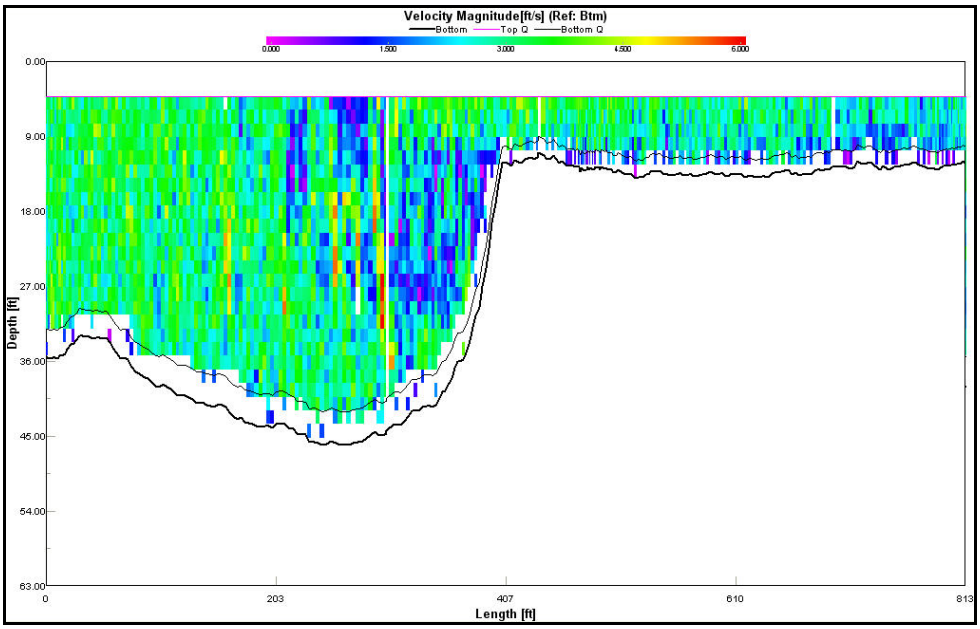


Figure E160. Transect 179 current velocity cross section, 5 May 2009, 2138 GMT. Display is from the southeast (left) to the northwest (right).

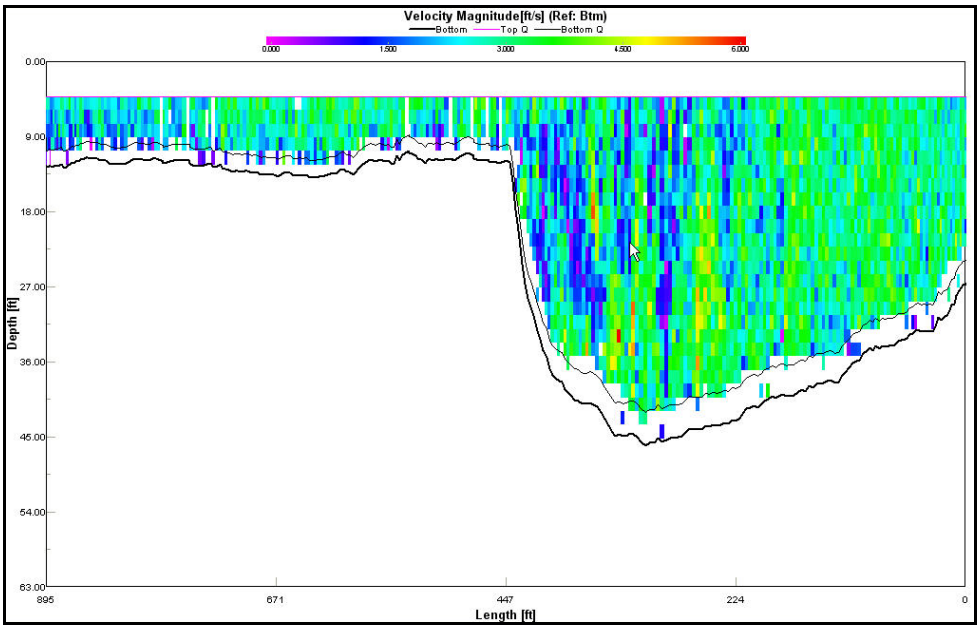


Figure E160. Transect 183 current velocity cross section, 5 May 2009, 2301 GMT. Display is from the northwest (left) to the southeast (right).

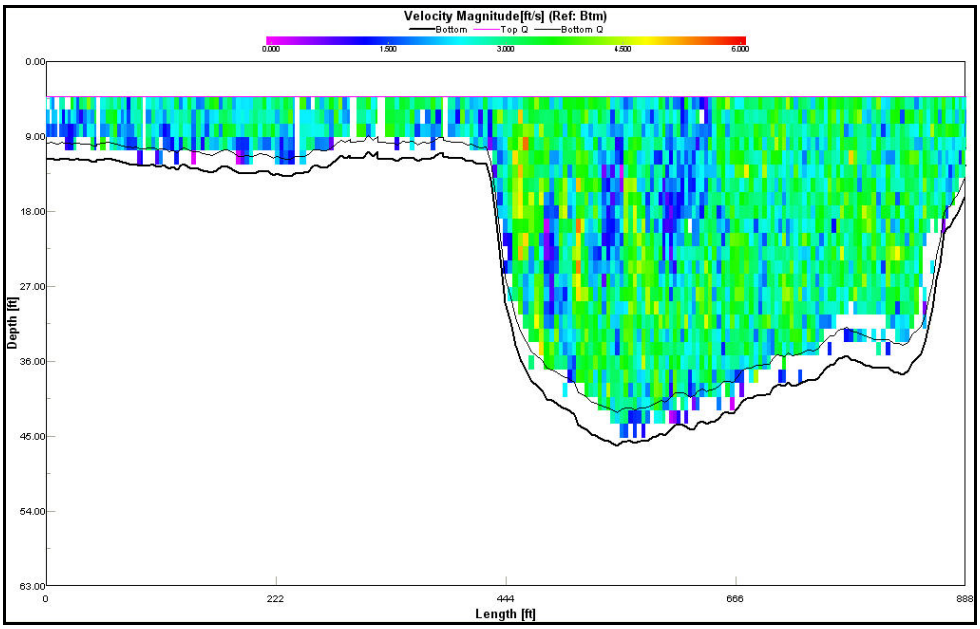


Figure E161. Transect 184 current velocity cross section, 5 May 2009, 2304 GMT. Display is from the northwest (left) to the southeast (right).

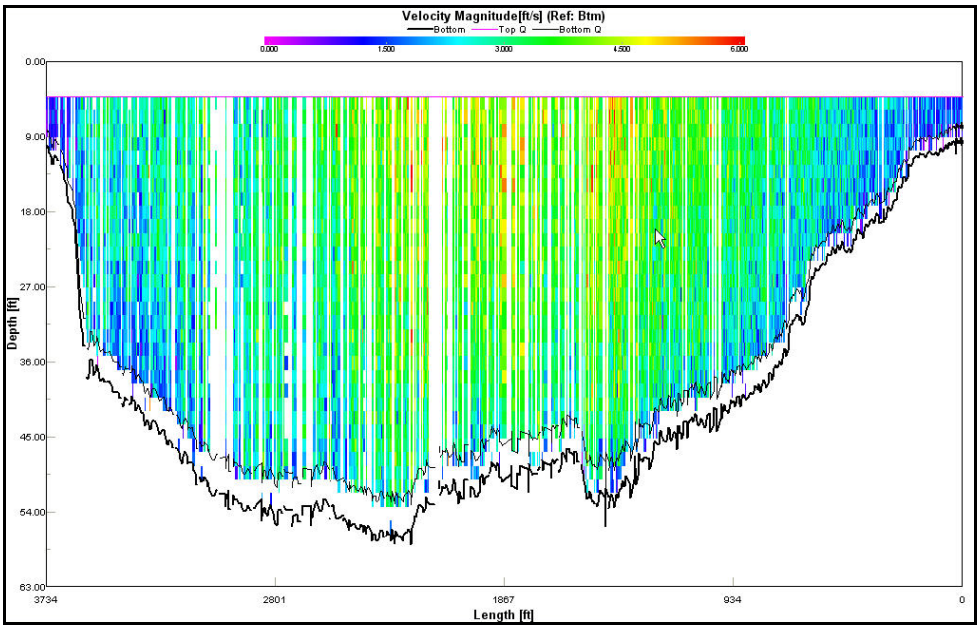


Figure E162. Transect 185 current velocity cross section, 6 May 2009, 1344 GMT. Display is from the southwest (left) to the northeast (right).

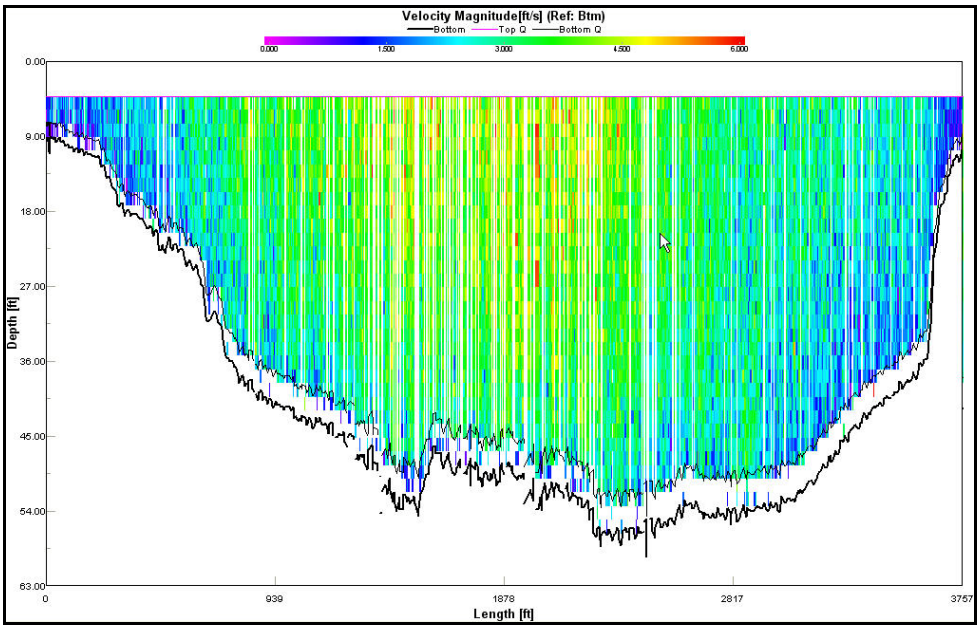


Figure E163. Transect 186 current velocity cross section, 6 May 2009, 1358 GMT. Display is from the southwest (left) to the northeast (right).

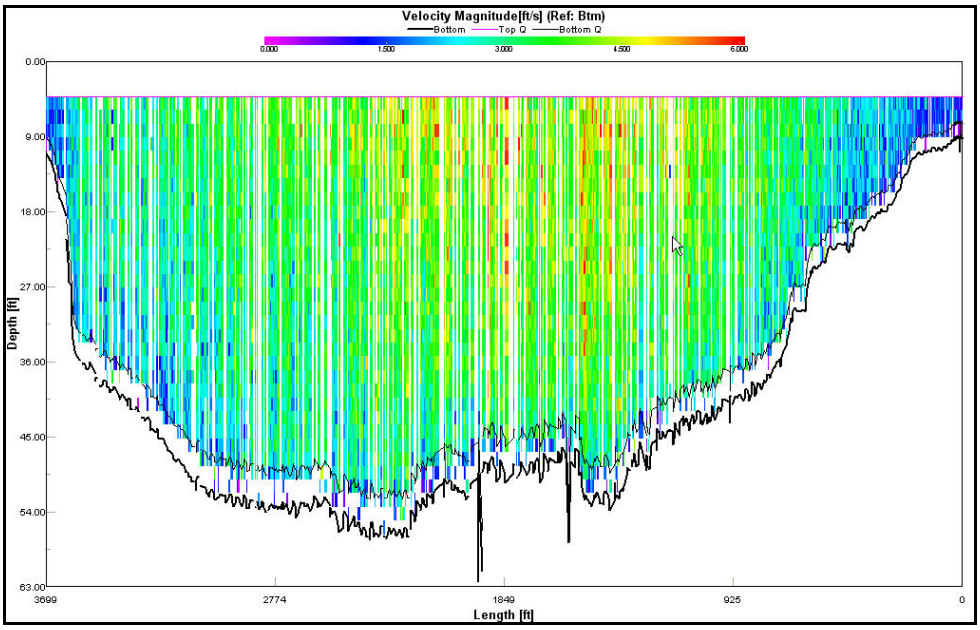


Figure E164. Transect 193 current velocity cross section, 6 May 2009, 1853 GMT.

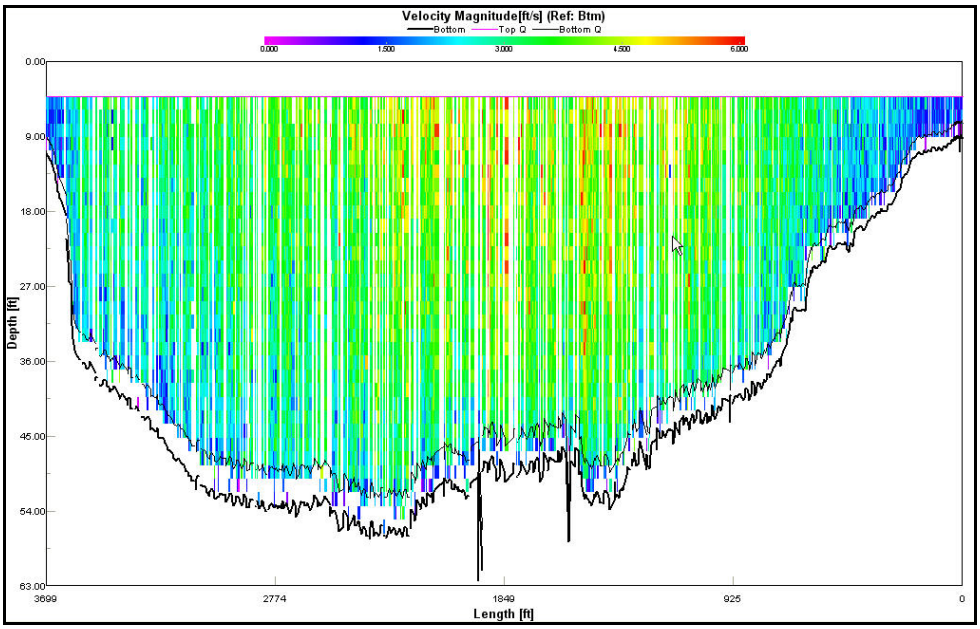


Figure E165. Transect 194 current velocity cross section, 6 May 2009, 1905 GMT.

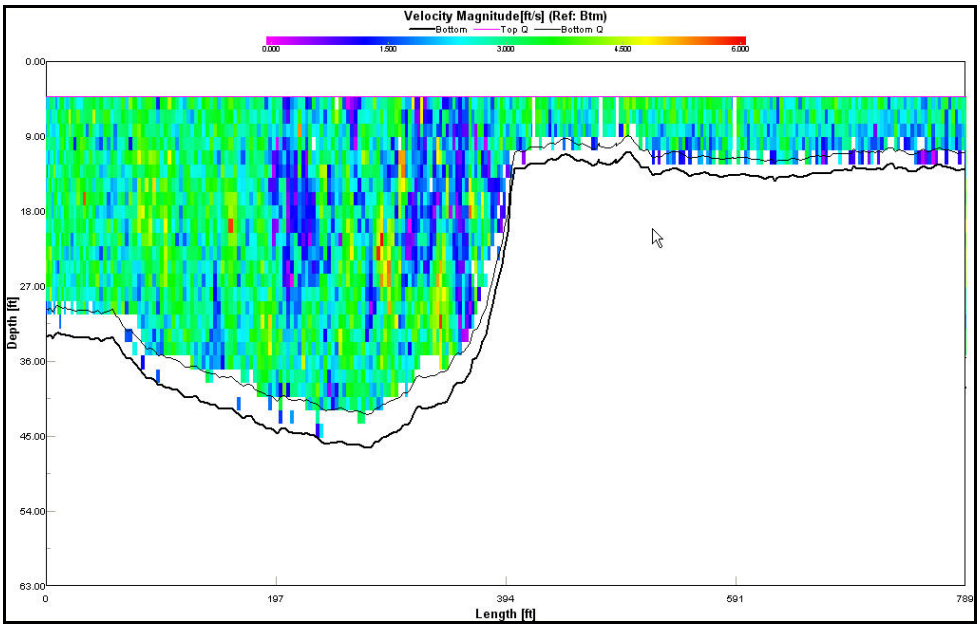


Figure E166. Transect 195 current velocity cross section, 6 May 2009, 1930 GMT. Display is from the southeast (left) to the northwest (right).

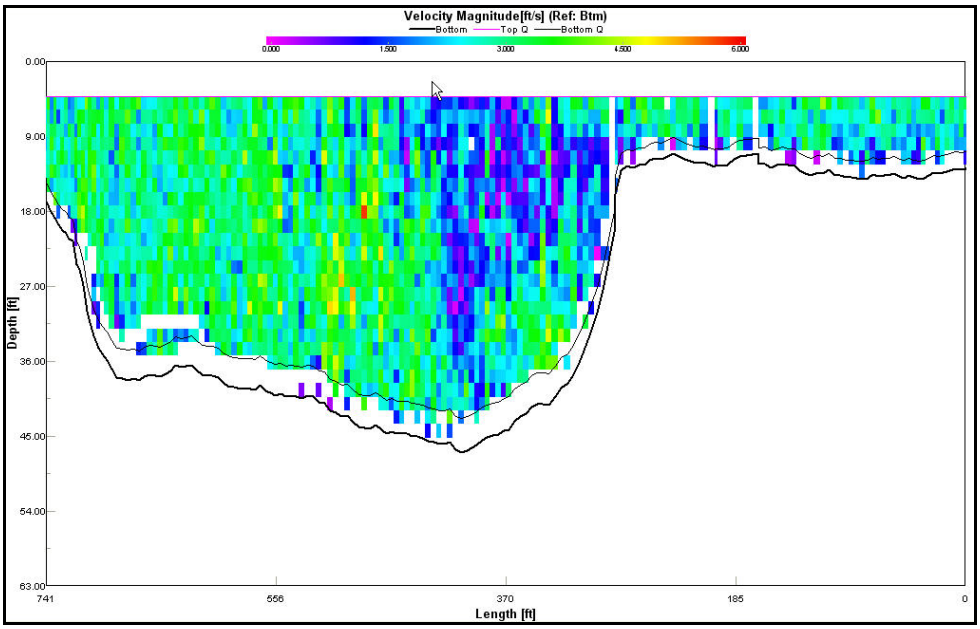


Figure E167. Transect 196 current velocity cross section, 6 May 2009, 1934 GMT. Display is from the southeast (left) to the northwest (right).

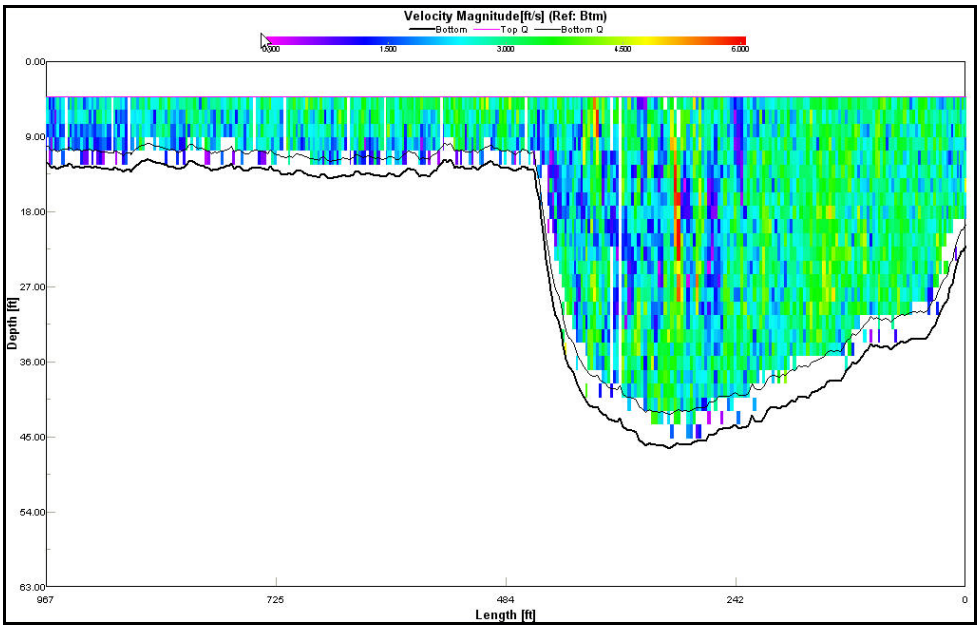


Figure E167. Transect 200 current velocity cross section, 6 May 2009, 2026 GMT. Display is from the northwest (left) to the southeast (right).

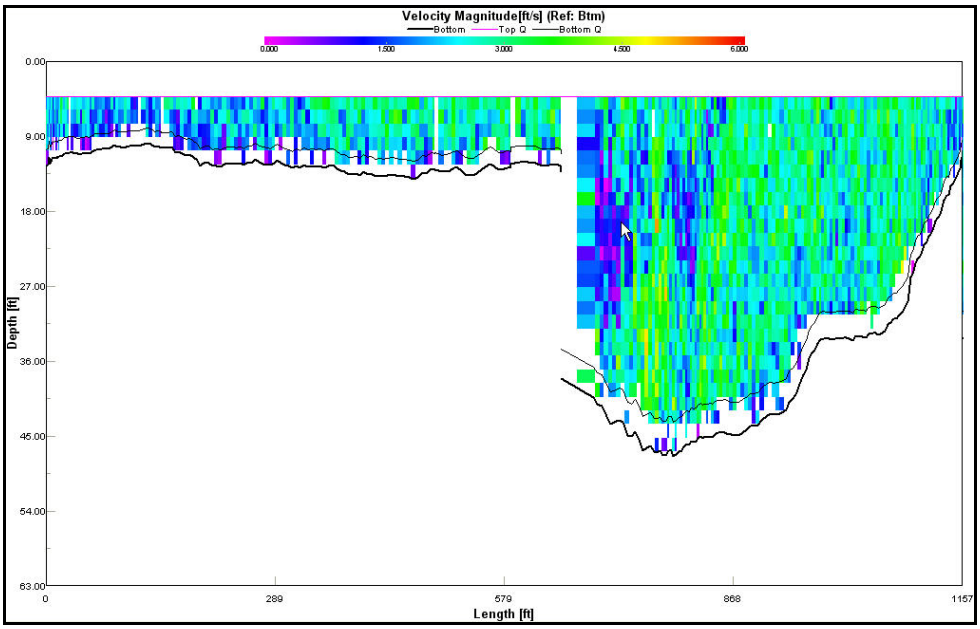


Figure E168. Transect 201 current velocity cross section, 6 May 2009, 2030 GMT. Display is from the northwest (left) to the southeast (right).

Appendix F

ADCP Discharge Measurements

Table F1. ADCP discharge measurements across the diversion channel.
Table F2. ADCP discharge measurements across the Mississippi River north of the diversion channel.
Table F3. ADCP discharge measurements across the Mississippi River south of the diversion channel.
Table F4. ADCP discharge measurements across Cubit's Gap.
Table F5. ADCP discharge measurements across the Mississippi River south of Cubit's Gap.
Table F6. ADCP discharge measurements across secondary channels off the Mississippi River.
Table F7. ADCP discharge measurements across secondary channels in Cubit's Gap.
Table F8. ADCP discharge measurements in Venice, Louisiana.

*Lines not surveyed as discharge lines.

Table F1. ADCP discharge measurements across the diversion channel.

Transect Line or Transect Number	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge into the diversion channel (ft^3/sec)
*2	3-10-2009	18:06	501	27545
7	3-10-2009	21:37	485	30130
8	3-10-2009	21:41	511	31114
WBD-MR	4-22-2009	17:26	563	41842
WBD-MR	4-22-2009	17:30	860	45126
WBD-MR	4-23-009	0:09	504	35005
WBD-MR	4-23-009	0:10	531	38154
WBD-MR	4-23-009	14:14	505	40046
WBD-MR	4-23-009	14:16	532	40059
WBD-MR	4-23-009	15:10	752	41304
WBD-MR	4-23-009	15:13	566	40729
*9	4-22-009	23:52	451	41084
*8	4-22-009	23:54	458	49993
*7	4-22-009	23:57	510	46410
*6	4-22-009	23:59	468	50656
*5	4-23-2009	0:05	516	38790
*WBD	4-23-2009	0:07	507	47261
8	4-23-2009	19:05	498	47980
8	4-23-2009	19:09	495	45324
8	4-23-2009	19:14	493	46239
WBD-MR	5-5-2009	21:35	949	41097
WBD-MR	5-5-2009	21:38	941	43590

Table F1 continued.

WBD-MR	5-5-2009	23:01	932	38865
WBD-MR	5-5-2009	23:04	979	42820
WBD-MR	5-6-2009	19:30	1055	42511
WBD-MR	5-6-2009	19:34	1033	41489
WBD-MR	5-6-2009	20:26	1126	43394
WBD-MR	5-6-2009	20:30	1243	42326
WBD-MR	5-29-2009	18:49	1072	69369
WBD-MR	5-29-2009	18:53	1195	67378
9	5-30-2009	17:39	540	74093
9	5-30-2009	17:42	500	72103
6	6-16-2009	18:59	556	53375
6	6-16-2009	19:03	523	51129
6	6-16-2009	20:40	563	53216
6	6-16-2009	20:43	572	50682
8	6-17-2009	17:32	523	52840
8	6-17-2009	17:37	509	49975
6	7-21-2009	18:58	490	31420
6	7-21-2009	18:59	672	30005
6	7-22-2009	20:23	484	28856
6	7-22-2009	20:25	489	28594
6	9-20-2009	17:13	479	29027
6	9-20-2009	17:17	481	31356

Table F2. ADCP discharge measurements across the Mississippi River north of the diversion channel.

Transect Line	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge down the Mississippi River (ft^3/sec)
*R-5.2	3-10-2009	21:51	3923	319610
R-5.2	4-22-2009	18:00	3780	507133
R-5.2	4-22-2009	18:11	3759	505422
24	4-22-2009	22:42	3850	539607

Table F2 continued.

25	4-22-2009	22:32	3825	599344
29	4-22-2009	21:31	3886	507064
28	4-22-2009	21:40	3960	508635
27	4-22-2009	21:52	3900	509674
*26	4-22-2009	22:01	3890	506875
*28	4-22-2009	21:40	3960	530442
*27	4-22-2009	21:52	3900	529215
*26	4-22-2009	22:01	3890	527903
*25	4-22-2009	22:12	3770	522888
*25	4-22-2009	22:32	3850	541121
*24	4-22-2009	22:41	3825	537080
*R-5.2	4-22-2009	22:51	3805	590059
R-5.2	4-23-2009	14:51	3837	517016
R-5.2	4-23-2009	14:59	3841	520514
R-5.2	9-23-2009	15:48	3797	331732
R-5.2	9-23-2009	15:57	3177	290720
28	4-23-2009	19:18	3924	548628
28	4-23-2009	19:41	3923	551167
28	4-23-2009	19:51	3938	552418
*R-5.2	4-23-2009	20:03	3822	548227
R-5.2	5-6-2009	13:44	3837	487146
R-5.2	5-6-2009	13:58	3829	484415
R-5.2	5-6-2009	18:53	3804	512897
R-5.2	5-6-2009	19:05	3799	517333
R-5.2	5-29-2009	20:12	3817	735621
R-5.2	5-29-2009	20:25	3817	744503
R-5.2	5-30-2009	19:09	3830	794402
R-5.2	5-30-2009	19:19	3836	761042
R-5.2	6-16-2009	20:53	3844	570681
R-5.2	6-16-2009	21:02	3803	565401
R-5.2	7-21-2009	17:59	3776	241446
R-5.2	7-21-2009	18:14	3769	249035
R-5.2	7-22-2009	20:55	3765	304602
R-5.2	7-22-2009	21:04	3809	319104

Table F3. ADCP discharge measurements across the Mississippi River south of the diversion channel.

Transect Line or Transect Number	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge down the Mississippi River (ft^3/sec)
*39	3-10-2009	22:15	3878	332331
*15	3-11-2009	18:23	3810	329361
*16	3-11-2009	18:41	3872	293565
R-4.5	4-22-2009	18:35	3971	474111
R-4.5	4-22-2009	18:45	3745	472176
*40	4-22-2009	18:59	3926	473473
*39	4-22-2009	19:17	3674	471560
*38	4-22-2009	19:28	3810	474024
*37	4-22-2009	19:39	3754	471560
*R-4.5	4-23-2009	00:15	3920	487154
R-4.5	4-23-2009	14:23	3905	469560
R-4.5	4-23-2009	14:32	3884	471592
R-4.5	4-23-2009	20:17	3941	509701
R-4.5	4-23-2009	20:27	3974	509417
R-4.5	4-23-2009	20:36	3935	510781
R-4.5	5-5-2009	15:22	3991	441799
R-4.5	5-5-2009	15:32	3958	438545
R-4.5	5-5-2009	21:04	3962	473225
R-4.5	5-5-2009	21:14	3944	465292
R-4.5	5-29-2009	15:03	4006	676154
R-4.5	5-29-2009	15:16	3934	675513
R-4.5	5-30-2009	17:12	3943	663756
R-4.5	5-30-2009	17:22	3952	685132
R-4.5	6-16-2009	15:12	3952	483044
R-4.5	6-16-2009	15:21	3967	487621
R-4.5	7-21-2009	19:05	3936	252291
R-4.5	7-21-2009	19:14	4007	222848
R-4.5	7-22-2009	19:55	3958	260365

Table F3 continued.

R-4.5	7-22-2009	20:05	3947	252357
R-4.5	7-23-2009	12:47	3921	277281
R-4.5	7-23-2009	12:56	3950	279250
R-4.5	7-23-2009	15:14	3918	290153
R-4.5	7-24-2009	13:05	3905	267704
R-4.5	7-24-2009	13:13	3891	271518

Table F4. ADCP discharge measurements across Cubit's Gap.

Transect Line	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge into Cubit's Gap (ft^3/sec)
24	3-11-2009	20:10	3889	46124
24	3-11-2009	20:22	4170	62744
24	3-11-2009	20:33	3958	46519
26	3-11-2009	20:48	4003	58543
26	3-11-2009	20:59	3795	46931
26	3-11-2009	21:11	3807	57607
27	4-23-2009	22:40	3937	80679
27	4-23-2009	22:48	3742	81517
27	4-23-2009	22:56	3932	80639
CG	7-21-2009	19:33	3866	42401
CG	7-21-2009	19:43	3687	40017
CG	7-24-2009	13:30	4172	35180
CG	7-24-2009	13:39	4039	29079

Table F5. ADCP discharge measurements across the Mississippi River south of Cubit's Gap.

Transect Line	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge down the Mississippi River (ft^3/sec)
R-2.6	3-10-2009	21:28	4266	297803
R-2.6	3-10-2009	21:39	4484	262126
R-2.6	3-10-2009	21:51	4481	297639
R-2.6	4-23-2009	21:53	4393	444613
R-2.6	4-23-2009	22:04	4274	444616
R-2.6	4-23-2009	22:14	4343	443288
R-2.6	4-23-2009	22:24	4247	439623
R-2.6	5-30-2009	14:11	4462	558827
R-2.6	5-30-2009	14:22	4551	563166
R-2.6	6-17-2009	14:02	4366	374419
R-2.6	6-17-2009	14:24	4363	383327
R-2.6	7-21-2009	21:56	4376	277735
R-2.6	7-21-2009	22:10	4332	269686
R-2.6	7-24-2009	12:41	4373	227300
R-2.6	7-24-2009	12:51	4428	230940

Table F6. ADCP discharge measurements across secondary channels off the Mississippi River.

Transect Line or Transect Number	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge into secondary channels (ft^3/sec)
R-4.9-LB	3-11-2009	17:39	188	262
R-4.9-LB	3-11-2009	17:43	228	213
13	3-11-2009	17:54	136	238
14	3-11-2009	17:58	138	206
R-6.5-LB	4-23-2009	18:26	507	6131
R-6.5-LB	4-23-2009	18:28	629	5168

Table F6 continued.

R-6.5-LB	4-23-2009	18:32	562	4470
R-6.5-RB	4-23-2009	18:43	353	594
R-6.5-RB	4-23-2009	18:45	350	307
115	4-23-2009	18:49	338	2044
File 127	4-23-2009	18:53	343	1491
R-3.5-RB	4-23-2009	20:59	608	1822
R-3.5-RB	4-23-2009	21:04	704	3039
R-3.5-RB	4-23-2009	21:08	582	2060
R-2.8-RB	4-23-2009	21:16	768	1379
R-2.8-RB	4-23-2009	21:20	770	571
R-2.8-RB	4-23-2009	21:40	813	3798
R-2.8-RB	4-23-2009	21:45	760	3524
R-6.5-LB	5-30-2009	19:48	528	7009
R-6.5-LB	5-30-2009	19:50	519	7384
R-6.5-RB	5-30-2009	19:56	536	2431
R-6.5-RB	5-30-2009	19:59	540	1671
R-3.5-RB	5-30-2009	14:46	767	1838
R-3.5-RB	5-30-2009	14:51	859	2346
R-2.8-RB	5-30-2009	14:35	1132	1224
R-2.8-RB	5-30-2009	14:39	1227	1375
R-6.5-LB	6-17-2009	18:32	491	3613
R-6.5-LB	6-17-2009	18:34	530	5007
R-6.5-RB	6-17-2009	18:21	534	829
R-6.5-RB	6-17-2009	18:23	530	393
R-4.9-LB	7-21-2009	18:28	159	1351
R-4.9-LB	7-21-2009	18:30	248	1721
R-4.9-LB	9-23-2009	17:52	151	541
R-4.9-LB	9-23-2009	17:53	137	519

Table F7. ADCP discharge measurements across secondary channels in Cubit's Gap.

Transect Line	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge into secondary channels (ft^3/sec)
CGRB	3-11-2009	19:56	214	5070
CGRB	3-11-2009	19:57	209	4241
CGRB	3-11-2009	19:59	213	4850
CGBB	3-11-2009	19:43	567	14862
CGBB	3-11-2009	19:47	525	12871
CGBB	3-11-2009	19:49	594	14994
CGOP	3-11-2009	19:28	265	4627
CGOP	3-11-2009	19:30	317	4568
CGOP	3-11-2009	19:31	312	5447
CGMP	3-11-2009	19:02	2093	38083
CGMP	3-11-2009	19:08	1500	28808
CGMP	3-11-2009	19:15	2110	38099
CGRB	5-30-2009	15:17	270	11077
CGRB	5-30-2009	15:19	215	9938
CGBB	5-30-2009	15:46	531	33250
CGBB	5-30-2009	15:49	537	33288
CGOP	5-30-2009	16:18	273	13507
CGOP	5-30-2009	16:20	496	17572
CGMP	5-30-2009	16:41	1749	72030
CGMP	5-30-2009	16:47	1837	71960
CGRB	6-17-2009	14:48	207	7184
CGRB	6-17-2009	14:50	215	7578
CGBB	6-17-2009	15:10	461	21276
CGBB	6-17-2009	15:13	581	20912
CGOP	6-17-2009	15:43	423	10378
CGOP	6-17-2009	15:45	282	8280
CGMP	6-17-2009	16:06	1392	51015
CGMP	6-17-2009	16:11	1551	49144
CGMP	7-21-2009	19:55	1749	24443

Table F7 continued.

CGMP	7-21-2009	19:58	1352	24508
CGOP	7-21-2009	20:22	358	2450
CGOP	7-21-2009	20:24	258	2362
CGBB	7-21-2009	20:46	495	9014
CGBB	7-21-2009	20:48	539	8243
CGRB	7-21-2009	21:08	197	2620
CGRB	7-21-2009	21:09	203	2709
CGMP	9-24-2009	13:49	1708	16324
CGMP	9-24-2009	13:52	1506	15823
CGOP	9-24-2009	14:07	237	1024
CGOP	9-24-2009	14:09	203	996
CGBB	9-24-2009	14:26	371	8142
CGBB	9-24-2009	14:29	267	7870
CGRP	9-24-2009	14:37	192	3139
CGRP	9-24-2009	14:38	138	3220

Table F8. ADCP discharge measurements in Venice, Louisiana.

Transect Line or Transect Number	Date (GMT)	Time (GMT)	Transect Length (ft)	Discharge (ft^3/sec)
*38	4-23-2009	16:08	2869	687926
A	4-23-2009	16:20	2898	687271
A	4-23-2009	16:28	2683	682496
BCB	4-23-2009	16:40	765	74146
BCB	4-23-2009	16:43	800	72140
BCB	4-23-2009	16:48	750	76742
44	4-23-2009	17:00	846	83123
45	4-23-2009	17:03	850	80148
46	4-23-2009	17:06	813	80357
C	4-23-2009	17:15	3231	520821
C	4-23-2009	17:23	3249	547629
C	4-23-2009	17:31	3207	518436
R-12.1	5-30-2009	21:46	2673	969264

Table F8 continued.

R-12.1	5-30-2009	22:05	2673	1003812
BCB	5-30-2009	21:20	784	107208
BCB	5-30-2009	21:22	802	114055
GP	5-30-2009	20:48	798	100490
GP	5-30-2009	20:51	806	104611
R-9.5	5-30-2009	20:17	3007	795093
R-9.5	5-30-2009	20:34	3009	769391
R-12.1	6-17-2009	20:31	2664	704437
R-12.1	6-17-2009	20:38	2658	693798
BCB	6-17-2009	19:53	714	73288
BCB	6-17-2009	19:57	757	71165
GP	6-17-2009	19:17	773	74004
GP	6-17-2009	19:21	796	74584
R-9.5	6-17-2009	18:50	3008	555437
R-9.5	6-17-2009	18:58	3012	556440
R-12.1	7-21-2009	14:40	2719	240188
R-12.1	7-21-2009	14:47	2714	229362
BCB	7-21-2009	15:02	635	53124
BCB	7-21-2009	15:04	768	51272
GP	7-21-2009	15:43	825	28385
GP	7-21-2009	15:46	826	29431
R-9.5	7-21-2009	16:44	3038	194654
R-9.5	7-21-2009	16:52	3039	197687
R-12.1	9-24-2009	15:23	2216	388628
R-12.1	9-24-2009	15:29	2152	385486
BCB	9-24-2009	15:40	382	19018
BCB	9-24-2009	15:43	355	18893
GP	9-24-2009	16:05	527	34509
R-9.5	9-24-2009	15:02	2600	315781
R-9.5	9-24-2009	15:09	2444	314251

APPENDIX G

Suspended Sediment Measurements

Data Collection Trips:

April 22-23, 2009
May 5-6, 2009
May 29-30, 2009
June 16-17, 2009
July 20-23, 2009
September 22-24, 2009

Contents:

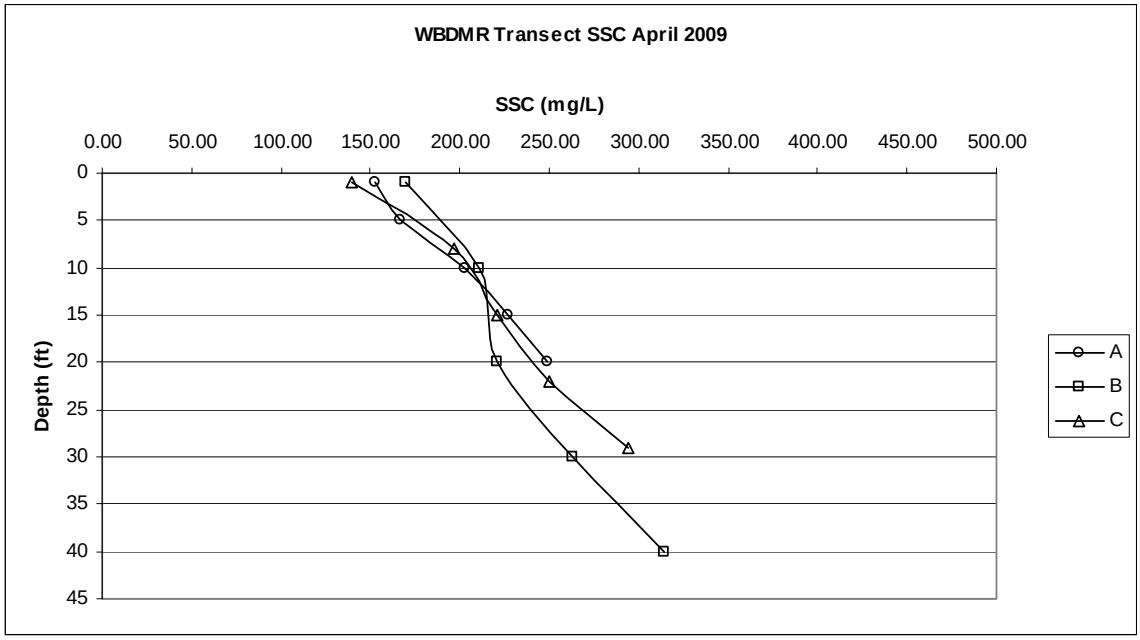
Suspended Sediment Concentrations
Suspended Sediment Grain Size

Suspended Sediment Concentrations

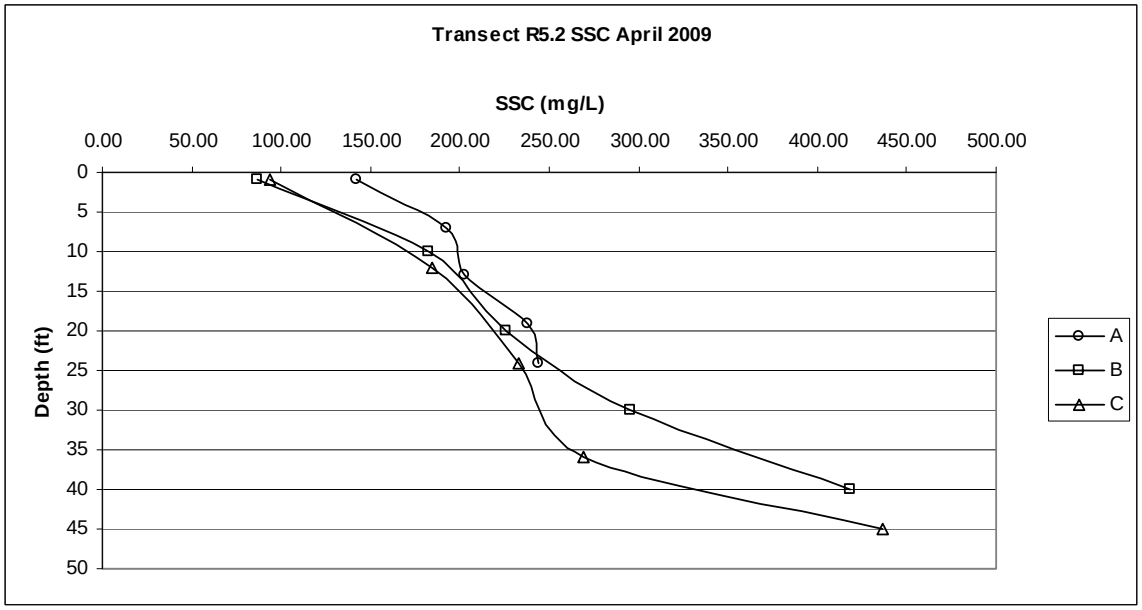
April 22-23, 2009
Suspended Sediment Concentration Tables and Graphs

Station	Depth (ft)	Date	Time (GMT)	Volume (ml)	Tare weight(g)	Gross weight (g)	SSC (mg/L)
WBDMR-A	1	4/23/2009	14:12-14:19	890	2.36	2.50	152.81
	5	4/23/2009	14:21-14:23	600	2.36	2.46	166.67
	10	4/23/2009	14:25-14:29	640	2.35	2.48	202.81
	15	4/23/2009	14:32-14:36	490	2.35	2.46	226.94
	20	4/23/2009	14:40-14:47	525	2.35	2.48	249.14
WBDMR-B	1	4/22/2009	22:55-23:06	500	2.36	2.45	169.20
	10	4/22/2009	23:09-23:11	740	2.37	2.52	211.22
	20	4/22/2009	23:14-23:16	675	2.37	2.52	220.74
	30	4/22/2009	23:19-23:24	760	2.36	2.56	263.55
	40	4/22/2009	23:28-23:31	600	2.37	2.56	313.83
WBDMR-C	1	4/22/2009	23:40-23:42	900	2.38	2.50	139.44
	8	4/22/2009	23:44-23:46	700	2.37	2.51	196.29
	15	4/22/2009	23:48-23:50	875	2.37	2.57	221.37
	22	4/22/2009	23:53-23:55	725	2.37	2.55	249.93
	29	4/22/2009	23:58-23:59	680	2.37	2.57	293.97
R5.2-A	1	4/23/2009	14:58-15:00	590	2.36	2.45	142.37
	7	4/23/2009	15:03-15:06	725	2.35	2.49	192.69
	13	4/23/2009	15:10-15:12	700	2.36	2.50	202.14
	19	4/23/2009	15:15-15:17	500	2.35	2.47	238.20
	24	4/23/2009	15:20-15:25	575	2.37	2.51	243.48
R5.2-B	1	4/23/2009	15:48-15:52	550	2.38	2.43	87.09
	10	4/23/2009	15:55-15:58	840	2.38	2.54	182.14
	20	4/23/2009	16:00-16:02	675	2.36	2.51	225.78
	30	4/23/2009	16:05-16:08	840	2.36	2.61	295.60
	40	4/23/2009	16:10-16:13	650	2.37	2.64	418.15
R5.2-C	1	4/23/2009	16:20-19:15	600	2.38	2.43	93.50
	12	4/23/2009	19:20-19:21	800	2.38	2.53	184.75
	24	4/23/2009	19:23-19:25	750	2.38	2.55	232.93
	36	4/23/2009	19:28-19:31	700	2.38	2.57	268.86
	45	4/23/2009	19:34	700	2.38	2.69	436.86

West Bay Diversion, Mississippi River Transect



Mississippi River Mile 5.2 Transect



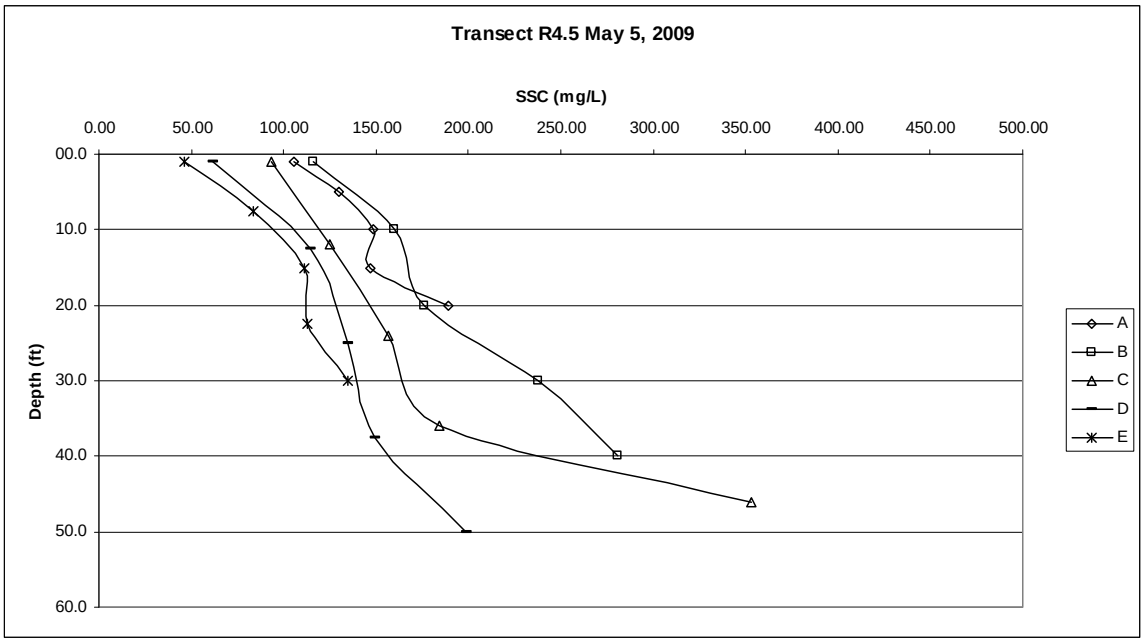
May 5-6, 2009
Suspended Sediment Concentration Tables and Graphs

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R4.5-A	01.0	5/5/09	18:54-18:56	480	2.82	2.87	105.83
	05.0	5/5/09	18:58-19:00	765	2.80	2.90	130.07
	10.0	5/5/09	19:02-19:04	600	2.80	2.89	148.67
	15.0	5/5/09	19:06-19:07	580	2.81	2.90	146.55
	20.0	5/5/09	19:09-19:11	705	2.82	2.96	188.79
R4.5-B	01.0	5/5/09	19:20-19:23	760	2.80	2.89	115.79
	10.0	5/5/09	19:25-19:26	830	2.82	2.95	160.00
	20.0	5/5/09	19:28-19:29	610	2.83	2.94	176.07
	30.0	5/5/09	19:31-19:33	660	2.83	2.99	238.18
	40.0	5/5/09	19:36-19:39	670	2.81	2.99	281.04
R4.5-C	01.0	5/5/09	19:48-19:50	705	2.80	2.87	93.62
	12.0	5/5/09	19:51-19:53	700	2.81	2.90	125.00
	24.0	5/5/09	19:54-19:56	775	2.82	2.95	156.26
	36.0	5/5/09	20:02-20:04	750	2.81	2.95	184.53
	46.0	5/5/09	20:06-20:08	780	2.82	3.09	353.33
R4.5-D	01.0	5/5/09	20:17-20:19	730	2.81	2.85	61.51
	12.5	5/5/09	20:21-20:23	755	2.80	2.89	114.83
	25.0	5/5/09	20:25-20:27	795	2.81	2.92	134.59
	37.5	5/5/09	20:28-20:31	720	2.82	2.93	149.03
	50.0	5/5/09	20:32-20:35	645	2.81	2.94	198.60
R4.5-E	01.0	5/5/09	20:45-20:46	655	2.83	2.86	46.11
	07.5	5/5/09	20:48-20:50	685	2.80	2.86	83.65
	15.0	5/5/09	20:52-20:53	710	2.80	2.87	110.99
	22.5	5/5/09	20:55-20:57	735	2.81	2.89	112.52
	30.0	5/5/09	20:59-21:01	710	2.82	2.92	134.37
WBDMR-A	01.0	5/5/09	21:46-21:48	620	2.82	2.88	103.21
	01.0	5/6/09	19:39-19:41	710	2.80	2.87	103.94
	07.5	5/5/09	21:52-21:53	540	2.81	2.89	155.56
	15.0	5/5/09	21:55-21:59	685	2.81	2.93	168.61
	15.0	5/6/09	19:42-19:43	540	2.82	2.90	163.52
	22.5	5/5/09	22:02-22:04	615	2.82	2.92	172.20
	30.0	5/5/09	22:08-22:10	855	2.83	2.99	185.61
	30.0	5/6/09	19:45-19:48	750	2.83	2.95	171.73

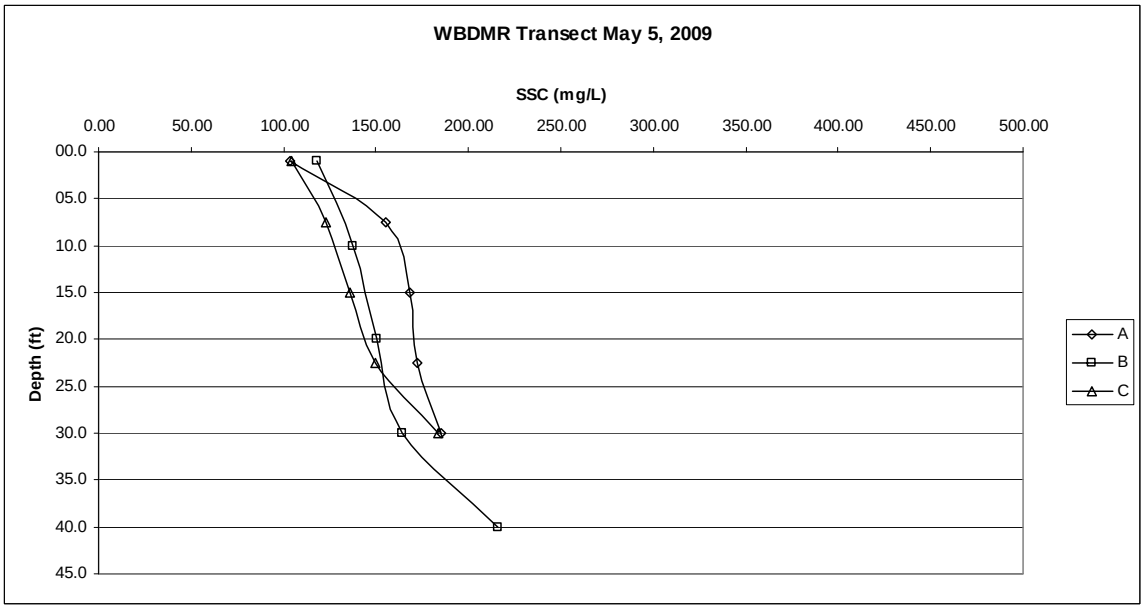
May 5-6, 2009 Suspended Sediment Concentration Table Continued

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
WBDMR-B	01.0	5/5/09	22:16-22:18	665	2.80	2.88	117.89
	01.0	5/6/09	19:51-19:52	730	2.81	2.89	113.15
	10.0	5/5/09	22:20-22:21	720	2.81	2.91	137.64
	20.0	5/5/09	22:23-22:25	750	2.83	2.94	150.80
	20.0	5/6/09	19:54-19:56	655	2.80	2.91	159.69
	30.0	5/5/09	22:27-22:29	855	2.81	2.95	164.56
	40.0	5/5/09	22:31-22:35	795	2.82	2.99	216.10
	40.0	5/6/09	20:00-20:04	800	2.80	2.97	203.00
WBDMR-C	01.0	5/5/09	22:40-22:41	705	2.81	2.88	103.97
	01.0	5/6/09	20:09-20:10	710	2.83	2.88	81.69
	07.5	5/5/09	22:43-22:45	750	2.82	2.92	123.07
	15.0	5/5/09	22:47-22:49	775	2.84	2.94	135.87
	15.0	5/6/09	20:12-20:15	710	2.82	2.92	142.39
	22.5	5/5/09	22:51-22:53	670	2.84	2.94	150.00
	30.0	5/5/09	22:55-22:57	780	2.80	2.95	183.33
	30.0	5/6/09	20:21-20:23	795	2.80	2.95	182.77
R5.2-A	01.0	5/6/2009	18:32-18:33	735	2.83	2.89	77.14
	07.5	5/6/2009	18:35-18:37	745	2.82	2.91	121.07
	15.0	5/6/2009	18:38-18:40	685	2.80	2.90	149.78
	22.5	5/6/2009	18:42-18:44	770	2.80	2.94	181.69
	30.0	5/6/2009	18:46-18:48	600	2.81	2.94	214.17
R5.2-B	01.0	5/6/2009	18:05-18:06	775	2.82	2.87	64.90
	12.0	5/6/2009	18:07-18:09	750	2.80	2.91	142.00
	24.0	5/6/2009	18:10-18:12	780	2.82	2.96	183.21
	36.0	5/6/2009	18:14-18:15	720	2.81	2.96	211.67
	48.0	5/6/2009	18:17-18:25	830	2.81	3.13	393.98
R5.2-C	01.0	5/6/2009	17:40-17:42	750	2.81	2.88	95.73
	12.0	5/6/2009	17:43-17:44	770	2.81	2.90	120.00
	24.0	5/6/2009	17:47-17:49	800	2.81	2.92	140.75
	36.0	5/6/2009	17:50-17:52	770	2.81	2.94	171.30
	48.0	5/6/2009	17:54-17:55	775	2.80	2.86	73.68
R5.2-D	01.0	5/6/2009	17:16-17:18	625	2.81	3.01	329.92
	12.5	5/6/2009	17:19-17:20	720	2.83	2.91	108.61
	25.0	5/6/2009	17:22-17:23	745	2.83	2.93	128.72
	37.5	5/6/2009	17:25-17:27	640	2.80	2.89	149.22
	50.0	5/6/2009	17:29-17:32	625	2.80	2.92	201.12
R5.2-E	01.0	5/6/2009	14:10-14:12	590	2.81	2.85	62.20
	07.5	5/6/2009	14:14-14:15	715	2.82	2.89	93.43
	15.0	5/6/2009	14:17-14:19	710	2.81	2.88	104.65
	22.5	5/6/2009	16:50-16:53	720	2.82	2.94	164.86
	30.0	5/6/2009	16:55-16:58	715	2.83	2.93	139.30

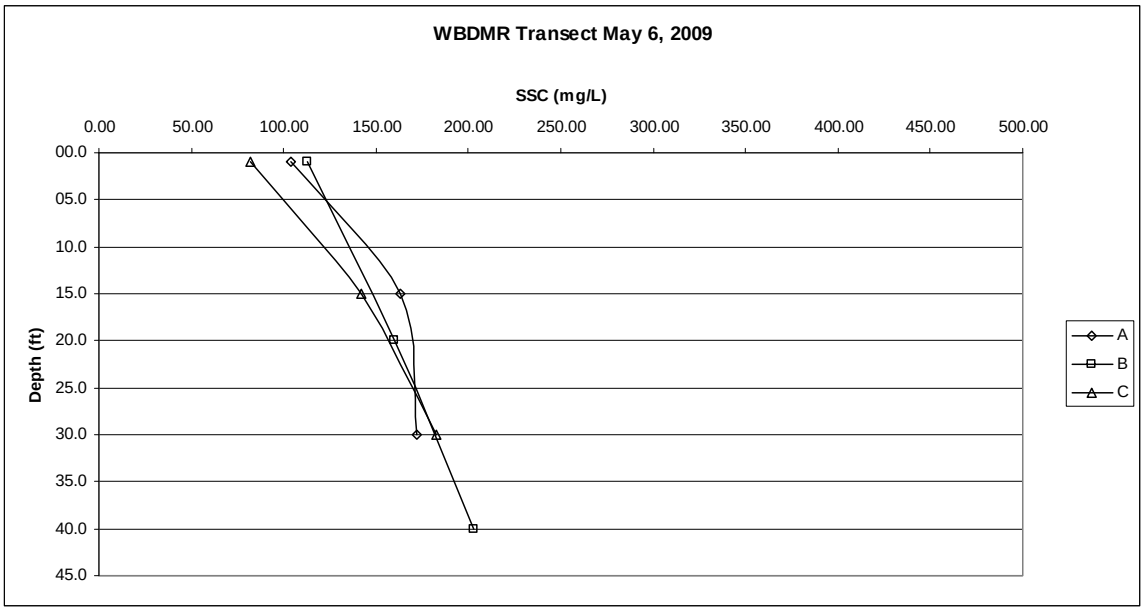
Mississippi River Mile 4.5 Transect



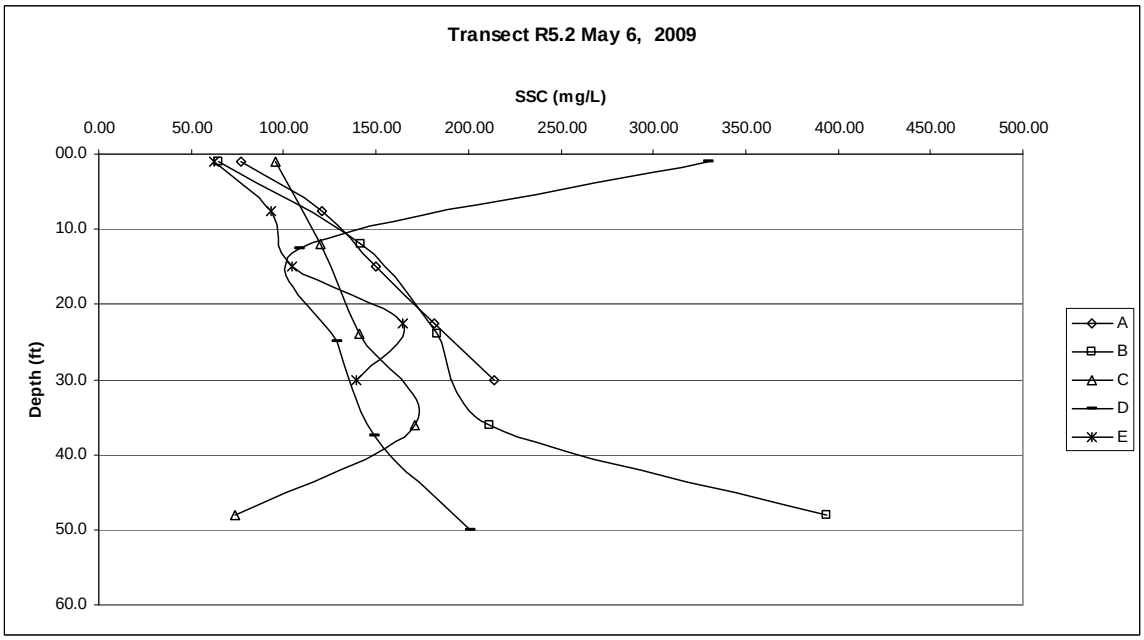
West Bay Diversion, Mississippi River Transect May 5, 2009



West Bay Diversion, Mississippi River Transect May 6, 2009



Mississippi River Mile 5.2 Transect



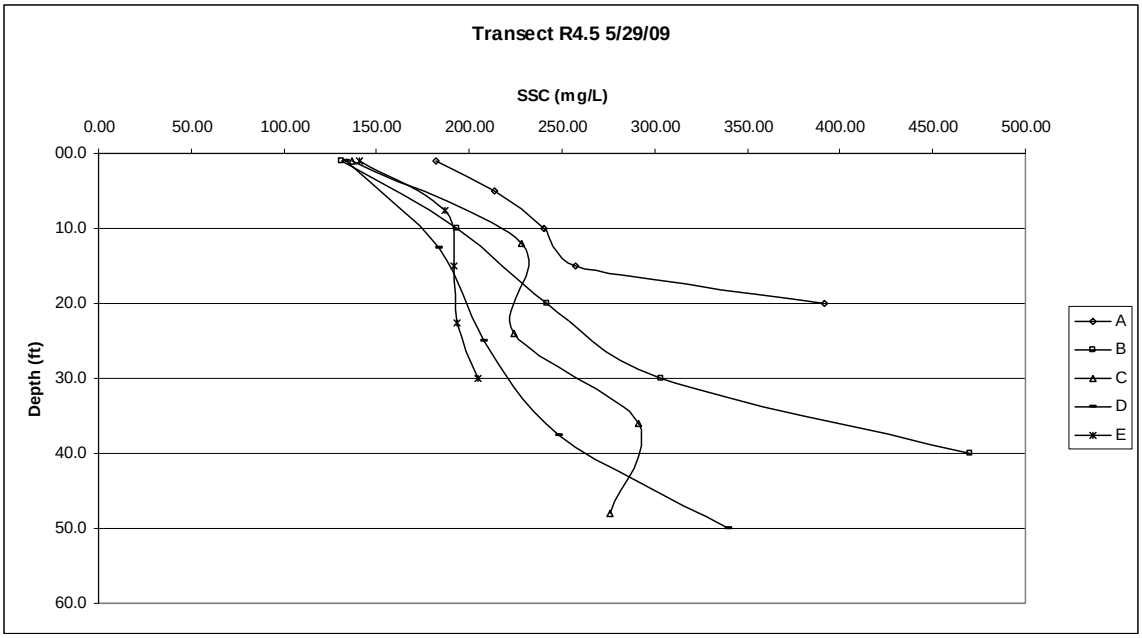
May 29-30, 2009
Suspended Sediment Concentration Tables and Graphs

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R4.5-A	01.0	5/29/09	15:45	780	2.83	2.97	181.79
	05.0	5/29/09	15:48	705	2.82	2.97	213.62
	10.0	5/29/09	15:50	780	2.80	2.99	240.38
	15.0	5/29/09	15:51	585	2.80	2.95	257.44
	20.0	5/29/09	16:02	510	2.81	3.01	391.76
R4.5-B	01.0	5/29/09	16:18	780	2.81	2.92	130.77
	10.0	5/29/09	16:23	740	2.80	2.95	193.51
	20.0	5/29/09	17:06	775	2.81	3.00	241.55
	30.0	5/29/09	17:10	820	2.81	3.06	303.66
	40.0	5/29/09	17:16	480	2.82	3.04	469.79
R4.5-C	01.0	5/29/09	17:27	690	2.79	2.89	136.52
	12.0	5/29/09	17:31	645	2.79	2.93	228.53
	24.0	5/29/09	17:34	605	2.80	2.94	224.30
	36.0	5/29/09	17:35	580	2.82	2.99	291.55
	48.0	5/29/09	17:38	715	2.80	2.99	275.66
R4.5-D	01.0	5/29/09	17:45	650	2.80	2.89	133.85
	12.5	5/29/09	17:48	780	2.80	2.94	183.72
	25.0	5/29/09	17:51	550	2.81	2.93	208.18
	37.5	5/29/09	18:02	715	2.83	3.00	248.25
	50.0	5/29/09	18:04	610	2.82	3.02	340.16
R4.5-E	01.0	5/29/09	18:13	620	2.81	2.89	140.81
	07.5	5/29/09	18:18	545	2.82	2.92	186.79
	15.0	5/29/09	18:22	720	2.79	2.93	191.94
	22.5	5/29/09	18:27	780	2.81	2.97	193.33
	30.0	5/29/09	18:29	480	2.80	2.90	204.79
WBDMR-A	01.0	5/29/09	19:00	590	2.81	2.91	167.29
	07.5	5/29/09	19:03	520	2.84	2.96	230.77
	15.0	5/29/09	19:12	670	2.82	3.01	293.43
	22.5	5/29/09	19:14	790	2.79	3.03	301.39
	30.0	5/29/09	19:19	730	2.79	3.00	281.64
WBDMR-B	01.0	5/29/09	19:23	445	2.81	2.88	157.75
	10.0	5/29/09	19:27	620	2.80	2.95	244.03
	20.0	5/29/09	19:32	595	2.81	2.94	208.91
	30.0	5/29/09	19:35	730	2.82	2.99	240.14
	40.0	5/29/09	19:38	630	2.80	3.05	382.54
WBDMR-C	01.0	5/29/09	19:45	670	2.82	2.93	154.63
	07.5	5/29/09	19:50	650	2.81	2.93	184.00
	15.0	5/29/09	19:51	660	2.80	2.96	243.18
	22.5	5/29/09	19:56	605	2.81	2.96	236.69
	30.0	5/29/09	20:01	710	2.83	3.07	342.54
R5.2-A	01.0	5/29/09	20:39	540	2.81	2.89	148.15
	07.5	5/29/09	20:43	740	2.80	2.94	180.14
	15.0	5/29/09	20:47	750	2.80	2.96	212.93
	22.5	5/29/09	20:50	715	2.81	2.98	237.62
	30.0	5/29/09	20:55	515	2.83	2.98	293.20

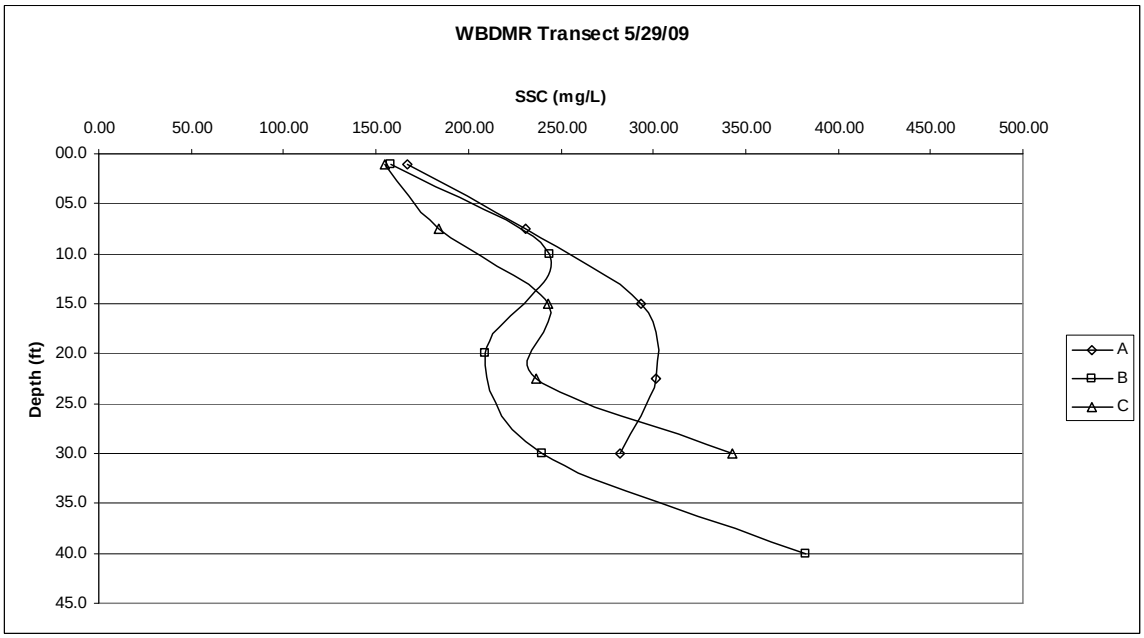
May 29-30, 2009 Suspended Sediment Table Continued

