Characterization of Dissolved Solids in the Ohio River and Selected Tributaries

February 2014

Adopted by ORSANCO on February 14, 2014 at the 208th Commission Meeting

Ohio River Valley Water Sanitation Commission
5735 Kellogg Avenue
Cincinnati, Ohio 45230
www.orsanco.org

Introduction

Total dissolved solids (TDS) refer to the sum of all minerals, salts, metals, cations or anions dissolved in water. Primary constituents of TDS include sulfate, chloride, calcium, magnesium, potassium, sodium, bicarbonates, and to a lesser extent bromide. TDS is not believed to pose a human health concern, but is regulated due to its potential to degrade taste and aesthetics of drinking water. High levels of TDS can also cause industrial water users problems with scaling in pipes and boilers, and can reduce water filter efficiency.

In recent years, increasing trends of dissolved solids and conductivity have been observed in the upper Ohio River and its tributaries. The underlying causes for these increased levels, however, are not well understood. Episodic events have also brought attention to the issue such as the sudden spike in TDS on the Monongahela River in 2008. Total dissolved solids concentrations reached as high as 900 mg/L during this event, and caused problems for municipal water suppliers and industrial water intakes. Drought conditions were noted as a contributing factor, but the exact nature of the sources is not fully understood. Public water utilities have also observed increasing concentrations of bromide (a minor constituent of TDS). Elevated levels of bromides in source waters are problematic for drinking water utilities as they form disinfection by-products which are regulated under the Safe Drinking Water Act. The source for the rising bromide levels is also unknown.

Concerns regarding TDS levels in the Ohio River prompted the Ohio River Valley Water Sanitation Commission (ORSANCO) to promulgate a 500 mg/L ambient water quality standard for TDS in June 2011 to ensure public drinking water supplies are protected. This in-stream standard, which is equivalent to US EPA's secondary maximum contaminant level (MCL), only applies at points of withdrawal for drinking water intakes along the Ohio River. States must now consider the new ambient water quality standard when establishing effluent limits in NPDES permits for Ohio River dischargers to ensure the 500 mg/L in-stream TDS standard is met at the nearest downstream water supply intake. At the time of the standard's adoption, however, very limited TDS data existed to aid state permit writers in defining ambient background concentrations for use in establishing appropriate permit limits.

In light of the deficiency of ambient data for the Ohio River, the Commission added TDS to the suite of analytes routinely monitored as part of the Bimonthly Sampling Program. TDS analyses have now been conducted on water quality samples collected every other month at 15 Ohio River and 14 tributary locations since July, 2011. Collecting only six samples per year will require many years to generate sufficient data to adequately characterize background conditions.

ORSANCO initiated a more intensive, one-year monitoring project to further accelerate the data collection effort and enhance confidence in quantifying background levels of TDS and its individual constituents. This special project was funded through ORSANCO's Ohio River Users Program (ORUP) with program oversight provided by the Ohio River Users Program Advisory Committee. The Commission's Water Users Advisory Committee also provided guidance and comments throughout the

completion of the study. The following report details the findings from the year long monitoring effort to characterize dissolved solids in the Ohio River.

Program Goals and Objectives

The goal of this project is to develop a better understanding of the dynamics of TDS and its constituents in the Ohio River while substantially enhancing the existing data set to characterize TDS levels in the Ohio River and selected tributaries.

The specific project objectives include:

1. Generate sufficient data to define ambient background levels of TDS at selected Ohio River locations.
2. Quantify TDS constituent makeup to document temporal and spatial variability.
3. Evaluate the possible development of site-specific translators to convert commonly collected conductivity measurements to estimate TDS concentrations.
4. Generate data to support possible development of an Ohio River stream criterion for bromide.

Study Design

Site Selection

Samples were collected once per week at sixteen locations for a period of approximately one year (55 weeks) starting December 2011 and concluding in December 2012. Monitoring sites were established at drinking water utilities, power plants and other industrial intakes. Eleven sites were at intakes drawing directly from the Ohio River, longitudinally distributed along the entire 981-mile length of the river from Pittsburgh, PA to Cairo, IL (see Figure 1 and Table 1). An additional five monitoring locations were established on five tributaries including the Allegheny, Monongahela, Beaver, Muskingum, and Big Sandy Rivers. Specific site selection was based, in part, on available municipal and industrial volunteer study participants. These participants were identified through coordination with ORSANCO's Water Users Advisory Committee (WUAC) and the Commission's Power Industry Advisory Committee (PIAC).

Table 1. List of Ohio River and tributary monitoring locations.

Location ID	River	Location
AL008	Allegheny	Pittsburgh, PA
MO005	Monongahela	Pittsburgh, PA
OH012	Ohio	Pittsburgh, PA
BE002	Beaver	Beaver Falls, PA
OH065	Ohio	Steubenville, OH
OH087	Ohio	Wheeling, WV
OH137	Ohio	Sistersville, WV
MU029	Muskingum	Beverly, OH
OH191	Ohio	Parkersburg, WV
OH260	Ohio	Cheshire, OH
OH306	Ohio	Huntington, WV
BS020	Big Sandy	Louisa, KY
OH463	Ohio	Cincinnati, OH
OH600	Ohio	Louisville, KY
OH792	Ohio	Evansville, IN
OH978	Ohio	Cairo, IL

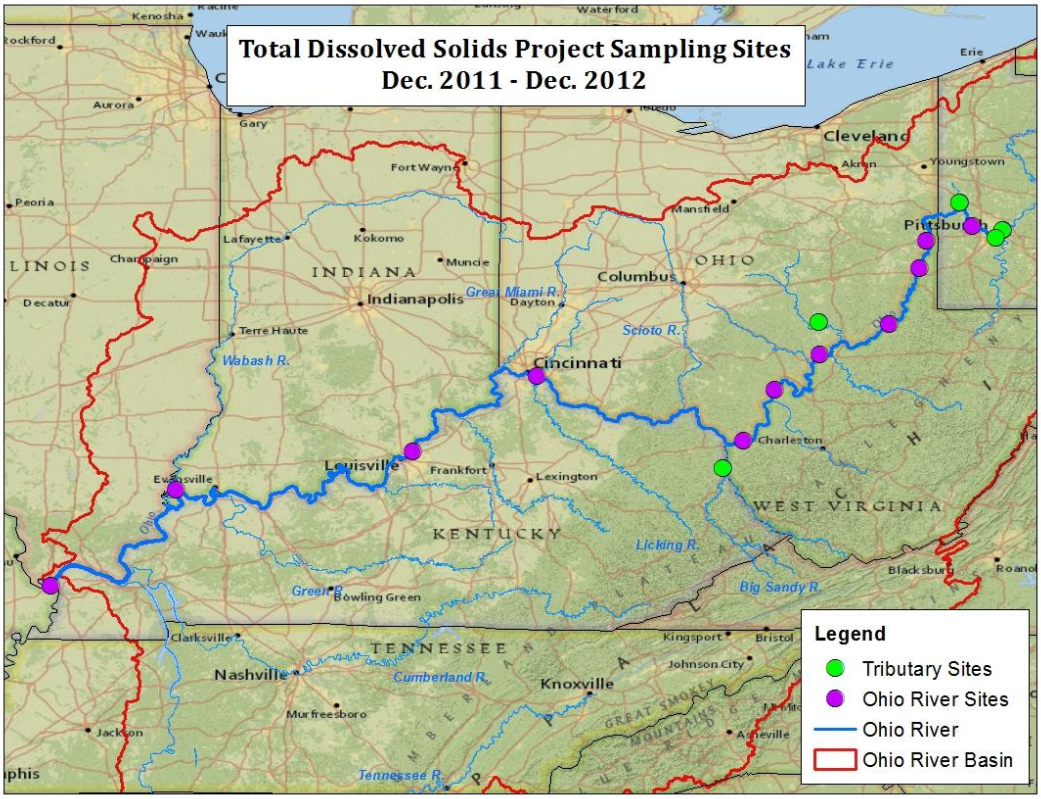


Figure 1. Ohio River mainstem and tributary dissolved solids sampling locations.

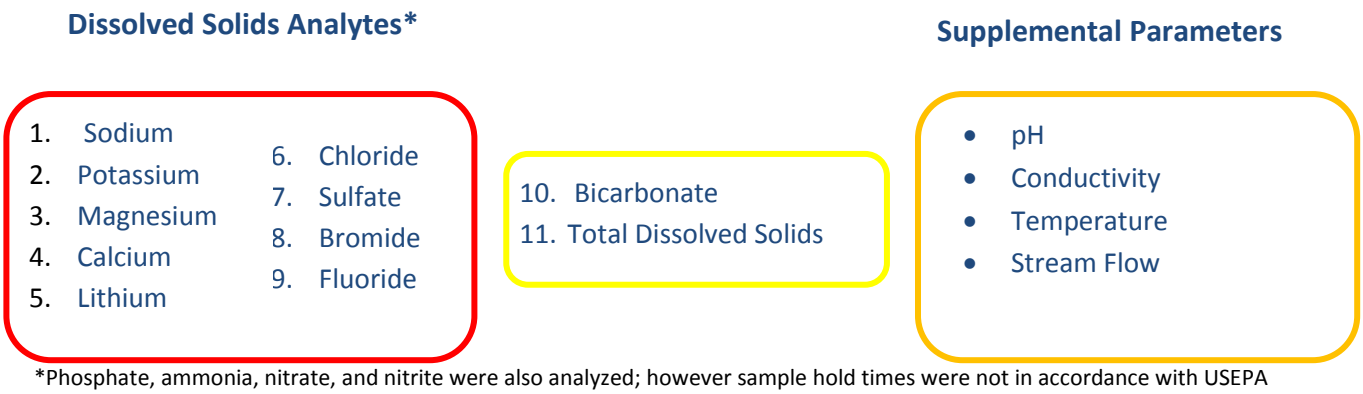
Sample Collection and Handling

Each weekly sampling event involved volunteer, on-site personnel collecting and shipping two raw-water samples to ORSANCO's office in Cincinnati, OH. ORSANCO provided all participants with standardized sampling kits which included: 1) two pre-labeled 150 ml sample bottles, 2) a cardboard shipping container, 3) a Styrofoam insulated inner container, 4) two freezer gel packs, 5) a chain-of-custody / data form, and 6) a pre-paid shipping label. Where possible, conductivity, pH, and temperature measurements were made on-site at the same time the raw water samples were collected. The physical parameter measurements and the sample date and time were recorded on the sample bottles and on the chain-of-custody form.

Ideally, samples were shipped on the same day of collection via UPS overnight delivery; however, samples were occasionally shipped on the following day due to a variety of reasons including time constraints of the volunteer samplers and shipping difficulties. Upon receipt at ORSANCO, the samples were logged in on a sample receipt form and prepped for analysis. One sample bottle from each site was shipped to Pace Analytical Laboratories for analysis (see Analysis section for more details). The second sample container was processed for in-house analysis. An aliquot was taken from this sample and stored at 4 °C until all in-house ion analyses were completed (no chemical preservatives were added). The remaining sample volume was then warmed to room temperature and pH and specific conductance (i.e. conductivity normalized to 25 °C) were measured using a Mettler Toledo Multi7 electrode meter. This instrument was calibrated for both parameters weekly or as needed.

Sample Analysis

The weekly samples were analyzed for total dissolved solids and a suite of 14 dissolved solids constituent parameters. Analyses were performed by two different laboratories based on parameter. Total dissolved solids and bicarbonate analyses were performed by Pace Analytical Laboratories in Columbus, OH and Indianapolis, IN. The remaining constituent analytes including sulfate, chloride, calcium, magnesium, potassium, sodium, lithium, fluoride, bromide, ammonia, phosphate, nitrate, and nitrite were analyzed in-house by ORSANCO staff using ion chromatography (Figure 2). It should be noted, however, that sample holding times could not be consistently met for the latter three analytes (i.e. phosphate, nitrate, and nitrite), and results for these parameters should be viewed with caution. Additional details regarding sample analysis are provided below.



*Phosphate, ammonia, nitrate, and nitrite were also analyzed; however sample hold times were not in accordance with USEPA methodology.

Figure 2. Analyte list of dissolved soilds constituents and supplemental parameters.

TDS and Bicarbonate Analysis

Total dissolved solids and bicarbonate concentrations were analyzed by Pace Analytical, a contract laboratory in the region. All samples were stored in a 4˚C refrigerator until custody was transferred to Pace Analytical. The TDS analysis was in accordance with USEPA method 160.1. This procedure

determines the concentration of TDS gravimetrically. The basic procedure involves pouring 100 milliliters of a well-mixed surface water sample through a constant weighted glass fiber filter. The saturated glass fiber filter is dried overnight in a 180˚C oven. The fiber filter is then weighed (and re-weighed) until a constant weight is achieved. To obtain the TDS value, the final weight is subtracted from the initial tare weight and divided by the sample volume used.

Pace Analytical determined bicarbonate levels using Standard Methods 2320B, which determines the alkalinity based on calcium carbonate. With this method, a measured aliquot of source water is pH tested and titrated to an end point of pH 4.5 with 0.02N H2S04 (sulfuric acid) and the titrating acid volume is recorded. A conversion factor to determine the bicarbonate alkalinity is used. For instances where the initial pH was >8.3, an additional titration step was used to determine phenolphthalein alkalinity.

Bicarbonate alkalinity was determined from calcium carbonate alkalinity, by multiplying the sulfuric acid volume (mL) used by the acid normality x 50,000 and then dividing by volume (mL) of sample analyzed. That value is multiplied by the conversion factor of 1.22 to derive the bicarbonate alkalinity present in sample.

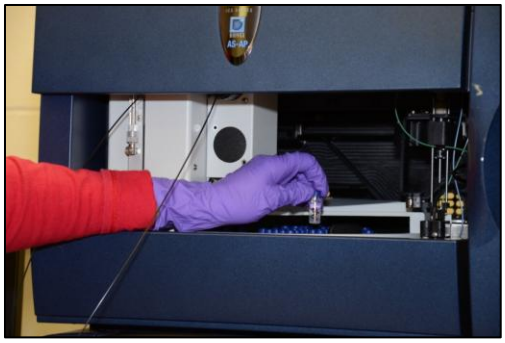
Inorganic Ions Analysis by Ion Chromatography

The ion chromatograph has the ability to separate a mixture of inorganic ions into individual analyte species and determine identification and concentration of each ion species for which it has been calibrated. Cations (sodium, ammonia, potassium, magnesium and calcium) and anions (fluoride, chloride, nitrite, nitrate, sulfate and phosphate) can be easily resolved within 25 minutes.

A 10mL sample aliquot warmed to room temperature was pushed through a 0.45 µm filter to remove particulate debris and prevent clogging of instrumentation. A 1 mL aliquot of filtered sample was transferred to a sample vial for analysis on the ion chromatograph.

Inorganic ions were analyzed using a Dionex IC5000 dual channel ion chromatograph which measures the concentration of inorganic analytes via a conductivity detector. The source water sample was injected into the appropriate eluent stream which passed through an ion exchanger column partitioning the mixture into individual ionic constituents before entering the suppressor. The suppressor converted the ions into a quantifiable form [acids (anions) or bases (cations)] by the conductivity detector. The retention time (i.e. the time it takes for the acid/base to pass over the detector) is unique for each ion species and allows for identification based on a reference standard. The concentration of ions present is determined by the eluting peak area. An IC chromatogram is a graphical representation of a mixture of inorganic anions or cations.

The anion calibration standard is a mixture of analytes containing fluoride, chloride, nitrite, nitrate, sulfate and phosphate. Similarly, the calibration standard for cations contained lithium, sodium, ammonium, potassium, magnesium and calcium.



The initial calibration range for the anions, chloride, nitrite, nitrate, bromide, and sulfate was 0.1-60 ug/mL; fluoride 0.02-12 ug/mL and phosphate ranged from 0.20-119 ug/mL. The initial calibration range for cations were as follows: lithium 0.05-25 ug/mL; sodium 0.20-100 ug/mL; ammonium 0.25-125 ug/mL; potassium 0.50-251 ug/mL; magnesium 0.25-125 ug/mL; and calcium 0.50-249 ug/mL.

This calibration range was used for the first 13 weeks of the study. Instrument parameters and the operating method were optimized so that the linear calibration range could be lowered to represent trace concentrations of anions. Beginning February 20, 2012, the anionic linear range was as follows: chloride, nitrite, bromide, nitrate and sulfate 0.036-50ug/mL; fluoride 0.008-10 ug/mL; and phosphate 0.080-99 ug/mL. In June 2012, the method was adjusted to increase the high end by including a full strength standard. The upper limit of the calibration range became: chloride, nitrate, bromide, sulfate 100 ug/mL; nitrite 102 ug/mL; fluoride 20 ug/mL; and phosphate 199 ug/mL. The lower end of the calibration range remained unchanged. In September 2012 a new lot of anion standard was received and the lower calibration ranges changed slightly; chloride, bromide, nitrate, sulfate 40 ug/mL; nitrite 41 ug/mL; phosphate 0.08; and fluoride 0.008 ug/mL . This did not alter results significantly.

Calibration ranges for cations was constant for the duration of the study on the lower end; however, a full strength standard was added so that the high end of the calibration range was extended in April 2012. The endpoint ranges for cation compoumds are as follows: Lithium 50 ug/mL; sodium 201 ug/mL; ammonium 250 ug/mL; potassium 502 ug/mL; magnesium 251 ug/mL; calcium 499 ug/mL.

Instrument blanks, reagent blanks and calibration curve checks, were analyzed routinely to ensure quality assurance and quality control parameters were maintained. These samples were reviewed prior to analysis of samples to verify that the instrument was functioning properly. Lab spikes and matrix spikes were also analyzed to determine percent recovery of analytes.

Samples were collected and analyzed for 55 weeks of the study; however, a computer malfunction resulted in unrecoverable IC data for weeks 49-55. Data for source water samples analyzed through week 48 were first reviewed by the QA/QC officer and then printed for entry into an excel spreadsheet which recorded all study data. QA/QC information was retained on the computer (post review) and was lost when a power glitch in late December destroyed the computer hard drive.

Sample Holding Times

The allowable sample holding times for each parameter analyzed are provided in Table 2 below. In most cases, samples were analyzed between 24-48 hours of receipt into the laboratory; exceptions to this were due to instrument down time or staffing shortages. Measurement results for nitrites, nitrates and phosphates were recorded as they were included in the calibration standard mixture; however, the allowable holding times for these analytes were exceeded in many cases due to shipping constraints and other factors. Data for these parameters should be viewed with caution as not all quality assurance objectives were met.

Table 2. Sample holding times by parameter.

Holding Time	***Parameters***
48 Hours	Nitrite, nitrate, phosphate
7 Days	Total dissolved solids
14 Days	Bicarbonate (alkalinity)
28 Days	Fluoride, chloride, bromide, sulfate, ammonia
180 Days	Sodium, calcium, potassium, magnesium

Data Management

All analytical results were reviewed for accuracy then archived in Excel spreadsheets. The ion chromatograph results were initially generated in Dionex Chromeleon software and then transferred to Excel files. TDS and bicarbonate results were provided by Pace in an electronic deliverable format and also archived in Excel. Physical parameter data were manually recorded in a sample log and then transcribed to Excel. Daily stream flow data for each sampling event were queried from ORSANCO's Access database of daily modeled flow results from the U.S. Army Corps of Engineer Cascade flow model.

Monitoring Results and Discussion

Objective 1: Characterize ambient levels of TDS.

Minimum concentrations of TDS by site in the Ohio River ranged between 104 mg/L at Steubenville, OH to 166 mg/L at Louisville, KY. Median TDS values across all mainstem sites fell within a fairly narrow range from 188 mg/L to 227 mg/L, with an overall Ohio River median value of 215 mg/L. Peak concentrations by site ranged from 280 mg/L at Moon Township, PA to 368 mg/L at Cheshire, OH. These results indicate that all Ohio River samples collected during the one-year study period had levels well below ORSANCO's 500 mg/L ambient water quality standard for total dissolved solids.

The TDS results are summarized in Table 3 and graphically presented in Figure 3 below. Complete sample results are provided in Appendix A.

Table 3. Total dissolved solids results summary.

ORSANCO Total Dissolved Solids Results Summary

			TDS Result, mg/L		
River	**Mile**	**Ohio River**	**Min**	**Median**	**Max**
Allegheny	8.2	0	62	161.5	236
Monongahela	4.5	0	113	218.0	362
Ohio	11.7	11.7	124	205.0	280
Beaver	6	25	163	276.0	386
Ohio	65.3	65.3	104	206.0	307
Ohio	86.8	86.8	106	217.0	328
Ohio	137.2	137.2	110	222.0	359
Muskingum	29	172	148	362.0	584
Ohio	190.5	190.5	106	227.0	364
Ohio	260	260	160	222.0	368
Ohio	306	306	126	188.5	301
Big Sandy	23.6	317.1	155	362.0	579
Ohio	462.8	462.8	150	195.0	335
Ohio	600	600	166	215.0	332
Ohio	791.5	791.5	160	223.0	341
Ohio	978	978	142	203.0	339

TDS levels observed in the five tributaries included in the study collectively exhibited more variability than concentrations observed in the mainstem of the Ohio River. The Allegheny River consistently had the lowest levels of all sites sampled with a minimum concentration of 62 mg/L and a maximum of 236 mg/L. The Monongahela River exhibited TDS concentrations comparable to the range of values observed on the Ohio River with minimum, median, and maximum concentrations of 113 mg/L , 218 mg/L, and 362 mg/L, respectively. The Beaver River showed somewhat higher levels, with a median concentration of 276 mg/L which was 21 to 47 percent higher than median values of all Ohio River locations.

The Muskingum and Big Sandy Rivers were appreciably different than other sites included in the study. Median TDS levels on these two tributaries at 362 mg/L each were greater than the maximum concentrations observed at all but two Ohio River locations. These two tributaries had the highest peak concentrations observed in the study at 584 mg/L for the Muskingum River and 579 mg/L on the Big Sandy River. It should be noted that ORSANCO's pollution control standards apply only to the Ohio River mainstem and not to the tributaries, thus these peak concentrations in excess of 500 mg/L do not constitute a standards violation.

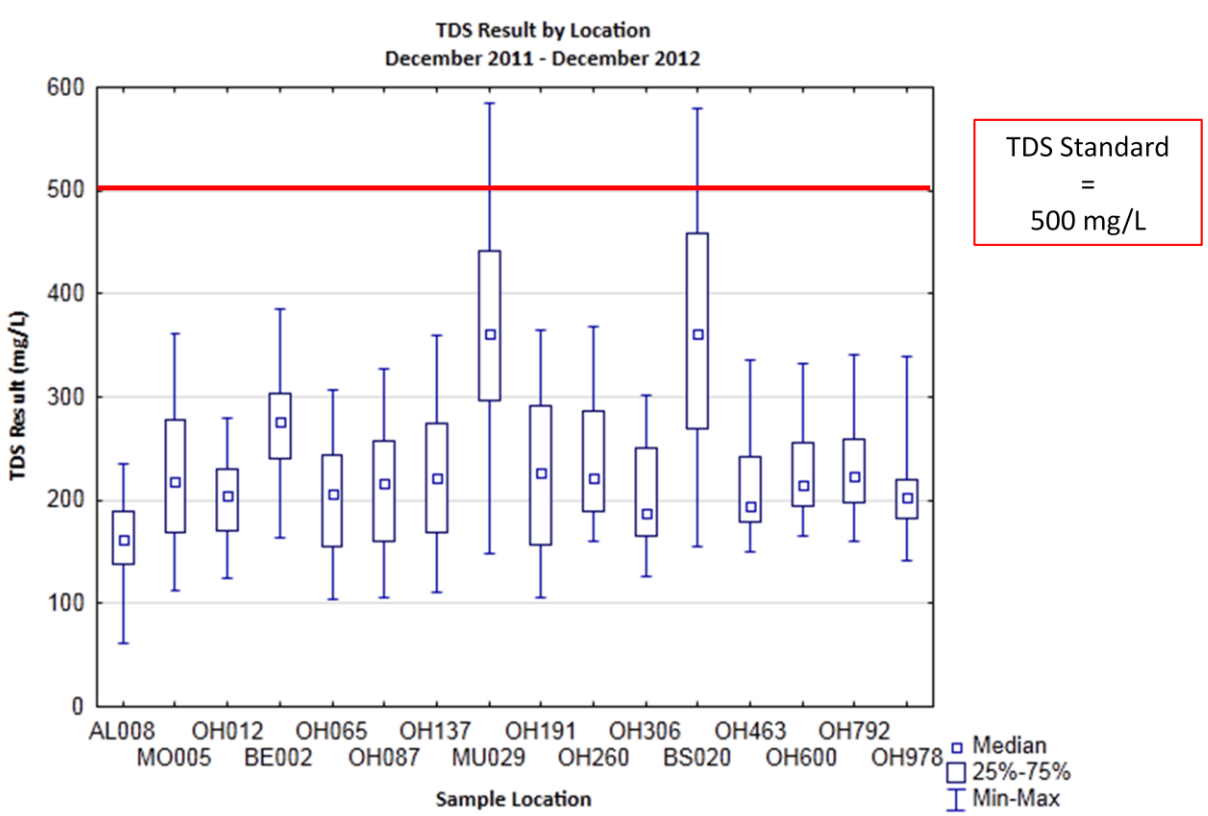


Figure 3. Box-and-whisker plot of TDS concentrations in the Ohio River and selected tributaries.

A comparison of TDS levels over the course of the one-year study period indicates the most critical period for elevated TDS levels in the Ohio River and the tributaries was in the late summer months, particularly in late August and early September (Figure 4). Conversely, the lowest measured TDS values typically occurred in the winter and spring months. These results are consistent with an inverse relationship with stream flow, with the highest concentrations occurring during times when stream flows are at their lowest levels.

