Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:
Non-Time-Critical Removal Action Surface Water Monitoring Plan
EPA-AO-038

Date Submitted:
July 29, 2011

Submitted to whom
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Summary of Changes to the Surface Water Monitoring Plan

General

- If there is a future requirement for a dredging operation, an operation-specific surface water monitoring plan will be prepared and submitted for approval as a part of the work plan package.
- Elimination of TDEC sampling and analysis for the Kingston and Rockwood Water Treatment Plants.
- Elimination of reference to sampling at Kingston Water Treatment Plant by plant personnel. Consumer confidence sampling has reverted to pre-spill frequency, with plant personnel having discretion to sample during storm events without being referenced in this plan.
- TVA will migrate data to the EPA Region 4 EQuis system; TVA will notify TDEC and EPA of any significant (e.g., exceed water quality criteria, etc.) detections upon receipt and review of initial laboratory reports.

Major Changes from the Non-Time-Critical Surface Water Monitoring Plan

- Elimination of surface water sampling from the Emory and Clinch Rivers.
- Consumer confidence sampling at the Kingston Water Treatment Plant reverts to pre-spill frequency.

Activity-by-Activity Changes

1. Emory and Clinch Rivers

   - The five TVA automated samplers at Emory River Mile (ERM) 4.0, ERM 2.0, ERM 0.3, Clinch River Mile (CRM) 2.5, and CRM 4.6 will be removed

2. Swan Pond Embayment

   - No change

3. Stilling Pond

   - No Change

Document No. EPA-AO-038

Kingston Ash Recovery Project
Non-Time-Critical Removal Action
Surface Water Monitoring Plan

Prepared by:
Jacobs

for the Tennessee Valley Authority

Revision	Description	Date
00	River Sampling Plan for TVA Review	July 26, 2011
01	River Sampling Plan for EPA Review	July 29, 2011

This Surface Water Monitoring Plan for the non-time-critical removal action reflects changes to the monitoring scope as a result of the evaluation of data from sampling events on the Emory and Clinch Rivers that were triggered by local rainfall >1.0 inches or Emory River flows >10,000 cubic feet per second. Evaluation of 15 events from October 2010 to May 2011 showed a downward temporal trend in concentrations of ash-related constituents and that there is little, if any, change in water quality of the Emory River as it flows by the Kingston Ash Recovery Project site (see Appendix A).

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List of Acronyms

µg/L	microgram per liter
BMP	best management practice
cfs	cubic feet per second
CoC	chain-of-custody
cy	cubic yard
DMP	Data Management Plan
DQO	data quality objective
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
ERM	Emory River Mile
KIF	Kingston Fossil Plant
mg/L	milligram per liter
msl	mean sea level
NPDES	National Pollutant Discharge Elimination System
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
SOP	Standard Operating Procedure
TDEC	Tennessee Department of Environment and Conservation
TSS	total suspended solid
TVA	Tennessee Valley Authority

1. INTRODUCTION AND BACKGROUND

This Surface Water Monitoring Plan, hereinafter referred to as "this Plan", was prepared pursuant to the May 2009 Administrative Order and Agreement on Consent (the Order) between the U.S. Environmental Protection Agency (EPA) Region 4 and the Tennessee Valley Authority (TVA) to address the December 2008 ash release from the TVA Kingston Fossil Plant (KIF) (EPA 2009). This plan revises and supersedes the *Surface Water Monitoring Plan for the Emory, Clinch, and Tennessee Rivers, Kingston Fossil Plant Ash Recovery Project* (TVA 2010c) issued by TVA and approved by the EPA in July 2010 with the completion of the time-critical removal action aggressive dredging operations in the Emory River.

As TVA's efforts progressed from completion of the time-critical removal action to implementation of the non-time-critical removal action for the Swan Pond Embayment and Dredge Cell, surface water monitoring has been tailored to collect data to assess the impact of these actions on the river system water quality. TVA has completed an evaluation of surface water monitoring data collected between August 31, 2010 and May 4, 2011 and has concluded that this Plan is warranted (see Appendix A).

The scope of this Plan considers the tasks that will be implemented in accordance with the approved *Kingston Ash Recovery Project, Non-Time-Critical Removal Action, Embayment/Dredge Cell Action Memorandum* (TVA 2010a). This Plan will be in effect until a post-removal action long-term monitoring plan is approved by EPA and the Tennessee Department of Environment and Conservation (TDEC). The principal modification to this Plan is the elimination of surface water monitoring at fixed locations on the Emory and Clinch Rivers, while retaining monitoring at several locations in the surface water drainage system of the Swan Pond Embayment, and monitoring at the KIF Stilling Pond as utilization of the Ball Field for ash processing continues. Figure 2 shows locations of the sampling locations.

The current surface water monitoring approach is being modified based on the evaluation of analytical results from storm-event surface water samples collected from the Emory and Clinch Rivers (see Appendix A).

This Plan does not address surface water monitoring for any future dredging operations that might occur as the result of collection and analysis of additional data in support of the future Engineering Evaluation/Cost Analysis (EE/CA) for the Emory, Clinch, and Tennessee River systems. Should additional dredging be necessary, a surface water monitoring plan will be prepared in conjunction with that dredging work plan.

The principal objectives of this Plan are to monitor ash not captured by engineered controls for Swan Pond Embayment ash removal.

Key elements of this Plan are:

KIF Stilling Pond Effluent – The KIF Stilling Pond National Pollutant Discharge Elimination System (NPDES)-permitted outfall will be monitored weekly for total suspended solids (TSS) and ash-related constituents.

Swan Pond Embayment – Manual grab samples will be collected weekly at key surface water drainage ditch locations and analyzed for TSS and ash-related constituents. In addition, an automated composite sample will be collected from the Clean Water Ditch (final point of surface water exit to the Emory River) following a local rainfall event of $\geq$0.5 inch in a 24-hour period. TVA will initially continue to sample at the current locations, with location adjustment occurring as the drainage system configuration is altered to accommodate restoration activities.

TVA sampling and analyses will be performed in accordance with the EPA-approved *Quality Assurance Project Plan (QAPP) for the Tennessee Valley Authority Kingston Ash Recovery Project. TVA-KIF-QAPP* (Environmental Standards, Inc. 2009). The QAPP provides the detail for overall sampling and analysis quality assurance/quality control (QA/QC) that will be implemented for this Plan. Agency (TDEC and EPA) sampling and analyses will be performed in accordance with their respective quality assurance provisions.

This Plan is organized as follows:

- Section 1 Introduction and Background
- Section 2 Non-Time-Critical Surface Water Monitoring Plan Objectives
- Section 3 Evaluation of Existing Surface Water Monitoring Data
- Section 4 Non-Time-Critical Surface Water Monitoring
- Section 5 Data Management
- Section 6 Quality Assurance/Quality Control

Table 6-2 of this Plan is the completed cross-walk table required by the approved QAPP.

The remainder of Section 1 provides background information for the TVA KIF, the ash spill event, and time-critical actions completed. Figure 1 shows the location of KIF in the vicinity of Kingston, Tennessee, and the Emory and Clinch Rivers. It also illustrates the general areas being addressed by time-critical and non time-critical actions.

1.1 DESCRIPTION OF THE AREA AND LOCATION

The KIF is located at the confluence of the Emory and Clinch Rivers on Watts Bar Reservoir near Kingston, Tennessee. The KIF is one of the TVA's larger fossil plants. It generates 10 billion kilowatt-hours of electricity a year, enough to supply the needs of about 670,000 homes in the Tennessee Valley. Plant construction began in 1951 and was completed in 1955. Kingston has nine coal-fired generating units. The winter net dependable generating capacity is 1,456 megawatts. The plant consumes some 14,000 tons of coal a day.