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R5.2-B	01.0	5/29/09	21:03	780	2.79	2.87	101.15
	12.0	5/29/09	21:07	645	2.81	2.92	165.43
	24.0	5/29/09	21:08	660	2.83	2.96	203.79
	36.0	5/29/09	21:11	630	2.81	3.00	297.30
	48.0	5/29/09	21:14	650	2.82	3.11	437.69
R5.2-C	01.0	5/29/09	21:21	665	2.80	2.88	122.26
	12.0	5/29/09	21:26	580	2.82	2.93	200.00
	24.0	5/29/09	21:28	640	2.82	2.97	223.44
	36.0	5/29/09	21:31	615	2.81	2.98	262.76
	48.0	5/29/09	21:36	470	2.79	2.95	323.40
R5.2-D	01.0	5/29/09	21:40	625	2.81	2.90	139.36
	12.5	5/29/09	21:42	670	2.80	2.91	165.37
	25.0	5/29/09	21:46	605	2.81	2.94	217.02
	37.5	5/29/09	21:49	550	2.81	2.95	257.27
	50.0	5/29/09	21:57	670	2.81	3.05	364.33
R5.2-E	01.0	5/29/09	22:03	450	2.82	2.89	150.89
	07.5	5/29/09	22:06	805	2.82	2.96	172.05
	15.0	5/29/09	22:11	635	2.80	2.92	196.54
	22.5	5/29/09	22:17	770	2.80	2.93	180.13
	30.0	5/29/09	22:18	635	2.81	2.94	205.20
CGRP	01.0	5/30/09	15:30	470	2.82	2.90	179.79
	09.0	5/30/09	15:33	795	2.81	3.05	310.82
	18.0	5/30/09	15:38	565	2.80	2.93	227.08
CGBB	01.0	5/30/09	15:57	680	2.80	2.91	170.74
	09.0	5/30/09	16:05	640	2.80	3.01	320.16
	18.0	5/30/09	16:06	665	2.80	2.99	292.03
CGOP	01.0	5/30/09	16:27	735	2.83	2.94	157.55
	07.5	5/30/09	16:29	630	2.82	2.95	206.51
	15.0	5/30/09	16:32	550	2.80	2.93	244.55
CGMP	01.0	5/30/09	16:57	790	2.82	2.97	192.28
	09.0	5/30/09	17:00	710	2.80	2.99	262.54
	18.0	5/30/09	17:03	635	2.80	2.98	289.76
GP	01.0	5/30/09	21:00	680	2.81	2.96	217.06
	14.0	5/30/09	21:01	700	2.80	2.96	224.71
	28.0	5/30/09	21:05	660	2.80	2.95	230.91
BCB	01.0	5/30/09	21:30	600	2.82	2.95	210.83
	21.0	5/30/09	21:32	655	2.81	2.96	232.82
	42.0	5/30/09	21:35	470	2.82	3.18	768.72
R4.9	01.0	5/30/09	18:50	610	2.81	2.93	185.90
	10.0	5/30/09	18:53	620	2.83	2.94	175.81

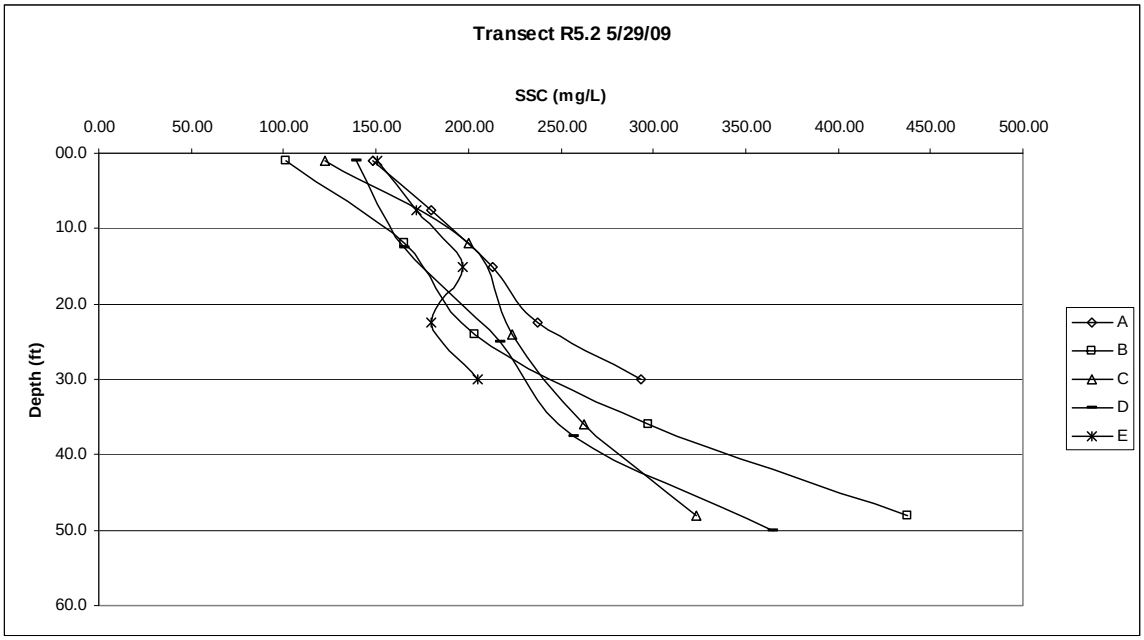
Mississippi River Mile 4.5 Transect



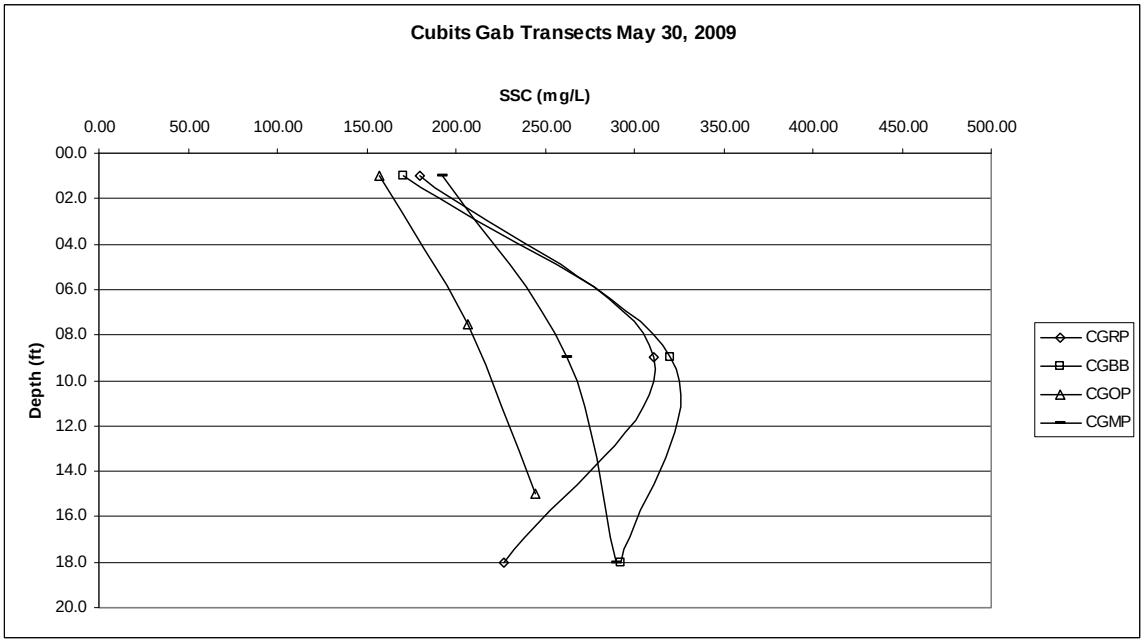
West Bay Diversion, Mississippi River Transect



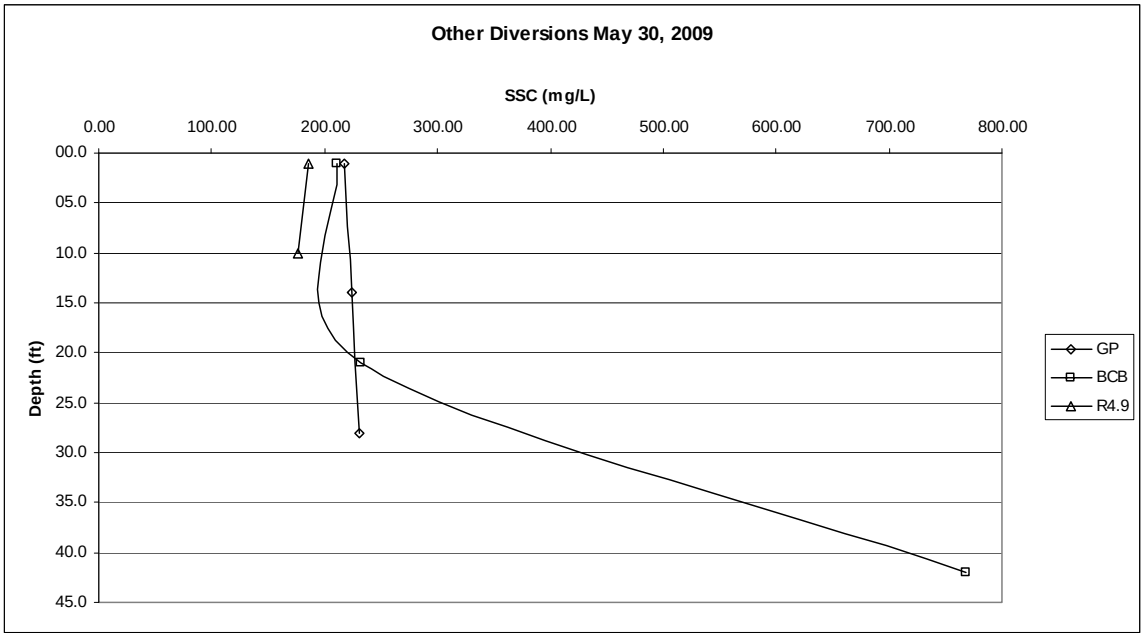
Mississippi River Mile 5.2 Transect



Cubits Gap Diversions



Other Diversions



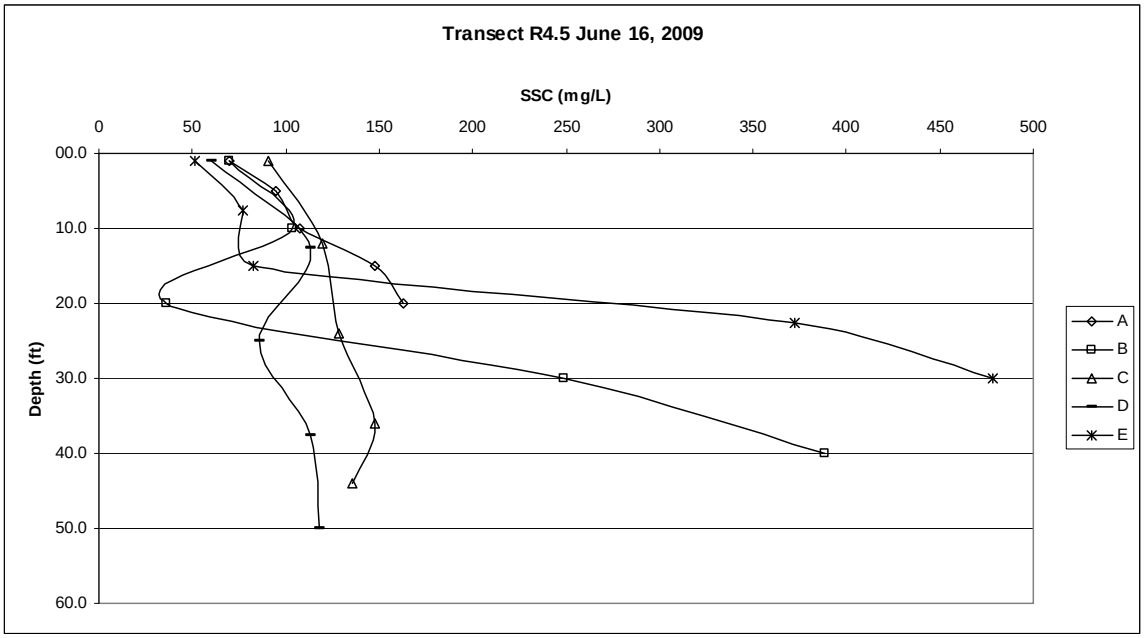
June 16-17, 2009
Suspended Sediment Concentration Tables and Graphs

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R4.5-A	01.0	6/16/2009	15:40	655	2.83	2.87	69.77
	05.0	6/16/2009	15:42	625	2.82	2.88	94.40
	10.0	6/16/2009	15:45	695	2.83	2.90	107.19
	15.0	6/16/2009	15:49	575	2.81	2.89	147.83
	20.0	6/16/2009	15:52	545	2.80	2.89	162.94
R4.5-B	01.0	6/16/2009	16:05	590	2.84	2.88	69.83
	10.0	6/16/2009	16:07	720	2.82	2.90	103.19
	20.0	6/16/2009	16:10	635	2.88	2.90	36.38
	30.0	6/16/2009	16:12	690	2.81	2.98	248.99
	40.0	6/16/2009	16:16	655	2.81	3.06	388.09
R4.5-C	01.0	6/16/2009	16:25	515	2.80	2.85	90.68
	12.0	6/16/2009	16:31	575	2.81	2.88	119.83
	24.0	6/16/2009	16:34	720	2.81	2.90	128.33
	36.0	6/16/2009	16:37	535	2.82	2.90	148.04
	44.0	6/16/2009	16:40	770	2.80	2.90	135.32
R4.5-D	01.0	6/16/2009	16:50	575	3.28	3.32	60.17
	12.5	6/16/2009	16:53	570	2.90	2.97	112.81
	25.0	6/16/2009	16:56	535	2.79	2.84	85.98
	37.5	6/16/2009	17:00	690	2.79	2.87	113.19
	50.0	6/16/2009	17:04	630	2.82	2.90	117.62
R4.5-E	01.0	6/16/2009	17:16	505	2.82	2.85	51.49
	07.5	6/16/2009	17:19	575	2.80	2.84	77.39
	15.0	6/16/2009	17:22	690	2.79	2.84	82.75
	22.5	6/16/2009	17:25	625	2.80	3.03	372.00
	30.0	6/16/2009	17:29	535	2.81	3.07	478.50
WBD-A	01.0	6/16/2009	19:15	475	2.80	2.85	92.63
	07.5	6/16/2009	19:18	790	2.81	2.89	96.33
	15.0	6/16/2009	19:20	655	2.83	2.89	91.45
	22.5	6/16/2009	19:23	695	2.81	2.87	87.91
	30.0	6/16/2009	19:26	775	2.82	2.91	107.48
WBD-B	01.0	6/16/2009	19:33	475	2.83	2.88	102.74
	12.5	6/16/2009	19:38	540	2.81	2.88	136.30
	25.0	6/16/2009	19:46	760	2.84	2.94	128.95
	37.5	6/16/2009	19:55	480	2.83	2.90	155.00
	50.0	6/16/2009	20:20	585	2.81	2.88	116.07
R5.2-A	01.0	6/16/2009	21:16	525	2.81	2.85	84.95
	07.5	6/16/2009	21:19	535	2.82	2.87	90.47
	15.0	6/16/2009	21:22	565	2.82	2.87	100.00
	22.5	6/16/2009	21:25	560	2.81	2.89	148.39
	30.0	6/16/2009	21:29	505	2.81	3.10	580.20
R5.2-B	01.0	6/16/2009	21:41	545	2.83	2.87	70.64
	12.0	6/16/2009	21:44	715	2.81	2.90	133.71
	24.0	6/16/2009	21:47	695	2.83	2.94	148.78
	36.0	6/16/2009	21:50	695	2.81	2.94	188.20
	45.0	6/16/2009	21:55	465	2.81	2.93	261.29

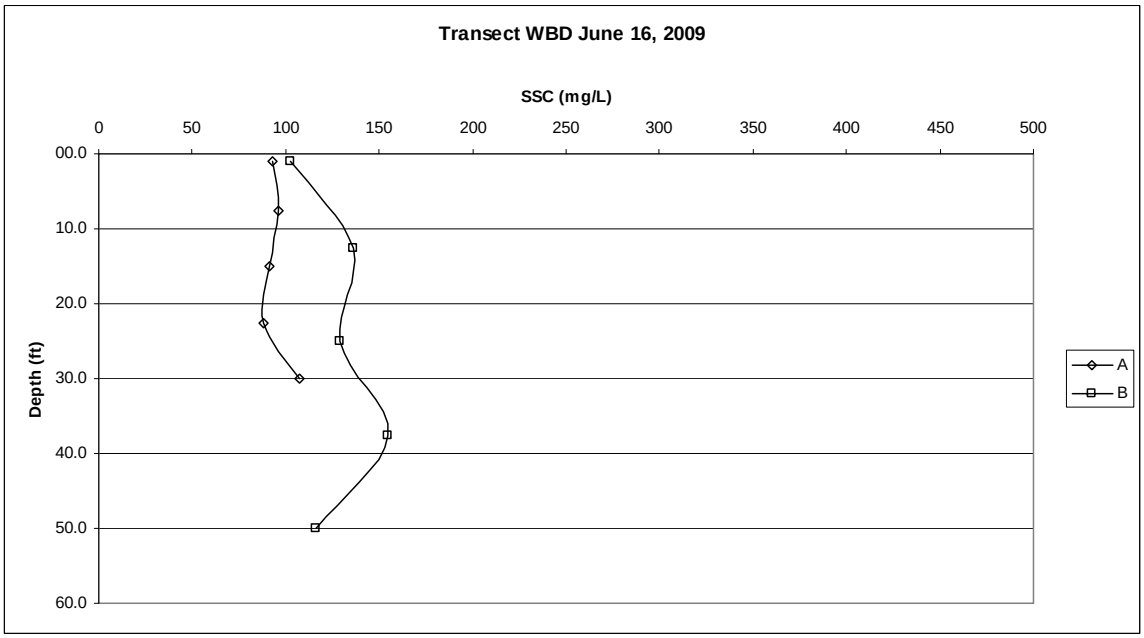
June 16-17, 2009 Suspended Sediment Table Continued

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R5.2-C	01.0	6/16/2009	22:02	635	2.84	2.92	135.59
	12.0	6/16/2009	22:04	575	2.83	2.88	98.61
	24.0	6/16/2009	22:07	540	2.80	2.87	130.93
	36.0	6/16/2009	22:09	635	2.80	2.88	120.79
	48.0	6/16/2009	22:13	725	2.80	2.93	173.52
R5.2-D	01.0	6/16/2009	22:20	500	2.82	2.87	83.40
	12.5	6/16/2009	22:23	545	2.83	2.89	100.73
	25.0	6/16/2009	22:26	465	2.81	2.88	143.66
	37.5	6/16/2009	22:29	525	2.82	2.88	119.81
	50.0	6/16/2009	22:33	550	2.81	2.89	141.27
R5.2-E	01.0	6/16/2009	22:41	450	2.81	2.84	56.22
	07.5	6/16/2009	22:43	795	2.80	2.86	66.54
	15.0	6/16/2009	22:47	545	2.81	2.86	89.72
	22.5	6/16/2009	22:50	540	2.80	2.86	99.07
	30.0	6/16/2009	22:55	605	2.81	2.88	111.07
CGRP	01.0	6/17/2009	14:55	535	2.81	2.85	75.33
	09.0	6/17/2009	14:57	480	2.80	2.85	95.83
	18.0	6/17/2009	15:01	515	2.82	2.89	119.61
CGBB	01.0	6/17/2009	15:17	565	2.81	2.85	80.53
	09.0	6/17/2009	15:21	685	2.81	2.88	89.64
	18.0	6/17/2009	15:24	565	2.82	2.88	105.31
CGOP	01.0	6/17/2009	15:50	575	2.82	2.86	73.57
	07.5	6/17/2009	15:53	685	2.83	2.89	83.07
	15.0	6/17/2009	15:56	540	2.81	2.86	92.04
CGMP	01.0	6/17/2009	16:19	645	2.81	2.87	90.23
	09.0	6/17/2009	16:22	665	2.84	2.91	109.13
	18.0	6/17/2009	16:25	665	2.81	2.88	100.30
GP	01.0	6/17/2009	19:32	560	2.81	2.86	93.75
	14.0	6/17/2009	19:34	735	2.81	2.88	94.15
	28.0	6/17/2009	19:37	545	2.81	2.88	120.92
BCB	01.0	6/17/2009	20:04	575	2.81	2.88	135.48
	21.0	6/17/2009	20:06	685	2.80	2.88	104.53
	42.0	6/17/2009	20:17	360	2.82	2.86	105.56
R4.9	01.0	6/17/2009	17:55	425	2.82	2.86	98.82
	06.0	6/17/2009	17:58	605	2.81	2.87	102.81
	10.0	6/17/2009	18:01	665	2.83	2.90	96.54

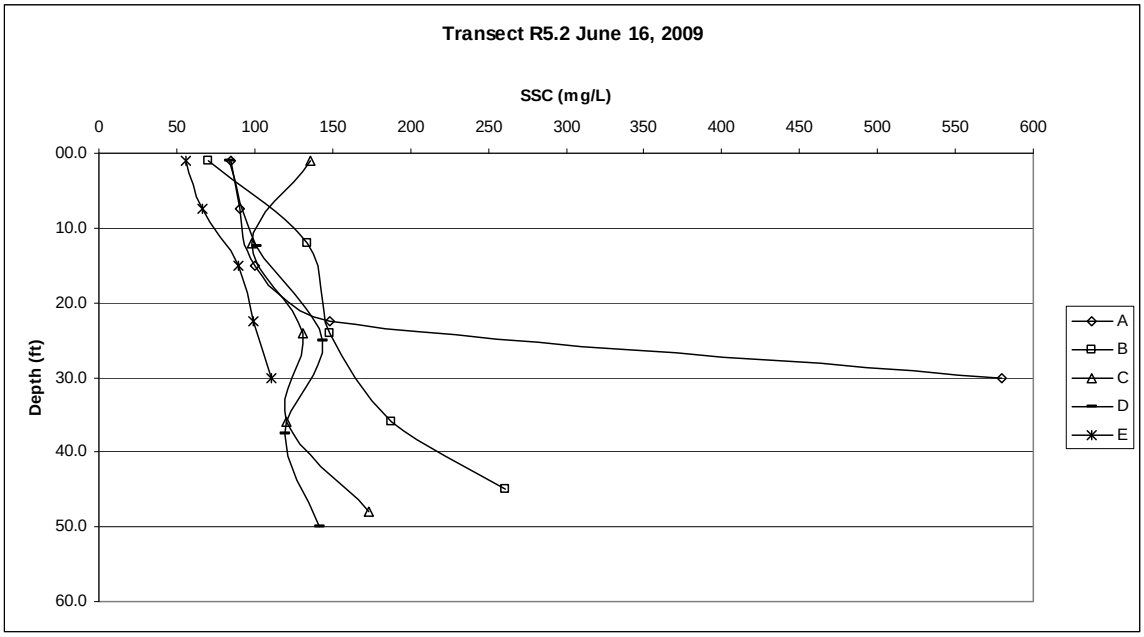
Mississippi River Mile 4.5 Transect



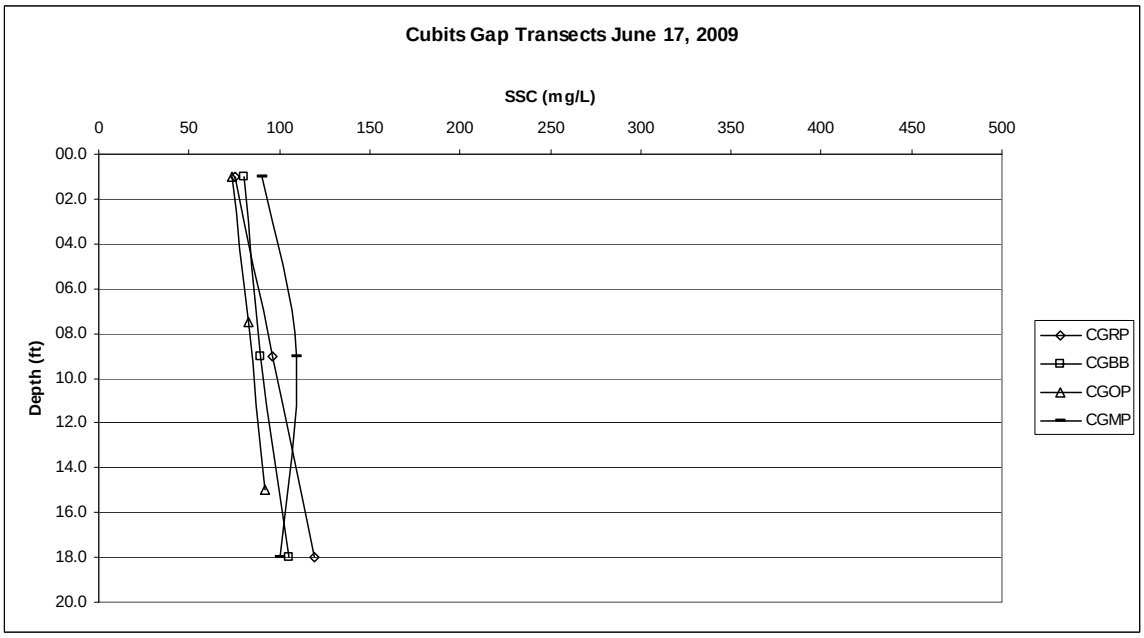
West Bay Diversion Transect



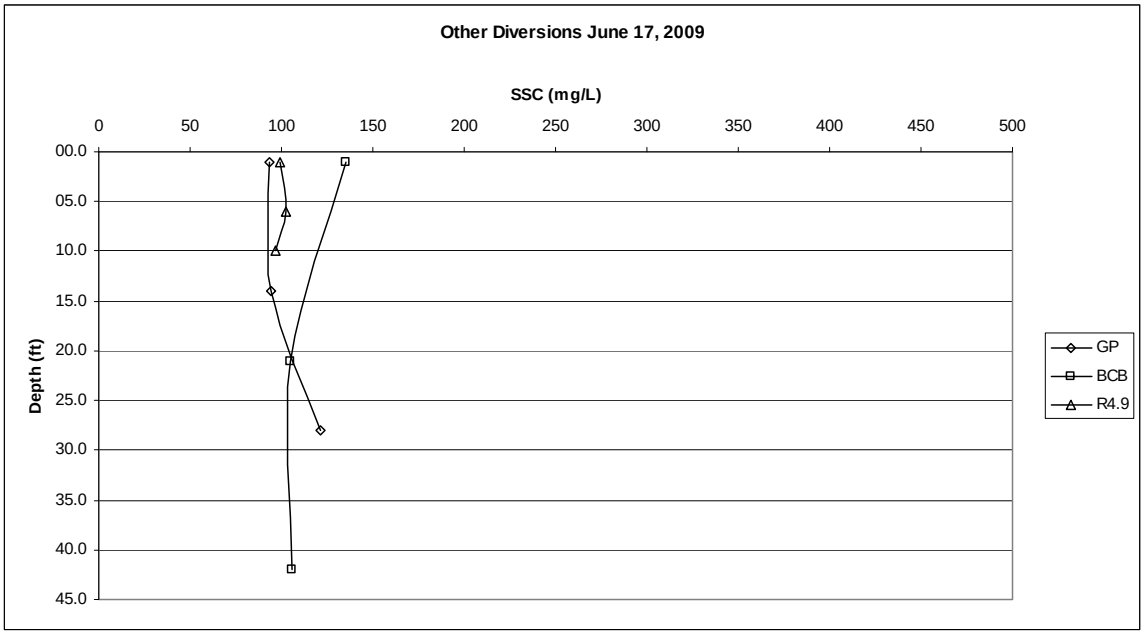
Mississippi River Mile 5.2 Transect



Cubits Gap Diversions



Other Diversions



July 20-23, 2009
Suspended Sediment Concentration Tables and Graphs

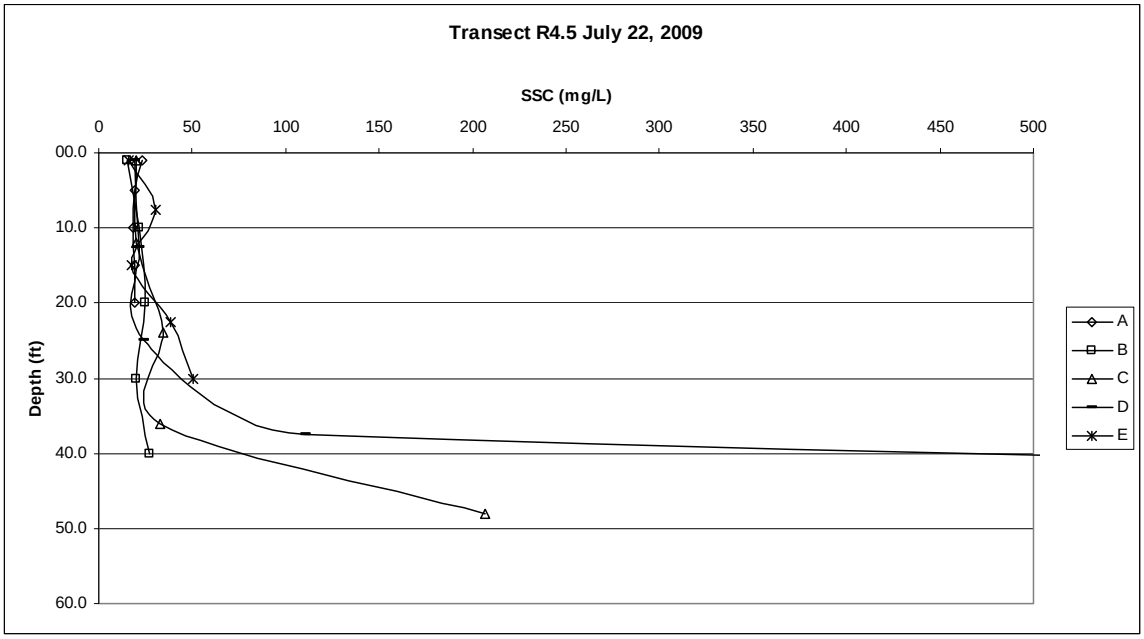
Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R4.5-A	01.0	7/22/2009	18:54	905	2.38	2.40	22.87
	05.0	7/22/2009	18:53	815	2.83	2.85	19.26
	10.0	7/22/2009	18:52	835	3.29	3.30	18.20
	15.0	7/22/2009	18:51	920	2.81	2.83	18.91
	20.0	7/22/2009	18:50	840	2.81	2.82	19.17
R4.5-B	01.0	7/22/2009	19:06	900	2.85	2.86	15.44
	10.0	7/22/2009	19:05	910	2.84	2.86	21.54
	20.0	7/22/2009	19:02	915	2.84	2.86	24.81
	30.0	7/22/2009	19:01	850	2.83	2.85	19.65
	40.0	7/22/2009	19:00	850	2.84	2.86	27.29
R4.5-C	01.0	7/22/2009	19:20	875	2.83	2.84	19.89
	12.0	7/22/2009	19:18	855	2.84	2.86	19.77
	24.0	7/22/2009	19:16	890	2.83	2.86	34.83
	36.0	7/22/2009	19:15	900	2.84	2.87	33.22
	48.0	7/22/2009	19:13	905	2.83	3.02	206.85
R4.5-D	01.0	7/22/2009	19:40	785	2.82	2.83	19.11
	12.5	7/22/2009	19:38	850	2.84	2.86	21.41
	25.0	7/22/2009	19:36	895	2.85	2.87	24.25
	37.5	7/22/2009	19:34	800	2.85	2.94	110.50
	50.0	7/22/2009	19:32	440	2.38	3.56	*2671.82
R4.5-E	01.0	7/22/2009	19:51	915	3.27	3.29	16.07
	07.5	7/22/2009	19:50	875	2.83	2.85	30.63
	15.0	7/22/2009	19:48	820	2.83	2.85	17.68
	22.5	7/22/2009	19:47	840	2.84	2.87	38.81
	30.0	7/22/2009	19:46	905	2.85	2.90	50.61
WBD-A	01.0	7/22/2009	20:37	820	2.38	2.39	18.05
	07.5	7/22/2009	20:36	860	2.38	2.40	18.72
	15.0	7/22/2009	20:34	900	2.38	2.39	16.22
	22.5	7/22/2009	20:33	895	2.84	2.86	20.67
	30.0	7/22/2009	20:32	870	2.85	2.87	17.36
WBD-B	01.0	7/22/2009	20:49	820	2.81	2.84	27.44
	12.0	7/22/2009	20:48	815	2.82	2.85	28.10
	24.0	7/22/2009	20:46	820	2.85	2.87	26.83
	36.0	7/22/2009	20:44	810	2.85	2.88	27.53
	48.0	7/22/2009	20:42	785	2.85	2.87	27.52
R5.2-A	01.0	7/22/2009	21:25	855	2.85	2.87	21.52
	07.5	7/22/2009	21:24	800	2.85	2.87	23.62
	15.0	7/22/2009	21:23	815	2.84	2.86	23.68
	22.5	7/22/2009	21:21	805	2.86	2.89	26.71
	30.0	7/22/2009	21:20	790	2.85	2.87	26.46
R5.2-B	01.0	7/22/2009	21:40	805	2.83	2.85	18.88
	12.0	7/22/2009	21:39	735	2.84	2.85	21.50
	24.0	7/22/2009	21:37	840	2.85	2.87	20.00
	36.0	7/22/2009	21:36	810	2.84	2.86	25.56
	42.0	7/22/2009	21:34	750	2.82	2.85	40.93

July 20-23, 2009 Suspended Sediment Table Continued

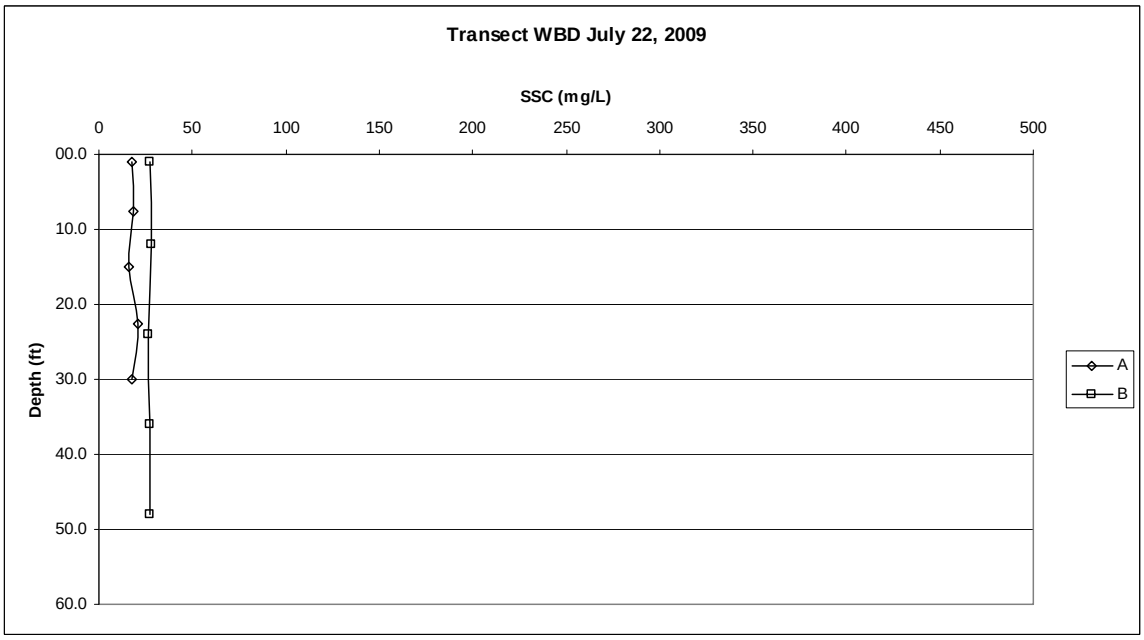
Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R5.2-C	01.0	7/22/2009	21:51	700	2.85	2.86	18.14
	12.0	7/22/2009	21:50	795	2.83	2.84	22.01
	24.0	7/22/2009	21:48	790	2.83	2.85	27.72
	36.0	7/22/2009	21:47	780	2.83	2.85	28.08
	48.0	7/22/2009	21:45	810	2.84	2.89	52.35
R5.2-D	01.0	7/22/2009	22:00	780	2.87	2.88	16.79
	12.5	7/22/2009	21:59	715	2.86	2.88	18.32
	25.0	7/22/2009	21:58	780	2.84	2.86	22.69
	37.5	7/22/2009	21:57	775	2.84	2.87	40.52
	50.0	7/22/2009	21:55	565	2.84	3.31	*828.50
R5.2-E	01.0	7/22/2009	22:10	750	2.84	2.86	30.67
	07.5	7/22/2009	22:08	850	2.84	2.86	28.71
	15.0	7/22/2009	22:07	700	2.83	2.85	37.14
	22.5	7/22/2009	22:06	840	2.84	2.91	83.45
	30.0	7/22/2009	22:04	745	2.83	2.92	111.41
CGRP	01.0	7/21/2009	21:13	700	2.39	2.41	24.86
	09.0	7/21/2009	21:17	890	2.83	2.85	23.60
	18.0	7/21/2009	21:21	645	2.84	2.86	28.22
CGBB	01.0	7/21/2009	20:53	770	2.86	2.87	24.42
	09.0	7/21/2009	20:57	755	2.84	2.87	27.55
	18.0	7/21/2009	21:00	730	2.85	2.87	24.38
CGOP	01.0	7/21/2009	20:24	410	2.82	2.83	23.90
	07.5	7/21/2009	20:28	465	2.83	2.84	24.09
	15.0	7/21/2009	20:37	720	2.85	2.87	25.83
CGMP	01.0	7/21/2009	20:10	760	2.85	2.87	23.29
	09.0	7/21/2009	20:13	665	2.87	2.89	27.82
	18.0	7/21/2009	20:16	630	2.86	2.88	30.63
GP	01.0	7/21/2009	15:53	420	2.86	2.87	29.52
	14.0	7/21/2009	16:00	840	2.84	2.86	28.57
	28.0	7/21/2009	16:03	660	2.85	2.87	30.15
BCB	01.0	7/21/2009	15:22	700	2.84	2.89	74.57
	21.0	7/21/2009	15:27	720	2.84	2.90	85.28
	42.0	7/21/2009	15:30	620	2.40	2.45	91.94
R4.9	01.0	7/21/2009	18:38	520	2.86	2.89	47.69
	06.0	7/21/2009	18:41	525	2.84	2.87	58.10
	10.0	7/21/2009	18:45	515	2.83	2.87	78.25

* High suspended sediment concentrations likely due to bottom disturbance from sampling device.

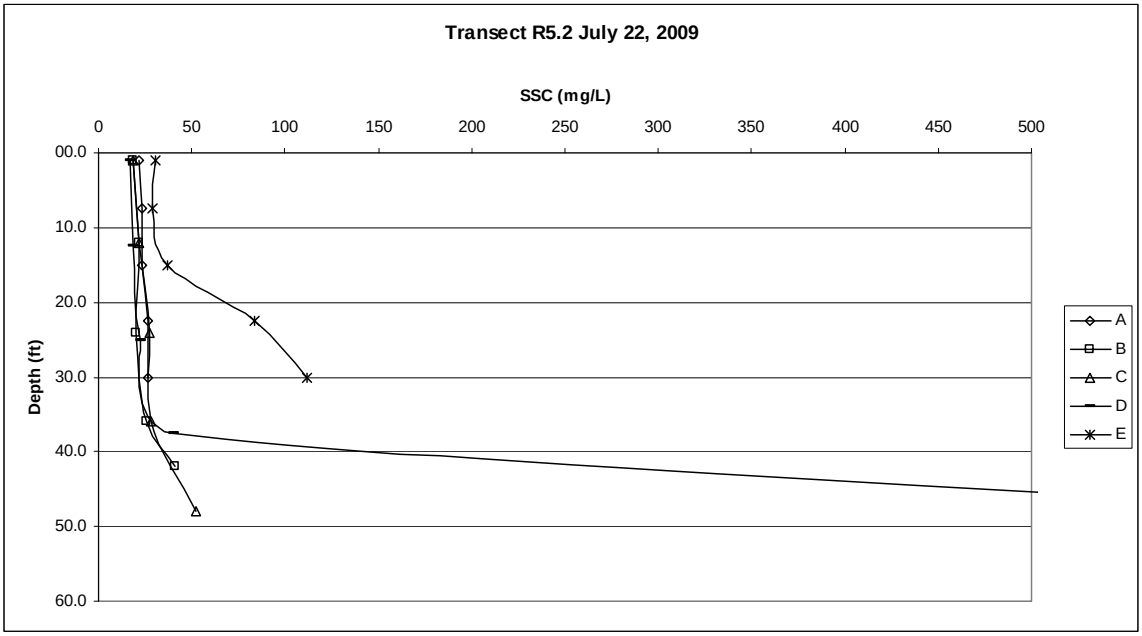
Mississippi River Mile 4.5 Transect



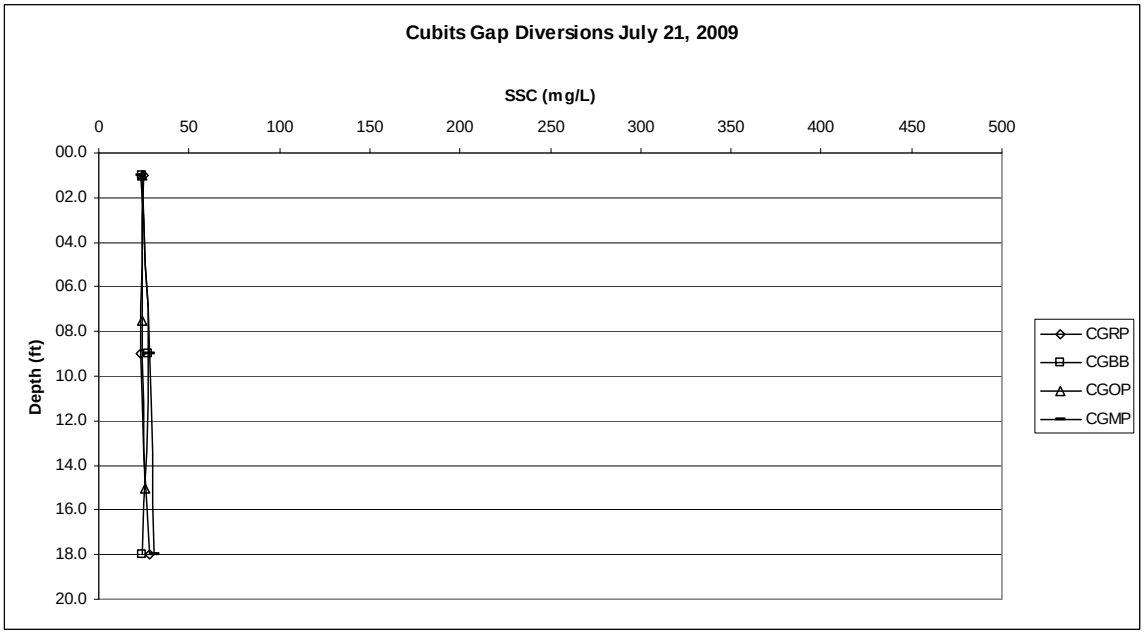
West Bay Diversion Transect



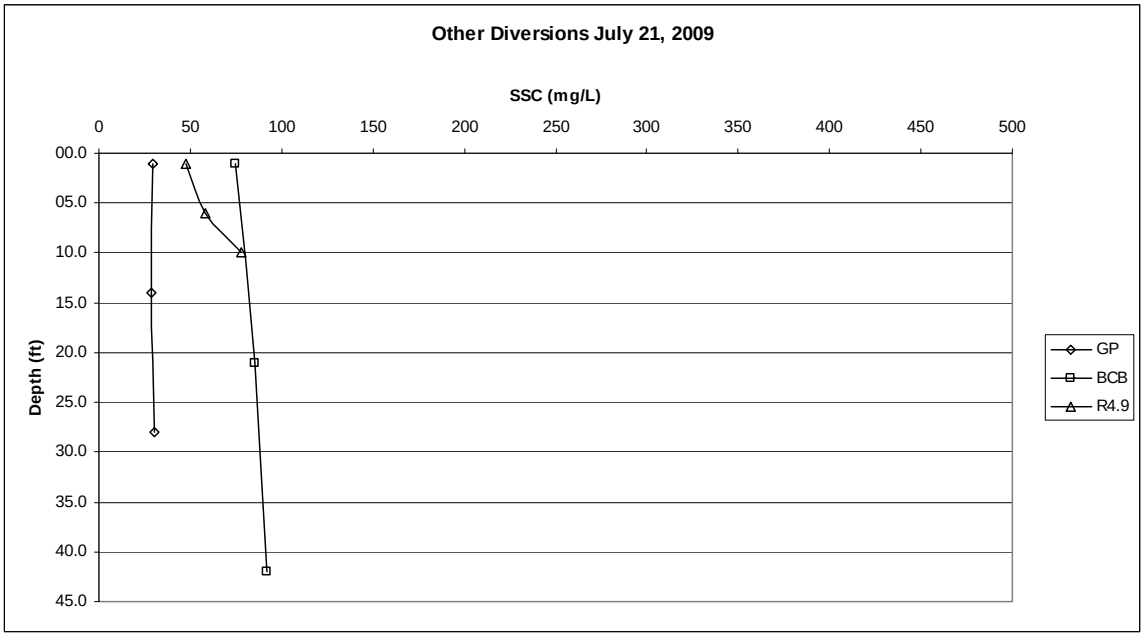
Mississippi River Mile 5.2 Transect



Cubits Gap Diversions



Other Diversions



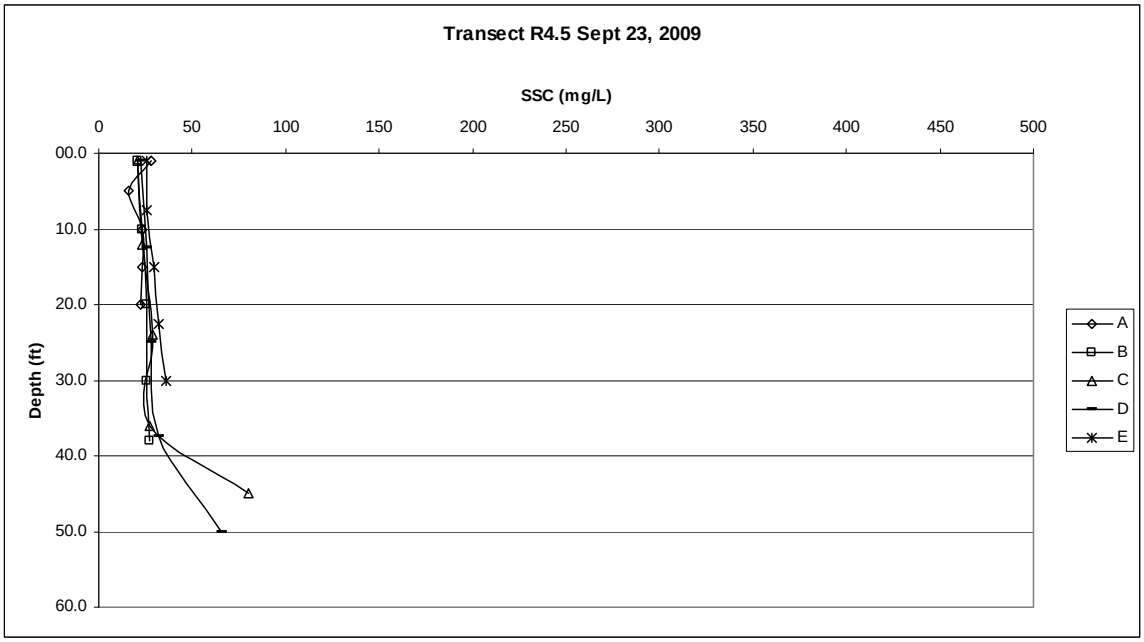
September 22-24, 2009
Suspended Sediment Concentration Tables and Graphs

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R4.5-A	01.0	9/23/2009	13:45	790	2.82	2.85	27.72
	05.0	9/23/2009	13:46	900	2.83	2.84	16.33
	10.0	9/23/2009	13:48	835	2.82	2.84	23.35
	15.0	9/23/2009	13:49	855	2.84	2.86	23.51
	20.0	9/23/2009	13:51	890	2.83	2.85	22.36
R4.5-B	01.0	9/23/2009	13:57	800	2.80	2.82	20.75
	10.0	9/23/2009	13:59	790	2.82	2.84	23.16
	20.0	9/23/2009	14:08	815	2.80	2.82	25.77
	30.0	9/23/2009	14:10	780	2.81	2.83	25.90
	38.0	9/23/2009	14:12	805	2.81	2.83	27.45
R4.5-C	01.0	9/23/2009	14:19	840	2.86	2.88	20.71
	12.0	9/23/2009	14:20	815	2.85	2.87	23.07
	24.0	9/23/2009	14:22	815	2.83	2.85	28.83
	36.0	9/23/2009	14:24	830	2.82	2.85	27.59
	45.0	9/23/2009	14:25	775	2.84	2.90	80.39
R4.5-D	01.0	9/23/2009	14:36	730	2.85	2.87	22.47
	12.5	9/23/2009	14:38	805	2.84	2.86	25.34
	25.0	9/23/2009	14:40	795	2.82	2.85	27.67
	37.5	9/23/2009	14:41	795	2.81	2.84	32.08
	50.0	9/23/2009	14:42	800	2.84	2.89	66.00
R4.5-E	01.0	9/23/2009	14:46	770	2.81	2.83	25.32
	07.5	9/23/2009	14:48	835	2.82	2.84	25.63
	15.0	9/23/2009	14:50	840	2.81	2.84	29.64
	22.5	9/23/2009	14:51	865	2.82	2.85	31.68
	30.0	9/23/2009	14:52	835	2.81	2.84	35.81
WBD-A	01.0	7/22/2009	17:22	735	2.81	2.83	27.48
	07.5	9/23/2009	17:24	850	2.82	2.84	24.71
	15.0	9/23/2009	17:25	830	2.82	2.84	29.28
	22.5	9/23/2009	17:27	865	2.82	2.84	28.67
	30.0	9/23/2009	17:28	805	2.83	2.85	27.83
WBD-B	01.0	9/23/2009	17:33	805	2.79	2.82	30.81
	12.0	9/23/2009	17:35	805	2.80	2.83	35.40
	24.0	9/23/2009	17:37	775	2.83	2.86	36.26
	36.0	9/23/2009	17:38	790	2.83	2.86	35.95
	45.0	9/23/2009	17:40	880	2.82	2.86	40.34
R5.2-A	01.0	9/23/2009	16:36	785	2.82	2.84	23.44
	07.5	9/23/2009	16:38	715	2.80	2.82	25.59
	15.0	9/23/2009	16:40	790	2.80	2.82	25.70
	22.5	9/23/2009	16:41	775	2.81	2.83	27.61
	30.0	9/23/2009	16:42	760	2.83	2.86	38.82
R5.2-B	01.0	9/23/2009	16:48	785	2.82	2.84	22.42
	12.0	9/23/2009	16:50	810	2.81	2.83	23.58
	24.0	9/23/2009	16:51	825	2.83	2.85	26.42
	36.0	9/23/2009	16:53	800	2.81	2.83	28.00
	42.0	9/23/2009	16:55	750	2.85	2.88	32.80

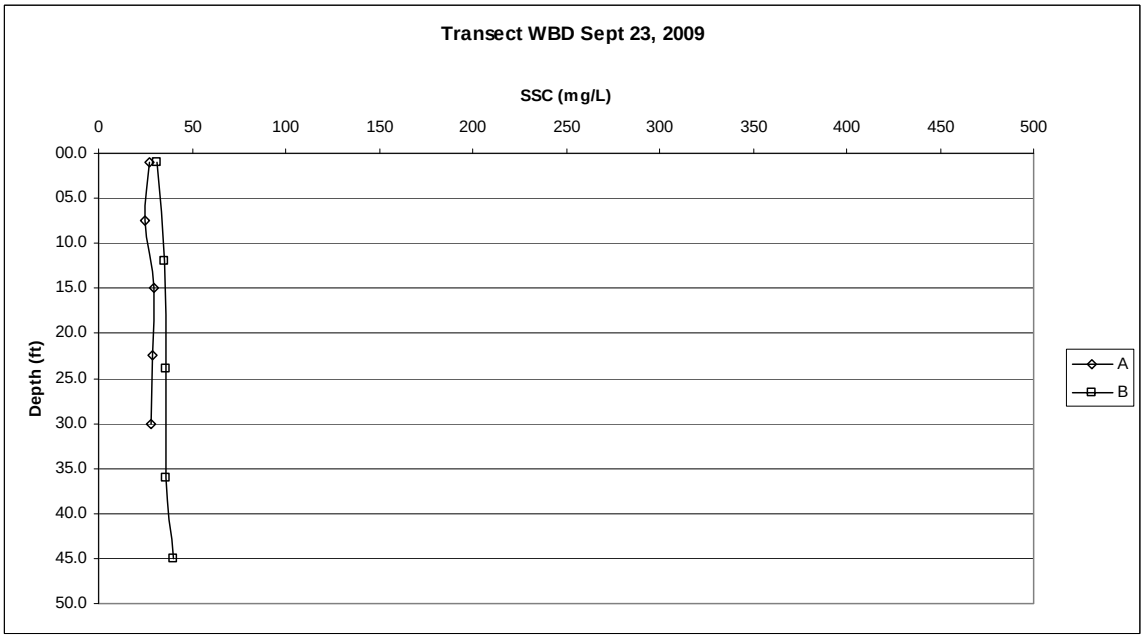
September 22-24, 2009 Suspended Sediment Table Continued

Station	Depth (ft)	Date	Time (GMT)	Volume	Tare weight(g)	Gross weight (g)	SSC (mg/L)
R5.2-C	01.0	9/23/2009	17:00	755	2.80	2.81	15.10
	12.0	9/23/2009	17:01	745	2.82	2.83	12.08
	24.0	9/23/2009	17:03	835	2.82	2.84	25.99
	36.0	9/23/2009	17:04	810	2.82	2.85	31.60
	48.0	9/23/2009	17:06	750	2.80	2.86	73.33
R5.2-D	01.0	9/23/2009	16:21	775	2.81	2.83	21.29
	12.5	9/23/2009	16:23	825	2.81	2.84	25.94
	25.0	9/23/2009	16:25	840	2.82	2.85	31.55
	37.5	9/23/2009	16:26	805	2.82	2.85	36.40
	50.0	9/23/2009	16:28	830	2.83	2.90	85.30
R5.2-E	01.0	9/23/2009	16:10	820	2.79	2.81	30.85
	07.5	9/23/2009	16:13	835	2.80	2.83	31.50
	15.0	9/23/2009	16:14	745	2.82	2.85	35.30
	22.5	9/23/2009	16:16	820	2.83	2.86	41.22
	30.0	9/23/2009	16:18	860	2.82	2.87	53.26
CGRP	01.0	9/24/2009	14:41	815	2.37	2.39	24.91
	09.0	9/24/2009	14:43	790	2.36	2.38	25.70
	18.0	9/24/2009	14:44	780	2.36	2.38	28.72
CGBB	01.0	9/24/2009	14:30	890	2.83	2.85	25.28
	09.0	9/24/2009	14:32	785	2.83	2.84	21.91
	18.0	9/24/2009	14:34	745	2.84	2.86	25.64
CGOP	01.0	9/24/2009	14:14	760	2.81	2.84	35.00
	07.5	9/24/2009	14:15	790	2.82	2.83	14.30
	15.0	9/24/2009	14:16	765	2.82	2.84	28.10
CGMP	01.0	9/24/2009	14:01	750	2.81	2.83	24.67
	09.0	9/24/2009	14:03	800	2.82	2.84	26.88
	18.0	9/24/2009	14:04	755	2.81	2.83	29.14
GP	01.0	9/24/2009	16:17	790	2.82	2.84	26.08
	14.0	9/24/2009	16:18	790	2.83	2.85	29.75
	28.0	9/24/2009	16:20	815	2.83	2.86	37.42
BCB	01.0	9/24/2009	15:49	890	2.84	2.87	28.09
	21.0	9/24/2009	15:51	770	2.83	2.85	30.78
	42.0	9/24/2009	15:53	825	2.81	2.83	29.45
R4.9	01.0	9/23/2009	17:57	800	2.82	2.84	28.25
	06.0	9/23/2009	17:59	785	2.81	2.83	30.19
	10.0	9/23/2009	18:00	755	2.82	2.84	31.66

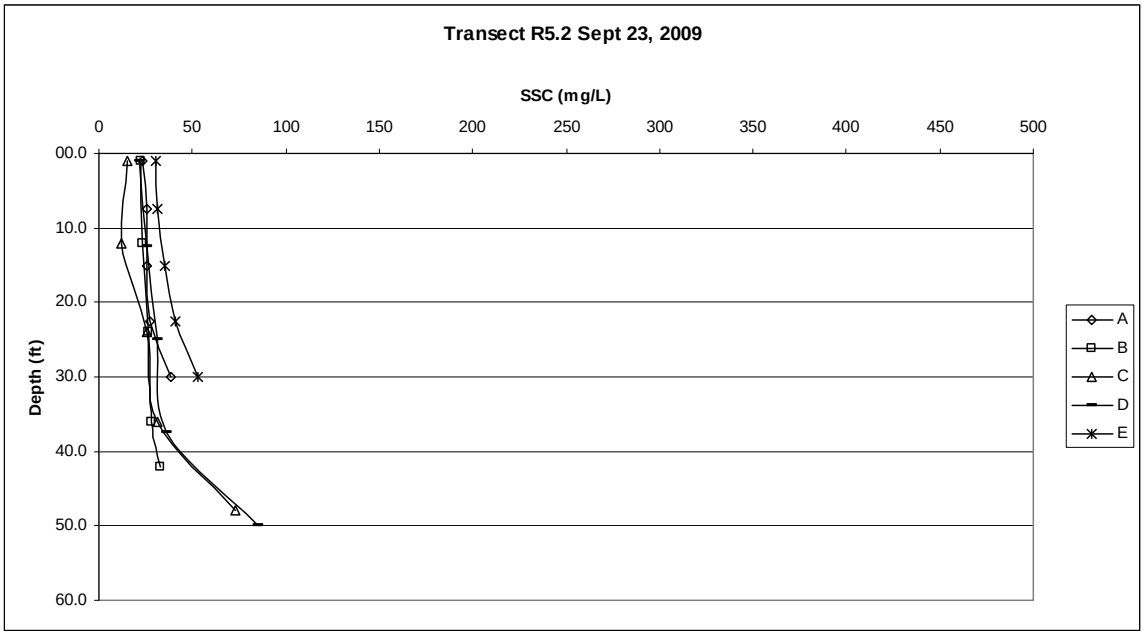
Mississippi River Mile 4.5 Transect



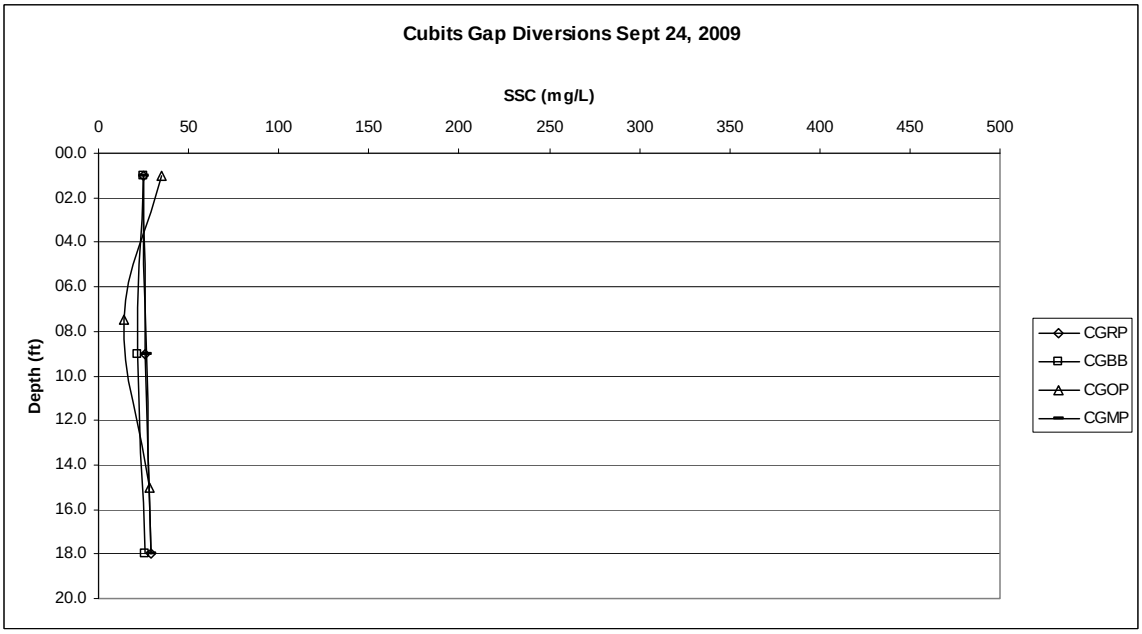
West Bay Diversion Transect



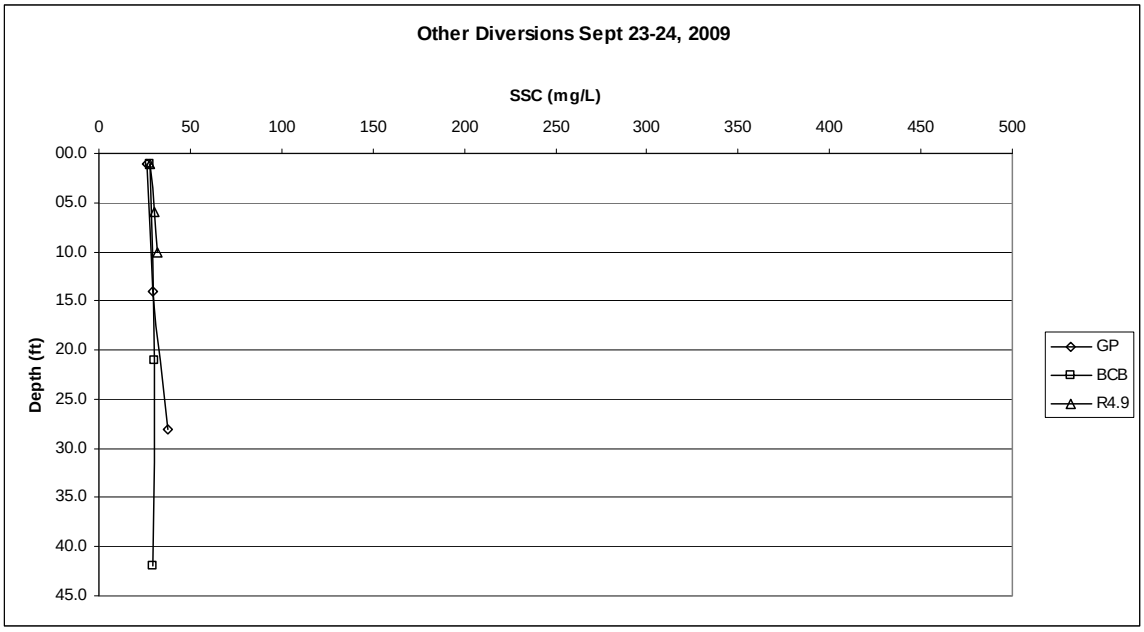
Mississippi River Mile 5.2 Transect



Cubits Gap Diversions



Other Diversions



Suspended Sediment Grain Size

Suspended Sediment Samples Wentworth Size Class
(% by volume)

April 22, 2009

West Bay Diversion, Mississippi River Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
WBDMR-A	1	0.12	71.66	28.23	22.54	25.71	16.40	7.01	0.12	0.00	0.00	0.00	0.00
	5	2.10	71.38	26.54	21.17	24.37	16.53	9.30	2.10	0.00	0.00	0.00	0.00
	10	4.24	70.27	25.48	19.87	22.92	16.26	11.23	4.24	0.00	0.00	0.00	0.00
	15	4.12	69.00	26.89	19.91	22.07	16.34	10.67	4.12	0.00	0.00	0.00	0.00
	20	7.09	65.85	27.07	19.06	20.55	15.44	10.80	7.05	0.04	0.00	0.00	0.00
WBDMR-B	1	0.34	71.18	28.47	22.49	24.95	15.83	7.91	0.34	0.00	0.00	0.00	0.00
	10	2.75	69.81	27.44	20.30	22.96	16.53	10.02	2.75	0.00	0.00	0.00	0.00
	20	3.33	69.44	27.23	20.39	22.89	16.42	9.75	3.33	0.00	0.00	0.00	0.00
	30	6.33	66.32	27.34	19.24	20.57	15.71	10.80	5.90	0.43	0.00	0.00	0.00
	40	9.65	64.18	26.17	18.37	19.96	15.42	10.44	8.04	1.62	0.00	0.00	0.00
WBDMR-C	1	0.59	68.84	30.57	22.55	23.38	14.95	7.96	0.59	0.00	0.00	0.00	0.00
	8	2.47	67.26	30.27	21.10	21.76	15.19	9.20	2.47	0.00	0.00	0.00	0.00
	15	3.62	68.52	27.86	19.99	21.92	16.20	10.41	3.62	0.00	0.00	0.00	0.00
	22	7.27	67.03	25.70	19.36	21.58	15.50	10.60	6.05	1.22	0.00	0.00	0.00
	29	4.48	67.85	27.66	19.84	21.74	16.10	10.17	4.47	0.02	0.00	0.00	0.00

Suspended Sediment Samples
Cumulative Grain Size Distributions

April 23, 2009

D_5-D_{50} (particle diameter in μm)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
WBDMR-A	1	0.85	1.58	2.34	3.04	3.76	4.52	5.30	6.13	7.02	8.00
	5	0.94	1.73	2.50	3.25	4.01	4.82	5.66	6.58	7.58	8.71
	10	1.08	1.82	2.59	3.37	4.17	5.01	5.92	6.93	8.07	9.39
	15	1.00	1.73	2.47	3.20	3.95	4.76	5.64	6.62	7.73	9.01
	20	1.05	1.72	2.43	3.16	3.92	4.74	5.64	6.67	7.86	9.28
WBDMR-B	1	0.86	1.58	2.33	3.02	3.73	4.48	5.27	6.10	6.99	7.96
	10	1.04	1.70	2.41	3.13	3.87	4.66	5.51	6.46	7.52	8.74
	20	0.99	1.66	2.41	3.15	3.90	4.69	5.54	6.48	7.54	8.76
	30	1.03	1.69	2.41	3.13	3.88	4.68	5.57	6.58	7.74	9.13
	40	1.02	1.73	2.49	3.26	4.05	4.92	5.88	6.98	8.28	9.13
WBDMR-C	1	0.93	1.55	2.21	2.85	3.49	4.17	4.89	5.67	6.53	7.49
	8	0.97	1.56	2.20	2.84	3.50	4.20	4.96	5.80	6.74	7.83
	15	1.02	1.67	2.36	3.08	3.81	4.59	5.44	6.39	7.47	8.73
	22	1.06	1.79	2.56	3.34	4.13	4.99	5.91	6.95	8.15	9.55
	29	1.03	1.69	2.39	3.10	3.84	4.63	5.49	6.45	7.55	8.83