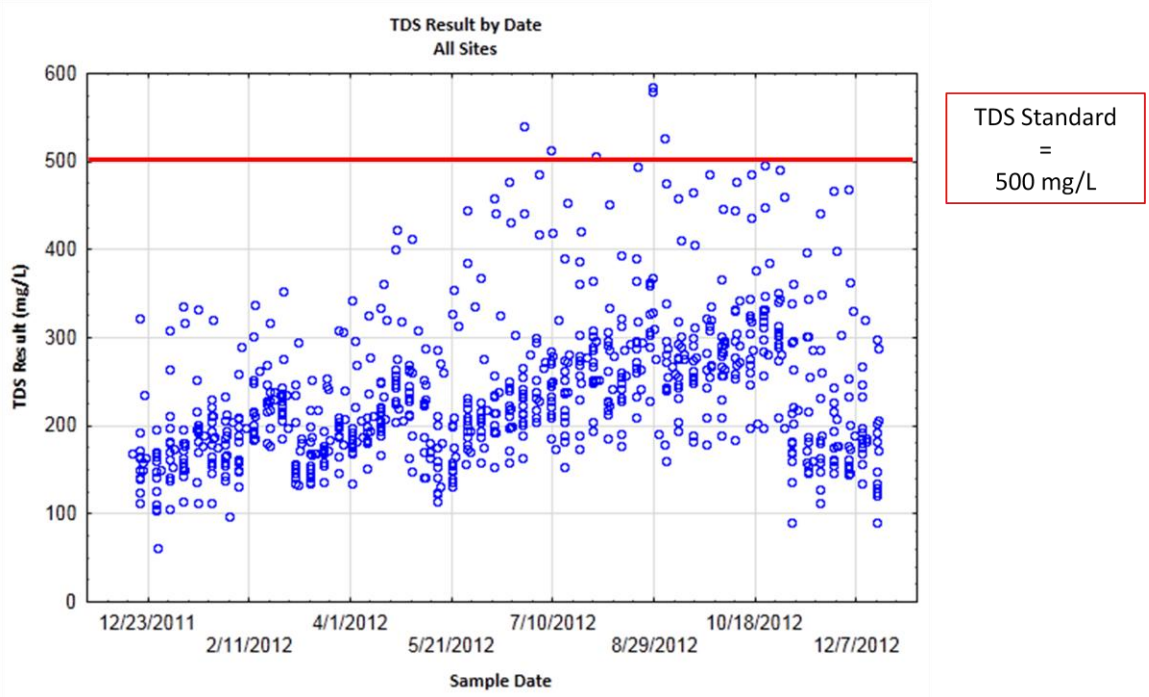


Figure 4. TDS concentrations for all sampling locations over the one-year study period.

Objective 2: Quantify TDS constituent makeup to document temporal and spatial variability.

In addition to the total dissolved solids analysis, each raw water sample collected was also analyzed for 14 individual ions listed in Figure 2 above. These results were evaluated to look at the ionic composition comprising the TDS results. It is important to note, however, two critical factors for consideration when comparing the individual ion results to the total dissolved solids concentrations. First, the 14 ions included in this study do not constitute the full realm of ions that make up total dissolved solids. Other ions may be present, and as such, the sum of the ions may under represent the combined total of all dissolved solids constituents present. The ions analyzed as part of this study include those ions that are typically found in the highest concentrations, such as bicarbonate, sulfate, and chloride, as well as some that are commonly found, but at much lower concentrations (e.g. bromide). Collectively these ions are presumed to represent the vast majority of ions in such riverine environments.

Potential laboratory variability is the second factor to consider when comparing results of this study. The TDS and bicarbonate analyses were performed by Pace Analytical Laboratories. As noted above, TDS is determined gravimetrically, while bicarbonate analysis is determined by titration based on calcium carbonate alkalinity. All other ions were analyzed by ORSANCO staff using ion chromatography. The use of different laboratories and different analytical methods can compound laboratory variability and must be considered when comparing results across methods and laboratories.

With those caveats aside, the individual ion concentrations were used to characterize the constituent make-up of dissolved solids and to evaluate possible seasonal or spatial trends. Overall, the five most prevalent ions measured in the Ohio River accounted for nearly 93 percent of the total sum of ions quantified (Figure 5). Sulfate routinely had the highest concentrations and typically comprised nearly

1/3 of the total ions present. Bicarbonate was the second most abundant ion making up 25 percent of the total concentration. Calcium, chloride, and sodium accounted for 15 %, 12%, and 10% , respectively. The other nine ions collectively amounted to just seven percent of the total, with magnesium by far the most prevalent.

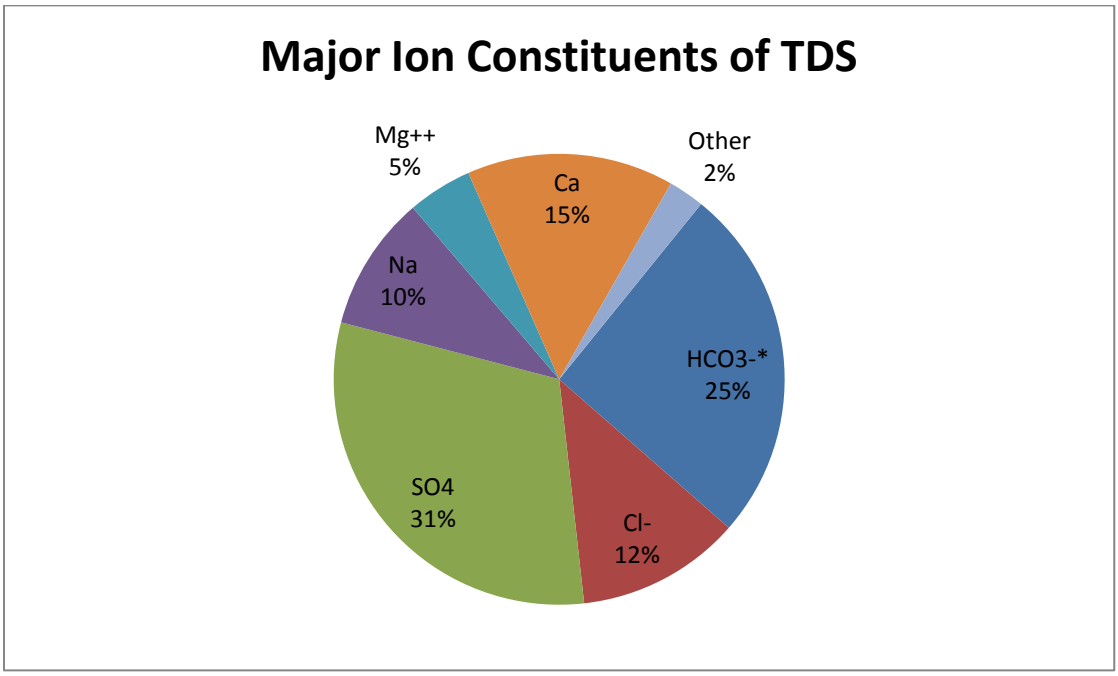


Figure 5. Ion composition of TDS in the Ohio River, based on median concentrations by ion.

Some spatial differences were observed in the ionic composition of dissolved solids. These differences were noted when comparing the tributaries to the Ohio River, as well as, when making comparisons across mainstem locations. The tributaries exhibited the most pronounced changes in constituent make-up. In addition to having the greatest overall concentrations, the tributaries also had some of the most extreme mixtures of dissolved solids constituents. For example, the Big Sandy River had the highest sulfate levels by concentration and percent composition of all sites sampled. Conversely, chloride concentrations and percent composition in the Big Sandy River were lowest observed among all locations.

Figure 6 presents the typical (i.e. median) dissolved solids constituent composition for each study site. Only the top five constituents (i.e. sulfate, bicarbonate, calcium, chloride, and sodium) are individually displayed, while the remaining minor ions are grouped together as "other." A similar graphic is provided in Figure 8 to illustrate how the ionic composition changes across sites. These changes are briefly summarized below for each of the major ions.

Sulfate – This ion steadily decreases in relative abundance moving from upstream to down on the Ohio River. Sulfate accounts for over one third (i.e. 36%) of the total dissolved solids concentration in the Ohio River at Moon Township, PA. By the time the Ohio River reaches the Mississippi River at Cairo, IL, sulfate makes up approximately one fifth (i.e. 21%) of the total sum of ions. The greatest extremes were

observed on the tributaries. The highest sulfate concentration of 254 mg/L and the greatest percent composition (i.e. 42%) were observed on the Big Sandy River. The Beaver River, conversely, experienced the lowest levels of sulfate with a minimum concentration observed of 31 mg/L and a percent composition of just 19 percent.

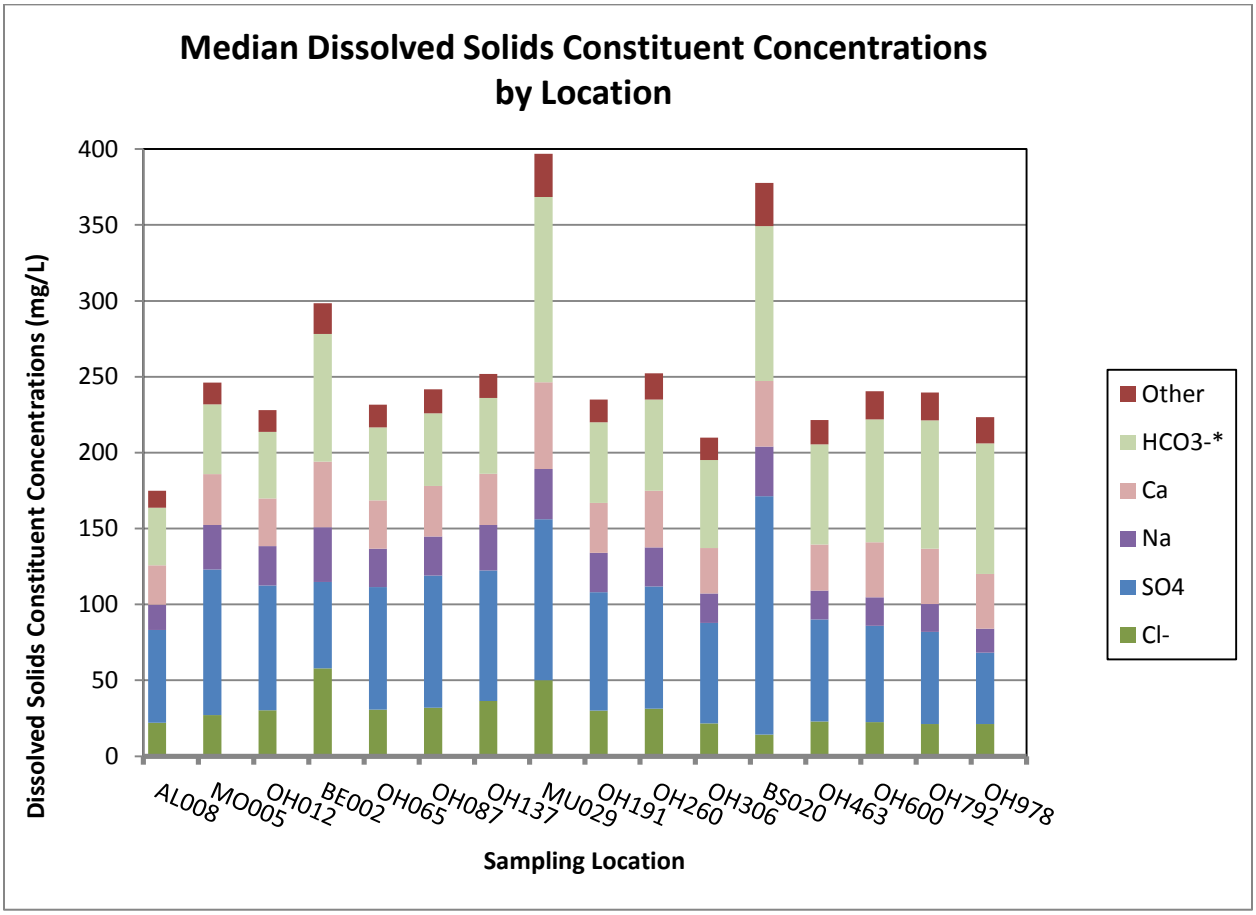


Figure 6. Stacked bar graph of median dissolved solids ion constituents.

Bicarbonate – Trending in the opposite direction as sulfate, percent composition of HCO_3 doubled from 19% in Pittsburgh, PA to 38% in Cairo, IL.

Calcium – Calcium remained fairly consistent in the Ohio River, with percent composition fluctuating by location from 13 % to 16 %.

Chloride – Ohio River chloride levels were typically below 30 mg/L. There was a general decline in abundance moving longitudinally downstream from a peak composition of nearly 15% at Sistersvile, WV to a low of approximately 9% at Evansville, IN. The Beaver River had the highest chloride composition at 19%, while the Big Sandy River had the lowest of just 4%.

Sodium – Typical levels of sodium comprised 11% of the total dissolved solids in the upper Ohio River and exhibited a slight decrease longitudinally, reducing to 7% of the total at the lower end of the Ohio River in Cairo, IL.

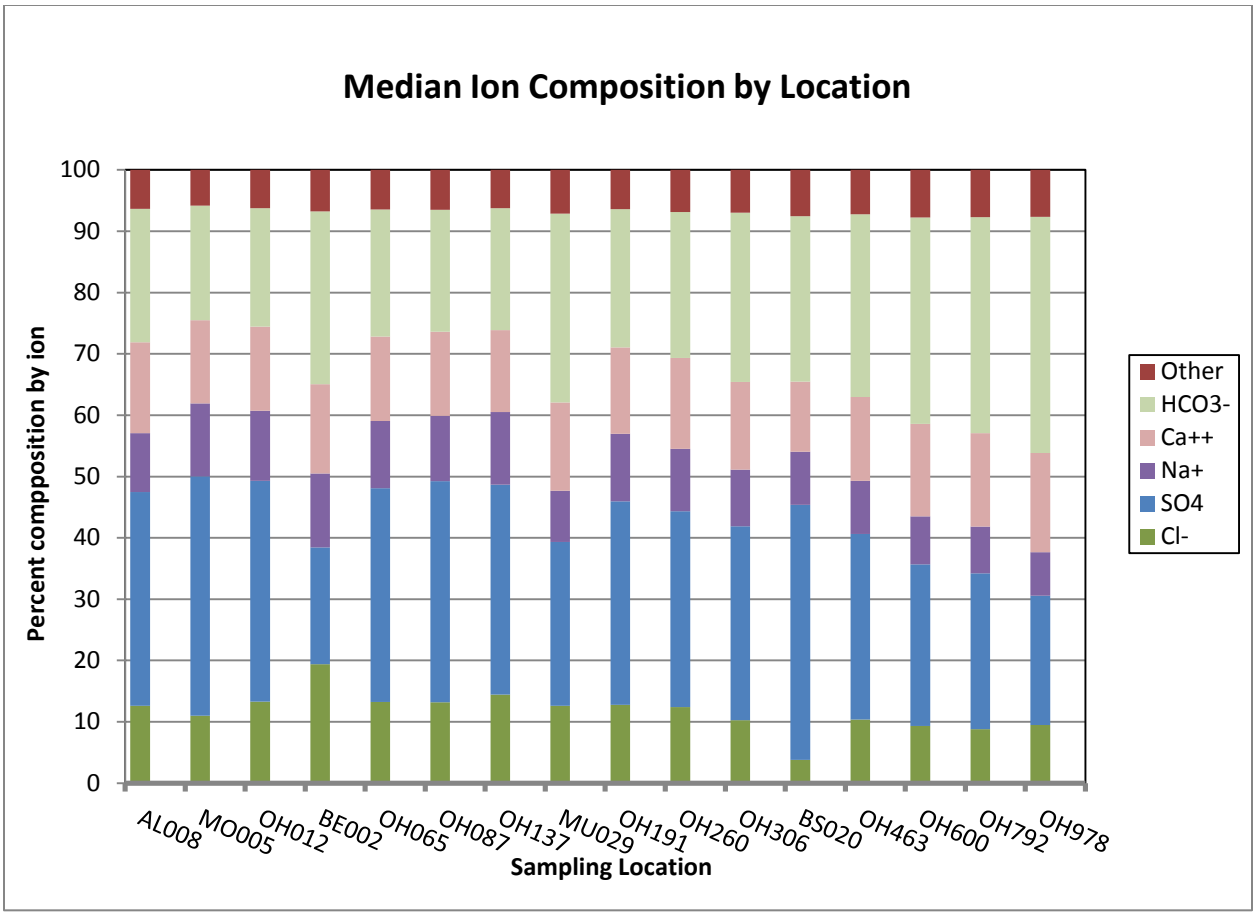


Figure 7. Major ion constituents of TDS by percentage.

Bromide – Typical bromide levels observed by ORSANCO were less than 100 ppb, however values peaked as high as 1,200 ppb. This maximum was observed at the uppermost Ohio River mainstem site, near Pittsburgh, PA, while the Big Sandy River produced the next highest value. In the first 12 weeks of sampling, the reporting limit was 100 ppb, leading to a relatively low percent detection. In the following weeks (13-48), the reporting limit was lowered to 35 ppb and the number of samples with detectable concentrations of bromide greatly increased. The bromide results had considerable variability and did not correlate as well with stream flow as did other constituents.

Implications of Ion Composition on Regulation of Dissolved Solids

Quantifying the ion composition of TDS has important implications on the regulation of dissolved solids in the Ohio River. ORSANCO's Pollution Control Standards include ambient water quality criteria for total dissolved solids (500 mg/L), chloride (250 mg/L), and sulfate (250 mg/L). In the discussions leading up to the Commission's adoption of the TDS standard in 2011, questions were raised as to whether or not a standard for TDS was necessary considering ORSANCO already had limits for chloride and sulfate. The premise was chloride and sulfate presumably constituted the vast majority of dissolved solids ions present, and thus, indirectly regulated TDS through direct control of the dominant ions.

Monitoring results from this study indicate chloride and sulfate combined account for 43 percent of the total dissolved solids in a typical Ohio River sample. While both ions are significant contributors to TDS concentrations, they are not the only major ions and make-up less than half of the total ion concentration. Based on these findings, the Commission's current standards for chloride and sulfate (i.e. 250 mg/L each) may not be adequate to ensure TDS concentrations remain below 500 mg/L.

Objective 3: Develop site-specific translators to convert commonly collected conductivity measurements to estimate TDS concentrations.

Conductivity is a commonly measured physical water quality parameter that is sometimes used as a surrogate for total dissolved solids analysis as it is very inexpensive and can be collected in real-time using widely available probes and datasondes. These monitoring devices measure conductivity and can either internally compute TDS based on the measured value, or the calculation can be completed manually after the initial data collection. The conversion from conductivity to TDS relies on a defined relationship, or conversion factor, between the two parameters.

Various conversion factors are used, but typical conversions estimate TDS by multiplying conductivity by 0.67, 0.65, or 0.625. The relationship of conductivity to TDS, however, is dependent on the specific ions present in the water sampled. Therefore, site specific characteristics can strongly influence this relationship and using default conversion factors may yield inaccurate estimates of TDS based on conductivity.

Specific conductance (i.e. conductivity normalized to a standardized temperature of 25°C) was collected for each sample analyzed for TDS to evaluate the site specific relationship of these two parameters at Ohio River and tributary sampling locations. As noted earlier in the report, samples were collected weekly at 11 Ohio River and 5 tributary locations. Results for specific conductance are presented in Figure 8 and are summarized by site in Table 4. Conductance values ranged from 173 us/cm on the Allegheny River to 870 us/cm on the Big Sandy River. The overall median value across all sites was 393 us/cm.

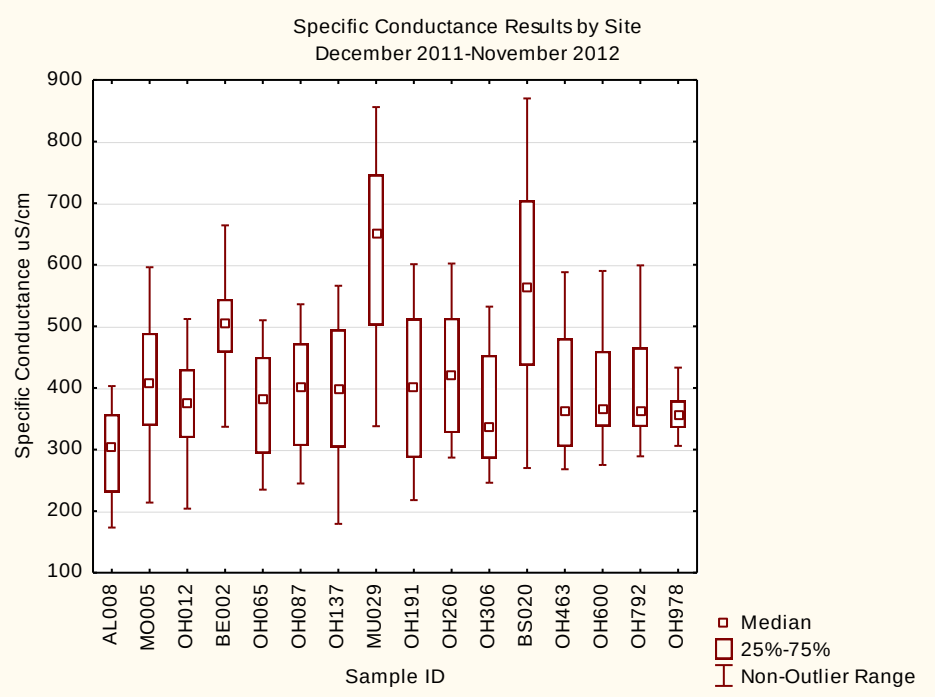


Figure 8. Box and whisker plot of specific conductance results by site.

Table 4. Summary table of specific conductance results.

ORSANCO Specific Conductance Results Summary

		Specific Conductance Result, uS/cm		
River	**Mile**	**Min**	**Median**	**Max**
Allegheny	8.2	173	297	403
Monongahela	4.5	214	408	596
Ohio	11.7	204	377	512
Beaver	2.2	296	494	664
Ohio	65.3	235	383	510
Ohio	86.8	245	403	536
Ohio	137.2	179	404	566
Muskingum	29	338	621	856
Ohio	190.5	218	401	601
Ohio	260	287	424	823
Ohio	306	246	373	602
Big Sandy	20.3	270	563	870
Ohio	462.8	268	361	588
Ohio	600	275	367	590
Ohio	791.5	289	363	599
Ohio	978	306	357	433

Regression analyses of specific conductance and TDS were completed for all Ohio River locations combined (Figure 9) and for each individual sampling site (see Appendix B). Correlation of specific conductance and TDS concentration varied by site. Coefficients of determination (R^2) were calculated for each site and were used to categorize the sites into three groups based on strength of correlation. Strong correlation was defined as having an R^2 greater than 0.9, while moderate correlation was defined as having an R^2 between 0.75 and 0.9. Sites with an R^2 less than 0.75 were considered to have a poor correlation.

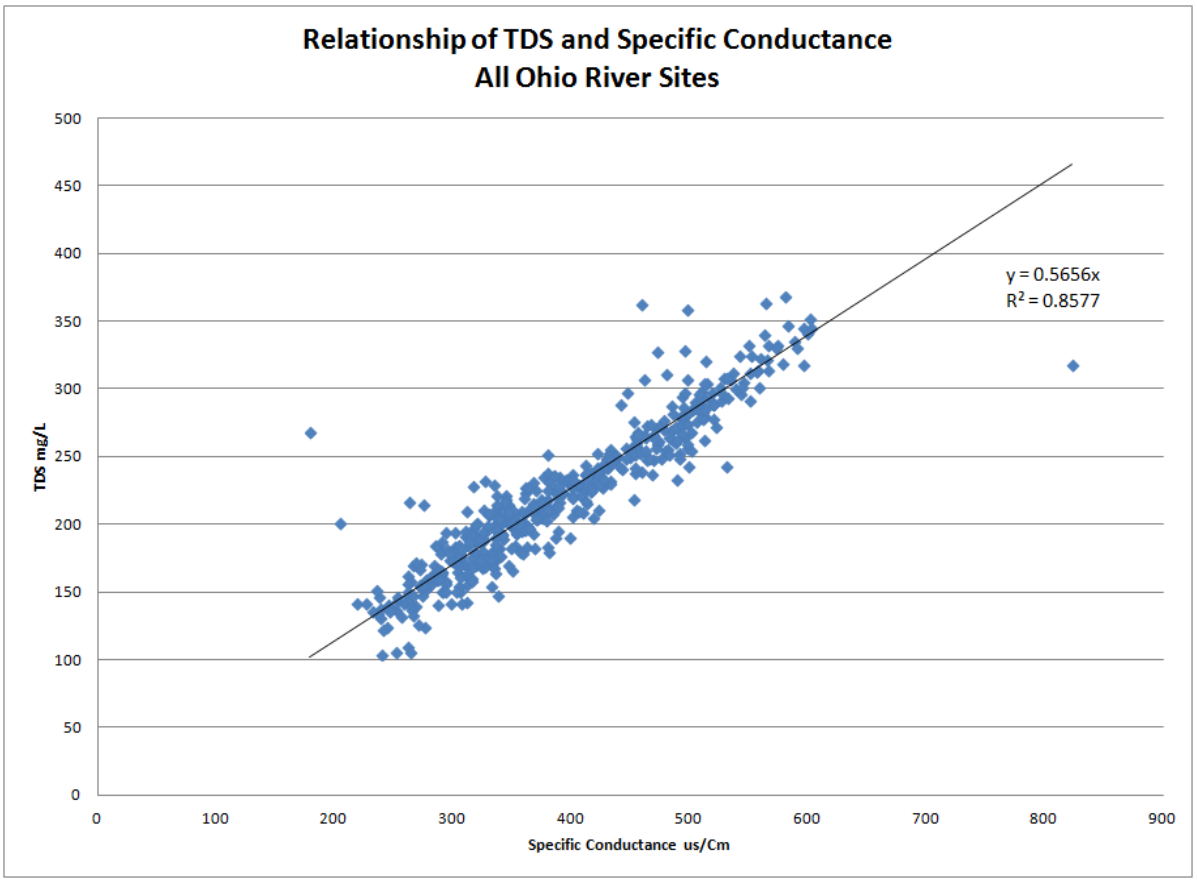


Figure 9. Linear regression of specific conductance versus TDS for all Ohio River sites combined.

Based on these categories, eight sites (i.e four Ohio River and four tributary sites) exhibited a strong correlation between specific conductance and total dissolved solids. Four Ohio River sites had a moderate correlation, and four sites (i.e. three Ohio River and one tributary) were classified as poorly correlated.