The KIF is located on the Emory River arm of Watts Bar Reservoir; the Emory River discharges into the Clinch River. The Emory River borders the KIF Ash Pond and Dredge Cells to the east. The Emory River rises on the Cumberland Plateau in Morgan County, Tennessee, and crosses into Roane County near Harriman, Tennessee. Flow on the Emory River in the vicinity of the KIF is not controlled by any upstream flood control or navigation structures. The river elevation is controlled by Watts Bar Dam, approximately 44 miles downstream. Normal summer pool elevation for the Emory River at the KIF is approximately 740 to741 feet mean sea level (msl) and normal winter pool elevation is 735 to 737 feet msl. The Watts Bar annual spring reservoir fill-period is from April 1 to April 15. The Emory River typical flow volume in the winter and spring ranges from 500 to 50,000 cubic feet per second (cfs). The 10-year probable flood flow rate is 110,000 cfs.

1.2 DESCRIPTION OF THE ASH RELEASE AND INITIAL RESPONSE ACTIONS

Just before 1 a.m. on Monday, December 22, 2008, a coal fly ash spill occurred at the KIF, allowing a large amount of fly ash to escape into the adjacent waters of the Emory River. Ash, a by-product of a coal-fired power plant, is stored in dredge cell containment areas. Failure of the Dredge Cell dike caused about 60 acres of ash in the 84-acre containment area to be displaced. At the time of the slide, the cells contained about 9.4 million cubic yards (cy) of ash. The dike failure released about 5.4 million cy of coal ash that covered about 275 acres.

Fly ash filled the Swan Pond Embayment on the north side of the KIF property adjacent to the failed Dredge Cell. During the emergency response phase of the recovery, a dike (Dike 2) was constructed in the eastern portion of the Swan Pond Embayment to contain approximately 2.4 million cy of fly ash to the west of the dike until a removal action plan could be developed, approved by the regulators, and implemented. Approximately 3 million cy of ash also entered the channel and overbank areas of the riverine section of the Emory River.

The U.S. Coast Guard issued an initial advisory that the Emory River would be closed to navigation from Emory River Mile (ERM) 0.0 to ERM 4.0. The advisory later extended the Emory River closure to ERM 6.0, out of concern for increased dredging operations. Also during the emergency response phase, TVA installed a 615-foot long underwater rock dam (Weir 1) in the Emory River just north of the existing plant intake skimmer wall to help reduce further downstream movement of ash. Weir 1 allowed water to continue flowing and retained the ash at the bottom of the river channel.

1.3 STATUS OF THE TIME-CRITICAL REMOVAL ACTION

In June 2009, TVA initiated aggressive dredging and excavation actions to recover the ash east of Dike 2 in accordance with the Order and following completion of a pilot project to evaluate hydraulic dredging as an ash removal method (see EPA productivity documents at http://www.epakingstontva.com/productivity). Removal of more than 3 million cy of ash from the Emory River was completed in August 2010. Offsite disposal of that ash was completed in November 2010.

A quantity of ash remained in the Emory River due to re-suspension and mixing with sediments (EPA 2010). It is estimated that approximately 175,000 to 350,000 cy remained in the river between ERM 0.0 to ERM 6.0, including material re-suspended from dredging, mixed material in sand bars and shallows, and ash mixed with sediment containing legacy cesium-137 between ERM 1.8 and ERM 0.0 from the U.S. Department of Energy activities on the Oak Ridge Reservation. Additionally, sediment-transport modeling has estimated that approximately 150,000 cy of ash were transported from the Emory River into the Clinch and Tennessee Rivers by storm events following the spill. The potential impacts of the remaining ash will be addressed by the future River System EE/CA.

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2. NON-TIME-CRITICAL SURFACE WATER MONITORING PLAN OBJECTIVES

2.1 DATA QUALITY OBJECTIVES

The data quality objective (DQO) process is a logical series of seven steps that guides investigators to a plan for the resource-effective acquisition of environmental data. The process is both flexible and iterative, and applies to both decision-making (e.g., compliance/non-compliance with a standard) and estimation (e.g., ascertaining the mean concentration of a contaminant). The DQO process establishes performance and acceptance criteria that drive the plan for collecting data of sufficient quality and quantity to support the goals of the study. The DQO process leads to efficient and effective expenditures of resources; consensus on the type, quality, and quantity of data needed to meet project goals; and full documentation of actions taken during project development (EPA 2006).

The steps in the DQO process are as follows:

1. State the problem
2. Identify the goal(s) of the study
3. Identify information inputs
4. Define the study boundaries
5. Develop the analytic approach
6. Specify performance or acceptance criteria
7. Develop the plan for data acquisition

The following paragraphs describe application of the DQO process to developing this Plan for the non-time-critical removal action.

2.1.1 Problem Statement

The August 4, 2009, Action Memorandum (TVA 2009) for the time-critical removal action provided direction for removal of the approximately 3 million cy of ash from the Emory River east of Dike 2 in order to reduce the potential for upstream flooding due to impairment of flow by the spilled ash; and to reduce the potential for ash migration downstream during high-flow events. Time-critical dredging in the Emory River was completed in August 2010. The Action Memorandum for the non-time-critical removal action for the Embayment/Dredge Cell (TVA 2010a) provides direction for removal of the approximately 2.4 million cy of ash west and upstream of Dike 2. Water quality monitoring will be needed to determine whether there are any water quality impacts from non-time-critical removal actions. This Plan for the non-time-critical phase of the project is being revised based on an evaluation of storm-flow data (see Appendix A) and in order to be resource-effective and meet project goals.

2.1.2 Project Goals

The primary objectives for water quality monitoring in support of non-time-critical removal actions are to:

- Evaluate the effectiveness of best management practices (e.g., settling basins and diversion ditches) in preventing or mitigating changes in surface water quality that might impact public health or the environment during non-time-critical ash excavation and removal from upstream of Dike 2, particularly during storm events; and
- Monitor the KIF Stilling Pond outfall to detect any adverse trends during the remainder of ash processing and loading.

2.2 MONITORING APPROACH

The following paragraphs state the key questions that must be addressed for each of these objectives, provides a brief basis for each question, and summarizes the monitoring approach required.

Questions 1 and 2: Do non-time-critical ash removal and processing activities cause water quality changes that would impair water-based recreation? Are the settling basins and other Best Management Practices (BMPs) effective in preventing offsite migration of ash-related contaminants?

Potential impacts of the non-time-critical ash recovery operations to water-based recreation and the effectiveness of BMPs for those operations are closely related. Collecting weekly grab samples to monitor the quality of water leaving the site through Dike 2, along with rain-event-triggered automated sampling of water leaving the site will provide information on BMP effectiveness.

Question 3: Do continuing ash processing and loading operations, including recovery of free water volume in the Ash Pond, cause unacceptable changes in water quality or violations of NPDES permit limits for the Stilling Pond discharge?

Although river dredging ended in August 2010, dredging to recover sufficient free water volume in the Ash Pond will continue as needed, and ash processing operations will continue until the closure of the Dredge Cell. Weekly grab samples of water from the NPDES-permitted outfall will provide continuing information on the quality of the Stilling Pond discharge.

2.3 INFORMATION INPUTS

The information necessary to achieve the objectives includes the following:

- Continuous rainfall measurements from the KIF meteorological station to trigger sampling;
- Results of analyses of samples from the Swan Pond Embayment monitoring locations, and the Stilling Pond outfall for general water quality parameters, total and dissolved metals, and TSS; and
- Results of analyses of water samples associated with Stilling Pond management.

2.4 SPATIAL AND TEMPORAL BOUNDARIES, TARGET POPULATIONS, AND CHARACTERISTICS OF INTEREST

The spatial boundaries of the study are the Swan Pond Embayment, and the Stilling Pond. TVA has established two locations to monitor releases from the non-time-critical ash removal operations (Settling Basins effluent and Clean Water Ditch), and one location to monitor discharges from the Stilling Pond related to ash processing activities.

The temporal boundary of the study is during the non-time-critical removal action in Swan Pond Embayment.

The human populations of interest are recreational users of the Swan Pond Embayment and Emory River.

The ecological populations of interest are flora and fauna that live in or depend on the river system for food.