D_{55}-D_{100} (particle diameter in μm)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
WBDMR-A	1	9.09	10.39	11.96	13.94	16.38	19.33	22.98	28.22	37.79	69.82
	5	10.02	11.62	13.60	16.06	19.06	22.81	28.00	35.91	49.37	98.67
	10	10.94	12.87	15.28	18.35	22.22	27.16	33.79	43.68	59.99	138.07
	15	10.55	12.46	14.90	17.96	21.72	26.42	32.80	42.61	59.08	130.50
	20	11.03	13.25	16.09	19.67	24.14	29.99	38.33	51.46	74.38	163.80
WBDMR-B	1	9.05	10.35	11.95	14.01	16.64	19.86	23.87	29.98	39.05	78.92
	10	10.18	11.92	14.08	16.79	20.16	24.39	29.97	38.19	52.56	127.95
	20	10.20	11.95	14.15	16.89	20.26	24.50	30.20	38.79	54.39	146.80
	30	10.85	13.02	15.80	19.24	23.47	28.98	36.83	48.96	71.41	200.53
	40	11.84	14.37	17.54	21.41	26.34	33.19	43.62	61.66	100.02	216.68
WBDMR-C	1	8.60	9.90	11.53	13.60	16.26	19.65	24.05	30.50	41.43	91.27
	8	9.11	10.68	12.67	15.24	18.50	22.59	28.03	36.25	50.56	149.20
	15	10.23	12.07	14.42	17.35	20.96	25.50	31.63	40.65	56.55	140.25
	22	11.25	13.39	16.14	19.64	24.05	29.90	38.50	52.08	78.36	237.88
	29	10.37	12.27	14.68	17.70	21.42	26.11	32.59	42.56	60.56	163.80

Suspended Sediment Samples Wentworth Size Class
(% by volume)

May, 5 2009

West Bay Diversion, Mississippi River Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
WBDMR-A	1	0.16	70.02	29.81	18.01	23.06	20.23	8.72	0.16	0.00	0.00	0.00	0.00
	7.5	2.27	70.69	27.04	15.84	20.83	20.85	13.18	2.27	0.00	0.00	0.00	0.00
	15	6.95	66.78	26.26	15.27	19.73	18.89	12.90	6.74	0.22	0.00	0.00	0.00
	22.5	6.70	67.05	26.27	15.44	19.69	18.60	13.33	6.70	0.00	0.00	0.00	0.00
	30	10.14	65.45	24.41	14.63	18.86	17.90	14.07	9.78	0.35	0.00	0.00	0.00
WBDMR-B	1	2.43	68.49	29.08	16.11	20.25	19.15	12.99	2.43	0.00	0.00	0.00	0.00
	10	0.86	69.47	29.67	17.31	21.86	20.09	10.21	0.86	0.00	0.00	0.00	0.00
	20	0.88	69.69	29.43	16.98	21.76	20.05	10.91	0.88	0.00	0.00	0.00	0.00
	30	7.34	65.90	26.76	15.66	20.41	18.59	11.24	7.29	0.05	0.00	0.00	0.00
	40	13.76	61.65	24.59	14.27	18.74	17.31	11.33	11.85	1.91	0.00	0.00	0.00
WBDMR-C	1	13.76	61.65	24.59	14.27	18.74	17.31	11.33	11.85	1.91	0.00	0.00	0.00
	7.5	6.67	66.33	26.99	15.91	19.93	18.07	12.43	6.62	0.05	0.00	0.00	0.00
	15	1.44	69.97	28.60	17.22	22.07	19.75	10.94	1.44	0.00	0.00	0.00	0.00
	22.5	6.26	67.81	25.93	15.66	20.30	18.49	13.36	6.18	0.09	0.00	0.00	0.00
	30	5.31	68.31	26.39	15.64	20.30	18.98	13.39	5.25	0.06	0.00	0.00	0.00

Mississippi River Mile 4.5 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
R4.5-A	1	0.00	68.82	31.18	19.69	24.78	19.40	4.95	0.00	0.00	0.00	0.00	0.00
	5	0.61	70.40	29.01	17.55	22.63	19.91	10.30	0.61	0.00	0.00	0.00	0.00
	10	2.73	69.90	27.37	16.14	20.74	19.51	13.52	2.73	0.00	0.00	0.00	0.00
	15	2.39	69.71	27.91	16.46	21.20	19.84	12.20	2.39	0.00	0.00	0.00	0.00
	20	3.95	70.01	26.03	16.60	21.93	19.38	12.11	3.95	0.00	0.00	0.00	0.00
R4.5-B	1	0.11	69.66	30.23	19.38	24.61	18.96	6.71	0.11	0.00	0.00	0.00	0.00
	10	1.14	70.81	28.04	17.27	22.51	20.07	10.96	1.14	0.00	0.00	0.00	0.00
	20	13.95	61.77	24.27	14.08	17.89	17.01	12.79	11.55	2.40	0.00	0.00	0.00
	30	6.39	67.23	26.40	15.73	21.32	18.98	11.21	6.38	0.01	0.00	0.00	0.00
	40	62.34	26.87	10.79	6.23	8.41	7.58	4.65	8.66	32.93	8.35	12.40	0.00
R4.5-C	1	37.39	44.41	18.21	10.18	14.42	12.66	7.16	2.19	7.31	7.34	20.55	0.00
	12	7.02	67.04	25.93	15.99	19.63	18.41	13.01	6.85	0.17	0.00	0.00	0.00
	24	1.51	69.49	29.00	17.28	22.06	20.09	10.06	1.51	0.00	0.00	0.00	0.00
	36	7.56	67.20	25.26	14.78	19.40	18.70	14.33	7.45	0.10	0.00	0.00	0.00
	46	45.86	38.96	15.16	8.79	10.96	10.69	8.53	15.66	30.09	0.12	0.00	0.00
R4.5-D	1	0.00	66.92	33.07	20.77	25.61	18.00	2.54	0.00	0.00	0.00	0.00	0.00
	12	1.70	69.83	28.48	17.01	21.59	19.34	11.89	1.70	0.00	0.00	0.00	0.00
	25	1.18	70.80	28.03	17.80	23.28	19.84	9.89	1.18	0.00	0.00	0.00	0.00
	37	1.29	70.09	28.64	17.08	21.96	20.09	10.96	1.29	0.00	0.00	0.00	0.00
	50	20.43	58.66	20.92	13.09	17.03	15.73	12.82	15.21	5.22	0.00	0.00	0.00
R4.5-E	1	0.00	65.76	34.24	19.88	24.12	17.94	3.83	0.00	0.00	0.00	0.00	0.00
	7.5	0.00	67.07	32.93	18.91	23.60	19.71	4.85	0.00	0.00	0.00	0.00	0.00
	15	0.19	69.39	30.42	18.66	23.92	19.97	6.84	0.19	0.00	0.00	0.00	0.00
	22	0.54	69.71	29.74	17.58	22.74	20.48	8.92	0.54	0.00	0.00	0.00	0.00
	30	2.81	69.67	27.52	16.28	20.82	19.41	13.17	2.81	0.00	0.00	0.00	0.00

Mississippi River Mile 5.2 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
R5.2-A	1	0.35	67.25	32.38	18.88	21.97	17.84	8.56	0.35	0.00	0.00	0.00	0.00
	7.5	0.87	69.38	29.75	18.72	22.92	18.77	8.97	0.87	0.00	0.00	0.00	0.00
	15	2.16	69.51	28.33	17.84	21.78	18.52	11.37	2.16	0.00	0.00	0.00	0.00
	22	1.97	69.31	28.71	18.04	22.11	18.61	10.55	1.97	0.00	0.00	0.00	0.00
	30	9.39	63.78	26.84	15.12	18.36	17.25	13.06	9.24	0.15	0.00	0.00	0.00
R5.2-B	1	0.00	65.66	34.32	19.82	22.88	16.92	6.05	0.00	0.00	0.00	0.00	0.00
	12	6.19	67.80	26.03	16.49	20.99	18.06	12.27	6.14	0.05	0.00	0.00	0.00
	24	8.35	65.93	25.72	16.06	20.15	17.61	12.11	7.58	0.77	0.00	0.00	0.00
	36	6.44	66.84	26.73	16.14	20.55	18.46	11.69	6.42	0.02	0.00	0.00	0.00
	48	37.42	44.46	18.13	10.66	13.29	12.12	8.39	12.87	22.35	2.11	0.10	0.00
R5.2-C	1	2.91	68.66	28.42	17.29	21.56	17.98	11.84	2.91	0.00	0.00	0.00	0.00
	12	2.11	69.37	28.54	17.08	21.62	18.87	11.81	2.11	0.00	0.00	0.00	0.00
	24	0.40	69.89	29.70	17.81	22.58	19.94	9.57	0.40	0.00	0.00	0.00	0.00
	36	4.92	67.94	27.15	15.97	20.15	18.47	13.36	4.92	0.00	0.00	0.00	0.00
	48	15.59	59.08	25.32	14.38	17.97	16.52	10.21	12.16	3.44	0.00	0.00	0.00
R5.2-D	1	1.55	69.25	29.21	17.60	22.16	18.10	11.39	1.55	0.00	0.00	0.00	0.00
	12	0.18	69.56	30.26	18.24	23.37	19.96	8.00	0.18	0.00	0.00	0.00	0.00
	25	0.44	70.30	29.27	18.15	23.54	19.92	8.69	0.44	0.00	0.00	0.00	0.00
	37	0.43	70.52	29.06	17.01	24.57	20.47	8.47	0.43	0.00	0.00	0.00	0.00
	50	3.56	68.50	27.94	16.94	20.31	19.86	11.40	3.56	0.00	0.00	0.00	0.00
R5.2-E	1	0.00	62.69	37.31	21.10	24.62	16.41	0.55	0.00	0.00	0.00	0.00	0.00
	7.5	0.83	68.54	30.63	16.71	22.57	17.58	11.69	0.83	0.00	0.00	0.00	0.00
	15	0.45	69.62	29.93	18.31	22.95	18.86	9.51	0.45	0.00	0.00	0.00	0.00
	22	1.21	71.13	27.66	17.29	22.77	19.97	11.09	1.21	0.00	0.00	0.00	0.00
	30	1.22	71.06	27.72	17.49	23.22	19.82	10.53	1.22	0.00	0.00	0.00	0.00

Suspended Sediment Samples
Cumulative Grain Size Distributions

May 5-6, 2009

D_5-D_{50} (particle diameter in μm)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
WBDMR-A	1	0.88	1.36	1.96	2.67	3.44	4.28	5.21	6.25	7.43	8.77
	8	0.92	1.47	2.16	2.97	3.86	4.87	6.02	7.34	8.88	10.68
	15	0.95	1.53	2.25	3.09	4.04	5.11	6.35	7.79	9.51	11.55
	23	0.95	1.52	2.24	3.07	3.99	5.04	6.24	7.63	9.28	11.24
	30	0.98	1.62	2.42	3.35	4.38	5.56	6.91	8.50	10.40	12.69
WBDMR-B	1	0.89	1.38	1.99	2.72	3.53	4.45	5.50	6.72	8.16	9.87
	10	0.88	1.37	1.97	2.67	3.45	4.31	5.27	6.36	7.62	9.08
	20	0.89	1.38	1.98	2.68	3.47	4.35	5.34	6.46	7.76	9.26
	30	0.92	1.46	2.15	2.97	3.89	4.93	6.09	7.43	8.99	10.81
	40	0.95	1.58	2.39	3.31	4.34	5.53	6.92	8.57	10.55	12.90
WBDMR-C	1	0.95	1.58	2.39	3.31	4.34	5.53	6.92	8.57	10.55	12.90
	8	0.91	1.45	2.14	2.96	3.86	4.87	6.01	7.31	8.85	10.68
	15	0.88	1.37	2.00	2.76	3.60	4.52	5.52	6.66	7.94	9.43
	23	0.94	1.52	2.27	3.12	4.07	5.13	6.33	7.70	9.31	11.22
	30	0.93	1.50	2.22	3.05	3.98	5.02	6.20	7.56	9.16	11.04
R4.5-A	1	0.85	1.30	1.88	2.55	3.28	4.05	4.89	5.80	6.81	7.95
	5	0.90	1.41	2.03	2.75	3.55	4.43	5.40	6.49	7.74	9.17
	10	0.92	1.45	2.13	2.92	3.80	4.77	5.88	7.15	8.63	10.37
	15	0.91	1.44	2.10	2.86	3.71	4.66	5.73	6.95	8.36	10.01
	20	0.94	1.53	2.28	3.13	4.05	5.06	6.18	7.44	8.88	10.55
R4.5-B	1	0.88	1.36	1.97	2.66	3.41	4.21	5.08	6.02	7.07	8.26
	10	0.92	1.45	2.11	2.87	3.70	4.62	5.63	6.78	8.08	9.58
	20	0.98	1.62	2.43	3.36	4.41	5.63	7.06	8.77	10.84	13.37
	30	0.91	1.46	2.17	3.02	3.96	5.02	6.20	7.53	9.07	10.85
	40	1.85	3.89	6.74	10.97	16.83	26.00	45.98	90.06	126.88	146.80
R4.5-C	1	1.55	2.60	4.40	6.26	9.36	12.48	17.61	24.46	48.34	124.44
	12	0.93	1.52	2.28	3.15	4.08	5.11	6.28	7.63	9.25	11.20
	24	0.88	1.37	2.00	2.74	3.56	4.46	5.46	6.59	7.87	9.37
	36	0.95	1.55	2.32	3.21	4.21	5.35	6.66	8.20	10.02	12.19
	46	1.26	2.54	4.18	6.17	8.76	12.36	17.29	23.45	31.78	45.56
R4.5-D	1	0.82	1.24	1.77	2.39	3.06	3.78	4.56	5.39	6.30	7.31
	12	0.89	1.40	2.05	2.81	3.64	4.56	5.58	6.74	8.07	9.62
	25	0.91	1.44	2.11	2.89	3.72	4.63	5.62	6.72	7.96	9.39
	37	0.91	1.42	2.06	2.79	3.61	4.51	5.52	6.66	7.97	9.49
	50	1.07	1.87	2.89	4.03	5.32	6.80	8.56	10.69	13.31	16.52
R4.5-E	1	0.80	1.19	1.69	2.27	2.91	3.61	4.37	5.21	6.14	7.19
	7.5	0.83	1.25	1.77	2.38	3.05	3.78	4.60	5.50	6.53	7.69
	15	0.87	1.35	1.94	2.63	3.37	4.18	5.07	6.06	7.17	8.42
	22	0.88	1.36	1.96	2.66	3.44	4.30	5.26	6.33	7.55	8.95
	30	0.91	1.45	2.13	2.91	3.78	4.76	5.85	7.10	8.56	10.27

D_5-D_{50} (particle diameter in μm)
(Continued)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
R5.2-A	1	0.85	1.29	1.84	2.46	3.14	3.87	4.68	5.59	6.62	7.82
	8	0.92	1.43	2.05	2.74	3.49	4.30	5.18	6.18	7.30	8.59
	15	0.93	1.48	2.15	2.89	3.68	4.55	5.51	6.60	7.85	9.31
	22	0.92	1.46	2.11	2.84	3.62	4.48	5.42	6.48	7.70	9.11
	30	0.95	1.51	2.20	2.99	3.89	4.92	6.12	7.54	9.27	11.38
R5.2-B	1	0.79	1.15	1.62	2.21	2.87	3.58	4.35	5.19	6.11	7.17
	12	0.92	1.53	2.31	3.15	4.05	5.05	6.17	7.45	8.93	10.69
	24	0.96	1.57	2.33	3.18	4.10	5.13	6.29	7.62	9.19	11.06
	36	0.94	1.52	2.23	3.03	3.92	4.91	6.03	7.32	8.84	10.63
	48	1.17	2.16	3.38	4.81	6.55	8.75	11.62	15.39	20.11	26.14
R5.2-C	1	0.90	1.42	2.08	2.83	3.65	4.55	5.56	6.69	8.00	9.51
	12	0.91	1.44	2.08	2.82	3.63	4.53	5.54	6.68	8.01	9.54
	24	0.89	1.38	1.99	2.69	3.45	4.30	5.23	6.29	7.49	8.87
	36	0.93	1.48	2.17	2.96	3.84	4.83	5.95	7.25	8.77	10.58
	48	0.96	1.57	2.33	3.21	4.22	5.38	6.74	8.37	10.35	12.78
R5.2-D	1	0.88	1.37	2.00	2.73	3.53	4.40	5.37	6.46	7.70	9.12
	12	0.88	1.36	1.95	2.63	3.38	4.20	5.11	6.12	7.27	8.58
	25	0.90	1.40	2.02	2.74	3.53	4.38	5.32	6.37	7.54	8.88
	37	0.72	1.25	2.08	2.76	3.52	4.42	5.46	6.60	7.86	9.32
	50	0.88	1.37	2.04	2.84	3.71	4.63	5.66	6.83	8.19	9.83
R5.2-E	1	0.79	1.15	1.58	2.08	2.64	3.25	3.92	4.65	5.46	6.36
	7.5	0.38	0.87	1.34	1.90	2.55	3.28	4.13	5.11	6.23	7.51
	15	0.87	1.35	1.96	2.67	3.43	4.26	5.18	6.19	7.34	8.66
	22	0.91	1.44	2.12	2.91	3.77	4.70	5.73	6.88	8.19	9.68
	30	0.92	1.46	2.13	2.91	3.76	4.68	5.70	6.83	8.11	9.57

D_{55}-D_{100} (particle diameter in μm)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
WBDMR-A	1	10.33	12.15	14.29	16.76	19.56	22.83	26.76	31.80	39.16	76.94
	8	12.80	15.25	18.03	21.13	24.65	28.77	33.92	41.06	52.29	109.47
	15	13.95	16.76	20.00	23.82	28.49	34.51	42.83	54.53	71.43	142.88
	23	13.59	16.37	19.56	23.24	27.62	33.14	40.60	51.89	70.88	146.80
	30	15.43	18.64	22.36	26.74	32.21	39.40	49.27	64.22	87.89	181.15
WBDMR-B	1	11.91	14.31	17.08	20.26	23.94	28.39	34.12	41.99	53.43	108.02
	10	10.80	12.82	15.19	17.90	20.99	24.56	28.92	34.79	43.93	93.56
	20	11.02	13.10	15.50	18.26	21.39	25.06	29.55	35.51	44.87	99.07
	30	12.98	15.54	18.57	22.17	26.41	31.44	37.89	49.02	79.77	161.20
	40	15.65	18.85	22.66	27.34	33.47	42.37	57.92	85.94	113.70	198.95
WBDMR-C	1	15.65	18.85	22.66	27.34	33.47	42.37	57.92	85.94	113.70	198.95
	8	12.88	15.52	18.62	22.19	26.47	32.01	39.85	51.77	71.48	157.90
	15	11.17	13.23	15.66	18.46	21.65	25.40	30.11	36.76	47.68	104.25
	23	13.48	16.16	19.28	22.92	27.33	32.97	40.64	51.95	69.72	144.48
	30	13.27	15.90	18.92	22.39	26.53	31.75	38.72	48.88	65.86	144.48
R4.5-A	1	9.23	10.71	12.44	14.47	16.86	19.67	23.05	27.23	33.08	65.26
	5	10.83	12.78	15.05	17.66	20.66	24.18	28.49	34.36	43.59	94.77
	10	12.43	14.86	17.66	20.85	24.54	28.99	34.74	42.79	54.96	113.70
	15	11.96	14.25	16.90	19.93	23.40	27.51	32.74	40.11	52.27	114.20
	20	12.51	14.82	17.50	20.62	24.28	28.80	34.80	43.62	58.58	131.03
R4.5-B	1	9.61	11.16	12.99	15.14	17.63	20.57	24.17	28.95	36.46	76.94
	10	11.32	13.36	15.73	18.45	21.55	25.21	29.81	36.19	46.40	101.77
	20	16.40	19.90	23.98	29.01	35.76	45.24	59.43	83.88	115.42	213.20
	30	12.92	15.33	18.13	21.50	25.62	30.47	36.21	44.87	73.63	150.40
	40	162.23	176.80	192.32	211.43	247.13	324.08	421.57	560.70	726.80	948.20
R4.5-C	1	163.78	260.76	324.55	370.73	409.33	445.12	482.36	531.36	581.13	672.38
	12	13.57	16.38	19.61	23.35	27.93	33.94	42.25	54.59	72.84	155.38
	24	11.11	13.16	15.56	18.33	21.49	25.19	29.86	36.39	46.40	94.66
	36	14.75	17.68	21.04	25.00	29.90	36.19	44.51	56.36	73.96	147.75
	46	68.32	100.09	120.30	134.18	145.85	157.05	168.83	182.43	201.20	309.60
R4.5-D	1	8.44	9.73	11.22	12.97	15.04	17.50	20.44	24.10	29.14	53.92
	12	11.46	13.63	16.17	19.09	22.44	26.50	31.75	39.15	49.76	95.42
	25	11.03	12.95	15.18	17.78	20.79	24.36	28.85	35.06	45.12	93.56
	37	11.27	13.37	15.80	18.58	21.74	25.47	30.09	36.43	46.72	101.77
	50	20.35	24.96	30.79	38.68	49.59	64.80	85.67	109.68	135.03	239.78
R4.5-E	1	8.39	9.77	11.39	13.30	15.55	18.20	21.40	25.51	31.22	55.20
	7.5	9.04	10.60	12.42	14.55	16.99	19.78	23.05	27.14	32.92	62.14
	15	9.87	11.54	13.49	15.75	18.33	21.33	24.96	29.65	36.72	72.13
	22	10.58	12.49	14.70	17.22	20.08	23.40	27.42	32.70	40.84	85.24
	30	12.31	14.72	17.51	20.74	24.46	28.92	34.65	42.67	54.96	115.00

D_{55}-D_{100} (particle diameter in μm)
(Continued)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
R5.2-A	1	9.23	10.92	12.96	15.40	18.26	21.60	25.72	31.49	41.00	85.95
	8	10.10	11.88	13.98	16.49	19.43	22.91	27.24	33.22	43.01	93.56
	15	11.03	13.10	15.57	18.49	21.90	26.03	31.35	38.91	51.23	111.73
	22	10.77	12.75	15.11	17.90	21.17	25.10	30.13	37.31	49.49	111.73
	30	13.96	17.05	20.68	24.94	30.16	36.87	46.28	61.15	84.15	165.10
R5.2-B	1	8.37	9.77	11.46	13.48	15.97	19.39	24.08	28.97	34.33	57.77
	12	12.78	15.27	18.16	21.55	25.75	31.22	38.67	49.73	69.31	161.50
	24	13.32	16.02	19.21	22.96	27.57	33.70	42.54	56.54	86.10	198.95
	36	12.76	15.28	18.17	21.47	25.47	30.69	37.97	49.18	71.69	154.00
	48	34.89	50.32	81.13	111.45	131.95	150.07	168.58	190.85	225.32	511.03
R5.2-C	1	11.31	13.46	16.01	19.05	22.70	27.22	33.24	41.84	54.73	111.73
	12	11.36	13.50	16.02	18.93	22.36	26.52	31.91	39.49	51.38	111.73
	24	10.48	12.36	14.58	17.14	20.08	23.47	27.57	33.05	41.67	92.30
	36	12.74	15.31	18.31	21.81	25.96	31.06	37.63	47.00	62.92	146.80
	48	15.73	19.27	23.54	28.97	36.88	52.35	74.60	95.86	121.20	195.00
R5.2-D	1	10.80	12.77	15.12	17.92	21.24	25.33	30.70	38.31	49.26	97.47
	12	10.08	11.84	13.88	16.25	18.97	22.14	25.97	30.94	38.28	79.19
	25	10.43	12.22	14.31	16.73	19.53	22.80	26.81	32.18	40.38	85.24
	37	11.01	12.84	14.78	16.93	19.47	22.54	26.24	31.51	38.92	70.99
	50	11.83	14.26	17.08	20.20	23.65	27.66	33.04	41.63	57.15	121.80
R5.2-E	1	7.39	8.55	9.90	11.48	13.34	15.60	18.35	21.57	25.59	42.99
	7.5	8.95	10.60	12.50	14.69	17.28	20.39	24.35	29.75	37.09	46.98
	15	10.18	11.97	14.10	16.59	19.51	22.97	27.31	33.24	42.19	84.47
	22	11.42	13.45	15.81	18.53	21.68	25.41	30.12	36.67	46.99	99.72
	30	11.25	13.20	15.47	18.10	21.13	24.75	29.34	35.84	46.47	101.77

Suspended Sediment Samples Wentworth Size Class
(% by volume)

May, 29-30 2009

West Bay Diversion, Mississippi River Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
WBDMR-A	1	2.29	71.91	25.79	18.75	22.34	18.28	12.54	2.29	0.00	0.00	0.00	0.00
	7.5	13.14	65.01	21.86	16.16	19.38	16.25	13.22	9.76	3.29	0.09	0.00	0.00
	15	16.55	62.69	20.76	15.64	18.77	15.45	12.84	11.34	5.08	0.13	0.00	0.00
	22.5	29.57	52.10	18.32	13.08	15.46	12.88	10.68	10.45	5.61	2.72	10.80	0.00
	30	14.90	63.77	21.31	15.83	19.10	15.43	13.42	12.86	2.04	0.00	0.00	0.00
WBDMR-B	1	2.35	70.89	26.76	20.37	22.74	16.94	10.84	2.35	0.00	0.00	0.00	0.00
	10	4.05	68.72	27.23	19.80	22.28	16.71	9.94	4.00	0.05	0.00	0.00	0.00
	20	17.11	61.19	21.69	16.15	19.11	15.06	10.88	10.24	6.86	0.01	0.00	0.00
	30	22.24	57.12	20.64	15.04	17.47	14.28	10.33	10.15	11.88	0.21	0.00	0.00
	40	29.10	52.98	17.92	13.57	16.20	12.90	10.32	12.98	11.95	2.65	1.52	0.00
WBDMR-C	1	1.15	70.83	28.03	20.77	23.80	16.65	9.61	1.15	0.00	0.00	0.00	0.00
	7.5	10.20	66.25	23.56	17.92	21.32	15.63	11.38	8.32	1.88	0.00	0.00	0.00
	15	6.66	68.81	24.54	18.58	22.12	16.66	11.45	6.53	0.13	0.00	0.00	0.00
	22.5	10.35	66.34	23.32	17.58	20.66	15.92	12.19	9.33	1.02	0.00	0.00	0.00
	30	27.98	53.77	18.25	13.58	16.23	13.09	10.87	13.31	9.64	2.56	2.47	0.00

Mississippi River Mile 4.5 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
R4.5A	1	2.34	70.31	27.36	20.50	23.45	16.68	9.69	2.34	0.00	0.00	0.00	0.00
	5	6.68	68.51	24.81	18.65	22.07	16.70	11.10	6.36	0.32	0.00	0.00	0.00
	10	11.20	65.78	23.01	17.46	20.80	15.88	11.64	8.27	2.89	0.04	0.00	0.00
	15	11.33	65.90	22.76	17.61	21.03	16.07	11.19	8.62	2.71	0.00	0.00	0.00
	20	12.24	64.78	22.98	16.94	20.17	15.99	11.68	9.79	2.45	0.00	0.00	0.00
R4.5B	1	1.05	69.04	29.91	21.41	23.76	16.06	7.82	1.05	0.00	0.00	0.00	0.00
	10	3.85	69.71	26.43	19.25	22.43	17.14	10.90	3.85	0.00	0.00	0.00	0.00
	20	12.54	63.90	23.57	16.35	18.79	15.87	12.90	10.21	2.31	0.03	0.00	0.00
	30	10.75	66.54	22.70	16.86	20.54	16.49	12.66	10.48	0.27	0.00	0.00	0.00
	40	35.07	49.32	15.62	12.04	14.60	12.15	10.53	16.44	11.54	3.28	3.81	0.00
R4.5C	1	2.29	70.10	27.61	20.40	23.21	16.16	10.33	2.27	0.02	0.00	0.00	0.00
	12	8.34	67.67	23.99	18.12	21.56	16.56	11.43	6.92	1.42	0.00	0.00	0.00
	24	5.01	70.05	24.95	18.53	22.02	17.61	11.89	5.00	0.01	0.00	0.00	0.00
	36	16.30	62.10	21.59	16.00	19.07	15.28	11.75	10.57	5.54	0.20	0.00	0.00
	48	20.23	59.17	20.60	15.17	18.53	14.05	11.42	11.41	8.81	0.00	0.00	0.00
R4.5D	1	0.69	70.74	28.58	21.19	24.07	17.03	8.45	0.69	0.00	0.00	0.00	0.00
	12.5	6.00	69.17	24.82	18.82	21.99	16.59	11.77	5.64	0.37	0.00	0.00	0.00
	25	13.49	64.27	22.25	16.96	20.07	15.50	11.74	9.45	4.02	0.02	0.00	0.00
	37.5	15.18	62.93	21.91	16.41	19.50	15.38	11.65	8.88	6.18	0.11	0.00	0.00
	50	20.54	58.85	20.61	15.26	17.92	14.48	11.19	10.10	10.23	0.22	0.00	0.00
R4.5E	1	1.97	68.96	29.08	20.42	22.28	16.35	9.91	1.97	0.00	0.00	0.00	0.00
	7.5	7.32	67.24	25.44	18.63	21.67	16.06	10.89	6.29	1.03	0.00	0.00	0.00
	15	4.10	70.16	25.74	19.08	22.57	17.28	11.24	3.68	0.42	0.00	0.00	0.00
	22	8.93	67.00	24.07	17.71	20.83	16.33	12.13	7.68	1.26	0.00	0.00	0.00
	30	9.11	67.34	23.55	17.49	20.84	16.63	12.39	7.74	1.37	0.00	0.00	0.00

Mississippi River Mile 5.2 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
R5.2A	1	5.13	68.47	26.40	19.35	22.05	16.18	10.89	5.04	0.09	0.00	0.00	0.00
	7.5	2.51	70.44	27.06	20.41	21.91	16.95	11.17	2.51	0.00	0.00	0.00	0.00
	15	10.77	65.95	23.29	17.22	20.76	15.84	12.14	9.59	1.18	0.00	0.00	0.00
	22	13.88	63.76	22.38	16.57	19.44	15.45	12.30	11.64	2.25	0.00	0.00	0.00
	30	24.96	55.52	19.51	14.32	16.83	13.40	10.98	13.62	9.98	0.96	0.42	0.00
R5.2B	1	0.82	69.09	30.08	21.96	24.30	15.31	7.52	0.82	0.00	0.00	0.00	0.00
	12	8.69	67.85	23.47	18.16	21.63	16.25	11.81	7.58	1.11	0.00	0.00	0.00
	24	13.46	64.60	21.93	16.65	20.29	15.65	12.02	10.72	2.74	0.00	0.00	0.00
	36	15.64	63.95	20.41	15.95	19.76	15.91	12.34	11.52	4.09	0.03	0.00	0.00
	48	38.66	45.97	15.38	11.35	13.47	11.31	9.85	15.95	14.61	3.12	4.98	0.00
R5.2C	1	2.64	70.27	27.10	20.80	22.71	16.76	10.00	2.61	0.03	0.00	0.00	0.00
	12	8.35	67.58	24.08	18.76	21.28	15.96	11.58	7.89	0.47	0.00	0.00	0.00
	24	4.97	69.39	25.63	19.14	21.95	17.12	11.18	4.93	0.04	0.00	0.00	0.00
	36	14.24	64.01	21.75	16.16	19.36	15.86	12.63	10.68	3.55	0.02	0.00	0.00
	48	33.51	49.69	16.81	12.33	14.62	12.25	10.50	14.31	13.55	2.89	2.76	0.00
R5.2D	1	4.39	64.24	31.38	19.91	20.65	14.79	8.89	4.12	0.27	0.00	0.00	0.00
	12	6.41	69.15	24.44	18.56	22.12	16.54	11.93	5.78	0.63	0.00	0.00	0.00
	25	4.56	70.19	25.25	18.99	22.41	17.30	11.50	4.28	0.28	0.00	0.00	0.00
	37.5	9.79	66.82	23.39	17.64	20.95	16.51	11.72	8.08	1.71	0.00	0.00	0.00
	50	22.83	56.96	20.20	14.93	17.77	14.06	10.20	9.49	12.36	0.79	0.19	0.00
R5.2E	1	5.16	68.38	26.44	19.13	22.25	16.47	10.53	4.78	0.38	0.00	0.00	0.00
	7.5	2.27	70.91	26.81	19.68	22.75	17.34	11.15	2.27	0.00	0.00	0.00	0.00
	15	0.31	70.89	28.81	20.93	23.60	17.85	8.51	0.31	0.00	0.00	0.00	0.00
	22	3.07	71.22	25.70	19.18	22.97	17.87	11.21	3.02	0.05	0.00	0.00	0.00
	30	4.19	70.57	25.24	18.59	22.24	17.76	11.98	4.12	0.07	0.00	0.00	0.00

Cubits Gap Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
CGBB	1	38.77	45.12	16.12	12.39	15.26	11.21	6.26	2.23	4.29	7.57	24.68	0.00
	9	8.24	68.12	23.64	18.12	21.83	16.76	11.42	6.13	2.11	0.00	0.00	0.00
	18	19.13	63.54	17.32	15.87	21.35	15.37	10.96	9.95	8.68	0.45	0.05	0.00
CGMP	1	5.65	69.51	24.83	18.43	22.28	17.36	11.45	4.97	0.69	0.00	0.00	0.00
	9	9.06	68.12	22.82	17.63	21.59	16.94	11.95	7.11	1.96	0.00	0.00	0.00
	18	15.84	62.90	21.26	15.79	19.06	15.79	12.27	9.51	5.64	0.50	0.19	0.00
CGOP	1	5.11	69.35	25.54	19.22	22.95	16.79	10.39	4.55	0.56	0.00	0.00	0.00
	7.5	8.75	67.60	23.65	17.95	21.54	16.57	11.55	7.05	1.70	0.00	0.00	0.00
	15	12.38	65.31	22.34	17.08	20.61	16.06	11.56	8.72	3.66	0.00	0.00	0.00
CGRP	1	0.78	75.45	23.78	20.60	25.99	18.47	10.39	0.78	0.00	0.00	0.00	0.00
	9	5.76	70.85	23.39	18.75	23.45	17.45	11.21	5.46	0.31	0.00	0.00	0.00
	18	12.36	65.72	21.92	17.18	21.07	15.87	11.61	9.47	2.89	0.00	0.00	0.00

Other Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
BCB	1	7.78	67.77	24.46	18.13	21.56	16.89	11.19	7.06	0.72	0.00	0.00	0.00
	21	15.32	62.46	22.22	16.73	19.77	15.31	10.64	8.28	7.03	0.00	0.00	0.00
	42	46.36	39.28	14.38	10.55	12.11	9.31	7.31	6.60	23.57	16.07	0.12	0.00
GP	1	8.77	66.69	24.53	18.85	20.52	15.46	11.87	8.70	0.07	0.00	0.00	0.00
	14	14.11	63.74	22.15	16.53	19.45	15.48	12.29	11.04	3.08	0.00	0.00	0.00
	28	17.46	61.71	20.83	16.32	19.10	14.62	11.68	11.56	5.77	0.13	0.00	0.00
R4.9	6	1.03	70.92	28.04	20.47	22.94	17.60	9.91	1.03	0.00	0.00	0.00	0.00
	10	2.51	69.51	27.98	20.29	22.20	16.74	10.28	2.40	0.10	0.00	0.00	0.00

Suspended Sediment Samples
Cumulative Grain Size Distributions

May 29-30, 2009

D_5-D_{50} (particle diameter in μm)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
WBDMR-A	1	1.00	1.71	2.49	3.28	4.11	5.00	5.97	7.06	8.28	9.72
	8	1.15	2.01	2.93	3.89	4.91	6.03	7.31	8.80	10.60	12.85
	15	1.18	2.10	3.08	4.09	5.17	6.36	7.73	9.36	11.35	13.87
	23	1.26	2.38	3.51	4.75	6.20	7.98	10.28	13.20	17.09	22.36
	30	1.22	2.08	3.01	3.98	5.03	6.19	7.52	9.08	10.96	13.31
WBDMR-B	1	0.89	1.55	2.37	3.17	3.97	4.79	5.66	6.61	7.68	8.89
	10	0.95	1.60	2.36	3.12	3.90	4.72	5.61	6.59	7.69	8.96
	20	1.12	1.99	2.94	3.91	4.93	6.06	7.34	8.84	10.66	12.95
	30	1.12	2.07	3.08	4.11	5.22	6.47	7.94	9.72	11.99	14.96
	40	1.32	2.41	3.56	4.76	6.09	7.64	9.52	11.92	15.10	19.25
WBDMR-C	1	0.87	1.57	2.32	3.03	3.78	4.57	5.42	6.33	7.33	8.45
	8	1.10	1.89	2.75	3.62	4.53	5.50	6.58	7.79	9.20	10.89
	15	1.08	1.83	2.64	3.47	4.34	5.26	6.26	7.39	8.68	10.19
	23	1.13	1.93	2.78	3.65	4.56	5.55	6.65	7.91	9.38	11.16
	30	1.28	2.35	3.48	4.67	5.99	7.52	9.37	11.71	14.81	18.88
R4.5A	1	0.97	1.65	2.39	3.13	3.88	4.67	5.53	6.47	7.51	8.69
	5	1.07	1.81	2.61	3.43	4.29	5.20	6.19	7.31	8.58	10.08
	10	1.12	1.93	2.81	3.70	4.64	5.65	6.77	8.06	9.56	11.37
	15	1.13	1.97	2.85	3.74	4.68	5.68	6.80	8.07	9.55	11.33
	20	1.11	1.92	2.79	3.69	4.64	5.68	6.84	8.18	9.77	11.71
R4.5-B	1	0.91	1.51	2.18	2.85	3.54	4.27	5.05	5.89	6.82	7.86
	10	0.99	1.68	2.44	3.21	4.01	4.86	5.79	6.83	7.99	9.34
	20	1.10	1.87	2.71	3.59	4.54	5.59	6.79	8.21	9.92	12.08
	30	1.12	1.93	2.82	3.73	4.70	5.75	6.93	8.28	9.88	11.81
	40	1.46	2.75	4.08	5.51	7.15	9.14	11.72	15.22	19.95	26.06
R4.5-C	1	1.01	1.65	2.36	3.09	3.84	4.63	5.49	6.42	7.46	8.66
	12	1.09	1.86	2.70	3.56	4.44	5.40	6.45	7.63	9.01	10.64
	24	1.03	1.77	2.59	3.41	4.26	5.17	6.16	7.29	8.57	10.09
	36	1.16	2.04	2.98	3.95	4.99	6.14	7.45	8.99	10.87	13.22
	48	1.25	2.14	3.10	4.12	5.23	6.48	7.91	9.61	11.69	14.32
R4.5-D	1	0.84	1.52	2.27	2.98	3.70	4.48	5.30	6.19	7.15	8.22
	12.5	1.07	1.82	2.62	3.44	4.28	5.18	6.17	7.27	8.53	10.01
	25	1.15	2.00	2.91	3.83	4.80	5.86	7.04	8.42	10.04	12.05
	37.5	1.14	2.00	2.93	3.87	4.88	5.98	7.23	8.68	10.43	12.60
	50	1.20	2.12	3.10	4.12	5.22	6.45	7.89	9.61	11.77	14.57
R4.5-E	1	0.82	1.49	2.23	2.91	3.62	4.39	5.23	6.14	7.14	8.28
	7.5	1.06	1.78	2.56	3.36	4.19	5.09	6.07	7.18	8.46	9.97
	15	1.04	1.75	2.52	3.31	4.13	5.00	5.96	7.02	8.22	9.63
	22	1.08	1.84	2.68	3.53	4.43	5.40	6.47	7.70	9.13	10.84
	30	1.10	1.89	2.74	3.61	4.53	5.52	6.63	7.89	9.37	11.15

D_5-D_{50} (particle diameter in μm)
(Continued)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
R5.2A	1	0.99	1.66	2.44	3.22	4.02	4.88	5.80	6.83	7.99	9.34
	8	0.91	1.52	2.32	3.13	3.92	4.71	5.56	6.50	7.57	8.82
	15	1.16	1.94	2.77	3.65	4.58	5.59	6.73	8.02	9.54	11.35
	22	1.13	1.96	2.87	3.79	4.77	5.84	7.06	8.48	10.18	12.29
	30	1.23	2.22	3.27	4.37	5.57	6.95	8.58	10.61	13.23	16.70
R5.2-B	1	0.93	1.53	2.19	2.85	3.53	4.24	5.00	5.81	6.71	7.71
	12	1.11	1.92	2.77	3.64	4.54	5.50	6.56	7.75	9.13	10.77
	24	1.17	2.02	2.93	3.87	4.87	5.96	7.18	8.58	10.24	12.25
	36	1.20	2.15	3.15	4.17	5.24	6.43	7.77	9.34	11.22	13.56
	48	1.47	2.79	4.15	5.68	7.51	9.88	13.12	17.43	23.33	31.53
R5.2-C	1	0.94	1.58	2.37	3.15	3.93	4.72	5.56	6.49	7.53	8.71
	12	1.04	1.81	2.68	3.55	4.42	5.34	6.35	7.48	8.78	10.33
	24	0.98	1.69	2.50	3.32	4.15	5.03	5.98	7.04	8.24	9.64
	36	1.15	2.01	2.94	3.90	4.92	6.04	7.32	8.81	10.62	12.86
	48	1.36	2.54	3.77	5.11	6.65	8.50	10.87	14.07	18.37	23.87
R5.2-D	1	0.91	1.47	2.09	2.71	3.36	4.06	4.84	5.72	6.72	7.89
	12	1.08	1.84	2.66	3.49	4.36	5.29	6.30	7.43	8.73	10.25
	25	0.98	1.76	2.58	3.38	4.22	5.12	6.10	7.18	8.40	9.81
	37.5	1.11	1.90	2.76	3.63	4.55	5.54	6.64	7.88	9.34	11.09
	50	1.21	2.16	3.17	4.22	5.36	6.65	8.15	9.97	12.26	15.22
R5.2-E	1	1.03	1.70	2.45	3.22	4.02	4.87	5.81	6.85	8.04	9.41
	7.5	0.95	1.65	2.42	3.17	3.95	4.79	5.70	6.69	7.81	9.09
	15	0.84	1.52	2.26	2.95	3.67	4.44	5.26	6.15	7.13	8.22
	22	1.01	1.73	2.52	3.31	4.14	5.01	5.97	7.02	8.21	9.58
	30	1.05	1.77	2.56	3.37	4.21	5.11	6.10	7.21	8.48	9.96
CGBB	1	1.44	2.74	3.96	5.35	6.93	8.82	11.31	14.49	18.54	24.59
	9	1.09	1.88	2.74	3.60	4.50	5.46	6.51	7.70	9.08	10.71
	18	1.39	2.58	3.73	4.85	6.02	7.28	8.69	10.30	12.21	14.55
CGMP	1	1.06	1.79	2.59	3.42	4.28	5.21	6.22	7.35	8.64	10.16
	9	1.11	1.94	2.83	3.73	4.67	5.68	6.79	8.05	9.51	11.24
	18	1.16	2.05	3.01	3.99	5.05	6.22	7.56	9.13	11.06	13.46
CGOP	1	1.06	1.77	2.55	3.34	4.16	5.04	5.99	7.05	8.24	9.62
	7.5	1.10	1.89	2.74	3.60	4.51	5.48	6.55	7.76	9.16	10.82
	15	1.14	1.98	2.89	3.81	4.78	5.83	7.00	8.35	9.93	11.84
CGRP	1	1.05	1.94	2.80	3.62	4.46	5.33	6.25	7.24	8.32	9.53
	9	1.12	1.94	2.80	3.66	4.55	5.50	6.52	7.66	8.94	10.43
	18	1.20	2.06	2.96	3.89	4.86	5.92	7.09	8.42	9.98	11.84
BCB	1	1.06	1.81	2.64	3.47	4.34	5.28	6.31	7.48	8.83	10.44
	21	1.14	1.98	2.90	3.83	4.81	5.88	7.08	8.48	10.15	12.21
	42	1.57	2.97	4.44	6.11	8.19	11.00	15.10	20.75	29.55	45.55
GP	1	0.99	1.76	2.63	3.47	4.33	5.23	6.21	7.31	8.60	10.15
	14	1.14	1.99	2.90	3.83	4.82	5.91	7.14	8.57	10.29	12.42
	28	1.21	2.14	3.11	4.09	5.12	6.26	7.55	9.07	10.93	13.28
R4.9	6	0.86	1.51	2.28	3.02	3.77	4.56	5.41	6.33	7.36	8.52
	10	0.93	1.56	2.30	3.05	3.80	4.59	5.43	6.36	7.42	8.64

D_{55}-D_{100} (particle diameter in μm)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
WBDMR-A	1	11.43	13.53	16.10	19.16	22.76	27.13	32.88	40.84	52.85	114.30
	8	15.67	19.16	23.39	28.59	35.37	44.59	57.79	78.51	115.95	285.88
	15	17.08	21.04	25.91	32.20	40.63	52.42	69.68	95.69	135.80	349.70
	23	29.68	41.53	60.54	89.56	147.57	258.85	361.72	486.49	570.89	692.09
	30	16.32	20.14	24.82	30.68	38.55	49.02	63.19	83.45	111.18	218.43
WBDMR-B	1	10.35	12.16	14.46	17.29	20.63	24.71	30.46	39.25	52.03	100.45
	10	10.45	12.31	14.69	17.66	21.22	25.57	31.57	41.18	57.73	143.48
	20	15.86	19.51	24.06	30.04	38.63	51.98	74.40	108.55	149.10	295.85
	30	18.65	23.24	29.30	37.84	51.32	77.51	114.25	147.03	180.78	332.25
	40	24.60	32.02	43.12	59.73	84.01	112.25	140.05	171.70	233.40	907.88
WBDMR-C	1	9.76	11.35	13.33	15.78	18.68	22.19	27.01	34.60	46.00	93.56
	8	12.95	15.55	18.83	22.97	28.47	36.23	47.59	65.49	97.89	234.55
	15	12.01	14.27	17.07	20.54	24.89	30.58	38.44	50.50	73.01	169.45
	23	13.38	16.18	19.76	24.24	29.80	37.05	47.74	65.04	93.71	203.70
	30	24.08	31.05	41.07	55.73	76.87	102.93	131.73	168.10	261.53	948.20
R4.5A	1	10.08	11.76	13.85	16.44	19.61	23.54	28.79	36.83	50.31	120.62
	5	11.89	14.13	16.90	20.32	24.55	30.13	38.07	50.54	73.94	182.00
	10	13.62	16.46	20.00	24.46	30.35	38.64	51.04	71.05	109.14	260.53
	15	13.54	16.32	19.79	24.09	29.70	37.63	49.90	70.97	109.83	239.78
	20	14.12	17.14	20.85	25.44	31.51	40.08	53.07	74.94	110.80	234.10
R4.5-B	1	9.07	10.51	12.27	14.47	17.17	20.49	24.82	31.33	42.78	97.18
	10	10.95	12.93	15.40	18.40	22.03	26.55	32.72	41.89	57.76	131.30
	20	14.81	18.22	22.35	27.43	34.04	43.00	55.79	75.36	108.25	244.85
	30	14.19	17.13	20.73	25.25	30.98	38.09	47.99	67.21	92.88	176.80
	40	34.18	46.05	63.73	84.93	106.05	127.50	152.73	192.80	429.23	948.20
R4.5-C	1	10.05	11.74	13.83	16.47	19.82	24.08	29.72	37.83	51.18	130.15
	12	12.62	15.10	18.14	21.84	26.56	33.11	42.94	58.19	86.76	230.43
	24	11.92	14.18	16.91	20.16	24.11	29.16	35.91	45.59	63.55	150.40
	36	16.21	19.96	24.69	30.84	39.33	51.39	69.70	99.32	141.70	295.00
	48	17.73	22.15	27.95	36.00	47.36	64.44	94.01	126.78	156.48	282.10
R4.5-D	1	9.46	10.95	12.80	15.12	17.90	21.22	25.49	31.82	41.78	84.37
	12.5	11.80	14.04	16.83	20.28	24.56	30.14	37.90	49.42	69.66	191.13
	25	14.58	17.78	21.78	26.89	33.84	43.73	58.52	82.18	122.98	277.55
	37.5	15.36	18.82	23.09	28.59	36.17	47.08	64.46	96.62	148.13	348.13
	50	18.15	22.60	28.27	36.15	47.61	66.11	98.24	137.05	175.88	348.13
R4.5-E	1	9.64	11.31	13.46	16.14	19.30	23.11	28.35	36.64	48.92	92.72
	7.5	11.80	14.07	16.90	20.43	24.96	31.16	40.28	54.68	80.12	196.80
	15	11.30	13.34	15.86	18.93	22.66	27.41	33.88	43.52	61.26	165.35
	22	12.96	15.63	18.93	22.97	28.08	35.05	44.99	59.98	87.32	224.10
	30	13.34	16.07	19.42	23.50	28.67	35.67	45.58	60.72	89.18	224.10

D_{55}-D_{100} (particle diameter in μm)
(Continued)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
R5.2A	1	10.96	12.97	15.52	18.73	22.65	27.68	34.97	46.00	64.27	147.00
	8	10.33	14.63	17.61	21.10	25.31	31.08	40.08	52.74	101.77	
	15	13.59	16.40	19.96	24.42	30.20	38.11	49.51	67.00	95.92	208.93
	22	14.99	18.38	22.54	27.80	35.01	45.11	59.42	81.08	111.68	223.65
	30	21.13	26.88	34.91	46.48	63.42	87.44	113.85	141.98	181.75	583.05
R5.2-B	1	8.86	10.21	11.85	13.89	16.43	19.65	23.90	30.39	41.46	92.30
	12	12.77	15.28	18.43	22.35	27.34	34.16	43.98	59.01	86.37	214.60
	24	14.77	18.00	22.12	27.30	33.79	42.64	57.12	80.52	113.10	245.45
	36	16.49	24.61	30.37	38.09	49.28	66.27	91.51	126.85	271.88	
	48	43.99	61.77	82.50	104.61	126.85	151.05	200.88	342.03	472.62	718.52
R5.2-C	1	10.13	11.86	14.07	16.86	20.25	24.35	29.82	38.44	52.80	115.52
	12	12.25	14.71	17.85	21.70	26.51	33.15	43.08	57.12	82.50	171.35
	24	11.33	13.46	16.15	19.41	23.28	28.11	34.99	45.39	63.04	135.13
	36	15.69	19.19	23.44	28.81	36.07	46.26	60.79	82.95	119.90	277.55
	48	31.23	41.93	57.53	79.39	104.48	129.63	156.45	191.10	287.33	948.20
R5.2-D	1	9.30	11.07	13.34	16.22	19.82	24.54	31.37	42.13	60.56	142.30
	12	12.10	14.38	17.23	20.78	25.27	31.18	39.36	51.41	73.13	191.13
	25	11.52	13.65	16.29	19.47	23.29	28.21	35.09	45.16	62.95	145.50
	37.5	13.25	15.96	19.31	23.40	28.55	35.49	45.54	62.86	100.92	218.43
	50	19.02	23.88	30.38	39.92	55.36	81.47	119.75	156.40	194.58	500.23
R5.2-E	1	11.07	13.09	15.61	18.73	22.61	27.64	34.77	45.94	66.87	170.60
	7.5	10.62	12.50	14.84	17.69	21.09	25.27	30.91	39.08	51.72	105.97
	15	9.50	11.04	12.99	15.38	18.17	21.39	25.45	31.30	40.44	72.13
	22	11.21	13.19	15.63	18.56	22.07	26.41	32.23	40.79	55.22	129.77
	30	11.74	13.92	16.58	19.78	23.62	28.44	34.88	44.31	60.52	148.83
CGBB	1	34.37	78.32	181.75	360.38	522.00	621.03	695.88	768.98	849.83	948.20
	9	12.68	15.13	18.11	21.74	26.32	32.60	41.85	56.28	87.19	251.13
	18	17.49	21.23	26.23	33.20	43.30	59.50	89.45	127.55	169.10	451.58
CGMP	1	11.97	14.20	16.91	20.21	24.25	29.46	36.77	47.94	69.58	209.85
	9	13.36	15.99	19.22	23.17	28.13	34.80	44.51	60.27	92.51	251.78
	18	16.47	20.19	24.73	30.54	38.38	49.67	67.86	99.76	148.78	501.80
CGOP	1	11.25	13.23	15.69	18.73	22.55	27.47	34.25	44.66	66.44	191.13
	7.5	12.84	15.35	18.49	22.39	27.31	33.85	43.30	58.85	90.15	234.55
	15	14.23	17.23	20.95	25.60	31.71	40.35	53.76	77.04	119.53	257.45
CGRP	1	10.93	12.59	14.60	17.02	19.89	23.39	28.06	34.95	45.48	91.69
	9	12.19	14.32	16.91	20.09	24.06	29.28	36.68	48.13	68.85	163.40
	18	14.16	17.11	20.92	25.76	31.75	39.70	52.68	75.76	111.80	264.33
BCB	1	12.39	14.80	17.74	21.31	25.75	31.60	39.91	53.55	82.14	208.45
	21	14.83	18.14	22.27	27.55	34.86	46.10	65.58	106.18	148.73	263.13
	42	73.42	130.70	167.28	191.95	214.10	237.23	264.40	300.83	359.63	684.95
GP	1	12.13	14.71	17.95	21.78	26.67	34.13	43.18	56.50	82.07	150.55
	14	15.15	18.60	22.85	28.22	35.37	45.37	60.16	83.62	117.63	239.78
	28	16.34	20.26	25.23	31.86	41.20	54.62	74.58	103.71	142.60	309.93
R4.9	6	9.92	11.64	13.78	16.36	19.40	23.06	27.85	34.46	43.55	84.08
	10	10.10	11.89	14.16	16.96	20.30	24.39	29.97	38.73	52.95	113.07

Suspended Sediment Samples Wentworth Size Class
(% by volume)

June, 16-17, 2009

West Bay Diversion, Mississippi River Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
WBDMR-A	1	28.10	51.42	20.48	15.92	16.80	13.58	5.13	2.96	10.69	7.07	7.39	0.00
	7.5	0.05	64.46	35.48	25.14	21.17	12.31	5.85	0.05	0.00	0.00	0.00	0.00
	15	1.94	68.87	29.18	20.82	23.72	15.55	8.78	1.94	0.00	0.00	0.00	0.00
	22.5	1.68	68.81	29.52	21.21	23.76	15.37	8.48	1.68	0.00	0.00	0.00	0.00
	30	3.55	67.72	28.74	20.72	23.08	14.76	9.17	3.44	0.11	0.00	0.00	0.00
WBDMR-B	1	0.29	68.62	31.09	21.88	23.69	15.40	7.65	0.29	0.00	0.00	0.00	0.00
	12.5	8.09	65.71	26.24	18.73	21.20	15.02	10.76	7.39	0.71	0.00	0.00	0.00
	25	5.74	66.73	27.53	19.95	22.04	14.86	9.89	4.80	0.95	0.00	0.00	0.00
	37.5	4.71	66.23	29.05	20.28	22.04	15.03	8.89	4.32	0.40	0.00	0.00	0.00
	48	9.51	60.84	29.66	18.59	19.00	13.70	9.55	8.10	1.41	0.00	0.00	0.00

Mississippi River Mile 4.5 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
R4.5-A	1	2.34	70.31	27.36	20.50	23.45	16.68	9.69	2.34	0.00	0.00	0.00	0.00
	5	6.68	68.51	24.81	18.65	22.07	16.70	11.10	6.36	0.32	0.00	0.00	0.00
	10	11.20	65.78	23.01	17.46	20.80	15.88	11.64	8.27	2.89	0.04	0.00	0.00
	15	11.33	65.90	22.76	17.61	21.03	16.07	11.19	8.62	2.71	0.00	0.00	0.00
	20	12.24	64.78	22.98	16.94	20.17	15.99	11.68	9.79	2.45	0.00	0.00	0.00
R4.5-B	1	1.05	69.04	29.91	21.41	23.76	16.06	7.82	1.05	0.00	0.00	0.00	0.00
	10	3.85	69.71	26.43	19.25	22.43	17.14	10.90	3.85	0.00	0.00	0.00	0.00
	20	12.54	63.90	23.57	16.35	18.79	15.87	12.90	10.21	2.31	0.03	0.00	0.00
	30	10.75	66.54	22.70	16.86	20.54	16.49	12.66	10.48	0.27	0.00	0.00	0.00
	40	35.07	49.32	15.62	12.04	14.60	12.15	10.53	16.44	11.54	3.28	3.81	0.00
R4.5-C	1	2.29	70.10	27.61	20.40	23.21	16.16	10.33	2.27	0.02	0.00	0.00	0.00
	12	8.34	67.67	23.99	18.12	21.56	16.56	11.43	6.92	1.42	0.00	0.00	0.00
	24	5.01	70.05	24.95	18.53	22.02	17.61	11.89	5.00	0.01	0.00	0.00	0.00
	36	16.30	62.10	21.59	16.00	19.07	15.28	11.75	10.57	5.54	0.20	0.00	0.00
	48	20.23	59.17	20.60	15.17	18.53	14.05	11.42	11.41	8.81	0.00	0.00	0.00
R4.5-D	1	0.69	70.74	28.58	21.19	24.07	17.03	8.45	0.69	0.00	0.00	0.00	0.00
	12.5	6.00	69.17	24.82	18.82	21.99	16.59	11.77	5.64	0.37	0.00	0.00	0.00
	25	13.49	64.27	22.25	16.96	20.07	15.50	11.74	9.45	4.02	0.02	0.00	0.00
	37.5	15.18	62.93	21.91	16.41	19.50	15.38	11.65	8.88	6.18	0.11	0.00	0.00
	50	20.54	58.85	20.61	15.26	17.92	14.48	11.19	10.10	10.23	0.22	0.00	0.00
R4.5-E	1	0.00	57.92	42.08	21.29	25.61	10.97	0.05	0.00	0.00	0.00	0.00	0.00
	7.5	0.93	67.79	31.29	16.40	20.42	18.60	12.37	0.93	0.00	0.00	0.00	0.00
	15	5.56	68.05	26.39	13.90	18.36	19.45	16.34	5.56	0.00	0.00	0.00	0.00
	22	2.14	70.09	27.76	14.68	19.38	20.52	15.51	2.14	0.00	0.00	0.00	0.00
	30	0.43	71.41	28.17	15.14	20.40	22.07	13.80	0.43	0.00	0.00	0.00	0.00

Mississippi River Mile 5.2 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
R5.2-A	1	0.00	66.33	33.67	17.83	23.30	18.92	6.28	0.00	0.00	0.00	0.00	0.00
	7.5	0.02	67.13	32.87	18.18	22.88	18.84	7.23	0.02	0.00	0.00	0.00	0.00
	15	1.43	68.10	30.48	16.92	21.66	18.74	10.78	1.43	0.00	0.00	0.00	0.00
	22.5	3.11	67.19	29.70	16.34	20.90	18.30	11.65	3.10	0.00	0.00	0.00	0.00
	30	9.90	63.40	26.71	14.74	18.91	17.03	12.72	8.80	1.10	0.00	0.00	0.00
R5.2-B	1	0.06	65.18	34.76	18.58	22.44	17.45	6.71	0.06	0.00	0.00	0.00	0.00
	12	0.42	67.90	31.68	17.70	22.84	19.78	7.58	0.42	0.00	0.00	0.00	0.00
	24	13.63	60.13	26.25	14.46	18.12	14.95	12.60	12.31	1.32	0.00	0.00	0.00
	36	30.90	49.19	19.92	10.95	14.89	13.55	9.79	14.02	9.47	1.53	5.88	0.00
	45	60.84	27.72	11.45	6.08	7.86	7.29	6.48	23.72	36.33	0.68	0.11	0.00
R5.2-C	1	0.04	67.56	32.40	18.09	22.82	18.11	8.55	0.04	0.00	0.00	0.00	0.00
	12	0.09	68.17	31.74	17.70	22.46	19.40	8.61	0.09	0.00	0.00	0.00	0.00
	24	10.06	63.38	26.56	14.65	18.84	16.91	12.99	8.96	1.10	0.00	0.00	0.00
	36	0.55	69.65	29.81	16.57	21.88	19.66	11.55	0.55	0.00	0.00	0.00	0.00
	48	0.01	69.19	30.80	17.39	22.82	20.26	8.73	0.01	0.00	0.00	0.00	0.00
R5.2-D	1	0.43	68.31	31.26	17.46	21.92	19.02	9.90	0.43	0.00	0.00	0.00	0.00
	12.5	1.93	67.78	30.30	16.58	20.92	18.55	11.73	1.93	0.00	0.00	0.00	0.00
	25	3.51	66.91	29.59	16.37	20.20	17.71	12.64	3.50	0.00	0.00	0.00	0.00
	37.5	0.23	68.21	31.56	17.11	21.82	19.33	9.96	0.23	0.00	0.00	0.00	0.00
	50	14.56	60.54	24.89	13.72	17.67	16.15	13.02	10.80	3.77	0.00	0.00	0.00
R5.2-E	1	0.06	65.35	34.59	23.83	24.80	12.93	3.79	0.06	0.00	0.00	0.00	0.00
	7.5	0.36	67.77	31.86	22.83	24.64	14.81	5.49	0.36	0.00	0.00	0.00	0.00
	15	0.00	66.77	33.26	23.49	25.10	15.89	2.30	0.00	0.00	0.00	0.00	0.00
	22.5	0.19	69.35	30.45	22.18	25.04	16.51	5.62	0.19	0.00	0.00	0.00	0.00
	30	0.10	68.91	31.00	22.47	24.79	16.41	5.24	0.10	0.00	0.00	0.00	0.00

Cubits Gap Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
CGBB	1	0.00	66.22	33.78	23.42	25.27	15.63	1.90	0.00	0.00	0.00	0.00	0.00
	9	0.00	68.13	31.87	22.42	24.57	16.22	4.91	0.00	0.00	0.00	0.00	0.00
	18	2.12	68.44	29.44	20.68	22.77	15.78	9.21	2.10	0.03	0.00	0.00	0.00
CGMP	1	0.51	69.39	30.10	21.64	23.97	15.81	7.96	0.51	0.00	0.00	0.00	0.00
	9	0.00	67.94	32.08	22.70	24.85	16.48	3.91	0.00	0.00	0.00	0.00	0.00
	18	0.29	69.29	30.44	21.31	23.23	16.42	8.33	0.29	0.00	0.00	0.00	0.00
CGOP	1	0.02	67.55	32.42	22.47	24.26	15.45	5.37	0.02	0.00	0.00	0.00	0.00
	7.5	0.10	68.60	31.30	22.00	23.82	15.86	6.92	0.10	0.00	0.00	0.00	0.00
	15	1.10	68.39	30.53	21.39	23.01	15.60	8.40	1.10	0.00	0.00	0.00	0.00
CGRP	1	0.28	68.03	31.70	21.70	23.33	15.71	7.30	0.28	0.00	0.00	0.00	0.00
	9	0.00	68.21	31.79	22.48	24.81	16.18	4.74	0.00	0.00	0.00	0.00	0.00
	18	0.09	68.35	31.57	22.11	24.34	16.37	5.52	0.09	0.00	0.00	0.00	0.00

Other Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
BCB	1	5.67	66.06	28.26	20.54	21.72	15.14	8.66	5.41	0.26	0.00	0.00	0.00
	21	6.54	64.89	28.59	20.43	21.07	14.69	8.69	6.09	0.45	0.00	0.00	0.00
	42	11.76	61.72	26.52	18.67	20.20	13.73	9.12	8.71	3.05	0.00	0.00	0.00
GP	1	1.86	68.88	29.26	21.18	23.36	15.24	9.11	1.86	0.00	0.00	0.00	0.00
	14	14.11	63.74	22.15	16.53	19.45	15.48	12.29	11.04	3.08	0.00	0.00	0.00
	28	17.46	61.71	20.83	16.32	19.10	14.62	11.68	11.56	5.77	0.13	0.00	0.00
R4.9	1	1.70	68.21	30.09	21.36	23.53	15.19	8.14	1.70	0.00	0.00	0.00	0.00
	6	4.07	67.08	28.84	20.36	23.06	15.29	8.37	3.91	0.16	0.00	0.00	0.00
	10	0.00	64.66	35.35	24.73	25.77	12.15	2.00	0.00	0.00	0.00	0.00	0.00

Suspended Sediment Samples Wentworth Size Class
(% by volume)

July 21-22, 2009

West Bay Diversion Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
WBD-A	1.00	**25.68**	**48.43**	**25.89**	**22.73**	**16.76**	**7.64**	**1.30**	**0.31**	**0.24**	**0.00**	**4.52**	**20.62**
	7.50	1.06	46.62	52.32	21.35	16.06	7.61	1.60	0.21	0.85	0.00	0.00	0.00
	15.00	1.71	45.53	52.76	21.21	15.38	7.41	1.54	0.38	1.31	0.02	0.00	0.00
	22.50	6.82	66.04	27.14	26.38	22.10	12.63	4.93	2.94	3.44	0.44	0.00	0.00
	30.00	4.00	45.64	50.35	20.41	15.32	7.76	2.16	0.98	2.07	0.79	0.16	0.00
WBD-B	1.00	6.52	72.29	21.19	23.45	24.14	16.86	7.83	3.46	2.92	0.14	0.00	0.00
	12.00	5.94	68.60	25.47	25.77	23.10	13.83	5.90	3.21	2.60	0.12	0.00	0.00
	24.00	5.24	69.12	25.64	26.50	23.77	13.68	5.17	2.74	2.43	0.08	0.00	0.00
	36.00	4.71	71.40	23.88	26.90	26.40	14.65	3.45	1.45	3.14	0.12	0.00	0.00
	48.00	32.25	48.93	18.82	19.32	18.26	10.21	1.13	11.46	19.25	1.54	0.00	0.00

Mississippi River Mile 4.5 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
R4.5-A	1.00	1.09	45.70	53.22	21.60	15.67	7.04	1.39	0.35	0.74	0.00	0.00	0.00
	5.00	2.53	47.38	50.09	21.89	16.96	7.07	1.47	1.39	0.87	0.26	0.00	0.00
	10.00	1.66	66.84	31.50	30.49	23.52	10.41	2.43	1.02	0.64	0.00	0.00	0.00
	15.00	3.87	57.52	38.61	25.13	20.44	9.63	2.32	1.63	1.82	0.42	0.00	0.00
	20.00	5.71	51.52	42.77	24.12	17.83	7.85	1.71	2.15	3.39	0.17	0.00	0.00
R4.5-B	1.00	0.00	40.42	59.58	20.04	12.88	6.43	1.07	0.00	0.00	0.00	0.00	0.00
	10.00	**17.01**	**54.48**	**28.51**	**24.09**	**19.46**	**9.50**	**1.43**	**0.00**	**0.00**	**0.00**	**3.97**	**13.05**
	20.00	2.58	67.79	29.63	29.65	24.14	11.86	2.15	0.12	1.96	0.49	0.00	0.00
	30.00	0.00	61.02	38.98	29.21	22.74	9.07	0.00	0.00	0.00	0.00	0.00	0.00
	40.00	0.55	64.73	34.72	31.95	21.40	9.14	2.24	0.21	0.35	0.00	0.00	0.00
R4.5-C	1.00	1.19	42.54	56.27	20.18	14.20	6.76	1.41	0.34	0.77	0.08	0.00	0.00
	12.00	**7.23**	**38.43**	**54.34**	**18.77**	**12.84**	**5.89**	**0.94**	**0.28**	**0.62**	**0.10**	**2.32**	**3.91**
	24.00	0.00	68.90	31.10	31.34	23.95	11.26	2.35	0.00	0.00	0.00	0.00	0.00
	36.00	1.95	65.69	32.35	31.58	22.33	9.67	2.11	0.35	1.50	0.11	0.00	0.00
	48.00	0.00	70.86	29.14	39.06	25.04	6.25	0.51	0.00	0.00	0.00	0.00	0.00
R4.5-D	1.00	5.64	36.26	58.10	19.54	12.59	4.08	0.05	0.12	0.13	3.39	2.01	0.00
	12.50	0.85	51.70	47.45	21.21	17.93	9.84	2.73	0.10	0.63	0.12	0.00	0.00
	25.00	0.00	48.23	51.77	23.17	16.90	7.10	1.06	0.00	0.00	0.00	0.00	0.00
	37.50	0.09	73.01	26.90	32.32	25.75	11.80	3.14	0.09	0.00	0.00	0.00	0.00
	50.00	0.00	77.55	22.45	29.42	28.23	15.75	4.16	0.00	0.00	0.00	0.00	0.00
R4.5-E	**1.00**	**16.29**	**58.09**	**25.63**	**23.30**	**19.66**	**11.99**	**3.13**	**0.61**	**1.64**	**0.00**	**4.33**	**9.71**
	7.50	0.59	74.43	24.98	26.96	25.97	16.41	5.10	0.11	0.46	0.02	0.00	0.00
	15.00	2.31	74.68	23.02	25.79	25.57	16.86	6.46	1.02	1.22	0.06	0.00	0.00
	22.00	2.97	73.79	23.25	25.29	24.70	16.69	7.12	1.58	1.31	0.08	0.00	0.00
	30.00	2.62	76.54	20.84	26.84	26.85	16.48	6.38	1.41	1.15	0.07	0.00	0.00