Conversion factors based on linear regressions were determined for each sampling location. These factors, along with the corresponding coefficients of determination, are summarized in Table 5 and graphically presented in Appendix B. The regression analysis indicated that the conversion factors for the Ohio River sites were all within a fairly small range from 0.55 to 0.58, with a combined overall Ohio

River conversion factor of 0.566. Tributary conversion factors ranged from 0.55 for the Allegheny to 0.62 for the Big Sandy.

Table 5. Site specific factors for converting specific conductance to total dissolved solids.

Site	Conversion Factor	R^2
Big Sandy 20.3	0.6204	0.9575
Muskingum 29	0.5954	0.9466
Ohio 306	0.5585	0.9457
Ohio 86.8	0.5666	0.9365
Monongahela 4.5	0.5766	0.9288
Beaver 2.2	0.5592	0.9231
Ohio 190.5	0.5763	0.9215
Ohio 462.8	0.5638	0.9122
Ohio 65.3	0.5641	0.8709
Ohio 600	0.5721	0.8438
Ohio 791.5	0.574	0.8348
Ohio 260	0.5567	0.7985
Ohio 11.7	0.5549	0.7389
Ohio 137.2	0.5723	0.7025
Ohio 978	0.5594	0.6154
Allegheny 8.2	0.5496	0.5584
Ohio River (Overall)	**0.5656**	0.8577

Commonly used conversion factors were found to be up to 20 percent greater than the site specific factors determined from this study. Use of such default conversion factors would overestimate TDS concentrations, and thus may not be appropriate for use on the Ohio River and the tributaries included in this monitoring effort.

Objective 4: Provide data to support possible development of an Ohio River stream criterion for bromide.

Elevated levels of bromide in source waters present a challenge for drinking water utilities as the bromide reacts during the treatment process to create disinfection byproducts. These byproducts, classified as trihalomethanes (THMs), are regulated as carcinogens under the Safe Drinking Water Act. Total trihalomethanes (TTHMs) must not exceed 80 ug/L in finished water samples. Higher concentrations of bromide, however, may increase the formation of THMs (specifically the brominated forms of THMs) through treatment, possibly causing water utilities to exceed Maximum Contaminant Level (MCL) requirements.

Though bromide is considered a minor constituent of TDS, bromide analysis was included in this study to compare the relationship of bromide in source water to THMs in finished waters, and to evaluate the potential need for the development of an ambient water quality standard for bromide to protect public drinking water supplies. Bromide was analyzed by ion chromatography for each weekly sample collected as part of this study. Levels ranged from less than 35 ug/L to 1,200 ug/L, with typical levels below 100 ug/L. In comparison, typical bromide levels were less than 0.05 percent of the median total dissolved solids concentration observed in the Ohio River (i.e. 215 mg/L).

Water utilities routinely analyze their finished water for THMs quarterly for compliance purposes, though some utilities collect disinfection byproduct data more frequently. As no additional THM samples were collected as part of this study, comparisons of bromide to THMs were based solely on the results generated by the utilities as part of their routine compliance monitoring. For most utilities which only collect THM data quarterly, this limited the maximum number of possible paired datasets (i.e. those having both a bromide and THM result) collected over the one-year study period to four.

Inadequate analytical detection limits for bromide further reduced the number of paired datasets. During the first 12 weeks of the study, the minimum reporting limit for bromide was 100 ug/L. Very few detections were measured during this period. Subsequent enhancements to the calibration of the ion chromatograph reduced the minimum reporting limit to 35 ug/L. This analytical refinement dramatically increased the number of bromide detections, thus improving the amount of data available for comparison.

The original study design was to compare raw water bromide levels from the drinking water utility intakes to THMs found at the plant effluent (i.e. just prior to entering the public water distribution system). This would minimize the travel time of the water sampled between monitoring locations, and presumably reduce the potential sample variability by establishing a standardized sampling point for all utilities. Many of the utilities, particularly those in smaller communities, however, do not collect THM data at the plant effluent, but rather only at points within their distribution system. This is problematic as THM concentrations change with increased residence time in the distribution system. Without standardized sampling locations at consistent residence times, data comparisons across utilities are challenging at best.

A further complicating factor is the timing of sample collection. Raw water sampled from an intake line for bromide analysis may take days to travel through the treatment process before reaching the plant effluent or distribution sampling point for THM analysis. This lag time between sampling points, which varies by treatment plant, reduces data comparability and increases uncertainty. For the purposes of this study, given the infrequent nature of quarterly sampling and the variability of lag time between sampling locations, paired datasets were restricted to only those sets where the finished water THM sample was collected within two days of the raw water bromide sample.

Using this working definition of “paired data”, 48 sets of results were evaluated in this study to compare the relationship of source water bromide to finished water THMs. The number of available datasets varied by site due the frequency of monitoring performed by the utility, number of non-detects for

bromide, and the timing of sample collections. For example, 26 of the datasets evaluated were from the Hays Mine Plant on the Monongahela River which collects THM samples daily. Conversely, several water treatment plants included in the study yielded no matched sets. Paired datasets are presented in Table 5.

A graphical representation comparing results for bromide and TTHMs is presented in Figure 10. The majority of the results ranged between 40 ug/L and 150 ug/L for bromide and 10 ug/L to 130 ug/L for TTHMs. When paired data from all sites are combined, few discernible trends can be derived from this comparison as concentrations of bromide are not strongly correlated with TTHMs. Unfortunately, not enough data points are available for most of the water plants to segregate the results out by plant. The two possible exceptions are the Hays Mine Plant on the Monongahela River and the PWSA plant on the Allegheny River. The PWSA results, when plotted separately, indicates a positive correlation between bromide and TTHMs, though the R^2 is only 0.55. A linear regression of the Hays Mine results shows no correlation with an R^2 of 0.027.

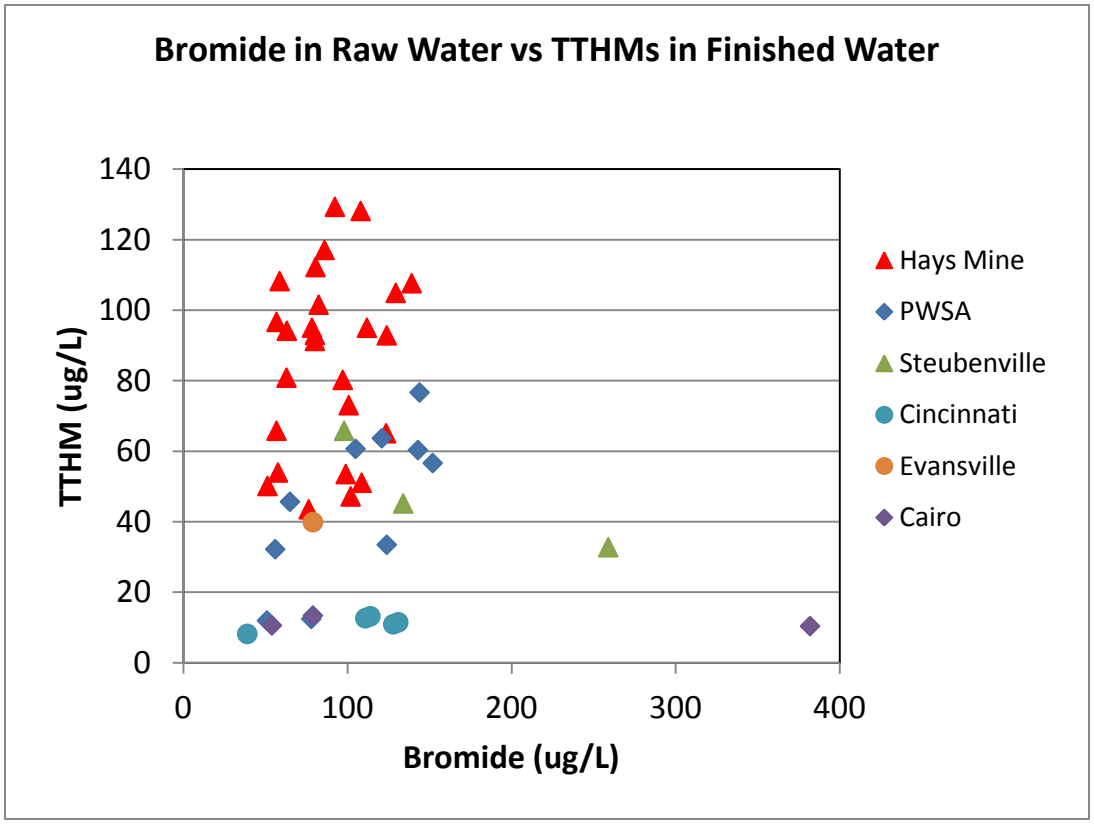


Figure 10. Comparison of raw water bromide levels to finished water TTHM concentrations.

Bromide results were also compared to the percent of the total THMs that were brominated (Figure 11). A regression analysis of these data suggest a weak, positive correlation (R^2 = 0.2) between the two parameters. Data from individual plants plotted separately also indicated a weak correlation. While neither comparison was sufficient to characterize the relationship of bromide to THMs, it is easy to discern groupings of data from the graphs that correspond to the different water utilities. This pattern may suggest that factors influencing the relationship of bromide and THM formation (e.g. temperature,

organic carbon, residence time, treatment process) vary greatly from plant to plant, thus making comparisons across sites of minimal utility.

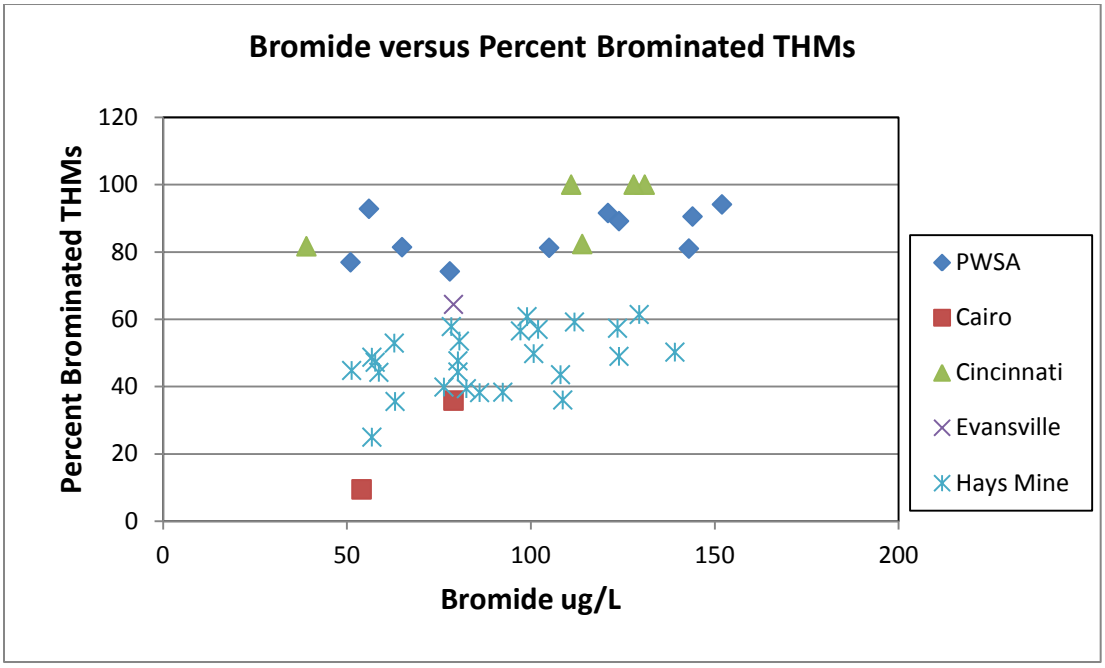


Figure 11. Bromide concentration versus percent brominated THMs.

Summary of Findings and Conclusions

The primary purpose of this study was to characterize dissolved solids in the Ohio River and selected tributaries. The four specific study objectives included:

1. Generate sufficient data to define ambient background levels of TDS at selected Ohio River locations.
2. Characterize the constituent makeup of TDS and document temporal and spatial variability.
3. Evaluate the possible development of site-specific translators to convert commonly collected conductivity measurements to estimate TDS concentrations.
4. Generate data to support possible development of an Ohio River stream criterion for bromide.

The major findings and conclusion of this project are organized below as a series of questions that address the study objectives listed above. The significant findings of the study and potential relevance to Commission interests are summarized as responses to those questions.

1. What are ambient levels of total dissolved solids in the Ohio River and do they exceed the ORSANCO's standard of 500 mg/l?

   Total dissolved solids in the Ohio ranged from a minimum of 104 mg/L to a peak of 368 mg/L. Median TDS values for all Ohio River sampling locations fell within a narrow ranged between

188 mg/L and 227 mg/L, with an overall Ohio River median value of 215 mg/L. These results indicate that all Ohio River samples collected during the one-year study period, including those at low flow conditions, had concentrations well below ORSANCO's 500 mg/L ambient water quality standard for total dissolved solids.

2. What is the constituent make-up of total dissolved solids in the Ohio River and how do these levels change?

   Five major ions accounted for nearly 93 percent of the total dissolved solids concentration measured in Ohio River samples. Sulfate routinely had the highest concentrations and typically comprised nearly 1/3 (i.e. 31%) of the total ions present. Bicarbonate was the second most abundant ion making up 25 percent of the total concentration. Calcium, chloride, and sodium accounted for 15 %, 12%, and 10%, respectively. The other nine ions collectively amounted to just seven percent of the total, with magnesium by far the most prevalent.

   Some spatial changes in ion composition were observed. Most notably, the prevalence of bicarbonate steadily increased longitudinally, doubling from 19 percent at the upper end of the Ohio River in Pittsburgh to 38 percent of the total sum of ions in Cairo, IL. Conversely, sulfate decreased from 36 percent in Pittsburgh to 21 percent near the mouth of the Ohio River.

3. What are the implications of the ion composition of TDS on the regulation of dissolved solids in the Ohio River?

   ORSANCO's Pollution Control Standards include ambient water quality criteria for total dissolved solids (500 mg/L), chloride (250 mg/L), and sulfate (250 mg/L). In the discussions leading up to the Commission's adoption of the TDS standard in 2011, questions were raised as to whether or not a standard for TDS was necessary considering ORSANCO already had limits for chloride and sulfate. The premise was chloride and sulfate presumably constituted the vast majority of dissolved solids ions present, and thus, indirectly regulated TDS through direct control of the dominant ions.

   Monitoring results from this study indicate chloride and sulfate combined account for 43 percent of the total dissolved solids in a typical Ohio River sample. While both ions are significant contributors to TDS concentrations, they are not the only major ions and make-up less than half of the total ion concentration. Based on these findings, the Commission's current standards for chloride and sulfate (i.e. 250 mg/L each) may not be adequate to ensure TDS concentrations remain below 500 mg/L.

4. What is the relationship of specific conductance and total dissolved solids in the Ohio River, and should commonly used conversion factors be used to estimate TDS?

   Conductivity or specific conductance is sometimes used as a surrogate for estimating total dissolved solids concentrations. This method involves multiplying the specific conductance by a

conversion factor to estimate TDS. Commonly used conversion factors range from 0.625 to 0.67.

One element of this study was to evaluate the relationship of specific conductance to TDS in the Ohio River and to compare site specific conversions factors to widely used default values. Site specific regression analyses indicate strong correlation of specific conductance to TDS for 8 of the 16 sampling locations. Four sites showed moderate correlation, and the remaining four sites were poorly correlated. Site specific conversion factors for Ohio River locations all fell within a narrow range between 0.55 and 0.58, with an overall factor of 0.566. Tributary conversion factors ranged between 0.55 (Allegheny River) and 0.62 (Big Sandy River).

Commonly used conversion factors were found to be up to 20 percent greater than the site specific factors determined from this study. Use of such default conversion factors would overestimate TDS concentrations, and thus may not be appropriate for use on the Ohio River. Site specific factors developed as part of this effort (ranging from 0.55 to 0.58) would provide a better method, compared to use of default values, to approximate TDS concentrations in the Ohio River from specific conductance measurements.

5. What do the study results indicate about the relationship of bromide in source water and trihalomethane formation in finished water?

   Paired data sets of bromide in source water and trihalomethanes in finished water were collected at participating drinking water utilities. Several factors including, infrequent quarterly THM sampling, high number of non-detects for bromide, and differences in the timing of sample collections significantly limited the number of available data points for comparison. Regression analysis of all paired data sets combined did not show a strong correlation between bromide and TTHMs or for bromide when compared to brominated forms of THMs.

   Insufficient data precluded site specific comparisons, with the exception of the Hays Mine plant on the Monongahela River and the PWSA water plant on the Allegheny River. Linear regression for these two facilities showed weak to no correlation between bromide and THMs (both total THMs and brominated THMs). While neither comparison was sufficient to characterize the relationship of bromide to THMs, it is easy to discern groupings of data from the graphs that correspond to the different water utilities. This pattern may suggest that factors influencing the relationship of bromide and THM formation (e.g. temperature, organic carbon, residence time, treatment process) vary greatly from plant to plant, thus making comparisons across sites difficult. A more intensive, plant specific sampling scheme may be necessary to adequately define the site specific relationships of bromide in raw water and the subsequent formation of THMs.