The analytical characteristics of interest are general water quality parameters, metals, and TSS associated with coal fly ash.

2.5 ANALYTIC APPROACH

Coal fly ash contains numerous constituents that have been linked to adverse health effects in human or ecological receptors. Specific constituents of interest include arsenic and selenium. Available screening levels are the state drinking water standards and water quality criteria; therefore, the analytical parameter of interest for samples collected from the monitoring locations will be compared to their respective screening levels. Other parameters of interest are general water quality parameters (temperature and pH), TSS, and total and dissolved metals as indicators of ash loading to the river system for evaluation of BMPs.

2.6 ACTION LEVEL AND DECISION RULE

Action levels for this project are the Tennessee Drinking Water Quality Criteria for Domestic Water Supplies, Federal Maximum Contaminant Levels, Tennessee Water Quality Criteria – Fish and Aquatic Life Continuous Chronic Criteria and Tennessee Water Quality Criteria – Human Consumption of Water and Organisms, and upstream reference concentrations. The decision rule for analytical results from surface water monitoring location samples is "If the concentration of any ash-related constituent demonstrates a sustained or increasing trend that indicates unacceptable loading of ash to the river system, then the need for modification of management practices will be evaluated, else continue monitoring."

2.7 PERFORMANCE OR ACCEPTANCE CRITERIA

The null hypothesis for Swan Pond Embayment surface water is: BMPs are adequate for controlling releases of ash-related contaminants during removal actions in the Swan Pond Embayment. The alternative hypothesis for Swan Pond Embayment surface water is: BMPs are not adequate for controlling releases of ash during removal actions in the Swan Pond Embayment.

The null hypothesis for the Stilling Pond discharge is: Ash processing activities in the Ball Field area do not result in an unacceptable release of ash-related contaminants. The alternative hypothesis for Stilling Pond surface waters is: Ash processing activities in the Ball Field area result in an unacceptable release of ash-related contaminants.

2.8 DATA ACCEPTANCE

DQOs are assessed by monitoring QA measures, such as accuracy, precision, representativeness, comparability, and completeness, as discussed in QAPP, Sections 14 and 22. Specific qualitative DQOs for the chemical analyses to be performed are presented in detail in Section 14.0 of the QAPP; in Appendix C; and in Tables D-3, E-3, F-4, and H-3. The objectives associated with accuracy and precision of laboratory results are assessed through an evaluation of the results of QC samples. The accuracy of field measurements for temperature and pH are assessed by instrument calibration and standardization, as described in the associated field Standard Operating Procedures (SOPs).

2.9 NON TIME-CRITICAL MONITORING PLAN DEVELOPMENT

Revision of the Surface Water Monitoring Plan (TVA 2010c) to meet the DQOs described above is based on review of event-related monitoring conducted from August 2010 through May 2011 (see Appendix A); evaluation of surface water data collected in that monitoring; and consultation with TDEC and EPA. The remaining sections of this Plan describe the non time-critical surface water monitoring plan scope, sampling design, data management, and QA/QC.

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3. NON-TIME-CRITICAL SURFACE WATER MONITORING PLAN

When time-critical dredging operations ceased, the principal sources of ash constituents in the Emory River were re-suspension of remaining ash mixed with sediments during periods of high flow and material not captured by BMPs in the Swan Pond Embayment. Accordingly, surface water monitoring during non-time-critical activities was triggered by local rainfall and/or high Emory River flows. An evaluation of 15 events from October 2010 to May 2011 showed a downward temporal trend in concentrations of ash-related constituents and that there is little, if any, change in water quality of the Emory River as it flows by the Kingston Ash Recovery Project site (see Appendix A); therefore, sampling in the Emory and Clinch Rivers is being discontinued.

The automated sampling at the Swan Pond Embayment will continue to be triggered by a ≥0.5 inch rainfall in a 24-hour period. A 24-hour period with < 0.5 inch will be the minimum separation time for consecutive sampling events.

The scope of this monitoring is discussed in the following sections.

3.1 MONITORING SCOPE

3.1.1 KIF Stilling Pond Effluent

The KIF Stilling Pond NPDES-permitted outfall will be monitored weekly for TSS and ash-related metal constituents, until ash processing on the Ball Field is completed. EPA will collect split samples at their discretion.

3.1.2 Swan Pond Embayment

Manual grab samples will be collected weekly at key surface water drainage ditch locations and analyzed for TSS and ash-related constituents. Initial locations are at the Clean Water Ditch upstream of discharge to the Emory River and at the Sediment Basins effluent ("dirty water ditch"). In addition, an automated composite sample will be collected from the Clean Water Ditch (final point of surface water exit to the Emory River) following a local rainfall event of ≥0.5 inch in a 24-hour period. Manual grab samples will be collected from the Sediment Basins effluent as quickly as a team can be mobilized following a rainfall event ≥0.5 inch. TVA will initially continue to sample the current locations, with adjustment occurring as the drainage system configuration is altered to accommodate restoration activities. EPA and TDEC concurrence is required for location adjustments. EPA will collect split samples at their discretion.

3.2 SAMPLE LOCATIONS, COLLECTION, AND ANALYSES

3.2.1 Sample Locations

<u>Sample Location for KIF Stilling Pond Effluent</u>

The location for sampling the KIF Stilling Pond is shown on Figure 2. A weekly grab sample will be collected at the NPDES-permitted outfall.

<u>Sample Locations for Swan Pond Embayment</u>

The current sample locations are shown on Figure 2. Locations will be adjusted with the concurrence of EPA and TDEC as removal action work in the embayment progresses and the surface water flow is re-configured. Grab samples will be collected at these locations.

3.2.2 Sample Collection

Water sampling and analysis will be performed in accordance with the QAPP. The QAPP implementation includes sample collection in accordance with a set of project-specific SOPs that govern the conduct of work in the field. The TVA SOPs were prepared and reviewed by KIF project staff cognizant of and experienced in implementing EPA Region 4 and TDEC field procedures. The current revisions of the SOPs are maintained on a website available to EPA and TDEC.

Samples will be collected following the procedures outlined in the SOP for surface water sampling (TVA-KIF-SOP-01 *Surface Water Sampling, Revision 1*). Duplicate samples will also be collected on a 1/20 frequency for TSS, total metals, and dissolved metals. Additionally, a matrix spike/matrix spike duplicate pair will be taken on a 1/20 frequency and submitted to the laboratory.

Field parameters using a multi-analyte programmable data logger (Hydrolab®) collocated at each sample location will be collected. Parameters of interest that will be documented are temperature and pH.

Following collection, the surface water sample will be transferred into appropriately clean, preserved bottleware (as required) as described in QAPP Section 7.2. A chain-of-custody (CoC) record will be completed as samples are collected in the field and will remain with the samples until the samples arrive at the laboratory for analysis. The samples will be shipped to the laboratory(-ies) via overnight carrier or laboratory courier. Signatures indicating the succession of sample custody will be documented on the CoC record.

Sample collection by TDEC and EPA will be performed in accordance with their respective SOPs.

3.2.3 Sample Analyses

Surface water samples will be sent to TVA contract laboratories for analyses. TVA maintains a rigorous contract laboratory program that includes periodic assessments (by a TVA-appointed QA contractor) to ensure compliance with analytical specifications. Table 3-1 summarizes the analytical parameters, test methods, and reporting limits that will be used to fulfill the DQOs of the surface water monitoring program. The analyte list is based on initial characterization of the ash and affected environmental media for a broader range of constituents (e.g., organic compounds) that was performed by TVA, EPA, and TDEC immediately after the spill. Additional detail for analytical methods is found in the QAPP.

<u>Data Review and Validation</u>

Data review and validation will be performed by TVA's independent QA contractor, in accordance with QAPP Sections 21.0 and 22.0.