Mississippi River Mile 5.2 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
R5.2-A	1.00	0.00	70.04	29.96	32.59	26.41	10.61	0.43	0.00	0.00	0.00	0.00	0.00
	7.50	0.00	70.69	29.31	30.58	26.26	12.08	1.77	0.00	0.00	0.00	0.00	0.00
	15.00	0.00	65.31	34.69	34.29	22.76	8.23	0.03	0.00	0.00	0.00	0.00	0.00
	22.50	9.33	63.50	27.17	27.51	22.73	10.68	2.58	3.74	5.27	0.33	0.00	0.00
	30.00	46.90	38.50	14.60	15.49	14.64	7.40	0.98	20.08	25.64	1.18	0.00	0.00
R5.2-B	1.00	10.33	61.88	27.80	26.87	21.21	10.04	3.75	2.59	1.50	3.86	2.38	0.00
	12.00	0.00	69.03	30.98	37.18	24.50	7.18	0.16	0.00	0.00	0.00	0.00	0.00
	24.00	1.33	71.97	26.70	30.03	27.58	12.88	1.48	0.27	1.04	0.02	0.00	0.00
	36.00	0.79	74.51	24.70	29.28	28.26	14.51	2.47	0.11	0.65	0.04	0.00	0.00
	42.00	0.00	60.76	39.24	34.40	17.99	6.62	1.73	0.00	0.00	0.00	0.00	0.00
R5.2-C	1.00	0.00	66.00	34.00	35.67	23.04	7.14	0.15	0.00	0.00	0.00	0.00	0.00
	12.00	0.00	69.42	30.59	31.42	26.12	11.40	0.48	0.00	0.00	0.00	0.00	0.00
	24.00	0.00	73.40	26.60	32.77	28.57	11.58	0.49	0.00	0.00	0.00	0.00	0.00
	36.00	0.00	73.18	26.82	33.00	27.90	11.60	0.66	0.00	0.00	0.00	0.00	0.00
	48.00	0.00	63.34	36.66	33.88	19.49	8.22	1.76	0.00	0.00	0.00	0.00	0.00
R5.2-D	1.00	0.72	47.08	52.20	21.24	16.65	8.00	1.19	0.18	0.51	0.03	0.00	0.00
	12.50	0.00	64.77	35.23	35.17	28.42	1.18	0.00	0.00	0.00	0.00	0.00	0.00
	25.00	0.00	70.55	29.45	31.21	25.82	12.47	1.05	0.00	0.00	0.00	0.00	0.00
	37.50	0.00	59.81	40.19	33.29	17.89	7.03	1.61	0.00	0.00	0.00	0.00	0.00
	50.00	0.00	79.59	20.41	35.28	31.11	11.72	1.48	0.00	0.00	0.00	0.00	0.00
R5.2-E	1.00	0.74	73.25	26.01	28.82	27.09	14.14	3.20	0.15	0.59	0.01	0.00	0.00
	7.50	1.69	73.75	24.56	27.57	26.69	15.10	4.39	0.72	0.96	0.01	0.00	0.00
	15.00	0.00	75.47	24.53	28.02	27.49	16.17	3.80	0.00	0.00	0.00	0.00	0.00
	22.50	3.37	78.35	18.28	25.33	28.34	18.13	6.56	1.90	1.36	0.11	0.00	0.00
	30.00	2.93	77.20	19.87	27.52	28.55	16.10	5.03	1.48	1.24	0.21	0.00	0.00

Cubits Gap Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
CGMP	1.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9.00	0.00	18.58	81.41	18.55	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18.00	0.00	34.76	65.25	27.61	7.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGOP	1.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7.50	32.39	62.35	32.39	23.93	15.25	13.27	9.90	2.40	2.86	0.00	0.00	0.00
	15.00	48.10	48.04	48.10	20.09	15.33	8.78	3.84	1.20	2.38	0.28	0.00	0.00
CGRP	1.00	3.74	48.79	47.47	18.58	12.82	10.06	7.33	2.03	1.40	0.32	0.00	0.00
	9.00	0.69	43.52	55.79	21.27	14.40	6.53	1.32	0.12	0.51	0.06	0.00	0.00
	18.00	3.34	46.83	49.84	19.86	15.14	8.30	3.52	1.53	1.79	0.02	0.00	0.00
CGBB	1.00	3.07	44.13	52.81	18.93	11.98	7.97	5.25	0.71	1.24	0.99	0.13	0.00
	9.00	6.26	64.83	28.92	27.27	20.48	11.60	5.47	1.92	3.94	0.40	0.00	0.00
	18.00	2.82	64.63	32.55	29.84	22.08	10.36	2.36	0.40	2.07	0.31	0.04	0.00

Other Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BCB	1.00	0.00	61.53	38.47	20.40	22.89	15.90	2.34	0.00	0.00	0.00	0.00	0.00
	21.00	3.01	62.95	34.04	19.20	22.81	14.62	6.33	3.01	0.00	0.00	0.00	0.00
	42.00	0.43	63.03	36.53	20.01	22.95	14.61	5.46	0.43	0.00	0.00	0.00	0.00
GP	1.00	0.00	7.73	92.25	7.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	14.00	0.00	39.52	60.48	25.98	13.54	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	28.00	0.00	37.22	62.79	28.51	8.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R4.9	1.00	0.00	47.86	52.12	25.68	22.15	0.02	0.00	0.00	0.00	0.00	0.00	0.00
	6.00	0.75	64.60	34.66	18.05	22.01	16.94	7.59	0.75	0.00	0.00	0.00	0.00
	10.00	0.00	63.15	36.86	19.00	22.41	17.34	4.40	0.00	0.00	0.00	0.00	0.00

Suspended Sediment Samples
Cumulative Grain Size Distributions

July 21-22, 2009

D_5-D_{50} (particle diameter in μm)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
WBD-A	**1**	**1.82**	**2.32**	**2.81**	**3.33**	**3.89**	**4.53**	**5.25**	**6.09**	**7.11**	**8.38**
	8	0.09	0.12	0.15	0.19	0.25	1.41	2.02	2.56	3.11	3.70
	15	0.10	0.12	0.15	0.18	0.24	1.47	2.04	2.56	3.08	3.66
	23	1.82	2.31	2.77	3.26	3.77	4.32	4.93	5.62	6.39	7.28
	30	0.10	0.12	0.15	0.19	0.25	1.59	2.18	2.73	3.32	3.95
WBD-B	1	1.99	2.60	3.21	3.84	4.53	5.28	6.10	7.03	8.08	9.28
	12	1.86	2.37	2.87	3.39	3.95	4.55	5.21	5.95	6.78	7.74
	24	1.87	2.38	2.87	3.39	3.93	4.51	5.15	5.86	6.66	7.57
	36	1.91	2.46	3.00	3.55	4.13	4.75	5.42	6.15	6.96	7.85
	48	2.05	2.73	3.43	4.19	5.04	6.02	7.17	8.54	10.21	12.31
R4.5-A	1	0.10	0.12	0.15	0.18	0.24	1.40	2.00	2.51	3.04	3.60
	5	0.10	0.12	0.14	0.17	0.23	1.53	2.19	2.76	3.36	3.99
	10	1.76	2.18	2.59	2.99	3.41	3.86	4.34	4.86	5.43	6.07
	15	0.12	0.17	1.47	2.06	2.56	3.07	3.59	4.16	4.79	5.49
	20	0.11	0.16	0.28	1.68	2.19	2.67	3.16	3.69	4.27	4.91
R4.5-B	1	0.08	0.11	0.13	0.17	0.21	0.29	1.34	1.92	2.40	2.90
	10	1.51	2.06	2.55	3.06	3.60	4.18	4.83	5.57	6.41	7.41
	20	**1.79**	**2.24**	**2.67**	**3.10**	**3.56**	**4.04**	**4.55**	**5.12**	**5.74**	**6.44**
	30	1.57	1.90	2.22	2.55	2.89	3.26	3.65	4.09	4.58	5.14
	40	1.79	2.17	2.52	2.87	3.24	3.62	4.02	4.47	4.96	5.50
R4.5-C	1	0.10	0.12	0.14	0.17	0.21	0.29	1.66	2.18	2.69	3.23
	12	**0.09**	**0.12**	**0.15**	**0.18**	**0.24**	**0.39**	**1.76**	**2.30**	**2.84**	**3.43**
	24	1.82	2.25	2.65	3.05	3.46	3.90	4.37	4.87	5.43	6.05
	36	1.81	2.22	2.60	2.99	3.38	3.80	4.24	4.72	5.25	5.84
	48	2.13	2.56	2.95	3.32	3.69	4.07	4.46	4.87	5.30	5.78
R4.5-D	1	0.08	0.11	0.14	0.17	0.22	0.31	1.43	1.99	2.49	3.02
	13	0.10	0.13	0.16	0.21	0.35	1.88	2.46	3.05	3.67	4.36
	25	0.10	0.12	0.15	0.18	0.25	1.63	2.19	2.70	3.23	3.79
	38	2.03	2.51	2.95	3.38	3.83	4.29	4.79	5.33	5.91	6.57
	50	2.14	2.70	3.22	3.74	4.28	4.85	5.47	6.13	6.86	7.67
R4.5-E	**1**	**1.84**	**2.34**	**2.83**	**3.36**	**3.92**	**4.56**	**5.28**	**6.11**	**7.09**	**8.27**
	8	1.91	2.43	2.93	3.45	4.00	4.59	5.24	5.95	6.74	7.63
	15	1.97	2.53	3.08	3.64	4.24	4.89	5.60	6.38	7.26	8.25
	22	1.96	2.52	3.06	3.62	4.22	4.87	5.58	6.38	7.29	8.32
	30	2.13	2.73	3.31	3.90	4.51	5.17	5.87	6.65	7.50	8.46

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

D_5-D_{50} (particle diameter in μm)
(Continued)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
R5.2-A	1	1.85	2.30	2.72	3.13	3.56	4.00	4.48	4.98	5.54	6.14
	8	1.80	2.26	2.69	3.13	3.59	4.07	4.58	5.14	5.75	6.42
	15	1.85	2.24	2.59	2.94	3.28	3.64	4.03	4.43	4.88	5.37
	23	1.83	2.32	2.79	3.27	3.77	4.31	4.90	5.55	6.28	7.11
	30	2.27	3.14	4.08	5.15	6.42	7.97	9.93	12.52	16.25	23.08
R5.2-B	1	1.80	2.28	2.74	3.21	3.71	4.24	4.83	5.48	6.22	7.07
	12	1.97	2.40	2.79	3.17	3.54	3.92	4.32	4.74	5.19	5.68
	24	1.87	2.37	2.85	3.33	3.83	4.35	4.91	5.52	6.17	6.90
	36	1.94	2.47	2.98	3.50	4.03	4.60	5.20	5.85	6.55	7.32
	42	1.79	2.13	2.44	2.74	3.05	3.37	3.70	4.06	4.44	4.87
R5.2-C	1	1.85	2.25	2.62	2.97	3.33	3.69	4.08	4.49	4.93	5.41
	12	1.78	2.22	2.64	3.06	3.49	3.95	4.43	4.96	5.53	6.16
	24	1.96	2.46	2.92	3.38	3.85	4.33	4.84	5.39	5.97	6.61
	36	1.99	2.48	2.93	3.38	3.83	4.30	4.80	5.33	5.91	6.54
	48	1.83	2.19	2.52	2.84	3.17	3.51	3.88	4.26	4.69	5.16
R5.2-D	1	0.09	0.12	0.15	0.18	0.24	1.39	2.01	2.55	3.11	3.71
	13	1.59	1.95	2.32	2.70	3.10	3.53	3.98	4.45	4.95	5.48
	25	1.86	2.31	2.73	3.15	3.59	4.05	4.54	5.08	5.66	6.31
	38	1.73	2.07	2.37	2.67	2.97	3.29	3.63	3.99	4.38	4.81
	50	2.41	2.97	3.48	3.96	4.44	4.94	5.45	6.00	6.58	7.21
R5.2-E	1	1.88	2.38	2.87	3.37	3.89	4.44	5.04	5.68	6.38	7.16
	8	1.92	2.45	2.96	3.49	4.05	4.64	5.28	5.98	6.75	7.60
	15	1.95	2.47	2.99	3.51	4.05	4.64	5.26	5.95	6.70	7.54
	23	2.22	2.90	3.56	4.23	4.93	5.67	6.47	7.33	8.27	9.31
	30	2.19	2.82	3.41	4.02	4.64	5.30	6.00	6.75	7.58	8.49
CGMP	1	0.46	0.50	0.55	0.60	0.65	0.72	0.86	1.33	1.50	1.63
	9	0.55	0.66	0.79	0.94	1.13	1.36	1.60	1.84	2.08	2.31
	18	0.58	0.74	0.91	1.12	1.39	1.68	1.99	2.30	2.62	2.97
CGOP	1	0.43	0.47	0.50	0.53	0.56	0.60	0.64	0.69	0.91	1.59
	8	1.68	2.08	2.47	2.86	3.29	3.76	4.28	4.89	5.61	6.49
	15	0.10	0.13	0.16	0.21	0.34	1.82	2.40	2.97	3.59	4.27
CGRP	1	0.10	0.13	0.16	0.21	1.06	1.90	2.47	3.04	3.66	4.37
	9	0.09	0.11	0.14	0.18	0.24	1.13	1.82	2.31	2.80	3.32
	18	0.09	0.12	0.15	0.20	0.29	1.65	2.22	2.77	3.37	4.02
CGBB	1	0.10	0.12	0.15	0.19	0.25	1.41	1.99	2.51	3.04	3.63
	9	1.81	2.26	2.70	3.14	3.61	4.11	4.66	5.28	5.98	6.79
	18	1.74	2.15	2.53	2.92	3.33	3.77	4.23	4.75	5.31	5.95
BCB	1	0.76	1.09	1.50	1.98	2.52	3.11	3.76	4.47	5.28	6.18
	21	0.81	1.20	1.71	2.29	2.93	3.63	4.41	5.27	6.24	7.36
	42	0.79	1.14	1.58	2.10	2.68	3.33	4.03	4.81	5.68	6.67
GP	1	0.53	0.64	0.74	0.87	1.01	1.19	1.38	1.59	1.79	2.00
	14	0.61	0.78	0.97	1.22	1.50	1.81	2.12	2.46	2.82	3.23
	28	0.60	0.76	0.93	1.15	1.41	1.71	2.03	2.37	2.72	3.10
R49	1	0.63	0.83	1.07	1.39	1.76	2.15	2.56	2.99	3.47	4.00
	6	0.79	1.16	1.62	2.18	2.82	3.54	4.34	5.26	6.31	7.52
	10	0.77	1.10	1.52	2.02	2.60	3.24	3.96	4.77	5.68	6.73

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

D_{55}-D_{100} (particle diameter in μm)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
WBD-A	**1**	**10.03**	**12.28**	**15.67**	**21.86**	**711.04**	**1021.57**	**1170.34**	**1311.84**	**1483.21**	**1997.34**
	8	4.36	5.12	6.00	7.06	8.38	10.12	12.53	16.26	23.46	237.43
	15	4.30	5.03	5.90	6.96	8.31	10.10	12.64	16.66	24.77	267.22
	23	8.33	9.59	11.13	13.07	15.63	19.21	24.82	36.43	101.07	323.08
	30	4.67	5.51	6.52	7.78	9.41	11.66	15.03	20.89	38.34	667.71
WBD-B	1	10.66	12.29	14.24	16.63	19.67	23.79	29.94	41.55	84.63	276.15
	12	8.86	10.19	11.79	13.80	16.39	19.96	25.41	35.95	77.16	277.52
	24	8.62	9.86	11.34	13.16	15.50	18.67	23.38	32.02	67.32	276.42
	36	8.86	10.02	11.36	12.98	14.96	17.55	21.18	27.24	49.33	275.54
	48	15.05	18.99	26.10	86.66	109.25	127.93	147.39	170.68	204.38	323.78
R4.5-A	1	4.23	4.95	5.78	6.79	8.05	9.70	11.99	15.54	22.44	235.52
	5	4.69	5.48	6.40	7.50	8.86	10.64	13.11	17.04	26.21	371.04
	10	6.80	7.63	8.61	9.78	11.23	13.10	15.68	19.68	27.98	235.97
	15	6.28	7.20	8.29	9.62	11.28	13.48	16.61	21.87	38.34	373.34
	20	5.65	6.51	7.55	8.83	10.49	12.77	16.24	22.85	90.90	296.85
R4.5-B	1	3.45	4.05	4.76	5.61	6.69	8.13	10.19	13.49	19.56	45.13
	10	**8.61**	**10.09**	**12.00**	**14.60**	**18.54**	**26.10**	**895.29**	**1133.50**	**1360.90**	**1996.46**
	20	7.23	8.14	9.22	10.51	12.11	14.17	17.01	21.37	30.17	372.91
	30	5.77	6.51	7.37	8.39	9.62	11.12	13.00	15.45	19.03	28.77
	40	6.12	6.84	7.68	8.71	9.99	11.67	14.01	17.62	24.53	231.22
R4.5-C	1	3.84	4.52	5.33	6.32	7.57	9.24	11.61	15.35	22.66	351.45
	12	**4.10**	**4.88**	**5.83**	**7.05**	**8.69**	**11.07**	**14.96**	**23.25**	**832.54**	**1995.69**
	24	6.75	7.56	8.50	9.63	11.02	12.79	15.18	18.68	24.75	52.52
	36	6.51	7.29	8.21	9.33	10.72	12.56	15.15	19.25	27.83	277.37
	48	6.30	6.87	7.53	8.29	9.19	10.31	11.78	13.89	17.66	44.89
R4.5-D	1	3.60	4.26	5.04	5.99	7.20	8.85	11.30	15.69	317.69	690.42
	13	5.14	6.03	7.09	8.37	9.97	12.04	14.86	19.10	26.93	313.48
	25	4.41	5.10	5.90	6.85	8.02	9.50	11.50	14.47	19.77	44.88
	38	7.30	8.14	9.12	10.28	11.71	13.54	16.02	19.72	26.52	70.78
	50	8.58	9.61	10.80	12.20	13.87	15.96	18.69	22.59	29.26	60.80
R4.5-E	**1**	**9.72**	**11.53**	**13.86**	**16.99**	**21.52**	**29.51**	**154.85**	**980.92**	**1311.57**	**1998.08**
	8	8.64	9.80	11.15	12.74	14.67	17.08	20.24	24.73	32.45	266.76
	15	9.38	10.69	12.23	14.06	16.31	19.18	23.07	28.96	40.78	275.84
	22	9.50	10.88	12.52	14.49	16.93	20.08	24.41	31.15	45.60	276.53
	30	9.55	10.80	12.27	14.04	16.23	19.08	23.02	29.24	42.58	276.04

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

D_{55}-D_{100} (particle diameter in μm)
(Continued)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
R5.2-A	1	6.82	7.57	8.44	9.45	10.65	12.13	14.02	16.63	20.80	38.68
	8	7.17	8.02	8.99	10.13	11.50	13.19	15.39	18.50	23.74	51.84
	15	5.93	6.56	7.31	8.20	9.29	10.66	12.45	14.90	18.62	32.88
	23	8.07	9.20	10.57	12.30	14.58	17.88	23.54	45.61	133.58	310.48
	30	75.50	92.59	105.44	117.37	129.47	142.54	157.61	176.58	204.72	315.02
R5.2-B	1	8.07	9.27	10.77	12.71	15.40	19.61	28.12	68.87	356.46	797.75
	12	6.22	6.82	7.51	8.31	9.27	10.47	12.04	14.29	18.09	37.35
	24	7.70	8.61	9.64	10.84	12.28	14.05	16.37	19.68	25.57	261.94
	36	8.18	9.15	10.26	11.55	13.08	14.98	17.46	20.99	27.12	269.44
	42	5.35	5.90	6.54	7.32	8.29	9.58	11.43	14.48	20.82	52.53
R5.2-C	1	5.95	6.55	7.25	8.06	9.04	10.27	11.89	14.21	18.09	36.52
	12	6.86	7.65	8.56	9.62	10.88	12.43	14.41	17.15	21.49	38.60
	24	7.32	8.11	9.00	10.02	11.24	12.72	14.60	17.19	21.32	38.73
	36	7.24	8.03	8.93	9.97	11.20	12.72	14.66	17.34	21.65	38.48
	48	5.69	6.30	7.02	7.89	9.00	10.48	12.60	15.98	22.29	50.34
R5.2-D	1	4.39	5.15	6.05	7.12	8.45	10.16	12.48	15.93	22.06	268.41
	13	6.03	6.62	7.25	7.94	8.70	9.57	10.57	11.83	13.57	18.28
	25	7.05	7.88	8.85	9.99	11.36	13.05	15.22	18.21	22.89	38.83
	38	5.30	5.86	6.52	7.33	8.34	9.68	11.62	14.75	20.95	52.38
	50	7.90	8.67	9.54	10.55	11.74	13.22	15.14	17.88	22.65	52.30
R5.2-E	1	8.03	9.02	10.15	11.48	13.08	15.08	17.72	21.56	28.49	254.24
	8	8.57	9.67	10.94	12.45	14.28	16.60	19.74	24.48	33.87	254.14
	15	8.48	9.54	10.76	12.19	13.89	15.98	18.68	22.45	28.66	60.75
	23	10.48	11.81	13.35	15.19	17.43	20.33	24.36	30.87	46.68	295.98
	30	9.51	10.67	12.02	13.62	15.58	18.11	21.62	27.28	40.86	489.56
CGMP	1	1.74	1.86	1.98	2.10	2.24	2.40	2.59	2.81	3.07	
	9	2.55	2.80	3.08	3.39	3.74	4.14	4.61	5.17	5.92	8.94
	18	3.35	3.76	4.22	4.73	5.31	5.97	6.72	7.58	8.66	12.99
CGOP	1	1.73	1.85	1.96	2.07	2.19	2.32	2.48	2.67	2.95	3.86
	8	7.64	9.20	11.46	14.73	19.11	24.48	31.24	41.05	65.95	238.19
	15	5.06	5.99	7.12	8.57	10.50	13.24	17.48	24.98	45.11	320.36
CGRP	1	5.21	6.26	7.65	9.61	12.60	17.21	23.83	33.45	52.36	322.22
	9	3.90	4.56	5.33	6.26	7.42	8.96	11.14	14.57	21.22	335.09
	18	4.78	5.66	6.74	8.09	9.88	12.37	16.15	22.83	40.47	267.61
CGBB	1	4.31	5.11	6.11	7.43	9.32	12.35	17.67	26.71	43.87	648.98
	9	7.75	8.91	10.37	12.28	14.90	18.71	24.72	35.88	107.33	321.98
	18	6.69	7.54	8.55	9.79	11.36	13.44	16.38	21.12	31.67	570.41
BCB	1	7.23	8.45	9.88	11.59	13.66	16.18	19.31	23.26	28.65	53.92
	21	8.65	10.15	11.94	14.08	16.66	19.90	24.49	32.64	49.95	128.05
	42	7.81	9.14	10.71	12.60	14.90	17.70	21.27	26.75	36.20	80.90
GP	1	2.21	2.43	2.66	2.92	3.19	3.48	3.77	4.09	4.49	6.16
	14	3.69	4.23	4.84	5.52	6.29	7.13	8.03	9.00	10.18	14.95
	28	3.52	3.97	4.47	5.02	5.64	6.32	7.08	7.92	8.90	12.99
R49	1	4.60	5.25	5.98	6.77	7.63	8.59	9.65	10.87	12.42	18.86
	6	8.94	10.62	12.62	14.99	17.77	21.19	25.82	31.96	39.84	68.60
	10	7.94	9.36	11.05	13.05	15.43	18.24	21.67	26.05	32.03	57.77

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

Suspended Sediment Samples Wentworth Size Class
(% by volume)

September 23-24, 2009

West Bay Diversion Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
WBD-A	1	4.44	63.45	32.11	22.69	16.52	13.72	10.53	3.39	1.03	0.03	0.00	0.00
	8	2.84	60.40	36.77	26.07	17.54	11.17	5.62	1.64	1.13	0.07	0.00	0.00
	15	2.79	46.46	50.75	18.99	13.67	9.04	4.77	1.46	1.04	0.29	0.00	0.00
	23	2.40	60.21	37.39	26.38	17.81	10.92	5.09	1.44	0.90	0.06	0.00	0.00
	30	1.20	41.81	56.99	18.56	12.44	7.41	3.41	1.00	0.20	0.00	0.00	0.00
WBD-B	1	5.33	46.96	47.70	17.20	13.58	10.04	6.14	2.34	1.43	1.41	0.16	0.00
	12	3.69	64.95	31.36	24.74	19.09	13.46	7.66	2.70	0.94	0.05	0.00	0.00
	24	**14.22**	**55.99**	**29.79**	**23.15**	**17.04**	**10.72**	**5.07**	**2.72**	**2.80**	**0.48**	**1.83**	**6.39**
	36	2.46	62.50	35.04	27.49	18.99	11.21	4.82	1.28	1.18	0.00	0.00	0.00
	45	26.25	48.95	24.81	20.70	15.17	9.00	4.07	9.98	14.34	1.92	0.00	0.00

Mississippi River Mile 4.5 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
R4.5-A	1	0.00	42.74	57.26	30.03	10.91	1.81	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.00	44.88	55.12	32.16	10.21	2.49	0.02	0.00	0.00	0.00	0.00	0.00
	10	0.00	45.73	54.27	30.08	12.01	3.62	0.02	0.00	0.00	0.00	0.00	0.00
	15	0.00	52.88	47.13	29.16	16.21	6.67	0.84	0.00	0.00	0.00	0.00	0.00
	20	17.30	42.90	39.79	24.63	13.47	4.62	0.19	5.40	8.66	2.99	0.25	0.00
R4.5-B	1	0.00	45.62	54.38	30.92	14.03	0.68	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	51.14	48.86	29.69	15.86	5.47	0.13	0.00	0.00	0.00	0.00	0.00
	20	2.54	54.37	43.09	29.78	16.64	6.27	1.68	1.59	0.95	0.00	0.00	0.00
	30	0.00	55.07	44.93	30.87	16.75	6.34	1.11	0.00	0.00	0.00	0.00	0.00
	38	**65.17**	**20.53**	**14.31**	**10.61**	**6.40**	**2.88**	**0.64**	**0.00**	**0.00**	**0.00**	**6.14**	**59.03**
R4.5-C	**1**	**64.21**	**17.60**	**18.19**	**10.24**	**5.20**	**1.98**	**0.18**	**0.00**	**0.00**	**0.00**	**11.38**	**52.83**
	12	0.00	54.25	45.75	29.45	17.04	7.00	0.76	0.00	0.00	0.00	0.00	0.00
	24	**52.53**	**27.75**	**19.72**	**14.56**	**8.81**	**3.79**	**0.59**	**0.00**	**0.00**	**0.00**	**8.41**	**44.13**
	36	**80.09**	**11.81**	**8.10**	**5.28**	**3.78**	**2.26**	**0.48**	**0.00**	**0.00**	**0.00**	**11.91**	**68.18**
	45	1.36	59.60	39.04	32.59	17.05	6.68	3.28	1.02	0.27	0.08	0.00	0.00
R4.5-D	1	0.00	46.72	53.28	29.69	14.01	3.02	0.00	0.00	0.00	0.00	0.00	0.00
	13	0.95	41.13	57.92	18.47	12.34	7.01	3.31	0.95	0.00	0.00	0.00	0.00
	25	0.00	63.73	36.27	26.28	20.19	14.92	2.34	0.00	0.00	0.00	0.00	0.00
	38	0.00	55.46	44.54	31.11	15.61	7.11	1.64	0.00	0.00	0.00	0.00	0.00
	45	0.00	41.97	58.03	41.81	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R4.5-E	1	0.00	42.95	57.05	37.19	5.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.00	60.30	39.70	29.76	17.20	10.96	2.38	0.00	0.00	0.00	0.00	0.00
	15	0.00	59.19	40.81	27.13	22.45	9.61	0.00	0.00	0.00	0.00	0.00	0.00
	22	2.14	64.85	33.02	25.41	19.62	13.44	6.39	2.10	0.04	0.00	0.00	0.00
	30	4.26	60.01	35.73	25.89	16.29	10.10	7.73	3.87	0.39	0.00	0.00	0.00

Mississippi River Mile 5.2 Transect

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
R5.2-A	1	0.00	37.32	62.68	36.79	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	2.84	38.63	58.53	16.79	9.98	6.52	5.35	2.17	0.62	0.05	0.00	0.00
	15	1.46	39.42	59.12	18.10	11.83	6.78	2.71	0.65	0.69	0.12	0.00	0.00
	23	18.43	48.77	32.80	22.74	14.69	7.74	3.60	0.92	0.07	12.24	5.21	0.00
	30	0.00	50.78	49.22	38.25	12.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R5.2-B	1	0.00	31.51	68.49	18.55	9.81	3.14	0.00	0.00	0.00	0.00	0.00	0.00
	12	2.98	38.42	58.60	19.06	12.01	5.40	1.95	1.16	0.80	0.91	0.11	0.00
	24	2.37	56.38	41.24	26.96	16.20	8.73	4.49	1.40	0.95	0.03	0.00	0.00
	36	0.00	56.86	43.14	36.79	16.87	3.20	0.00	0.00	0.00	0.00	0.00	0.00
	42	0.00	55.29	44.71	35.90	15.35	3.65	0.39	0.00	0.00	0.00	0.00	0.00
R5.2-C	1	0.00	47.54	52.46	29.18	15.31	3.05	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	49.03	50.98	28.52	15.45	5.06	0.00	0.00	0.00	0.00	0.00	0.00
	24	1.74	56.73	41.53	28.09	17.17	8.27	3.20	1.09	0.66	0.00	0.00	0.00
	36	0.00	56.85	43.15	34.82	15.38	5.61	1.03	0.00	0.00	0.00	0.00	0.00
	48	**40.55**	**41.93**	**17.52**	**24.29**	**13.39**	**3.36**	**0.89**	**0.00**	**0.00**	**0.00**	**5.77**	**34.78**
R5.2-D	1	0.00	46.28	53.72	30.57	12.95	2.77	0.00	0.00	0.00	0.00	0.00	0.00
	13	0.00	51.58	48.43	29.95	19.66	1.96	0.00	0.00	0.00	0.00	0.00	0.00
	25	0.00	58.15	41.85	33.58	17.14	7.33	0.10	0.00	0.00	0.00	0.00	0.00
	38	0.03	65.16	34.82	33.02	21.30	9.32	1.53	0.03	0.00	0.00	0.00	0.00
	50	**32.60**	**49.49**	**17.91**	**27.33**	**17.21**	**4.52**	**0.43**	**0.00**	**0.00**	**1.51**	**13.05**	**18.04**
R5.2-E	1	2.66	44.92	52.42	18.44	14.30	8.76	3.43	1.65	0.97	0.05	0.00	0.00
	8	2.69	48.47	48.84	18.28	14.51	10.29	5.39	1.43	0.61	0.46	0.20	0.00
	15	1.02	50.71	48.28	18.81	15.16	11.09	5.64	0.67	0.32	0.02	0.00	0.00
	23	0.00	67.01	32.99	32.46	22.96	10.74	0.85	0.00	0.00	0.00	0.00	0.00
	30	0.00	70.04	29.96	30.46	22.68	13.60	3.29	0.00	0.00	0.00	0.00	0.00

Cubits Gap Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
CGMP	1	0.51	55.94	43.54	28.08	16.53	8.28	3.05	0.51	0.01	0.00	0.00	0.00
	9	2.57	56.98	40.45	27.49	17.16	8.99	3.34	1.21	1.22	0.14	0.00	0.00
	18	1.77	59.20	39.04	27.98	18.42	9.55	3.25	1.11	0.66	0.00	0.00	0.00
CGOP	1	0.00	32.56	67.44	19.08	9.56	3.41	0.51	0.00	0.00	0.00	0.00	0.00
	8	0.00	55.06	44.94	29.67	17.72	7.09	0.58	0.00	0.00	0.00	0.00	0.00
	15	3.12	58.31	38.58	27.05	18.08	9.59	3.58	1.79	1.23	0.10	0.00	0.00
CGRP	1	1.09	35.59	63.32	19.03	10.52	4.64	1.41	0.55	0.49	0.06	0.00	0.00
	9	1.52	37.25	61.24	18.96	11.04	5.20	2.06	0.86	0.45	0.20	0.00	0.00
	18	3.03	56.67	40.30	27.56	17.29	8.52	3.30	1.75	1.21	0.07	0.00	0.00
CGBB	1	0.00	45.17	54.83	24.92	14.04	5.55	0.66	0.00	0.00	0.00	0.00	0.00
	9	0.00	36.97	63.03	18.96	11.70	5.43	0.88	0.00	0.00	0.00	0.00	0.00
	18	2.05	34.06	63.90	18.29	10.38	4.30	1.09	0.92	0.86	0.26	0.00	0.00

Other Diversions

	Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BCB	1	6.07	56.23	37.70	26.56	17.11	8.86	3.71	2.20	3.20	0.68	0.00	0.00
	21	**23.43**	**48.23**	**28.34**	**21.56**	**15.12**	**8.22**	**3.33**	**1.49**	**0.90**	**0.00**	**4.11**	**16.93**
	42	3.76	55.67	40.58	28.17	16.71	7.91	2.88	2.03	1.73	0.00	0.00	0.00
GP	1	**5.76**	**35.27**	**58.97**	**18.24**	**11.89**	**4.76**	**0.38**	**0.68**	**2.64**	**2.00**	**0.32**	**0.12**
	14	4.72	45.95	49.33	19.39	14.40	8.13	4.03	1.97	1.64	1.07	0.03	0.00
	28	**10.62**	**57.69**	**31.69**	**26.06**	**18.60**	**9.63**	**3.41**	**1.54**	**1.15**	**0.03**	**1.98**	**5.92**
R4.9	1	2.12	45.80	52.09	20.07	14.69	8.12	2.91	0.94	0.59	0.50	0.10	0.00
	6	**3.63**	**46.98**	**49.39**	**19.09**	**14.54**	**9.32**	**4.03**	**1.13**	**0.63**	**0.05**	**0.52**	**1.30**
	10	**9.60**	**59.46**	**30.94**	**24.50**	**18.60**	**11.58**	**4.78**	**0.98**	**1.23**	**0.30**	**1.72**	**5.37**

Suspended Sediment Samples
Cumulative Grain Size Distributions

September 23-24, 2009

D_5-D_{50} (particle diameter in μm)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
WBD-A	1.00	1.65	2.05	2.43	2.84	3.28	3.77	4.34	5.00	5.80	6.79
	7.50	1.61	1.96	2.29	2.64	3.00	3.40	3.83	4.33	4.89	5.55
	15.00	0.10	0.12	0.15	0.19	0.34	1.76	2.25	2.75	3.29	3.90
	22.50	1.60	1.94	2.27	2.61	2.97	3.35	3.78	4.26	4.80	5.44
	30.00	0.10	0.12	0.15	0.18	0.22	1.17	1.74	2.19	2.65	3.16
WBD-B	1.00	0.10	0.13	0.16	0.21	1.16	1.85	2.39	2.96	3.61	4.37
	12.00	1.72	2.12	2.52	2.93	3.37	3.86	4.41	5.03	5.77	6.65
	24.00	**1.74**	**2.17**	**2.58**	**3.02**	**3.49**	**4.02**	**4.63**	**5.34**	**6.20**	**7.25**
	36.00	1.70	2.07	2.42	2.77	3.15	3.55	4.00	4.49	5.06	5.71
	45.00	1.88	2.39	2.89	3.42	4.03	4.72	5.54	6.55	7.85	9.57
R4.5-A	1.00	1.46	1.71	1.93	2.14	2.34	2.55	2.78	3.01	3.27	3.54
	5.00	1.59	1.86	2.08	2.29	2.51	2.72	2.94	3.18	3.43	3.70
	10.00	1.46	1.72	1.96	2.18	2.40	2.63	2.87	3.13	3.41	3.71
	15.00	1.44	1.73	2.00	2.26	2.53	2.82	3.13	3.46	3.83	4.24
	20.00	1.50	1.83	2.14	2.46	2.80	3.16	3.56	4.02	4.55	5.17
R4.5-B	1.00	1.37	1.63	1.86	2.09	2.31	2.55	2.80	3.07	3.37	3.69
	10.00	1.43	1.71	1.96	2.22	2.47	2.75	3.04	3.36	3.71	4.09
	20.00	1.57	1.88	2.16	2.45	2.74	3.05	3.39	3.76	4.16	4.61
	30.00	1.55	1.85	2.13	2.40	2.68	2.98	3.29	3.63	4.01	4.42
	38.00	**2.20**	**3.09**	**4.17**	**5.65**	**8.05**	**13.27**	**765.96**	**980.65**	**1064.73**	**1128.47**
R4.5-C	**1.00**	**1.85**	**2.54**	**3.35**	**4.44**	**6.09**	**9.35**	**23.08**	**867.13**	**968.54**	**1036.31**
	12.00	1.47	1.77	2.04	2.31	2.59	2.89	3.21	3.55	3.94	4.37
	24.00	1.96	2.59	3.26	4.05	5.03	6.36	8.35	11.86	20.62	852.82
	36.00	**2.79**	**5.02**	**10.46**	**684.07**	**901.17**	**977.36**	**1036.40**	**1086.75**	**1132.22**	**1175.45**
	45.00	1.76	2.10	2.41	2.72	3.03	3.35	3.70	4.07	4.48	4.94
R4.5-D	1.00	1.50	1.76	1.99	2.21	2.43	2.66	2.91	3.17	3.46	3.77
	12.50	0.09	0.12	0.14	0.17	0.22	0.33	1.62	2.08	2.55	3.05
	25.00	1.62	1.98	2.32	2.66	3.03	3.44	3.88	4.38	4.95	5.62
	37.50	1.62	1.93	2.20	2.47	2.75	3.04	3.34	3.67	4.04	4.44
	45.00	1.91	2.18	2.40	2.60	2.78	2.96	3.14	3.32	3.50	3.69
R4.5-E	1.00	1.39	1.64	1.88	2.10	2.33	2.56	2.80	3.05	3.31	3.58
	7.50	1.72	2.06	2.36	2.66	2.97	3.29	3.64	4.02	4.45	4.94
	15.00	1.55	1.86	2.16	2.46	2.78	3.12	3.50	3.93	4.41	4.97
	22.00	1.69	2.08	2.45	2.84	3.25	3.70	4.21	4.78	5.45	6.25
	30.00	1.66	2.02	2.36	2.71	3.08	3.49	3.93	4.43	5.01	5.70

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

D_5-D_{50} (particle diameter in μm)
(Continued)

	Depth (ft)	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
R5.2-A	1.00	1.46	1.71	1.93	2.15	2.35	2.55	2.76	2.96	3.17	3.39
	7.50	0.09	0.12	0.14	0.18	0.22	0.30	1.42	1.94	2.42	2.93
	15.00	0.09	0.12	0.15	0.18	0.23	0.34	1.52	1.99	2.44	2.92
	22.50	1.64	2.03	2.40	2.80	3.23	3.70	4.25	4.89	5.65	6.61
	30.00	1.57	1.85	2.11	2.36	2.61	2.87	3.14	3.43	3.73	4.05
R5.2-B	1.00	0.08	0.10	0.13	0.16	0.19	0.25	0.34	1.37	1.83	2.23
	12.00	0.10	0.12	0.15	0.18	0.22	0.32	1.61	2.06	2.52	3.01
	24.00	1.52	1.84	2.14	2.44	2.76	3.10	3.48	3.89	4.36	4.89
	36.00	1.86	2.18	2.45	2.72	2.98	3.24	3.52	3.81	4.12	4.46
	42.00	1.82	2.14	2.41	2.66	2.91	3.17	3.44	3.72	4.02	4.35
R5.2-C	1.00	1.43	1.69	1.93	2.16	2.39	2.63	2.89	3.17	3.48	3.82
	12.00	1.39	1.66	1.90	2.14	2.38	2.64	2.92	3.22	3.55	3.92
	24.00	1.52	1.84	2.14	2.44	2.76	3.10	3.46	3.87	4.32	4.83
	36.00	1.77	2.09	2.37	2.64	2.91	3.19	3.48	3.79	4.13	4.49
	48.00	2.49	3.12	3.70	4.30	4.94	5.66	6.50	7.55	8.95	11.10
R5.2-D	1.00	1.53	1.80	2.02	2.24	2.46	2.68	2.92	3.18	3.45	3.75
	12.50	1.39	1.67	1.92	2.17	2.43	2.72	3.02	3.35	3.72	4.14
	25.00	1.82	2.15	2.43	2.70	2.98	3.26	3.56	3.88	4.22	4.61
	37.50	1.84	2.22	2.57	2.91	3.26	3.63	4.02	4.44	4.90	5.41
	50.00	2.51	3.12	3.68	4.23	4.81	5.44	6.15	6.96	7.95	9.20
R5.2-E	1.00	0.10	0.13	0.16	0.19	0.26	1.47	2.00	2.51	3.05	3.67
	7.50	0.10	0.13	0.16	0.20	0.38	1.80	2.33	2.87	3.48	4.17
	15.00	0.10	0.13	0.16	0.21	1.29	1.91	2.42	2.96	3.56	4.25
	22.50	1.88	2.28	2.65	3.01	3.37	3.76	4.17	4.62	5.11	5.67
	30.00	1.97	2.40	2.79	3.17	3.58	4.00	4.47	4.98	5.56	6.22
CGMP	1.00	1.51	1.81	2.10	2.38	2.68	2.99	3.33	3.71	4.13	4.60
	9.00	1.57	1.89	2.19	2.50	2.82	3.17	3.54	3.96	4.43	4.97
	18.00	1.60	1.93	2.25	2.57	2.90	3.26	3.65	4.09	4.58	5.14
CGOP	1.00	0.09	0.11	0.13	0.16	0.19	0.23	0.34	1.54	1.94	2.33
	7.50	1.51	1.81	2.08	2.35	2.64	2.94	3.26	3.62	4.01	4.44
	15.00	1.58	1.91	2.23	2.56	2.90	3.27	3.68	4.14	4.65	5.25
CGRP	1.00	0.10	0.12	0.14	0.17	0.20	0.26	1.33	1.79	2.20	2.62
	9.00	0.10	0.12	0.15	0.17	0.21	0.28	1.49	1.93	2.35	2.79
	18.00	1.55	1.88	2.18	2.49	2.82	3.17	3.55	3.97	4.45	5.00
CGBB	1.00	0.12	0.17	0.34	1.52	1.85	2.15	2.47	2.80	3.16	3.56
	9.00	0.09	0.12	0.14	0.17	0.20	0.26	1.29	1.77	2.19	2.62
	18.00	0.09	0.12	0.14	0.17	0.20	0.25	1.18	1.70	2.11	2.53
BCB	1.00	1.58	1.93	2.26	2.59	2.95	3.33	3.75	4.23	4.76	5.39
	21.00	1.73	2.18	2.62	3.09	3.61	4.21	4.89	5.71	6.73	8.03
	42.00	1.58	1.91	2.21	2.52	2.83	3.17	3.54	3.95	4.41	4.93
GP	1.00	0.09	0.12	0.14	0.17	0.21	0.28	1.41	1.92	2.40	2.91
	14.00	0.09	0.12	0.14	0.18	0.31	1.80	2.33	2.86	3.44	4.09
	28.00	1.73	2.14	2.53	2.94	3.36	3.83	4.35	4.94	5.62	6.41
R4.9	1.00	0.10	0.13	0.15	0.19	0.29	1.69	2.17	2.65	3.16	3.74
	6.00	0.10	0.12	0.15	0.20	1.22	1.86	2.35	2.87	3.44	4.08
	10.00	1.71	2.13	2.53	2.95	3.40	3.90	4.46	5.11	5.86	6.77

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

D_{55}-D_{100} (particle diameter in μm)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
WBD-A	1.00	8.06	9.75	12.02	15.06	19.03	24.16	30.96	40.89	59.50	268.77
	7.50	6.34	7.33	8.59	10.25	12.52	15.71	20.35	27.67	43.21	276.13
	15.00	4.62	5.50	6.61	8.09	10.14	13.13	17.67	25.11	41.31	364.78
	22.50	6.20	7.14	8.32	9.86	11.94	14.84	19.05	25.72	39.58	275.82
	30.00	3.74	4.43	5.27	6.35	7.81	9.91	13.14	18.56	29.57	171.17
WBD-B	1.00	5.29	6.47	8.03	10.17	13.18	17.47	23.92	35.15	67.31	631.87
	12.00	7.73	9.08	10.79	12.99	15.87	19.73	25.18	33.84	52.54	311.68
	24.00	**8.59**	**10.35**	**12.72**	**16.01**	**20.89**	**29.24**	**53.02**	**174.27**	**1153.28**	**1997.79**
	36.00	6.49	7.44	8.62	10.14	12.16	14.94	18.96	25.34	38.80	238.70
	45.00	11.95	15.41	20.87	32.17	73.85	104.76	131.99	162.70	205.14	338.71
R4.5-A	1.00	3.85	4.20	4.59	5.06	5.64	6.37	7.39	8.94	11.84	26.88
	5.00	3.99	4.33	4.71	5.16	5.70	6.41	7.39	8.96	12.25	32.24
	10.00	4.05	4.44	4.88	5.42	6.08	6.95	8.19	10.19	14.15	32.26
	15.00	4.71	5.26	5.91	6.70	7.70	9.03	10.91	13.82	19.12	44.78
	20.00	5.92	6.88	8.17	10.03	13.06	19.48	96.16	143.17	208.60	588.16
R4.5-B	1.00	4.05	4.45	4.91	5.45	6.10	6.90	7.93	9.36	11.61	18.26
	10.00	4.53	5.03	5.62	6.33	7.22	8.37	9.97	12.38	16.69	33.32
	20.00	5.14	5.74	6.47	7.37	8.54	10.12	12.48	16.53	26.87	234.50
	30.00	4.89	5.43	6.07	6.85	7.82	9.10	10.91	13.75	19.22	44.98
	38.00	**1185.36**	**1238.99**	**1290.81**	**1342.63**	**1395.69**	**1451.59**	**1512.18**	**1583.21**	**1685.38**	**1999.54**
R4.5-C	**1.00**	**1093.49**	**1147.41**	**1200.56**	**1254.66**	**1311.08**	**1371.48**	**1438.61**	**1517.39**	**1624.67**	**1999.26**
	12.00	4.86	5.43	6.10	6.92	7.95	9.32	11.22	14.12	19.27	38.80
	24.00	**984.51**	**1064.66**	**1132.94**	**1198.37**	**1264.10**	**1332.66**	**1407.27**	**1493.58**	**1607.35**	**1999.17**
	36.00	**1217.58**	**1259.91**	**1303.18**	**1348.22**	**1395.88**	**1447.50**	**1505.19**	**1574.03**	**1672.00**	**1999.48**
	45.00	5.46	6.06	6.77	7.66	8.81	10.41	12.91	17.60	29.45	312.68
R4.5-D	1.00	4.13	4.53	5.01	5.59	6.31	7.27	8.60	10.60	13.91	24.63
	12.50	3.62	4.29	5.11	6.14	7.53	9.49	12.50	17.59	28.20	122.54
	25.00	6.43	7.41	8.63	10.17	12.09	14.47	17.41	21.16	26.48	45.05
	37.50	4.90	5.43	6.06	6.84	7.85	9.23	11.29	14.75	21.44	51.55
	45.00	3.88	4.08	4.30	4.53	4.79	5.08	5.42	5.85	6.45	8.53
R4.5-E	1.00	3.87	4.19	4.53	4.91	5.33	5.82	6.40	7.14	8.20	11.57
	7.50	5.50	6.19	7.04	8.13	9.62	11.71	14.73	19.08	25.57	45.92
	15.00	5.63	6.42	7.36	8.49	9.84	11.44	13.36	15.78	19.18	28.74
	22.00	7.22	8.40	9.89	11.78	14.19	17.34	21.66	28.22	41.45	130.27
	30.00	6.54	7.59	8.98	10.91	13.72	18.03	24.89	36.29	57.92	170.80

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

D_{55}-D_{100} (particle diameter in μm)
(Continued)

	Depth (ft)	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
R5.2-A	1.00	3.62	3.86	4.12	4.40	4.72	5.07	5.48	5.99	6.72	8.58
	7.50	3.52	4.22	5.08	6.23	7.87	10.54	15.58	25.52	45.21	294.99
	15.00	3.48	4.12	4.91	5.90	7.24	9.16	12.13	17.22	27.80	311.17
	22.50	7.84	9.53	11.96	15.78	22.72	42.82	351.02	430.03	503.51	690.60
	30.00	4.40	4.78	5.20	5.66	6.20	6.81	7.56	8.52	9.89	13.51
R5.2-B	1.00	2.64	3.08	3.59	4.19	4.93	5.89	7.25	9.40	13.41	30.64
	12.00	3.55	4.19	4.95	5.90	7.15	8.90	11.59	16.44	30.51	626.81
	24.00	5.53	6.29	7.25	8.49	10.19	12.67	16.58	23.39	38.50	268.89
	36.00	4.84	5.26	5.76	6.35	7.08	8.02	9.29	11.16	14.24	25.75
	42.00	4.71	5.13	5.61	6.19	6.91	7.86	9.20	11.26	14.92	50.70
R5.2-C	1.00	4.20	4.65	5.17	5.80	6.58	7.60	8.97	10.94	14.07	24.60
	12.00	4.34	4.83	5.41	6.10	6.98	8.13	9.72	12.09	16.06	28.70
	24.00	5.43	6.14	7.00	8.09	9.53	11.52	14.52	19.57	30.76	204.30
	36.00	4.90	5.37	5.91	6.57	7.39	8.49	10.08	12.76	18.50	45.10
	48.00	15.68	786.47	994.68	1100.04	1187.08	1270.76	1358.05	1456.06	1580.63	1999.02
R5.2-D	1.00	4.09	4.48	4.93	5.46	6.13	7.00	8.20	10.04	13.33	28.63
	12.50	4.60	5.14	5.75	6.48	7.33	8.36	9.62	11.25	13.61	21.10
	25.00	5.05	5.56	6.17	6.93	7.90	9.23	11.13	13.98	18.48	33.22
	37.50	6.00	6.67	7.47	8.45	9.67	11.26	13.44	16.67	22.28	68.41
	50.00	**10.94**	**13.72**	**20.33**	**586.30**	**803.56**	**947.83**	**1080.77**	**1224.78**	**1413.31**	**1997.11**
R5.2-E	1.00	4.39	5.25	6.33	7.72	9.58	12.14	15.86	21.84	35.70	342.02
	7.50	5.00	6.02	7.33	9.06	11.40	14.67	19.36	26.74	42.11	679.12
	15.00	5.07	6.08	7.36	9.03	11.26	14.29	18.49	24.68	35.51	268.51
	22.50	6.30	7.04	7.91	8.97	10.27	11.92	14.08	17.08	21.81	39.61
	30.00	6.99	7.91	9.03	10.40	12.12	14.31	17.19	21.19	27.55	52.20
CGMP	1.00	5.16	5.81	6.61	7.61	8.94	10.78	13.50	17.92	26.49	125.91
	9.00	5.61	6.37	7.32	8.54	10.18	12.47	15.91	21.64	34.78	304.91
	18.00	5.80	6.58	7.54	8.76	10.36	12.53	15.66	20.65	31.04	230.23
CGOP	1.00	2.74	3.19	3.71	4.33	5.09	6.07	7.45	9.66	14.21	44.92
	7.50	4.94	5.52	6.21	7.04	8.09	9.46	11.35	14.14	18.95	38.66
	15.00	5.95	6.80	7.85	9.20	10.98	13.45	17.10	23.22	38.93	304.10
CGRP	1.00	3.08	3.61	4.22	4.96	5.91	7.20	9.14	12.52	20.29	310.77
	9.00	3.28	3.85	4.52	5.34	6.42	7.93	10.25	14.40	24.36	423.99
	18.00	5.64	6.40	7.35	8.56	10.17	12.43	15.87	21.85	37.62	276.10
CGBB	1.00	4.02	4.54	5.15	5.89	6.83	8.07	9.83	12.56	17.59	44.93
	9.00	3.09	3.63	4.26	5.03	6.01	7.33	9.24	12.27	17.91	49.29
	18.00	3.00	3.53	4.15	4.91	5.89	7.23	9.25	12.79	21.33	408.79
BCB	1.00	6.13	7.04	8.19	9.70	11.80	14.89	19.93	30.23	91.83	412.06
	21.00	**9.77**	**12.23**	**15.98**	**22.55**	**40.55**	**834.47**	**1072.84**	**1241.94**	**1433.83**	**1996.60**
	42.00	5.54	6.27	7.17	8.32	9.87	12.10	15.58	21.90	41.19	237.39
GP	1.00	3.48	4.15	4.95	5.95	7.27	9.12	11.97	17.32	128.57	1857.73
	14.00	4.86	5.78	6.93	8.42	10.45	13.38	18.05	27.07	58.52	542.01
	28.00	**7.38**	**8.57**	**10.10**	**12.14**	**15.01**	**19.45**	**28.03**	**83.06**	**1109.49**	**1997.62**
R4.9	1.00	4.40	5.18	6.15	7.37	8.97	11.18	14.40	19.63	31.13	663.46
	6.00	**4.85**	**5.79**	**6.97**	**8.52**	**10.63**	**13.59**	**17.96**	**25.22**	**44.11**	**1989.37**
	10.00	**7.89**	**9.29**	**11.09**	**13.46**	**16.71**	**21.45**	**29.50**	**55.31**	**1048.09**	**1997.26**

Bold print indicates data that showed grain sizes above 1000μm that is likely due to instrument error.

APPENDIX H

Bed Material Grain Size Distributions

Contents:

Bottom Drag Samples
Push Core Samples

Bottom Drag Samples

Bottom Sediment Samples Wentworth Size Class
(% by volume)

March 10-11, 2009

Sample	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BSS-1	99.99	0.00	0.00	0.00	0.00	0.00	0.00	6.21	74.23	18.25	1.30	0.00
BSS-2	36.34	49.55	14.08	8.56	12.03	13.79	15.17	16.51	18.86	0.97	0.00	0.00
BSS-3	99.99	0.00	0.00	0.00	0.00	0.00	0.00	5.82	81.64	12.53	0.00	0.00
BSS-4	2.04	59.24	38.72	20.86	20.67	11.38	6.33	2.04	0.00	0.00	0.00	0.00
BSS-5	100.01	0.00	0.00	0.00	0.00	0.00	0.00	11.14	83.53	5.34	0.00	0.00
BSS-6	100.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	73.55	21.88	0.00	0.00
BSS-7	100.01	0.00	0.00	0.00	0.00	0.00	0.00	7.98	76.12	15.17	0.74	0.00
BSS-8	49.73	32.85	17.45	10.92	11.26	7.42	3.25	2.57	34.75	12.11	0.30	0.00
BSS-9	100.00	0.00	0.00	0.00	0.00	0.00	0.00	10.70	80.34	8.96	0.00	0.00
BSS-10	95.30	3.79	0.92	0.55	0.88	1.15	1.21	1.84	47.08	46.22	0.16	0.00
BSS-11	16.33	57.55	26.14	16.92	20.21	13.92	6.50	3.86	10.45	1.92	0.10	0.00
BSS-12	60.07	26.56	13.39	7.88	8.66	6.70	3.32	2.51	46.66	10.90	0.00	0.00
BSS-13	0.20	68.48	31.33	22.20	25.73	15.82	4.73	0.20	0.00	0.00	0.00	0.00
BSS-14	46.97	37.02	16.04	10.39	12.70	9.84	4.09	3.15	26.12	17.00	0.70	0.00
BSS-15	0.08	66.73	33.18	21.24	25.88	15.67	3.94	0.08	0.00	0.00	0.00	0.00
BSS-16	100.02	0.00	0.00	0.00	0.00	0.00	0.00	9.90	80.30	9.82	0.00	0.00
BSS-17	29.08	49.26	21.69	14.32	16.63	12.26	6.05	1.88	17.83	9.17	0.20	0.00
BSS-18	97.93	1.54	0.52	0.25	0.26	0.33	0.70	11.74	73.08	12.21	0.90	0.00
BSS-19	100.01	0.00	0.00	0.00	0.00	0.00	0.00	3.82	69.61	26.03	0.55	0.00

March 10-11, 2009
(Continued)

Sample	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BSS-20	98.20	1.33	0.50	0.22	0.17	0.26	0.68	13.50	77.66	7.04	0.00	0.00
BSS-21	98.72	0.96	0.27	0.14	0.08	0.17	0.57	11.50	80.53	6.69	0.00	0.00
BSS-22	46.27	42.18	11.54	7.22	10.42	13.45	11.09	8.28	30.85	4.58	2.56	0.00
BSS-23	97.23	2.17	0.61	0.28	0.37	0.49	1.03	12.62	79.37	5.24	0.00	0.00
BSS-24	32.25	54.04	13.70	7.84	12.02	17.95	16.23	10.06	18.85	2.50	0.84	0.00
BSS-25	93.11	5.64	1.27	0.59	1.08	1.61	2.36	14.24	74.90	3.97	0.00	0.00
BSS-26	34.53	46.79	18.71	12.73	15.66	12.09	6.31	4.78	27.15	2.60	0.00	0.00
BSS-27	64.34	26.48	9.17	6.02	7.76	7.31	5.39	11.71	50.32	2.31	0.00	0.00
BSS-28	23.36	56.44	20.18	14.60	19.41	15.45	6.98	3.91	17.14	2.24	0.07	0.00
BSS-29	74.81	18.63	6.58	3.67	4.80	5.44	4.72	14.92	57.66	2.23	0.00	0.00
BSS-30	8.65	69.04	22.37	16.00	21.84	19.45	11.75	5.02	3.56	0.07	0.00	0.00
BSS-31	3.24	69.67	27.09	18.91	24.43	18.72	7.61	2.29	0.95	0.00	0.00	0.00

May 31, 2009

Sample	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BSS-58	64.52	27.45	8.02	5.08	7.13	7.78	7.45	7.87	44.77	9.91	1.97	0.00
BSS-59	4.02	65.90	30.07	18.28	22.57	17.30	7.76	3.67	0.35	0.00	0.00	0.00
BSS-60	98.51	1.14	0.36	0.14	0.10	0.21	0.68	20.26	73.55	4.70	0.00	0.00
BSS-61	98.26	1.37	0.37	0.15	0.13	0.28	0.80	19.68	71.61	6.97	0.00	0.00
BSS-66	88.69	9.51	1.82	0.88	1.62	2.65	4.37	40.95	44.69	2.86	0.18	0.00
BSS-68	35.27	56.12	8.60	4.18	6.38	14.62	30.94	31.20	4.07	0.00	0.00	0.00
BSS-69	36.94	53.82	9.24	5.45	9.35	17.09	21.92	20.03	10.77	4.23	1.91	0.00
BSS-70	0.56	58.84	40.61	22.58	21.79	10.65	3.82	0.56	0.00	0.00	0.00	0.00
BSS-71	5.70	65.52	28.77	16.01	20.63	19.18	9.71	4.63	1.07	0.00	0.00	0.00
BSS-72	9.57	64.30	26.12	15.28	20.35	18.01	10.66	6.90	2.68	0.00	0.00	0.00
BSS-73	40.52	49.66	9.81	5.80	8.43	13.18	22.25	31.48	5.76	2.69	0.60	0.00
BSS-74	12.60	67.40	19.99	13.15	18.04	18.96	17.25	10.67	1.94	0.00	0.00	0.00

July 23, 2009

Sample	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BSS-5	65.51	27.38	7.11	8.81	9.36	7.67	1.54	16.67	41.77	7.08	0.00	0.00
BSS-6	100.00	0.00	0.00	0.00	0.00	0.00	0.00	2.60	67.87	29.53	0.00	0.00
BSS-7	65.92	27.56	6.53	8.80	9.49	7.90	1.37	9.45	46.48	9.99	0.00	0.00
BSS-8	100.00	0.00	0.00	0.00	0.00	0.00	0.00	2.74	52.80	43.81	0.65	0.00
BSS-9	7.27	70.22	22.51	28.84	24.80	12.33	4.25	2.32	2.67	1.90	0.38	0.00
BSS-10	100.00	0.00	0.00	0.00	0.00	0.00	0.00	1.12	59.52	39.34	0.02	0.00
BSS-11	4.59	74.59	20.82	29.30	27.47	13.82	4.00	1.52	1.76	1.21	0.11	0.00
BSS-12	4.11	76.65	19.24	26.45	26.81	16.97	6.42	1.63	1.46	0.97	0.05	0.00
BSS-13	2.75	78.98	18.27	26.94	27.93	17.61	6.51	1.45	0.63	0.56	0.11	0.00
BSS-14	9.72	71.80	18.48	24.29	24.27	16.20	7.03	2.49	3.74	2.48	0.72	0.30
BSS-15	90.15	7.27	2.59	2.36	2.29	2.55	0.07	7.73	71.44	10.98	0.00	0.00
BSS-16	55.06	35.99	8.95	12.00	12.08	9.51	2.40	4.38	37.51	13.18	0.00	0.00
BSS-17	39.31	48.08	12.62	17.40	17.13	11.03	2.52	7.29	24.36	7.66	0.00	0.00
BSS-18	34.07	53.93	11.99	19.65	20.25	11.87	2.17	3.57	24.00	6.51	0.00	0.00
BSS-19	100.00	0.00	0.00	0.00	0.00	0.00	0.00	12.66	59.67	27.64	0.02	0.00
BSS-20	21.59	64.06	14.35	20.11	22.15	15.94	5.86	3.59	11.85	6.15	0.01	0.00
BSS-21	100.00	0.00	0.00	0.00	0.00	0.00	0.00	14.88	76.53	8.59	0.00	0.00
BSS-22	13.95	69.82	16.23	21.62	23.14	17.35	7.71	3.26	6.96	3.73	0.01	0.00
BSS-23	100.00	0.00	0.00	0.00	0.00	0.00	0.00	12.80	76.49	10.71	0.00	0.00
BSS-24	28.79	55.96	15.25	18.40	18.63	13.67	5.26	6.50	16.32	5.98	0.00	0.00
BSS-25	100.00	0.00	0.00	0.00	0.00	0.00	0.00	18.08	70.97	10.96	0.00	0.00

July 23, 2009
(Continued)

Sample	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BSS-26	39.58	50.05	10.37	12.65	15.01	14.96	7.43	8.64	22.86	8.09	0.00	0.00
BSS-27	61.45	31.08	7.48	9.03	9.96	8.64	3.45	17.99	35.29	8.16	0.00	0.00
BSS-28	14.94	68.92	16.14	21.51	22.98	16.92	7.52	3.59	7.83	3.53	0.00	0.00
BSS-29	100.00	0.00	0.00	0.00	0.00	0.00	0.00	11.15	78.19	10.65	0.00	0.00
BSS-30	26.13	63.33	10.54	12.89	15.91	18.46	16.08	10.67	11.59	3.87	0.00	0.00
BSS-31	21.20	63.89	14.91	19.49	20.77	16.14	7.50	5.08	11.75	4.38	0.00	0.00
BSS-58	18.18	66.81	15.01	19.63	21.31	17.16	8.70	5.13	9.61	3.45	0.00	0.00
BSS-59	52.32	39.83	7.85	9.70	11.58	10.39	8.15	19.17	25.64	7.04	0.24	0.23
BSS-60	48.46	43.14	8.40	10.36	13.03	12.53	7.23	17.98	26.14	4.34	0.00	0.00
BSS-61	41.88	47.81	10.31	13.38	15.68	13.26	5.49	11.20	24.22	6.46	0.00	0.00
BSS-62	17.65	67.83	14.52	19.37	22.18	17.61	8.67	7.48	8.79	1.38	0.00	0.00
BSS-63	20.21	64.67	15.12	19.25	20.76	15.98	8.68	8.73	9.94	1.54	0.00	0.00
BSS-64	66.79	28.76	4.45	4.79	6.52	7.87	9.58	28.70	33.15	4.94	0.00	0.00
BSS-65	49.47	44.78	5.75	6.29	7.52	12.20	18.78	24.93	20.61	3.34	0.28	0.32
BSS-66	79.48	19.47	1.05	1.20	2.23	1.45	14.59	46.63	31.67	1.18	0.00	0.00
BSS-67	72.99	24.89	2.12	2.62	3.43	2.52	16.32	42.03	25.33	2.41	2.16	1.07
BSS-70	15.15	66.29	18.56	18.89	19.66	16.60	11.14	7.63	5.45	1.71	0.36	0.00
BSS-71	25.18	65.63	9.20	11.48	15.15	18.44	20.56	18.14	7.04	0.00	0.00	0.00
BSS-72	16.04	73.26	10.71	13.39	16.57	20.59	22.70	12.35	2.67	0.63	0.39	0.00
BSS-73	67.24	28.62	4.14	4.36	6.10	6.35	11.81	34.62	30.27	2.35	0.00	0.00
CGMP	13.35	74.63	12.02	18.67	23.22	20.40	12.35	5.78	5.26	2.18	0.13	0.00
CGOP	19.35	60.93	19.72	19.80	19.02	14.16	7.95	7.45	8.38	3.35	0.17	0.00
CGRP	7.69	59.38	32.93	27.97	18.72	8.48	4.22	3.12	1.89	1.68	1.00	0.00
CGBB	83.97	10.71	5.32	3.95	3.18	3.26	0.32	5.73	66.04	12.21	0.00	0.00

September 22-23, 2009

Sample	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BSS-5	23.16	63.22	13.62	17.86	20.17	16.94	8.24	7.14	12.76	3.26	0.00	0.00
BSS-6	100.00	0.00	0.00	0.00	0.00	0.00	0.00	1.92	66.54	31.55	0.00	0.00
BSS-7	92.84	5.09	2.07	1.61	1.23	2.14	0.12	4.36	69.63	18.85	0.00	0.00
BSS-8	27.13	58.56	14.31	18.68	19.50	14.36	6.03	3.54	13.96	9.57	0.06	0.00
BSS-9	4.62	75.76	19.62	26.68	26.75	16.42	5.91	1.69	1.59	1.17	0.17	0.00
BSS-10	100.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74	54.04	43.85	0.37	0.00
BSS-12	22.88	63.36	13.76	17.59	20.05	17.26	8.46	3.40	10.64	8.35	0.50	0.00
BSS-13	1.77	84.40	13.83	21.60	28.91	24.70	9.19	0.86	0.45	0.40	0.07	0.00
BSS-14	4.65	77.39	17.97	24.23	26.63	18.68	7.85	2.00	1.04	1.32	0.30	0.00
BSS-15	18.42	62.91	18.67	24.38	22.67	12.33	3.52	3.35	9.41	5.53	0.13	0.00
BSS-16	14.39	71.25	14.36	17.33	20.70	20.79	12.44	3.84	5.93	4.30	0.31	0.00
BSS-17	52.94	37.57	9.49	13.51	13.90	8.97	1.19	7.32	37.09	8.54	0.00	0.00
BSS-18	18.25	68.16	13.58	17.70	21.45	19.66	9.36	3.94	10.42	3.90	0.00	0.00
BSS-19	57.85	34.14	8.01	10.71	11.84	9.69	1.89	10.38	38.81	8.67	0.00	0.00
BSS-20	22.95	65.27	11.78	20.75	24.12	16.79	3.61	0.06	10.96	11.91	0.02	0.00
BSS-21	100.00	0.00	0.00	0.00	0.00	0.00	0.00	8.25	82.11	9.64	0.00	0.00
BSS-22	45.76	44.50	9.74	12.59	14.49	12.72	4.70	8.10	26.77	10.89	0.00	0.00
BSS-23	100.00	0.00	0.00	0.00	0.00	0.00	0.00	11.09	81.72	7.19	0.00	0.00
BSS-24	58.59	33.84	7.57	10.79	11.95	9.44	1.67	7.02	42.30	9.27	0.00	0.00
BSS-25	75.19	20.57	4.24	5.00	6.74	7.70	1.14	15.87	52.62	6.70	0.00	0.00

September 22-23, 2009
(Continued)