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
PWSA	AL008	Allegheny	1	12/05/11	9:04			0.066	14.851	0.019	<RL	2.338	34.714	<RL	<RL	10.237	<RL	1.031	4.868	18.373	198.8
PWSA	AL008	Allegheny	2	12/12/11	7:30			0.065	15.616	0.027	<RL	2.450	36.886	<RL	<RL	10.909	<RL	1.159	5.068	19.315	212.0
PWSA	AL008	Allegheny	3	12/19/11	8:15	112	38	0.068	17.351	0.025	<RL	4.091	44.700	<RL	<RL	11.159	<RL	0.961	5.649	21.000	231.0
PWSA	AL008	Allegheny	4	12/28/11	13:12	62	28	0.066	13.019	0.017	<RL	2.874	30.812	<RL	<RL	8.649	<RL	0.875	4.185	15.671	173.4
PWSA	AL008	Allegheny	5	01/03/12	8:17	106	28	0.064	14.184	0.018	<RL	2.650	46.070	<RL	<RL	9.692	<RL	0.852	4.815	17.447	194.8
PWSA	AL008	Allegheny	6	01/09/12	13:45	114	30	0.061	16.423	0.069	0.107	2.503	39.370	<RL	<RL	11.750	<RL	1.006	5.268	18.995	211.0
PWSA	AL008	Allegheny	7	01/17/12	8:10	113	32	0.065	21.735	0.035	<RL	3.577	34.443	<RL	<RL	13.092	<RL	0.871	4.923	18.793	220.0
PWSA	AL008	Allegheny	8	01/23/12	14:39	113	26	0.050	19.726	0.031	<RL	2.414	29.646	0.350	<RL	10.763	<RL	0.606	3.613	13.507	195.3
PWSA	AL008	Allegheny	9	02/01/12	15:11	97	23	0.064	14.036	0.018	<RL	2.679	28.833	<RL	<RL	8.183	<RL	0.580	3.681	13.667	177.4
PWSA	AL008	Allegheny	10	02/06/12	7:40	172	30	0.068	16.895	0.039	<RL	2.486	33.198	<RL	<RL	10.095	<RL	0.728	4.565	16.791	197.2
PWSA	AL008	Allegheny	11	02/13/12	8:00	168	34	0.071	22.554	0.028	<RL	2.574	48.266	<RL	<RL	14.343	<RL	0.938	6.214	21.736	255.0
PWSA	AL008	Allegheny	12	02/20/12	9:00	158	39	0.087	28.285	0.025	0.051	3.040	60.185	<RL	<RL	19.926	<RL	1.411	8.043	26.909	403.0
PWSA	AL008	Allegheny	13	02/27/12	7:20	164	36	0.086	24.098	0.026	0.078	2.627	53.472	<RL	<RL	17.123	<RL	1.318	7.148	24.153	276.0
PWSA	AL008	Allegheny	14	03/05/12	7:40	124	24	0.062	15.961	0.017	<RL	2.482	36.087	<RL	<RL	9.786	<RL	<RL	2.441	14.683	192.6
PWSA	AL008	Allegheny	15	03/12/12	7:10	150	28	0.069	18.444	0.038	0.900	2.336	41.183	<RL	<RL	12.241	<RL	0.081	5.058	18.770	221.0
PWSA	AL008	Allegheny	16	03/19/12	9:00	236	32	0.114	21.267	0.031	<RL	1.988	42.492	0.363	<RL	14.156	<RL	0.327	5.529	21.226	245.0
PWSA	AL008	Allegheny	17	03/26/12	7:20	147	34	0.094	20.267	0.012	0.476	1.897	55.161	<RL	<RL	14.842	<RL	1.378	6.879	23.667	268.0
PWSA	AL008	Allegheny	18	04/02/12	7:20	134	36	0.123	19.949	0.009	0.046	2.113	56.089	<RL	<RL	14.571	<RL	1.420	7.119	24.286	271.0
PWSA	AL008	Allegheny	19	04/09/12	7:20	151	34	0.103	22.049	0.044	0.056	2.012	66.796	0.587	<RL	16.753	<RL	1.455	8.167	26.954	305.0
PWSA	AL008	Allegheny	20	04/16/12	8:15	167	38	0.138	20.942	0.010	0.051	2.215	72.538	0.145	<RL	14.253	<RL	1.347	7.653	24.594	317.0
PWSA	AL008	Allegheny	21	04/27/12	7:50	206	48	0.140	26.440	0.031	0.087	1.596	73.980	0.163	<RL	20.657	0.115	1.765	9.648	32.080	357.0
PWSA	AL008	Allegheny	22	04/30/12	8:00	163	40	0.144	22.052	0.010	0.056	1.677	51.985	<RL	<RL	16.673	<RL	1.376	7.180	24.996	282.0
PWSA	AL008	Allegheny	23	05/08/12	8:00	141	40	0.136	21.316	0.039	0.047	1.543	37.595	<RL	<RL	16.283	<RL	1.446	5.638	21.446	243.0
PWSA	AL008	Allegheny	24	05/14/12	7:10	114	32	0.113	15.029	0.060	0.088	2.099	34.858	<RL	<RL	11.752	<RL	1.179	4.838	17.567	199.2
PWSA	AL008	Allegheny	25	05/21/12	7:10	150	28	0.125	17.482	0.019	0.038	1.923	44.902	<RL	<RL	12.797	<RL	1.204	5.794	20.249	229.0
PWSA	AL008	Allegheny	26	05/28/12	8:20	157	32	0.125	19.662	0.027	0.065	1.583	58.305	<RL	<RL	15.138	<RL	1.370	6.701	22.670	258.0
PWSA	AL008	Allegheny	27	06/04/12	7:15	158	38	0.140	21.539	0.054	0.069	1.964	74.734	<RL	<RL	17.416	0.096	1.793	8.126	26.974	286.0
PWSA	AL008	Allegheny	28	06/11/12	7:40	154	34	0.142	20.909	0.079	0.068	2.796	68.068	0.277	<RL	16.148	<RL	1.752	7.767	25.973	288.0
PWSA	AL008	Allegheny	29	06/18/12	7:20	172	40	0.159	23.684	0.055	0.083	2.358	75.972	<RL	<RL	17.880	<RL	1.666	8.388	27.813	319.0
PWSA	AL008	Allegheny	30	06/25/12	7:15	163	40	0.191	22.760	0.021	0.076	1.882	72.231	0.106	<RL	18.773	<RL	1.842	9.401	29.489	338.0
PWSA	AL008	Allegheny	31	07/02/12	8:02	204	40	0.183	28.709	0.016	0.144	2.489	74.137	<RL	<RL	22.090	0.008	1.917	9.279	30.183	342.0
PWSA	AL008	Allegheny	32	07/09/12	7:35	210	38	0.137	31.022	<RL	0.078	1.954	77.186	<RL	<RL	22.140	<RL	2.020	9.714	30.879	360.0
PWSA	AL008	Allegheny	33	07/16/12	7:52	182	40	0.190	29.995	0.050	0.114	2.271	74.356	<RL	<RL	24.007	<RL	1.988	9.876	30.944	366.0
PWSA	AL008	Allegheny	34	07/23/12	8:04	189	44	0.215	27.676	0.058	0.110	1.969	66.953	<RL	<RL	21.506	0.076	1.915	8.675	28.811	327.0
PWSA	AL008	Allegheny	35	07/30/12	7:30	194	40	0.161	29.453	0.063	0.143	2.682	70.845	0.078	<RL	21.793	<RL	2.156	8.509	29.029	352.0
PWSA	AL008	Allegheny	36	08/06/12	7:10	186	40	0.194	26.557	0.053	0.110	2.745	70.929	0.184	<RL	21.138	0.005	2.230	8.570	28.246	339.0
PWSA	AL008	Allegheny	37	08/13/12	7:00	191	34	0.193	26.353	0.030	0.105	2.461	70.397	<RL	<RL	21.666	0.015	2.301	8.460	27.947	336.0
PWSA	AL008	Allegheny	38																		
PWSA	AL008	Allegheny	39	08/31/12	7:00	191	422	0.201	31.636	0.043	0.136	1.846	67.209	<RL	<RL	32.397	<RL	1.180	<RL	31.738	348.0
PWSA	AL008	Allegheny	40	09/03/12	8:04	179	40	0.184	32.756	0.053	0.184	1.773	75.393	<RL	<RL	34.071	<RL	1.178	<RL	36.604	367.0
PWSA	AL008	Allegheny	41	09/10/12	7:00	195	40	0.187	33.016	0.044	0.159	1.367	71.856	<RL	<RL	25.416	<RL	1.977	10.112	31.958	365.0
PWSA	AL008	Allegheny	42	09/17/12	7:00	190	42	0.178	33.452	0.086	0.167	1.852	76.918	<RL	<RL	25.925	<RL	2.086	10.392	33.075	376.0
PWSA	AL008	Allegheny	43	09/24/12	7:00	209	44	0.162	31.334	0.038	0.168	2.115	76.451	<RL	<RL	24.068	<RL	2.046	10.384	33.554	378.0
PWSA	AL008	Allegheny	44	10/01/12	7:00	189	46	0.130	30.102	0.059	0.121	2.555	71.522	<RL	<RL	24.789	<RL	2.267	9.615	32.203	362.0
PWSA	AL008	Allegheny	45	10/08/12	7:00	184	46	0.141	29.772	0.082	0.124	2.730	72.690	<RL	<RL	25.637	<RL	2.149	9.520	32.125	364.0
PWSA	AL008	Allegheny	46	10/15/12	7:00	197	57	0.125	28.188	0.076	0.125	2.611	73.770	<RL	<RL	22.913	<RL	2.214	10.123	33.401	362.0
PWSA	AL008	Allegheny	47	10/22/12	7:00	198	50	0.119	31.759	0.014	0.152	1.598	61.028	0.372	<RL	24.230	<RL	2.003	9.086	31.664	353.0
PWSA	AL008	Allegheny	48	10/29/12	7:00	210	58	0.174	33.745	0.052	0.151	1.589	68.013	<RL	<RL	25.531	<RL	2.040	9.842	35.005	388.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
HAYS MINE	MO005	Monongahela	1	12/05/11	8:30			0.078	11.814	0.021	<RL	2.756	60.880	<RL	<RL	12.898	<RL	0.996	6.178	24.663	255.0
HAYS MINE	MO005	Monongahela	2	12/12/11	8:10			0.080	9.148	0.027	<RL	2.880	58.903	<RL	<RL	11.224	<RL	1.156	6.040	24.568	243.0
HAYS MINE	MO005	Monongahela	3	12/20/11	7:00	158	39	0.079	14.786	0.020	<RL	2.915	71.484	<RL	<RL	15.509	<RL	1.006	6.739	25.615	283.0
HAYS MINE	MO005	Monongahela	4	12/27/11	7:00	168	50	0.092	17.222	0.025	<RL	3.033	91.181	<RL	<RL	20.123	<RL	1.129	8.343	32.512	349.0
HAYS MINE	MO005	Monongahela	5	01/03/12	10:00	180	48	0.094	15.657	0.027	<RL	3.206	93.646	2.479	<RL	16.199	<RL	1.180	7.594	29.888	310.0
HAYS MINE	MO005	Monongahela	6	01/09/12	8:00	180	43	0.082	19.967	0.038	<RL	3.486	78.083	<RL	<RL	20.620	<RL	1.134	7.797	29.537	327.0
HAYS MINE	MO005	Monongahela	7	01/17/12	5:00	198	40	0.097	24.927	0.026	<RL	3.320	82.400	<RL	<RL	24.423	<RL	1.042	7.669	29.050	348.0
HAYS MINE	MO005	Monongahela	8	01/23/12	7:00	194	40	0.097	29.461	0.008	<RL	2.639	60.332	<RL	<RL	19.889	<RL	0.820	5.922	24.248	320.0
HAYS MINE	MO005	Monongahela	9	01/30/12	7:30	166	42	0.101	17.912	0.023	<RL	3.088	58.644	<RL	<RL	14.927	<RL	0.864	5.798	23.948	279.0
HAYS MINE	MO005	Monongahela	10	02/06/12	7:00	209	52	0.107	23.026	0.048	<RL	3.034	85.927	<RL	<RL	21.392	<RL	1.199	8.439	31.964	366.0
HAYS MINE	MO005	Monongahela	11	02/13/12	7:00	249	48	0.111	38.341	0.031	<RL	3.250	87.211	<RL	<RL	31.069	0.209	1.249	9.233	34.111	415.0
HAYS MINE	MO005	Monongahela	12	02/20/12	7:00	247	46	0.116	23.050	0.053	<RL	2.680	115.056	<RL	<RL	32.860	0.138	1.407	10.161	35.582	437.0
HAYS MINE	MO005	Monongahela	13	02/27/12	7:00	215	42	0.118	24.306	0.047	<RL	2.859	90.374	0.104	<RL	26.397	0.021	1.428	8.862	32.094	373.0
HAYS MINE	MO005	Monongahela	14	03/05/12	7:00	135	32	0.090	9.665	<RL	<RL	2.945	46.253	0.086	<RL	10.736	<RL	0.161	3.210	20.729	214.0
HAYS MINE	MO005	Monongahela	15	03/12/12	7:00	147	38	0.095	19.101	0.017	0.057	2.688	52.785	0.259	<RL	16.517	<RL	0.128	5.384	23.237	268.0
HAYS MINE	MO005	Monongahela	16	03/19/12	7:00	174	44	0.142	20.765	0.148	<RL	2.466	75.316	<RL	<RL	21.716	<RL	0.444	7.765	29.843	336.0
HAYS MINE	MO005	Monongahela	17	03/26/12	9:00	198	46	0.078	20.531	0.032	0.109	1.902	52.885	<RL	<RL	23.539	0.025	1.647	9.283	33.300	358.0
HAYS MINE	MO005	Monongahela	18	04/02/12	7:00	169	44	0.228	16.242	0.024	<RL	3.745	50.343	<RL	<RL	13.602	<RL	1.925	11.384	35.769	339.0
HAYS MINE	MO005	Monongahela	19	04/09/12	8:30	199	50	0.670	22.011	0.036	0.076	2.835	94.264	<RL	<RL	25.223	0.008	1.616	9.537	35.044	388.0
HAYS MINE	MO005	Monongahela	20	04/16/12	7:00	220	48	0.222	27.551	0.030	<RL	2.967	97.786	<RL	<RL	26.138	0.286	1.679	9.503	33.843	411.0
HAYS MINE	MO005	Monongahela	21	04/23/12	7:00	264	54	0.199	29.560	0.090	0.051	3.120	108.478	<RL	<RL	32.656	0.254	1.917	10.850	38.163	447.0
HAYS MINE	MO005	Monongahela	22	04/30/12	7:00	269	56	0.153	29.507	0.018	0.058	2.537	114.322	<RL	<RL	37.622	0.169	1.751	10.747	36.446	467.0
HAYS MINE	MO005	Monongahela	23	05/07/12	7:00	188	36	0.139	11.255	0.027	<RL	1.766	81.736	<RL	<RL	19.688	0.025	1.550	7.034	26.242	307.0
HAYS MINE	MO005	Monongahela	24	05/14/12	7:00	124	36	0.135	14.558	0.033	<RL	2.212	51.345	<RL	<RL	16.282	<RL	1.245	5.296	21.098	241.0
HAYS MINE	MO005	Monongahela	25	05/21/12	10:30	132	32	0.131	14.865	0.045	<RL	2.370	51.708	<RL	<RL	15.748	<RL	1.192	5.086	20.050	236.0
HAYS MINE	MO005	Monongahela	26	05/29/12	7:00	232	44	0.159	26.594	0.038	0.083	2.892	93.105	<RL	<RL	28.137	0.174	1.783	8.212	30.662	375.0
HAYS MINE	MO005	Monongahela	27	06/04/12	7:00	204	42	0.179	24.875	0.044	0.063	2.994	85.805	<RL	<RL	27.351	0.142	1.834	7.896	28.397	353.0
HAYS MINE	MO005	Monongahela	28	06/11/12	8:00	257	46	0.193	33.677	0.053	0.080	3.597	108.429	0.119	<RL	35.507	0.170	2.083	9.636	33.827	430.0
HAYS MINE	MO005	Monongahela	29	06/18/12	9:30	251	46	0.197	34.119	0.052	0.057	3.296	112.843	<RL	<RL	36.380	0.204	1.981	9.995	33.458	438.0
HAYS MINE	MO005	Monongahela	30	06/25/12	7:00	242	44	0.199	30.776	0.041	0.063	3.160	108.922	<RL	<RL	35.271	0.146	1.976	9.411	31.662	401.0
HAYS MINE	MO005	Monongahela	31	07/02/12	11:30	300	46	0.189	38.350	<RL	<RL	3.982	112.280	0.320	<RL	46.181	0.313	2.312	10.935	37.225	520.0
HAYS MINE	MO005	Monongahela	32	07/09/12	7:00	284	50	0.137	31.022	<RL	0.078	1.954	77.186	<RL	<RL	40.053	0.267	2.494	10.681	36.944	482.0
HAYS MINE	MO005	Monongahela	33	07/16/12	7:00	274	46	0.319	43.173	0.059	0.112	2.985	118.313	<RL	<RL	45.485	0.284	2.522	11.120	37.386	517.0
HAYS MINE	MO005	Monongahela	34	07/23/12	7:00	362	56	0.265	37.547	0.053	0.130	3.585	164.742	<RL	<RL	21.548	0.091	1.920	8.692	28.862	596.0
HAYS MINE	MO005	Monongahela	35	07/30/12	7:00	301	50	0.238	28.190	0.034	0.081	3.296	136.436	0.082	<RL	44.693	0.403	2.414	11.254	37.766	507.0
HAYS MINE	MO005	Monongahela	36	08/06/12	7:00	218	40	0.232	23.400	0.093	0.059	3.393	97.690	<RL	<RL	30.543	0.192	2.159	8.652	32.316	395.0
HAYS MINE	MO005	Monongahela	37	08/13/12	7:00	232	48	0.233	22.716	0.110	0.092	2.994	100.360	0.111	<RL	33.896	0.241	2.234	8.725	31.842	407.0
HAYS MINE	MO005	Monongahela	38	08/20/12	7:00	261	50	0.227	31.165	0.048	0.086	2.999	98.838	0.079	<RL	34.599	0.116	2.373	9.115	33.786	409.0
HAYS MINE	MO005	Monongahela	39	08/27/12	7:00	304	46	0.261	31.659	0.064	0.108	2.725	104.163	<RL	<RL	34.843	0.220	2.503	9.978	36.473	436.0
HAYS MINE	MO005	Monongahela	40	09/04/12	7:00	282	50	0.288	34.736	0.087	0.139	4.373	127.823	<RL	<RL	68.117	<RL	1.850	9.135	57.850	478.0
HAYS MINE	MO005	Monongahela	41	09/10/12	7:00	278	50	0.243	33.730	0.053	0.080	3.852	119.670	<RL	0.026	42.150	<RL	1.995	11.448	39.805	489.0
HAYS MINE	MO005	Monongahela	42	09/17/12	10:30	292	56	0.303	36.113	0.063	0.124	3.905	122.898	<RL	<RL	46.444	<RL	2.684	11.614	41.986	511.0
HAYS MINE	MO005	Monongahela	43	09/24/12	7:00	283	54	0.282	29.652	0.041	0.097	3.347	129.975	<RL	<RL	46.723	<RL	2.446	11.667	39.860	536.0
HAYS MINE	MO005	Monongahela	44	10/01/12	7:00	284	59	0.216	34.475	0.052	0.101	4.309	119.058	0.823	<RL	44.733	<RL	2.783	11.664	41.079	502.0
HAYS MINE	MO005	Monongahela	45	10/09/12	7:00	305	58	0.213	34.890	0.081	0.124	4.094	139.013	0.733	<RL	51.988	<RL	2.765	11.909	42.455	546.0
HAYS MINE	MO005	Monongahela	46	10/15/12	7:00	306	55	0.189	34.984	0.050	0.102	3.666	130.334	1.467	<RL	48.807	<RL	2.694	11.592	40.748	526.0
HAYS MINE	MO005	Monongahela	47	10/22/12	7:00	319	55	0.203	33.119	0.222	0.121	3.654	126.592	0.714	<RL	45.555	<RL	2.981	11.497	40.425	510.0
HAYS MINE	MO005	Monongahela	48	10/29/12	9:00	293	54	0.272	32.338	0.058	0.099	3.296	121.321	<RL	<RL	45.091	<RL	2.531	10.772	38.890	491.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
MOON TOWN	OH012	Ohio	1	12/05/11	9:20			0.084	15.903	0.026	<RL	2.951	56.909	<RL	<RL	13.997	<RL	1.111	6.274	24.609	261.0
MOON TOWN	OH012	Ohio	2	12/12/11	8:25			0.077	13.306	0.025	<RL	3.120	57.812	<RL	<RL	12.618	<RL	1.148	6.264	25.130	258.0
MOON TOWN	OH012	Ohio	3	12/19/11	8:30	164	41	0.082	16.989	0.019	<RL	3.116	68.371	<RL	<RL	15.485	<RL	1.067	6.840	25.880	290.0
MOON TOWN	OH012	Ohio	4	12/27/11	8:15	142	44	0.087	17.645	0.005	<RL	3.123	69.043	<RL	<RL	16.551	<RL	1.107	7.205	27.371	298.0
MOON TOWN	OH012	Ohio	5	01/03/12	9:10	170	44	0.090	18.212	0.014	<RL	3.283	75.442	<RL	<RL	15.210	<RL	1.049	6.840	26.437	283.0
MOON TOWN	OH012	Ohio	6	01/09/12	11:40	172	42	0.079	23.364	0.036	<RL	3.310	61.613	<RL	<RL	18.526	<RL	1.187	7.153	26.960	301.0
MOON TOWN	OH012	Ohio	7	01/16/12	9:30	196	46	0.080	28.903	0.021	0.103	3.212	76.549	<RL	<RL	24.394	<RL	1.128	8.137	30.717	360.0
MOON TOWN	OH012	Ohio	8	01/23/12	9:30	205	38	0.0895	49.681	0.0384	1.1721	2.8692	54.1841	0	<RL	26.413	<RL	0.795	5.572	22.461	375.0
MOON TOWN	OH012	Ohio	9	01/30/12	9:35	159	38	0.085	22.944	0.002	<RL	3.243	50.645	<RL	<RL	15.181	<RL	0.817	5.486	21.924	277.0
MOON TOWN	OH012	Ohio	10	02/06/12	8:30	183	45	0.104	27.863	0.043	<RL	3.189	69.351	<RL	<RL	20.737	<RL	1.050	7.608	28.760	339.0
MOON TOWN	OH012	Ohio	11	02/13/12	9:50	216	42	0.096	37.557	0.038	<RL	2.813	68.640	<RL	<RL	26.858	0.036	1.222	8.224	29.589	367.0
MOON TOWN	OH012	Ohio	12	02/21/12	9:30	228	44	0.106	27.312	0.019	<RL	2.877	95.154	<RL	<RL	29.287	<RL	1.432	9.526	33.601	317.0
MOON TOWN	OH012	Ohio	13	02/27/12	9:30	213	42	0.109	29.427	0.032	<RL	3.040	80.894	0.642	<RL	25.695	<RL	1.413	8.684	30.459	372.0
MOON TOWN	OH012	Ohio	14	03/05/12	10:00	147	36	0.095	14.904	0.016	<RL	3.001	47.445	<RL	<RL	13.382	<RL	0.235	3.940	21.810	237.0
MOON TOWN	OH012	Ohio	15	03/12/12	9:45	152	38	0.087	23.307	0.023	0.111	2.720	51.244	0.086	<RL	17.810	<RL	0.399	6.051	24.104	277.0
MOON TOWN	OH012	Ohio	16	03/19/12	9:30	170	40	0.236	26.800	0.037	0.084	2.911	65.436	0.218	<RL	21.242	<RL	0.520	7.849	29.065	332.0
MOON TOWN	OH012	Ohio	17	03/26/12	8:15	198	44	0.118	24.302	0.055	0.100	2.498	76.452	0.235	<RL	21.719	<RL	1.497	8.518	30.669	350.0
MOON TOWN	OH012	Ohio	18	04/02/12	10:55	189	44	0.136	23.350	0.032	0.071	2.605	74.660	0.512	<RL	21.169	0.008	1.524	8.425	30.382	342.0
MOON TOWN	OH012	Ohio	19	04/09/12	10:35	184	46	0.134	27.250	<RL	0.047	2.709	83.747	<RL	<RL	23.816	<RL	1.658	9.611	33.024	379.0
MOON TOWN	OH012	Ohio	20	04/16/12	8:00	216	48	0.159	32.103	0.090	0.114	2.816	93.118	<RL	<RL	27.650	0.113	1.814	10.519	35.592	413.0
MOON TOWN	OH012	Ohio	21	04/23/12	9:25	248	48	0.183	33.442	0.106	0.074	2.943	97.855	<RL	<RL	27.936	0.157	1.911	10.999	36.584	430.0
MOON TOWN	OH012	Ohio	22	04/30/12	9:00	213	46	0.147	28.254	0.037	0.062	2.193	83.226	<RL	<RL	24.106	0.026	1.633	9.967	32.303	379.0
MOON TOWN	OH012	Ohio	23	05/07/12	11:30	187	38	0.160	15.342	0.023	<RL	2.086	80.947	<RL	<RL	21.714	0.021	1.425	7.394	27.210	319.0
MOON TOWN	OH012	Ohio	24	05/14/12	11:15	124	34	0.137	18.336	0.037	<RL	2.411	46.286	0.183	<RL	15.737	<RL	1.236	5.642	20.847	244.0
MOON TOWN	OH012	Ohio	25	05/21/12	11:24	137	32	0.127	19.442	0.047	<RL	2.637	50.117	0.080	<RL	16.067	<RL	1.291	5.747	21.166	251.0
MOON TOWN	OH012	Ohio	26	05/29/12	11:15	188	34	0.149	25.306	0.030	0.063	2.942	74.468	0.308	<RL	22.566	0.062	1.674	7.625	26.898	319.0
MOON TOWN	OH012	Ohio	27	06/04/12	10:15	194	36	0.157	24.796	0.055	0.049	2.651	76.776	0.089	<RL	20.414	0.080	1.900	8.348	28.258	327.0
MOON TOWN	OH012	Ohio	28	06/11/12	10:00	201	42	0.177	28.221	0.054	0.064	4.036	79.242	0.104	<RL	23.518	0.097	2.059	8.704	29.199	204.0
MOON TOWN	OH012	Ohio	29	06/18/12	10:30	211	42	0.183	32.964	0.049	0.096	4.815	89.123	0.138	<RL	26.872	0.089	2.116	9.420	31.704	384.0
MOON TOWN	OH012	Ohio	30	06/25/12	11:30	214	46	0.194	33.143	0.055	0.066	4.002	86.536	0.074	<RL	28.173	0.145	2.099	9.164	31.091	368.0
MOON TOWN	OH012	Ohio	31	07/02/12	11:30	232	42	0.208	35.642	0.046	0.105	4.079	90.999	<RL	<RL	31.953	0.186	2.273	10.119	32.114	419.0
MOON TOWN	OH012	Ohio	32	07/09/12	12:00	246	44	0.195	40.256	<RL	0.073	4.257	88.967	0.098	<RL	32.370	0.231	2.409	10.145	33.574	430.0
MOON TOWN	OH012	Ohio	33	07/16/12	11:45	219	46	0.258	42.703	0.046	0.106	4.856	89.574	0.116	<RL	34.325	0.199	2.635	10.699	35.108	452.0
MOON TOWN	OH012	Ohio	34	07/23/12	11:00	280	50	0.241	40.920	0.071	0.129	4.252	118.354	0.147	<RL	24.359	0.026	2.685	12.894	36.803	512.0
MOON TOWN	OH012	Ohio	35	07/30/12	11:45	268	48	0.221	32.252	0.054	0.106	3.500	107.362	0.139	<RL	36.085	0.271	2.550	10.489	35.915	456.0
MOON TOWN	OH012	Ohio	36	08/06/12	11:00	228	40	0.240	31.215	0.088	0.109	3.889	92.886	0.140	<RL	34.468	<RL	2.453	9.410	32.541	417.0
MOON TOWN	OH012	Ohio	37	08/13/12	11:00	229	42	0.232	31.540	0.079	0.078	3.752	87.698	0.117	<RL	32.445	0.224	2.510	9.144	31.785	406.0
MOON TOWN	OH012	Ohio	38	08/20/12	11:25	233	44	0.239	34.956	0.023	0.066	3.752	83.479	0.078	<RL	31.742	0.164	2.609	9.171	31.447	489.0
MOON TOWN	OH012	Ohio	39	08/27/12	11:45	228	42	0.253	37.455	0.088	0.116	3.981	82.499	0.084	<RL	30.740	0.284	2.697	10.361	32.916	404.0
MOON TOWN	OH012	Ohio	40	09/04/12	10:45	242	46	0.278	40.523	0.241	0.156	3.863	89.744	0.166	<RL	54.875	<RL	1.750	0.932	46.754	421.0
MOON TOWN	OH012	Ohio	41	09/10/12	13:00	232	44	0.233	38.751	0.061	0.126	3.675	89.958	0.125	0.026	34.362	<RL	1.815	10.819	35.254	432.0
MOON TOWN	OH012	Ohio	42	09/17/12	13:30	249	46	0.259	40.430	0.007	0.145	4.254	109.939	0.143	<RL	38.913	<RL	2.731	12.052	38.718	475.0
MOON TOWN	OH012	Ohio	43	09/24/12	11:50	209	46	0.233	36.145	0.061	0.109	3.374	82.758	0.083	<RL	32.209	<RL	2.275	10.064	33.633	409.0
MOON TOWN	OH012	Ohio	44	10/01/12	12:30	230	55	0.233	36.986	0.081	0.124	3.347	81.771	0.177	<RL	34.559	<RL	2.336	9.751	36.316	433.0
MOON TOWN	OH012	Ohio	45	10/08/12	10:10	259	56	0.174	39.315	0.056	0.100	4.197	101.556	0.131	<RL	40.388	<RL	2.704	11.160	39.385	472.0
MOON TOWN	OH012	Ohio	46	10/15/12	11:45	261	53	0.185	38.842	0.073	0.109	4.924	101.588	1.818	<RL	38.741	<RL	2.756	11.148	39.452	473.0
MOON TOWN	OH012	Ohio	47	10/22/12	10:30	258	52	0.185	38.361	0.072	0.131	3.982	94.597	0.764	<RL	37.039	<RL	2.741	10.674	38.031	455.0
MOON TOWN	OH012	Ohio	48	10/29/12	12:30	274	53	0.238	40.609	0.070	0.149	3.527	96.678	0.153	<RL	38.431	<RL	2.589	11.579	40.194	476.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
BEAVER FALLS	BE002	Beaver	7	01/20/12	8:55	190	54	0.136	41.608	0.026	<RL	3.749	31.555	0.671	<RL	19.262	<RL	1.695	5.625	23.833	337.0
BEAVER FALLS	BE002	Beaver	7R					0.138	39.696	0.033	<RL	4.064	32.250								
BEAVER FALLS	BE002	Beaver	8			175	50	0.138	39.748	0.079	<RL	4.064	32.250	<RL	<RL	21.479	<RL	1.766	5.779	24.543	317.0
BEAVER FALLS	BE002	Beaver	9	02/03/12	10:00	204	58	0.141	38.616	0.064	<RL	4.644	41.823	3.229	<RL	20.722	<RL	2.187	7.284	29.808	347.0
BEAVER FALLS	BE002	Beaver	11	02/16/12	11:00	263	72	0.160	67.009	<RL	<RL	5.490	56.699	<RL	<RL	40.349	<RL	2.727	10.374	41.645	500.0
BEAVER FALLS	BE002	Beaver	12	02/23/12	9:45	231	70	0.153	45.502	0.057	0.112	5.058	49.480	<RL	<RL	27.129	<RL	2.584	9.255	36.425	407.0
BEAVER FALLS	BE002	Beaver	13	02/29/12	10:30	236	68	0.164	56.906	0.001	<RL	4.414	49.047	<RL	<RL	33.678	<RL	2.464	9.207	37.708	446.0
BEAVER FALLS	BE002	Beaver	14	03/08/12	9:10	185	56	0.144	44.490	0.130	0.051	4.444	38.304	0.149	<RL	26.378	<RL	1.718	7.151	29.671	328.0