Table 3-1
Analytes, Methods, and Target Reporting Limits for Surface Water Monitoring

Test Parameter	Test Method	Limit of Quantitation
Basic Water Chemistry		
pH	150.1/SM 4500 H^+ B	0.1 pH Units
Total Suspended Solids	160.2/SM2540D	1.0 mg/L
Metals –Total and Dissolved		
Aluminum	6010B/6020/200.7/200.8	20 µg/L
Antimony	6010B/6020/200.7/200.8	2 µg/L
Arsenic	6010B/6020/200.7/200.8	2 µg/L
Barium	6010B/6020/200.7/200.8	10 µg/L
Beryllium	6010B/6020/200.7/200.8	2 µg/L
Boron	6010B/6020/200.7/200.8	50 µg/L
Cadmium	6010B/6020/200.7/200.8	1 µg/L
Calcium	6010B/6020/200.7/200.8	1,000 µg/L
Chromium	6010B/6020/200.7/200.8	2 µg/L
Cobalt	6010B/6020/200.7/200.8	2 µg/L
Copper	6010B/6020/200.7/200.8	5 µg/L
Iron	6010B/6020/200.7/200.8	50 µg/L
Lead	6010B/6020/200.7/200.8	2 µg/L
Magnesium	6010B/6020/200.7/200.8	1,000 µg/L
Manganese	6010B/6020/200.7/200.8	5 µg/L
Mercury	7470A/245.1	0.2 µg/L
Molybdenum	6010B/6020/200.7/200.8	5 µg/L
Nickel	6010B/6020/200.7/200.8	5 µg/L
Potassium	6010B/6020/200.7/200.8	1,000 µg/L
Selenium	6010B/6020/200.8	2 µg/L
Silver	6010B/6020/200.8	2 µg/L
Sodium	6010B/6020/200.8	1,000 µg/L
Thallium	6010B/6020/200.8	2 µg/L
Vanadium	6010B/6020/200.8	4 µg/L
Zinc	6010B/6020/200.8	50 µg/L

Note: For definitions, see the List of Acronyms section.

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4. DATA MANAGEMENT

An EPA-approved KIF Project Data Management Plan (DMP) is in place to address the challenges of managing technical data from a wide array of analysis processes. The DMP provides a basis for supporting a full technical data management cycle from pre-planning of sampling events to reporting and analysis with a particular emphasis on ensuring completeness, data usability, and most importantly, defensibility of the data. As the TVA data are verified and validated, the data will be migrated to the EPA Region 4 EQuIS data management system.

The major objectives of the DMP are to:

- Maintain data control, consistency, reliability, and reproducibility throughout the life of the project;
- Establish the framework for consistent documentation of the quality and validity of field and laboratory data compiled during all investigations;
- Describe in detail the data management procedures for all site-related data including groundwater, surface water, soil, sediment, air, biological, toxicological, and any other site-specific data collected;
- Describe how these new data will be integrated and comprehensively managed with previously collected and historical data;
- Include procedures and timelines for sharing data with stakeholders, and procedures for providing both electronic and hardcopies to specified recipients of each type of data; and
- Enable the use of project data in a consistent and easily shared format among appropriate internal and external parties (such as TVA, consultants, EPA, and TDEC.

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5. QUALITY ASSURANCE/QUALITY CONTROL AND QUALITY ASSURANCE PROJECT PLAN CROSS-WALK TABLE

The Kingston Ash Recovery Project has developed a comprehensive QAPP which governs the collection, analysis, reporting, and use of environmental data associated with the overall project. The QAPP (ESI 2009) has been approved by EPA and TDEC and is available in the Administrative Record, available at http://www.tva.gov/kingston/admin_record/index.htm. The QAPP was prepared in accordance with EPA's *Guidance for Quality Assurance Project Plans*, EPA QA/G-5 (EPA 2002). The QAPP provides the framework for implementation of the environmental sampling to support both time-critical and non-time-critical removal actions, as needed.

The QAPP details the requirements for the performance of all field sampling and laboratory analyses in support of the TVA Kingston Ash Recovery Project objectives. It also identifies the roles and responsibilities of TVA and contractor staff who implement the QAPP requirements. Embodied within the QAPP are the fundamental elements that ensure project objectives are met. These include:

- Data collection activities are documented in sampling and analysis plans.
- Field sampling and data plans are implemented following standard procedures.
- Field personnel are trained to the procedures.
- Independent assessments are performed and documented to ensure adherence to procedures in the field and to identify opportunities for continuous improvement.
- Sample analyses are performed by laboratories qualified to national standards.
- Periodic independent audits are performed on laboratories to ensure adherence to procedures and good practices.
- Data deliverables include the necessary documentation to perform independent, third-party validation of data in accordance with EPA national functional guidelines.
- Data are validated in accordance with EPA national functional guidelines.
- Data are managed in a controlled environment that also provides flexibility for data use and interpretation.

The primary goal of TVA's QA program is to generate defensible analytical data to characterize the extent of the fly ash deposition, to monitor the spill containment and removal and remedial operations, and to assess the potential short-term and long-term health hazards and biological impact. The QA program ensures that the data generated from site-wide sampling and monitoring activities are of sufficient quality to meet the objectives of the Kingston Ash Recovery Project.

The scope of the QAPP is to provide the appropriate QA procedures and QC measures to be applied to all sampling and monitoring activities associated with the Kingston Ash Recovery Project.

This section supplements the QAPP by providing task-specific information for the required elements that are not included in the approved QAPP (e.g., task-specific DQOs).

Task-specific sampling procedures are described in Section 3.2 of this Plan. Details are specified in the SOPs listed in Table 5-1.

Table 5-1
Standard Operating Procedures for the Surface Water Monitoring Plan

SOP Number	SOP Title
TVA-KIF-SOP-01	Surface Water Sampling
TVA-KIF-SOP-06	Field Documentation
TVA-KIF-SOP-07	Sample Labeling, Packing, and Shipping
TVA-KIF-SOP-08	Decontamination of Equipment
TVA-KIF-SOP-11	Field Quality Control Sampling
TVA-KIF-SOP-12	Management of Investigation-Derived Waste
TVA-KIF-SOP-13	Sample Retain Archive and Maintenance
TVA-KIF-SOP-14	Hydrolab Datasonde® Standardization and Field Parameter Measurement
TVA-KIF-SOP-18	Management and Implementation of EQuIS-Based Chain-of-Custody

Appendix C to the QAPP presents QA requirements for aqueous matrices. For this Plan, aqueous matrices include mid-depth surface water.

Sample containers, preservation, and holding times for aqueous samples are listed in Table C-1 of the QAPP.

Analytes, methods, and target reporting limits are listed in Table 3-1.

Precision and accuracy objectives for QC samples for aqueous matrices are listed in Table C-3 of the QAPP.

Table 5-2 provides a "cross-walk" that summarizes the document location where the task-specific QAPP-required elements may be found.

Table 5-2
Quality Assurance Project Plan Cross-Walk

QAPP Element	Location in Surface Water Monitoring Plan	Location in SOP
Data Quality Objectives	Section 2.1 Data Quality Objectives	
Sampling Design	Section 3.0 Non-Time-Critical Surface Water Monitoring Plan	
Sampling Methods	Section 3.2 Sample Location, Collection, and Analyses	Applicable SOPs[1]
Sample Collection	Section 3.2 Sample Location, Collection, and Analyses	Applicable SOPs[1]
Data Review and Validation (QAPP Sections 21.0 and 22.0)	Section 3.2 Sample Location, Collection, and Analyses	
Assessments and Response Actions (QAPP Section 19.0)		

Note: [1]Applicable SOPs are listed in Table 6-1.

6. REFERENCES

Tennessee Valley Authority (TVA) 2010a (May 18). *Action Memorandum for the Kingston Ash Recovery Project, Non-Time-Critical Removal Action, Embayment/Dredge Cell*. Document No. EPA-AO-024.

TVA 2010b (May 24). *Kingston Ash Recovery Project Non-Time-Critical Removal Action for the River System Sampling and Analysis Plan (SAP).* Document No. EPA-AO-021.