Sample	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	% very coarse sand
BSS-26	23.18	61.60	15.22	19.62	20.61	15.15	6.23	5.69	13.42	4.07	0.00	0.00
BSS-27	100.00	0.00	0.00	0.00	0.00	0.00	0.00	16.08	71.86	12.06	0.00	0.00
BSS-28	55.99	37.10	6.92	8.20	10.33	12.22	6.35	9.59	31.86	14.53	0.01	0.00
BSS-29	100.00	0.00	0.00	0.00	0.00	0.00	0.00	13.02	79.61	7.37	0.00	0.00
BSS-30	9.97	77.71	12.32	16.21	20.39	22.62	18.49	7.12	2.16	0.69	0.00	0.00
BSS-31	9.45	76.56	13.99	22.07	27.18	19.94	7.36	2.52	5.12	1.81	0.00	0.00
BSS-58	75.60	20.02	4.39	5.53	6.65	6.50	1.35	16.87	47.03	11.69	0.00	0.00
BSS-59	47.92	41.91	10.17	12.57	13.94	11.53	3.87	14.13	29.65	4.14	0.00	0.00
BSS-60	40.27	50.07	9.66	14.22	16.10	12.30	7.46	16.56	19.90	3.70	0.11	0.00
BSS-61	41.04	49.84	9.12	11.00	13.89	15.21	9.74	12.01	22.01	7.02	0.00	0.00
BSS-62	61.23	31.57	7.20	8.28	9.98	8.72	4.59	22.61	33.27	5.35	0.00	0.00
BSS-63	16.41	73.09	10.50	18.75	22.82	17.41	14.12	10.97	3.85	1.32	0.28	0.00
BSS-64	41.85	51.36	6.79	8.20	10.49	13.93	18.75	22.41	16.27	2.91	0.27	0.00
BSS-65	20.43	69.70	9.87	14.22	17.62	19.74	18.12	11.56	5.97	2.53	0.38	0.00
BSS-66	51.56	42.75	5.69	7.34	8.57	10.32	16.52	18.36	13.38	11.47	7.90	0.45
BSS-67	50.65	44.41	4.94	6.13	7.84	9.79	20.64	31.25	15.89	2.31	1.21	0.00
BSS-68	31.72	62.30	5.98	6.16	8.45	16.49	31.21	26.28	5.45	0.00	0.00	0.00
BSS-70	40.44	49.53	10.04	12.26	13.02	10.57	13.68	22.72	15.96	1.77	0.00	0.00
BSS-71	25.35	63.13	11.53	11.73	13.34	16.95	21.11	17.06	6.60	1.50	0.19	0.00
BSS-72	28.91	62.83	8.25	10.54	12.92	16.87	22.50	17.55	7.69	3.20	0.48	0.00
BSS-73	24.34	67.09	8.57	10.35	14.66	20.42	21.67	15.35	7.09	1.69	0.21	0.00
BSS-74	9.64	77.59	12.77	17.88	19.54	20.57	19.61	7.06	1.11	1.15	0.32	0.00
CGBD-32	90.42	7.76	1.83	1.74	2.01	3.47	0.54	6.44	64.86	19.11	0.00	0.00
CGBD-33	100.00	0.00	0.00	0.00	0.00	0.00	0.00	9.36	81.74	8.90	0.00	0.00
CGBD-34	56.54	38.79	4.68	5.41	7.68	10.68	15.02	30.62	24.80	1.12	0.00	0.00
CGBD-57	8.42	73.40	18.18	22.36	24.44	18.40	8.20	3.48	3.59	1.26	0.09	0.00

Bottom Sediment Samples
Cumulative Grain Size Distributions

March 10-11, 2009

D_5-D_{50} (particle diameter in μm)

Sample	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
BSS-1	129.63	141.97	151.37	159.63	166.83	173.80	180.70	187.53	194.37	201.60
BSS-2	1.43	2.84	4.60	6.78	9.55	13.10	17.48	22.53	28.36	35.26
BSS-3	131.17	141.67	150.10	157.23	163.87	169.97	175.97	182.00	188.07	194.07
BSS-4	0.80	1.15	1.58	2.05	2.57	3.13	3.74	4.43	5.20	6.07
BSS-5	122.10	131.60	138.90	145.63	151.43	157.03	162.53	167.80	173.10	178.50
BSS-6	134.87	147.97	157.53	165.87	173.47	180.70	187.70	194.70	201.77	208.77
BSS-7	125.60	137.43	146.63	153.93	161.17	167.63	174.03	180.53	187.13	193.70
BSS-8	1.29	2.40	3.60	4.98	6.70	8.99	12.39	17.65	26.13	58.52
BSS-9	122.07	132.27	140.00	147.30	153.43	159.57	165.40	171.13	176.87	183.03
BSS-10	74.51	163.30	181.17	194.53	204.87	214.90	223.93	232.93	241.70	250.47
BSS-11	1.00	1.65	2.39	3.18	4.04	4.99	6.06	7.30	8.75	10.49
BSS-12	1.60	3.07	4.89	7.36	11.15	17.31	27.45	65.22	147.90	164.23
BSS-13	0.96	1.51	2.12	2.74	3.38	4.06	4.78	5.56	6.43	7.40
BSS-14	1.38	2.58	3.94	5.53	7.51	10.08	13.54	18.13	24.44	37.18
BSS-15	0.87	1.33	1.87	2.47	3.11	3.78	4.52	5.32	6.20	7.18
BSS-16	123.10	133.90	141.57	148.80	155.17	161.43	167.23	173.07	178.97	185.13
BSS-17	1.12	1.95	2.88	3.88	5.00	6.29	7.82	9.69	12.07	15.20
BSS-18	109.87	125.40	135.63	143.77	151.07	157.93	164.57	171.03	177.50	184.37
BSS-19	136.97	149.67	159.53	167.83	175.83	183.33	190.77	198.27	205.80	213.33
BSS-20	111.00	124.03	133.13	140.13	146.97	152.87	158.77	164.53	170.23	175.93
BSS-21	115.37	128.10	136.97	144.20	150.67	156.77	162.67	168.27	173.87	179.70
BSS-22	1.75	3.59	5.91	9.00	13.12	18.00	23.28	29.28	36.92	48.41
BSS-23	104.63	123.17	132.93	140.13	147.13	152.93	158.83	164.43	169.97	175.50
BSS-24	1.44	2.89	4.78	7.24	10.46	14.31	18.36	22.42	26.69	31.47
BSS-25	38.41	101.90	121.70	131.50	139.17	146.17	152.23	158.13	163.93	169.60
BSS-26	1.25	2.25	3.36	4.57	5.96	7.62	9.65	12.23	15.55	19.82
BSS-27	2.26	4.68	7.99	13.01	20.63	32.20	57.87	111.80	127.70	138.83
BSS-28	1.19	2.11	3.13	4.20	5.38	6.70	8.22	10.01	12.14	14.68
BSS-29	3.02	7.83	17.09	31.23	61.34	105.27	122.90	133.43	141.33	148.83
BSS-30	1.12	1.92	2.82	3.77	4.80	5.93	7.20	8.65	10.32	12.25
BSS-31	1.02	1.65	2.36	3.11	3.89	4.75	5.68	6.73	7.90	9.23

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D_{55}-D_{100} (particle diameter in μm)

Sample	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
BSS-1	208.83	216.63	225.20	233.77	244.73	255.83	271.80	292.03	327.57	716.90
BSS-2	43.62	54.11	67.44	85.51	109.17	132.93	155.03	178.10	208.63	385.27
BSS-3	200.63	207.17	213.93	222.07	230.23	240.00	251.27	266.20	287.10	409.60
BSS-4	7.08	8.27	9.70	11.50	13.86	17.02	21.45	29.07	44.15	133.70
BSS-5	184.30	190.07	196.23	203.27	210.33	219.07	228.97	241.87	259.07	373.10
BSS-6	216.13	224.00	231.87	241.07	250.77	261.97	275.60	293.23	318.70	449.70
BSS-7	200.97	208.27	216.13	225.23	234.37	246.67	260.27	279.53	312.27	716.90
BSS-8	147.70	167.67	183.30	197.77	212.07	227.90	246.37	270.70	311.50	812.57
BSS-9	189.20	195.53	202.83	210.03	218.63	228.23	239.63	253.80	276.40	409.60
BSS-10	259.50	269.30	279.07	290.37	302.30	316.03	332.67	354.97	388.57	676.23
BSS-11	12.61	15.20	18.39	22.49	28.78	41.74	81.20	161.77	209.97	786.90
BSS-12	176.77	187.50	198.10	208.43	219.40	230.97	244.77	260.90	284.43	449.70
BSS-13	8.50	9.75	11.23	12.97	15.08	17.62	20.75	25.06	32.89	92.09
BSS-14	117.73	160.43	183.87	204.60	225.00	246.53	271.27	302.47	351.43	948.20
BSS-15	8.29	9.55	11.00	12.69	14.68	17.03	19.93	23.82	30.68	86.63
BSS-16	191.30	198.00	205.10	212.30	221.37	230.67	242.73	256.33	279.20	409.60
BSS-17	19.25	24.66	33.33	54.03	156.60	189.57	218.97	252.30	302.50	840.67
BSS-18	191.27	198.80	206.80	215.30	225.63	236.73	251.30	271.40	304.80	948.20
BSS-19	221.73	230.20	239.60	249.80	261.20	275.10	292.23	314.50	354.43	716.90
BSS-20	182.17	188.53	195.07	202.83	210.60	220.50	231.30	246.77	269.97	493.60
BSS-21	185.77	191.80	198.60	205.80	213.00	222.70	232.47	246.77	266.57	373.10
BSS-22	72.17	123.60	144.90	161.03	175.83	191.63	210.03	234.67	292.50	948.20
BSS-23	181.43	187.53	193.60	200.90	208.40	216.97	227.50	240.50	258.43	373.10
BSS-24	37.16	44.52	55.16	73.69	113.97	145.90	170.77	197.33	235.93	948.20
BSS-25	175.23	181.43	187.83	194.27	202.30	210.40	221.03	232.93	252.60	373.10
BSS-26	25.59	35.16	58.78	131.93	155.63	173.77	191.43	211.10	237.90	409.60
BSS-27	148.40	156.97	165.47	173.90	183.10	192.77	204.67	218.77	239.43	373.10
BSS-28	17.73	21.42	26.25	33.80	51.00	127.77	164.03	192.23	227.37	674.50
BSS-29	155.60	162.37	169.13	175.93	184.00	192.30	203.17	215.77	235.97	413.27
BSS-30	14.50	17.09	20.08	23.59	27.86	33.55	41.95	56.70	104.33	339.80
BSS-31	10.76	12.53	14.58	16.97	19.78	23.16	27.60	34.58	49.97	234.10

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D_5-D_{50} (particle diameter in μm)

Sample	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
BSS-58	2.50	5.60	10.07	16.81	26.04	38.63	60.33	117.73	138.85	152.90
BSS-59	0.91	1.43	2.04	2.71	3.44	4.23	5.12	6.12	7.28	8.62
BSS-60	101.93	114.88	123.90	131.15	137.65	143.75	149.65	155.38	161.08	166.95
BSS-61	100.03	114.28	123.80	131.53	138.35	144.85	151.05	157.10	163.20	169.35
BSS-66	21.37	53.84	81.25	93.52	101.83	108.48	114.50	120.20	125.73	131.20
BSS-68	2.14	5.34	11.08	18.31	24.29	29.41	34.12	38.69	43.27	47.96
BSS-69	2.08	4.71	8.42	13.18	18.09	22.72	27.23	31.91	36.97	42.69
BSS-70	0.80	1.16	1.57	2.02	2.50	3.01	3.56	4.17	4.84	5.58
BSS-71	0.91	1.43	2.06	2.77	3.57	4.48	5.53	6.76	8.22	9.97
BSS-72	0.95	1.55	2.27	3.10	4.02	5.07	6.29	7.71	9.38	11.34
BSS-73	1.97	4.35	7.66	12.43	18.35	24.31	30.30	36.52	43.02	49.87
BSS-74	1.15	2.04	3.09	4.25	5.55	7.07	8.85	10.98	13.52	16.44

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D_{55}-D_{100} (particle diameter in μm)

Sample	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
BSS-58	164.93	175.95	187.13	198.78	211.15	225.98	243.83	269.08	321.15	948.20
BSS-59	10.19	12.03	14.19	16.70	19.58	23.09	28.07	36.92	55.82	194.20
BSS-60	172.85	179.05	185.95	192.85	201.30	210.15	221.60	234.63	255.55	373.10
BSS-61	175.55	182.50	189.63	197.40	206.38	216.15	228.68	245.08	270.80	493.60
BSS-66	136.90	142.78	149.00	155.98	163.50	172.60	184.13	200.00	229.78	712.28
BSS-68	52.88	58.11	63.75	69.97	76.98	85.15	95.16	108.28	128.70	263.13
BSS-69	49.42	57.52	67.68	80.32	96.29	117.25	146.10	190.00	301.93	948.20
BSS-70	6.44	7.43	8.61	10.02	11.79	14.11	17.22	21.73	30.90	
BSS-71	12.02	14.37	16.97	19.83	23.12	27.30	33.74	45.23	68.60	228.88
BSS-72	13.62	16.21	19.11	22.51	26.91	33.45	43.73	61.31	106.72	239.78
BSS-73	56.94	64.21	71.77	79.76	88.49	98.55	111.15	129.43	170.38	867.55
BSS-74	19.71	23.39	27.66	32.84	39.21	47.10	57.25	71.99	99.79	239.78

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D_5-D_{50} (particle diameter in μm)

Sample	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
BSS-5	3.29	5.07	7.46	10.88	15.68	22.86	70.69	96.39	110.60	122.41
BSS-6	134.58	148.11	158.44	167.40	175.61	183.39	190.97	198.46	206.03	213.75
BSS-7	3.47	5.34	7.81	11.30	16.22	23.61	90.00	114.60	128.80	140.66
BSS-8	135.17	151.35	164.20	175.56	186.20	196.44	206.53	216.65	226.96	237.61
BSS-9	2.17	2.71	3.22	3.74	4.27	4.84	5.46	6.14	6.89	7.75
BSS-10	145.28	159.84	170.99	180.66	189.51	197.93	206.15	214.27	222.47	230.86
BSS-11	2.24	2.82	3.37	3.91	4.47	5.06	5.70	6.39	7.14	7.98
BSS-12	2.28	2.90	3.49	4.09	4.73	5.41	6.15	6.96	7.87	8.89
BSS-13	2.35	2.99	3.60	4.22	4.85	5.53	6.27	7.07	7.96	8.96
BSS-14	2.29	2.93	3.55	4.20	4.89	5.65	6.49	7.43	8.50	9.73
BSS-15	8.15	89.39	118.61	129.97	138.90	146.79	154.08	161.03	167.82	174.64
BSS-16	3.01	4.28	5.74	7.59	10.05	13.39	18.03	25.07	84.33	128.05
BSS-17	2.64	3.53	4.44	5.45	6.61	8.00	9.69	11.80	14.55	18.31
BSS-18	2.76	3.66	4.53	5.45	6.45	7.59	8.91	10.47	12.40	14.86
BSS-19	104.99	118.85	130.02	140.04	149.50	158.69	167.83	177.07	186.55	196.39
BSS-20	2.49	3.30	4.11	4.97	5.90	6.95	8.13	9.49	11.06	12.92
BSS-21	106.17	116.92	125.17	132.29	138.81	145.03	151.05	157.04	163.06	169.23
BSS-22	2.38	3.10	3.82	4.58	5.40	6.32	7.35	8.52	9.87	11.44
BSS-23	108.85	120.00	128.56	135.95	142.73	149.20	155.48	161.70	167.98	174.41
BSS-24	2.38	3.16	3.96	4.84	5.84	7.01	8.40	10.07	12.10	14.63
BSS-25	100.01	111.33	120.14	127.89	135.00	141.81	148.48	155.13	161.85	168.76
BSS-26	2.75	3.91	5.24	6.85	8.83	11.22	14.05	17.38	21.43	26.71
BSS-27	3.19	4.91	7.17	10.28	14.50	20.36	30.65	73.25	93.33	107.94
BSS-28	2.37	3.10	3.83	4.60	5.43	6.36	7.39	8.58	9.94	11.53
BSS-29	111.86	122.88	131.34	138.60	145.28	151.60	157.75	163.84	169.98	176.26
BSS-30	2.72	3.87	5.18	6.74	8.63	10.88	13.47	16.41	19.74	23.57
BSS-31	2.43	3.22	4.02	4.87	5.83	6.91	8.16	9.62	11.34	13.40

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D_5-D_{50} (particle diameter in μm)
(Continued)

Sample	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
BSS-58	2.43	3.21	4.00	4.85	5.80	6.87	8.09	9.52	11.18	13.14
BSS-59	3.10	4.74	6.76	9.34	12.61	16.82	22.64	32.21	51.14	72.06
BSS-60	3.01	4.51	6.34	8.61	11.37	14.67	18.69	24.02	32.54	53.86
BSS-61	2.77	3.93	5.21	6.71	8.50	10.65	13.25	16.44	20.55	26.39
BSS-62	2.45	3.26	4.08	4.97	5.95	7.05	8.29	9.71	11.34	13.23
BSS-63	2.40	3.18	3.98	4.85	5.81	6.91	8.17	9.64	11.36	13.42
BSS-64	4.36	8.83	14.97	22.75	35.21	53.21	67.78	79.59	90.21	100.37
BSS-65	3.66	6.42	10.89	16.52	22.41	28.67	35.59	43.41	52.21	61.93
BSS-66	19.54	45.79	55.00	62.29	68.82	75.00	81.05	87.11	93.28	99.69
BSS-67	8.45	27.00	43.94	52.90	60.25	66.97	73.46	79.91	86.49	93.35
BSS-70	2.11	2.77	3.46	4.23	5.11	6.13	7.33	8.75	10.44	12.44
BSS-71	2.89	4.23	5.81	7.71	9.97	12.57	15.48	18.76	22.48	26.77
BSS-72	2.72	3.83	5.09	6.57	8.35	10.45	12.88	15.61	18.65	22.00
BSS-73	4.65	9.72	16.65	27.93	44.54	57.23	67.30	76.28	84.81	93.23
CGMP	2.70	3.63	4.56	5.56	6.64	7.83	9.15	10.64	12.34	14.27
CGOP	2.09	2.71	3.34	4.04	4.83	5.75	6.84	8.14	9.70	11.61
CGRP	1.75	2.14	2.52	2.90	3.30	3.73	4.20	4.73	5.32	6.01
CGBB	3.80	9.37	25.97	119.40	134.24	144.26	152.66	160.49	168.07	175.57

July 23, 2009
D_{55}-D_{100} (particle diameter in μm)

Sample	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
BSS-5	133.35	144.06	154.99	166.52	179.11	193.40	210.47	232.60	266.17	377.19
BSS-6	221.76	230.18	239.18	249.02	259.96	272.53	287.75	307.56	337.83	476.40
BSS-7	151.64	162.38	173.31	184.80	197.30	211.41	228.21	249.94	282.98	424.86
BSS-8	248.76	260.59	273.35	287.37	303.14	321.41	343.49	372.24	415.43	574.32
BSS-9	8.74	9.90	11.30	13.05	15.36	18.63	23.97	36.55	123.48	686.00
BSS-10	239.57	248.77	258.59	269.33	281.32	295.17	311.94	333.69	367.29	508.15
BSS-11	8.93	10.02	11.30	12.84	14.77	17.34	21.08	27.75	54.27	588.08
BSS-12	10.05	11.39	12.97	14.88	17.26	20.36	24.75	32.01	51.86	544.80
BSS-13	10.08	11.37	12.88	14.67	16.88	19.72	23.62	29.73	43.18	588.21
BSS-14	11.18	12.90	15.00	17.65	21.14	26.16	34.64	59.45	191.68	1914.56
BSS-15	181.61	188.85	196.52	204.85	214.15	224.81	237.48	253.54	279.52	412.38
BSS-16	146.23	161.41	175.69	190.05	205.19	221.97	241.65	266.80	304.82	479.31
BSS-17	24.17	40.39	110.10	133.97	155.15	176.87	201.32	231.77	276.71	436.51
BSS-18	18.23	23.46	36.19	128.01	152.53	174.22	197.05	224.45	264.38	435.04
BSS-19	206.77	217.87	229.91	243.23	258.27	275.84	297.21	325.05	366.94	509.51
BSS-20	15.17	17.97	21.66	26.99	36.77	100.57	154.09	202.61	268.21	501.16
BSS-21	175.62	182.35	189.57	197.41	206.15	216.27	228.43	244.36	268.76	375.29

July 23, 2009

D_{55}-D_{100} (particle diameter in μm)

(Continued)

Sample	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
BSS-22	13.29	15.51	18.23	21.71	26.48	33.99	52.19	135.95	220.58	506.12
BSS-23	181.08	188.10	195.60	203.79	212.93	223.46	236.16	252.62	277.84	376.45
BSS-24	17.87	22.29	29.15	46.58	106.38	139.44	171.33	208.86	263.00	437.65
BSS-25	175.95	183.55	191.68	200.59	210.55	222.04	235.90	253.88	281.03	376.97
BSS-26	34.80	57.87	103.84	129.42	152.10	175.37	201.59	234.28	282.56	438.02
BSS-27	121.06	133.79	146.75	160.43	175.36	192.28	212.39	238.14	276.10	377.62
BSS-28	13.41	15.68	18.51	22.18	27.33	35.87	62.22	143.65	218.97	493.26
BSS-29	182.76	189.61	196.90	204.87	213.77	224.01	236.34	252.36	277.00	376.50
BSS-30	28.07	33.60	40.81	51.09	67.49	93.91	128.45	170.26	230.22	487.68
BSS-31	15.91	19.04	23.14	28.98	39.25	81.72	135.08	180.21	239.84	436.70
BSS-58	15.50	18.37	22.00	26.87	34.22	49.46	103.55	156.97	220.99	435.77
BSS-59	88.91	104.21	119.30	135.05	152.25	171.98	196.01	228.15	280.34	1903.96
BSS-60	78.87	96.22	111.49	126.47	142.15	159.46	179.72	205.39	243.18	371.61
BSS-61	37.53	80.65	107.19	127.69	147.39	168.25	192.06	221.78	264.88	385.71
BSS-62	15.47	18.17	21.59	26.19	33.25	47.91	85.40	126.47	177.81	373.52
BSS-63	15.93	19.08	23.23	29.23	39.72	64.44	99.92	136.40	185.36	373.68
BSS-64	110.50	120.90	131.86	143.71	156.90	172.08	190.37	214.08	249.45	372.17
BSS-65	72.42	83.65	95.70	108.84	123.55	140.62	161.52	189.50	234.74	1918.27
BSS-66	106.42	113.61	121.41	130.04	139.80	151.19	165.07	183.19	210.51	285.27
BSS-67	100.62	108.49	117.17	127.00	138.50	152.56	171.09	199.05	265.16	1977.40
BSS-70	14.84	17.76	21.42	26.22	33.01	43.82	63.79	99.52	161.41	686.87
BSS-71	31.79	37.76	44.87	53.34	63.38	75.36	90.07	109.42	139.27	239.13
BSS-72	25.71	29.87	34.59	40.08	46.63	54.78	65.53	81.26	110.56	901.93
BSS-73	101.79	110.71	120.21	130.55	142.11	155.47	171.59	192.45	223.34	323.17
CGMP	16.52	19.19	22.41	26.46	31.87	39.88	54.53	92.71	169.71	588.66
CGOP	13.97	16.95	20.89	26.56	36.24	58.47	97.55	144.08	215.10	590.69
CGRP	6.82	7.80	9.03	10.63	12.87	16.33	22.74	40.67	112.43	800.00
CGBB	183.10	190.81	198.92	207.65	217.33	228.35	241.38	257.90	285.87	435.32

September 22-23, 2009

D_5-D_{50} (particle diameter in μm)

Sample	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
BSS-5	2.51	3.37	4.25	5.22	6.32	7.59	9.05	10.76	12.75	15.12
BSS-6	138.34	151.96	162.32	171.32	179.56	187.38	194.96	202.49	210.07	217.82
BSS-7	16.53	119.04	136.22	146.79	155.52	163.51	171.09	178.45	185.69	192.97
BSS-8	2.47	3.29	4.12	5.03	6.05	7.21	8.58	10.20	12.16	14.57
BSS-9	2.26	2.87	3.45	4.05	4.67	5.34	6.07	6.86	7.75	8.75
BSS-10	141.25	157.04	169.38	180.20	190.22	199.84	209.27	218.68	228.24	238.07
BSS-12	2.48	3.34	4.23	5.21	6.33	7.62	9.11	10.84	12.87	15.25
BSS-13	2.58	3.39	4.19	5.03	5.92	6.88	7.91	9.02	10.22	11.52
BSS-14	2.29	2.95	3.60	4.28	5.00	5.77	6.62	7.56	8.60	9.77
BSS-15	2.27	2.91	3.53	4.17	4.86	5.60	6.43	7.36	8.44	9.70
BSS-16	2.42	3.25	4.12	5.09	6.21	7.52	9.02	10.73	12.67	14.86
BSS-17	2.95	4.12	5.41	6.93	8.81	11.22	14.46	19.14	27.95	107.37
BSS-18	2.50	3.36	4.26	5.25	6.37	7.65	9.09	10.73	12.59	14.71
BSS-19	3.14	4.60	6.37	8.64	11.62	15.49	20.79	30.18	98.07	117.38
BSS-20	2.81	3.70	4.55	5.44	6.39	7.43	8.59	9.90	11.40	13.14
BSS-21	117.81	128.62	137.34	144.05	150.08	155.84	161.48	167.10	172.80	178.61
BSS-22	2.85	4.07	5.44	7.10	9.14	11.64	14.70	18.56	23.73	32.02
BSS-23	112.78	123.12	131.01	137.70	143.78	149.56	155.14	160.65	166.16	171.78
BSS-24	3.25	4.75	6.54	8.82	11.79	15.72	21.27	31.94	112.08	129.84
BSS-25	4.47	8.82	14.76	21.88	72.35	101.00	113.62	123.72	132.80	141.46
BSS-26	2.41	3.18	3.96	4.81	5.75	6.81	8.04	9.48	11.18	13.22
BSS-27	103.39	114.56	123.27	130.94	138.01	144.79	151.43	158.07	164.80	171.72
BSS-28	3.31	5.26	7.93	11.43	15.60	20.48	26.64	36.21	78.85	110.48
BSS-29	109.71	120.04	127.95	134.70	140.86	146.69	152.39	157.98	163.62	169.38
BSS-30	2.60	3.55	4.55	5.68	6.97	8.46	10.15	12.05	14.17	16.53
BSS-31	2.55	3.37	4.16	4.98	5.85	6.77	7.78	8.87	10.08	11.43
BSS-58	4.35	8.08	13.80	21.97	73.19	97.54	111.06	122.30	132.64	142.67
BSS-59	2.78	3.96	5.31	6.94	8.98	11.52	14.73	18.89	24.83	37.07
BSS-60	2.93	4.08	5.31	6.73	8.40	10.42	12.89	16.02	20.20	26.55
BSS-61	2.89	4.26	5.90	7.94	10.44	13.35	16.70	20.63	25.52	32.23
BSS-62	3.22	5.13	7.71	11.13	15.53	21.66	34.42	68.79	85.45	98.38
BSS-63	2.89	3.90	4.89	5.90	6.99	8.19	9.53	11.05	12.84	14.98
BSS-64	3.34	5.34	8.01	11.46	15.58	20.28	25.63	31.79	38.94	47.19
BSS-65	2.89	4.03	5.26	6.67	8.32	10.26	12.50	15.05	17.95	21.24
BSS-66	3.70	6.12	9.45	14.15	20.40	27.88	36.22	45.34	55.38	66.69
BSS-67	4.03	7.17	11.54	17.41	24.88	33.13	41.22	48.94	56.46	63.98
BSS-68	3.53	6.37	10.56	15.43	20.19	24.73	29.17	33.60	38.13	42.82
BSS-70	2.77	3.99	5.39	7.09	9.22	11.98	15.72	21.09	29.21	40.28
BSS-71	2.54	3.63	4.94	6.63	8.83	11.59	14.86	18.57	22.70	27.34
BSS-72	3.05	4.55	6.34	8.59	11.40	14.74	18.55	22.76	27.39	32.50
BSS-73	2.97	4.45	6.28	8.52	11.09	13.89	16.86	20.06	23.56	27.47
BSS-74	2.63	3.51	4.41	5.40	6.51	7.82	9.36	11.19	13.36	15.90

September 22-23, 2009
D_5-D_{50} (particle diameter in μm)
(Continued)

Sample	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
CGBD-32	13.84	94.85	121.88	135.83	145.96	154.78	163.15	171.29	179.33	187.41
CGBD-33	115.50	126.15	134.25	141.14	147.42	153.38	159.12	164.80	170.50	176.31
CGBD-34	4.19	7.92	12.96	18.62	25.33	33.93	44.58	55.69	66.13	75.94
CGBD-57	2.23	2.89	3.56	4.26	5.03	5.87	6.82	7.88	9.08	10.45

September 22-23, 2009
D_{55}-D_{100} (particle diameter in μm)

Sample	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
BSS-5	17.97	21.53	26.25	33.39	48.78	94.63	132.32	170.44	222.57	423.39
BSS-6	225.84	234.26	243.31	253.13	264.12	276.74	291.96	311.78	341.94	489.56
BSS-7	200.44	208.24	216.52	225.52	235.50	247.01	260.96	278.79	305.54	423.24
BSS-8	17.65	21.76	27.82	39.35	108.92	157.26	198.66	246.03	313.55	529.21
BSS-9	9.89	11.21	12.76	14.64	16.99	20.07	24.51	32.10	56.96	590.77
BSS-10	248.34	259.20	270.90	283.73	298.14	314.81	335.01	361.42	401.65	550.17
BSS-12	18.11	21.66	26.32	33.16	46.73	117.81	176.39	234.41	315.75	591.20
BSS-13	12.94	14.50	16.24	18.23	20.55	23.36	26.99	32.20	41.81	581.51
BSS-14	11.10	12.62	14.41	16.54	19.19	22.64	27.54	35.78	58.98	660.62
BSS-15	11.22	13.11	15.57	19.04	24.67	39.06	125.88	184.93	263.02	586.45
BSS-16	17.34	20.19	23.56	27.72	33.22	41.50	58.88	135.79	239.72	589.21
BSS-17	127.06	141.99	155.65	169.19	183.42	199.13	217.59	241.28	277.52	434.16
BSS-18	17.15	20.03	23.56	28.16	34.93	48.94	116.98	170.37	231.72	430.69
BSS-19	131.90	145.01	157.80	170.93	184.96	200.59	218.98	242.33	277.05	432.95
BSS-20	15.22	17.77	21.08	25.80	34.78	178.65	223.80	267.68	325.95	509.50
BSS-21	184.61	190.88	197.53	204.67	212.49	221.44	232.51	248.64	270.79	375.29
BSS-22	79.37	114.19	136.23	156.36	176.73	198.82	224.34	256.44	303.38	439.01
BSS-23	177.60	183.71	190.21	197.27	205.13	214.20	225.12	239.24	261.12	366.75
BSS-24	143.52	155.91	167.93	180.21	193.26	207.74	224.71	246.17	278.25	432.86
BSS-25	149.99	158.68	167.73	177.39	188.04	200.12	214.58	233.19	261.42	375.72
BSS-26	15.74	18.95	23.29	29.92	44.71	104.17	143.75	183.27	236.43	434.79
BSS-27	178.95	186.59	194.81	203.82	213.94	225.65	239.79	258.34	286.60	404.61
BSS-28	130.14	147.50	164.44	181.93	200.80	222.08	247.39	279.83	327.82	506.99
BSS-29	175.35	181.62	188.34	195.64	203.81	213.22	224.63	239.46	262.56	371.16
BSS-30	19.17	22.16	25.58	29.60	34.50	40.74	49.34	62.88	92.04	435.18
BSS-31	12.95	14.70	16.77	19.28	22.49	26.93	34.16	55.27	164.17	435.50
BSS-58	152.75	163.16	174.19	186.18	199.60	215.19	234.21	259.50	299.16	438.62
BSS-59	85.63	105.48	121.36	136.31	151.54	167.93	186.62	209.63	242.22	324.62
BSS-60	39.28	64.30	85.29	103.01	120.36	139.00	160.74	188.97	233.46	665.93
BSS-61	43.65	69.82	98.12	120.81	142.39	165.15	191.20	224.07	272.86	436.68

September 22-23, 2009
D_{55}-D_{100} (particle diameter in μm)
(Continued)

Sample	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
BSS-62	110.21	121.78	133.62	146.17	159.91	175.53	194.15	218.00	253.11	369.85
BSS-63	17.63	21.02	25.53	31.76	40.44	52.22	67.92	90.08	130.29	613.81
BSS-64	56.55	66.99	78.52	91.34	105.87	122.91	144.00	172.63	219.89	770.70
BSS-65	25.04	29.53	35.01	41.96	51.25	64.34	83.79	115.02	180.26	668.77
BSS-66	79.85	95.77	116.09	143.85	184.78	247.25	335.98	452.82	621.62	1259.61
BSS-67	71.70	79.84	88.63	98.41	109.65	123.18	140.58	165.86	215.76	926.13
BSS-68	47.78	53.09	58.87	65.30	72.62	81.21	91.78	105.82	127.51	205.06
BSS-70	52.25	64.02	75.81	88.13	101.59	116.99	135.73	160.65	200.05	323.96
BSS-71	32.60	38.62	45.61	53.86	63.75	75.96	91.77	114.33	155.46	591.17
BSS-72	38.19	44.63	52.07	60.86	71.61	85.41	104.55	135.33	206.84	679.39
BSS-73	31.95	37.21	43.56	51.44	61.46	74.55	92.24	118.05	165.04	591.81
BSS-74	18.83	22.16	25.94	30.29	35.40	41.65	49.82	61.88	86.10	684.92
CGBD-32	195.69	204.37	213.64	223.72	234.86	247.52	262.75	284.05	315.56	447.19
CGBD-33	182.31	188.62	195.32	202.62	210.75	220.13	231.38	245.95	268.51	372.44
CGBD-34	85.50	95.09	105.02	115.60	127.23	140.47	156.27	176.55	206.38	309.25
CGBD-57	12.02	13.84	16.01	18.65	22.01	26.60	33.81	50.09	123.84	662.25

Push Core Samples

Push Core Samples Wentworth Size Class
(% by volume)

March 10-12, 2009

Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
CGPC32	64.79	24.26	10.94	5.52	6.83	6.68	5.24	21.76	39.93	2.43	0.67	0.00
CGPC33	32.32	49.59	18.08	9.18	13.18	15.13	12.10	18.36	13.95	0.02	0.00	0.00
CGPC34	5.58	76.55	17.87	9.95	15.51	26.76	24.33	5.58	0.00	0.00	0.00	0.00
CGPC35	16.65	70.64	12.72	6.62	10.45	20.19	33.38	12.79	1.59	1.66	0.61	0.00
CGPC36	21.29	63.13	15.57	8.23	13.43	18.51	22.97	17.93	2.11	1.05	0.20	0.00
CGPC57	16.30	66.87	16.83	9.20	13.80	20.13	23.75	14.91	1.39	0.00	0.00	0.00
WBPC37	42.96	48.15	8.89	5.07	8.91	15.12	19.05	17.67	15.27	5.88	4.15	0.00
WBPC39	79.92	17.07	3.00	1.41	2.38	4.93	8.35	18.34	51.27	4.65	5.65	0.00
WBPC40	85.93	10.46	3.61	1.76	2.28	2.66	3.76	21.19	59.43	5.00	0.31	0.00
WBPC41	14.63	73.37	12.01	7.08	13.65	26.57	26.07	12.12	2.51	0.00	0.00	0.00
WBPC42	0.02	76.64	23.32	15.49	23.95	25.98	11.22	0.02	0.00	0.00	0.00	0.00
WBPC43	95.80	2.90	1.30	0.66	0.95	0.68	0.61	11.78	74.80	9.21	0.02	0.00
WBPC44	8.26	71.83	19.90	13.80	20.44	21.85	15.74	8.08	0.19	0.00	0.00	0.00
WBPC45	16.94	64.89	18.17	9.10	13.12	19.88	22.80	12.84	4.10	0.00	0.00	0.00
WBPC46	17.65	65.76	16.58	10.95	16.37	20.20	18.24	11.46	6.19	0.00	0.00	0.00
WBPC47	73.92	17.04	9.03	3.74	3.47	3.38	6.45	15.62	52.92	5.18	0.20	0.00
WBPC48	5.00	63.08	31.92	17.05	20.97	16.00	9.07	4.98	0.02	0.00	0.00	0.00

March 10-12, 2009
(Continued)

Depth (ft)	% Sand	%Silt	%Clay	% very fine silt	% fine silt	%med silt	%coarse silt	%very fine sand	% fine sand	%med sand	%coarse sand	%very coarse sand
WBPC51	11.57	66.24	22.20	11.69	15.92	21.42	17.21	9.70	1.88	0.00	0.00	0.00
WBPC52	21.59	57.38	21.03	11.27	16.49	18.41	11.21	13.39	8.20	0.00	0.00	0.00
WBPC53	9.40	65.88	24.73	15.55	18.93	17.69	13.70	5.01	1.51	1.22	1.65	0.00
WBPC54	35.61	52.82	11.60	6.63	9.88	15.09	21.22	31.93	3.68	0.00	0.00	0.00
WBPC55	18.89	63.25	17.85	12.21	17.67	17.26	16.11	13.79	4.82	0.28	0.00	0.00
WBPC56	35.50	49.82	14.69	7.93	10.19	12.32	19.38	23.37	5.18	3.51	3.44	0.00
WBPC996	16.30	67.42	16.28	8.52	14.26	22.00	22.64	11.27	3.39	1.52	0.11	0.00
WBPC997	7.39	65.70	26.91	14.04	18.35	19.47	13.84	6.97	0.42	0.00	0.00	0.00
WBPC998	39.92	52.53	7.55	3.14	6.10	16.78	26.51	14.92	24.15	0.85	0.00	0.00
WBPC999	42.26	45.41	12.31	6.82	10.44	13.49	14.66	15.10	19.34	4.55	3.26	0.00

Push Core Samples
Cumulative Grain Size Distributions

March 10-12, 2009

D_5-D_{50} (particle diameter in μm)

Sample	D_5	D_{10}	D_{15}	D_{20}	D_{25}	D_{30}	D_{35}	D_{40}	D_{45}	D_{50}
CGPC32	1.72	3.75	6.90	12.11	20.34	33.14	61.68	93.74	109.08	120.30
CGPC33	1.10	2.02	3.29	4.92	7.01	9.70	13.03	16.83	20.99	25.87
CGPC34	1.20	2.16	3.40	4.94	6.86	9.25	12.10	15.15	18.16	21.06
CGPC35	1.49	3.08	5.40	8.64	12.84	17.37	21.63	25.60	29.38	33.01
CGPC36	1.22	2.37	4.02	6.17	8.85	12.03	15.55	19.28	23.22	27.49
CGPC57	1.20	2.25	3.65	5.41	7.63	10.42	13.74	17.31	20.95	24.71
WBPC37	2.07	5.00	9.09	14.15	19.41	24.56	29.77	35.32	41.56	49.00
WBPC39	10.23	27.77	43.33	63.15	91.27	113.55	126.45	136.43	144.93	152.83
WBPC40	7.16	30.72	70.34	98.59	114.15	124.68	133.25	140.30	147.23	153.60
WBPC41	1.55	3.34	5.76	8.73	12.07	15.43	18.57	21.53	24.42	27.30
WBPC42	0.90	1.70	2.60	3.55	4.61	5.78	7.07	8.50	10.10	11.90
WBPC43	90.48	121.13	131.68	139.58	146.93	153.05	159.15	165.08	170.90	176.78
WBPC44	1.15	2.05	3.11	4.27	5.54	6.97	8.60	10.46	12.60	15.01
WBPC45	1.12	2.02	3.27	4.88	6.99	9.74	13.15	16.89	20.68	24.51
WBPC46	1.27	2.41	3.78	5.32	7.12	9.25	11.77	14.70	17.91	21.33
WBPC47	2.06	5.00	13.01	35.03	58.53	85.11	113.15	129.25	140.63	150.15
WBPC48	0.86	1.30	1.83	2.44	3.13	3.91	4.81	5.85	7.05	8.47
WBPC51	1.01	1.71	2.62	3.70	5.01	6.62	8.65	11.16	14.12	17.31
WBPC52	1.02	1.76	2.75	3.96	5.43	7.21	9.37	11.92	14.83	17.98
WBPC53	0.97	1.63	2.45	3.34	4.30	5.37	6.61	8.06	9.82	11.97
WBPC54	1.65	3.51	6.06	9.49	14.01	19.17	24.42	29.63	35.02	40.86
WBPC55	1.20	2.24	3.48	4.85	6.38	8.13	10.17	12.57	15.43	18.76
WBPC56	1.34	2.64	4.36	6.63	9.80	14.23	19.65	25.79	32.83	40.38
WBPC996	1.23	2.30	3.79	5.76	8.27	11.26	14.51	17.80	21.11	24.51
WBPC997	0.93	1.47	2.14	2.93	3.85	4.94	6.24	7.82	9.73	12.02
WBPC998	2.27	7.17	14.77	20.89	25.72	30.05	34.21	38.48	43.05	48.26
WBPC999	1.49	3.22	5.61	8.76	12.81	17.62	22.90	28.85	35.95	44.77

March 10-12, 2009

D_{55}-D_{100} (particle diameter in μm)

Sample	D_{55}	D_{60}	D_{65}	D_{70}	D_{75}	D_{80}	D_{85}	D_{90}	D_{95}	D_{100}
CGPC32	129.98	139.15	148.15	157.40	167.28	177.83	191.03	208.20	235.98	948.20
CGPC33	32.17	40.88	53.71	73.73	95.24	113.45	130.28	148.15	171.00	295.85
CGPC34	23.91	26.77	29.76	32.94	36.53	40.73	45.98	53.14	65.57	154.00
CGPC35	36.64	40.31	44.17	48.36	53.12	58.82	66.37	78.05	112.73	827.23
CGPC36	32.28	37.67	43.64	50.27	57.51	65.73	75.46	88.84	114.53	692.58
CGPC57	28.71	33.05	37.87	43.22	49.41	56.76	66.30	80.09	103.25	213.20
WBPC37	58.59	72.11	90.99	112.90	135.08	159.43	191.48	258.28	484.25	948.20
WBPC39	160.50	168.33	176.25	185.65	195.68	208.60	226.80	266.98	617.68	948.20
WBPC40	159.95	166.53	173.13	180.45	188.70	198.05	209.75	227.08	262.65	697.75
WBPC41	30.30	33.48	36.99	41.01	45.93	52.38	62.52	81.03	110.95	275.78
WBPC42	13.88	15.97	18.20	20.55	23.14	26.09	29.65	34.42	41.71	71.32
WBPC43	183.28	189.80	196.85	204.95	213.08	224.38	236.63	254.08	283.40	609.43
WBPC44	17.66	20.56	23.81	27.50	32.03	37.83	45.81	57.76	77.96	185.50
WBPC45	28.51	32.78	37.49	42.77	49.06	57.06	68.76	89.88	126.08	269.45
WBPC46	25.01	29.16	33.95	39.65	46.91	56.89	74.12	106.70	142.75	282.10
WBPC47	158.73	166.90	174.98	183.73	192.75	203.70	215.93	232.70	264.45	771.55
WBPC48	10.15	12.13	14.47	17.23	20.56	24.91	31.47	42.34	63.47	161.20
WBPC51	20.58	24.00	27.69	31.91	36.92	43.31	52.72	71.31	107.63	213.20
WBPC52	21.40	25.32	30.28	37.41	49.21	72.57	100.45	124.78	152.55	288.98
WBPC53	14.61	17.71	21.25	25.45	30.69	37.38	46.30	60.91	114.07	948.20
WBPC54	47.52	55.46	64.58	74.43	84.24	93.84	103.68	114.68	129.10	213.20
WBPC55	22.64	27.26	33.02	40.22	49.18	60.53	75.73	97.69	135.00	373.10
WBPC56	48.06	55.97	64.31	73.56	84.16	97.64	116.88	155.55	414.80	948.20
WBPC996	28.13	32.13	36.66	41.92	48.19	56.09	66.87	85.08	136.30	544.98
WBPC997	14.68	17.62	20.83	24.49	28.92	34.62	42.29	53.78	78.80	185.90
WBPC998	54.71	63.30	79.18	110.65	133.68	151.28	168.18	187.05	211.98	373.10
WBPC999	55.95	70.96	93.23	120.00	143.35	165.58	190.58	228.03	387.25	948.20

APPENDIX I

Suspended Sediment Flux Data:
ADCP Method and Moving Boat Method

Data Collection Trips:

April 22-23, 2009
May 5-6, 2009
May 29-30, 2009
June 16-17, 2009
July 20-23, 2009
September 22-24, 2009

Suspended Sediment Grain Size Fluxes

April 22-23, 2009

ADCP Backscatter Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
WBDMR	24084.63	6630.24	4916.16	5416.02	3834.33	2348.76	885.89	53.50	0.00	0.00	0.00

Moving Boat Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
WBDMR	25644.93	7059.77	5234.64	5766.89	4082.73	2500.92	943.29	56.96	0.00	0.00	0.00

May 5-6, 2009

ADCP Backscatter Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	147296.51	42129.50	25282.12	31752.95	26918.13	14796.05	4710.25	1577.31	124.43	5.98	0.00
R4.5	152890.26	40900.57	24655.88	31625.50	27622.32	14567.63	5754.22	4785.16	966.28	2015.33	0.00
WBDMR	12986.52	3513.53	2062.37	2653.64	2460.90	1560.91	695.00	40.20	0.00	0.00	0.00

Moving Boat Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	164295.33	46991.48	28199.81	35417.42	30024.63	16503.59	5253.84	1759.34	138.79	6.67	0.00
R4.5	148178.10	39639.99	23895.97	30650.79	26770.98	14118.65	5576.88	4637.68	936.50	1953.21	0.00
WBDMR	13183.60	3566.85	2093.66	2693.91	2498.25	1584.59	705.54	40.81	0.00	0.00	0.00

May 29-30, 2009

ADCP Backscatter Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	333525.54	80435.97	59586.78	69110.66	52919.28	36621.52	23433.85	9260.94	1040.96	1114.30	0.00
R4.5	324224.90	78327.56	57998.65	67923.93	51912.51	36087.37	22785.18	8189.81	505.25	493.70	0.00
GP	39949.80	8990.15	6883.24	7866.17	6066.60	4771.34	4166.82	1188.22	16.75	0.00	0.00
BCB	57019.76	11604.09	8631.37	10157.60	7890.58	5538.42	4170.28	5953.54	3054.41	22.14	0.00
WBDMR	33803.16	7661.46	5697.32	6691.95	5230.73	3841.92	2817.85	1339.27	188.39	333.30	0.00
R4.9	730.30	204.53	148.85	164.81	125.42	73.71	12.53	0.37	0.00	0.00	0.00
CGRP	2899.53	667.68	546.32	681.41	500.56	320.95	151.80	30.90	0.03	0.00	0.00
CGBB	11027.72	2098.13	1704.61	2147.92	1593.14	1052.54	672.87	554.40	294.78	909.28	0.00
CGOP	3711.62	884.87	671.12	805.36	611.40	414.37	251.34	73.26	0.01	0.00	0.00
CGMP	22024.33	5058.88	3806.17	4619.60	3677.33	2618.69	1584.82	607.76	36.81	14.15	0.00

May 29-30, 2009
(continued)

Moving Boat Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	363684.16	87860.29	65057.28	76190.50	58230.44	40479.32	25558.21	9186.53	566.74	553.78	0.00
R4.5	348784.24	78489.05	60094.56	68676.10	52964.82	41656.51	36378.73	10373.81	146.20	0.00	0.00
GP	44464.06	9048.88	6730.75	7920.90	6153.08	4318.87	3251.99	4642.57	2381.83	17.27	0.00
BCB	50460.58	11436.85	8504.82	9989.60	7808.31	5735.13	4206.42	1999.23	281.23	497.54	0.00
WBDMR	33954.86	7695.84	5722.88	6721.99	5254.20	3859.16	2830.49	1345.28	189.24	334.79	0.00
R4.9	1007.52	232.00	189.83	236.78	173.93	111.52	52.75	10.74	0.01	0.00	0.00
CGRP	3855.67	733.58	595.99	750.99	557.02	368.00	235.26	193.84	103.07	317.92	0.00
CGBB	14848.18	3539.89	2684.80	3221.81	2445.87	1657.68	1005.48	293.08	0.04	0.00	0.00
CGOP	3968.28	911.49	685.78	832.35	662.57	471.83	285.55	109.50	6.63	2.55	0.00
CGMP	27919.42	6440.04	4886.46	5784.66	4423.22	3040.25	1874.90	936.89	258.69	274.19	0.00

June 16-17, 2009

ADCP Backscatter Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	145938.65	43054.26	25229.50	30909.77	24895.92	12955.91	5320.23	3099.09	128.78	349.38	0.00
R4.5	182801.59	46194.61	31829.90	38001.71	29924.74	20457.52	11508.50	4320.00	284.87	278.35	0.00
GP	11857.83	2855.29	2135.17	2446.73	1791.98	1307.11	966.49	349.83	4.97	0.00	0.00
BCB	23403.33	6504.06	4653.04	4913.85	3397.71	2065.34	1576.56	293.13	0.02	0.00	0.00
WBD	13077.56	3752.72	2657.66	2831.18	1903.68	1100.19	457.17	186.42	92.51	96.61	0.00
CGRP	787.19	249.42	173.95	190.18	126.63	46.07	0.97	0.00	0.00	0.00	0.00
CGBB	2416.45	765.98	535.81	584.85	383.67	129.13	16.89	0.21	0.00	0.00	0.00
CGOP	900.70	282.97	197.73	213.42	140.83	62.12	3.67	0.00	0.00	0.00	0.00
CGMP	5719.11	1765.51	1251.53	1373.63	928.50	385.11	15.17	0.00	0.00	0.00	0.00

June 16-17, 2009
(continued)

Moving Boat Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	171978.44	43459.56	29945.34	35751.74	28152.98	19246.29	10827.12	4064.22	268.00	261.87	0.00
R4.5	145562.61	35050.55	26210.57	30035.23	21997.74	16045.69	11864.24	4294.38	61.01	0.00	0.00
GP	15809.01	4393.51	3143.14	3319.32	2295.16	1395.14	1064.97	198.01	0.01	0.00	0.00
BCB	18232.76	3726.81	2627.11	2860.34	1685.05	731.57	221.67	6.49	0.00	0.00	0.00
WBD	11859.21	3726.81	2627.11	2860.34	1685.05	731.57	221.67	6.49	0.00	0.00	0.00
CGRP	1166.74	369.84	258.71	282.38	185.25	62.35	8.15	0.10	0.00	0.00	0.00
CGBB	3500.62	1099.78	768.50	829.47	547.35	241.45	14.25	0.00	0.00	0.00	0.00
CGOP	1067.01	329.39	233.50	256.28	173.23	71.85	2.83	0.00	0.00	0.00	0.00
CGMP	8575.08	2507.65	1742.20	1933.19	1334.79	680.22	271.73	87.28	8.52	9.69	0.00

July 20-23, 2009

ADCP Backscatter Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	13305.14	3887.94	4036.23	3275.77	1438.11	251.31	166.02	206.23	30.86	12.64	0.00
R4.5	11969.10	4497.69	3192.18	2532.87	1237.42	312.05	65.23	92.09	28.67	10.91	0.00
GP	1429.06	1026.66	296.38	105.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00
BCB	2923.98	1062.81	581.02	669.03	439.89	137.69	33.56	0.00	0.00	0.00	0.00
WBD	1979.56	654.51	464.73	405.86	230.17	74.17	59.01	83.61	7.15	0.36	0.00
R4.9	38.41	15.83	8.03	8.52	4.39	1.54	0.10	0.00	0.00	0.00	0.00
CGRP	95.79	48.88	19.06	13.52	7.95	3.89	1.17	1.18	0.13	0.00	0.00
CGBB	339.25	129.22	85.98	61.67	33.85	14.79	3.43	8.20	1.92	0.18	0.00
CGOP	58.51	35.20	8.59	5.96	4.30	2.68	0.70	1.02	0.06	0.00	0.00
CGMP	915.92	753.07	140.92	21.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00

July 20-23, 2009
(continued)

Moving Boat Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	13465.41	5059.97	3591.24	2849.51	1392.11	351.06	73.39	103.60	32.26	12.28	0.00
R4.5	10741.27	7716.72	2227.67	796.48	0.26	0.00	0.00	0.00	0.00	0.00	0.00
GP	1702.80	618.93	338.36	389.61	256.17	80.18	19.54	0.00	0.00	0.00	0.00
BCB	8256.79	3001.18	1640.69	1889.22	1242.17	388.81	94.75	0.01	0.00	0.00	0.00
WBD	1621.34	668.19	339.02	359.80	185.40	64.82	4.05	0.00	0.00	0.00	0.00
R4.9	87.47	44.64	17.41	12.35	7.26	3.55	1.07	1.08	0.12	0.00	0.00
CGRP	103.71	39.50	26.29	18.85	10.35	4.52	1.05	2.51	0.59	0.06	0.00
CGBB	363.07	218.44	53.27	37.01	26.69	16.62	4.35	6.34	0.34	0.00	0.00
CGOP	61.05	50.20	9.39	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGMP	1046.05	502.91	227.32	171.19	88.79	31.33	10.04	12.49	1.70	0.27	0.00

September 22-24, 2009

ADCP Backscatter Method

Station	Total Flux (Tons/Day)	Clay	very fine silt (tons/day)	fine silt (tons/day)	med silt (tons/day)	coarse silt (tons/day)	very fine sand (tons/day)	fine sand (tons/day)	med sand (tons/day)	coarse sand (tons/day)	very coarse sand (tons/day)
R5.2	3842.62	1834.34	1062.75	574.32	238.94	71.75	18.65	9.47	23.19	9.21	0.00
R4.5	2579.46	1211.08	764.12	373.15	157.00	39.05	18.33	12.66	3.77	0.31	0.00
GP	2369.68	1169.03	459.53	341.16	192.63	95.47	46.78	38.86	25.40	0.76	0.00
BCB	976.99	382.36	267.36	165.20	81.92	32.14	20.64	24.07	3.30	0.00	0.00
WBD	2016.69	790.80	454.47	324.48	215.02	116.78	56.52	49.69	8.59	0.35	0.00
R4.9	12.65	6.59	2.54	1.86	1.03	0.37	0.12	0.07	0.06	0.01	0.00
CGRP	109.33	60.08	23.89	14.16	6.69	2.46	1.15	0.78	0.12	0.00	0.00
CGBB	278.03	168.45	57.62	33.47	14.16	2.43	0.85	0.80	0.24	0.00	0.00
CGOP	24.16	12.15	6.10	3.65	1.62	0.38	0.14	0.10	0.01	0.00	0.00
CGMP	531.41	217.93	148.00	92.31	47.50	17.08	5.01	3.34	0.24	0.00	0.00

September 22-24, 2009
(continued)

Moving Boat Method

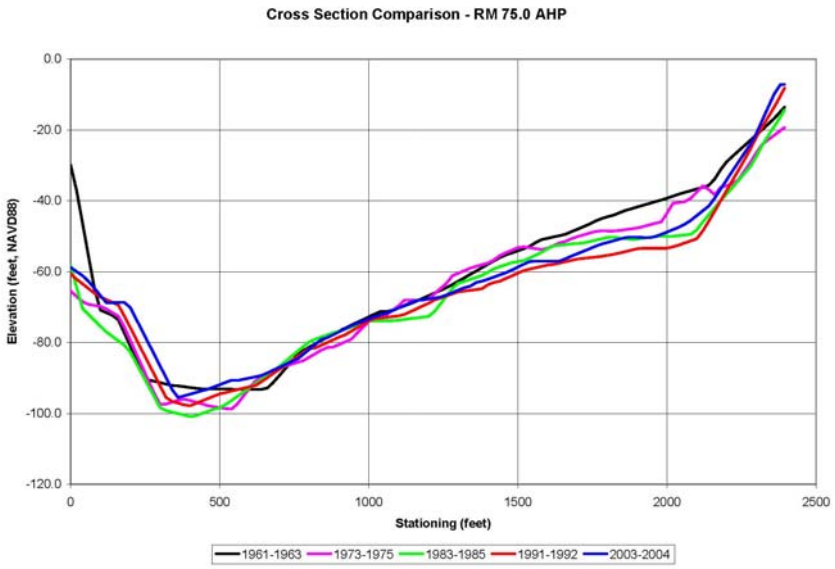
Station	Flux/Tons/Day Method 2	Clay	very fine silt	fine silt	med silt	coarse silt	very fine sand	fine sand	med sand	coarse sand	very coarse sand
R5.2	4494.74	2110.32	1331.49	650.22	273.57	68.05	31.93	22.06	6.56	0.54	0.00
R4.5	3024.70	1492.17	586.55	435.47	245.88	121.86	59.71	49.60	32.42	0.97	0.00
GP	3115.98	1219.49	852.72	526.90	261.26	102.52	65.83	76.78	10.52	0.00	0.00
BCB	1079.37	422.43	295.38	182.52	90.50	35.51	22.80	26.60	3.64	0.00	0.00
WBD	1997.05	1040.18	400.85	293.33	162.20	58.19	18.67	11.72	9.91	2.00	0.00
R4.9	15.10	8.30	3.30	1.95	0.92	0.34	0.16	0.11	0.02	0.00	0.00
CGRP	125.27	75.89	25.96	15.08	6.38	1.10	0.38	0.36	0.11	0.00	0.00
CGBB	314.57	158.29	79.48	47.57	21.07	4.88	1.87	1.29	0.11	0.00	0.00
CGOP	28.05	11.50	7.81	4.87	2.51	0.90	0.26	0.18	0.01	0.00	0.00
CGMP	597.98	287.82	144.91	89.09	44.52	16.33	7.13	5.94	2.01	0.24	0.00

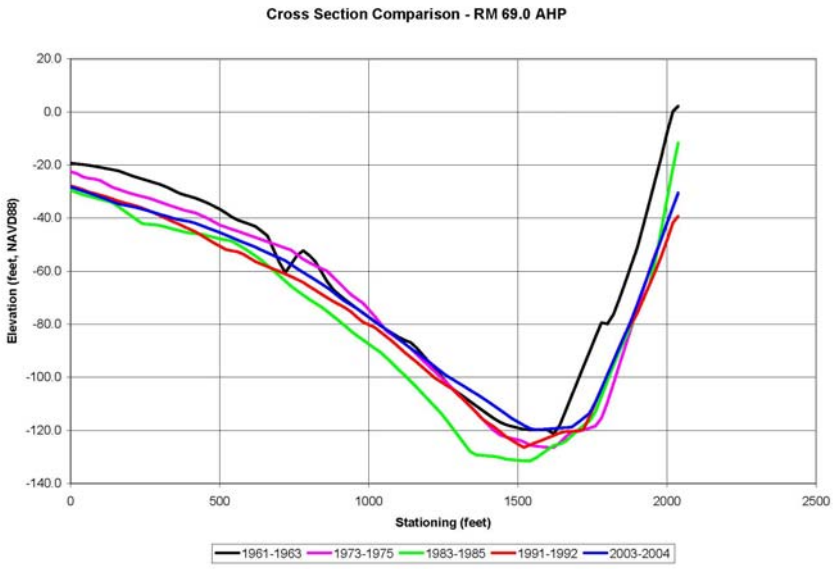
APPENDIX J

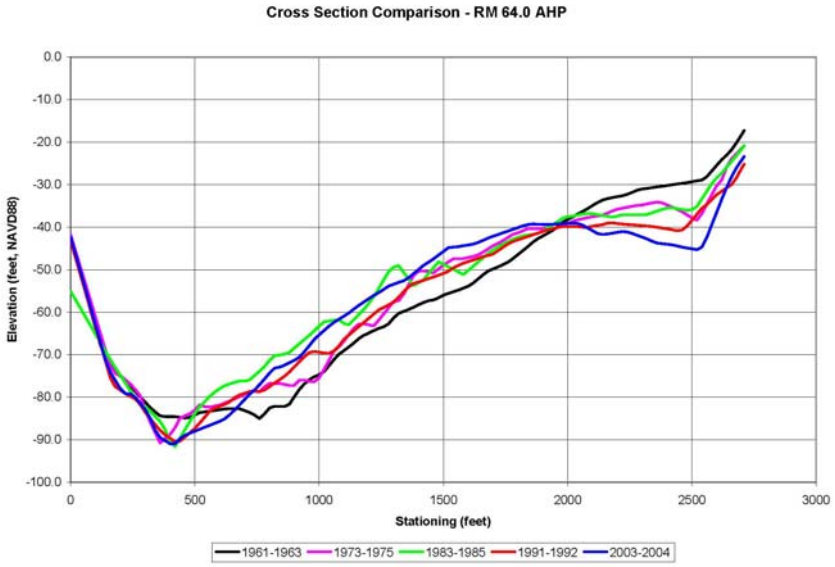
Geometric Cross Section Data

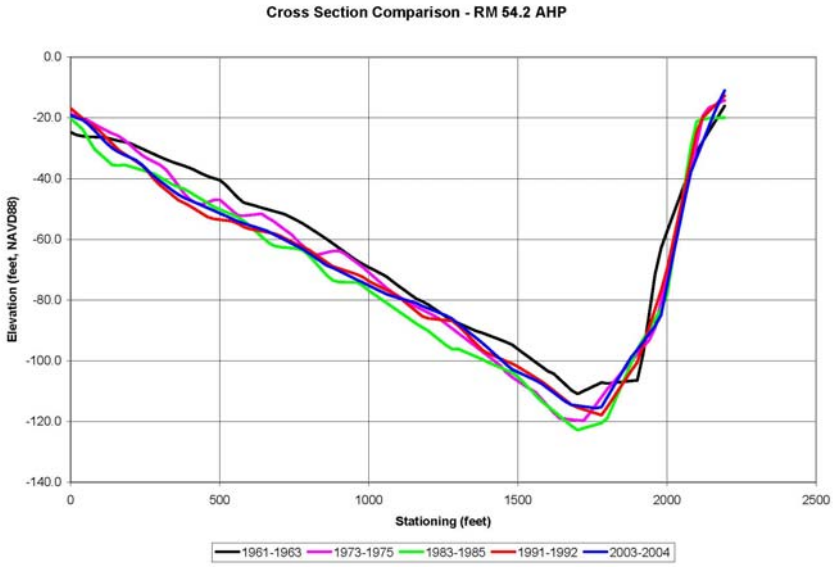
Section 1 – Comparative Cross Section Plots
Section 2 – Cross Sections for 1997 Spring Flood
Section 3 – Cross Sections for 2008 Spring Flood
Section 4 – Cross Sections for Hurricane Katrina 2005

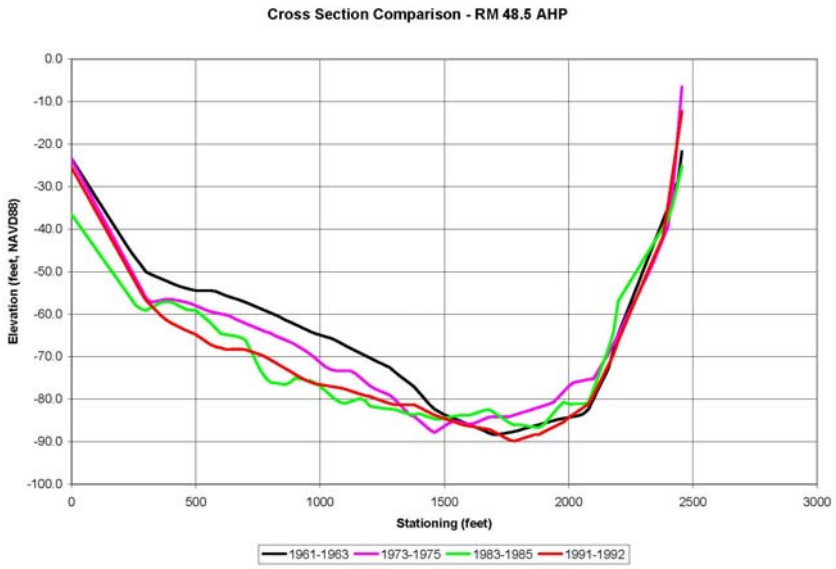
Section 1 - Comparative Cross Section Plots

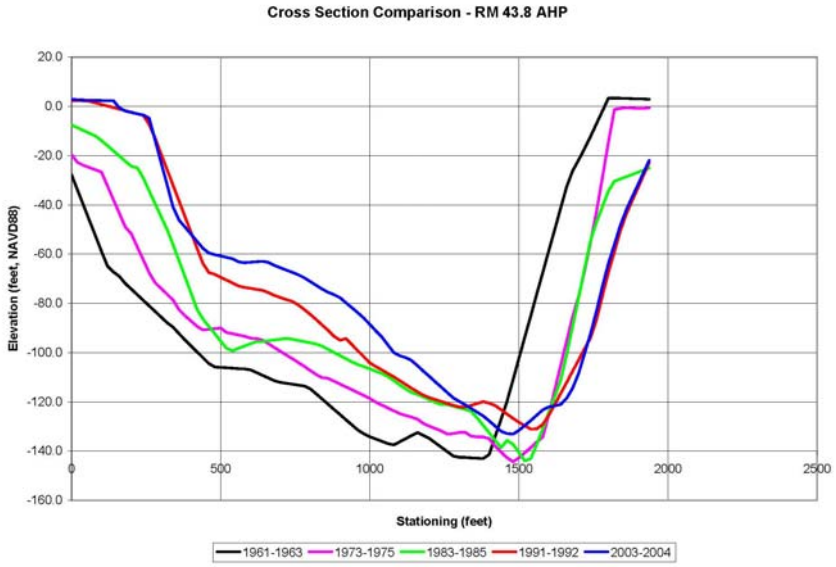

Cross Section Comparison - RM 75.0 AHP
Elevation (feet, NAVD88)
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

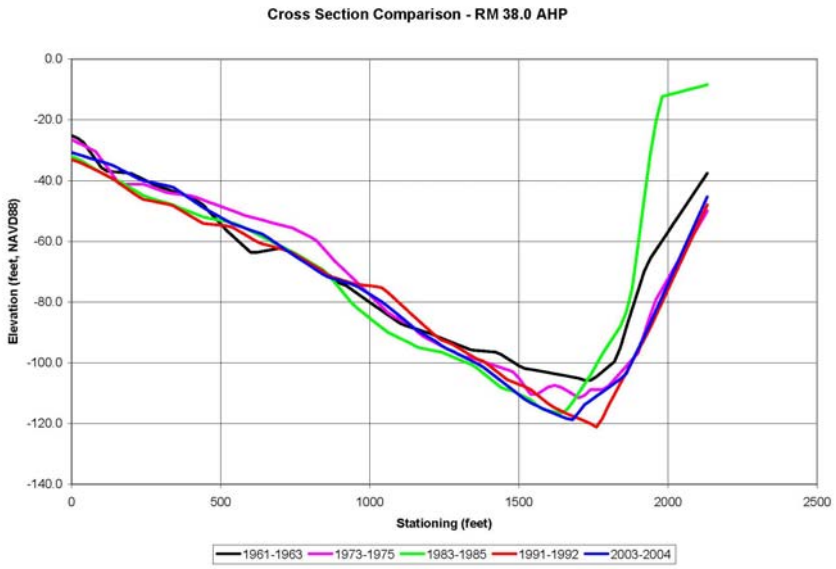

Cross Section Comparison - RM 69.0 AHP
Elevation (feet, NAVD88)
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

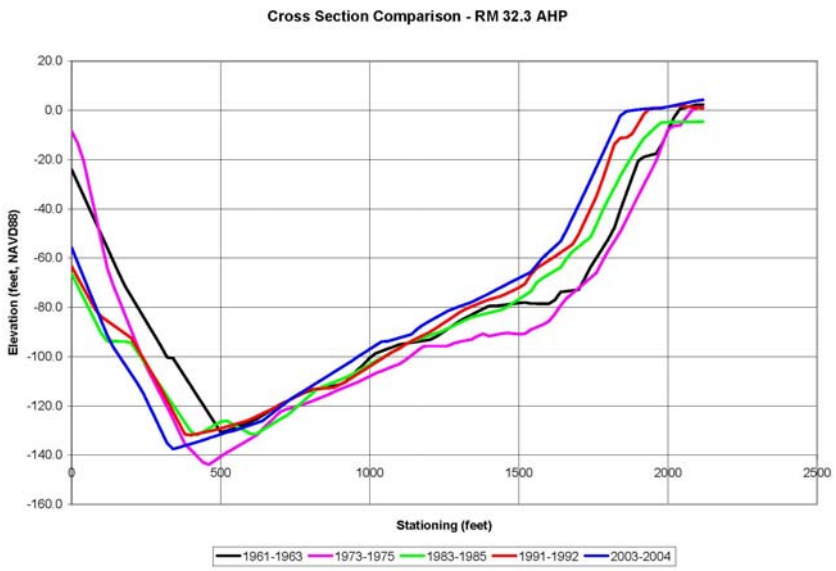

Cross Section Comparison - RM 64.0 AHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
0
500
1000
1500
2000
2500
3000
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