BEAVER FALLS	BE002	Beaver	15	03/16/12	11:30	219	68	0.182	46.108	0.034	0.084	3.931	52.657	<RL	<RL	28.481	<RL	1.594	9.216	37.585	423.0
BEAVER FALLS	BE002	Beaver	16	03/21/12	9:55	242	72	0.163	47.071	0.074	0.118	4.643	57.077	<RL	<RL	29.240	<RL	1.819	10.138	40.530	441.0
BEAVER FALLS	BE002	Beaver	17	03/29/12	10:30	240	76														434.0
BEAVER FALLS	BE002	Beaver	18	04/04/12	8:30	270	84	0.230	53.305	0.020	0.089	4.305	64.986	<RL	<RL	32.572	0.079	3.112	11.468	45.620	492.0
BEAVER FALLS	BE002	Beaver	19	04/11/12	9:30	278	94	0.260	54.519	0.0645	0.036	4.308	72.597	0.108	<RL	33.656	0.119	3.539	12.785	50.773	517.0
BEAVER FALLS	BE002	Beaver	20	04/19/12	9:50	320	96	0.291	58.366	0.072	<RL	4.595	74.189	<RL	<RL	34.903	0.400	3.831	12.872	51.865	544.0
BEAVER FALLS	BE002	Beaver	21	04/26/12	8:10	318	90	0.274	59.720	0.123	0.076	4.896	75.419	6.286	<RL	36.017	0.334	3.495	13.062	50.986	548.0
BEAVER FALLS	BE002	Beaver	22	05/04/12	12:00	308	92	0.296	61.040	0.048	0.091	4.638	67.236	0.112	<RL	38.242	0.205	3.783	12.338	48.525	540.0
BEAVER FALLS	BE002	Beaver	23	05/10/12	10:50	163	52	0.188	29.699	0.042	<RL	4.029	31.253	0.092	<RL	19.703	<RL	2.704	6.257	27.008	296.0
BEAVER FALLS	BE002	Beaver	24	05/17/12	9:30	260	78	0.296	43.079	0.045	0.066	4.630	47.050	0.094	<RL	31.069	0.042	3.147	10.107	42.054	458.0
BEAVER FALLS	BE002	Beaver	25	05/24/12	9:00	314	90	0.326	58.809	0.045	0.088	5.602	72.611	<RL	<RL	37.101	<RL	3.977	11.848	47.536	532.0
BEAVER FALLS	BE002	Beaver	26	06/01/12	13:30	335	90	0.315	67.487	0.057	0.096	7.792	80.477	0.314	<RL	40.841	0.319	4.532	12.823	51.790	576.0
BEAVER FALLS	BE002	Beaver	27	06/06/12	10:10	276	88	0.288	51.201	0.050	0.043	6.025	61.337	0.171	<RL	33.540	0.155	3.755	10.362	44.340	467.0
BEAVER FALLS	BE002	Beaver	28	06/14/12	11:30	325	88	0.305	74.705	0.043	0.223	8.249	72.788	0.289	<RL	37.852	<RL	3.858	9.753	40.694	586.0
BEAVER FALLS	BE002	Beaver	29	06/21/12	9:00	303	92	0.334	60.840	0.034	0.058	5.394	64.705	0.209	<RL	34.455	<RL	3.747	10.099	41.092	525.0
BEAVER FALLS	BE002	Beaver	30	06/29/12	8:00	282	88	0.313	54.101	0.049	0.060	4.862	55.731	0.166	<RL	35.564	<RL	4.230	11.284	43.969	510.0
BEAVER FALLS	BE002	Beaver	31	07/06/12	7:40	272	78	0.276	58.296	<RL	0.042	5.240	55.453	0.159	<RL	32.551	<RL	4.135	10.076	45.809	481.0
BEAVER FALLS	BE002	Beaver	33	07/18/12	8:40	282	84	0.359	59.565	0.028	0.091	7.870	56.390	0.253	<RL	38.591	<RL	4.559	10.478	41.685	523.0
BEAVER FALLS	BE002	Beaver	34	07/27/12	7:20	278	88	0.366	55.158	0.035	0.104	6.228	54.000	0.205	<RL	37.362	<RL	4.543	10.427	42.063	496.0
BEAVER FALLS	BE002	Beaver	35	08/02/12	8:30	253	80	0.324	50.083	0.0219	0.0708	4.601	51.091	0.122	<RL	13.062	<RL	1.351	3.087	13.224	471.0
BEAVER FALLS	BE002	Beaver	36	08/09/12	8:00	279	84	0.345	55.465	<RL	0.123	5.336	56.102	0.313	<RL	36.085	<RL	4.348	10.732	42.651	500.0
BEAVER FALLS	BE002	Beaver	37	08/17/12	13:50	294	58	0.352	56.125	0.015	0.104	6.335	52.384	0.218	<RL	38.582	<RL	4.712	10.335	42.789	503.0
BEAVER FALLS	BE002	Beaver	38	08/23/12	10:00	295	80	0.364	59.201	0.097	0.141	6.353	52.253	0.295	<RL	37.988	<RL	5.035	10.576	42.752	489.0
BEAVER FALLS	BE002	Beaver	39	08/30/12	9:55	276		0.372	60.681	<RL	0.103	6.154	62.854	0.112	<RL	62.212	<RL	4.097	5.881	70.263	532.0
BEAVER FALLS	BE002	Beaver	40	09/07/12	9:15	268	80	0.363	58.530	0.032	0.093	7.240	56.758	0.254	0.023	38.902	<RL	4.370	10.755	46.417	512.0
BEAVER FALLS	BE002	Beaver	41	09/13/12	8:30	276	92	0.386	57.961	0.0462	0.085	6.739	57.351	0.161	<RL	41.252	<RL	4.734	10.974	48.321	518.0
BEAVER FALLS	BE002	Beaver	42	09/26/12	9:45	321	93	0.395	68.633	0.1131	0.113	8.582	65.530	0.488	<RL	46.777	0.207	5.278	12.464	52.700	548.0
BEAVER FALLS	BE002	Beaver	43	09/26/12	9:00	269	94	0.427	60.734	0.0735	0.124	7.165	56.998	0.201	<RL	43.191	<RL	4.537	11.474	47.066	552.0
BEAVER FALLS	BE002	Beaver	44	10/03/12	9:15	294	96	0.323	62.113	0	0.094	6.587	61.744	0.243	<RL	43.558	<RL	4.340	12.052	49.937	548.0
BEAVER FALLS	BE002	Beaver	45	10/10/12	10:00	343	100	0.396	73.419	0.0891	0.149	7.884	67.653	0.393	<RL	50.599	<RL	5.092	13.495	53.920	610.0
BEAVER FALLS	BE002	Beaver	46	10/18/12	8:45	376	106	0.373	78.196	0	0.159	9.055	70.677	0.254	<RL	52.947	<RL	5.513	13.964	57.201	637.0
BEAVER FALLS	BE002	Beaver	47	10/25/12	7:55	386	106	0.359	82.817	0.0103	<RL	8.501	73.406	0.350	<RL	53.552	<RL	5.653	14.306	60.431	664.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
STEUBENVILLE	OH065	Ohio	1	12/05/11	9:00			0.090	16.234	0.022	<RL	2.994	47.229	<RL	<RL	12.400	<RL	1.380	5.971	22.805	244.0
STEUBENVILLE	OH065	Ohio	2	12/12/11	9:20			0.097	16.820	0.026	<RL	3.014	50.908	<RL	<RL	13.548	<RL	1.466	6.257	24.788	259.0
STEUBENVILLE	OH065	Ohio	3	12/19/11	8:45	124	44	0.099	19.426	0.038	<RL	3.437	54.496	<RL	<RL	14.045	<RL	1.462	6.687	25.355	276.0
STEUBENVILLE	OH065	Ohio	4	12/27/11	9:45	104	36	0.080	17.001	<RL	<RL	3.328	48.819	<RL	<RL	12.452	<RL	1.360	5.857	21.723	239.0
STEUBENVILLE	OH065	Ohio	5	01/03/12	10:10	138	38	0.089	17.818	0.003	<RL	3.440	59.260	<RL	<RL	12.758	<RL	1.193	6.045	22.824	247.0
STEUBENVILLE	OH065	Ohio	6	01/09/12	9:30	158	44	0.089	22.440	<RL	<RL	3.427	50.903	<RL	<RL	16.307	<RL	1.290	6.706	25.559	294.0
STEUBENVILLE	OH065	Ohio	7	01/17/12	8:00	170	42	0.094	27.329	0.041	<RL	3.064	56.090	<RL	<RL	20.852	<RL	1.312	7.376	27.210	319.0
STEUBENVILLE	OH065	Ohio	7D	01/17/12	8:00			0.092	30.148	0.032	<RL	3.273	59.131	<RL	<RL	18.727	<RL	1.130	6.577	24.349	319.0
STEUBENVILLE	OH065	Ohio	8	01/23/12	8:30	158	34	0.085	28.384	0.048	<RL	3.022	40.617	<RL	<RL	15.451	<RL	0.816	4.543	17.979	264.0
STEUBENVILLE	OH065	Ohio	9	01/30/12	8:15	138	32	0.087	21.969	<RL	<RL	6.815	39.126	5.843	<RL	13.445	<RL	1.039	4.820	18.877	238.0
STEUBENVILLE	OH065	Ohio	10	02/06/12	11:30	162	36	0.139	21.928	0.057	<RL	3.286	47.946	<RL	<RL	13.501	<RL	1.027	5.830	21.725	261.0
STEUBENVILLE	OH065	Ohio	11	02/13/12	9:30	191	42	0.103	26.411	0.044	<RL	3.481	59.161	<RL	<RL	18.632	<RL	1.356	7.595	28.064	310.0
STEUBENVILLE	OH065	Ohio	12	02/21/12	10:30	218	49	0.172	38.575	0.038	0.107	3.811	80.153	<RL	<RL	30.835	0.014	1.698	9.439	33.455	412.0
STEUBENVILLE	OH065	Ohio	13	02/27/12	13:30	206	44	0.126	35.604	<RL	<RL	3.561	89.288	<RL	<RL	27.421	<RL	1.517	9.284	31.839	373.0
STEUBENVILLE	OH065	Ohio	14	03/05/12	9:00	151	32	0.103	19.699	0.062	<RL	3.059	40.546	<RL	<RL	13.170	<RL	0.386	3.193	18.966	235.0
STEUBENVILLE	OH065	Ohio	15	03/12/12	13:20	141	34	0.116	24.850	0.113	0.102	2.933	43.348	0.159	<RL	17.403	<RL	0.538	5.426	22.439	265.0
STEUBENVILLE	OH065	Ohio	16	03/19/12	11:30	155	40	0.064	26.905	0.079	0.050	2.998	56.665	1.152	<RL	19.812	<RL	0.698	7.045	27.003	311.0
STEUBENVILLE	OH065	Ohio	17	03/26/12	13:45	201	48	0.163	26.860	0.021	0.339	2.795	73.190	0.273	<RL	19.526	<RL	1.499	7.700	28.094	352.0
STEUBENVILLE	OH065	Ohio	18	04/02/12	10:00	175	44	0.154	24.715	0.092	<RL	3.032	69.804	<RL	<RL	20.145	<RL	1.829	8.441	29.838	336.0
STEUBENVILLE	OH065	Ohio	19	04/09/12	10:20	180	40	0.190	25.538	0.027	<RL	4.062	76.059	<RL	<RL	21.374	<RL	1.819	9.096	31.677	356.0
STEUBENVILLE	OH065	Ohio	20	04/16/12	11:10	206	50	0.188	30.689	0.031	0.259	3.227	86.833	0.120	<RL	25.376	<RL	2.042	10.235	35.553	401.0
STEUBENVILLE	OH065	Ohio	21	04/23/12	10:15	243	52	0.220	34.985	0.070	0.077	3.827	90.873	0.092	<RL	27.561	0.055	2.269	10.966	37.336	427.0
STEUBENVILLE	OH065	Ohio	22	04/30/12	10:15	239	52	0.177	33.676	0.050	0.072	2.951	90.094	<RL	<RL	26.395	0.033	1.908	10.850	36.261	423.0
STEUBENVILLE	OH065	Ohio	23	05/07/12	7:50	227	48	0.173	24.764	0.042	0.055	2.483	91.581	<RL	<RL	27.501	0.046	1.748	8.961	31.355	387.0
STEUBENVILLE	OH065	Ohio	24	05/14/12	11:30	122	32	0.155	17.160	0.049	0.054	2.650	46.921	0.089	<RL	14.614	<RL	1.543	5.711	21.226	241.0
STEUBENVILLE	OH065	Ohio	25	05/21/12	14:05	140	40	0.150	18.301	0.042	0.068	2.620	54.105	0.105	<RL	17.385	<RL	1.488	6.107	23.043	268.0
STEUBENVILLE	OH065	Ohio	26	05/29/12	11:20	174	36	0.165	24.910	0.036	0.053	2.975	62.821	<RL	<RL	19.775	<RL	1.794	6.907	24.959	297.0
STEUBENVILLE	OH065	Ohio	27	06/04/12	7:50	217	38	0.189	29.565	0.056	0.074	3.449	80.101	<RL	<RL	24.448	0.228	2.160	8.612	30.362	263.0
STEUBENVILLE	OH065	Ohio	28	06/11/12	9:40	202	44	0.195	29.476	0.055	0.116	3.485	81.766	<RL	<RL	23.394	0.168	2.490	8.824	30.360	342.0
STEUBENVILLE	OH065	Ohio	29	06/18/12	13:40	219	48	0.216	33.352	0.056	0.074	4.171	80.640	<RL	<RL	24.924	0.066	2.452	9.317	31.835	379.0
STEUBENVILLE	OH065	Ohio	30	06/25/12	13:45	232	46	0.234	36.412	0.061	0.074	4.492	86.802	0.094	<RL	28.659	0.087	2.474	9.838	33.426	327.0
STEUBENVILLE	OH065	Ohio	31	07/02/12	9:45	238	48	0.246	37.547	0.075	0.098	4.728	80.745	<RL	<RL	29.062	0.235	2.543	10.219	34.143	416.0
STEUBENVILLE	OH065	Ohio	32	07/09/12	8:45	249	50	0.254	41.246	<RL	0.068	4.768	83.687	<RL	<RL	31.378	0.185	2.880	10.477	35.271	433.0
STEUBENVILLE	OH065	Ohio	33	07/16/12	13:30	237	50	0.272	43.285	0.013	0.113	4.267	93.814	<RL	<RL	35.362	0.094	2.905	10.713	35.564	468.0
STEUBENVILLE	OH065	Ohio	34	07/23/12	10:20	257	48	0.302	44.619	0.087	0.141	4.649	89.298	<RL	<RL	43.788	0.474	3.114	12.876	38.755	450.0
STEUBENVILLE	OH065	Ohio	35	07/30/12	11:00	289	54	0.273	41.335	0.080	<RL	4.223	112.082	0.085	<RL	42.595	0.358	2.870	11.635	38.840	506.0
STEUBENVILLE	OH065	Ohio	36	08/06/12	10:35	227	48	0.258	34.766	0.020	0.147	3.674	87.939	<RL	<RL	32.422	0.206	2.839	10.006	34.623	426.0
STEUBENVILLE	OH065	Ohio	37	08/13/12	10:40	260	48	0.294	36.983	0.081	0.122	4.173	96.423	0.081	<RL	36.359	0.349	3.102	10.354	35.757	454.0
STEUBENVILLE	OH065	Ohio	38	08/22/12	9:30	242	56	0.302	38.005	0.043	0.093	3.767	87.831	<RL	<RL	33.891	0.230	3.046	9.578	34.690	429.0
STEUBENVILLE	OH065	Ohio	39	08/27/12	7:50	289	50	0.378	39.766	0.080	0.104	4.244	90.394	<RL	<RL	34.904	<RL	2.705	9.986	33.848	441.0
STEUBENVILLE	OH065	Ohio	40	09/04/12	11:10	241	50	0.313	43.015	0.090	0.152	4.637	87.149	<RL	<RL	55.793	<RL	2.462	1.943	49.603	423.0
STEUBENVILLE	OH065	Ohio	41	09/10/12	10:15	248	50	0.287	44.818	0.098	0.133	4.686	91.212	<RL	0.027	36.141	<RL	2.717	11.564	38.575	469.0
STEUBENVILLE	OH065	Ohio	42	09/17/12	13:20	255	58	0.305	46.238	0.172	0.133	5.026	92.386	0.111	<RL	38.679	<RL	3.320	11.505	39.921	479.0
STEUBENVILLE	OH065	Ohio	43	09/24/12	11:15	283	54	0.295	44.586	0.069	0.128	4.453	88.478	0.134	<RL	37.240	<RL	3.171	11.472	38.580	509.0
STEUBENVILLE	OH065	Ohio	44	10/01/12	13:20	257	55	0.293	42.134	0.141	0.146	4.929	90.139	1.127	<RL	38.098	<RL	3.035	10.646	38.380	471.0
STEUBENVILLE	OH065	Ohio	45	10/09/12	10:00	270	59	0.261	45.529	0.137	0.145	4.503	92.559	1.546	<RL	39.622	<RL	2.970	11.107	41.170	485.0
STEUBENVILLE	OH065	Ohio	46	10/15/12	13:15	269	60	0.238	42.687	0.118	0.134	4.747	93.878	<RL	<RL	38.351	<RL	3.184	11.754	40.724	483.0
STEUBENVILLE	OH065	Ohio	47	10/22/12	10:15	298	58	0.258	44.963	0.061	0.138	5.517	103.019	1.536	<RL	43.653	<RL	3.366	11.628	41.787	510.0
STEUBENVILLE	OH065	Ohio	48	10/29/12	13:35	307	56	0.303	43.314	0.070	0.142	5.254	102.142	0.084	<RL	39.679	<RL	3.026	11.501	40.779	497.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
WHEELING	OH087	Ohio	1	12/05/11	13:30			0.092	16.667	0.022	<RL	3.113	50.102	<RL	<RL	13.264	<RL	1.460	6.293	24.526	253.0
WHEELING	OH087	Ohio	2	12/13/11	8:30			0.099	16.844	0.023	<RL	3.170	53.055	<RL	<RL	13.186	<RL	1.478	6.443	25.784	266.0
WHEELING	OH087	Ohio	3	12/19/11	8:30	150	46	0.105	20.641	0.046	<RL	3.560	56.992	<RL	<RL	14.929	<RL	1.602	7.045	27.256	290.0
WHEELING	OH087	Ohio	4	12/27/11	8:00	106	40	0.074	17.322	0.037	<RL	3.394	51.115	<RL	<RL	12.622	<RL	1.232	6.151	23.373	251.0
WHEELING	OH087	Ohio	5	01/03/12	8:30	142	40	0.091	18.201	0.042	<RL	3.455	61.529	<RL	<RL	13.272	<RL	1.205	6.233	24.135	258.0
WHEELING	OH087	Ohio	6	01/10/12	8:00	150	45	0.091	22.531	0.053	<RL	3.477	54.271	<RL	<RL	16.506	<RL	1.305	7.103	27.204	291.0
WHEELING	OH087	Ohio	7	01/17/12	9:00	183	48	0.090	31.161	0.045	<RL	3.480	60.977	<RL	<RL	21.942	<RL	1.333	7.651	29.242	337.0
WHEELING	OH087	Ohio	8	01/23/12	13:45	155	38	0.090	26.529	0.051	<RL	3.029	43.920	<RL	<RL	16.084	<RL	0.952	5.318	20.869	271.0
WHEELING	OH087	Ohio	9	01/30/12	13:00	144	38	0.088	22.648	0.033	<RL	3.255	41.129	<RL	<RL	13.449	<RL	0.986	5.092	20.122	253.0
WHEELING	OH087	Ohio	10	02/06/12	13:30	148	39	0.099	21.032	0.039	<RL	3.216	47.797	<RL	<RL	14.215	<RL	1.033	6.325	24.312	261.0
WHEELING	OH087	Ohio	11	02/13/12	13:30	193	46	0.110	26.243	0.039	0.104	3.420	59.087	<RL	<RL	17.086	<RL	1.234	7.280	27.505	315.0
WHEELING	OH087	Ohio	12	02/23/12	10:30	238	50	0.132	35.122	0.055	<RL	3.448	83.692	<RL	<RL	27.652	<RL	1.679	9.409	33.010	413.0
WHEELING	OH087	Ohio	13	02/27/12	13:00	217	48	0.130	32.211	0.062	<RL	3.841	77.035	<RL	<RL	22.007	<RL	1.622	8.496	30.057	377.0
WHEELING	OH087	Ohio	14	03/05/12	14:00	141	34	0.187	22.774	0.035	0.176	3.118	43.064	<RL	<RL	14.387	<RL	0.420	3.631	20.446	245.0
WHEELING	OH087	Ohio	15	03/12/12	14:30	156	42	ONG METHOD CAN/T QUANTITATE!							<RL	14.379	<RL	<RL	5.783	20.427	293.0
WHEELING	OH087	Ohio	16	03/19/12	13:45	178	48	0.151	25.989	0.072	<RL	3.147	62.901	<RL	<RL	19.766	<RL	0.631	7.919	29.641	331.0
WHEELING	OH087	Ohio	17	03/26/12	13:00	202	48	0.123	25.985	0.031	0.047	2.770	71.498	<RL	<RL	20.325	<RL	1.622	8.467	30.838	354.0
WHEELING	OH087	Ohio	18	04/02/12	13:30	185	48	0.294	25.258	0.037	0.415	2.713	72.999	0.394	<RL	20.643	<RL	1.834	9.007	32.086	352.0
WHEELING	OH087	Ohio	19	04/09/12	9:00	210	50	0.169	25.096	<RL	<RL	2.993	84.185	<RL	<RL	21.623	<RL	1.746	10.190	34.341	380.0
WHEELING	OH087	Ohio	20	04/16/12	13:30	249	54	0.200	29.343	0.020	0.144	3.050	97.609	0.634	<RL	25.665	<RL	2.116	11.421	37.928	429.0
WHEELING	OH087	Ohio	21	04/23/12	14:00	253	54	0.209	33.133	0.071	0.070	3.676	95.391	0.102	<RL	26.311	<RL	2.149	11.615	38.580	431.0
WHEELING	OH087	Ohio	22	04/30/12	13:30	265	52	0.198	37.939	0.043	0.066	3.482	96.805	<RL	<RL	30.536	0.201	2.215	11.658	38.962	453.0
WHEELING	OH087	Ohio	23	05/07/12	13:30	224	48	0.182	25.670	0.033	0.063	2.595	99.484	<RL	<RL	30.829	0.147	1.856	9.730	33.430	410.0
WHEELING	OH087	Ohio	24	05/15/12	7:30	132	34	0.147	17.483	0.043	<RL	2.778	50.484	<RL	<RL	15.116	<RL	1.543	6.140	22.659	256.0
WHEELING	OH087	Ohio	25	05/21/12	8:30	148	38	0.174	18.401	0.036	0.039	2.762	54.794	<RL	<RL	17.375	<RL	1.441	6.581	23.624	274.0
WHEELING	OH087	Ohio	26	05/29/12	8:30	179	36	0.184	22.139	0.044	0.053	2.711	71.695	<RL							306.0
WHEELING	OH087	Ohio	27	06/04/12	8:00	208	42	0.268	29.360	0.049	0.063	3.521	80.491	<RL	<RL	24.373	0.131	2.195	8.960	30.300	352.0
WHEELING	OH087	Ohio	28	06/11/12	8:00	236	48	0.252	33.205	0.034	0.087	3.701	87.219	<RL	<RL	26.036	0.116	2.456	9.765	33.267	385.0
WHEELING	OH087	Ohio	29	06/18/12	9:00	223	48	0.232	31.846	0.063	0.104	3.619	107.580	<RL	<RL	25.235	0.041	2.281	10.024	32.392	386.0
WHEELING	OH087	Ohio	30	06/25/12	8:30	233	50	0.183	28.368	0.037	0.054	3.429	70.790	<RL	<RL	22.537	<RL	2.130	8.034	26.453	395.0
WHEELING	OH087	Ohio	31	07/02/12	8:00	252	48	0.310	37.075	0.058	0.093	4.949	89.736	<RL	<RL	29.727	0.133	2.581	10.832	35.246	436.0
WHEELING	OH087	Ohio	32	07/09/12	8:30	249	50	0.259	39.915	<RL	<RL	4.342	89.489	0.072	<RL	32.183	0.105	2.765	10.961	36.209	437.0
WHEELING	OH087	Ohio	33	07/16/12	8:00	239	52	0.300	41.113	0.039	0.096	4.222	92.330	<RL	<RL	33.603	0.168	2.928	11.594	36.951	459.0
WHEELING	OH087	Ohio	34	07/23/12	8:30	270	52	0.326	44.120	0.055	0.135	4.358	97.377	<RL	<RL	44.876	0.592	2.533	11.604	37.391	478.0
WHEELING	OH087	Ohio	35	07/30/12	8:30	308	54	0.328	45.284	0.077	0.157	4.587	115.705	<RL	<RL	45.912	0.248	2.954	11.913	39.186	528.0
WHEELING	OH087	Ohio	36	08/06/12	8:00	297	52	0.307	40.951	0.063	0.166	3.967	120.612	0.152	<RL	43.068	0.344	2.993	12.263	41.015	518.0
WHEELING	OH087	Ohio	37	08/15/12	13:30	257	50	0.262	35.767	0.055	0.110	3.828	96.979	0.167	<RL	35.140	0.232	3.030	10.556	35.751	446.0
WHEELING	OH087	Ohio	38	08/20/12	8:30	273	52	0.299	37.511	0.036	0.061	4.008	101.054	<RL	<RL	36.594	0.228	3.046	10.572	35.419	463.0
WHEELING	OH087	Ohio	39	08/27/12	15:00	328	48	0.333	40.613	0.057	0.115	3.873	101.118	<RL	<RL	36.419	<RL	3.382	12.109	38.559	472.0
WHEELING	OH087	Ohio	40	09/04/12	14:45	244	50	0.326	40.871	0.094	0.120	4.321	98.446	<RL	<RL	58.159	<RL	2.327	4.855	48.429	412.0
WHEELING	OH087	Ohio	41	09/10/12	15:00	256	52	0.332	45.817	0.055	0.147	4.927	96.500	0.166	0.027	38.254	<RL	2.908	12.257	39.889	481.0
WHEELING	OH087	Ohio	42	09/17/12	15:30	262	50	0.326	46.485	0.085	0.142	4.945	99.821	<RL	<RL	38.531	<RL	3.397	12.401	40.162	485.0
WHEELING	OH087	Ohio	43	09/24/12	14:30	264	50	0.283	45.196	0.045	0.153	4.975	96.902	0.085	<RL	38.676	<RL	3.221	11.890	40.093	495.0
WHEELING	OH087	Ohio	44	10/01/12	15:00	280	57	0.278	45.320	0.038	0.278	4.962	104.113	0.097	<RL	42.336	<RL	3.240	11.940	42.177	512.0
WHEELING	OH087	Ohio	45	10/03/12	15:00	264	58	0.253	42.629	0.044	0.147	5.095	97.149	1.830	<RL	38.116	<RL	2.997	11.882	39.944	482.0
WHEELING	OH087	Ohio	46	10/15/12	8:30	277	60	0.255	45.444	0.133	0.137	4.545	95.168	0.085	<RL	40.556	<RL	3.088	11.498	41.939	494.0
WHEELING	OH087	Ohio	47	10/22/12	15:00	312	61	0.258	47.598	0.076	0.155	5.209	110.878	1.270	<RL	43.332	<RL	3.451	13.210	44.572	536.0
WHEELING	OH087	Ohio	48	10/29/12	15:00	289	58	0.273	45.212	0.074	0.136	5.708	107.586	<RL	<RL	42.068	<RL	3.165	12.730	43.272	520.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
SISTERSVLLE	OH137	Ohio	4	12/27/11	9:31	110	46	0.088	20.461	0.029	<RL	3.331	46.562	<RL	<RL	13.750	<RL	1.268	6.175	24.053	261.0
SISTERSVLLE	OH137	Ohio	5	01/03/12	9:21	162	46	0.117	20.049	0.030	<RL	3.343	68.967	<RL	<RL	15.536	<RL	1.237	6.899	26.063	281.0
SISTERSVLLE	OH137	Ohio	6	01/09/12	8:00	154	47	0.087	24.469	0.038	<RL	3.376	54.635	<RL	<RL	18.145	<RL	1.248	7.332	27.821	304.0
SISTERSVLLE	OH137	Ohio	7	01/17/12	10:20	202	50	0.103	36.215	0.032	<RL	3.646	59.613	<RL	<RL	22.768	<RL	1.202	7.203	27.775	359.0
SISTERSVLLE	OH137	Ohio	8	01/24/12	10:00	185	42	0.087	27.433	0.033	<RL	2.914	45.721	<RL	<RL	16.781	<RL	0.880	5.488	21.644	285.0
SISTERSVLLE	OH137	Ohio	9	01/30/12	8:30	159	42	0.123	26.344	0.026	<RL	3.339	43.918	<RL	<RL	16.303	<RL	1.044	5.468	21.955	277.0
SISTERSVLLE	OH137	Ohio	10	02/06/12	10:20	158	41	0.105	22.927	0.030	<RL	3.201	51.341	<RL	<RL	16.302	<RL	1.187	6.948	25.993	279.0
SISTERSVLLE	OH137	Ohio	11	02/13/12	9:30	201	48	0.108	26.896	0.046	0.129	3.264	63.239	<RL	<RL	20.213	<RL	1.344	8.376	30.836	336.0
SISTERSVLLE	OH137	Ohio	12	02/20/12	11:15	229	50	0.124	43.322	0.050	<RL	3.690	74.000	<RL	<RL	30.906	0.004	1.533	9.318	32.985	334.0
SISTERSVLLE	OH137	Ohio	13	02/27/12	9:30	243	52	0.130	33.720	0.090	<RL	3.920	69.255	<RL	<RL	25.851	<RL	1.757	8.636	31.023	427.0
SISTERSVLLE	OH137	Ohio	14	03/05/12	8:30	157	38	0.148	22.303	0.038	<RL	2.997	49.803	0.196	<RL	16.043	<RL	0.361	4.671	22.565	277.0
SISTERSVLLE	OH137	Ohio	15	03/12/12	9:38	169	42	0.108	27.583	0.044	0.290	3.011	50.932	0.104	<RL	20.399	<RL	0.427	6.621	26.276	304.0
SISTERSVLLE	OH137	Ohio	16	03/14/12	8:00	168	48	0.072	29.642	0.030	0.251	3.025	57.747	<RL	<RL	21.834	<RL	0.630	7.537	28.538	334.0
SISTERSVLLE	OH137	Ohio	17	03/26/12	8:35	210	52	0.091	20.388	0.020	<RL	1.784	52.968	0.285	<RL	23.538	0.034	1.649	9.280	33.334	375.0
SISTERSVLLE	OH137	Ohio	18	04/02/12	8:45	193	50	0.143	25.488	0.081	<RL	3.122	70.694	0.525	<RL	21.728	0.009	1.746	8.890	31.545	353.0
SISTERSVLLE	OH137	Ohio	19	04/09/12	9:00	180	50	0.183	29.097	0.562	<RL	3.010	78.999	0.373	<RL	24.434	<RL	1.823	9.868	33.819	381.0
SISTERSVLLE	OH137	Ohio	20	04/16/12	6:35	222	54	0.172	29.930	0.017	<RL	2.732	87.507	<RL	<RL	26.068	0.009	1.791	10.660	35.833	407.0
SISTERSVLLE	OH137	Ohio	21	04/23/12	9:00	258	56	0.219	35.453	0.089	0.067	3.025	100.747	<RL	<RL	31.552	0.144	2.093	11.883	39.154	455.0
SISTERSVLLE	OH137	Ohio	22	04/30/12	9:00	263	54	0.231	36.636	0.038	0.067	3.616	96.469	<RL	<RL	28.936	0.113	2.299	11.930	38.985	454.0
SISTERSVLLE	OH137	Ohio	23	05/07/12	10:00	225	50	0.159	28.965	0.025	0.060	2.650	74.464	<RL	<RL	25.521	0.065	1.792	9.167	31.345	370.0
SISTERSVLLE	OH137	Ohio	24	05/14/12	9:00	153	44	0.169	20.761	0.062	<RL	2.617	48.072	<RL	<RL	17.851	<RL	1.635	6.195	24.054	273.0
SISTERSVLLE	OH137	Ohio	25	05/21/12	9:00	156	40	0.148	22.743	0.087	0.044	2.730	50.999	<RL	<RL	18.874	0.005	1.541	6.330	23.258	281.0
SISTERSVLLE	OH137	Ohio	26	05/29/12	10:00	194	40	0.164	25.928	0.048	0.048	2.331	71.364	<RL	<RL	24.544	0.043	1.635	7.502	25.751	294.0