TVA 2010c (July 1). *Surface Water Monitoring Plan for the Emory, Clinch, and Tennessee Rivers, Kingston Fossil Plant Ash Recovery Project*. Document No. EPA-AO-013.

TVA 2009 (August 4). Action Memorandum: *Request for Removal Action at the TVA Kingston Fossil Fuel Plant Release Site, Roane County, Tennessee*. From Mike Scott, TVA General Manager, Kingston Project and TVA's Kingston Project Coordinator to Anda A. Ray, TVA Senior Vice President, Office of Environment and Research at Kingston Recovery Executive.

U.S. Environmental Protection Agency (EPA) 2010 (March 5) Memorandum: *Documentation of the decision process for EPA approval of the final dredge depth determination for the time-critical removal action*. From Leo Francendese, EPA On-Scene Coordinator to Steve McCracken, TVA Onsite General Manager.

EPA 2009 (May 11). *Administrative Order and Agreement on Consent, Docket No. CERCLA-04-2009-3766*, Region 4.

EPA 2006 (February). *Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4*, EPA/240/B-06/001, Washington, D.C.

EPA 2002 (December). *Guidance for Quality Assurance Project Plans*, *EPA QA/G-5*.

Environmental Standards, Inc. 2009 (December 18). *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project*. *TVA-KIF-QAPP*. Prepared for the Tennessee Valley Authority, Office of Environment and Research, Environmental Resources.

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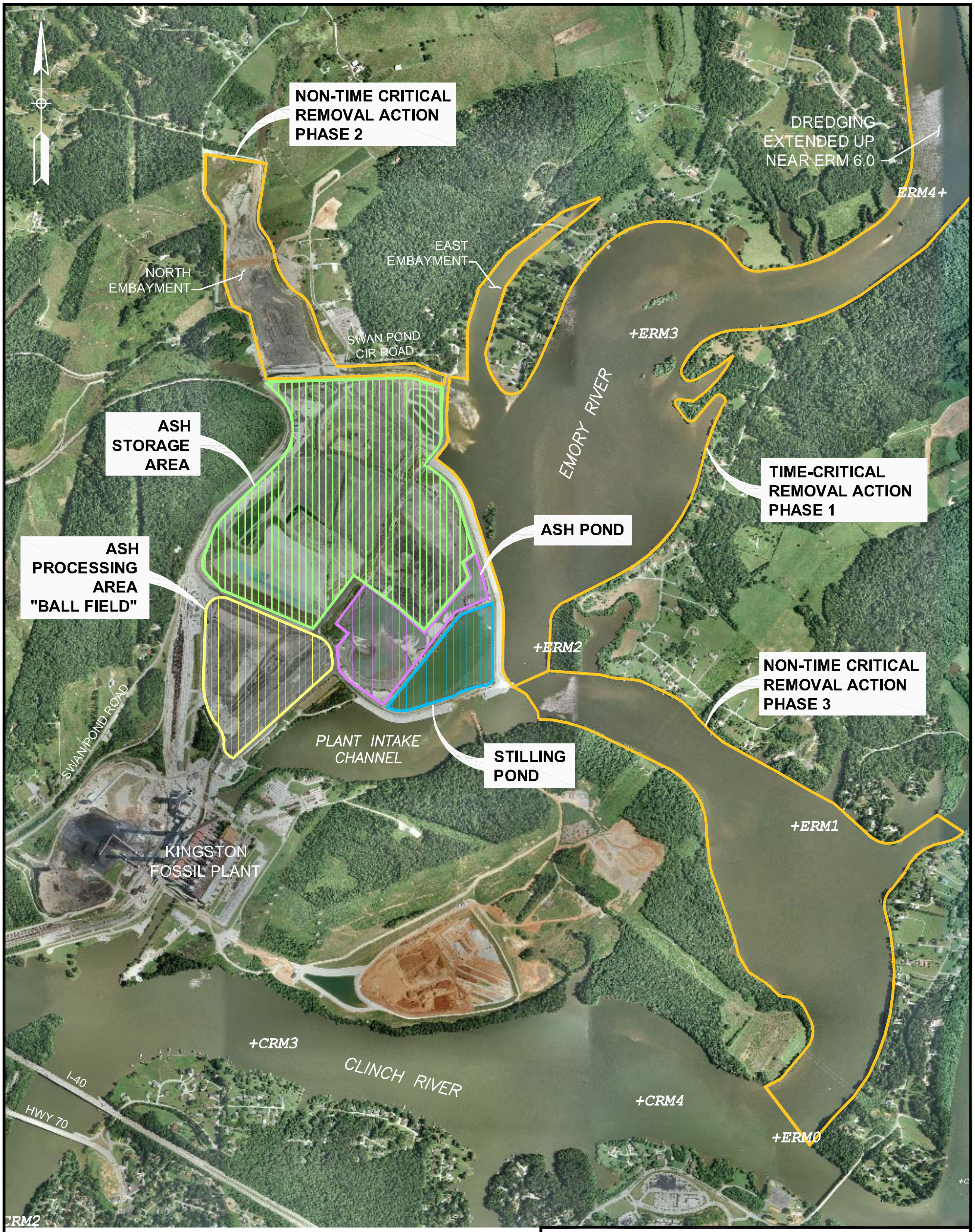
Figures



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NOTE:

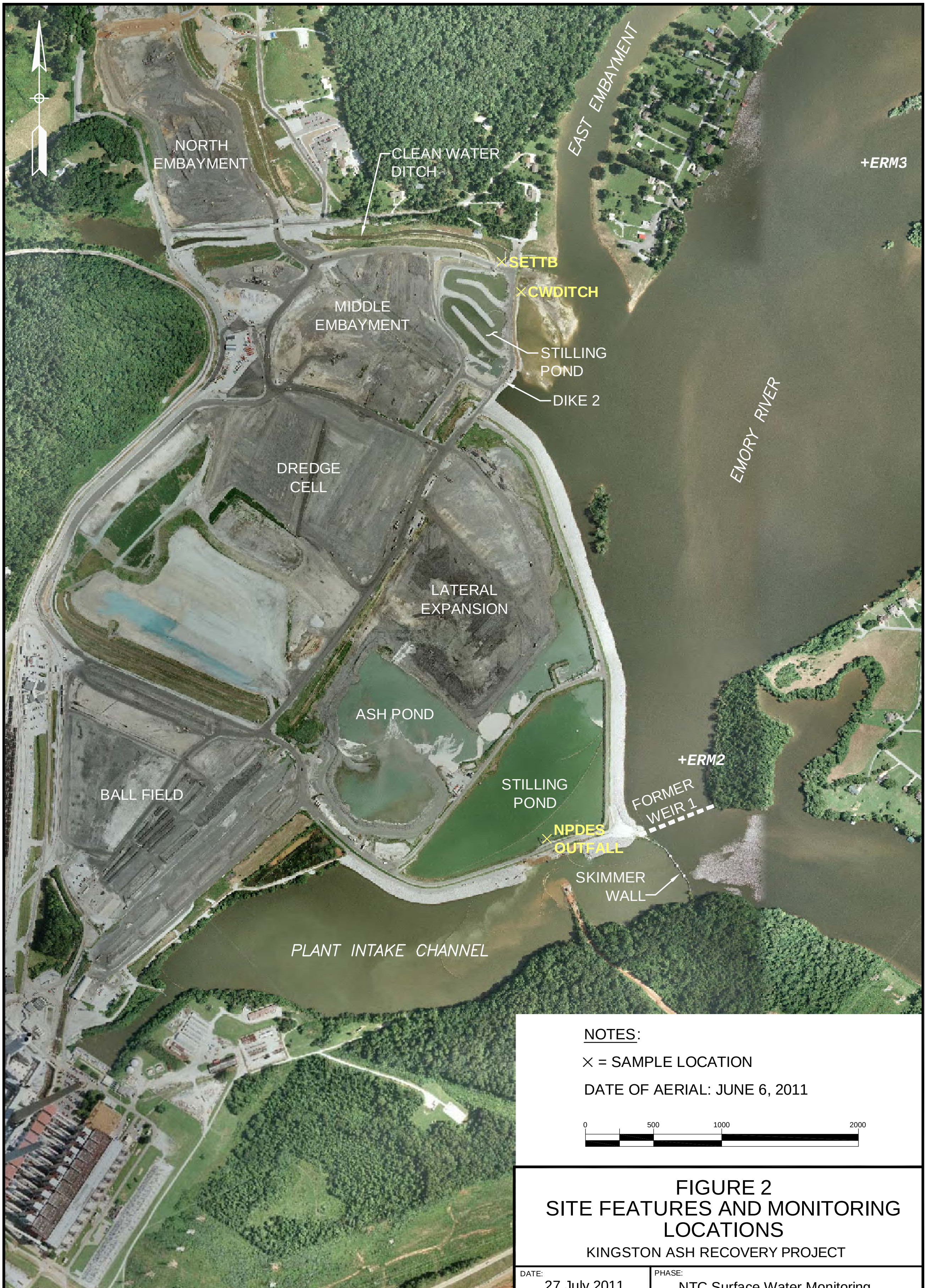
DATE OF AERIAL: JUNE 6, 2011

0 1000 2000 4000
SCALE IN FEET

FIGURE 1
SITE LOCATION AND ASH REMOVAL SCOPE

KINGSTON ASH RECOVERY PROJECT

DATE:	PHASE:
27 July 2011	NTC Surface Water Monitoring



NOTES:

× = SAMPLE LOCATION

DATE OF AERIAL: JUNE 6, 2011

0 500 1000 2000

FIGURE 2
SITE FEATURES AND MONITORING LOCATIONS
KINGSTON ASH RECOVERY PROJECT

DATE: 27 July 2011

PHASE: NTC Surface Water Monitoring

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APPENDIX A

Non-Time-Critical Surface Water Monitoring:

Proposed Elimination of Floating Monitor-Based Storm Water Sampling

Non-Time-Critical Surface Water Monitoring:

Proposed Elimination of Floating Monitor-Based Storm Water Sampling

July 11, 2011

Purpose

This memorandum evaluates water quality data from the Emory and Clinch Rivers collected by automated samplers deployed on floating platforms pursuant to the approved July 23, 2010, *Kingston Ash Recovery Project Non-Time-Critical Surface Water Monitoring Plan for the Emory, Clinch, and Tennessee Rivers*, Document No. EPA-AO-013.

The result of this evaluation is that, except for the first significant storm (November 30 to December1, 2010) following completion of dredging, there is little indication of any continuing impacts of the ash spill on water quality in the Emory and Clinch Rivers, and there have been very few exceedences of any water quality standards. For subsequent storm flow events, concentrations of all constituents appear to be decreasing with time for similar size storms. This suggests that the bed of the Emory River is approaching a stable contour and the potential for significant migration of ash-related constituents has been reduced.

Because of the findings of this evaluation, the Tennessee Valley Authority (TVA) requests approval to discontinue automated Emory and Clinch River rainfall/elevated flow event sampling and to remove the floating platforms from the river. No change is recommended for stormwater sampling for the embayment. The basis for TVA's recommendation follows.

Discussion

Since the completion of Emory River dredging (the time-critical removal action) in the summer of 2010, TVA has been collecting samples from several locations on the Emory and Clinch Rivers in response to 24-hour cumulative local rainfalls >1.0 inch and/or instantaneous Emory River flows as measured at the Oakdale, Tennessee gaging station >10,000 cubic feet per second (cfs). For context, typical average daily Emory River flows range from about 700 to 1300 cfs, depending on the season.

Automated sampling devices installed on floating platforms at Emory River Miles (ERM) 4.0, 2.0, and 0.3 and Clinch River Miles (CRM) 4.6 and CRM 2.5 have been used to collect these samples. Stations at ERM 4.0 and CRM 4.6 collect storm flows that are representative of conditions upstream of the ash spill. Trends in concentrations of arsenic and selenium (representative of ash-related constituents), and total suspended solids (TSS--representative of total sediment load) were used to evaluate potential storm-event transport of ash-related constituents during the time period from August 31, 2010 to May 4, 2011, after completion of dredging to remove ash from the river.

Local rainfall events do not necessarily cause high flows in the river, nor have they caused water quality exceedances. Rainfall at the Kingston Fossil Plant measuring greater than 1.0 inches triggered sampling events on September 12, 2010, October 26, 2010, October 28, 2010, and November 17, 2010. Arsenic concentrations (Figure A-1) measured in these samples were well below the 0.01 micrograms per liter (mg/L) Tennessee Drinking Water Standard (TDWS) and Tennessee Water Quality Criterion (TWQC). Selenium was detected at low levels in each of these samples (Figure A-3); the highest measured concentration was 0.00059 mg/L at CRM 2.5 on September 12, 2010. Peak flows associated with these rain events were low (236, 98, 204, and 1,380 cfs, respectively) and characteristic of the typical fall season low-flow condition in the Emory River. During the period from June 26 to November 15, 2010, Emory River flows ranged from 9.4 to 1,570 cfs, averaging 188 cfs.

A few months after the end of dredging, the first large flow event in the Emory River from November 30 to December 1, 2010, caused re-suspension of sediment and temporarily increased concentrations of ash-related contaminants. However, by the end of the evaluation period similar storm events caused little or no difference in concentrations of ash-related contaminants between upstream and downstream sites

The November 30, 2010 rainfall event resulted in a peak Emory River flow of 57,100 cfs and a daily average flow of 22,600 cfs measured at the Oakdale, Tennessee gauging station. The automated samplers collected 24-hour composite samples for this event; the sampling period ended December 1, 2010. Arsenic concentrations were near or above the TDWS and TWQC at ERM 2.0 (0.0099 mg/L), ERM 0.3 (0.0096 mg/L), and CRM 2.5 (0.0125 mg/L). Lead also exceeded the TWQC in the samples from ERM 2.0 and CRM 2.5 on December 1, 2010. TSS values also were elevated (Figure A-2), indicating re-suspension of materials deposited on the streambed. Selenium was detected in the samples for this storm flow, with a maximum concentration of 0.0004 mg/L at ERM 0.3. Selenium was not detected in samples from any subsequent storms (Figure A-3). Concentrations of other ash-related constituents follow patterns of detection similar to arsenic and TSS. For example, Figure A-4 presents concentrations of barium measured during storm events.

The only other exceedances of the TWQC during the evaluation period were for mercury measured in samples collected on March 1, 2011 from CRM 4.6 and CRM 2.5. Mercury is a legacy constituent associated with historical releases from the U.S. Department of Energy's Oak Ridge Reservation. Because those were observed only in the Clinch River, and both upstream and downstream of the Emory River confluence, there is no reason to believe that these water quality exceedences for mercury were related in any way to the Kingston Ash Recovery Project site.

During the evaluation period there were 12 storm flows subsequent to the November 30 to December 1, 2010 event that exceeded the 10,000 cfs sample collection trigger. Concentrations of arsenic and TSS for the subsequent sampling events were similar at upstream and downstream locations, except for two events with flows greater than 19,000 cfs. For those two events, concentrations at ERM 0.3 and CRM 2.5 were higher than for upstream samples, but were significantly lower than for the November 30 to December 1, 2010 event, and did not exceed water quality standards.

For similar-size flow events, concentrations of all constituents appear to be decreasing with time. This suggests that the bed of the Emory River is approaching a stable contour and the potential for significant migration of ash-related constituents has been reduced.

<u>Recommendation</u>

Given the downward temporal trend in concentrations of ash-related constituents for similar-size flow events (even for the highest flow events), the decreasing water quality variability among stations during a single storm event, and the fact that there have been few exceedences of either TDWS or TWQC (none since March 1, 2011), TVA proposes to remove all the floating monitors. This analysis of the data over a nine-month period that includes 15 high-flow or rainfall-triggered sample collections indicates a very low probability of water quality exceedences in the Emory or Clinch Rivers related to the Kingston Ash Recovery Project activities.