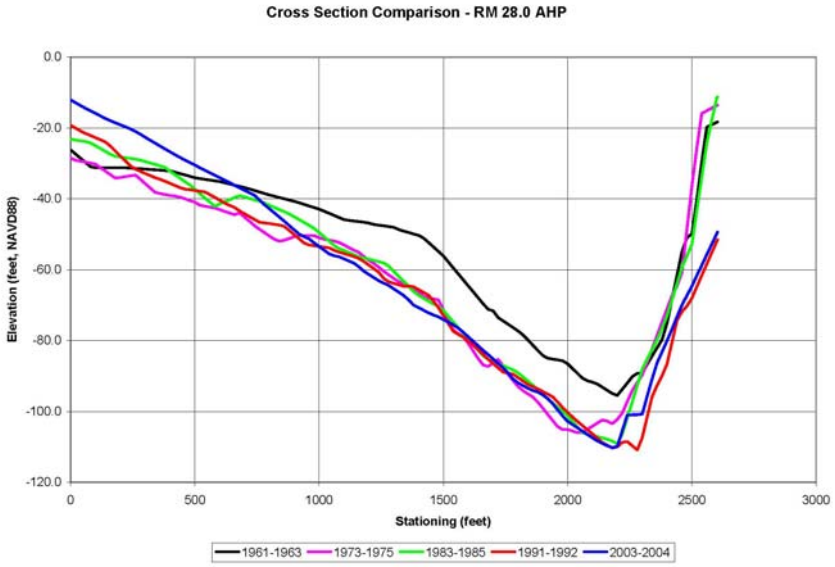

Cross Section Comparison - RM 54.2 AHP
Elevation (feet, NAVD88)
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

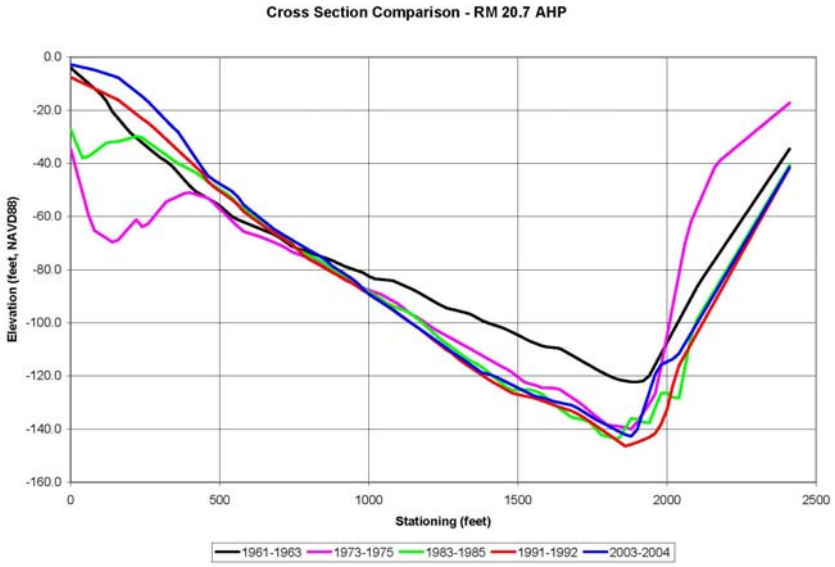

Cross Section Comparison - RM 48.5 AHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
0
500
1000
1500
2000
2500
3000
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992

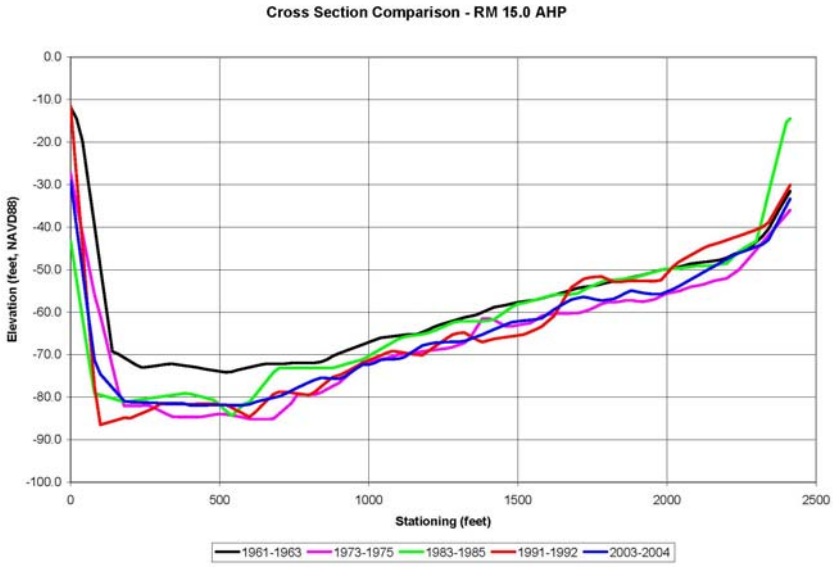

Cross Section Comparison - RM 43.8 AHP
Elevation (feet, NAVD88)
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

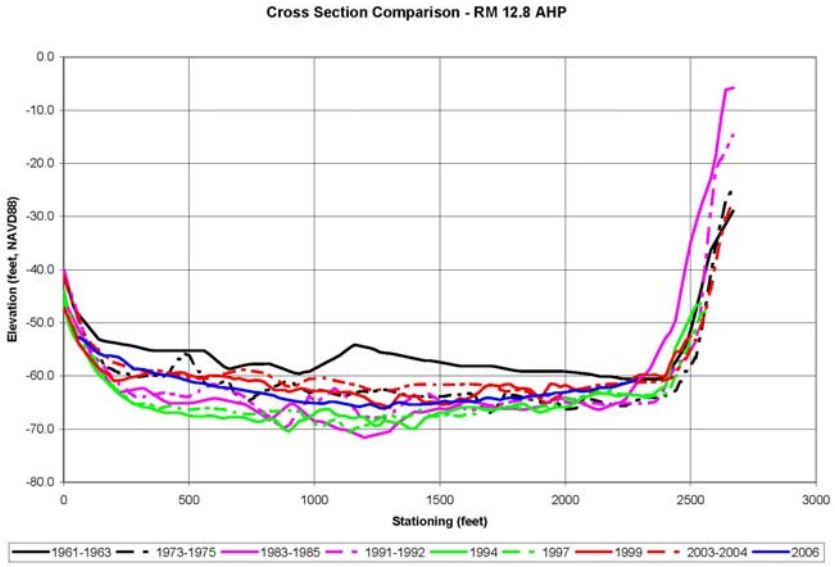

Cross Section Comparison - RM 38.0 AHP
Elevation (feet, NAVD88)
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

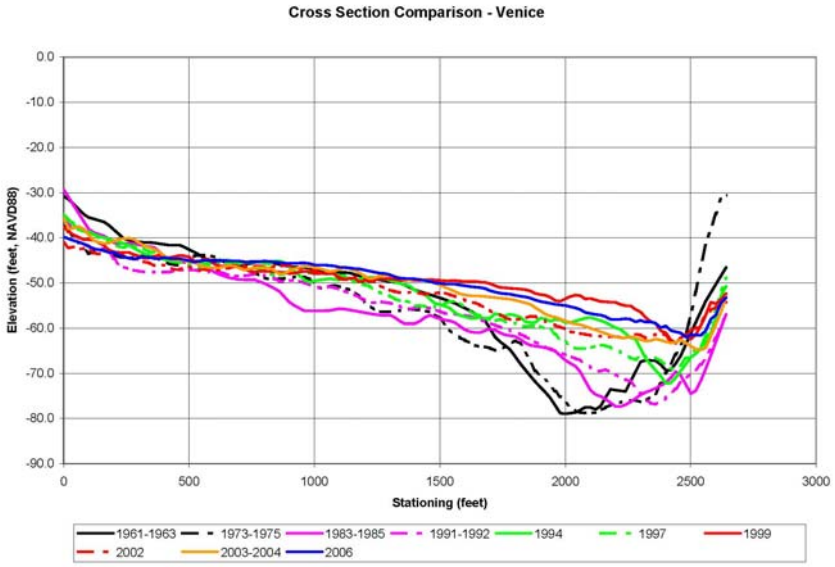

Cross Section Comparison - RM 32.3 AHP
Elevation (feet, NAVD88)
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

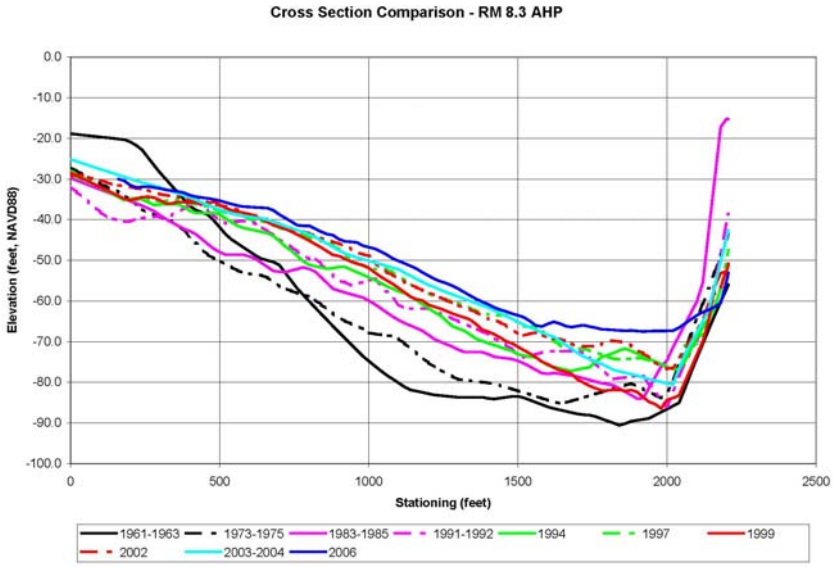

Cross Section Comparison - RM 28.0 AHP
Elevation (feet, NAVD88)
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
0
500
1000
1500
2000
2500
3000
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

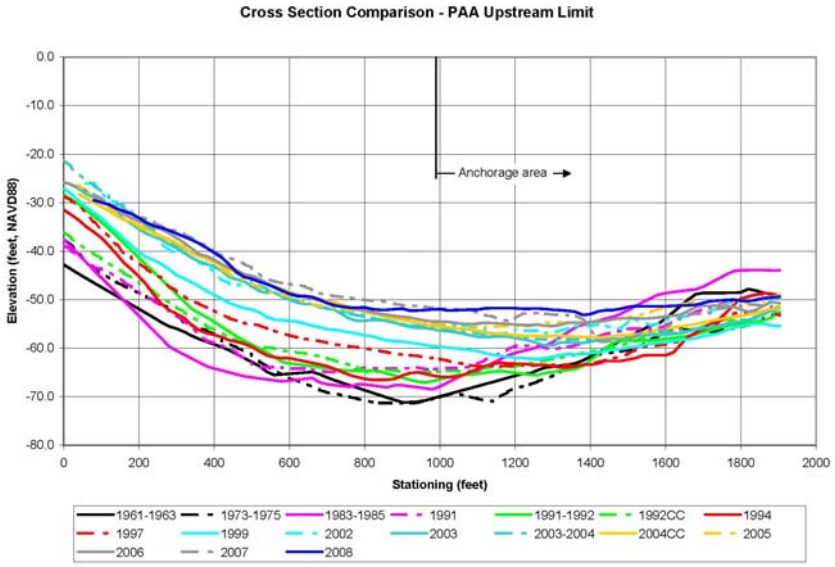

Cross Section Comparison - RM 20.7 AHP
Elevation (feet, NAVD88)
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

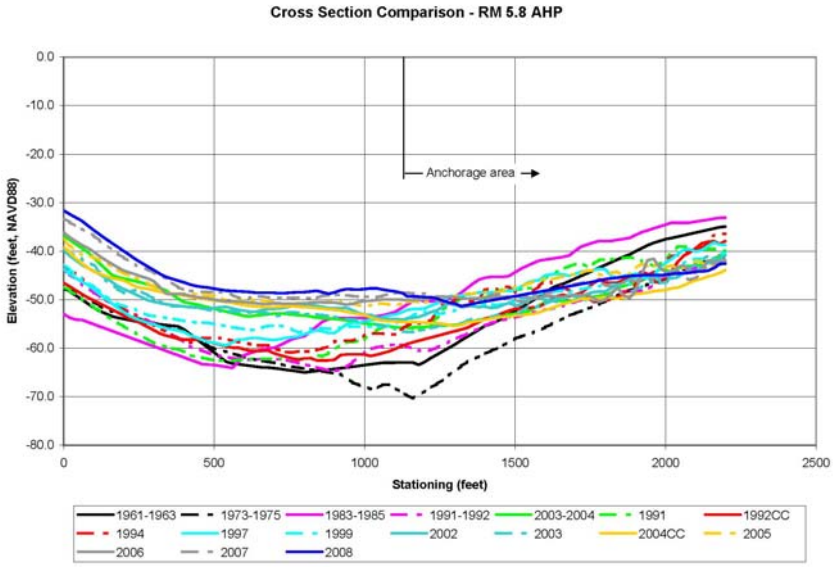

Cross Section Comparison - RM 15.0 AHP
Elevation (feet, NAVD88)
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004

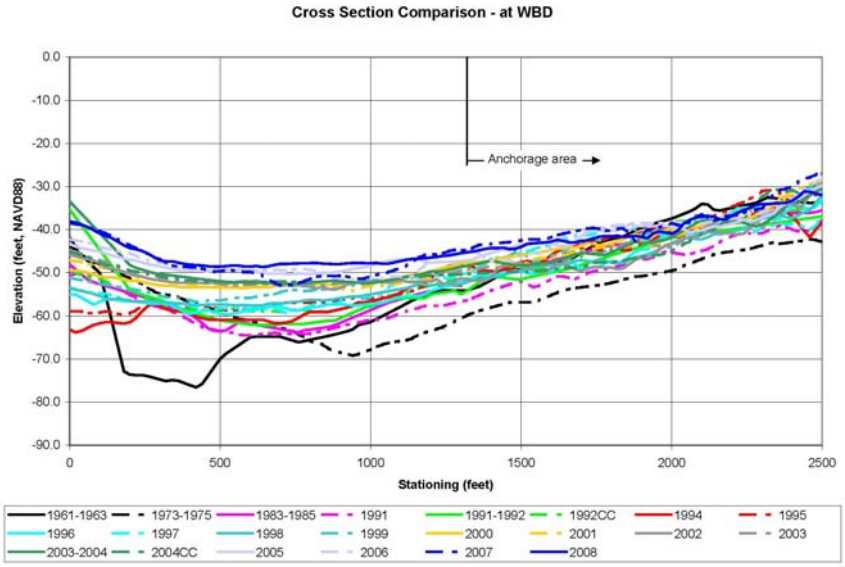

Cross Section Comparison - RM 12.8 AHP
Elevation (feet, NAVD88)
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
1994
1997
1999
2003-2004
2006

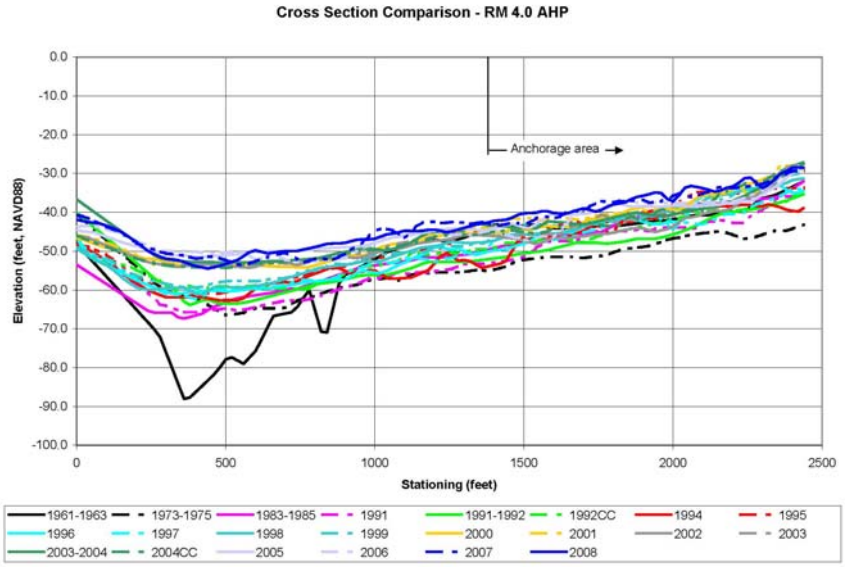

Cross Section Comparison - Venice
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
0
500
1000
1500
2000
2500
3000
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
1994
1997
1999
2002
2003-2004
2006

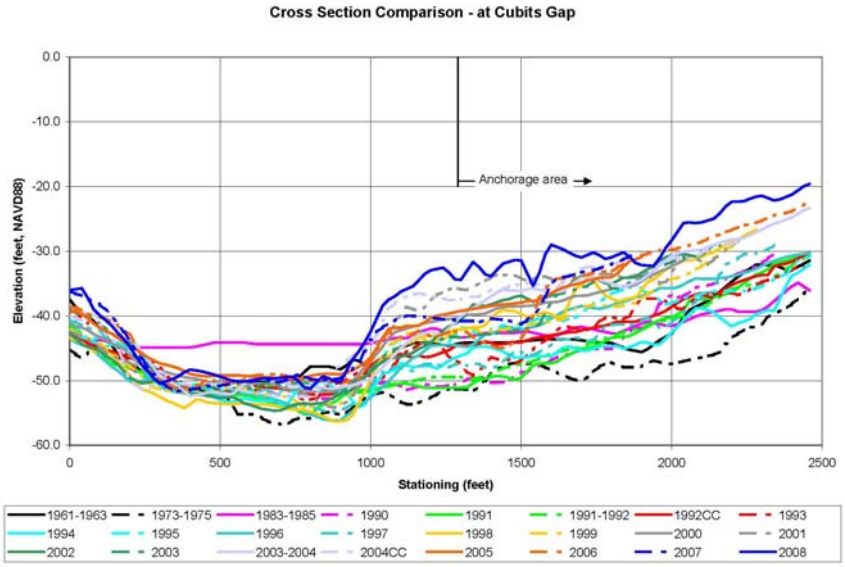

Cross Section Comparison - RM 8.3 AHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1983-1985
1991-1992
1994
1997
1999
2002
2003-2004
2006

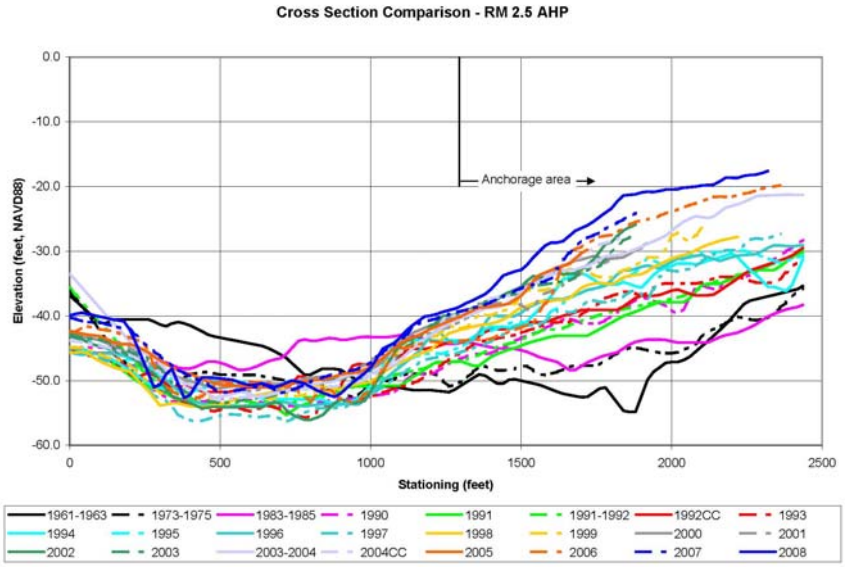

Cross Section Comparison - PAA Upstream Limit
Elevation (feet, NAVD88)
Stationing (feet)
Anchorage area
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
1961-1963
1973-1975
1983-1985
1991
1991-1992
1992CC
1994
1997
1999
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

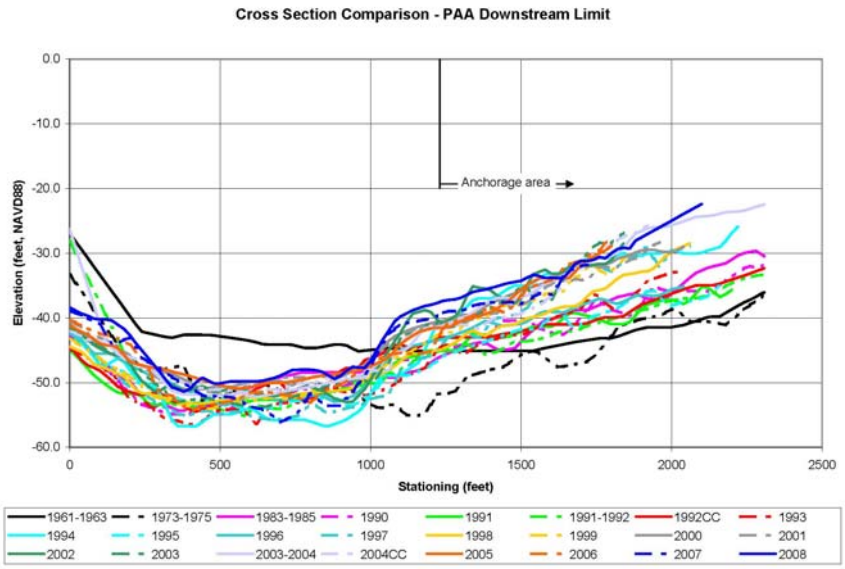

Cross Section Comparison - RM 5.8 AHP
Elevation (feet, NAVD88)
Stationing (feet)
Anchorage area
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
0
500
1000
1500
2000
2500
1961-1963
1973-1975
1983-1985
1991-1992
2003-2004
1991
1992CC
1994
1997
1999
2002
2003
2004CC
2005
2006
2007
2008

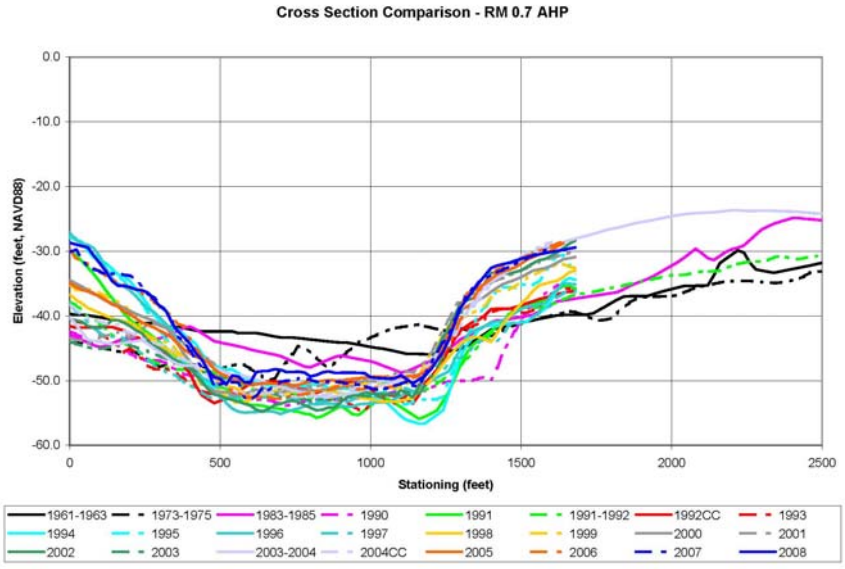

Cross Section Comparison - at WBD
Anchorage area
Elevation (feet, NAVD88)
Stationing (feet)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
0
500
1000
1500
2000
2500
1961-1963
1973-1975
1983-1985
1991
1991-1992
1992CC
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

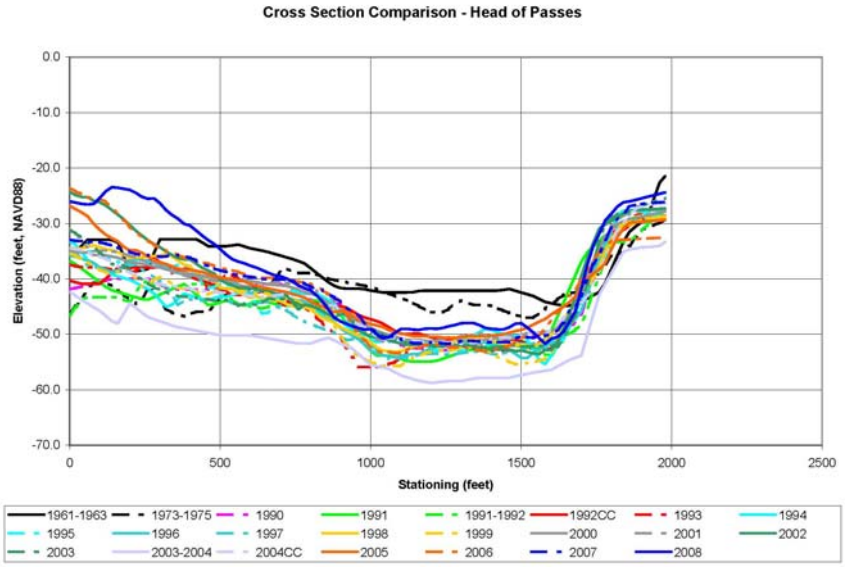

Cross Section Comparison - RM 4.0 AHP
Anchorage area
Elevation (feet, NAVD88)
Stationing (feet)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
0
500
1000
1500
2000
2500
1961-1963
1973-1975
1983-1985
1991
1991-1992
1992CC
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

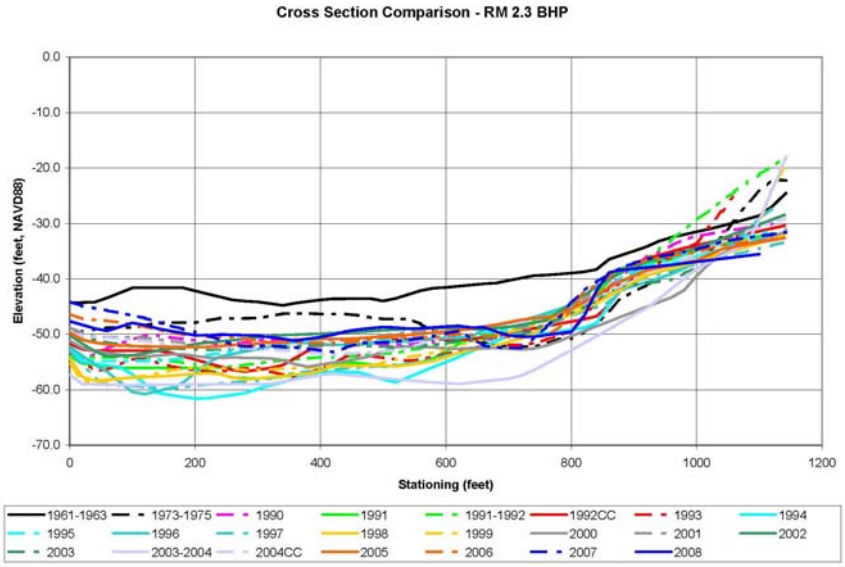

Cross Section Comparison - at Cubits Gap
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing (feet)
Anchorage area
1961-1963
1973-1975
1983-1985
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

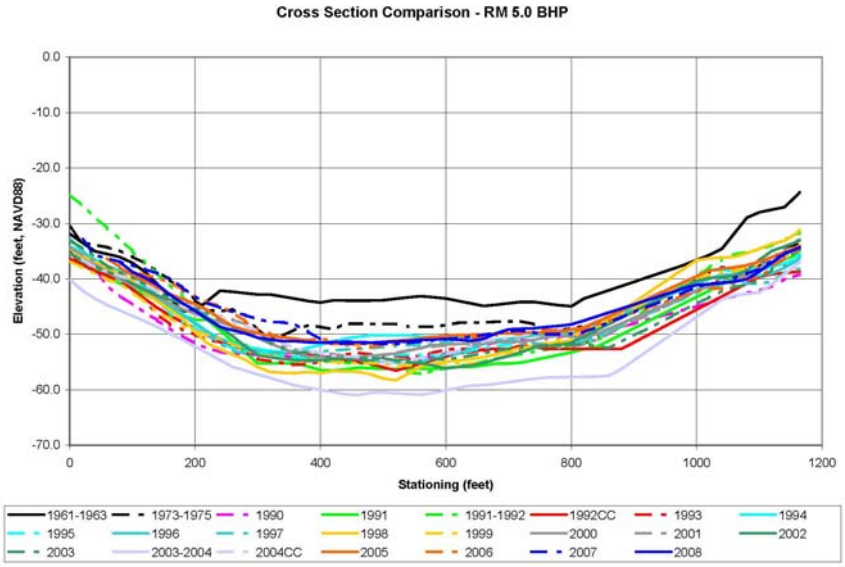

Cross Section Comparison - RM 2.5 AHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing (feet)
Anchorage area
1961-1963
1973-1975
1983-1985
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

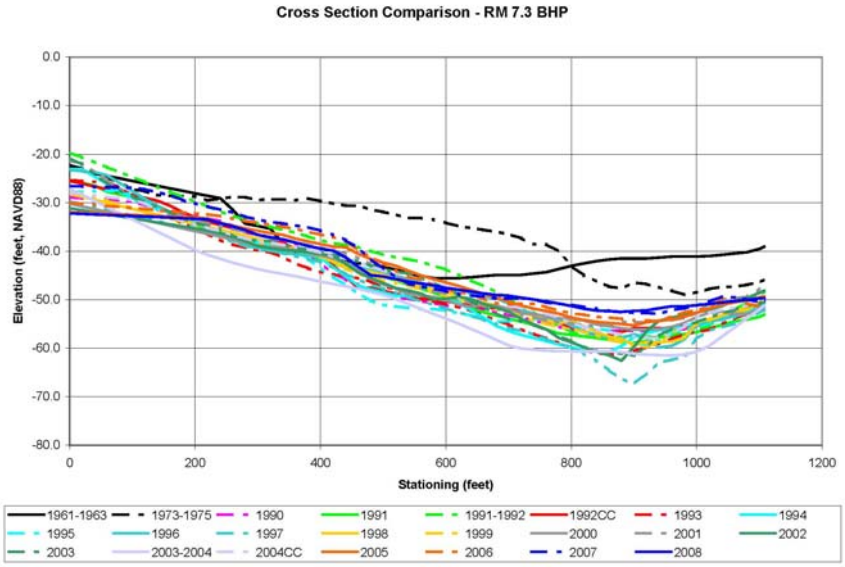

Cross Section Comparison - PAA Downstream Limit
Anchorage area
Elevation (feet, NAVD88)
Stationing (feet)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
1961-1963
1973-1975
1983-1985
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

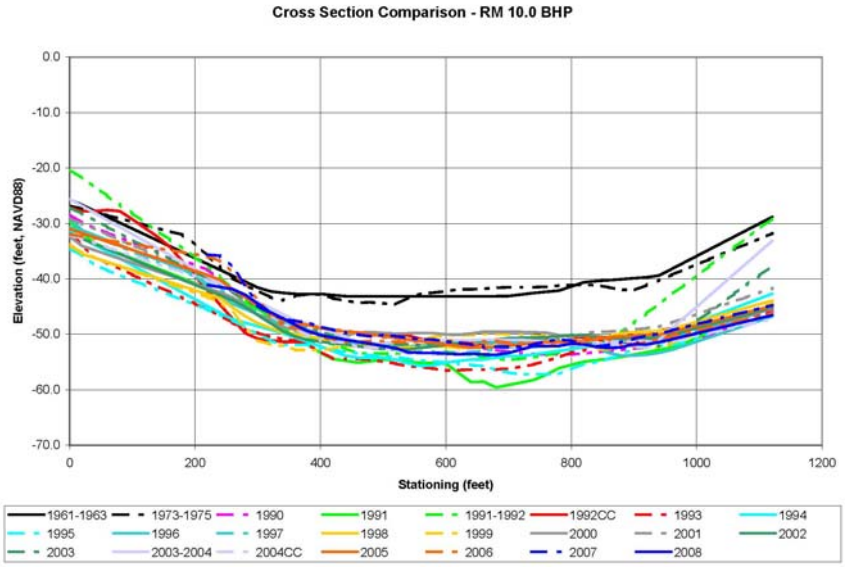

Cross Section Comparison - RM 0.7 AHP
Elevation (feet, NAVD88)
Stationing (feet)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
1961-1963
1973-1975
1983-1985
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

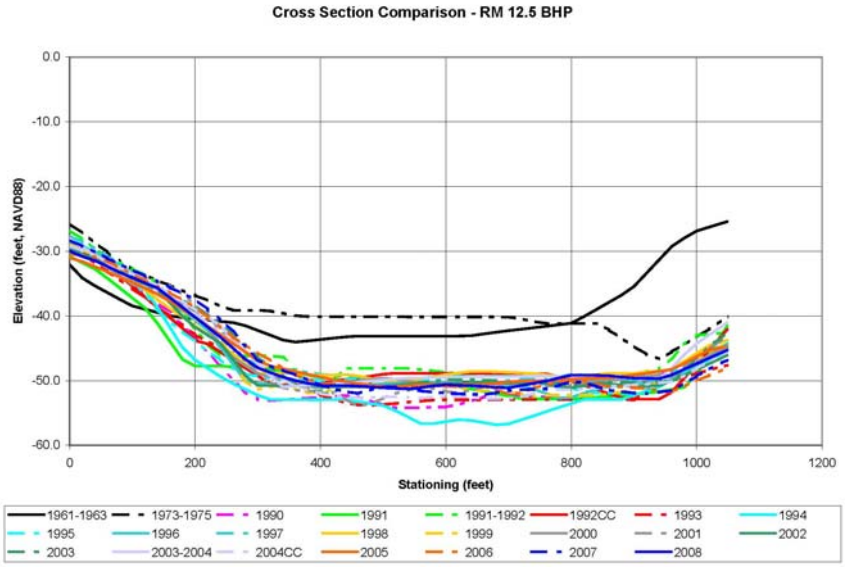

Cross Section Comparison - Head of Passes
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
500
1000
1500
2000
2500
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

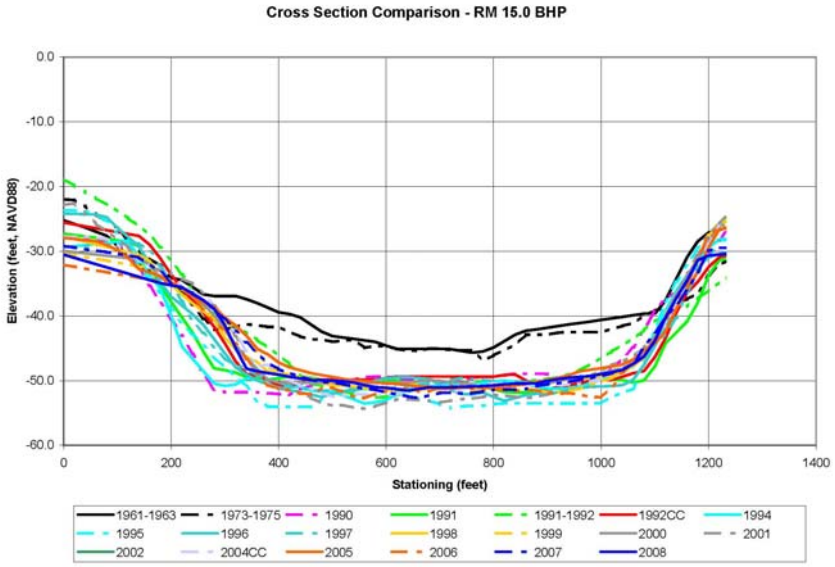

Cross Section Comparison - RM 2.3 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
200
400
600
800
1000
1200
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

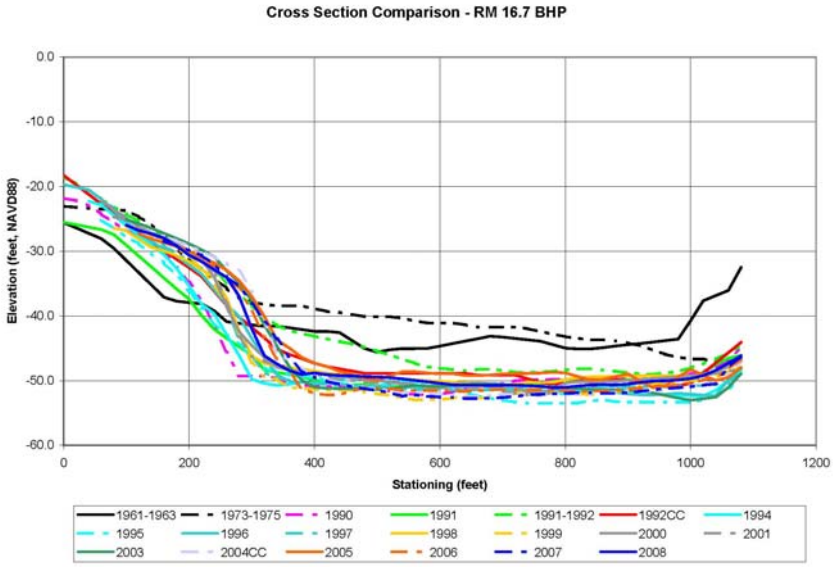

Cross Section Comparison - RM 5.0 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
200
400
600
800
1000
1200
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

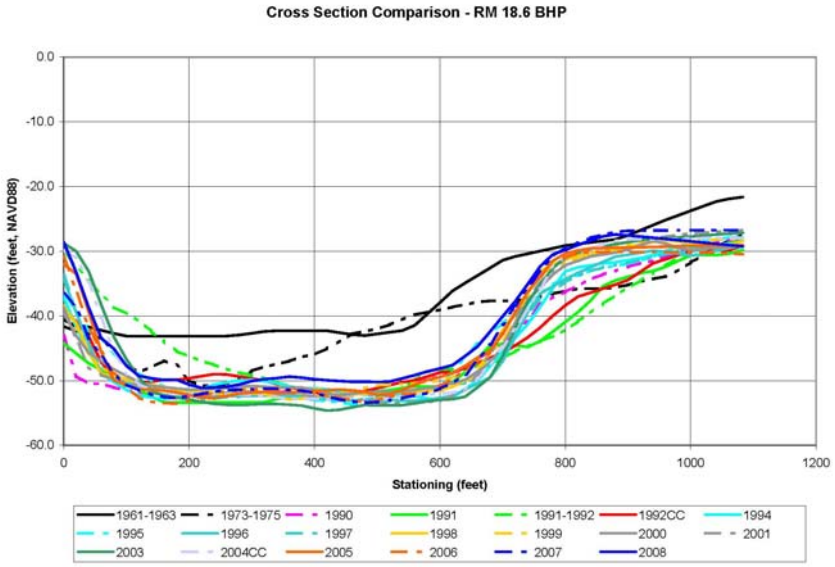

Cross Section Comparison - RM 7.3 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
0
200
400
600
800
1000
1200
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008


Cross Section Comparison - RM 10.0 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
200
400
600
800
1000
1200
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

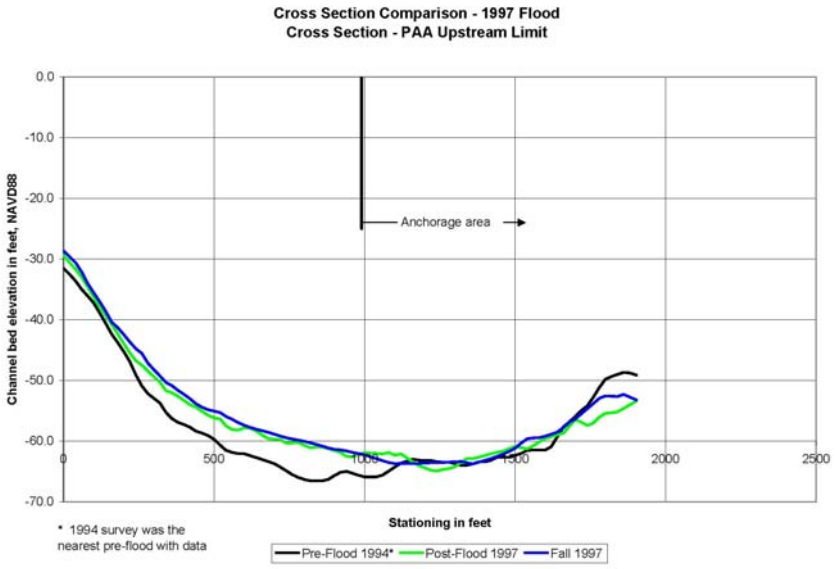

Cross Section Comparison - RM 12.5 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2003-2004
2004CC
2005
2006
2007
2008

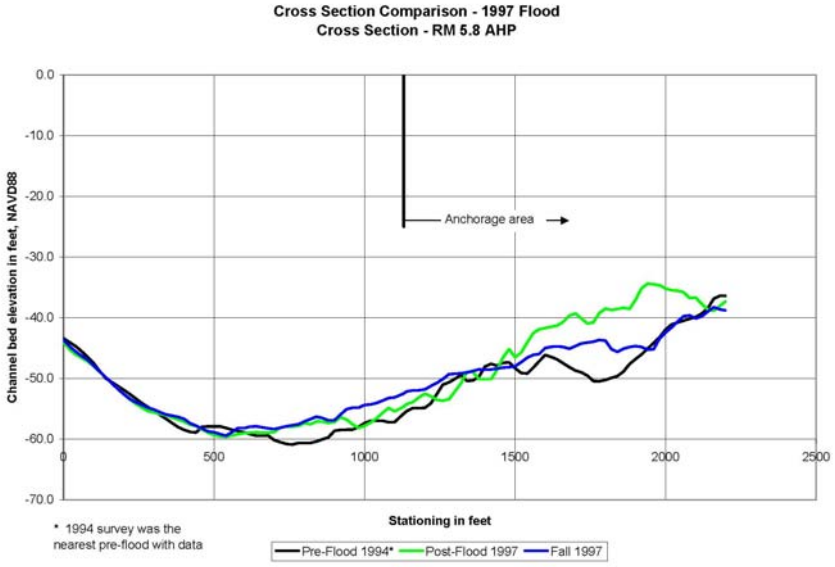

Cross Section Comparison - RM 15.0 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1994
1995
1996
1997
1998
1999
2000
2001
2002
2004CC
2005
2006
2007
2008

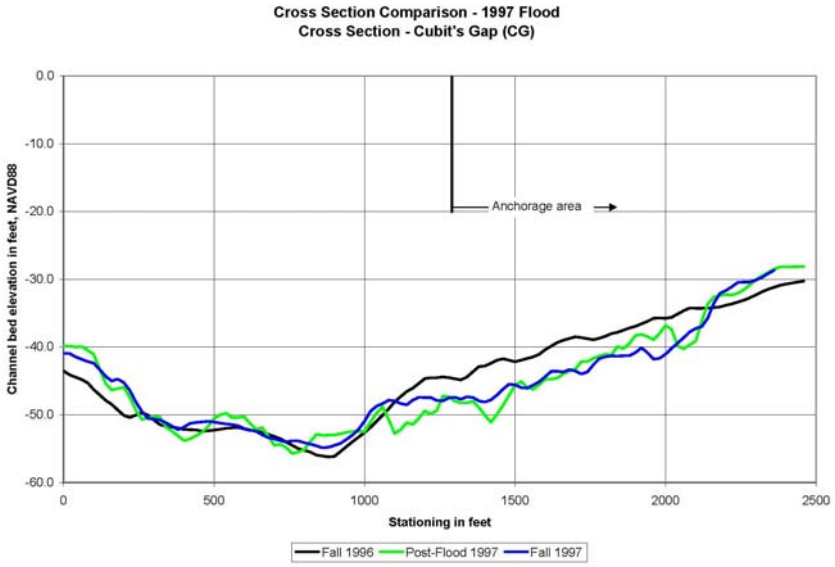

Cross Section Comparison - RM 16.7 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1994
1995
1996
1997
1998
1999
2000
2001
2003
2004CC
2005
2006
2007
2008

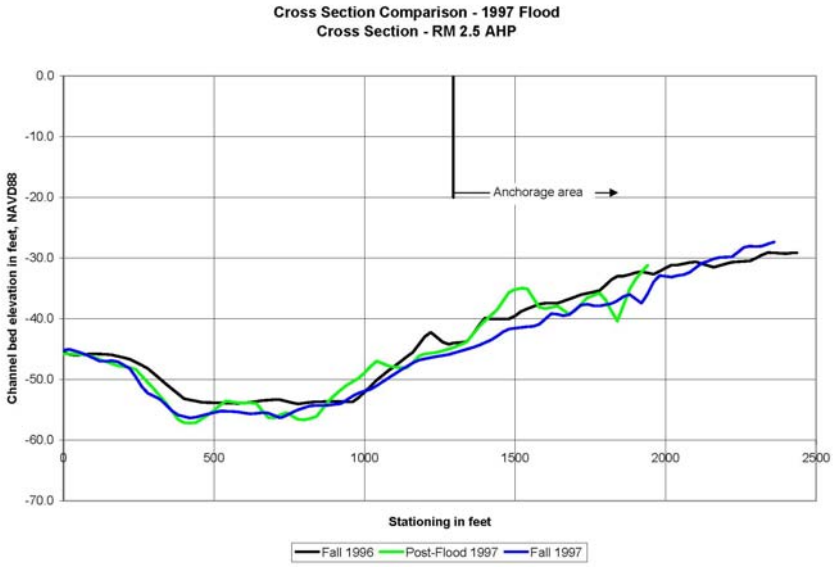

Cross Section Comparison - RM 18.6 BHP
Elevation (feet, NAVD88)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing (feet)
1961-1963
1973-1975
1990
1991
1991-1992
1992CC
1994
1995
1996
1997
1998
1999
2000
2001
2003
2004CC
2005
2006
2007
2008

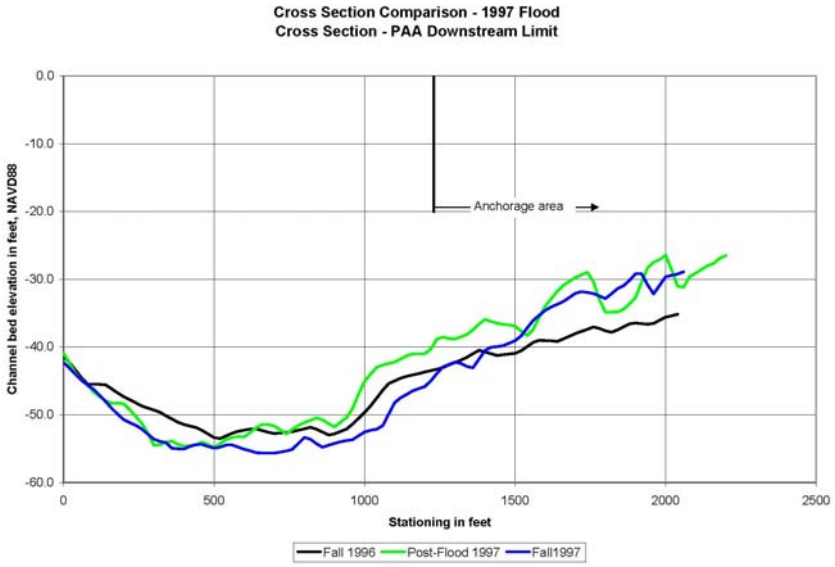
Section 2 – Cross Sections for 1997 Spring Flood

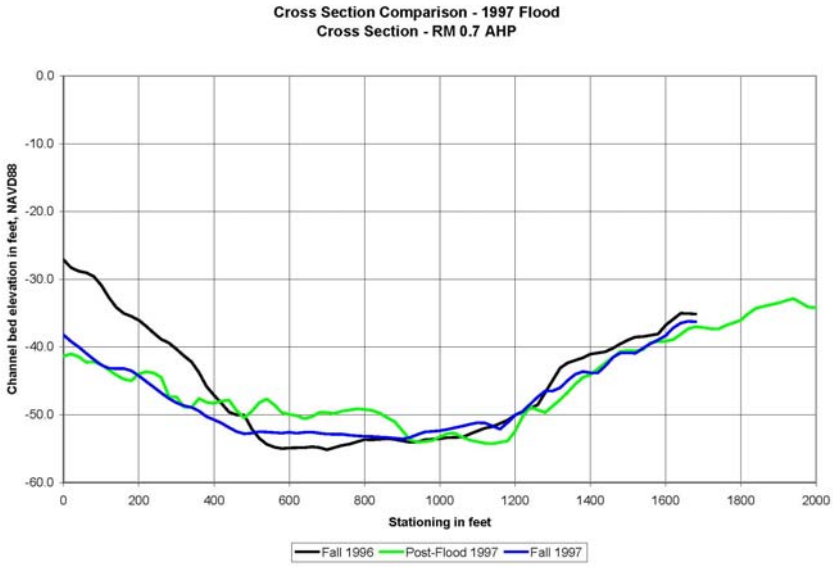

Cross Section Comparison - 1997 Flood
Cross Section - PAA Upstream Limit
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
500
1000
1500
2000
2500
Anchorage area
Stationing in feet
* 1994 survey was the nearest pre-flood with data
Pre-Flood 1994*
Post-Flood 1997
Fall 1997

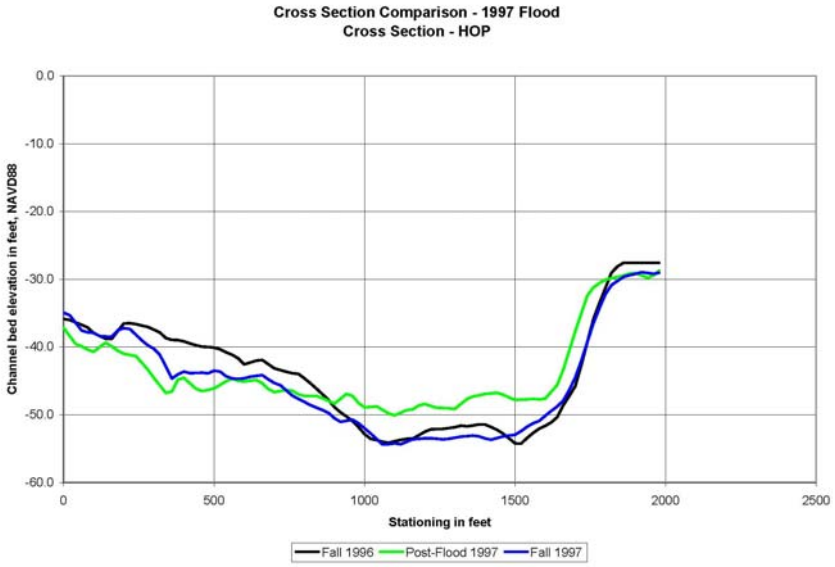

Cross Section Comparison - 1997 Flood
Cross Section - RM 5.8 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
500
1000
1500
2000
2500
Anchorage area
Stationing in feet
* 1994 survey was the nearest pre-flood with data
Pre-Flood 1994*
Post-Flood 1997
Fall 1997

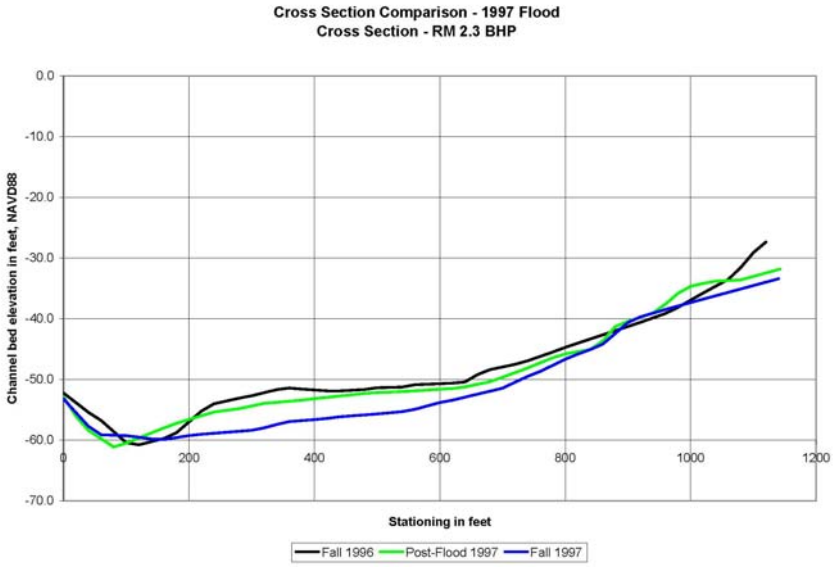

Cross Section Comparison - 1997 Flood
Cross Section - Cubit's Gap (CG)
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Fall 1996
Post-Flood 1997
Fall 1997

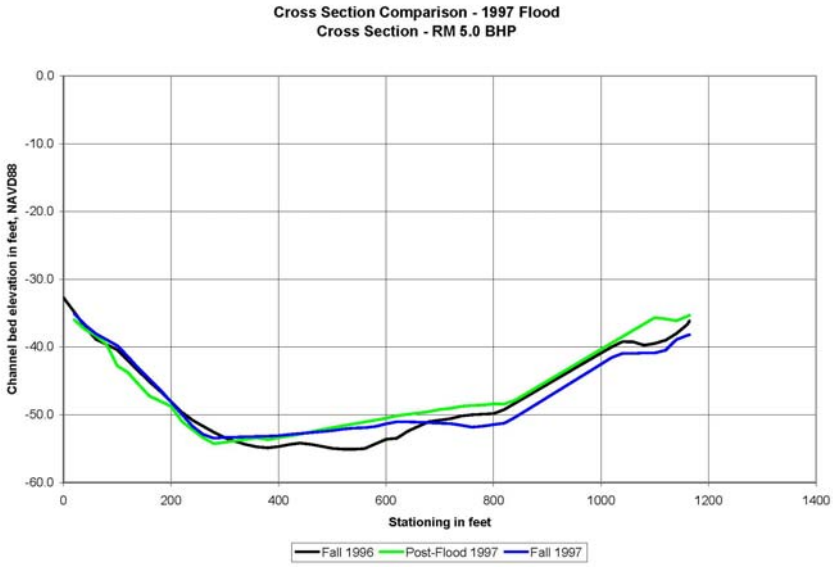

Cross Section Comparison - 1997 Flood
Cross Section - RM 2.5 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Fall 1996
Post-Flood 1997
Fall 1997

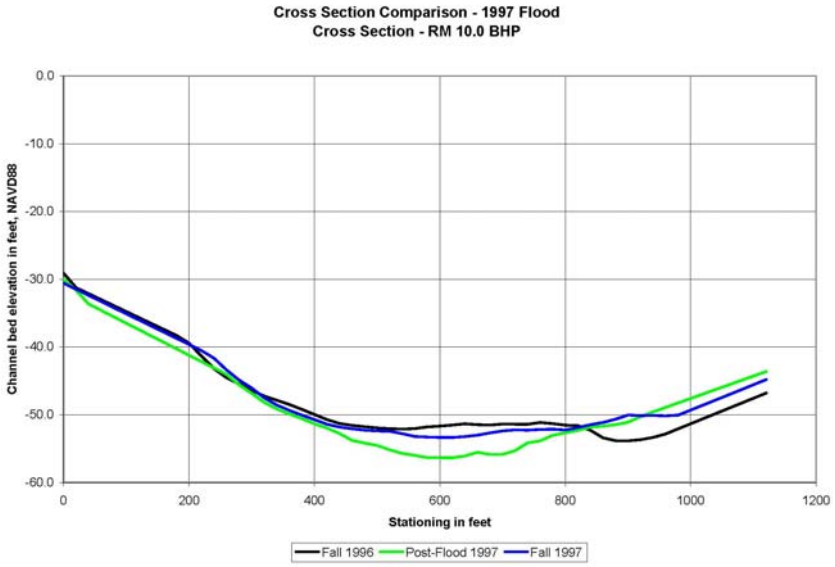

Cross Section Comparison - 1997 Flood
Cross Section - PAA Downstream Limit
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Fall 1996
Post-Flood 1997
Fall1997

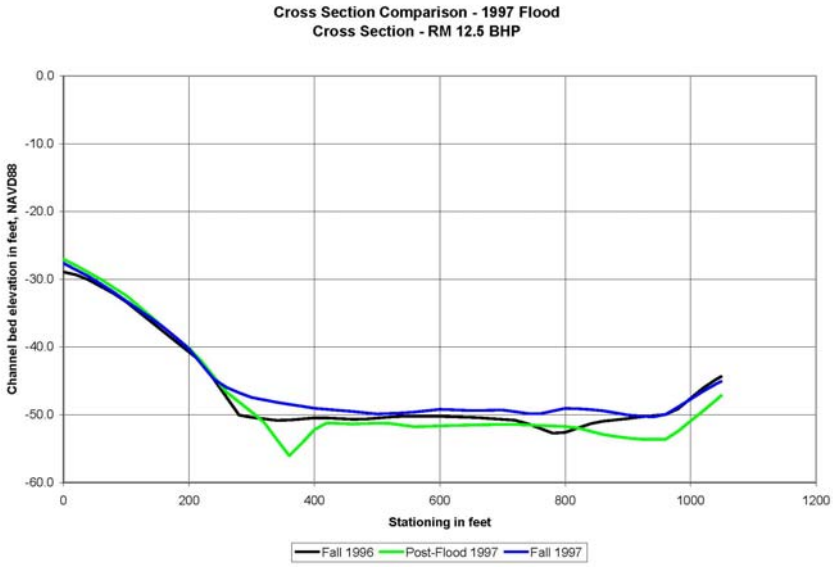

Cross Section Comparison - 1997 Flood
Cross Section - RM 0.7 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Stationing in feet
Fall 1996
Post-Flood 1997
Fall 1997


Cross Section Comparison - 1997 Flood
Cross Section - HOP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Fall 1996
Post-Flood 1997
Fall 1997

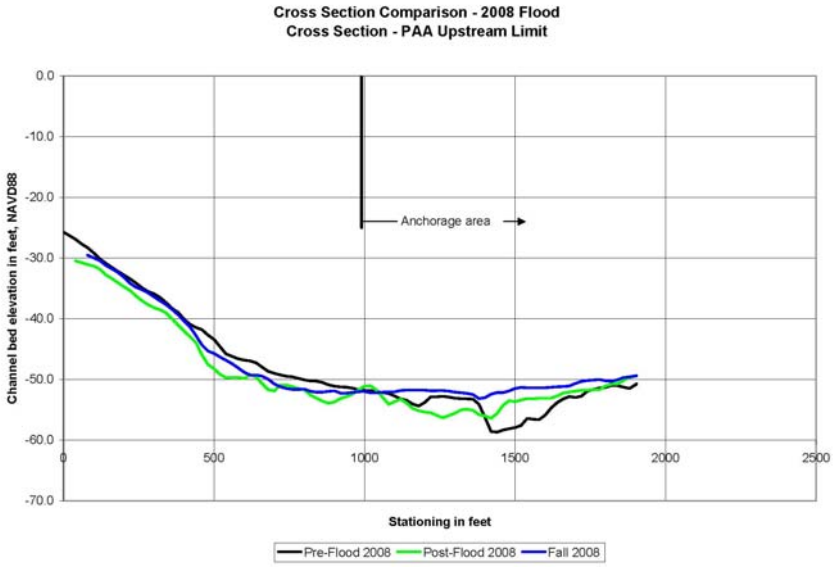

Cross Section Comparison - 1997 Flood
Cross Section - RM 2.3 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
200
400
600
800
1000
1200
Stationing in feet
Fall 1996
Post-Flood 1997
Fall 1997

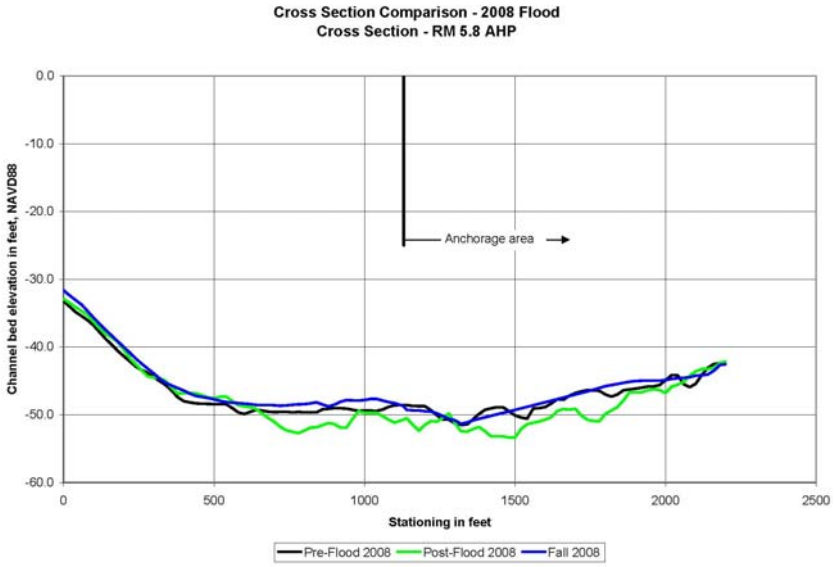

Cross Section Comparison - 1997 Flood
Cross Section - RM 5.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
Stationing in feet
Fall 1996
Post-Flood 1997
Fall 1997

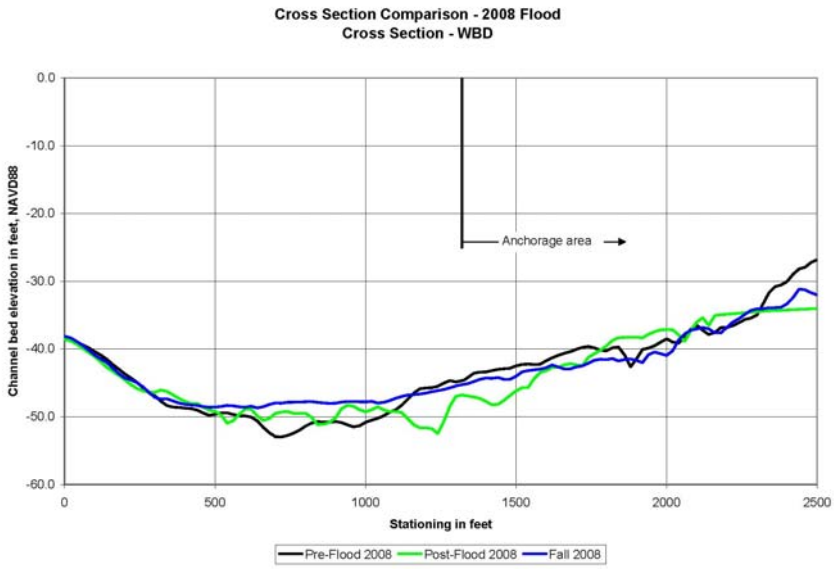

Cross Section Comparison - 1997 Flood
Cross Section - RM 10.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Fall 1996
Post-Flood 1997
Fall 1997

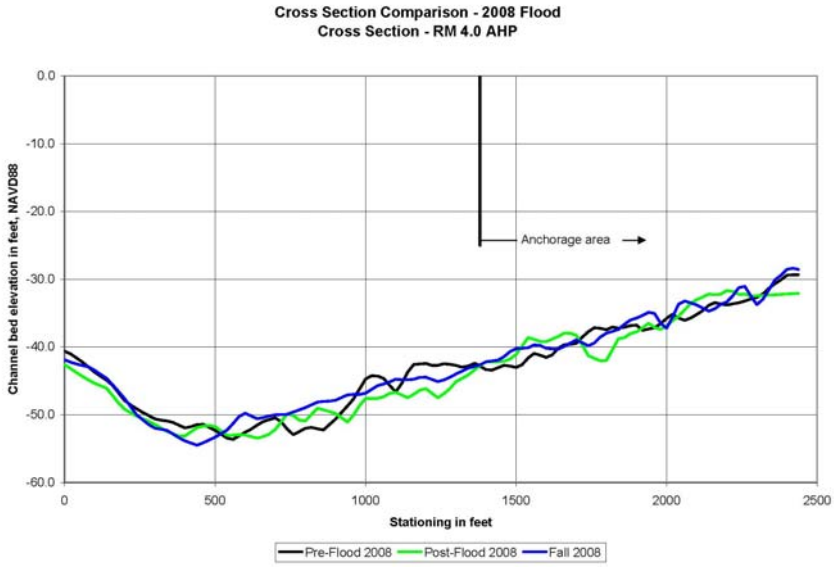

Cross Section Comparison - 1997 Flood
Cross Section - RM 12.5 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Fall 1996
Post-Flood 1997
Fall 1997

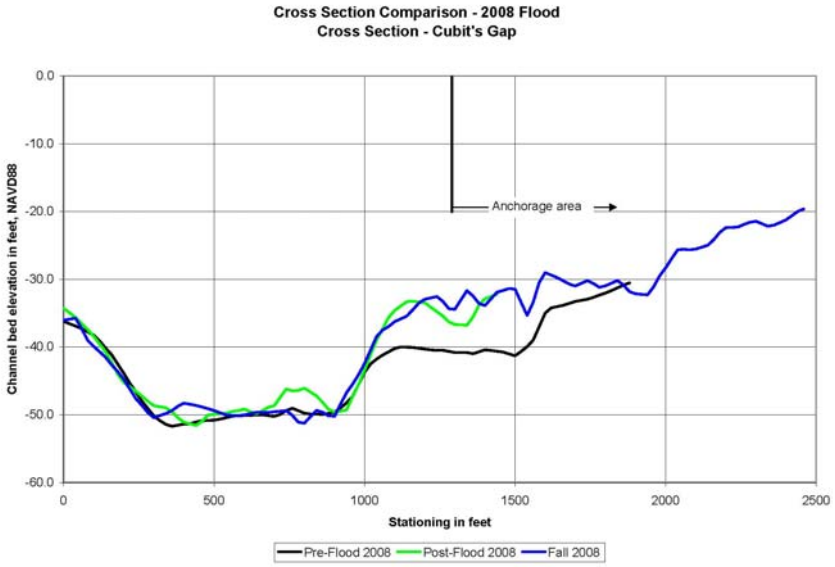
Section 3 – Cross Sections for 2008 Spring Flood

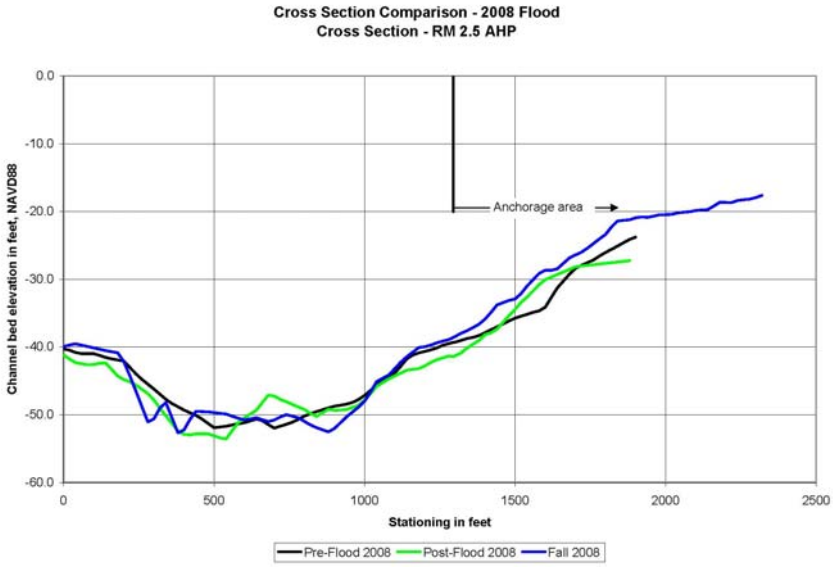

Cross Section Comparison - 2008 Flood
Cross Section - PAA Upstream Limit
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
500
1000
1500
2000
2500
Anchorage area
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

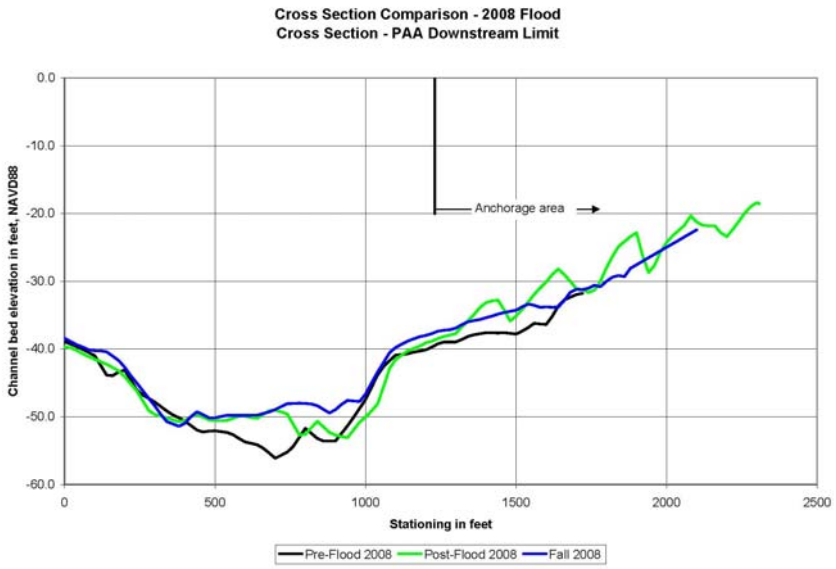

Cross Section Comparison - 2008 Flood
Cross Section - RM 5.8 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Anchorage area
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