SISTERSVLLE	OH137	Ohio	27	06/04/12	8:00	187	38	0.176	26.032	0.041	0.060	2.580	72.535	<RL	<RL	22.430	0.122	1.872	7.916	26.690	323.0
SISTERSVLLE	OH137	Ohio	28	06/11/12	9:00	233	46	0.249	37.637	0.048	0.062	3.525	84.621	<RL	<RL	31.341	0.302	2.213	9.080	30.692	397.0
SISTERSVLLE	OH137	Ohio	29	06/18/12	9:00	243	50	0.227	44.263	0.125	0.068	3.642	92.742	<RL	<RL	33.864	0.222	2.453	10.307	34.540	440.0
SISTERSVLLE	OH137	Ohio	30	06/25/12	9:00	237	50	0.227	38.940	0.038	0.055	3.341	93.077	<RL	<RL	31.211	0.234	2.325	10.161	33.101	400.0
SISTERSVLLE	OH137	Ohio	32	07/09/12	9:00	271	48	0.240	46.130	<RL	0.063	4.485	96.103	<RL	<RL	36.827	0.272	2.697	11.523	35.942	471.0
SISTERSVLLE	OH137	Ohio	33	07/16/12	9:00	253	50	0.311	49.236	0.249	0.130	4.080	92.926	<RL	<RL	39.958	0.357	2.758	11.574	36.240	491.0
SISTERSVLLE	OH137	Ohio	34	07/23/12	9:00	274	54	0.304	43.956	0.053	0.122	4.078	98.376	<RL	<RL	60.622	0.777	2.614	13.198	41.334	475.0
SISTERSVLLE	OH137	Ohio	35	07/30/12	9:00	287	50	0.310	48.704	0.115	0.159	4.566	97.282	<RL	<RL	39.232	0.193	3.065	11.688	38.159	494.0
SISTERSVLLE	OH137	Ohio	36	08/06/12	9:00	307	50	0.292	48.173	0.045	0.110	3.713	113.116	<RL	<RL	49.326	0.515	2.946	11.890	38.098	534.0
SISTERSVLLE	OH137	Ohio	37	08/13/12	9:00	314	52	0.303	48.487	0.048	0.139	3.671	124.111	<RL	<RL	48.115	0.460	3.069	12.548	40.744	557.0
SISTERSVLLE	OH137	Ohio	38	08/20/12	9:00	295	48	0.277	46.248	0.061	0.132	3.218	99.591	<RL	<RL	41.699	0.378	2.951	11.018	36.069	493.0
SISTERSVLLE	OH137	Ohio	39	08/27/12	9:00	359	46	0.307	47.251	0.116	0.121	3.708	104.699	<RL	<RL	47.891	9.995	32.493	11.418	61.625	498.0
SISTERSVLLE	OH137	Ohio	40	09/04/12	9:00	297	50	0.333	56.351	0.136	0.137	4.207	105.259	<RL	<RL	80.971	<RL	2.346	11.463	51.107	495.0
SISTERSVLLE	OH137	Ohio	41	09/10/12	9:20	276	48	0.399	47.471	0.128	0.125	3.961	103.000	<RL	0.027	44.737	<RL	2.347	11.584	38.240	505.0
SISTERSVLLE	OH137	Ohio	42	09/17/12	9:00	292	50	0.334	52.756	0.117	0.144	4.311	102.187	<RL	<RL	46.968	0.054	3.387	11.945	39.133	517.0
SISTERSVLLE	OH137	Ohio	43	09/24/12	9:20	243	56	0.314	48.695	0.076	0.143	4.612	100.816	<RL	<RL	42.858	<RL	3.406	11.941	40.454	531.0
SISTERSVLLE	OH137	Ohio	44	10/01/12	9:00	268	56	0.275	49.966	0.078	0.162	4.815	100.703	1.062	<RL	43.851	<RL	3.155	11.835	41.001	179.3
SISTERSVLLE	OH137	Ohio	45	10/08/12	9:00	296	58	0.289	52.941	0.121	0.138	4.898	109.502	1.470	<RL	47.933	<RL	3.123	12.505	43.054	543.0
SISTERSVLLE	OH137	Ohio	46	10/15/12	9:00	305	58	0.265	57.302	0.040	0.143	4.919	101.215	<RL	<RL	51.135	0.025	3.254	11.846	41.269	545.0
SISTERSVLLE	OH137	Ohio	47	10/22/12	9:00	332	63	0.248	56.377	<RL	0.141	4.966	111.734	0.881	<RL	48.986	<RL	3.036	12.345	43.245	566.0
SISTERSVLLE	OH137	Ohio	48	10/29/12	8:00	313	61	0.309	53.376	0.080	0.139	4.955	110.779	<RL	<RL	47.388	<RL	3.186	12.660	43.970	556.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
MUSK AEP	MU029	Muskingum	1	12/06/11	9:22			0.125	22.525	0.020	<RL	6.767	74.091	<RL	<RL	15.033	<RL	3.049	14.093	45.520	420.0
MUSK AEP	MU029	Muskingum	2	12/13/11	8:12			0.146	23.899	0.025	<RL	7.574	70.737	<RL	<RL	15.309	<RL	3.121	13.657	44.641	422.0
MUSK AEP	MU029	Muskingum	3	12/21/11	7:59	236	107	0.134	27.075	0.028	<RL	7.719	78.231	<RL	<RL	16.396	<RL	2.996	14.948	48.968	459.0
MUSK AEP	MU029	Muskingum	4	12/27/11	9:15	148	82	0.116	19.491	0.026	<RL	7.309	55.140	<RL	<RL	11.882	<RL	2.569	11.153	37.540	349.0
MUSK AEP	MU029	Muskingum	5	01/03/12	8:35	264	100	0.128	26.794	0.643	<RL	7.126	101.784	<RL	<RL	16.548	<RL	2.304	15.043	49.450	455.0
MUSK AEP	MU029	Muskingum	6	01/10/12	8:00	317	122	0.144	35.987	0.032	<RL	8.152	88.323	<RL	<RL	22.102	<RL	2.467	17.645	59.715	539.0
MUSK AEP	MU029	Muskingum	7	01/17/12	8:10	333	122	0.135	44.369	0.034	<RL	7.154	96.127	<RL	<RL	27.200	<RL	2.470	18.445	60.463	580.0
MUSK AEP	MU029	Muskingum	8	01/24/12	8:30	320	104	0.192	37.611	0.033	<RL	7.161	78.054	<RL	<RL	20.662	<RL	2.019	14.228	47.304	501.0
MUSK AEP	MU029	Muskingum	9	01/31/12	8:20	213	70	0.123	27.599	0.032	<RL	6.335	45.502	<RL	<RL	15.058	<RL	2.136	8.831	30.385	338.0
MUSK AEP	MU029	Muskingum	10	02/07/12	8:15	290	101	0.152	36.330	0.014	<RL	7.249	77.612	<RL	<RL	22.135	<RL	2.273	15.042	51.200	488.0
MUSK AEP	MU029	Muskingum	11	02/14/12	9:02	337	120	0.136	41.972	0.013	<RL	7.151	94.663	<RL	<RL	22.630	0.203	1.997	16.290	54.602	568.0
MUSK AEP	MU029	Muskingum	12	02/21/12	8:15	317	108	0.147	50.117	0.007	<RL	6.735	86.333	<RL	<RL	31.278	<RL	2.593	16.477	52.129	574.0
MUSK AEP	MU029	Muskingum	13	02/28/12	8:12	353	124	0.162	44.773	0.079	<RL	6.474	99.709	<RL	<RL	26.849	<RL	2.453	18.183	58.584	594.0
MUSK AEP	MU029	Muskingum	14	03/06/12	8:10	295	94	0.170	54.856	<RL	<RL	6.534	71.044	<RL	<RL	25.467	<RL	1.752	16.808	46.747	486.0
MUSK AEP	MU029	Muskingum	15	03/13/12	8:15	253	88	0.474	54.949	<RL	0.073	5.713	65.644	<RL	<RL	21.818	<RL	1.264	13.891	42.936	438.0
MUSK AEP	MU029	Muskingum	16	03/20/12	8:13	246	96	0.163	27.417	0.040	0.088	5.487	63.186	0.197	<RL	18.136	<RL	1.666	14.338	44.681	424.0
MUSK AEP	MU029	Muskingum	17	03/28/12	8:04	307	110	0.167	32.761	<RL	0.279	4.882	77.229	<RL	<RL	21.660	<RL	2.598	15.993	53.172	503.0
MUSK AEP	MU029	Muskingum	18	04/03/12	8:30	296	116	0.207	32.583	0.030	0.287	4.623	79.515	<RL	<RL	22.124	<RL	2.637	16.882	54.806	506.0
MUSK AEP	MU029	Muskingum	19	04/10/12	9:00	326	126	0.211	38.302	0.026	<RL	3.649	93.721	0.111	<RL	25.725	<RL	2.644	19.103	60.981	567.0
MUSK AEP	MU029	Muskingum	20	04/17/12	8:15	362	136	0.218	44.919	0.024	0.815	3.037	109.453	<RL	<RL	29.632	<RL	2.804	21.441	67.416	630.0
MUSK AEP	MU029	Muskingum	21	04/24/12	8:12	423	136	0.247	50.121	0.092	0.059	2.536	124.530	<RL	<RL	33.119	0.057	3.196	23.498	70.665	671.0
MUSK AEP	MU029	Muskingum	22	05/01/12	7:13	413	134	0.257	49.827	0.035	0.066	2.092	121.649	<RL	<RL	33.699	0.052	3.025	23.430	69.872	674.0
MUSK AEP	MU029	Muskingum	23	05/08/12	8:00	288	100	0.198	27.006	0.067	0.037	5.213	82.845	<RL	<RL	19.894	0.051	3.187	15.773	48.649	466.0
MUSK AEP	MU029	Muskingum	24	05/15/12	8:50	271	110	0.193	29.416	0.133	<RL	7.684	75.966	0.088	<RL	20.801	<RL	3.231	15.945	51.255	486.0
MUSK AEP	MU029	Muskingum	25	05/22/12	8:55	354	130	0.218	38.691	0.084	0.066	2.851	103.705	<RL	<RL	26.257	<RL	3.054	20.800	61.877	586.0
MUSK AEP	MU029	Muskingum	26	05/29/12	9:06	386	122	0.243	50.139	0.066	0.061	2.337	115.556	<RL	<RL	32.985	0.370	3.613	21.855	59.412	612.0
MUSK AEP	MU029	Muskingum	27	06/05/12	8:57			0.260	50.868	0.130	0.074	4.653	103.728	0.084	<RL	33.874	0.401	4.368	20.247	61.513	610.0
MUSK AEP	MU029	Muskingum	28	06/12/12	8:28	442	130	0.258	65.743	0.096	0.073	2.951	128.437	0.080	<RL	44.121	1.062	4.353	23.444	64.464	701.0
MUSK AEP	MU029	Muskingum	29	06/19/12	8:20	431	130	0.274	61.463	0.346	0.081	1.524	132.476	0.134	<RL	42.560	1.126	4.285	23.797	61.948	708.0
MUSK AEP	MU029	Muskingum	30	06/26/12	8:25	441	144	0.278	62.572	0.059	0.081	2.388	126.746	<RL	<RL	34.482	<RL	3.345	17.454	50.030	712.0
MUSK AEP	MU029	Muskingum	31	07/03/12	8:07	418	120	0.319	66.492	0.133	0.074	2.250	121.127	<RL	<RL	47.260	0.892	5.012	22.699	57.322	692.0
MUSK AEP	MU029	Muskingum	32	07/10/12	9:00	420	100	0.286	72.248	<RL	0.067	0.018	133.426	<RL	<RL	51.869	<RL	5.030	24.748	53.361	698.0
MUSK AEP	MU029	Muskingum	33	07/17/12	8:50	453	138	0.320	78.956	0.059	0.065	0.943	135.526	<RL	<RL	57.534	<RL	5.324	26.620	66.608	785.0
MUSK AEP	MU029	Muskingum	34	07/24/12	9:15	421	122	0.352	70.616	0.127	0.119	1.105	120.322	0.081	<RL	37.587	0.345	3.185	11.238	38.492	722.0
MUSK AEP	MU029	Muskingum	35	07/31/12	9:25	507	146	0.368	91.030	0.102	0.138	2.124	139.206	0.090	<RL	63.778	<RL	5.523	25.993	72.255	856.0
MUSK AEP	MU029	Muskingum	36	08/07/12	8:39	452	110	0.361	72.179	0.010	0.140	0.434	151.788	<RL	<RL	58.724	0.585	5.261	25.790	57.926	764.0
MUSK AEP	MU029	Muskingum	37	08/14/12	8:30			0.370	89.275	0.143	0.174	1.345	136.254	0.128	<RL	56.631	0.565	5.044	22.401	50.960	791.0
MUSK AEP	MU029	Muskingum	38	08/21/12	9:02	494	122	0.373	87.463	0.036	0.117	0.826	151.130	<RL	<RL	65.687	<RL	5.498	25.196	60.811	826.0
MUSK AEP	MU029	Muskingum	39	08/28/12	9:10	584	140	0.380	79.308	0.142	0.132	1.489	166.606	<RL	<RL	62.609	0.823	5.720	29.829	71.305	848.0
MUSK AEP	MU029	Muskingum	40	09/04/12	9:07	475	134	0.370	77.714	0.178	0.115	2.361	147.068	<RL	<RL	102.606	<RL	4.755	151.590	107.943	811.0
MUSK AEP	MU029	Muskingum	41	09/11/12	9:53	411	120	0.344	78.745	0.217	0.158	1.310	113.732	<RL	0.026	56.430	<RL	4.841	24.544	39.339	728.0
MUSK AEP	MU029	Muskingum	42	09/18/12	7:50	405	116	0.355	74.898	0.107	0.131	1.216	121.436	<RL	<RL	59.339	0.496	5.872	25.026	54.709	721.0
MUSK AEP	MU029	Muskingum	43	09/25/12	9:05	485	139	0.373	85.694	0.152	0.115	4.700	117.921	<RL	<RL	63.142	<RL	5.731	24.732	72.703	768.0
MUSK AEP	MU029	Muskingum	44	10/02/12	8:45	446	150	0.287	77.335	0.074	0.095	7.261	106.014	0.139	<RL	54.561	0.060	5.138	23.680	72.302	814.0
MUSK AEP	MU029	Muskingum	45	10/09/12	8:03	477	140	0.293	70.706	0.034	0.099	4.325	144.206	<RL	<RL	59.424	<RL	4.852	25.906	73.234	809.0
MUSK AEP	MU029	Muskingum	46	10/16/12	8:35	437	148	0.278	61.253	0.066	0.095	3.864	113.399	1.645	<RL	48.622	<RL	4.959	24.296	71.637	723.0
MUSK AEP	MU029	Muskingum	47	10/23/12	8:20	448	162	0.294	70.141	0.044	0.087	4.636	114.399	1.538	<RL	53.225	<RL	4.935	25.409	76.305	775.0
MUSK AEP	MU029	Muskingum	48	10/30/12	8:15	491	164	0.301	74.523	0.124	0.094	5.870	123.953	0.160	<RL	54.501	0.156	5.246	26.808	81.868	819.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
DUPONT	OH191	Ohio	1	12/05/11	13:05			0.089	14.612	0.017	<RL	2.687	42.865	0.836	<RL	11.555	<RL	1.310	6.020	23.133	239.0
DUPONT	OH191	Ohio	2	12/12/11	8:30			0.075	13.991	0.030	<RL	2.449	41.515	<RL	<RL	12.324	<RL	1.227	5.379	21.254	225.0
DUPONT	OH191	Ohio	3	12/19/11	9:00	140	48	0.096	16.747	0.027	<RL	2.950	50.315	<RL	<RL	12.652	<RL	1.313	6.598	24.875	264.0
DUPONT	OH191	Ohio	4	12/27/11	18:00	106	48	0.089	19.693	0.019	<RL	3.063	47.482	<RL	<RL	13.802	<RL	1.377	6.512	25.029	264.0
DUPONT	OH191	Ohio	5	01/03/12	9:00	138	42	0.088	15.047	0.025	<RL	3.251	59.414	<RL	<RL	13.031	<RL	1.127	6.192	23.217	245.0
DUPONT	OH191	Ohio	6	01/09/12	8:30	143	46	0.093	19.086	0.047	<RL	3.149	50.748	<RL	<RL	11.627	<RL	0.934	5.040	18.603	311.0
DUPONT	OH191	Ohio	7	01/16/12	8:45	137	46	0.083	18.517	0.036	<RL	2.677	47.955	<RL	<RL	14.012	<RL	1.068	6.649	24.702	265.0
DUPONT	OH191	Ohio	8	01/23/12	8:50	165	40	0.078	28.959	0.028	<RL	2.494	40.678	<RL	<RL	14.161	<RL	6.177	4.946	18.741	290.0
DUPONT	OH191	Ohio	9	01/30/12	9:00	156	40	0.091	26.709	0.025	<RL	2.715	36.805	<RL	<RL	15.800	<RL	0.964	4.954	20.216	262.0
DUPONT	OH191	Ohio	10	02/06/12	9:00	131	38	0.089	18.349	0.054	<RL	2.809	41.400	<RL	<RL	13.066	<RL	1.110	5.993	22.201	238.0
DUPONT	OH191	Ohio	11	02/13/12	13:00	184	48	0.102	23.216	0.035	<RL	3.057	54.763	<RL	<RL	16.583	<RL	1.197	7.598	27.357	301.0
DUPONT	OH191	Ohio	12	02/20/12	14:00	181	48	0.181	25.620	0.057	<RL	2.739	59.086	<RL	<RL	20.420	<RL	1.638	8.173	28.461	324.0
DUPONT	OH191	Ohio	13	02/27/12	13:05	229	52	0.138	34.960	0.030	<RL	3.129	73.812	<RL	<RL	28.815	<RL	1.695	9.307	32.334	389.0
DUPONT	OH191	Ohio	14	03/05/12	13:10	142	34	0.087	14.912	0.028	<RL	2.404	41.876	<RL	<RL	12.144	<RL	0.114	3.002	17.962	226.0
DUPONT	OH191	Ohio	15	03/12/12	13:30	134	42	0.093	16.219	0.012	<RL	2.188	40.704	<RL	<RL	12.703	<RL	0.199	5.014	20.861	236.0
DUPONT	OH191	Ohio	16	03/19/12	13:15	136	46	0.099	15.796	0.031	0.042	2.292	34.767	0.229	<RL	13.120	<RL	0.458	5.129	21.061	232.0
DUPONT	OH191	Ohio	17	03/26/12	13:10	188	52	0.189	24.632	0.059	0.743	2.512	57.610	1.526	<RL	19.435	<RL	1.593	8.133	29.346	325.0
DUPONT	OH191	Ohio	18	04/02/12	8:50	170	52	0.139	20.474	0.050	<RL	2.210	57.512	<RL	<RL	18.022	<RL	1.640	7.942	28.483	310.0
DUPONT	OH191	Ohio	19	04/10/12	12:25	237	70	0.199	28.526	0.017	<RL	2.605	79.409	<RL	<RL	22.902	<RL	1.996	12.125	39.764	412.0
DUPONT	OH191	Ohio	20	04/16/12	13:05	250	76	0.182	31.930	0.002	<RL	2.448	88.074	<RL	<RL	26.026	<RL	2.018	12.829	42.626	449.0
DUPONT	OH191	Ohio	21	04/23/12	9:15	244	64	0.217	31.103	0.071	0.036	2.538	87.913	<RL	<RL	26.133	0.024	1.986	12.061	37.937	426.0
DUPONT	OH191	Ohio	22	04/30/12	13:30	212	60	0.178	27.245	0.026	0.050	2.318	76.197	<RL	<RL	22.793	<RL	1.803	10.435	34.101	384.0
DUPONT	OH191	Ohio	23	05/07/12	13:20	142	34	0.126	14.118	0.024	<RL	1.542	41.860	<RL	<RL	12.392	<RL	1.578	5.594	19.663	218.0
DUPONT	OH191	Ohio	24	05/14/12	13:30	141	44	0.176	21.978	0.073	0.105	2.532	50.987	<RL	<RL	19.174	<RL	1.714	6.607	25.061	287.0
DUPONT	OH191	Ohio	25	05/21/12	13:00	159	44	0.164	19.583	0.057	0.042	2.817	55.012	<RL	<RL	16.451	<RL	1.651	7.376	25.638	286.0
DUPONT	OH191	Ohio	26	05/29/12	14:00	207	48	0.153	25.971	0.044	0.051	2.458	64.561	<RL	<RL	20.885	0.123	1.822	8.775	28.915	330.0
DUPONT	OH191	Ohio	27	06/04/12	13:00	210	50	0.180	28.858	0.049	0.053	2.231	76.605	<RL	<RL	25.717	0.193	1.949	9.092	29.122	311.0
DUPONT	OH191	Ohio	28	06/11/12	8:30	235	58	0.207	33.415	0.058	0.062	3.201	80.296	<RL	<RL	26.747	0.175	2.409	10.648	33.812	376.0
DUPONT	OH191	Ohio	29	06/18/12	8:15	241	56	0.279	41.531	0.129	0.075	3.223	90.312	<RL	<RL	32.229	0.125	2.367	11.027	34.735	442.0
DUPONT	OH191	Ohio	30	06/25/12	8:30	266	64	0.269	46.192	0.076	0.047	3.118	96.014	0.076	<RL	36.049	0.066	2.732	12.429	38.464	461.0
DUPONT	OH191	Ohio	31	07/02/12	9:30	295	66	0.277	49.914	0.058	0.083	2.578	97.993	<RL	<RL	38.081	0.175	2.951	14.432	40.972	511.0
DUPONT	OH191	Ohio	32	07/09/12	8:30	274	54	0.214	46.966	<RL	0.056	3.070	88.481	<RL	<RL	35.826	0.170	2.747	11.716	36.051	467.0
DUPONT	OH191	Ohio	33	07/16/12	9:20	262	60	0.270	52.609	0.074	0.078	2.931	88.314	<RL	<RL	41.310	0.253	3.156	12.814	37.948	512.0
DUPONT	OH191	Ohio	34	07/23/12	13:15	304	56	0.299	56.099	0.055	0.113	3.241	92.230	<RL	<RL	43.482	0.330	2.924	12.348	36.871	514.0
DUPONT	OH191	Ohio	35	07/30/12	13:00	272	52	0.279	49.430	0.062	0.121	3.813	92.744	<RL	<RL	42.097	0.270	3.150	10.772	36.276	490.0
DUPONT	OH191	Ohio	36	08/06/12	13:15	291	49	0.286	49.646	0.063	0.145	3.225	97.594	<RL	<RL	39.981	<RL	3.097	12.225	37.081	504.0
DUPONT	OH191	Ohio	37	08/13/12	13:15	323	54	0.327	53.206	0.044	0.190	2.985	117.355	0.124	<RL	51.081	<RL	3.222	13.096	38.751	559.0
DUPONT	OH191	Ohio	38	08/20/12	13:00	364	64	0.323	56.871	0.039	0.115	2.570	123.914	<RL	<RL	53.698	<RL	3.591	14.202	42.209	564.0
DUPONT	OH191	Ohio	39	08/27/12	8:30	363	58	0.298	51.868	0.017	0.114	3.361	117.137	<RL	<RL	45.837	0.541	3.520	13.880	42.533	459.0
DUPONT	OH191	Ohio	40	09/05/12	13:10	288	58	0.314	54.353	0.166	0.108	3.232	107.328	<RL	<RL	49.667	<RL	1.391	<RL	26.935	504.0
DUPONT	OH191	Ohio	41	09/10/12	13:00	318	72	0.317	58.500	0.082	0.121	3.377	117.636	<RL	0.026	51.511	<RL	3.213	16.643	44.865	596.0
DUPONT	OH191	Ohio	42	09/17/12	13:00	300	54	0.330	53.143	0.109	0.136	2.982	109.887	<RL	<RL	46.092	<RL	3.473	14.598	39.213	538.0
DUPONT	OH191	Ohio	43	09/25/12	12:15	308	56	0.308	54.216	0.060	0.115	3.923	101.265	<RL	<RL	47.959	<RL	3.483	12.643	39.219	531.0
DUPONT	OH191	Ohio	44	10/01/12	13:00	301	64	0.318	54.080	0.088	0.140	4.625	103.320	<RL	<RL	45.093	<RL	3.594	14.116	43.344	558.0
DUPONT	OH191	Ohio	45	10/08/12	13:00	332	73	0.299	57.066	0.088	0.144	5.302	107.751	0.086	<RL	47.697	<RL	3.661	15.341	46.929	574.0
DUPONT	OH191	Ohio	46	10/15/12	13:10	345	78	0.262	57.605	<RL	0.052	4.338	110.815	<RL	<RL	50.126	<RL	3.714	15.951	47.300	596.0
DUPONT	OH191	Ohio	47	10/22/12	12:40	331	77	0.285	58.621	0.074	0.142	4.524	106.094	0.989	<RL	49.535	0.016	3.430	13.726	43.857	572.0
DUPONT	OH191	Ohio	48	10/29/12	12:15	352	69	0.315	60.981	0.012	<RL	4.900	114.190	<RL	<RL	53.892	<RL	3.392	14.551	47.467	601.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
KYGER OVEC	OH260	Ohio	1	12/06/11	9:50			0.106	18.147	0.023	<RL	4.369	53.797	<RL	<RL	13.453	<RL	1.986	8.179	30.104	301.0
KYGER OVEC	OH260	Ohio	1D	12/06/11	9:50			0.100	18.062	0.007	<RL	4.394	53.617	<RL	<RL	14.010	<RL	2.048	8.166	30.025	301.0
KYGER OVEC	OH260	Ohio	2	12/15/11	9:13	168	60	0.102	17.690	0.027	<RL	4.406	68.223	<RL	<RL	15.498	<RL	1.828	8.633	31.095	324.0
KYGER OVEC	OH260	Ohio	3	12/22/11	9:12	164	62	0.110	21.375	0.035	<RL	4.311	66.168	<RL	<RL	15.723	<RL	1.741	9.260	33.266	335.0
KYGER OVEC	OH260	Ohio	4	12/27/11	10:03	160	56	0.085	22.637	0.045	<RL	4.262	56.602	<RL	<RL	15.464	<RL	1.845	8.175	30.629	313.0
KYGER OVEC	OH260	Ohio	5	01/05/12	9:07	174	58	0.093	18.334	0.035	<RL	3.842	77.469	<RL							318.0
KYGER OVEC	OH260	Ohio	6	01/10/12	9:30	177	60	0.098	22.577	0.048	<RL	4.221	63.844	<RL	<RL	17.785	<RL	1.569	9.375	33.390	339.0
KYGER OVEC	OH260	Ohio	7	01/17/12	9:58	192	58	0.097	23.957	0.043	<RL	3.569	65.917	<RL	<RL	17.579	<RL	1.336	9.035	32.743	341.0
KYGER OVEC	OH260	Ohio	8	01/24/12	9:40	211	52	0.099	25.725	0.030	<RL	3.515	58.783	<RL	<RL	18.004	<RL	1.214	7.538	27.795	326.0
KYGER OVEC	OH260	Ohio	9	01/31/12	9:45	194	50	0.119	30.367	0.024	<RL	3.923	47.586	<RL	<RL	17.139	<RL	1.171	6.326	24.504	316.0
KYGER OVEC	OH260	Ohio	10	02/09/12	8:45	197	54	0.113	23.047	0.039	<RL	3.913	57.436	<RL	<RL	14.927	<RL	1.127	7.582	27.213	317.0
KYGER OVEC	OH260	Ohio	11	02/14/12	8:45	211	60	0.116	27.104	0.030	<RL	4.005	64.311	<RL	<RL	19.206	<RL	1.461	9.991	35.129	363.0
KYGER OVEC	OH260	Ohio	12	02/21/12	7:51	239	66	0.115	32.181	0.033	<RL	3.928	75.305	<RL	<RL	24.603	<RL	1.529	11.045	37.384	422.0
KYGER OVEC	OH260	Ohio	13	02/28/12	8:20	277	68	0.138	45.391	0.084	<RL	4.289	87.753	<RL	<RL	34.789	<RL	1.869	12.121	41.631	478.0
KYGER OVEC	OH260	Ohio	14	03/08/12	9:30	181	46	0.117	23.528	0.050	0.055	3.424	53.651	<RL	<RL	17.709	<RL	0.721	7.018	27.627	303.0
KYGER OVEC	OH260	Ohio	15	03/15/12	9:45	169	52	0.132	25.339	0.047	0.374	3.388	55.778	0.858	<RL	18.713	<RL	0.759	8.105	29.120	327.0
KYGER OVEC	OH260	Ohio	16	03/22/12	10:00	184	52	0.152	19.750	0.009	<RL	2.719	47.118	<RL	<RL	15.640	<RL	0.679	7.195	27.373	287.0
KYGER OVEC	OH260	Ohio	17	03/29/12	5:35	208	64														384.0
KYGER OVEC	OH260	Ohio	18	04/03/12	9:00	222	68	0.206	27.824	<RL	0.072	2.958	75.781	<RL	<RL	22.791	<RL	1.953	11.049	38.105	401.0
KYGER OVEC	OH260	Ohio	19	04/12/12	10:00	211	70	0.179	27.156	0.167	<RL	2.874	78.878	<RL	<RL	22.694	<RL	2.023	11.589	38.415	404.0
KYGER OVEC	OH260	Ohio	20	04/17/12	8:45	234	70	0.182	29.527	0.036	0.037	2.483	85.072	<RL	<RL	24.134	<RL	2.017	12.230	39.827	426.0
KYGER OVEC	OH260	Ohio	21	04/24/12	9:45	276	72	0.192	35.515	0.052	0.056	2.650	91.428	<RL	<RL	27.061	0.007	2.048	12.868	41.637	452.0
KYGER OVEC	OH260	Ohio	22	05/01/12	9:00	260	66	0.224	36.667	<RL	<RL	2.802	104.107	<RL	<RL	31.718	0.127	2.311	13.855	43.548	488.0
KYGER OVEC	OH260	Ohio	23	05/10/12	9:30	170	54	0.173	20.829	0.036	0.055	2.629	63.622	<RL	<RL	20.265	<RL	1.933	8.360	30.032	323.0
KYGER OVEC	OH260	Ohio	24	05/16/12	9:45	181	56	0.183	24.465	0.092	0.052	3.456	58.911	<RL	<RL	20.253	<RL	1.939	8.461	30.966	336.0
KYGER OVEC	OH260	Ohio	25	05/22/12	8:30	175	52	0.159	20.852	0.096	0.040	3.295	60.792	0.338	<RL	17.941	<RL	1.792	8.285	28.709	322.0
KYGER OVEC	OH260	Ohio	26	05/29/12	9:15	201	50	0.160	21.318	0.032	0.049	2.874	67.944	<RL	<RL	18.426	<RL	1.856	9.006	29.629	320.0
KYGER OVEC	OH260	Ohio	27	06/07/12	9:45	219	54	0.201	28.228	0.058	0.044	2.719	77.381	0.128	<RL	25.453	0.264	1.987	9.858	30.901	344.0
KYGER OVEC	OH260	Ohio	28	06/13/12	9:10	238	56	0.196	31.628	0.068	0.053	2.613	87.479	<RL	<RL	43.959	1.053	4.336	23.332	64.131	380.0
KYGER OVEC	OH260	Ohio	29	06/19/12	9:00	220	58	0.244	30.919	0.062	0.067	3.139	83.877	0.089	<RL	26.361	0.137	2.231	10.573	32.700	388.0
KYGER OVEC	OH260	Ohio	30	06/25/12	9:45	256	60	0.237	33.731	0.030	0.052	2.624	82.266	<RL	<RL	25.760	<RL	2.050	9.502	28.975	433.0
KYGER OVEC	OH260	Ohio	31	07/05/12	8:30	266	58	0.263	44.120	0.042	0.457	3.228	90.479	<RL	<RL	35.024	0.213	2.517	12.194	36.176	469.0
KYGER OVEC	OH260	Ohio	32	07/10/12	8:30	279	64	0.257	47.828	<RL	0.062	3.234	91.852	0.091	<RL	36.134	0.230	2.729	12.927	38.408	492.0
KYGER OVEC	OH260	Ohio	33	07/17/12	9:00	272	66	0.339	49.984	0.044	0.084	3.432	101.336	<RL	<RL	38.705	0.266	2.992	14.668	41.096	522.0
KYGER OVEC	OH260	Ohio	34	07/23/12	8:15	321	62	0.284	55.865	0.090	0.111	3.489	93.128	<RL	<RL	37.286	0.426	2.947	11.563	37.419	513.0
KYGER OVEC	OH260	Ohio	35	07/31/12	9:00	296	60	0.289	49.605	0.072	0.450	3.633	98.757	0.092	<RL	41.391	<RL	3.105	13.020	38.906	507.0