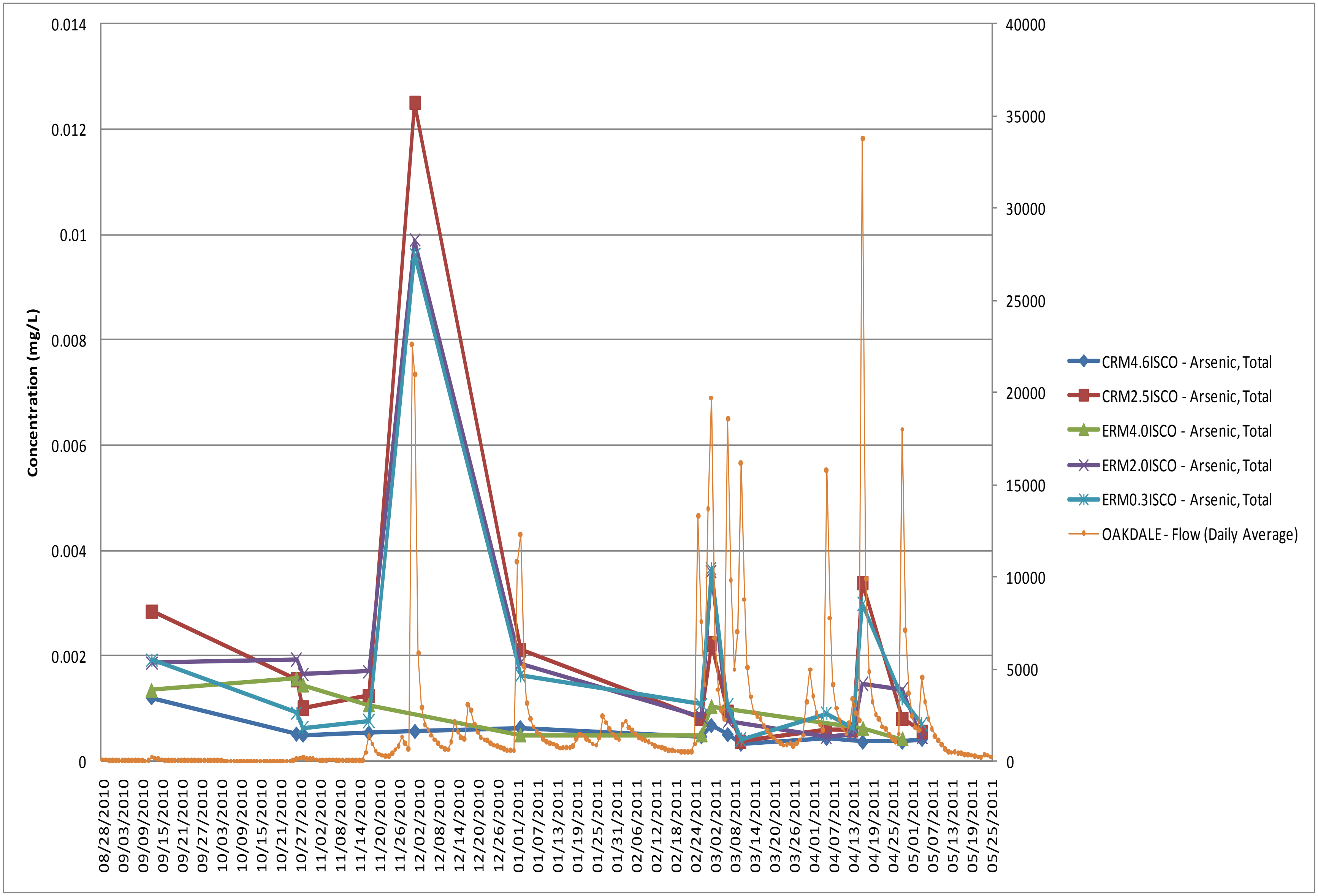

Figure A-1. Concentrations of Arsenic in Storm Event Surface Water Samples

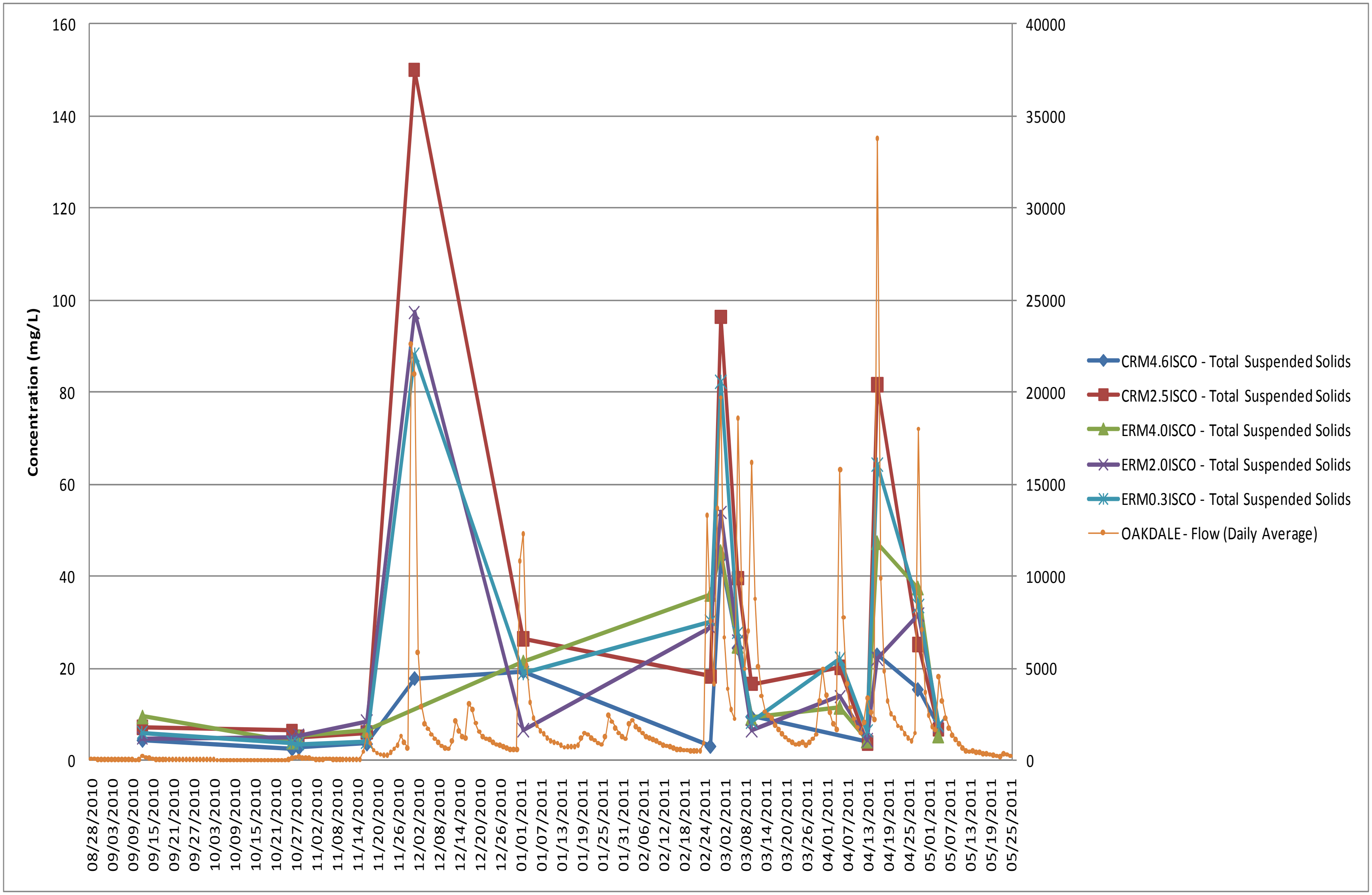

Figure A-2. Concentrations of TSS in Storm Event Surface Water Samples