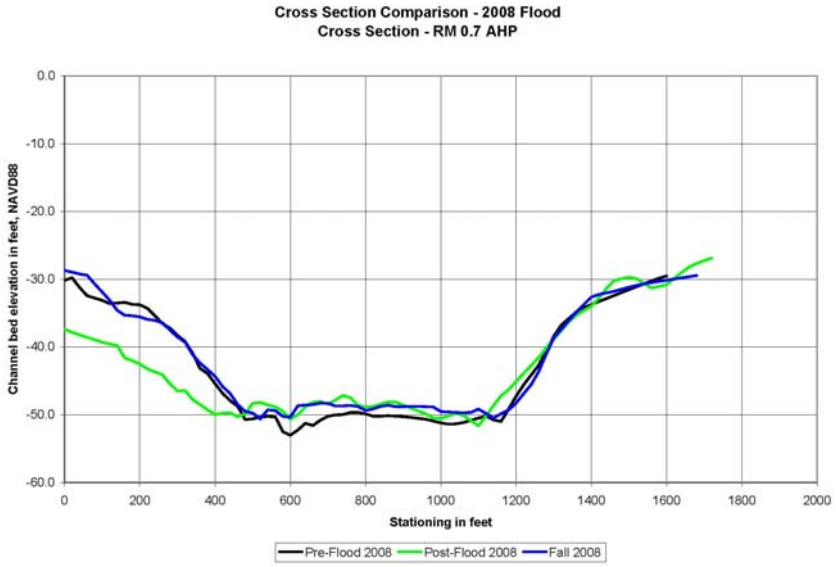

Cross Section Comparison - 2008 Flood
Cross Section - WBD
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Flood 2008
Post-Flood 2008
Fall 2008

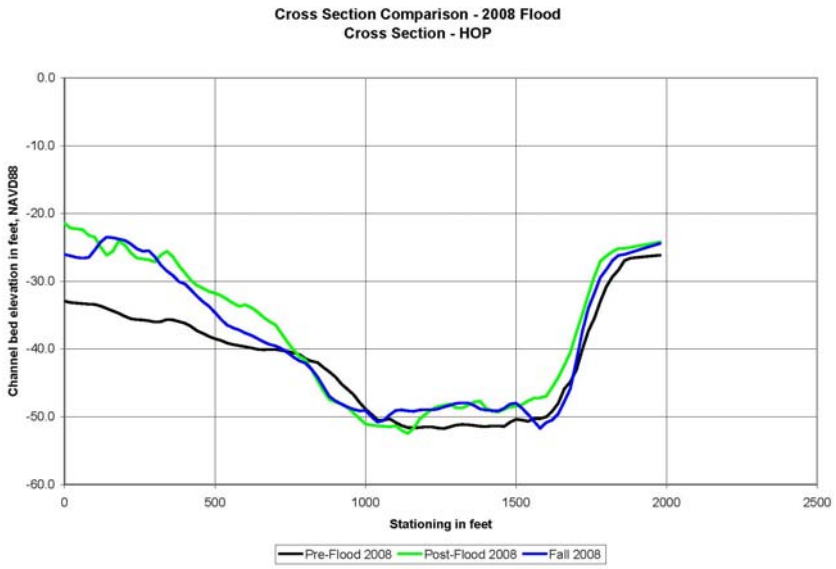

Cross Section Comparison - 2008 Flood
Cross Section - RM 4.0 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Flood 2008
Post-Flood 2008
Fall 2008

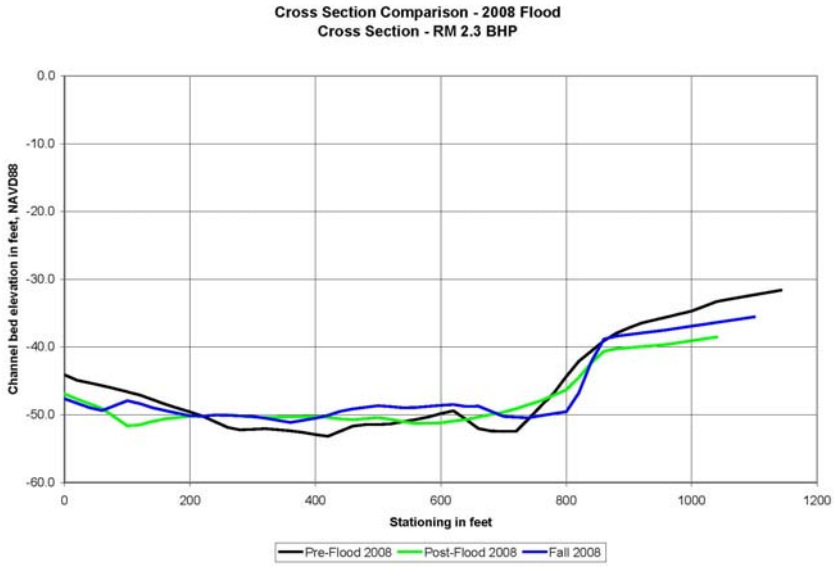

Cross Section Comparison - 2008 Flood
Cross Section - Cubit's Gap
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Flood 2008
Post-Flood 2008
Fall 2008

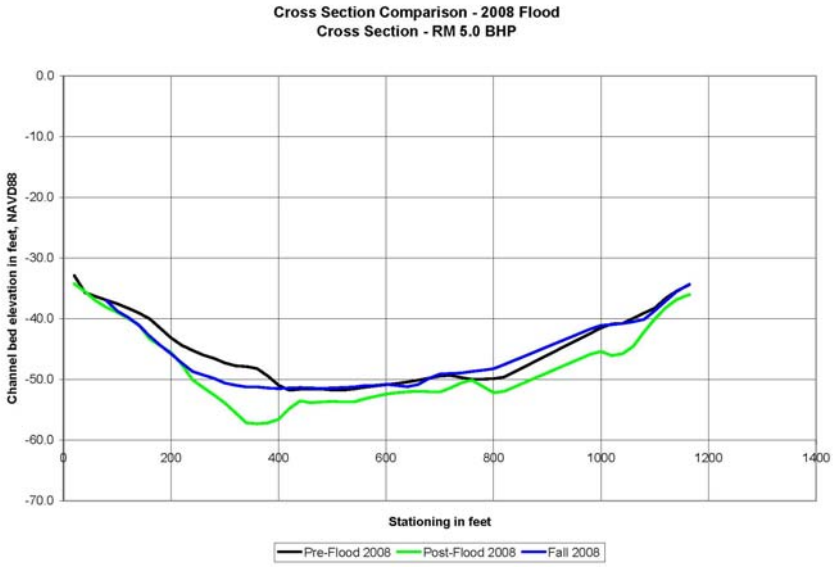

Cross Section Comparison - 2008 Flood
Cross Section - RM 2.5 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Flood 2008
Post-Flood 2008
Fall 2008

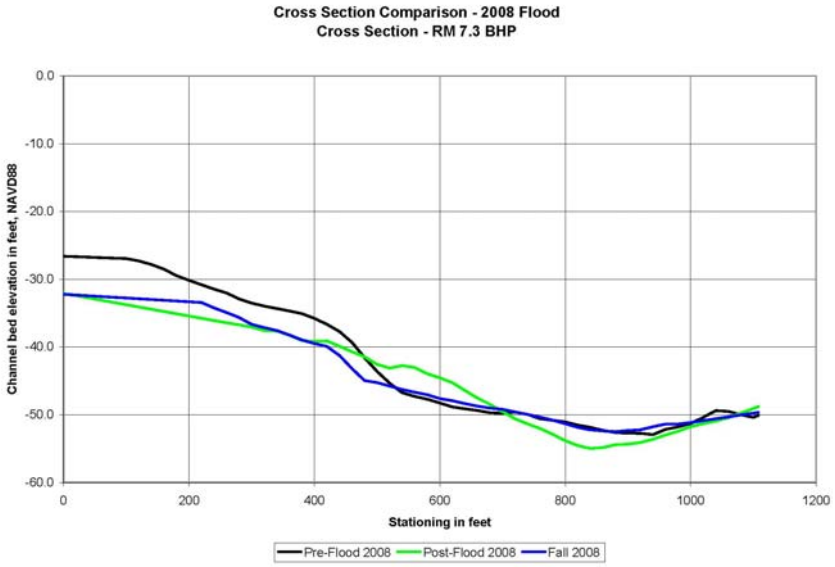

Cross Section Comparison - 2008 Flood
Cross Section - PAA Downstream Limit
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Flood 2008
Post-Flood 2008
Fall 2008

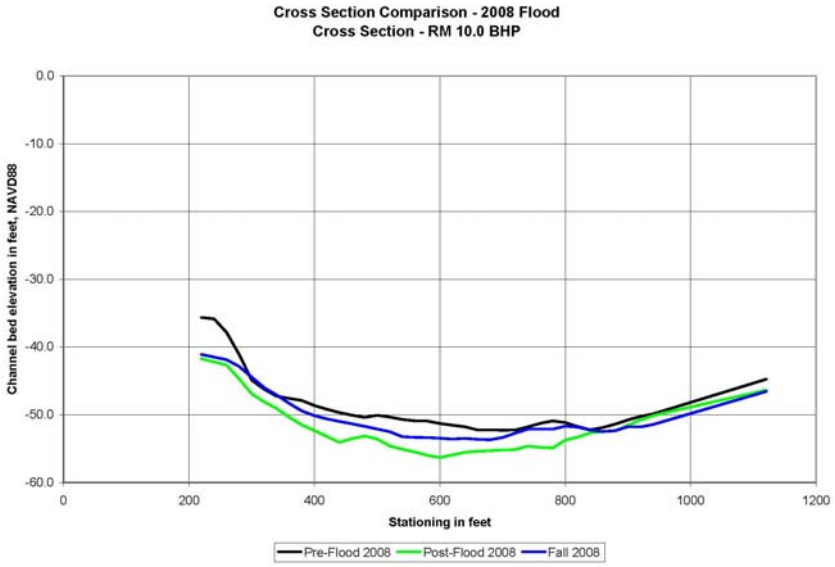

Cross Section Comparison - 2008 Flood
Cross Section - RM 0.7 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

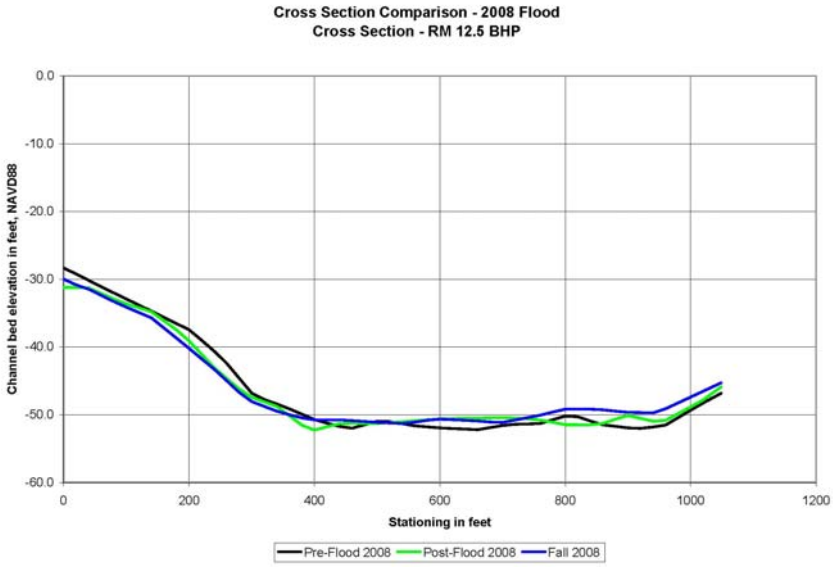

Cross Section Comparison - 2008 Flood
Cross Section - HOP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

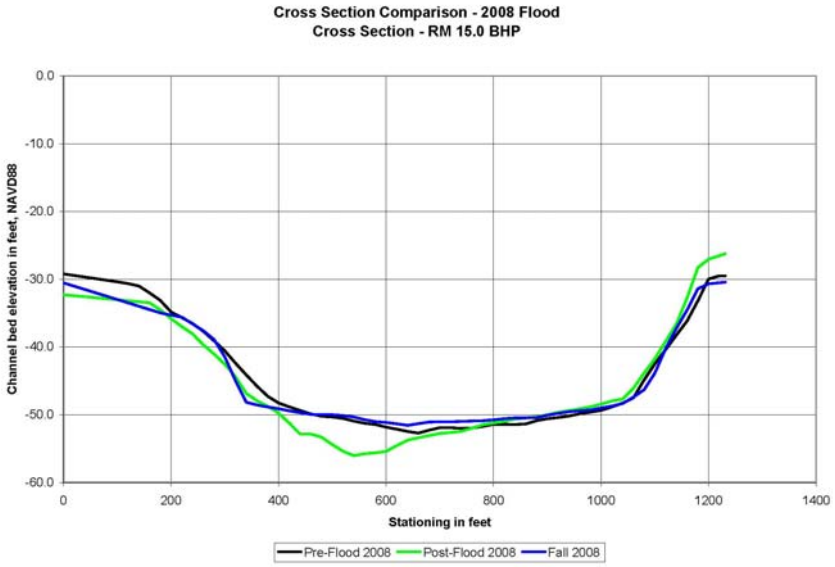

Cross Section Comparison - 2008 Flood
Cross Section - RM 2.3 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

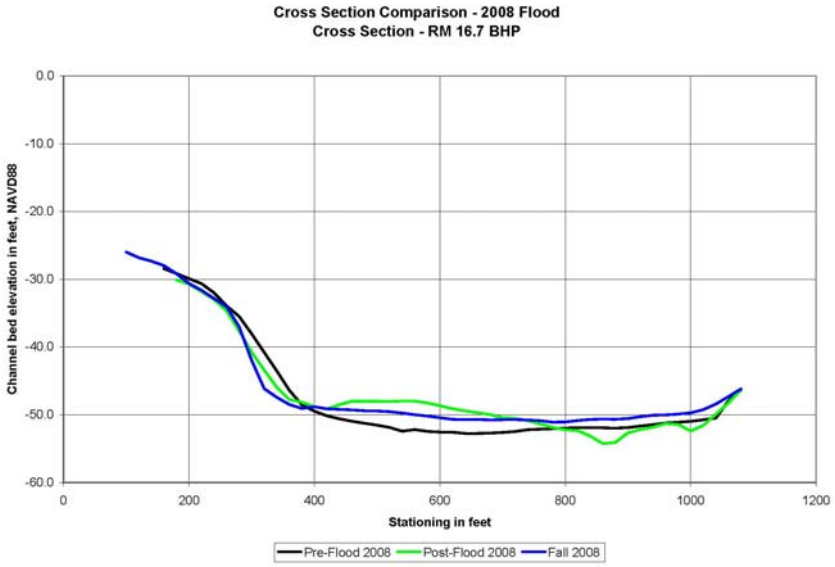

Cross Section Comparison - 2008 Flood
Cross Section - RM 5.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
200
400
600
800
1000
1200
1400
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

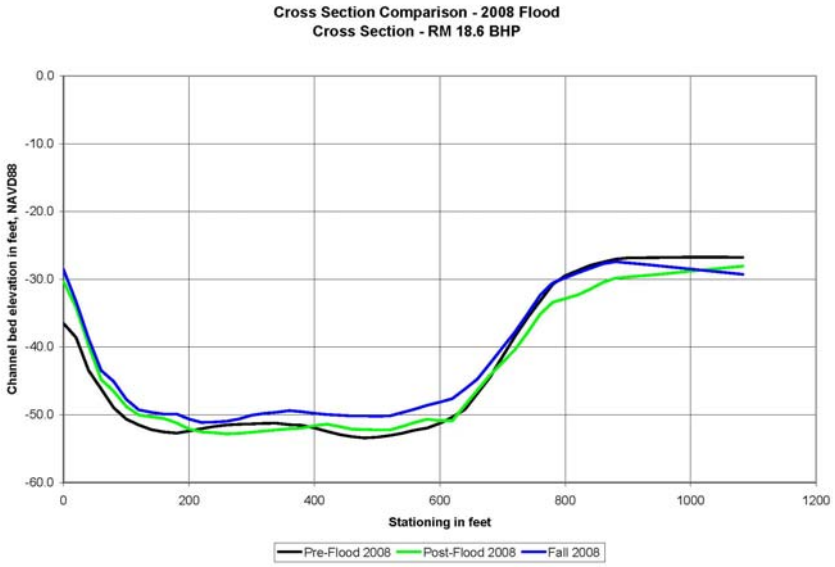

Cross Section Comparison - 2008 Flood
Cross Section - RM 7.3 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008


Cross Section Comparison - 2008 Flood
Cross Section - RM 10.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

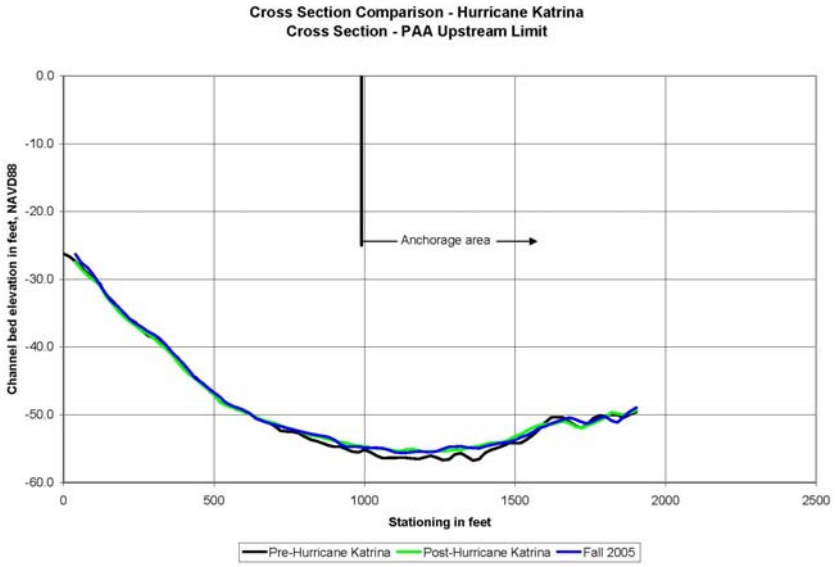

Cross Section Comparison - 2008 Flood
Cross Section - RM 12.5 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

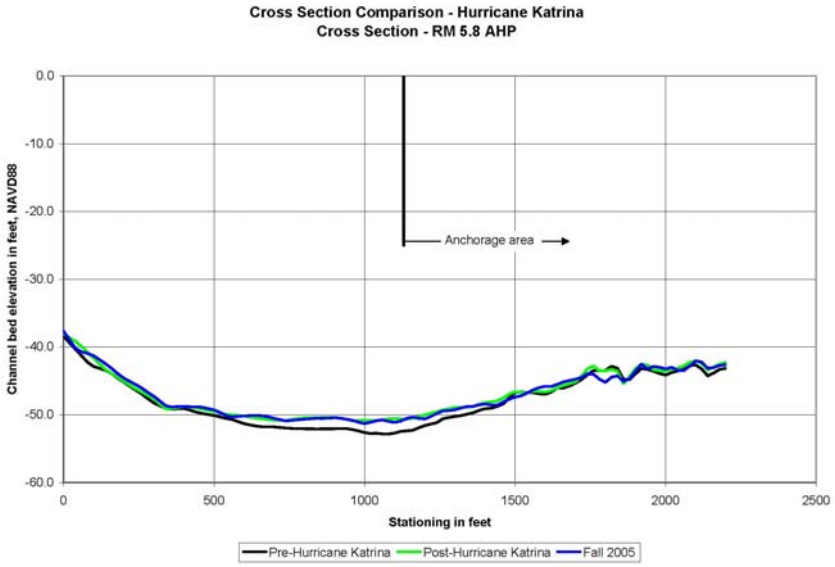

Cross Section Comparison - 2008 Flood
Cross Section - RM 15.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

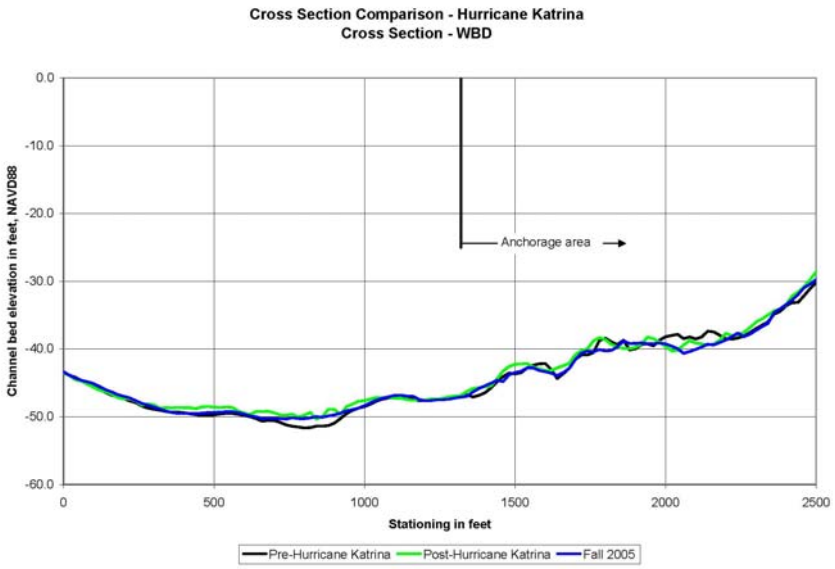

Cross Section Comparison - 2008 Flood
Cross Section - RM 16.7 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

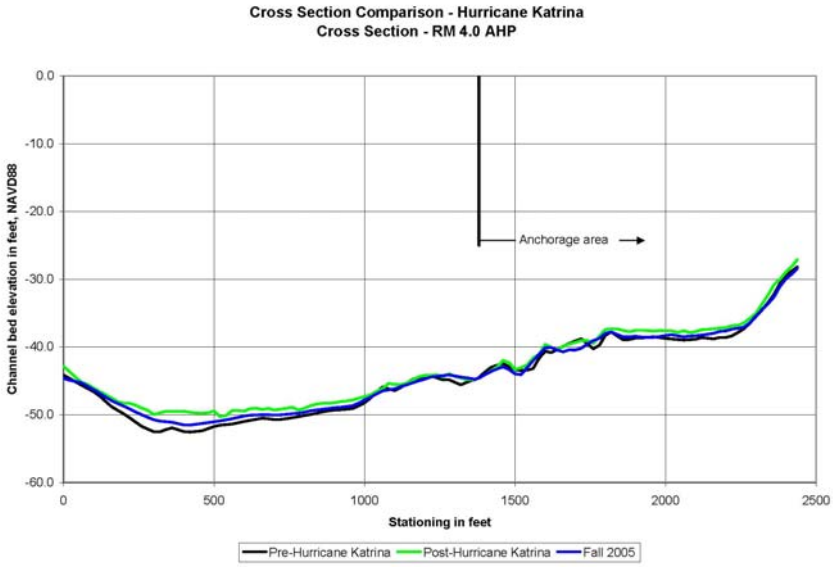

Cross Section Comparison - 2008 Flood
Cross Section - RM 18.6 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Flood 2008
Post-Flood 2008
Fall 2008

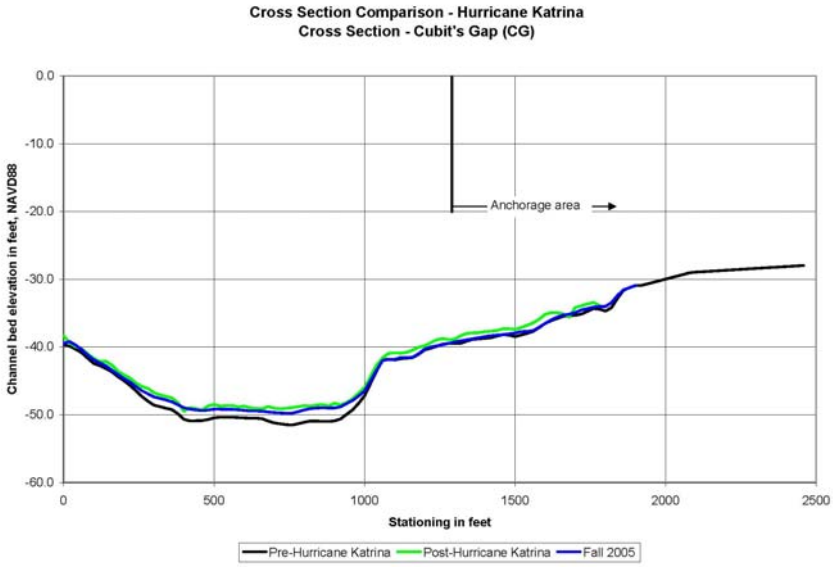
Section 4 – Cross Sections for Hurricane Katrina 2005

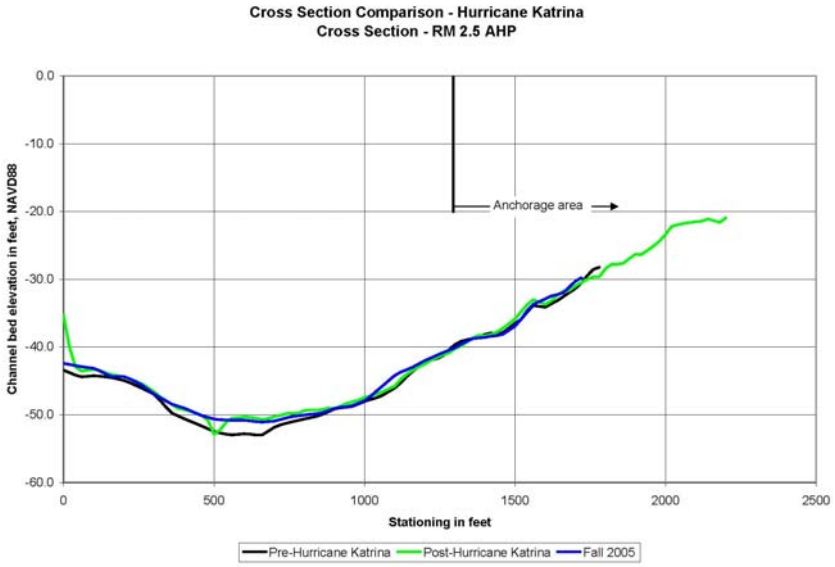

Cross Section Comparison - Hurricane Katrina
Cross Section - PAA Upstream Limit
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

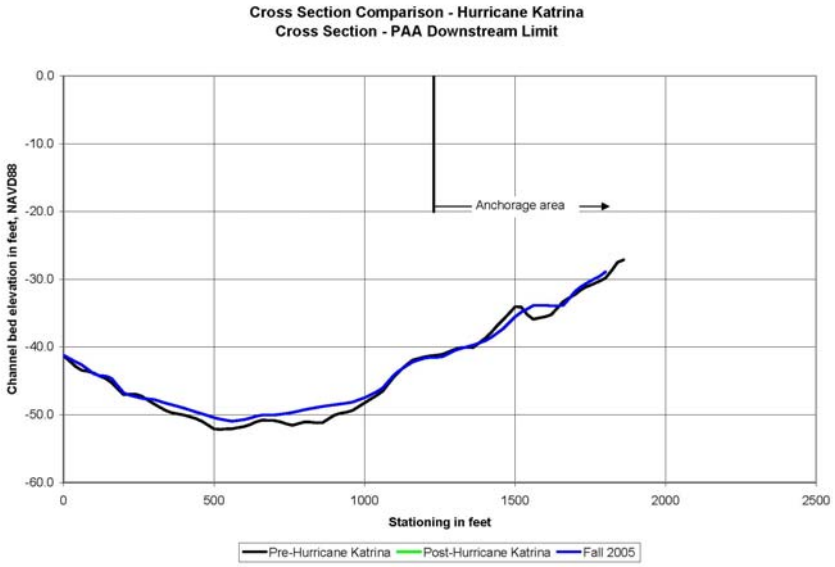

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 5.8 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

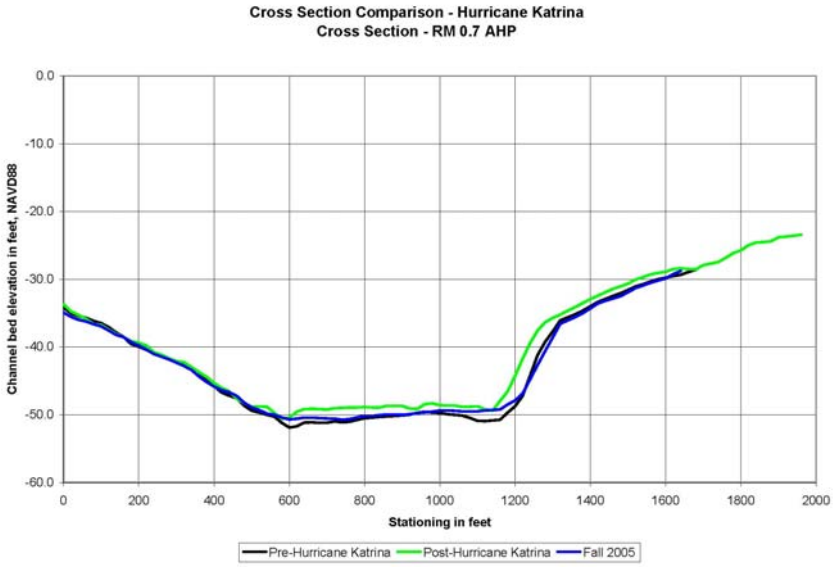

Cross Section Comparison - Hurricane Katrina
Cross Section - WBD
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

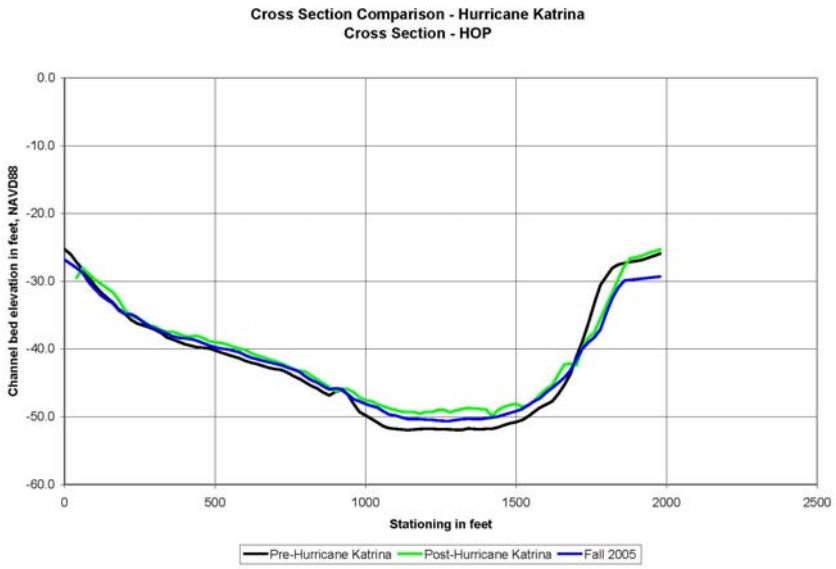

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 4.0 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

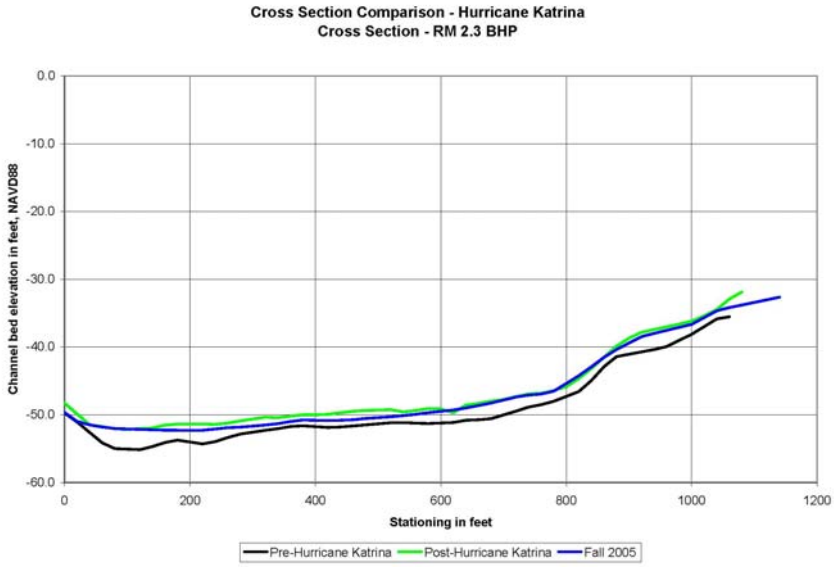

Cross Section Comparison - Hurricane Katrina
Cross Section - Cubit's Gap (CG)
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

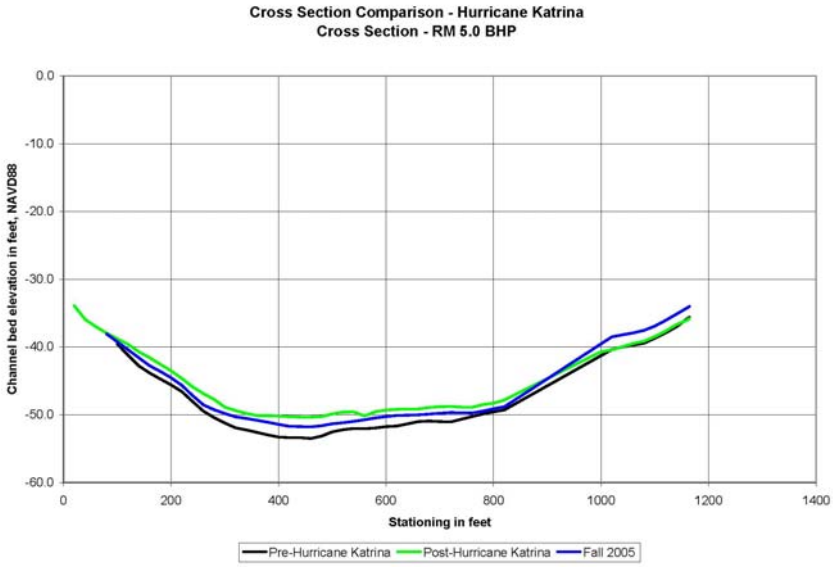

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 2.5 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

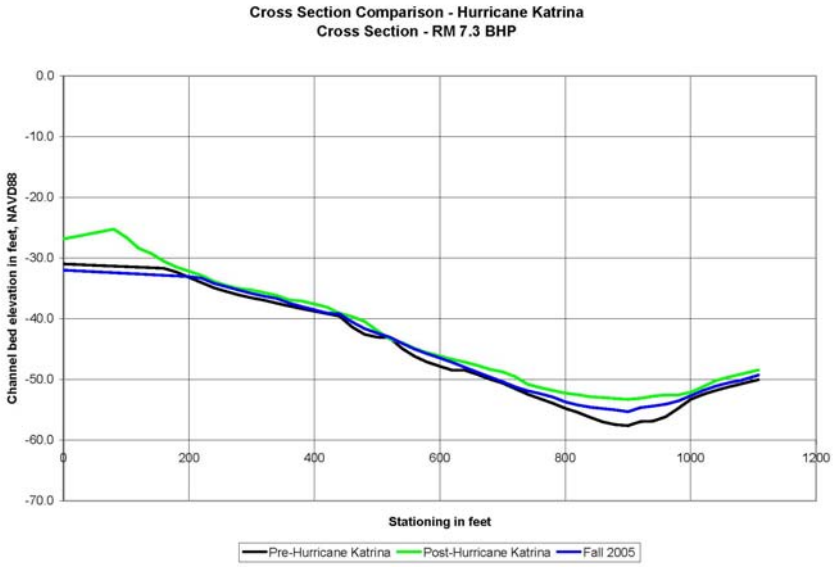

Cross Section Comparison - Hurricane Katrina
Cross Section - PAA Downstream Limit
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Anchorage area
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

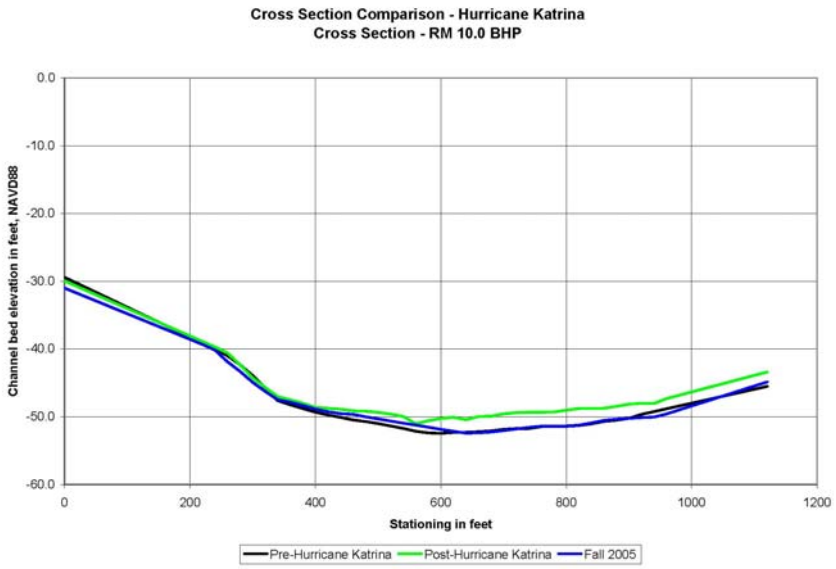

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 0.7 AHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

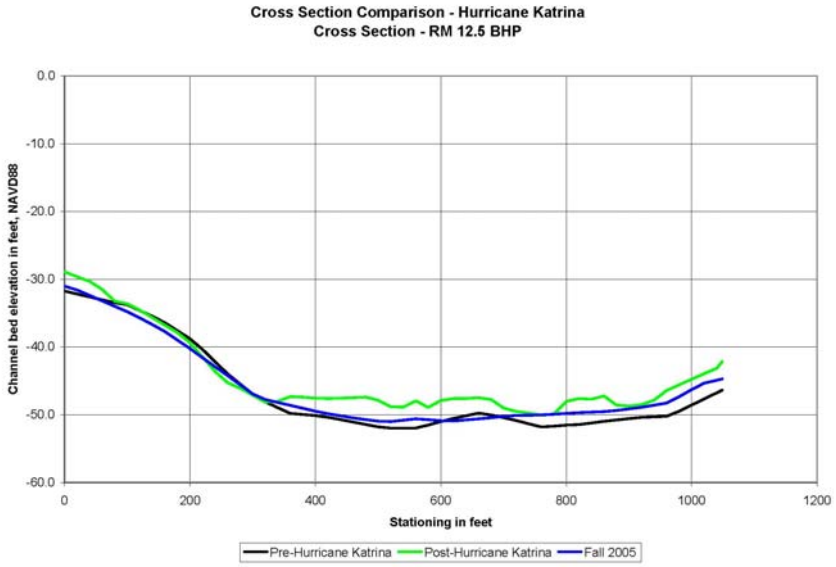

Cross Section Comparison - Hurricane Katrina
Cross Section - HOP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
500
1000
1500
2000
2500
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

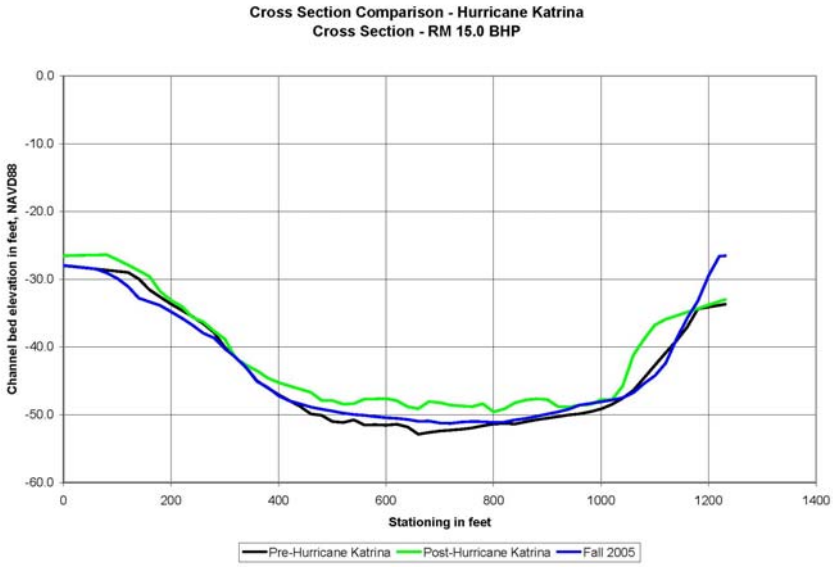

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 2.3 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

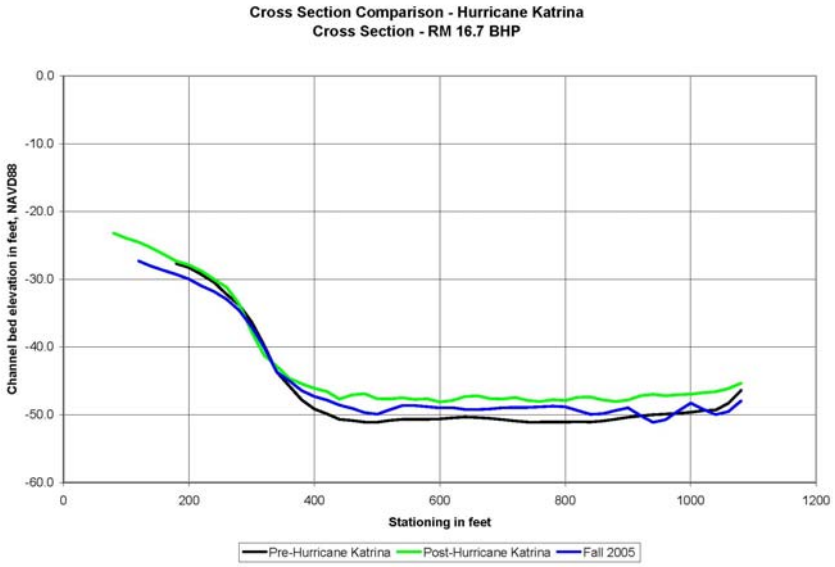

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 5.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

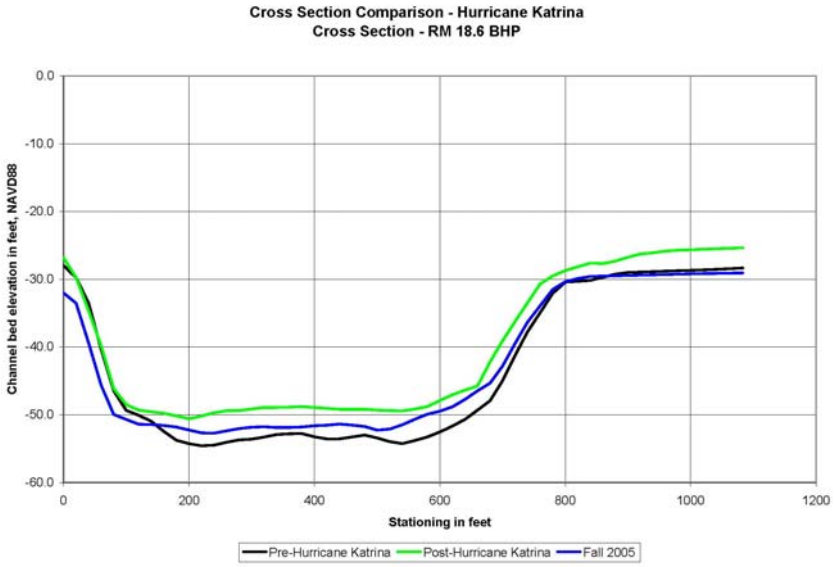

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 7.3 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005


Cross Section Comparison - Hurricane Katrina
Cross Section - RM 10.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005


Cross Section Comparison - Hurricane Katrina
Cross Section - RM 12.5 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

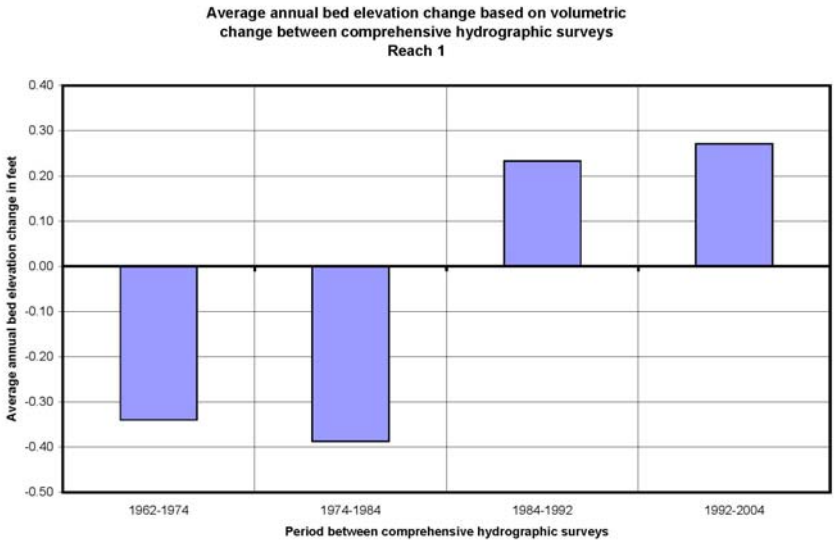

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 15.0 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
1400
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

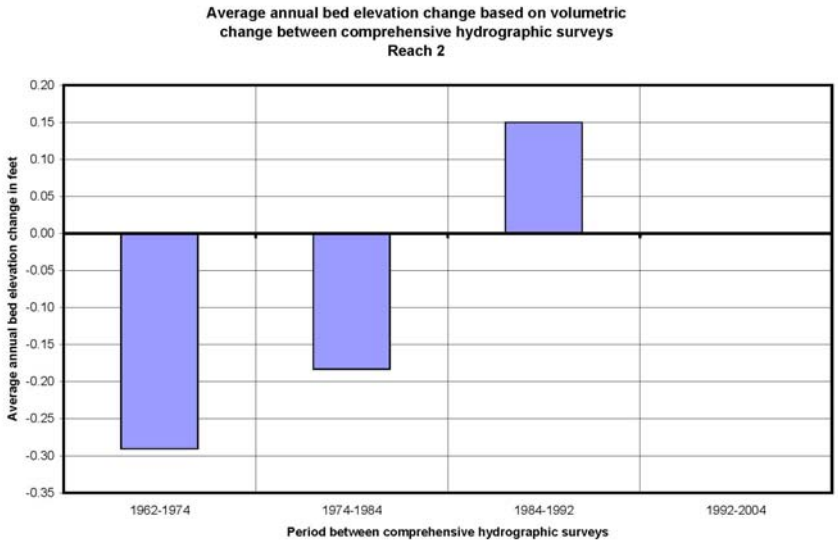

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 16.7 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

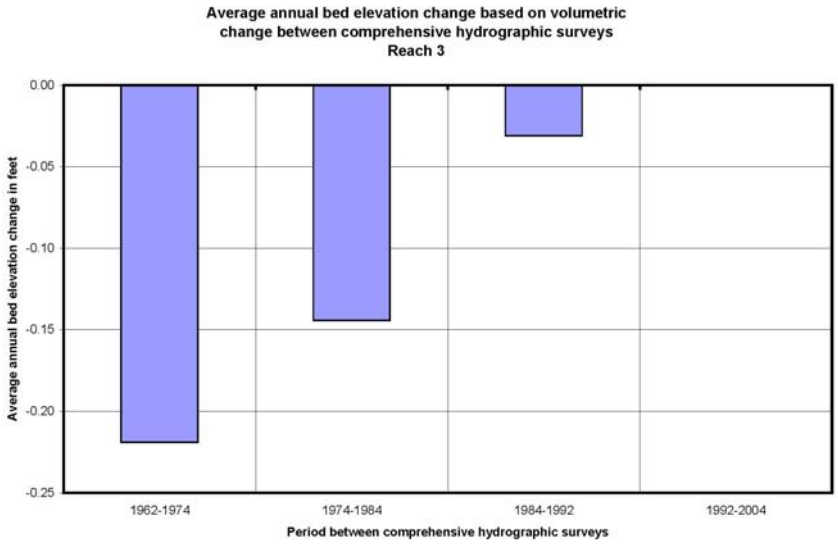

Cross Section Comparison - Hurricane Katrina
Cross Section - RM 18.6 BHP
Channel bed elevation in feet, NAVD88
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
0
200
400
600
800
1000
1200
Stationing in feet
Pre-Hurricane Katrina
Post-Hurricane Katrina
Fall 2005

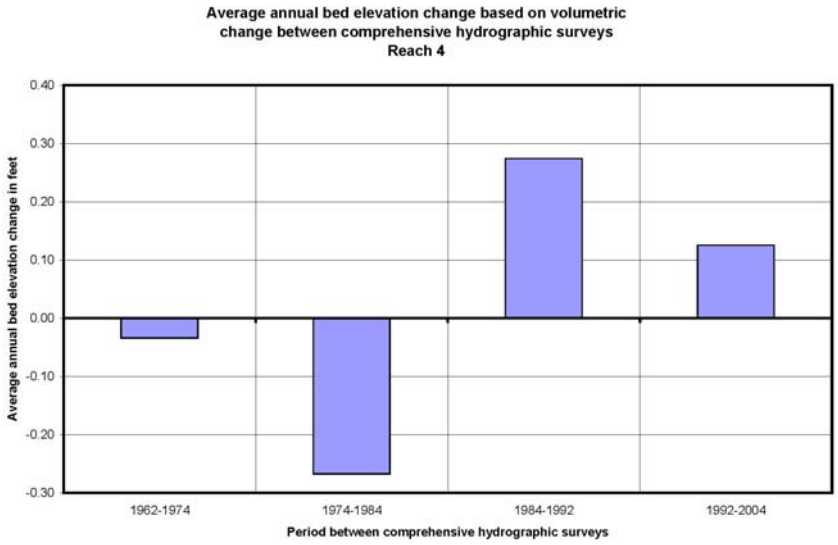
APPENDIX K

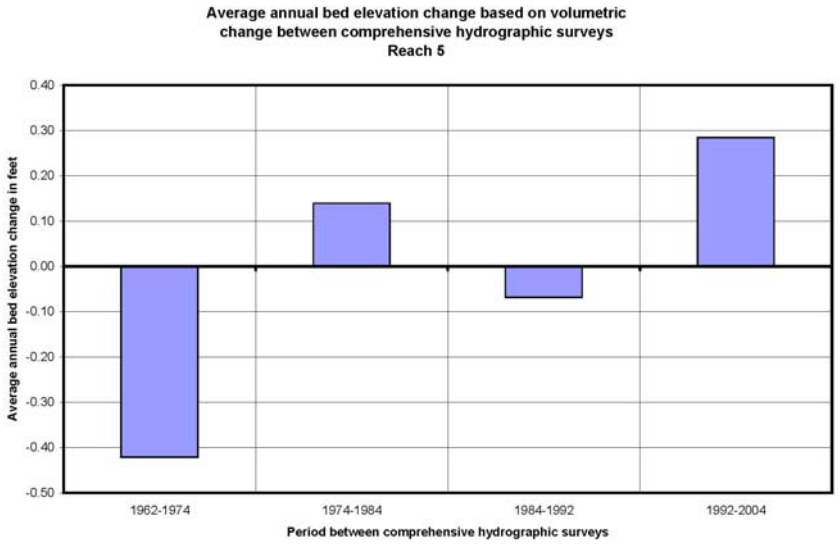
Volumetric Data

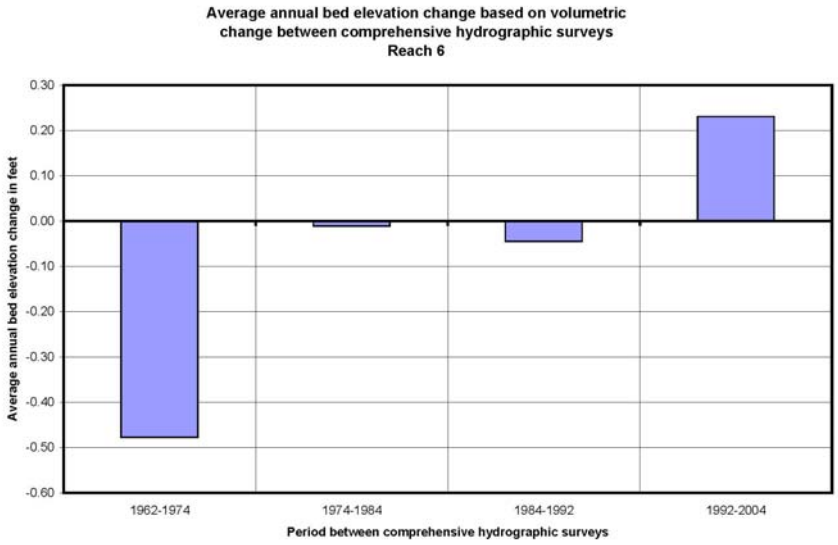

Average annual bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 1
Average annual bed elevation change in feet
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

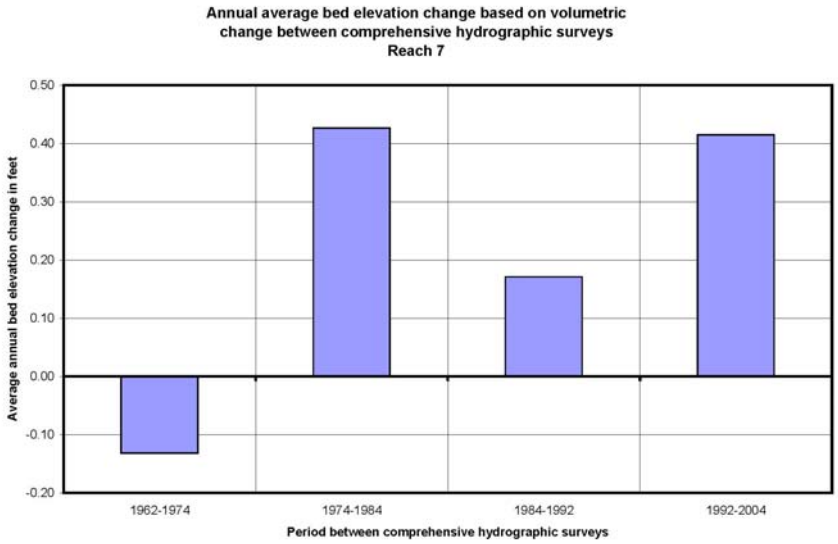

Average annual bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 2
Average annual bed elevation change in feet
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

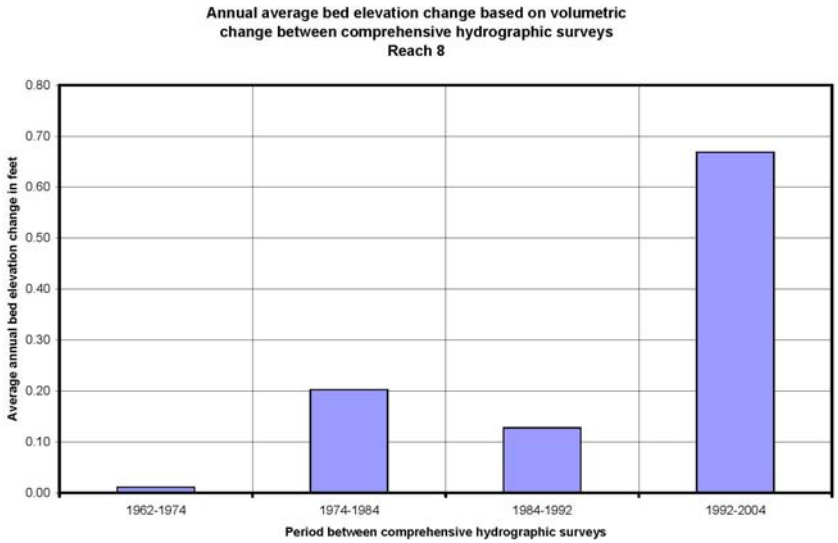

Average annual bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 3
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
Average annual bed elevation change in feet
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

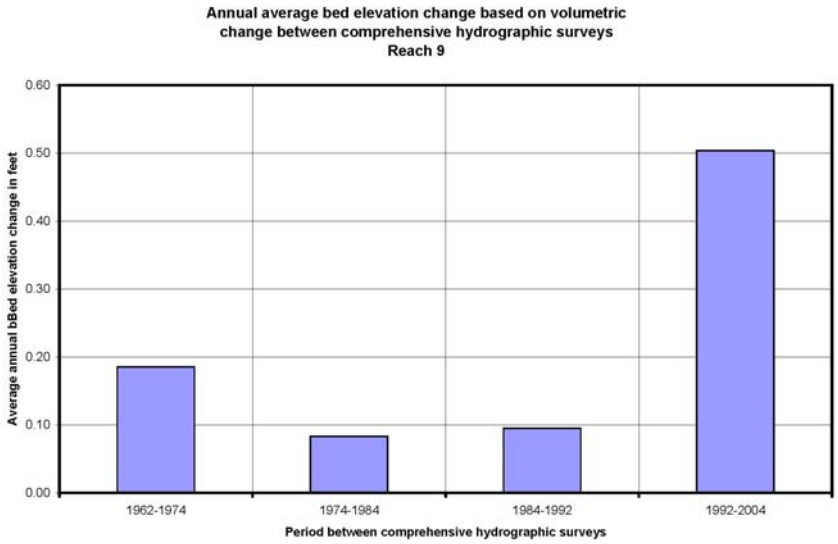

Average annual bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 4
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
Average annual bed elevation change in feet
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

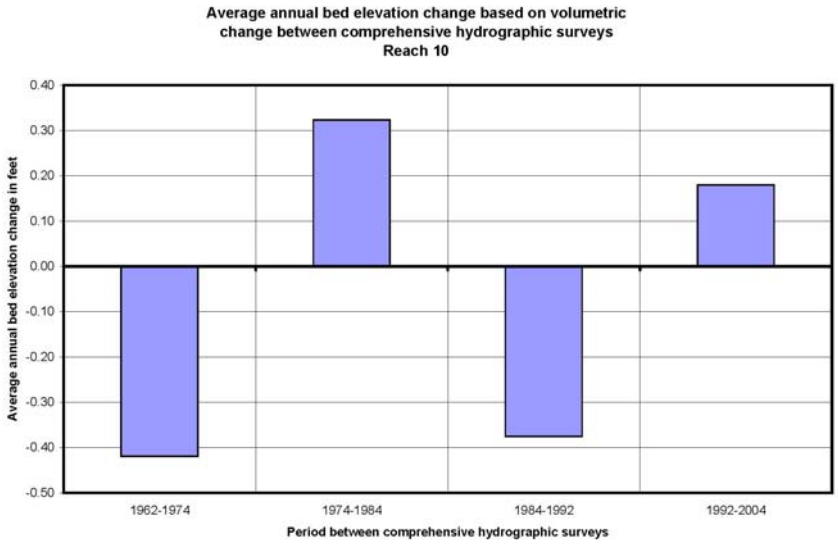

Average annual bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 5
Average annual bed elevation change in feet
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

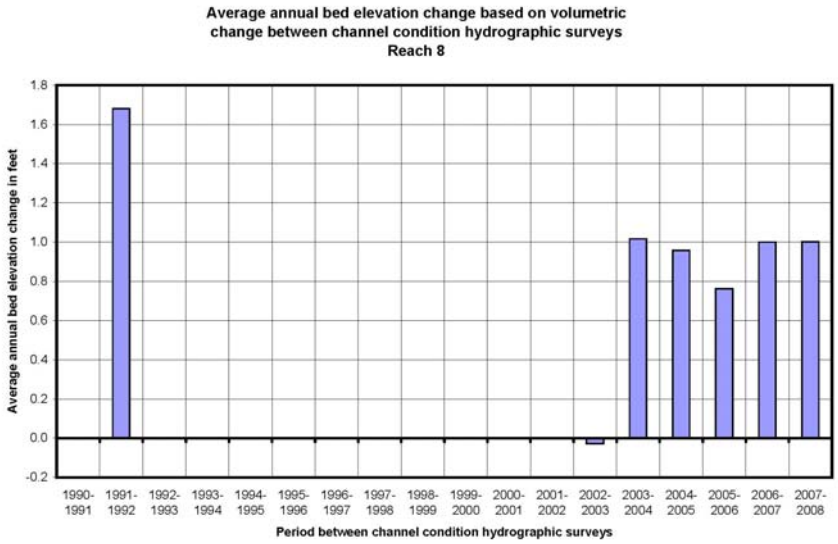

Average annual bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 6
Average annual bed elevation change in feet
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

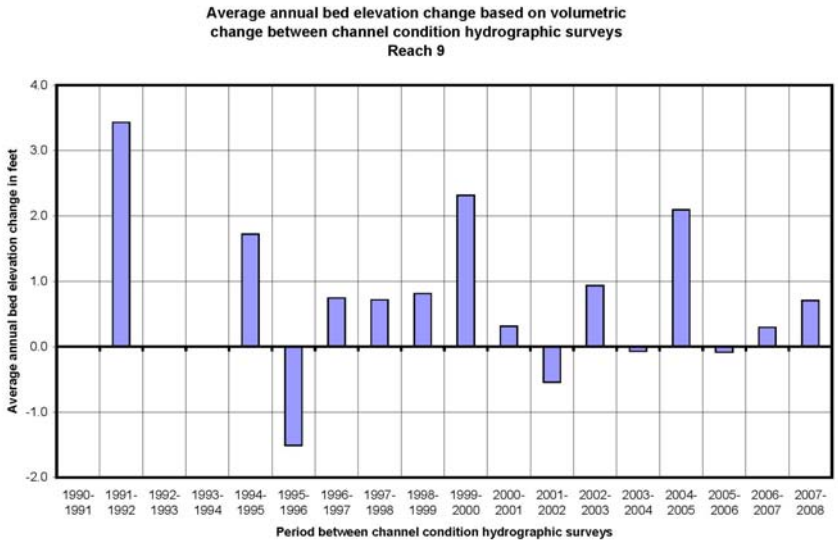

Annual average bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 7
Average annual bed elevation change in feet
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

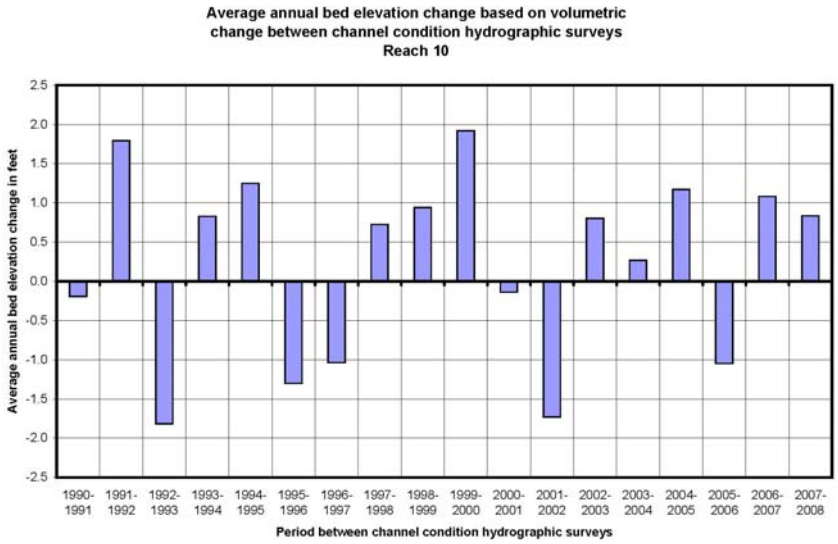

Annual average bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 8
Average annual bed elevation change in feet
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

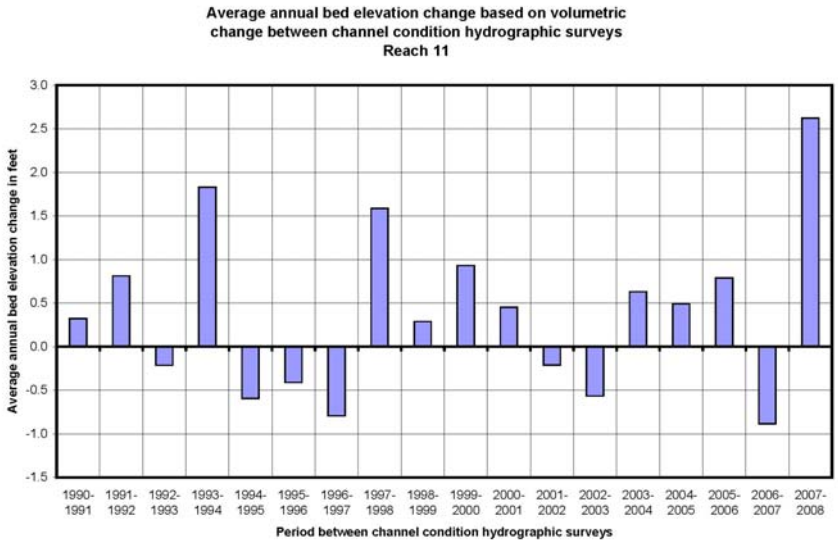

Annual average bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 9
Average annual bBed elevation change in feet
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

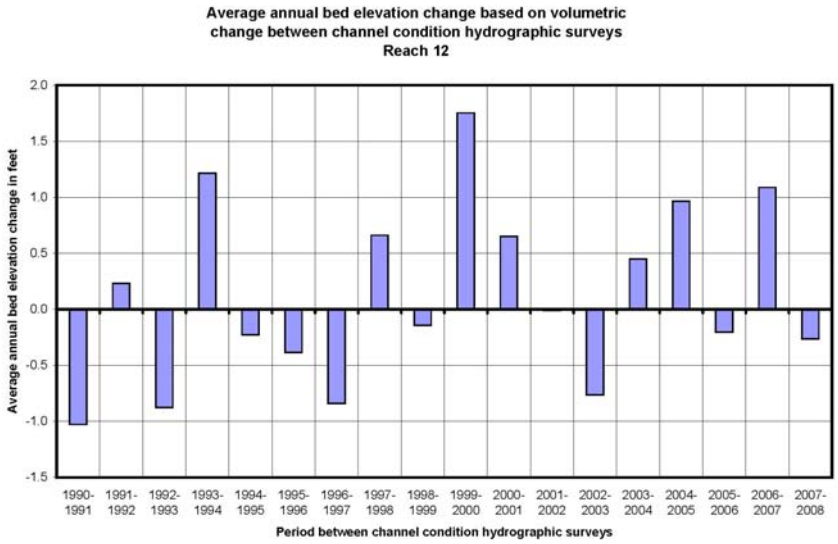

Average annual bed elevation change based on volumetric
change between comprehensive hydrographic surveys
Reach 10
Average annual bed elevation change in feet
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
1962-1974
1974-1984
1984-1992
1992-2004
Period between comprehensive hydrographic surveys

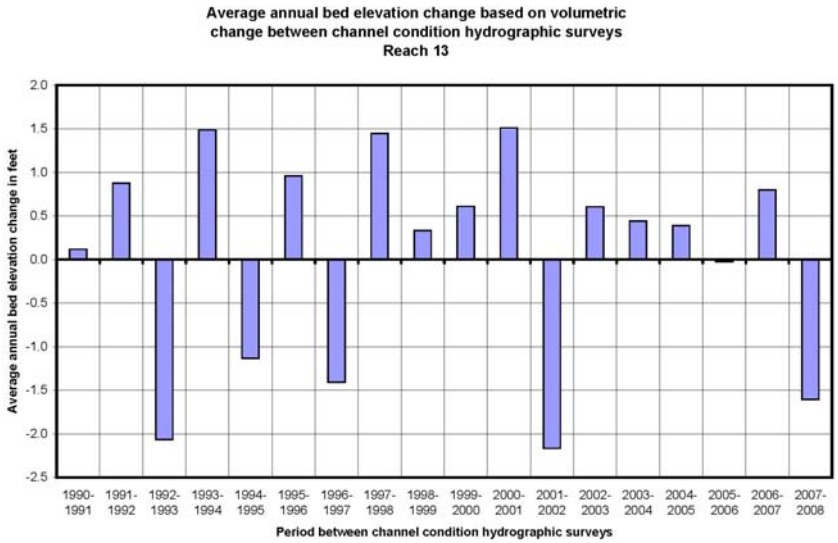

Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 8
Average annual bed elevation change in feet
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys

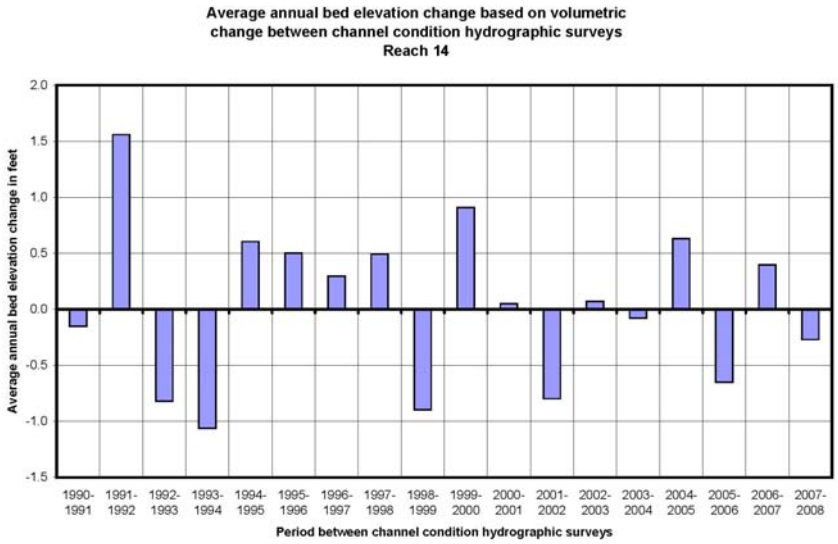

Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 9
Average annual bed elevation change in feet
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys

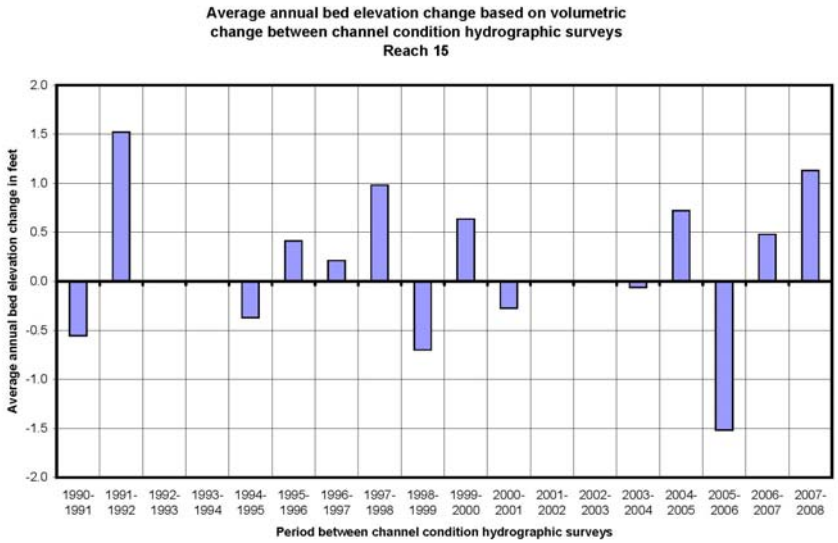

Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 10
Average annual bed elevation change in feet
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys


Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 11
Average annual bed elevation change in feet
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys


Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 12
Average annual bed elevation change in feet
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys


Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 13
Average annual bed elevation change in feet
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys


Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 14
Average annual bed elevation change in feet
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys


Average annual bed elevation change based on volumetric
change between channel condition hydrographic surveys
Reach 15
Average annual bed elevation change in feet
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
Period between channel condition hydrographic surveys

APPENDIX L

Historic Events Timeline Report

ACKNOWLEDGMENT:

The authors gratefully acknowledge the contribution of Mr. Rick Broussard of USACE, New Orleans District, Engineering Division, Civil Branch, as author of the historic events timeline report. The comprehensive events chronology prepared by Mr. Broussard was an invaluable resource in developing a thorough understanding of the history of the study area from a river engineering perspective. His contributions were essential to accurate interpretation and evaluation of the results of this study and are greatly appreciated.