KYGER OVEC	OH260	Ohio	36	08/07/12	9:00	287	54	0.324	50.475	0.052	0.124	3.870	98.960	<RL	<RL	44.512	0.409	3.247	11.621	38.298	509.0
KYGER OVEC	OH260	Ohio	37	08/14/12	9:05	287	56	0.328	50.075	0.089	0.171	3.527	99.214	0.113	<RL	40.955	0.248	3.357	12.685	39.235	511.0
KYGER OVEC	OH260	Ohio	38	08/21/12	9:10	318	58	0.295	53.649	0.030	0.129	3.251	111.158	<RL	<RL	47.069	0.271	3.402	12.979	41.772	823.0
KYGER OVEC	OH260	Ohio	39	08/28/12	8:35	368	60	0.342	55.532	0.084	0.168	3.256	124.244	<RL	<RL	51.231	0.532	3.593	14.566	42.867	580.0
KYGER OVEC	OH260	Ohio	40	09/04/12	9:00	340	66	0.324	57.403	0.087	0.073	3.146	128.386	<RL	<RL	90.245	<RL	2.570	42.952	64.042	563.0
KYGER OVEC	OH260	Ohio	41	09/11/12	9:20	301	60	0.314	51.037	0.034	0.122	3.059	112.972	<RL	0.028	45.681	<RL	2.791	14.841	42.011	544.0
KYGER OVEC	OH260	Ohio	42	09/18/12	9:05	312	60	0.322	55.115	0.167	0.140	2.958	112.094	<RL	<RL	50.381	<RL	3.426	14.699	40.667	550.0
KYGER OVEC	OH260	Ohio	43	09/25/12	8:45	314	57	0.332	57.419	0.096	0.121	3.527	110.415	2.427	<RL	48.681	<RL	3.348	13.688	38.729	566.0
KYGER OVEC	OH260	Ohio	44	10/02/12	9:00	257	53	0.266	46.718	0.107	0.115	3.778	91.820	<RL	<RL	42.250	<RL	3.293	11.574	35.954	498.0
KYGER OVEC	OH260	Ohio	45	10/10/12	7:30	292	59	0.403	73.390	0.065	0.147	7.923	68.473	2.100	<RL	50.869	<RL	4.966	13.487	53.714	526.0
KYGER OVEC	OH260	Ohio	46	10/16/12	9:00	319	64	0.285	59.407	0.096	0.151	4.855	109.818	<RL	<RL	50.107	<RL	3.655	14.879	44.184	578.0
KYGER OVEC	OH260	Ohio	47	10/23/12	9:05	347	71	0.290	58.029	0.050	0.149	5.206	108.988	1.502	<RL	49.039	<RL	3.782	15.562	47.075	583.0
KYGER OVEC	OH260	Ohio	48	10/30/12	8:30	345	67	0.331	57.623	0.060	0.152	4.711	123.353	<RL	<RL	52.338	0.123	3.572	15.837	47.111	602.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
HUNTINGTON	OH306	Ohio	1	12/05/11	14:00			0.095	14.614	0.017	<RL	3.744	43.014	<RL	<RL	11.133	<RL	1.785	7.312	25.310	255.0
HUNTINGTON	OH306	Ohio	2	12/12/11	16:30			0.071	12.647	0.030	<RL	3.351	36.851	<RL	<RL	10.535	<RL	1.587	6.128	20.973	220.0
HUNTINGTON	OH306	Ohio	3	12/20/11	17:00	150	59	0.099	17.621	0.024	<RL	3.881	59.252	<RL	<RL	13.573	<RL	1.625	9.020	30.016	306.0
HUNTINGTON	OH306	Ohio	4	12/27/11	13:00	126	52	0.091	17.568	0.057	<RL	3.829	49.248	<RL	<RL	12.596	<RL	1.590	7.722	25.788	270.0
HUNTINGTON	OH306	Ohio	5	01/03/12	14:00	170	50	0.089	15.795	0.031	<RL	3.677	65.186	<RL	<RL	13.423	<RL	1.327	7.715	25.729	269.0
HUNTINGTON	OH306	Ohio	6	01/09/12	14:00	150	54	0.082	18.164	0.036	<RL	4.433	54.914	<RL	<RL	14.753	<RL	1.499	8.659	28.379	294.0
HUNTINGTON	OH306	Ohio	8	01/23/12	13:00	147	42	0.078	17.807	0.024	<RL	3.074	42.723	<RL	<RL	12.784	<RL	0.955	6.346	19.505	253.0
HUNTINGTON	OH306	Ohio	9	01/31/12	13:03	167	46	0.097	26.171	0.031	<RL	3.533	44.393	<RL	<RL	15.820	<RL	1.227	6.434	22.864	287.0
HUNTINGTON	OH306	Ohio	10	02/06/12	18:00	150	47	0.091	17.518	0.042	<RL	3.467	46.396	<RL	<RL	13.124	<RL	1.284	7.615	24.626	261.0
HUNTINGTON	OH306	Ohio	11	02/14/12	16:30	185	52	0.098	20.444	0.024	<RL	3.886	56.365	<RL	<RL	16.124	<RL	1.351	9.120	28.596	305.0
HUNTINGTON	OH306	Ohio	12	02/21/12	14:00	177	58	0.096	21.134	0.004	<RL	3.321	59.851	<RL	<RL	18.634	<RL	1.599	9.474	27.880	335.0
HUNTINGTON	OH306	Ohio	13	02/27/12	8:30	185	50	0.092	24.759	0.004	<RL	3.504	53.698	<RL	<RL	20.226	<RL	1.589	8.927	26.360	312.0
HUNTINGTON	OH306	Ohio	14	03/06/12	15:00	133	38	0.078	16.276	0.012	0.067	2.829	40.827	0.309	<RL	12.151	<RL	0.266	4.836	19.403	266.0
HUNTINGTON	OH306	Ohio	15	03/12/12	9:50	136	44	0.092	14.604	0.039	0.050	2.831	44.947	<RL	<RL	12.797	<RL	0.376	7.032	22.202	246.0
HUNTINGTON	OH306	Ohio	16	03/19/12	12:00	159	50	0.108	17.729	0.042	<RL	3.030	51.704	0.089	<RL	15.239	<RL	0.713	8.472	25.368	287.0
HUNTINGTON	OH306	Ohio	17	03/26/12	12:00	165	54	0.101	16.845	0.374	<RL	2.933	49.485	<RL	<RL	14.124	<RL	1.586	8.430	26.709	286.0
HUNTINGTON	OH306	Ohio	18	04/02/12	17:30	180	58	0.153	21.078	0.057	0.792	2.964	61.828	0.445	<RL	18.112	<RL	1.752	9.528	30.984	332.0
HUNTINGTON	OH306	Ohio	20	04/16/12	16:00	194	64	0.146	21.151	0.004	<RL	2.191	68.011	0.368	<RL	19.332	<RL	1.820	10.993	32.433	353.0
HUNTINGTON	OH306	Ohio	21	04/23/12	16:45	205	66	0.195	22.043	0.044	0.041	2.190	73.450	<RL	<RL	21.623	<RL	2.033	11.754	32.339	371.0
HUNTINGTON	OH306	Ohio	22	05/01/12	16:30	148	48	0.128	13.079	<RL	<RL	2.309	53.377	<RL	<RL	14.863	<RL	1.658	8.619	22.396	266.0
HUNTINGTON	OH306	Ohio	23	05/07/12	16:30	170	48	0.125	15.037	0.033	<RL	2.237	50.822	<RL	<RL	13.857	<RL	1.841	8.269	24.390	266.0
HUNTINGTON	OH306	Ohio	24	05/14/12	12:30	176	52	0.167	15.671	0.035	0.039	2.791	67.404	<RL	<RL	18.230	<RL	1.673	9.076	28.283	316.0
HUNTINGTON	OH306	Ohio	26	05/30/12	11:00	171	50	0.137	14.951	0.032	0.056	2.362	56.365	<RL							272.0
HUNTINGTON	OH306	Ohio	28	06/11/12	17:30	193	58	0.160	22.639	0.044	0.036	2.546	72.275	<RL	<RL	22.694	<RL	2.072	10.093	28.099	341.0
HUNTINGTON	OH306	Ohio	30	06/25/12	15:30	213	60	0.173	26.416	0.036	0.044	2.540	78.829	<RL	<RL	25.085	<RL	2.273	10.996	30.310	338.0
HUNTINGTON	OH306	Ohio	31	07/02/12	16:00	219	58	0.210	29.177	0.050	0.065	2.720	72.524	<RL	<RL	25.952	0.035	2.280	11.237	30.149	374.0
HUNTINGTON	OH306	Ohio	32	07/10/12	16:00	251	62	0.224	37.339	<RL	0.044	3.018	85.898	0.313	<RL	32.975	0.151	2.545	12.577	33.750	438.0
HUNTINGTON	OH306	Ohio	33	07/17/12	13:00	238	70	0.213	38.186	0.032	0.047	2.615	84.764	<RL	<RL	32.169	<RL	2.575	12.422	34.098	453.0
HUNTINGTON	OH306	Ohio	35	07/30/12	12:00	251	60	0.243	36.119	0.013	0.076	3.341	82.114	<RL	<RL	32.666	<RL	2.809	12.356	32.449	432.0
HUNTINGTON	OH306	Ohio	36	08/07/12	17:30	224	56	0.241	33.973	0.022	0.073	2.997	77.557	<RL	<RL	31.700	<RL	2.845	11.508	32.691	416.0
HUNTINGTON	OH306	Ohio	38	08/22/12	10:30	264	56	0.282	41.427	0.018	0.145	3.003	89.866	<RL	<RL	36.272	0.120	3.139	12.326	34.972	462.0
HUNTINGTON	OH306	Ohio	40	09/04/12	14:00	272	62	0.298	45.191	0.113	0.148	2.907	106.161	<RL	<RL	72.700	<RL	2.246	29.775	51.200	488.0
HUNTINGTON	OH306	Ohio	41	09/10/12	14:00	294	64	0.270	45.134	0.030	0.106	2.815	111.739	<RL	0.028	48.613	<RL	2.707	14.750	39.195	532.0
HUNTINGTON	OH306	Ohio	42	09/17/12	14:00	252	64	0.268	40.261	0.068	0.118	2.556	96.514	<RL	<RL	40.234	<RL	3.131	14.581	36.485	482.0
HUNTINGTON	OH306	Ohio	43	09/25/12	9:30	256	67	0.229	36.142	0.033	0.092	2.591	90.434	<RL	<RL	38.058	<RL	3.052	14.792	33.734	455.0
HUNTINGTON	OH306	Ohio	44	10/01/12	14:00	268	58	0.250	44.071	0.063	0.113	3.179	101.395	<RL	<RL	42.011	<RL	3.209	14.444	36.589	501.0
HUNTINGTON	OH306	Ohio	45	10/08/12	16:00	254	61	0.218	40.254	0.057	0.095	3.906	82.776	<RL	<RL	38.003	<RL	3.131	12.898	34.193	451.0
HUNTINGTON	OH306	Ohio	46	10/15/12	11:00	248	62	0.214	39.168	0.118	0.104	4.050	90.110	1.006	<RL	37.894	<RL	3.270	13.616	34.954	463.0
HUNTINGTON	OH306	Ohio	47	10/22/12	14:00	285	63	0.241	46.592	0.041	0.120	4.216	95.049	<RL	<RL	40.323	<RL	2.689	14.021	38.021	502.0
HUNTINGTON	OH306	Ohio	48	10/29/12	15:45	301	67	0.336	48.586	0.089	0.123	4.600	98.496	0.698	<RL	42.416	<RL	3.331	14.760	41.582	525.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
BIG SANDY	BS020	Big Sandy	1	12/06/11	9:00			0.082	12.288	0.008	<RL	2.132	137.575	<RL	<RL	23.295	<RL	2.332	21.315	38.376	489.0
BIG SANDY	BS020	Big Sandy	2	12/12/11	10:40			0.066	8.011	0.011	<RL	3.060	102.037	<RL	<RL	14.132	<RL	1.865	15.938	29.805	362.0
BIG SANDY	BS020	Big Sandy	3	12/19/11	15:31	322	90	0.084	13.768	0.015	<RL	2.787	156.971	<RL	<RL	25.478	<RL	2.440	23.429	42.279	530.0
BIG SANDY	BS020	Big Sandy	4	12/27/11	13:48	196	62	0.072	9.546	0.015	1.125	2.586	108.318	<RL	<RL	16.614	<RL	1.818	16.190	30.134	374.0
BIG SANDY	BS020	Big Sandy	5	01/03/12	15:13	308	78	0.077	12.095	0.021	<RL	1.960	165.329	<RL	<RL	24.082	<RL	2.184	20.892	37.618	464.0
BIG SANDY	BS020	Big Sandy	6	01/09/12	10:31	336	96	0.085	15.165	0.030	<RL	2.240	157.120	<RL	<RL	31.849	<RL	2.485	24.063	43.202	552.0
BIG SANDY	BS020	Big Sandy	7	01/16/12	11:47	253	76	0.078	12.951	0.005	<RL	1.891	115.835	<RL	<RL	24.691	<RL	2.006	17.711	33.010	434.0
BIG SANDY	BS020	Big Sandy	8	01/23/12	14:30	179	50	0.079	7.195	<RL	<RL	2.213	34.555	<RL	<RL	11.260	<RL	1.353	10.976	20.662	300.0
BIG SANDY	BS020	Big Sandy	9	01/30/12	14:25	234	64	0.092	9.732	0.016	<RL	2.198	103.212	2.673	<RL	18.427	<RL	1.899	15.867	29.176	385.0
BIG SANDY	BS020	Big Sandy	10	02/06/12	12:00	259	75	0.094	11.031	<RL3	<RL	1.796	118.760	<RL	<RL	23.475	<RL	2.117	18.635	34.486	437.0
BIG SANDY	BS020	Big Sandy	11	02/13/12	13:50	302	82	0.088	14.224	0.018	<RL	2.236	137.454	<RL	<RL	26.978	<RL	2.311	22.072	39.270	493.0
BIG SANDY	BS020	Big Sandy	12	02/20/12	13:47	269	76	0.110	13.276	0.009	<RL	1.932	126.138	<RL	<RL	26.091	<RL	2.430	18.965	32.465	474.0
BIG SANDY	BS020	Big Sandy	13	02/27/12	13:48	236	64	0.081	9.122	0.017	<RL	2.113	107.360	<RL	<RL	18.806	<RL	2.014	17.398	30.518	384.0
BIG SANDY	BS020	Big Sandy	14	03/05/12	11:48	155	44	0.075	19.736	0.007	<RL	2.107	69.593	<RL	<RL	11.032	<RL	0.715	12.703	21.737	270.0
BIG SANDY	BS020	Big Sandy	15	03/12/12	13:00	218	58	0.073	10.062	0.001	<RL	1.946	104.704	<RL	<RL	17.468	<RL	0.842	18.189	28.891	378.0
BIG SANDY	BS020	Big Sandy	16	03/20/12	12:15	254	72	0.215	8.842	0.018	0.064	1.787	118.116	<RL	<RL	21.313	<RL	1.531	21.094	34.334	431.0
BIG SANDY	BS020	Big Sandy	17	03/26/12	14:27	309	88	0.107	10.109	0.051	<RL	1.493	141.560	<RL	<RL	27.124	<RL	2.713	23.014	40.161	502.0
BIG SANDY	BS020	Big Sandy	18	04/02/12	9:30	343	102	0.179	13.073	0.021	<RL	1.461	154.283	<RL	<RL	34.616	<RL	3.052	24.827	44.105	570.0
BIG SANDY	BS020	Big Sandy	19	04/09/12	13:48	199	70	0.114	7.742	0.061	<RL	1.493	95.573	<RL	<RL	20.908	<RL	2.259	15.823	30.458	380.0
BIG SANDY	BS020	Big Sandy	20	04/16/12	12:45	334	106	0.136	13.293	0.013	<RL	1.095	146.850	<RL	<RL	35.497	<RL	2.974	23.795	42.867	555.0
BIG SANDY	BS020	Big Sandy	21	04/23/12	11:55	401	130	0.145	15.320	0.027	0.056	1.303	173.955	<RL	<RL	44.672	0.243	3.507	28.022	49.360	648.0
BIG SANDY	BS020	Big Sandy	22	04/30/12	13:31	262	66	0.116	14.416	<RL	<RL	1.603	108.751	<RL	<RL	24.027	<RL	2.201	17.360	32.701	422.0
BIG SANDY	BS020	Big Sandy	23	05/08/12	9:00	248	78	0.142	9.550	0.017	<RL	1.540	112.965	<RL	<RL	22.740	<RL	2.598	18.825	32.628	426.0
BIG SANDY	BS020	Big Sandy	24	05/14/12	13:00	287	94	0.127	12.613	0.026	0.060	1.238	128.125	<RL	<RL	29.151	<RL	2.832	21.461	38.678	500.0
BIG SANDY	BS020	Big Sandy	25	05/21/12	11:55	328	100	0.160	13.749	0.030	0.066	1.424	141.617	<RL	<RL	32.706	<RL	2.918	23.321	41.344	534.0
BIG SANDY	BS020	Big Sandy	26	05/29/12	11:50	445	138	0.176	18.857	0.035	0.069	1.050	199.558	<RL							702.0
BIG SANDY	BS020	Big Sandy	27	06/04/12	14:41	368	106	0.177	15.667	0.017	0.072	2.210	178.958	<RL	<RL	40.332	<RL	3.693	25.698	45.972	589.0
BIG SANDY	BS020	Big Sandy	28	06/11/12	13:00	459	138	0.158	21.896	0.012	0.089	1.194	211.014	<RL	<RL	51.833	<RL	3.888	31.024	53.694	710.0
BIG SANDY	BS020	Big Sandy	29	06/18/12	13:56	477	146	0.282	26.964	0.022	0.108	0.964	221.281	<RL	<RL	64.390	<RL	4.329	31.682	54.158	770.0
BIG SANDY	BS020	Big Sandy	30	06/26/12	11:17	540	156	0.175	30.932	<RL	0.115	0.878	254.114	<RL	<RL	72.005	<RL	4.566	35.467	58.201	838.0
BIG SANDY	BS020	Big Sandy	31	07/03/12	13:00	486	150	0.204	32.074	0.070	0.161	0.475	206.417	<RL	<RL	70.475	<RL	4.478	32.151	51.890	802.0
BIG SANDY	BS020	Big Sandy	32	07/09/12	16:48	513	160	0.200	26.868	<RL	0.073	1.011	221.227	<RL	<RL	73.306	<RL	4.948	33.892	54.398	821.0
BIG SANDY	BS020	Big Sandy	33	07/16/12	16:42	391	118	0.184	23.277	0.119	0.092	1.403	182.820	<RL	<RL	46.292	<RL	4.102	27.738	47.843	678.0
BIG SANDY	BS020	Big Sandy	34	07/23/12	13:47	387	114	0.209	16.579	0.034	0.071	2.600	173.440	0.070	<RL	17.054	<RL	2.219	10.382	31.366	644.0
BIG SANDY	BS020	Big Sandy	35	07/30/12	14:15	364	108	0.190	15.591	0.013	0.069	2.404	160.076	<RL	<RL	35.202	<RL	3.725	25.953	46.469	583.0
BIG SANDY	BS020	Big Sandy	36	08/07/12	15:47	334	100	0.199	12.546	0.011	<RL	2.240	143.876	<RL	<RL	36.000	<RL	3.694	22.815	43.342	551.0
BIG SANDY	BS020	Big Sandy	37	08/13/12	9:00	393	64	0.295	14.080	0.012	0.087	2.563	174.785	0.129	<RL	36.336	<RL	4.021	28.516	51.502	627.0
BIG SANDY	BS020	Big Sandy	38	08/20/12	11:57	390	110	0.171	18.212	0.029	0.055	2.673	158.455	<RL	<RL	36.248	<RL	4.057	26.912	47.812	610.0
BIG SANDY	BS020	Big Sandy	38	08/20/12	11:57	390		0.181	18.365	0.085	0.069	2.650	158.984	<RL	<RL	36.174	<RL	4.058	26.792	47.719	610.0
BIG SANDY	BS020	Big Sandy	39	08/28/12	10:40	579	136	0.211	21.754	0.014	0.081	1.154	226.205	<RL	0.006	48.823	<RL	4.730	38.444	62.671	776.0
BIG SANDY	BS020	Big Sandy	40	09/03/12	11:48	526	144	0.252	25.016	<RL	0.112	0.587	247.787	<RL	<RL	100.489	<RL	4.161	244.549	102.908	870.0
BIG SANDY	BS020	Big Sandy	41	09/10/12	13:55	459	142	0.221	19.501	0.015	0.096	1.875	209.372	<RL	0.038	56.368	<RL	4.020	32.181	53.593	754.0
BIG SANDY	BS020	Big Sandy	42	09/17/12	11:40	465	136	0.197	23.235	<RL	0.101	1.690	205.286	<RL	<RL	51.189	<RL	4.400	34.016	57.944	747.0
BIG SANDY	BS020	Big Sandy	43	09/24/12	11:47	323	102	0.162	13.905	0.022	0.063	3.116	136.879	<RL	<RL	31.552	<RL	2.938	22.943	44.855	532.0
BIG SANDY	BS020	Big Sandy	44	10/01/12	11:11	366	116	0.145	18.013	<RL	0.089	2.351	171.244	<RL	<RL	41.316	<RL	3.951	29.395	53.049	627.0
BIG SANDY	BS020	Big Sandy	45	10/08/12	13:00	445	135	0.162	19.576	0.023	0.101	1.894	198.042	<RL	<RL	50.033	<RL	4.285	34.169	59.339	723.0
BIG SANDY	BS020	Big Sandy	46	10/16/12	13:59	485	137	0.153	20.639	<RL	0.094	1.547	209.434	0.117	<RL	50.386	<RL	4.314	36.846	61.545	704.0
BIG SANDY	BS020	Big Sandy	47	10/23/12	15:30	496	132	0.154	22.594	0.014	0.097	0.890	213.463	0.691	<RL	52.344	0.153	4.449	36.529	60.504	762.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
CINCINNATI	OH463	Ohio	1	12/05/11	11:20			0.107	13.432	0.016	<RL	4.023	45.079	<RL	<RL	10.359	<RL	2.163	8.608	28.063	272.0
CINCINNATI	OH463	Ohio	2	12/12/11	10:20			0.084	11.999	0.008	<RL	3.307	39.918	<RL	<RL	10.545	<RL	1.761	7.175	22.848	236.0
CINCINNATI	OH463	Ohio	3	12/19/11	11:30	172	69	0.110	16.355	0.018	<RL	4.443	54.252	<RL	<RL	12.689	<RL	1.911	9.509	30.210	309.0
CINCINNATI	OH463	Ohio	4	12/29/11	11:17	150	62	0.105	17.768	0.022	<RL	4.172	54.957	<RL	<RL	13.046	<RL	1.702	9.082	29.590	302.0
CINCINNATI	OH463	Ohio	5	01/04/12	10:37	154	56	0.257	14.709	0.023	<RL	3.847	64.632	1.366	<RL	12.344	<RL	1.527	8.431	27.154	274.0
CINCINNATI	OH463	Ohio	6	01/10/12	14:35	180	64	0.339	17.542	0.036	<RL	4.080	59.277	<RL	<RL	15.542	<RL	1.550	9.811	31.624	318.0
CINCINNATI	OH463	Ohio	7	01/19/12	11:32	177	62	0.094	18.791	0.025	<RL	3.352	51.416	<RL	<RL	14.780	<RL	1.481	9.146	29.395	306.0
CINCINNATI	OH463	Ohio	8	01/25/12	14:47	187	52	0.096	18.920	0.024	<RL	3.351	49.110	<RL	<RL	13.508	<RL	1.196	7.997	24.747	290.0
CINCINNATI	OH463	Ohio	9	01/31/12	10:55	190	54	0.110	30.877	0.025	<RL	3.678	43.371	<RL	<RL	17.495	<RL	1.268	6.771	24.192	314.0
CINCINNATI	OH463	Ohio	10	02/06/12	15:45	161	57	0.104	20.148	0.024	0.161	3.970	45.703	<RL	<RL	13.049	<RL	1.237	7.390	24.481	280.0
CINCINNATI	OH463	Ohio	11	02/13/12	16:37	195	60	0.104	18.768	0.026	<RL	3.727	54.310	<RL	<RL	15.194	<RL	1.517	9.847	29.605	310.0
CINCINNATI	OH463	Ohio	12	02/21/12	13:37	198	66	0.113	24.314	0.027	0.159	4.087	65.225	<RL	<RL	20.373	<RL	1.819	11.584	33.719	363.0
CINCINNATI	OH463	Ohio	13	03/01/12	12:25	198	60	0.105	23.406	0.023	<RL	3.386	57.161	<RL	<RL	17.859	<RL	1.510	9.168	27.066	336.0
CINCINNATI	OH463	Ohio	14	03/07/12	11:33	172	46	0.099	22.312	<RL	0.039	3.136	47.584	<RL	<RL	9.483	<RL	<RL	2.422	13.045	268.0
CINCINNATI	OH463	Ohio	15	03/13/12	11:33	167	48	0.129	17.024	0.019	<RL	3.032	48.841	<RL	<RL	14.163	<RL	0.575	7.958	24.698	271.0
CINCINNATI	OH463	Ohio	16	03/21/12	11:45	172	54	0.106	19.433	0.007	<RL	3.079	52.903	<RL	<RL	15.450	<RL	0.714	9.056	26.774	304.0
CINCINNATI	OH463	Ohio	17	03/28/12	15:10	179	58	0.118	16.107	0.009	<RL	2.874	51.534	0.368	<RL	14.936	<RL	1.777	9.359	27.555	289.0
CINCINNATI	OH463	Ohio	18	04/04/12	16:01	183	68	0.145	20.423	0.013	0.114	3.020	58.089	<RL	<RL	2.498	<RL	<RL	5.633	32.806	337.0
CINCINNATI	OH463	Ohio	19	04/11/12	17:58	195	70	0.142	22.789	<RL	<RL	2.443	74.144	0.413	<RL	20.982	<RL	2.020	12.214	35.611	388.0
CINCINNATI	OH463	Ohio	20	04/18/12	14:43	208	70	0.150	20.850	0.044	0.292	2.366	66.902	0.630	<RL	18.713	<RL	1.912	11.611	32.806	360.0
CINCINNATI	OH463	Ohio	21	04/25/12	11:45	220	78	0.174	23.134	0.045	0.046	1.772	72.250	<RL	<RL	21.116	0.030	2.143	13.171	35.671	401.0
CINCINNATI	OH463	Ohio	22	05/01/12	10:10	189	64	0.123	16.089	0.025	<RL	2.538	61.483	<RL	<RL	17.051	<RL	2.045	10.810	28.177	326.0
CINCINNATI	OH463	Ohio	23	05/10/12	8:00	180	56	0.151	16.843	0.044	0.039	3.163	54.944	<RL	<RL	14.890	<RL	2.111	9.583	27.887	301.0
CINCINNATI	OH463	Ohio	24	05/16/12	11:15	180	62	0.177	16.503	0.052	<RL	3.903	60.528	<RL	<RL	17.622	<RL	2.123	9.609	30.251	324.0
CINCINNATI	OH463	Ohio	25	05/23/12	9:15	165	62	0.152	16.789	0.025	0.067	3.219	53.199	<RL	<RL	15.766	<RL	1.934	9.569	27.767	303.0
CINCINNATI	OH463	Ohio	26	05/30/12	13:00	194	60	0.146	17.325	0.035	0.088	2.790	55.363	<RL	<RL	15.701	<RL	1.992	9.782	28.296	301.0
CINCINNATI	OH463	Ohio	27	06/06/12	9:30	176	60	0.157	17.244	0.028	0.038	2.487	63.116	<RL	<RL	17.550	<RL	2.071	10.158	26.905	305.0
CINCINNATI	OH463	Ohio	28	06/12/12	9:26	192	64	0.178	19.430	0.033	<RL	2.461	67.241	<RL	<RL	19.138	0.049	2.158	10.776	29.613	341.0
CINCINNATI	OH463	Ohio	29	06/19/12	12:30	199	72	0.175	21.724	0.052	0.138	2.082	74.769	0.611	<RL	20.588	0.056	2.249	12.323	31.022	362.0
CINCINNATI	OH463	Ohio	30	06/25/12	11:35	223	70	0.192	27.342	0.045	0.045	2.488	77.349	<RL	<RL	22.791	<RL	2.192	11.282	29.700	393.0
CINCINNATI	OH463	Ohio	31	07/03/12	12:00	228	70	0.196	27.228	0.115	0.068	2.008	73.582	<RL	<RL	25.395	0.194	2.392	12.574	31.918	399.0
CINCINNATI	OH463	Ohio	32	07/09/12	13:40	229	70	0.229	29.786	<RL	0.039	2.106	77.996	<RL	<RL	28.846	0.301	2.559	13.191	32.806	413.0
CINCINNATI	OH463-LDB	Ohio	32	07/09/12	13:40	229		0.220	29.751	<RL	0.039	1.751	78.219	0.085	<RL	20.855	<RL	1.883	8.525	21.321	413.0
CINCINNATI	OH463-RDB	Ohio	32	07/09/12	13:40	229		0.187	29.891	<RL	0.045	1.734	78.473	<RL	<RL	23.120	<RL	2.068	10.065	24.950	413.0
CINCINNATI	OH463	Ohio	33	07/16/12	13:00	205	70	0.281	29.680	0.110	0.050	1.790	77.301	<RL	<RL	28.578	0.235	2.578	13.200	33.137	418.0
CINCINNATI	OH463	Ohio	34	07/24/12	13:30	249	74	0.276	35.442	0.191	0.089	2.576	86.051	0.080	<RL	32.907	0.272	2.844	13.950	36.052	491.0
CINCINNATI	OH463	Ohio	35	07/31/12	13:53	252	66	0.236	34.305	0.055	0.082	2.622	86.170	0.075	<RL	30.970	0.175	3.011	13.899	35.570	453.0
CINCINNATI	OH463	Ohio	36	08/08/12	16:00	242	66	0.257	34.613	0.138	0.131	2.346	76.566	<RL	<RL	30.825	0.211	3.069	12.365	32.790	430.0
CINCINNATI	OH463	Ohio	37	08/13/12	10:36	242	64	0.262	37.299	<RL9	0.059	2.508	83.268	<RL	<RL	33.081	0.324	3.083	12.844	34.425	453.0
CINCINNATI	OH463	Ohio	38	08/20/12	16:20	288	72	0.285	38.249	0.094	0.101	2.327	94.954	0.113	<RL	36.127	0.286	3.400	14.558	37.263	484.0
CINCINNATI	OH463	Ohio	39	08/29/12	11:15	311	72	0.292	34.643	0.138	0.107	2.268	99.204	<RL	<RL	32.461	0.263	3.548	16.556	39.296	480.0
CINCINNATI	OH463	Ohio	40	09/05/12	10:20	255	72	0.255	36.911	0.171	0.140	2.585	96.207	<RL	<RL	55.938	<RL	2.443	41.294	51.767	501.0
CINCINNATI	OH463	Ohio	41	09/13/12	10:45	282	60	0.292	41.179	0.139	0.111	2.638	98.663	<RL	0.027	38.420	<RL	2.856	15.709	39.071	497.0
CINCINNATI	OH463	Ohio	42	09/19/12	10:00	278	72	0.296	44.301	0.266	0.150	2.637	103.961	<RL	<RL	41.851	0.026	3.457	16.019	40.776	520.0
CINCINNATI	OH463	Ohio	43	09/26/12	11:45	335	78	0.307	47.525	0.106	0.135	2.710	122.601	<RL							588.0
CINCINNATI	OH463	Ohio	44	10/03/12	10:00	297	77	0.235	40.074	0.101	0.128	2.531	113.566	<RL	<RL	43.193	<RL	3.512	17.832	41.330	526.0
CINCINNATI	OH463	Ohio	45	10/10/12	11:15	273	72	0.228	39.240	0.051	0.101	3.171	96.849	<RL	<RL	39.204	<RL	3.361	16.061	37.495	493.0
CINCINNATI	OH463	Ohio	46	10/17/12	11:00	286	66	0.257	45.303	0.054	0.109	3.449	101.148	0.880	<RL	42.121	<RL	3.563	15.593	38.416	513.0
CINCINNATI	OH463	Ohio	47	10/24/12	10:45	282	71	0.283	39.138	0.052	0.100	3.982	92.309	1.352	<RL	36.788	<RL	3.483	15.372	38.666	485.0
CINCINNATI	OH463	Ohio	48	10/31/12	17:00	281	74	0.298	41.052	0.047	0.115	4.544	95.817	0.091	<RL	38.488	<RL	3.494	15.724	39.578	493.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