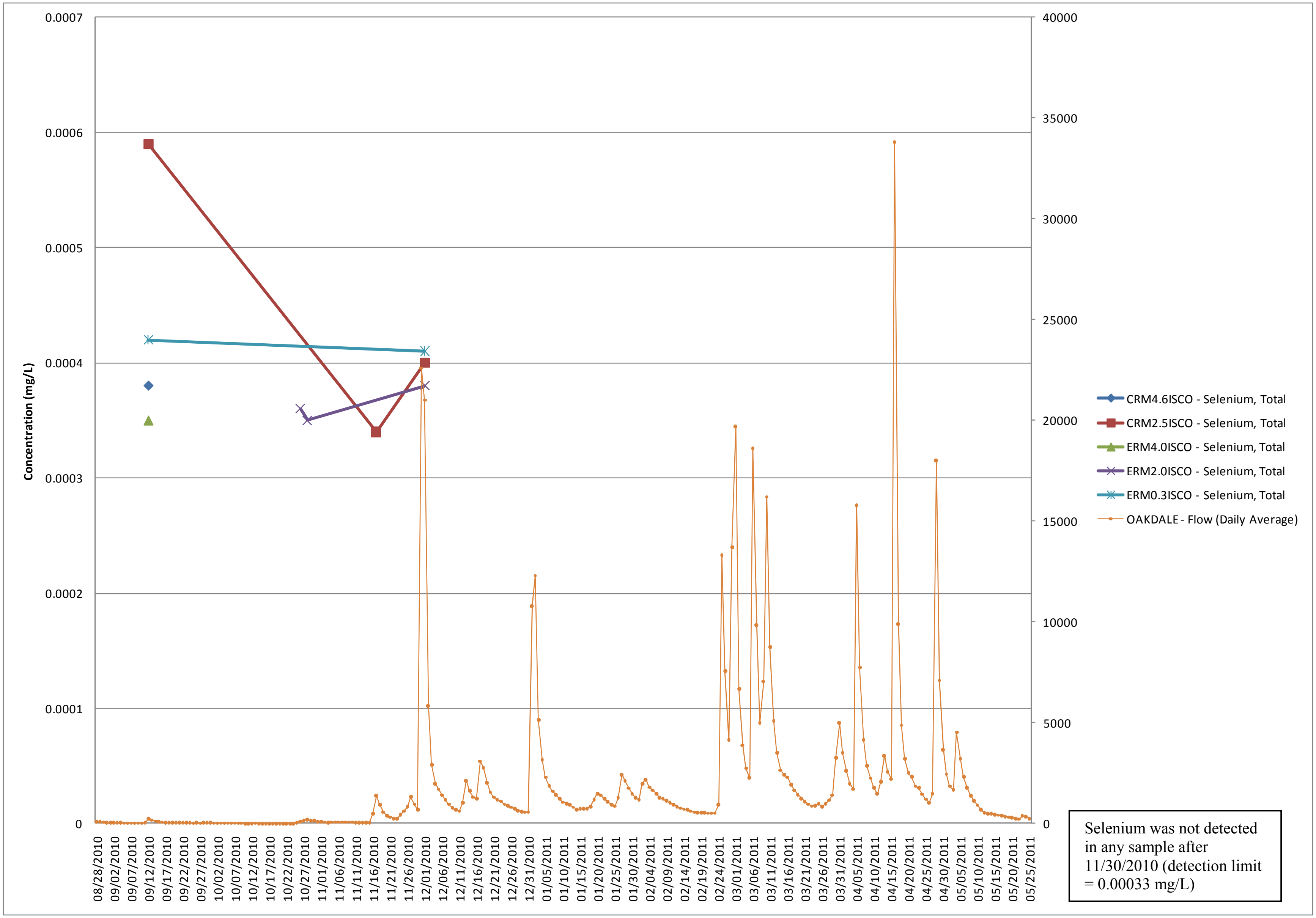

Figure A-3. Concentrations of Selenium in Storm Event Surface Water Samples

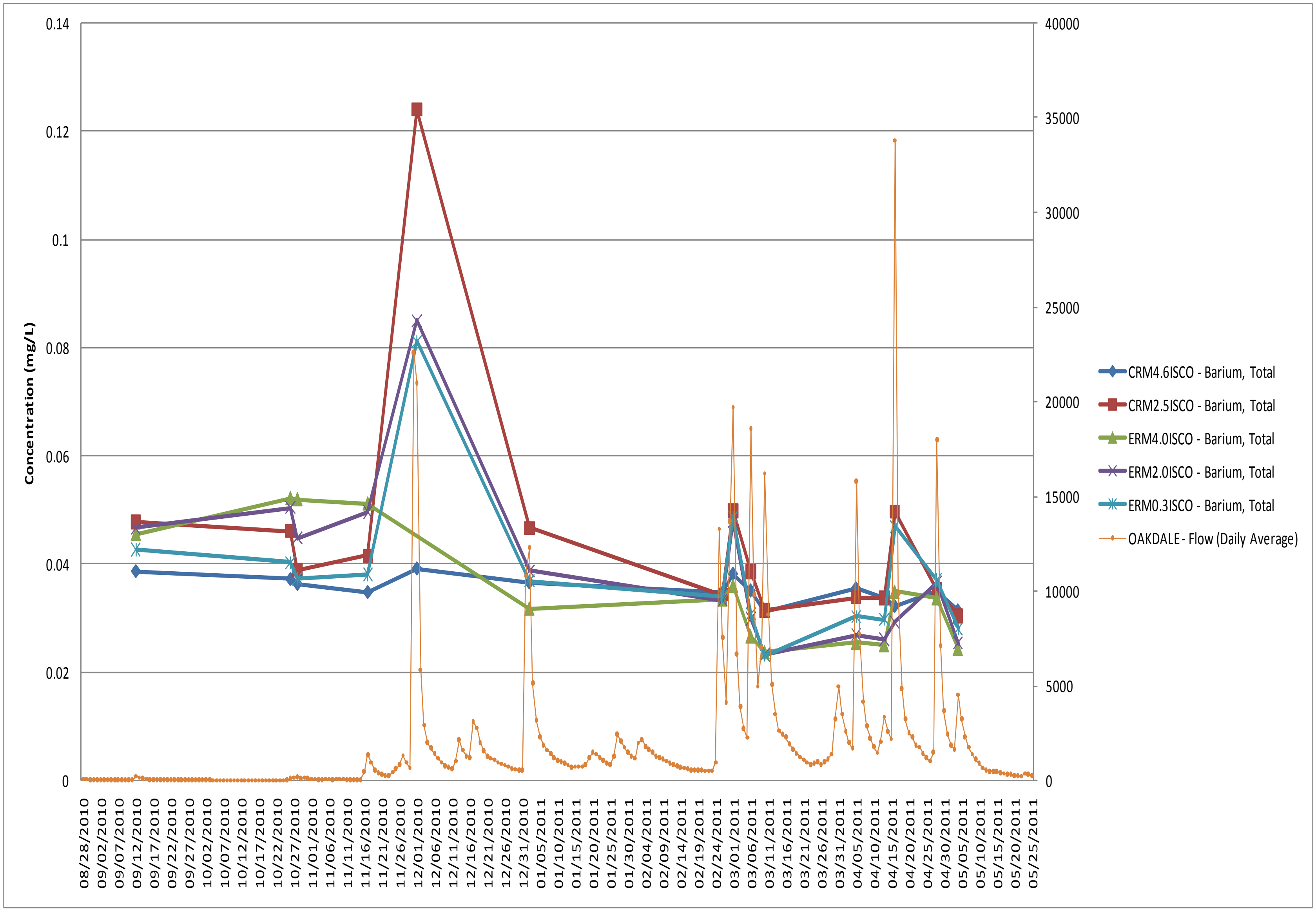

Figure A-4. Concentrations of Barium in Storm Event Surface Water Samples