CHRONOLOGY OF THE HISTORY OF THE DEVELOPMENT AND MAINTENANCE OF THE MISSISSIPPI RIVER, BETWEEN BELLE CHASSE, LOUISIANA, APPROXIMATE MILE 74.5 AHP, AND THE SOUTHWEST PASS ENTRANCE CHANNEL.

Prepared by

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USACE, New Orleans District
September 2009

In 1960 the Corps was maintaining a project, which provided for a deep draft channel from Baton Rouge, LA to the Gulf of Mexico, and which had been authorized and constructed under the River and Harbors Act of 2 March 1945, House Document 215, 76th Congress; 1st Session, and prior River and Harbor Acts. The dimensions that were being maintained were as follows:

- Baton Rouge to New Orleans; - 35 ft. deep (M.L.W.) by 500 feet
- Port of New Orleans; - 35 (M.L.G.) by 1,500 feet, with portion 40 by 500 feet
- New Orleans to Head of Passes; - 40 (M.L.G.) by 1,000 feet
- In Southwest Pass; - 40 (M.L.G.) by 800 feet
- In Southwest Pass Bar Channel; - 40 (M.L.G.) by 600 feet
- In South Pass; - 30 (M.L.G.) by 450 feet

1962 – River and Harbor Act of 23 October 1962 (Public Law no. 87-874, Senate Document No. 36, 87th Congress, 1st Session) provides for a channel 40 feet deep and 500 feet wide from Baton Rouge to the Upper limits of the Port of New Orleans and also 40 feet deep for a width of 500 feet within the presently authorized 35-by 1,500-foot channel in the port limits of New Orleans.

1968 – The River and Harbor Act of 1968, approved 13 August 1968 (House Document 361, 90th Congress, 2nd Session), provides for additional navigation outlets from the Mississippi River in the vicinity of Venice, Louisiana, by enlargement of the existing channels of Baptiste Collette bayou and Grand-Tiger Passes to provide channels -14 feet deep (Mean Low Gulf) over a bottom width of 150 feet, with entrance channels in open water -16 feet deep over a bottom width of 250 feet. Jetties, to the -6-foot depth contour, are authorized if and when justified to reduce the cost of maintenance dredging.

1977 - 1979 – Begin work in Baptiste Collette Bayou in November 1977, completed in May 1978, jetty construction was completed in May 1979. The enlargement of Grand

and Tiger Passes began in March 1978 and was completed in October 1978 and construction of the jetty was completed in March 1979.

1980's and 1990's – The Mississippi River, Baton Rouge to the Gulf, Louisiana project, GDM Supplement No. 2, approved by the Office of the Chief of Engineers (OCE) on 9 Jan 85, added major changes to the project scope. This supplement provided for restoration of the deteriorated bank lines of the Mississippi River, between Venice and the SW Pass entrance, with hydraulic fill. This was accomplished through the construction of foreshore dikes along the banks of the Mississippi River and SW Pass, between Mile 11.2 AHP (Baptiste Collette Bayou) and Mile 18.5 BHP. The restoration of the shoreline was accomplished by nourishing and re-establishing the channel banks through a combination of contracts for dedicated dredging, as well as O&M dredging, and the construction of the forthcoming -45' deep draft project. Material dredged under these contracts was then placed behind the newly constructed foreshore dikes. The effect of this effort was to restore the banks of the Mississippi River below Venice, Louisiana, and SWP in order to confine the flow to within the river banks, which ultimately increased flow velocities yielding a net result of less shoaling and less required maintenance dredging. The foreshore dike construction commenced in FY '86 and was completed around FY '90/'91.

Bank Nourishment above the Head of Passes was accomplished via dedicated dredging within the Mississippi River under the following contracts:

- Contract 86-C-0165, Bank Nourishment behind foreshore dikes along Mississippi River, between Miles 0.8R AHP and 4.0R AHP. This work was performed between Feb '87 and Apr '87.

  Borrow for restoration of the bank was obtained from the west half of the Mississippi River navigation channel and between Miles 0.8R AHP and 3.425 R AHP. At this time, the SW Pass -40' channel was maintained to a width of 1000' (500' each side of the channel centerline), starting at Mile 1.0 AHP. Beginning at 1.0 AHP, the channel transitioned from 1000' to 800' (400' each side of the channel centerline) at Mile 0.6 AHP. At this time, a minimum depth of -45' MLG within this reach of the channel was required during maintenance dredging of the -40' project. Dredging under this contract was allowed to a depth of -55' MLG with a 2' allowable overdepth and anywhere within the limits of the 1,000' wide navigation channel. Borrow was actually performed within the western half of the channel and approx 1.16 million gross cubic yards of borrow were removed from the channel. As after dredging surveys are not available for this report, based off of the limits dredged and gross quantity removed, it is estimated that dredging was performed to approx -54' to -55' MLG and approx 350' inside (east) of the west bottom edge of cut. Again, this is simply an estimate as actual after dredging surveys are not available and latitude was allowed as to the depth and width that could be dredged.

- Contract 88-C-0137, Bank Nourishment behind foreshore dikes along Mississippi River, between Miles 11.2L AHP (Baptiste Collette Bayou) and 4.2L AHP. This work was awarded in Jul '88 and completed around the end of CY '89. The

actual limits of embankment constructed were between Miles 11.2L AHP and 5.8L AHP. (The embankment between Miles 5.8L AHP to 4.2L AHP was completed in a subsequent contract awarded in FY ’92)

Borrow for restoration of the bank was allowed from the east side of the Mississippi River, between Miles 11.15L AHP and 3.5L AHP. Borrow was allowed to a maximum depth of -59’ MLG and the allowable landside top edge of cut began basically at a) the -40’ contour, but no closer that 400’ from the foreshore dike, between Miles 11.15L AHP and 9.9L AHP; b) a varying minimum distance of 400’-600’ from the foreshore dike, between Miles 9.9L AHP and 8L AHP; c) the -40’ contour, but no closer that 400’ from the foreshore dike, between Miles 8L AHP and 4L AHP (lower limit of foreshore protection); and d) the -55’ contour, between Miles 4L AHP and 3.5L AHP (lower limit of work).

As the Contractor had problems excavating the fine silty sands in the lower portion of the borrow area, the reach of embankment that was to be constructed between Miles 5.8L AHP to 4.2L AHP was deleted from this contract. A total of approx 1.9 million gross cubic yards of borrow were removed from the channel and placed within the embankment constructed between Miles 11.2L AHP and 5.8L AHP.

- Contract 90-C-0067, Mississippi River and Tributaries, Channel Improvement – Bank Degrading, Mile 10.4R AHP to 8.0R AHP. As this reach of the river continued to scour, it became apparent that some form of control would be warranted in order to prevent the river from breaching through the bank and entering the Grand Pass and West Bay areas. A plan was developed that included armoring the bank with Articulated Concrete Mattresses (ACM). However, due to the extreme steep slope (which varied from 1V:1H and steeper) that was present within this reach of river bank, the bank first had to be degraded in order to provide a stable slope upon which the ACM could be installed. Thus, a dredging contract to degrade the bank to a 1V on 5H slope was awarded. Dredging commenced on 6 Jul 90 and was completed on 7 Aug 90. On 1 Aug 90, the Corp’s bank grading unit arrived on the jobsite and began preparing completed portion of the bank that had been degraded for placement of ACM. A total of approx 700,000 cubic yards was excavated and placed behind the foreshore dike along the Mississippi River, between Miles 10.4R AHP and 7.5R AHP.

- Contract 92-C-0080, Bank Nourishment behind foreshore dikes along Mississippi River, between Miles 8.1R AHP and 4.0R AHP, and Miles 7.3L AHP and 3.4L AHP. This work was performed between Sep ’92 and Feb ’93.

  Borrow for restoration of the bank was allowed both the east and west sides of the channel. Borrow was allowed to a maximum depth of -60’ MLG and the areas utilized for this contract were as follows:

a) Mile 6.95R AHP to Mile 6.0R AHP, between the -40’ and -50’ contours, with approx 616,000 CYS removed;

b) Mile 5.5R AHP to Mile 4.0R AHP; between the -40’ and -50’ contours, with approx 140,000 CYS removed; beginning an average distance of approx 600’ from the dike centerline and channel-ward the approx -35’ contour, with approx 866,000 CYS removed;

c) Mile 6.85L AHP to Mile 6.5L AHP (between the -35’ and -45’ contours) and Mile 5.8L AHP to Mile 4.2L AHP (with the top of cut beginning approx 400’ from the foreshore dike C/L and extending just beyond the -55’ contour), with approx 882,000 CYS removed; and

d) Mile 3.65R AHP to Mile 3.25R AHP (with the top of cut beginning approx 400’ from the foreshore dike C/L and extending just beyond the -55’ contour), with approx 344,000 CYS removed.

In all, a total of approx 2.71 million gross CYS were excavated from the channel and placed within the embankment areas covered under this contract.

The deepening of the Mississippi River Southwest Pass Ship Channel, from -40’ to -55’, was authorized under the Mississippi River Ship Channel – Gulf to Baton Rouge project under the Supplemental Appropriation Act of 1985, (Public Law 99-88 dated 15 Aug 1985) and the Water Resources Development Act (WRDA) OF 1986, (PUBLIC Law 99-662). Construction of the first phase, a -45’ channel from the Gulf of Mexico to Mile 181 AHP, commenced in July 1987 and was completed in Dec 1987. This resulted in the deepening of the authorized -40’ MLG navigation channel to -45’MLG, plus and additional authorized 2’ advance maintenance and 2’ allowable overdepth. The authorized width for the new deep draft project is 750’ between New Orleans and Southwest Pass Mile 17.5 BHP, transitioning to 600’ at Mile 18.0 BHP, and 600’ from Mile 18.0 BHP thought the Southwest Pass jetty and entrance channel. In order to provide a -45’ channel between Belle Chase and the Gulf, dredging was performed within the following 3 reaches:

a) Miles 3.5 AHP to 9.0 BHP (Contract 87-C-0177, initiated in Sep ’87 and completed in Dec ’87) – approx 6.4 Million CYS dredged,

b) Miles 9.0 BHP to 18.8 BHP (Contract 87-C-0152, initiated in Jul ’87 and completed in Sep ’87) – approx 6.4 Million CYS dredged,

c) Miles 18.8 BHP to 21.0 BHP (Contract 87-C-0213, initiated in Oct ’87 and completed in Nov ’87) – approx 0.44 Million CYS dredged, and

d) Miles 21.0 BHP to 22.1 BHP (performed by Gov’t hopper dredge “Wheeler” in Jul ’87) – approx 0.47 Million CYS dredged.

Saltwater Barrier Sill Construction

- Due to the severe drought during the summer of 1988, an earthen saltwater barrier sill was constructed at approx River Mile 63.7 in order to reduce saltwater intrusion. This entailed the excavation of approx 1.6 million CYS from a borrow site immediately upstream of the sill. The limits of the borrow pit used were between approx river miles 64.1R AHP and 64.36R AHP. The width of the pit was approx 500', extending riverward of the -35' contour. Work commenced in Jul '88 and was completed in Oct '88.

- In FY '00, the sill was reconstructed at the original location, approx Mile 63.7 AHP. A rental dredge contract was awarded for the reconstruction of the earthen sill, with borrow obtained from the Mississippi River at approx Mile 64R AHP. Approximately 610,000 CYS of borrow was placed at the sill location and the work completed in Oct '99

CWPPRA – Channel Armor Gap Crevasse

The project consisted of deepening an existing 200-foot wide gap in the Mississippi River channel bank armor located at approx river Mile 4.6L AHP. In addition, a diversion channel leading from the armor gap to Mary Bowers Pond was constructed. The project was completed in Dec '97. The project was designed to restore vegetated wetlands by increasing fresh water and sediment from the Mississippi River to the Delta National Wildlife Refuge area. The average flow of water is approximately 2,500 cubic feet per second and is expected to benefit approx 936 acres of wetlands over the 20-year life span of the project.

CWPPRA – West Bay Sediment Diversion

The diversion site is located on the west bank of the Mississippi River, in Plaquemines Parish, Louisiana, approx 4.7 miles above Head of Passes. The project diverts Mississippi River water and sediments into West Bay.

The objective of the project is to restore vegetated wetlands in an area that is currently shallow open water. The project is designed to divert sediments to create, nourish, and maintain approximately 9,800 acres of fresh to intermediate marsh in the West Bay area over the project life. The project consists of a large scale, uncontrolled conveyance channel for the diversion of sediments from the river. The conveyance channel was proposed to be constructed in two phases:

(1) Construction of an initial channel with an average discharge of 20,000 cubic feet per second (cfs);

(2) After a period of intensive monitoring, possible enlargement of the channel to a 50,000 cfs discharge.

The following is a summary of events associated with the construction and maintenance of the project as of this date:

- The initial construction of the 20,000 cfs diversion was completed in Nov ’03, along with dredging in the Pilottown Anchorage Area to account for induced shoaling impacts within the anchorage area due to the diversion. Approx 1.39 Million gross CYS of material was dredged during construction of the 20,000 cfs diversion channel, as well as dredging in the Pilottown Anchorage Area below the diversion to Mile 1.5R AHP, and to create wetlands within the shallow waters of West Bay. Approximately 735,000 CYS was dredged from the shallow draft anchorage area and approx 655,000 CYS was dredged for construction of the diversion channel itself.

- Maintenance dredging of the Pilottown Anchorage Area was performed in FY ’06. This dredging event entailed maintenance dredging of the shallow draft anchorage, initially dredged in Nov ’03 in conjunction with the construction of the 20,000 cfs diversion at Mile 4.7R AHP and extending from the diversion downstream to Mile 1.5 AHP. In addition to maintenance of the shallow draft anchorage, initial dredging of the deep draft anchorage, between Approx Mile 6.4R AHP and Mile 4.7R AHP, was also performed. During this contract, approx 1.88 Million gross CYS (640,000 gross CYS from the deep draft anchorage and 1,240,000 gross CYS from the shallow draft anchorage) was dredged and placed into the shallow waters of West Bay for wetland creation.

Appendix M: Detailed Model Descriptions

Contents :

HEC-6T 1-dimensional model description

Adaptive Hydraulics (ADH) 2-dimensional model description

CH3D-SED 3-dimension Model description

HEC-6T 1 Dimensional Model Technical Description

MODEL PURPOSE AND PHILOSOPHY

HEC-6 / HEC-6T is a one-dimensional movable boundary open channel flow numerical model designed to simulate and predict changes in river profiles resulting from scour and/or deposition over moderate time periods (typically years). A continuous flow record is partitioned into a series of steady flows of variable discharges and durations. For each flow a water surface profile is calculated thereby providing energy slope, velocity, depth, etc. at each cross section. Potential sediment transport rates are then computed at each section. These rates, combined with the duration of the flow, permit a volumetric accounting of sediment within each reach. The amount of scour or deposition at each section is then computed and the cross section adjusted accordingly. The computations then proceed to the next flow in the sequence and the cycle is repeated beginning with the updated geometry. The sediment calculations are performed by grain size fraction thereby allowing the simulation of hydraulic sorting and armoring. Features of HEC-6 / HEC6-T include: capability to analyze networks of streams, channel dredging, various levee and encroachment alternatives, and to use several methods for computation of sediment transport rates.

Prediction of sediment behavior in shallow reservoirs and most rivers requires that the interactions between the flow hydraulics, sediment transport, channel roughness and related changes in boundary geometry be considered. HEC-6 / HEC-6T is designed to incorporate these interactions into the simulation.

HEC-6 simulates the capability of a stream to transport sediment, given the yield from upstream sources. This computation of transport includes both bed and suspended load as described by Einstein's Bed-Load Function (1950). A reach of river with a bed composed of the same type of sediment material as that moving in the stream is termed an 'alluvial' reach (Einstein 1950). Einstein recognized that an alluvial reach provides a record of the sediment that the stream has, and does, transport. That record is reflected in the materials that form the stream boundaries. Using the hydraulic properties of the flow and the characteristics of the sediment material (which can be determined by analyzing samples of the

riverbed sediment particles), one can compute the rate of sediment transport. HEC-6 / HEC-6T implements similar concepts to compute the movement of sediment materials for a temporal sequence of flows and, through volume conservation of bed material, changes in channel dimensions. The transport, deposition, and erosion of silts and clays may also be calculated. Effects of the creation and removal of an armor layer are also simulated.

APPLICATIONS OF HEC-6 / HEC-6T

A dynamic balance exists between the sediment moving in a natural stream, the size and gradation of sediment material in the stream's boundaries and the flow hydraulics. When a reservoir is constructed, flood damage reduction measures are implemented, or a minimum depth of flow is maintained for navigation, that balance may be changed. HEC-6 can be used to predict the impact of making one or more of those changes on the river hydraulics, sediment transport rates, and channel geometry.

HEC-6 is designed to simulate long-term trends of scour and/or deposition in a stream channel that might result from modifying the frequency and duration of the water discharge and/or stage, or from modifying the channel geometry (e.g., encroaching on the floodplains). HEC-6 can be used to evaluate deposition in reservoirs (both the volume and location of deposits), design channel contractions required to maintain navigation depths or decrease the volume of maintenance dredging, predict the influence that dredging has on the rate of deposition, estimate possible maximum scour during large flood events, and evaluate sedimentation in fixed channels.

SUMMARY OF HEC-6 / HEC-6T CAPABILITIES

Geometry

A river system consisting of a main stem, tributaries and local inflow/outflow points can be simulated. Such a system in which tributary sediment transport is calculated is referred to as a network model. Sediment transport is calculated by HEC-6 / HEC-6T in primary rivers and tributaries. There will be upper limits on the number of network branches, number of cross sections, etc., due to computer memory limitations.

Hydraulics

The one-dimensional energy equation is used by HEC-6 / HEC-6T for water surface profile computations. Manning's equation and n values for overbank and channel areas may be specified by discharge or elevation. Manning's n for the channel can also be varied by Limerinos' (1970) method using the bed gradation of each cross section. Expansion and contraction losses are included in the determination of energy losses. The energy loss coefficients may be changed at any cross section.

For each discharge in a hydrograph, the downstream water surface elevation can be determined by either a user-specified rating curve or a time dependent water surface elevation. Internal boundary conditions can be imposed on the solution. The downstream rating curve can be changed at any time. Internal boundary conditions can also be changed at any time.

HEC-6 / HEC-6T can be executed in "fixed bed" mode, in which only water surface profiles are computed. Sediment information such as inflowing sediment load and bed gradations are not needed to run HEC-6 / HEC-6T in fixed-bed mode.

Sediment

Sediment transport rates are calculated for grain sizes up to 2048 mm (large boulders). Sediment sizes larger than 2048 mm that may exist in the bed, are used for sorting computations but are not transported. For deposition and erosion of clay and silt sizes up to 0.0625 mm, Krone's method is used for deposition and Ariathurai and Krone's adaptation of Parthenaides' method is used for scour. The default procedure for clay and silt computations allows only deposition using a method based on settling velocity.

The sediment transport function for bed material load is selected by the user. HEC-6T provides 18 transport functions including:

Toffaleti (1969)

Madden's (1963) modification of Laursen's (1958) relationship

Yang's stream powers: Sand (1973) and Gravel (1984)

DuBoy's (Brown 1950)

Einstein (1950)

Ackers-White (1973)

Colby (1964)

Toffaleti and Schoklitsch combination

Meyer-Peter and Muller gravel transport (1948)

Schoklitsch gravel transport

Toffaleti (1969) and Meyer-Peter and Muller (1948) combination

Madden's (1985) modification of Laursen's (1958) relationship

Laursen–Copeland

Engelund-Hansen

Parker gravel transport (1990)

Proffitt and Sutherland

Brownlie (with transport normalized at D50 value)

Brownlie (with transport calculated for each grain size)

Deposition or scour is modeled by moving each cross section point within the movable bed (i.e., the area which is shifted vertically each time step due to sediment movement).

The movable bed limits may extend beyond the channel bank "limits". Deposition is allowed to occur in all wetted areas, even if the wetted areas are beyond the conveyance or movable bed limits. Scour occurs only within the movable bed limits. Sediment transport potential is based upon the hydraulic and sediment characteristics of the channel alone. Simulation of geological controls such as bedrock or a clay layer may be done by specifying a minimum elevation for the

movable bed at any particular cross section.

The sediment boundary conditions (inflowing sediment load as a function of water discharge) for the main river channel, its tributaries and local inflow/outflow points can be changed with time. HEC-6 / HEC-6T has the capability to simulate the diversion of water and sediment by grain size. A transmissive boundary condition is available at each downstream boundary; this boundary condition forces all sediment entering that section to pass it, resulting in no scour or deposition at that section.

General

Computed information includes the total sediment discharge passing each cross section and the volume of deposits (or scour) accumulated at each cross section from the beginning of the simulation. HEC-6 / HEC-6T also has the ability to simulate the effects of dredging activities. Dredging can be initiated when a depth of deposition is exceeded or can occur on a periodic basis. Dredging can also be based upon a required minimum depth for navigation.

THEORETICAL ASSUMPTIONS AND LIMITATIONS

HEC-6 / HEC-6T is a one-dimensional continuous simulation model that uses a sequence of steady flows to represent discharge hydrographs. There is no provision for simulating the development of meanders or specifying a lateral distribution of sediment load across a cross section. The cross section is subdivided into two parts with input data; that part which has a movable bed, and that which does not. The movable bed is constrained within the limits of the wetted perimeter and other limitations. The entire wetted part of the cross section is normally moved uniformly up or down; an option is available, however, which causes the bed elevation to be adjusted in horizontal layers when deposition occurs. Bed forms are not simulated; however, n values can be input as functions of discharge, which indirectly permits consideration of the effects of bed forms if the user can determine those effects from measured data. Limerinos' (1970) method is available as an option for computation of bed roughness. Density and secondary currents are not simulated.

SINGLE EVENT ANALYSIS

HEC-6 is designed to analyze long-term scour and/or deposition. Single flood

event analyses must be performed with caution. HEC-6 bed material transport algorithms assume that equilibrium conditions are reached within each time step (with certain restrictions); however, the prototype is often influenced by unsteady non-equilibrium conditions during flood events. Equilibrium may not occur under these conditions because of the continuously changing hydraulic and sediment dynamics. If such situations predominate, single event analyses should be performed only on a qualitative basis. For gradually changing sediment and hydraulic conditions, such as for large rivers with slow rising and failing hydrographs, single event analyses may be performed with confidence.

Adaptive Hydraulics (ADH) Modeling System

Hydrodynamics

ADH is a state-of-the-art ADaptive Hydraulics Modeling system developed by the US Army Engineer Engineering Research and Development Center Coastal and Hydraulics Laboratory. It is capable of simulating both saturated and unsaturated groundwater, overland flow, three-dimensional Navier-Stokes flow, and two- or three-dimensional shallow water problems with the current study utilizing the two-dimensional shallow water module. The 2D shallow-water equations used for this application are a result of the vertical integration of the equations of mass and momentum conservation for incompressible flow under the hydrostatic pressure assumption. Written in conservative form, the 2D shallow water equations are:

$$\frac{\partial \mathbf{U}}{\partial t} + \frac{\partial \mathbf{F}}{\partial x} + \frac{\partial \mathbf{G}}{\partial y} + \mathbf{H} = 0 \qquad \textbf{(1)}$$

where

$$\mathbf{U} = \begin{Bmatrix} h \\ uh \\ vh \end{Bmatrix} \qquad \textbf{(2)}$$

$$\mathbf{F} = \begin{Bmatrix} uh \\ u^2 h + \frac{1}{2} g h^2 - h \dfrac{\sigma_{xx}}{\rho} \\ uvh - h \dfrac{\sigma_{yx}}{\rho} \end{Bmatrix} \qquad \textbf{(3)}$$

$$\mathbf{G} = \begin{Bmatrix} vh \\ uvh - h\dfrac{\sigma_{xy}}{\rho} \\ v^2 h + \frac{1}{2} g h^2 - h\dfrac{\sigma_{yy}}{\rho} \end{Bmatrix} \qquad \textbf{(4)}$$

and

$$\mathbf{H} = \begin{Bmatrix} 0 \\ gh\dfrac{\partial z_b}{\partial x} + n^2 gh\dfrac{u\sqrt{u^2 + v^2}}{C_o h^{1/3}} \\ gh\dfrac{\partial z_b}{\partial y} + n^2 gh\dfrac{v\sqrt{u^2 + v^2}}{C_o h^{1/3}} \end{Bmatrix} \qquad \textbf{(5)}$$

where:

ρ	=	fluid density
g	=	gravitational acceleration
z_b	=	riverbed elevation
n	=	Manning's roughness coefficient
h	=	flow depth
u	=	x-component of velocity
v	=	y-component of velocity

C_o = dimensional conversion coefficient (1 for SI units, 1.486 for U.S. customary units)

σ's = the Reynolds stresses due to turbulence, where the first subscript indicates the direction, and the second indicates the face on which the stress acts.

The Reynolds stresses are determined using the Boussinesq approach to the gradient in the mean currents:

$$\sigma_{xx} = 2\rho v_t \frac{\partial u}{\partial x} \qquad (6)$$

$$\sigma_{yy} = 2\rho v_t \frac{\partial v}{\partial y} \qquad (7)$$

and

$$\sigma_{xy} = \sigma_{yx} = 2\rho v_t \left(\frac{\partial u}{\partial y} + \frac{\partial v}{\partial x} \right) \qquad (8)$$

where v_t = kinematic eddy viscosity (which varies spatially).

The ADH shallow-water equations are placed in conservative form so that mass balance and the balance of momentum and pressure are identical across an interface. This is important in order to match the speed and height of a surge or hydraulic jump.

The equations are represented in a finite element approach. The quality of the numerical solution depends on the choice of the basis/trial function and the test function. The trial function determines how the variables are represented and the test function determines the manner in which the differential equation is

enforced. In the Galerkin approach the test functions are chosen to be identical with the trial functions. When the flow is advection-dominated, the Galerkin approach produces oscillatory behavior. The Galerkin form of the test function cannot detect the presence of a node-to-node oscillation and so allows this spurious solution. The approach used in ADH is to enrich the standard Galerkin test function with an additional term that can detect and control this spurious solution.

This Petrov-Galerkin method used here is based on elemental constants for coefficients. This reduces the stabilization to the nonconservative form. This is not a problem for conservation since the stabilization is only applied within the elements and uses the Galerkin test function to enforce "flux" balance across element edges. For illustration, consider the shallow-water equations in nonconservative form

$$\frac{\partial U}{\partial t} + A\frac{\partial U}{\partial x} + B\frac{\partial U}{\partial y} + H = 0 \qquad \textbf{(9)}$$

where $A = \frac{\partial F}{\partial U}$ and $B = \frac{\partial G}{\partial U}$. The trial functions (or interpolation/basis functions) are the Lagrange polynomials. These are piecewise linear functions that are continuous across element boundaries. Spatial derivatives, however, are not continuous across these element edges. Each of the dependent and independent variables is interpolated via these trial functions. For example,

$$\tilde{u}(x) = \sum_{j=1}^{N} \phi_j(x) u_j , \qquad (10)$$

means that the approximate solution is made up of the sum of the products of the trial function for node j and the nodal value at that location. The test function is chosen as:

$$\phi_i^* = \phi_i I + \alpha \left(\frac{\partial \phi_i}{\partial x} A + \frac{\partial \phi_i}{\partial y} B \right) \qquad (11)$$

where,

$$\alpha = 0.5\, l \left[\bar{v} \bullet \bar{v} + gh + \left(\frac{l}{\Delta t} \right)^2 \right]^{-1/2} \qquad (12)$$

l	=	$(\Omega_e)^{1/2}$, the square of the element area
$\bar{v}$	=	$(\bar{u}, \bar{v})$, the element average velocity components
Δt	=	time step size

The finite element statement becomes:

$$\int_{\Omega} \left(\phi_i \frac{\partial U_l}{\partial t} - \frac{\partial \phi_i}{\partial x} F_l - \frac{\partial \phi_i}{\partial y} G_l + \phi_i H_l \right) d\Omega +$$

$$\int_{\partial\Omega} \phi_i \left\{ F_l n_x + G_l n_y \right\} ds + \sum_e \int_{\Omega_e} \alpha \left(\frac{\partial \phi_i}{\partial x} A_l + \frac{\partial \phi_i}{\partial y} B_l \right)$$

$$\left(\frac{\partial U_l}{\partial t} + A_l \frac{\partial U_l}{\partial x} + B_l \frac{\partial U_l}{\partial y} + H_l \right) = 0 \qquad (13)$$

Where, the subscript l indicates the finite element approximation. The Petrov-Galerkin contributions are integrated over the interior of the elements, but not across element edges. This contribution stabilizes the Galerkin approach. This scheme utilizes a single scaling factor, α. This is different from the scheme reported in Berger and Stockstill (1995). That scheme involved scaling each

eigenvalue, but that method does not converge using the iterative solver in ADH. Instead, a single value scaling (Equation 12) is used.

One of the major benefits of ADH is its ability to adapt the mesh in areas where additional resolution is needed to properly resolve the hydrodynamics. This process is done by normalizing the results so that an error quantity is determined for each element. If this error exceeds the tolerance set by the user, then the element is refined. ADH is also able to unrefined previously refined areas when the added resolution is no longer needed. ADH contains other essential features such as wetting and drying, completely coupled sediment and salt transport, and wind effects. A series of modularized libraries make it possible for ADH to include vessel movement, friction descriptions, as well as a host of other crucial features. ADH can run in parallel or on a single processor and runs on both Windows systems and UNIX based systems.

Sediment

SEDLIB Multiple Grain Sized Mixed Sediment Library

Purpose

SEDLIB is a sediment transport library. It is capable of solving problems consisting of multiple grain sizes, cohesive and cohesionless sediment types, and multiple layers. It calculates erosion and deposition processes simultaneously, and simulates such bed processes as armoring, consolidation, and discrete depositional strata evolution.
The SEDLIB library system is designed to link to any appropriate hydrodynamic code. The hydrodynamic code must be capable of performing advection diffusion calculations for a constituent. SEDLIB interacts with the parent code by providing sources and sinks to the advection diffusion solver in the parent code. The solver is then used to calculate both bedload and suspended load transport, for each grain class. The sources and sinks are passed to the parent code via a fractional step modification of the time derivative term.

Organization

SEDLIB is designed to be both robust and adaptable. To this end, an organizational scheme for SEDLIB was developed such that the parts of the library that are most likely to be changed and/or updated are also the parts that are the least integral to the function of the library as a whole. Figure 1 gives a schematic description of this organization.

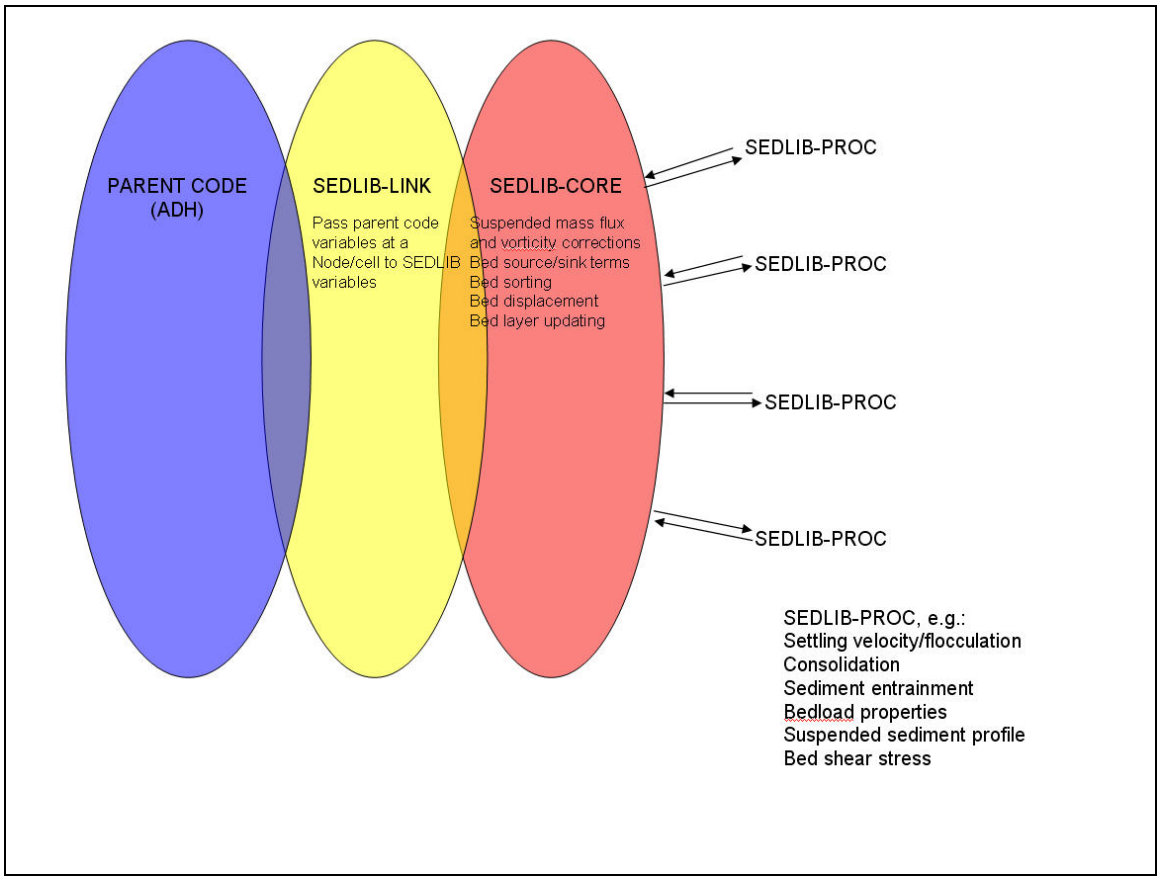

Figure 1: SEDLIB organizational chart

In Figure 1, the colored ovals represent common variable spaces – that is, those subroutines within a given oval share a set of common variables. Where the ovals overlap represent subroutines that share multiple sets of common variables.

The parent code shares a set of common variables with the SEDLIB-LINK routines. The parent code calls the SEDLIB-LINK at each computational point. So, for example, if the computational point in the parent code is a set of nodes, the parent code will have a nodal loop and *within that loop* the parent code will call the SEDLIB-LINK routine. SEDLIB performs all of its calculations at a single point. All spatial gradients and fluxes are calculated in the parent code via the advection-diffusion calculations.

The purpose of the SEDLIB-LINK routines is merely to pass information to and from the SEDLIB library. This message passing is facilitated by sharing two sets of common variables across the SEDLIB-LINK – one set that is associated with the parent code, and one set that is associated with SEDLIB.

When the SEDLIB-LINK is called, all of the relevant hydrodynamic and sediment information is passed from the parent code variables to the corresponding SEDLIB variables. The SEDLIB-LINK then calls one or more of the SEDLIB-CORE routines. Upon completion of the execution of the SEDLIB-CORE routines, the SEDLIB-LINK passes the updated sediment information from the SEDLIB common variables back to the corresponding variables in the parent code.

The SEDLIB-CORE routines perform the fundamental sediment transport calculations. These include such things as the development of source and sink terms, erosion and

deposition, bed sorting, and bed layer accounting. These routines contain very little specific information concerning the physics of individual processes – that information is contained in the SEDLIB-PROC routines. Rather, these routines are the basic computational engines that are used to combine all of the various physical processes into a coherent framework.

The SEDLIB-PROC routines are a set of subroutines with no common variables whatsoever. That is, all information passing to and from these routines is passed through the call statements. Each of these routines represents an individual physical process.

It is expected that most of the future development of the code will consists of adding new and updated content to the SEDLIB-PROC routines. Since each of these is completely independent of the rest of the code, they can be tested independently and then inserted into the code with relative ease. Hence, the whole library system is optimized for both adaptability and consistency by organizing it such that those aspects of the library that are the most mutable are also those aspects of the library that are the most modular.

SEDLIB-CORE

The SEDLIB-CORE routines contain the fundamental sediment transport calculations. The routines are given as follows:

sedlib_core_bed.c – this the main subroutine for sediment bed calculations

sedlib_core_suspended_transport.c – this is the main subroutines for passing information to the parent code needed for suspended sediment calculations

sedlib_core_bedload_transport.c – this is the main subroutines for passing information to the parent code needed for bedload sediment calculations

sedlib_core_bed_shear_stress.c – this calculates the bed shear stress.

sedlib_core_critical_shear_stress.c – this calculates the critical shear stress for noncohesive grains

sedlib_core_noncoh_erosion_deposition_flux.c- this calculates the erosion and deposition potentials for noncohesive grains.

sedlib_core_coh_deposition_flux.c – this calculates the depositional flux potentials for cohesive grains

sedlib_core_mixed_sed_erosion_flux.c – this calculates the erosion and deposition potentials for mixed sediment beds

sedlib_core_limit_erosion.c – this is called to address the special case where erosion switches to deposition in the middle of a sediment time step

sedlib_core_active_strata_source.c – this calculates the sediment information associated with the active strata

sedlib_core_bed_sorting_and_displacement.c – this calculates the bed displacement and active layer grain distribution

sedlib_core_active_layer_properties.c – this calculates the active layer porosity and cohesive parameters

sedlib_core_time_to_erode_layer.c – this calculates the time required to erode a given bed layer

sedlib_core_bed_layer_update.c – this updates the bed layer information at the end of the time step

CH3D-SED Model

Hydrodynamics

The governing partial differential equations are based on the following assumptions: a) a hydrostatic pressure distribution, b) the Boussinesq approximation, and c) an eddy viscosity approach adequately describes turbulent mixing.

The basic equations for an incompressible fluid in a right-handed Cartesian coordinate system (x,y,z) are (Johnson et al., 1991b):

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0 \qquad (5\text{-}1)$$

$$\frac{\partial u}{dt}+\frac{\partial u^2}{dx}+\frac{\partial uv}{\partial y}+\frac{\partial uw}{\partial z}=fv-\frac{1}{\rho_o}\frac{\partial p}{\partial x}+\frac{\partial}{\partial x}\left(A_h\frac{\partial u}{\partial x}\right)+\frac{\partial}{\partial y}\left(A_h\frac{\partial u}{\partial y}\right)+\frac{\partial}{\partial z}\left(A_v\frac{\partial u}{\partial z}\right) \qquad (5\text{-}2)$$

$$\frac{\partial v}{\partial t}+\frac{\partial uv}{\partial x}+\frac{\partial v^2}{\partial y}+\frac{\partial vw}{\partial z}=-fu-\frac{1}{\rho_o}\frac{\partial p}{\partial y}+\frac{\partial}{\partial x}\left(A_h\frac{\partial v}{\partial x}\right)+\frac{\partial}{\partial y}\left(A_h\frac{\partial v}{\partial y}\right)+\frac{\partial}{\partial z}\left(A_v\frac{\partial v}{\partial z}\right) \qquad (5\text{-}3)$$

$$\frac{\partial p}{\partial z}=-\rho g \qquad (5\text{-}4)$$

$$\frac{\partial T}{\partial t}+\frac{\partial uT}{\partial x}+\frac{\partial vT}{\partial y}+\frac{\partial wT}{\partial z}=\frac{\partial}{\partial x}\left(K_h\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial y}\left(K_h\frac{\partial T}{\partial y}\right)+\frac{\partial}{\partial z}\left(K_v\frac{\partial T}{\partial z}\right) \qquad (5\text{-}5)$$

$$\frac{\partial S}{\partial t}+\frac{\partial uS}{\partial x}+\frac{\partial vS}{\partial y}+\frac{\partial wS}{\partial z}=\frac{\partial}{\partial x}\left(K_h\frac{\partial S}{\partial x}\right)+\frac{\partial}{\partial y}\left(K_h\frac{\partial S}{\partial y}\right)+\frac{\partial}{\partial z}\left(K_v\frac{\partial S}{\partial z}\right) \qquad (5\text{-}6)$$

$$\rho=\rho(T,S) \qquad (5\text{-}7)$$

where

(u,v,w) = velocities in (x,y,z) directions,

t = time,

f = Coriolis parameter defined as $2\Omega \sin \varphi$,

where

Ω = rotational speed of the earth,

φ = latitude,

ρ = density,

p = pressure,

A_h, K_h = horizontal turbulent eddy viscosity and diffusion coefficients,

A_v, K_v = vertical turbulent eddy viscosity and diffusion coefficients,

g = gravitational acceleration,

T = temperature and

S = salinity.

The equation of state for density as a function of salinity and temperature is:

$$\rho = P/(\alpha + 0.698P) \quad (5\text{-}8)$$

where

$$P = 5890 + 38T - 0.375T^2 + 3S$$

$$\alpha = 1779.5 + 11.25T - 0.0745T^2 - (3.8 + 0.01T)S$$

Temperature is in degrees Celsius and salinity in is parts per thousand .

Within the model, the basic equations presented above are normalized, boundary-fitted, and sigma-stretched as presented in Chapman, Johnson, and Vemulakonda (1996).

Initial and boundary conditions

The governing equations presented in the previous section are subject to surface, bottom and lateral boundaries. These boundary conditions are discussed generally here and the reader is again referenced to Chapman, Johnson, and Vemulakonda (1996) for additional details.

The free-surface boundary conditions are wind stress and heat exchange. Wind stress enters as source terms into the momentum equations (Equations 5-2 and 5-3) in the following form:

$$A_v\left(\frac{\partial \bar{u}}{\partial z}, \frac{\partial \bar{v}}{\partial z}\right) = \left(\tau_{s_\xi}, \tau_{s_\eta}\right)/\rho = \left(C\,W_\xi^2, C\,W_\eta^2\right) \quad (5\text{-}9)$$

where

τ_s = wind shear stress

C = surface drag coefficient

W = wind speed (m/s)

The surface drag coefficient is approximated using Garratt (1977):

$$C = (0.75 + 0.067\,W) \times 10^{-3} \quad (5\text{-}10)$$

Heat exchange is represented through a surface heat exchange coefficient and the daily equilibrium temperature and enters as a source term in Equation 5-5. The surface heat exchange coefficient and equilibrium temperature are calculated from geographical and meteorological conditions (Edinger et.al., 1974) accounting for latitude, wind speed, cloud cover, and wet and dry bulb temperatures. Zero salinity flux is imposed at the surface.

The bottom boundary condition is a quadratic shear stress:

$$A_v\left(\frac{\partial u}{\partial z},\frac{\partial v}{\partial z}\right)=\left(\tau_{b_\xi},\tau_{b_\eta}\right)/\rho=\frac{U_r}{A_{vr}}Z_r\,C_d\left(u_1^2+v_1^2\right)^{1/2}\left(u_1,v_1\right) \qquad (5\text{-}11)$$

where

τ_b = bottom shear stress,

U_r = reference velocity,

Z_r = reference height,

C_d = bottom drag coefficient and

u_1, v_1 = near-bottom horizontal velocity

The bottom friction for the present study was specified as a spatially constant bottom friction coefficient, and the values applied are discussed with respect to model calibration. During different periods of model calibration, the bottom friction coefficient was specified as a uniform value varies from 0.00128 to 0.04.

The CH3D surface heat exchange coefficient is given by:

$$k=\frac{K_T}{\rho C_p} \qquad (5\text{-}12)$$

where K_T = surface heat exchange coefficient (W/m²/°C), and C_p = specific heat of water (4000 J/kg).

Sediment

The concept of sediment transport and bed evolution, and the appropriate mathematical formulation, described herein, accounts for the following important aspects of sediment-flow interaction in natural watercourses: suspended-sediment transport, bedload transport, and interaction between the two; bed level changes; differential settling; hydraulic sorting and armoring; interaction between the flow and changes in bed elevation and bed surface size distribution; and washload transport.

Bedload Transport and Bed Evolution

Since it is difficult to account for the exact position and size of each sediment particle being entrained from the bed or ending its trajectory at a certain spot on

the bed surface (Fig. 1), a uniform size distribution is assumed inside a finite elemental area of bed surface. This elemental area must satisfy the condition that its dimension Δ1 is not less than the maximum average saltation length. If this requirement is satisfied, then the bedload flux (taken as parallel to the bed surface) represents bedload exchange between two neighboring elemental areas.

Image: Figure 1. Schematic Representation of Bed-Material Finite Elemental Volume.

The notion of an active layer is introduced to obviate the need to account for the position and size of each sediment particle below the bed surface that may, during erosion, become exposed to the flow and become part of the bed surface. The active layer is defined as an upper layer of the bed, including the bed surface, having a uniform size distribution over its depth. It is assumed that all sediment particles of a given size class inside the active layer are equally exposed to the flow irrespective of their location in the layer.

A finite elemental volume ΔV is defined as having dimension Δl and a thickness E_m (Fig. 1). For a fixed active-layer floor elevation, the mass-conservation equation for one particular size class of sediment in the active-layer elemental volume is written as follows:

$$\rho_s(1-p)\frac{\partial(\beta E_m)}{\partial t}+\nabla\cdot\vec{q}_b+S_e-S_d=0$$

Eq. 1

where p = porosity of the bed material, assumed to be constant; ρ_s = density of sediment, assumed to be constant; β = active-layer size fraction, defined as a ratio of the mass of particles of one particular size class inside the active-layer elemental volume ΔV to the mass $\rho_s(1-p)\Delta V$ of all sediment particles contained in ΔV; S_e = suspended-sediment 'erosion' source, representing the entrainment of sediment particles from the bed into suspension; S_d = suspended-sediment 'deposition' source, representing gravitational settling of suspended sediment particles onto the bed.

Subsurface material below the active-layer elemental volume is discretized into a sequence of control volumes, one below the other, called herein stratum control volumes (Fig. 2). Each stratum control volume has the same dimension Δ1 as the active-layer elemental volume above it. The bed material inside one stratum control volume is assumed to have uniform size distribution.

The stratum control volume immediately below the active-layer elemental volume is called the active-stratum control volume. It is possible, indeed likely, that the active-layer elemental volume and active-stratum elemental volume have different size distributions. The active-layer floor, which is at the same time an active-stratum ceiling, descends or rises whenever the bed elevation changes due to deposition or erosion occurring in the active-layer elemental volume. If, for example, the active-layer floor descends, some of the material that belonged to the active-stratum control volume becomes part of the active-layer elemental volume, whose homogeneous size distribution thus may change.

Image: Figure 2. Stratum Control Volumes Below an Active-Layer Elemental Volume.

In order to represent the exchange of sediment particles between the active-layer elemental volume and the active-stratum control volume due to active-layer floor movement, another 'source' term is introduced, called herein the active-layer floor 'source' S_F, again specific to one particular size class of particles. The mass-conservation equation for a size class of sediment particles in the active-layer elemental volume then reads:

$$\rho_s(1-p)\frac{\partial(\beta E_m)}{\partial t}+\nabla\cdot\vec{q}_b+S_e-S_d-S_F=0$$

Eq. 2

Since the bedload flux is a vector parallel to the bed surface, the vector Eq.(2) is essentially two-dimensional.

The mass of a particular size class in the active-stratum control volume may change only due to active-layer floor movement, i.e. due to exchange of material between the active layer and active stratum, while the active-stratum floor elevation remains unchanged. This is expressed by a mass-conservation equation written for each size class in the active-stratum control volume:

$$\rho_s(1-p)\frac{\partial}{\partial t}\left[\beta_s\left(z_b-E_m\right)\right]+S_F=0$$

Eq. 3

where z_b = bed-surface level (bed elevation); β_s = active-stratum size fraction; and (z_b-E_m) = active-layer floor elevation, i.e. active-stratum ceiling.

Summation of the mass-conservation equations for all size classes in the active-layer elemental volume and use of the basic constraint:

$$\sum \beta = 1$$

Eq. 4

where $\sum$ represents summation over all size classes, leads to the global mass-conservation equation for the active-layer elemental volume:

$$\rho_s (1-p) \frac{\partial E_m}{\partial t} + \sum \left(\nabla \cdot \vec{q}_b + S_e - S_d - S_F \right) = 0$$

Eq. 5

A similar equation can be obtained for the active-stratum control volume:

$$\rho_s (1-p) \frac{\partial \left(z_b - E_m \right)}{\partial t} + \sum S_F = 0$$

Eq. 6

where again Eq.(4) is invoked. Summation of Eqs.(5) and (6) gives the global mass-conservation equation for bed sediment:

$$\rho_s (1-p) \frac{\partial Z_b}{\partial t} + \sum \left(\nabla \cdot \vec{q}_b + S_e - S_d \right) = 0$$

Eq. 7

which can be recognized as the familiar Exner equation with the addition of suspended-sediment source terms. This last equation is again essentially two-dimensional, for the bedload-flux vector is parallel to the bed surface.

When the overall bed slope is small, the mass-conservation equation for a particular size class of active-layer sediment and global mass-conservation equation for bed sediment, (Eqs.(2) and (7)), could be written in Cartesian coordinates as follows:

$$\rho_s (1-p) \frac{\partial \left(\beta E_m \right)}{\partial t} + \frac{\partial q_{b_x}}{\partial x} + \frac{\partial q_{b_y}}{\partial y} + S_e - S_d - S_F = 0$$

Eq. 8

$$\rho_s(1-p)\frac{\partial z_b}{\partial t}+\sum\left(\frac{\partial q_{b_x}}{\partial x}+\frac{\partial q_{b_y}}{\partial y}+S_e-S_d\right)=0$$

Eq. 9

where q_{b_x}, q_{b_y} = x- and y-direction components of the bedload flux.

Suspended-Sediment Transport

Under the assumption that the suspended sediment particles are advected essentially by the local water velocity, except for the downward gravitational settling expressed through the fall velocity, the mass-conservation equation for one particular size class of suspended sediment in the elemental volume has the following form in Cartesian coordinates:

$$\frac{\partial(\rho C)}{\partial t}+\frac{\partial}{\partial x}(\rho Cu)+\frac{\partial}{\partial y}(\rho Cv)+\frac{\partial}{\partial z}(\rho Cw)-\frac{\partial}{\partial z}(\rho Cw_f)$$
$$=\frac{\partial}{\partial x}\left(D_H\frac{\partial(\rho C)}{\partial x}\right)+\frac{\partial}{\partial y}\left(D_H\frac{\partial(\rho C)}{\partial y}\right)+\frac{\partial}{\partial z}\left(D_H\frac{\partial(\rho C)}{\partial z}\right)$$

Eq. 10

where ρ = density of a mixture of water and suspended sediment (all size classes); C = dimensionless concentration, i.e. ratio of the mass ρC dV of the particular size-class particles contained in elemental volume dV to the total mass of the elemental volume; w_f = fall velocity for suspended-sediment particles of a particular size class; u,v,w = water-velocity components; D_H = horizontal mass-diffusivity coefficient; D_v = vertical mass-diffusivity coefficient.

Suspended-Sediment Source Terms

The suspended-sediment 'erosion' source represents entrainment of active-layer and bedload sediment particles into suspension. It is generally accepted that the entrainment of near-bed sediment particles into suspension can be modeled as an upward near-bed mass diffusion flux modified by β to reflect the availability of the particular size class in the active-layer control volume:

$$S_e=-\beta\left(D_v\frac{\partial(\rho C)}{\partial z}\right)_a$$

Eq. 11

Subscript 'a' denotes that the mass-diffusion flux is evaluated at a near-bed point some distance a above the bed surface.

The suspended-sediment 'erosion' source is further modeled as:

$$S_e = -\beta D_{v_a} \frac{(\rho C)_{a+\Delta a} - (\rho C)_a}{\Delta a}$$

Eq. 12

where C_a is a near-bed concentration estimated in a way to reflect the action of near-bed flow on the active-layer and bedload particles at a certain bed-surface location. Concentration $C_{a+\Delta a}$ is a near-bed concentration extrapolated from the suspended-sediment computations.

The suspended-sediment 'deposition' source represents gravitational settling of sediment particles already in suspension, i.e. particles that have been entrained into suspension elsewhere, or entered the model through a boundary, and transported as suspended sediment until reaching the vicinity of a certain location on the bed surface. The suspended-sediment 'deposition' source is modeled as a downward near-bed fall velocity flux:

$$S_d = \left(w_f \rho C \right)_{a+\Delta a}$$

Eq. 13

where concentration $C_{a+\Delta a}$ is extrapolated from the suspended-sediment computations. Subscript 'a + Δa' denotes that concentration $C_{a+\Delta a}$ is evaluated at some distance a + Δa above the bed surface.

One should note that when Eq.(10) is integrated over the elemental volume next to the bed, it must contain the same terms as described by Eqs. (11)-(13), i.e. downward near-bed fall-velocity flux and upward near-bed mass diffusion flux modified by β.

Primary Sediment Unknowns and Auxiliary Relations

If the sediment mixture in a natural watercourse is represented by a total of KS sediment size classes, then the following sediment variables are considered primary sediment unknowns: (1) bed-surface level z_b and KS active-layer size fractions β for each active-layer elemental volume; and (2) KS suspended-sediment concentrations C for each elemental volume containing a mixture of water and suspended sediment.

The near-bed concentration C_a , bedload flux q_b, active-layer thickness E_m ' active-layer floor 'source' S_F , fall velocity w_f , mass-diffusion coefficient D, and density of mixture containing water and suspended sediment ρ are in general functions of flow variables and primary sediment unknowns and are treated as auxiliary relations.

The basic nature of the auxiliary relations is described next. Beforehand, it is worth mentioning that the present work establishes a reliable computational framework for solving the relevant conservation laws as correctly as possible, incorporating the best available empirical information, that may be even site-specific for a particular application. The numerical procedure for solution of the sediment equations is formulated without reference to the specific empirical relations that ultimately must be invoked to evaluate the auxiliary relations. This allows for use of any suitable empirical relation when evaluating a particular auxiliary relation, and renders the formal numerical procedure independent of any specific empirical relation.

The near-bed concentration C_a (for a particular size class of sediment) generally depends on the near-bed flow characteristics and it is evaluated by using an appropriate empirical relation, for example that of van Rijn (1984a).

The net bedload flux is represented herein as:

$$q_b = (1-\gamma)\zeta_h \beta q_b^t$$

Eq. 14

where q_b^t = theoretical bedload capacity for a bed containing only sediment of the particular size class, evaluated using an appropriate bedload predictor such as proposed by van Rijn (1984a). This load is adjusted by ζ_h , a so called hiding factor accounting for the reduction or increase in a particular size class transport rate when it is part of a mixture. Empirical relations such as those proposed by Karim and Kennedy (1982) or Shen and Lu (1983) can be used to evaluate ζ_h. The adjusted load is modified by β to reflect the availability of the particular size class in the active-layer elemental volume. Finally, the load is modified by $(1-\gamma)$ to reflect the fact that some fraction γ of the particular size-class particles is transported as suspended load.

The active-layer thickness E_m is evaluated by an appropriate empirical concept of the depth of bed material that supplies material for bedload transport and suspended-sediment entrainment. Examples are the concepts of Karim and Kennedy (1982), Bennet and Nordin (1977), or Borah et al. (1982).

The active-layer floor 'source' S_F or a particular size class of sediment is derived from the mass-conservation equation for that particular size class in the active-stratum control volume. When the active-layer floor (active-stratum ceiling) descends, then:

$$S_F = -\rho_s (1-p) \frac{\partial}{\partial t} \left[\beta_s \left(z_b - E_m \right) \right]$$

Eq. 15

gives the mass of the particular size class, formerly comprising size fraction β_s of the active-stratum control volume, which becomes part of the active-layer elemental volume. When the active-layer floor (active-stratum ceiling) rises, then:

$$S_F = -\rho_s (1-p) \frac{\partial}{\partial t} \left[\beta \left(z_b - E_m \right) \right]$$

Eq. 16

gives the mass of the particular size class, formerly comprising size fraction β of the active-layer elemental volume, which becomes part of the active stratum control volume.

Depending on sediment-particle size, different experimental relations can be used to compute particle fall velocity, as described by van Rijn (1984b).

The mass-diffusion coefficient D is obtained by modifying the momentum-diffusion coefficient A to reflect the difference in the diffusion of a discrete sediment particle and the diffusion of a fluid 'particle' (or small coherent fluid structure), and also to reflect the damping of the fluid turbulence by the sediment particles, as suggested by van Rijn (1984b).

The local density of water with suspended sediment is modified to reflect the influence of local suspended-sediment concentration by using an appropriate empirical relation such as proposed by Zhou and McCorquodale (1992) or Holly and Rahuel (1989).

Auxiliary Relations and Active-Layer Considerations

One should note that the numerical procedure for solution of the sediment equations is formulated above without reference to the specific empirical relations which ultimately must be invoked to evaluate the auxiliary relations. This allows for use of any suitable empirical relation when evaluating a particular

auxiliary relation, and renders the formal numerical procedure independent of any specific empirical relation.

The empirical relations adopted herein to evaluate near-bed concentration C_a, components of bedload flux q_b, active-layer thickness E_m, active-layer floor 'source' S_F, fall velocity w_f, mass-diffusion coefficient D and density of mixture containing water and suspended sediment ρ, are the same ones that are used as examples in the discussion of the nature of auxiliary relations above.

The near-bed concentration C_a is evaluated using Van Rijn's (1984b) expression:

$$C_{a_{ks}} = 0.015 \frac{D_{ks}}{a} \frac{T_{ks}^{1.5}}{D^{*0.3}_{ks}}$$

Eq. 54

in which

$$D^*_{ks} = D_{ks}\left[\frac{(s-1)g}{v^2}\right]^{1/3}$$ = dimensionless particle diameter;

$$T_{ks} = \frac{u_*^2 - (u^*_c)^2_{ks}}{(u^*_c)^2_{ks}}$$ = transport-stage parameter;

$$u^* \frac{u\sqrt{g}}{C}$$ = effective bed-shear velocity;

$$C = 18\log\left(\frac{12d}{3D_{90}}\right)$$ = grain Chezy coefficient;

$$s = \frac{\rho s}{\rho}$$ = dimensionless sediment density;

and a=height above the bed, defined as one half of the average dune height, g=gravity; v=kinematic viscosity; d=depth; D_{90} =characteristic particle diameter for sediment mixture; u^*_c =critical shear velocity evaluated from Shields diagram; u=depth-averaged velocity component.

The theoretical bedload capacity is computed by using the empirical relations proposed by Van Rijn (1984a). A component of the theoretical (i.e. equilibrium, or capacity) bedload flux in, for example, the ξ-direction can be expressed, for the ks-th size class, as:

$$\left(q_b^t\right)_{ks} = 0.053 \cdot \rho_s \cdot \sqrt{(s-1)\, g D_{ks}}\, D_{ks} \frac{T_{ks}^{2.1}}{D^{*0.3}_{ks}}$$

Eq. 55

where all variables have the same meaning as in Eq.(54).
Van Rijn's original expression, representing volume flux, is multiplied herein by the sediment density in order to obtain mass flux, to be consistent with the other terms in the sediment equations.

Hiding effects are taken into account through the Karim, Holly and Yang (1987) empirical relation for the hiding factor:

$$\left(\zeta_h\right)_{ks} = \left(\frac{D_{ks}}{D_{50}}\right)^{0.85}$$

Eq. 56

Van Rijn (1984b) presented theoretical-experimental curves relating the ratio of suspended load to total load to the ratio of bed-shear velocity to fall velocity. The ratio of suspended load to total load is adopted herein as the transport-mode allocation parameter γ for the ks-th size-class particles. The graphical results of Van Rijn (Van Rijn (1984b), Figure 18) are approximated by:

$$\gamma_{ks} = \left(\frac{q_s}{q_t}\right)_{ks} = 0.25 + 0.325 \ln\left(\frac{u^*}{w_{f_{ks}}}\right) \qquad 0.4 < \frac{u^*}{w_{f_{ks}}} < 10$$

Eq. 57

where γ =transport-mode allocation parameter, q_s =suspended load, q_t =total load, w_f =fall velocity, and u^* =bed-shear velocity.

It is pointed above that there is a marked difference in the treatment of the active layer during erosion as distinguished from deposition. During persistent erosion, the active layer is described as a mixing layer. As the bed elevation descends, erosion proceeds through the active stratum (underlying the active layer) with the active-layer floor changing its elevation. The active-layer thickness during erosion is defined, according to the conceptualization of Bennett and Nordin (1977), as proportional to the erosion that occurs over the current computational time step:

$$\mathrm{E_m} = -c\left(z_b^{n+1} - z_b^{n}\right)$$

Eq. 58

where c is a parameter.

As the bed surface approaches an armored condition, then Eq. (58) leads to a zero active-layer thickness. In such situations Borah's (Borah et al, 1982) armored-layer thickness can be used as a limiting value for the active-layer thickness:

$$\mathrm{E_m} = -c\left(z_b^{n+1} - z_b^{n}\right) + \frac{1}{\sum_{\mathrm{ks=m}}^{\mathrm{KS}} \beta_{\mathrm{ks}}} \frac{D_{\mathrm{m}}}{1\text{-p}}$$

Eq. 59

where D_{m} is the smallest nonmoving size-class.

Movement of the active-layer floor $(\mathrm{z_b\text{-}E_m})$ generates the active-layer floor 'source' S_F. A consequence of Eq. (58) is that the active-layer floor may be descending either more quickly or more slowly than the bed elevation, depending on the current erosion rate, and that in principle the active-layer floor may even happen to rise during erosion.

If the active-layer floor descends during erosion (which is the usual case) then the active-layer floor 'source' $(S_{\mathrm{F}})_{\mathrm{ks}}$ for the ks-th size class, when discretized over the time step, has the following form:

$$S_{\mathrm{F_{ks}}} = -\frac{\rho_{\mathrm{s}}(1-p)}{\Delta \mathrm{t}}\left[\left(z_{\mathrm{b}}^{\mathrm{n+1}} - E_{\mathrm{m}}^{\mathrm{n+1}}\right) - \left(z_{\mathrm{b}}^{\mathrm{n}} - E_{\mathrm{m}}^{\mathrm{n}}\right)\right](\beta_{\mathrm{s}})_{\mathrm{ks}}$$

Eq. 60

where $(\beta_{\mathrm{s}})_{\mathrm{ks}}$ is the ks-th size-class fractional representation in the active stratum. One should note that the active-stratum size distribution remains unchanged in this case.

On rare occasions, when the erosion rate undergoes an extremely sharp decrease over the computational time step, the active-layer floor may actually rise during erosion. If this happens, then the active-layer floor 'source', discretized over the time step, has the form:

$$S_{F_{ks}} = -\frac{\rho_s (1-p)}{\Delta t}\left[\left(z_b^{n+1} - E_m^{n+1}\right) - \left(z_b^{n} - E_m^{n}\right)\right]\frac{\beta_{ks}^{n+1} + \beta_{ks}^{n}}{2}$$

Eq. 61

where β_{ks} is the ks-th size-class fractional representation in the active layer. In such a case the active-stratum size distribution changes, as active-layer material is released to it, and in principle this calls for inclusion of the active-stratum mass-conservation equation in the simultaneous solution of sediment equations. However since such situations are expected to be rare, they are handled explicitly herein, by updating the active-stratum size distribution at the end of computational time step, when necessary.

During persistent deposition, the active layer is described as a deposition layer. Newly deposited material is added to the existing material in the active layer and assumed to be fully mixed with it. The active-layer floor elevation is assumed to remain constant during deposition and the active-layer thickness is defined as:

$$E_m^{n+1} = E_m^{n} + \left(z_b^{n+1} - z_b^{n}\right)$$

Eq. 62

while the active-layer floor 'source' is equal to zero:

$$S_{F_{ks}} = 0$$

Eq. 63

The definition of the active layer, evaluation of the active-layer thickness and treatment of the active-layer floor 'source' depend on whether erosion or deposition occurs during the current computational time step. However, the tendency toward erosion or deposition is itself a part of the solution for the computational step. To resolve this ambiguity, one can make use of an iterative solution of the sediment equations. At the beginning of each iteration either erosion or deposition is assumed, based on whether erosion or deposition occurred during the previous iteration. Then one can easily compute the derivatives of the active-layer thickness E_m and active-layer floor 'source' $(S_F)_{ks}$ with respect to sediment variables, evaluated for previous-iteration values of sediment variables. These derivatives are then used to determine the coefficients in the discretized sediment equations.

In a clear still fluid the particle fall velocity w_f of a solitary sand particle smaller than about 100 μm (Stokes range) can be described by:

$$w_{f_{ks}} = \frac{1}{18}\frac{(s-1)gD_{ks}^2}{\nu}$$

Eq. 64

For suspended-sand particles in the range 100-1000 μm, the following equation, as proposed by Zanke (1977), is used:

$$w_{f_{ks}} = 10\frac{\nu}{D_{ks}}\left[\sqrt{1+\frac{0.01(s-1)gD_{ks}^3}{\nu^2}}-1\right]$$

Eq. 65

For particles larger than about 1000 μm the following equation, as proposed by Van Rijn (1982), is used:

$$w_{f_{ks}} = 1.1\sqrt{(s-1)gD_{ks}^2}$$

Eq. 66

As described by van Rijn (1984b), the vertical mass-diffusion coefficient D_v is related to the diffusion of fluid momentum by:

$$D_v = \beta_d \phi A_v$$

Eq. 67

The β_d-factor describes the difference in the diffusion of a discrete sediment particle and the diffusion of a fluid 'particle' (or small coherent fluid structure) and is assumed to be constant over the depth:

$$\beta_d = 1+2\left(\frac{w_{f_{ks}}}{u_*}\right)^2 \qquad 0.1 < \frac{w_{f_{ks}}}{u_*} < 1$$

Eq. 68

The ϕ-factor expresses the damping of the fluid turbulence by the sediment particles and is assumed to be dependent on the local sediment concentration:

$$\phi = 1 + \left(\frac{C}{C_o}\right)^{0.8} - 2\left(\frac{C}{C_o}\right)^{0.4}$$

Eq. 69

where C_o = 0.65 = maximum volumetric near-bed concentration; C = total volumetric concentration. The horizontal diffusivities in CH3D are assigned values.

According to Zhou and McCorquodale (1992), local fluid density is related to the local values of suspended-sediment concentration as follows:

$$\rho = \rho_r + C\left(1 - \frac{1}{s-1}\right)$$

Eq. 70

where ρ_r = the reference density of clear water, possibly influenced by temperature and/or salinity.