Appendix A: Dissolved Solids Monitoring Results

Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
LOUISVILLE	OH600	Ohio	1																		
LOUISVILLE	OH600	Ohio	2	12/14/11	9:04			0.095	12.085	0.015	<RL	4.010	42.769	<RL	<RL	9.651	<RL	1.817	9.074	29.712	279.0
LOUISVILLE	OH600	Ohio	3	12/19/11	15:30	192	87	0.126	15.369	0.024	<RL	5.325	41.647	0.095	<RL	10.284	<RL	2.108	10.051	34.319	317.0
LOUISVILLE	OH600	Ohio	4	12/27/11	14:15	166	88	0.121	17.294	0.028	<RL	5.041	56.755	<RL	<RL	12.343	<RL	1.839	11.454	37.960	350.0
LOUISVILLE	OH600	Ohio	5	01/03/12	12:44	182	74	0.108	13.858	0.019	<RL	4.471	55.216	<RL	<RL	10.535	<RL	1.531	9.224	32.257	295.0
LOUISVILLE	OH600	Ohio	6	01/09/12	13:17	173	80	0.209	16.685	0.034	<RL	5.035	54.528	<RL	<RL	13.141	<RL	1.699	10.563	35.347	326.0
LOUISVILLE	OH600	Ohio	7	01/17/12	14:10	195	86	0.128	17.614	0.023	<RL	4.532	56.252	<RL	<RL	14.556	<RL	1.588	11.372	38.634	357.0
LOUISVILLE	OH600	Ohio	8	01/23/12	13:15	222	82	0.123	21.058	<RL	<RL	4.360	48.775	<RL	<RL	12.451	<RL	1.154	8.914	30.077	344.0
LOUISVILLE	OH600	Ohio	9	01/30/12	13:44	185	72	0.128	18.143	0.026	<RL	4.350	42.438	<RL	<RL	11.494	<RL	1.254	7.881	28.049	305.0
LOUISVILLE	OH600	Ohio	10	02/06/12	10:36	189	72	0.134	22.407	0.039	<RL	4.758	45.244	<RL	<RL	14.378	<RL	1.546	9.342	32.779	319.0
LOUISVILLE	OH600	Ohio	11	02/13/12	11:02	215	84	0.116	18.230	0.021	<RL	4.431	50.527	<RL	<RL	13.648	<RL	1.572	11.078	38.008	346.0
LOUISVILLE	OH600	Ohio	12	02/20/12	10:52	217	89	0.126	21.176	0.013	<RL	4.748	59.301	<RL	<RL	17.284	<RL	1.893	12.694	39.972	389.0
LOUISVILLE	OH600	Ohio	13	02/27/12	11:26	233	90	0.128	22.136	0.028	<RL	4.256	65.792	<RL	<RL	18.563	<RL	1.848	13.162	40.081	400.0
LOUISVILLE	OH600	Ohio	14	03/05/12	13:33	205	64	0.119	22.653	0.016	<RL	3.177	62.324	0.091	<RL	17.446	<RL	0.660	10.745	32.171	346.0
LOUISVILLE	OH600	Ohio	15	03/12/12	13:15	182	76	0.109	14.738	0.003	0.067	3.314	45.968	1.109	<RL	12.358	<RL	0.609	9.373	33.650	307.0
LOUISVILLE	OH600	Ohio	16	03/19/12	10:40	168	76	0.217	14.447	0.015	0.187	3.141	47.904	<RL	<RL	11.941	<RL	0.757	10.052	33.750	315.0
LOUISVILLE	OH600	Ohio	17	03/26/12	9:31	200	86	0.138	16.440	0.018	0.055	3.053	47.035	0.196	<RL	<RL	<RL	<RL	<RL	<RL	336.0
LOUISVILLE	OH600	Ohio	18	04/02/12	9:11	192	84	0.120	16.294	0.055	0.046	2.432	73.308	<RL	<RL	18.765	0.001	1.424	7.656	28.663	314.0
LOUISVILLE	OH600	Ohio	19	04/09/12	9:55	193	90	0.166	18.719	0.029	<RL	3.413	55.926	0.071	<RL	15.508	<RL	1.914	11.840	38.520	367.0
LOUISVILLE	OH600	Ohio	20	04/16/12	14:19	190	86	0.160	23.425	0.034	<RL	3.107	67.663	<RL	<RL	19.498	<RL	2.038	12.825	39.180	398.0
LOUISVILLE	OH600	Ohio	21	04/23/12	9:30	229	96	0.217	25.771	0.073	0.042	3.537	68.232	<RL	<RL	21.658	0.081	2.286	14.014	41.145	424.0
LOUISVILLE	OH600	Ohio	22	04/30/12	10:58	232	86	0.185	24.736	0.036	0.040	2.653	71.961	<RL	<RL	21.993	0.007	2.318	13.753	38.228	412.0
LOUISVILLE	OH600	Ohio	23	05/08/12	8:02	231	78	0.162	21.335	0.045	<RL	4.494	61.363	<RL	<RL	18.076	<RL	2.347	11.485	35.687	367.0
LOUISVILLE	OH600	Ohio	24	05/14/12	9:20	202	76	0.172	15.732	0.056	<RL	4.160	59.312	0.073	<RL	14.100	<RL	2.262	11.864	34.279	340.0
LOUISVILLE	OH600	Ohio	25	05/21/12	12:58	200	78	0.180	16.298	0.038	0.041	4.231	63.364	0.359	<RL	16.498	<RL	2.214	10.931	34.427	347.0
LOUISVILLE	OH600	Ohio	26	05/29/12	16:00	210	70	0.169	19.111	0.032	<RL	3.739	61.198	<RL	<RL	16.738	<RL	2.137	10.871	31.816	334.0
LOUISVILLE	OH600	Ohio	27	06/04/12	10:04	208	80	0.181	20.249	0.051	<RL	4.372	56.503	0.136	<RL	17.358	0.038	2.355	11.235	33.003	344.0
LOUISVILLE	OH600	Ohio	28	06/11/12	10:00	215	86	0.200	22.567	0.065	<RL	4.221	54.974	0.092	<RL	19.172	<RL	2.365	11.521	34.412	275.0
LOUISVILLE	OH600	Ohio	29	06/20/12	13:39	199	76	0.208	22.480	0.099	0.041	3.754	66.075	0.082	<RL	20.146	<RL	2.263	11.915	32.706	362.0
LOUISVILLE	OH600	Ohio	30	06/25/12	13:17	205	78	0.193	23.507	0.094	<RL	3.733	64.647	<RL	<RL	20.992	<RL	2.319	12.078	32.601	351.0
LOUISVILLE	OH600	Ohio	31	07/02/12	9:28	209	76	0.212	24.994	0.099	0.049	4.316	60.806	<RL	<RL	22.093	0.069	2.382	12.423	33.298	367.0
LOUISVILLE	OH600	Ohio	32	07/09/12	9:12	233	82	0.232	29.743	<RL	0.041	3.969	72.589	<RL	<RL	25.786	0.043	2.689	14.395	36.265	427.0
LOUISVILLE	OH600	Ohio	33	07/16/12	10:00	211	84	0.245	30.252	0.035	<RL	3.352	67.811	<RL	<RL	26.015	0.006	2.703	14.196	35.530	423.0
LOUISVILLE	OH600	Ohio	35	07/30/12	9:00	253	78	0.259	34.490	0.132	0.077	3.261	79.081	0.080	<RL	30.952	0.096	3.018	14.011	37.621	458.0
LOUISVILLE	OH600	Ohio	36	08/06/12	7:44	262	96	0.262	35.262	0.034	0.112	2.696	89.327	<RL	<RL	33.735	0.161	3.069	14.325	37.440	472.0
LOUISVILLE	OH600	Ohio	37	08/13/12	9:05	255	76	0.275	35.003	0.067	0.080	3.184	82.999	0.085	<RL	31.702	0.087	3.348	14.319	37.851	462.0
LOUISVILLE	OH600	Ohio	38	08/20/12	8:50	266	74	0.252	35.366	0.072	0.067	3.395	78.211	<RL	<RL	31.605	0.103	3.398	13.166	36.484	456.0
LOUISVILLE	OH600	Ohio	39	08/27/12	11:15	307	76	0.292	37.795	0.080	0.069	3.414	79.378	0.082	<RL	32.122	0.228	3.600	14.916	38.269	461.0
LOUISVILLE	OH600	Ohio	41	09/11/12	8:58	289	80	0.306	44.789	0.134	0.107	4.122	92.769	0.143	0.027	38.592	<RL	2.933	16.523	41.691	520.0
LOUISVILLE	OH600	Ohio	42	09/17/12	7:25	274	80	0.306	38.385	0.152	0.110	3.737	94.926	<RL	<RL	36.405	<RL	3.627	17.085	41.382	497.0
LOUISVILLE	OH600	Ohio	43	09/24/12	7:47	283	82	0.283	41.241	0.157	0.107	4.173	90.809	0.133	<RL	38.181	<RL	3.464	16.102	42.308	499.0
LOUISVILLE	OH600	Ohio	44	10/01/12	8:50	292	78	0.290	45.316	0.077	0.139	3.942	108.888	<RL	<RL	41.843	<RL	3.576	18.028	43.917	550.0
LOUISVILLE	OH600	Ohio	45	10/08/12	7:53	331	89	0.304	48.989	0.113	0.124	4.457	114.419	0.415	<RL	47.670	<RL	3.944	18.906	47.484	590.0
LOUISVILLE	OH600	Ohio	46	10/15/12	8:09	322	84	0.260	45.568	0.086	0.108	4.288	110.794	0.113	<RL	45.914	<RL	3.699	18.094	44.367	565.0
LOUISVILLE	OH600	Ohio	47	10/23/12	10:23	332	92	0.278	41.658	0.066	0.097	4.705	104.454	1.655	<RL	41.696	<RL	3.759	18.416	44.532	549.0
LOUISVILLE	OH600	Ohio	48	10/29/12	8:00	304	86	0.313	39.295	0.095	0.299	5.892	90.815	0.122	<RL	37.672	<RL	3.550	17.475	41.828	512.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

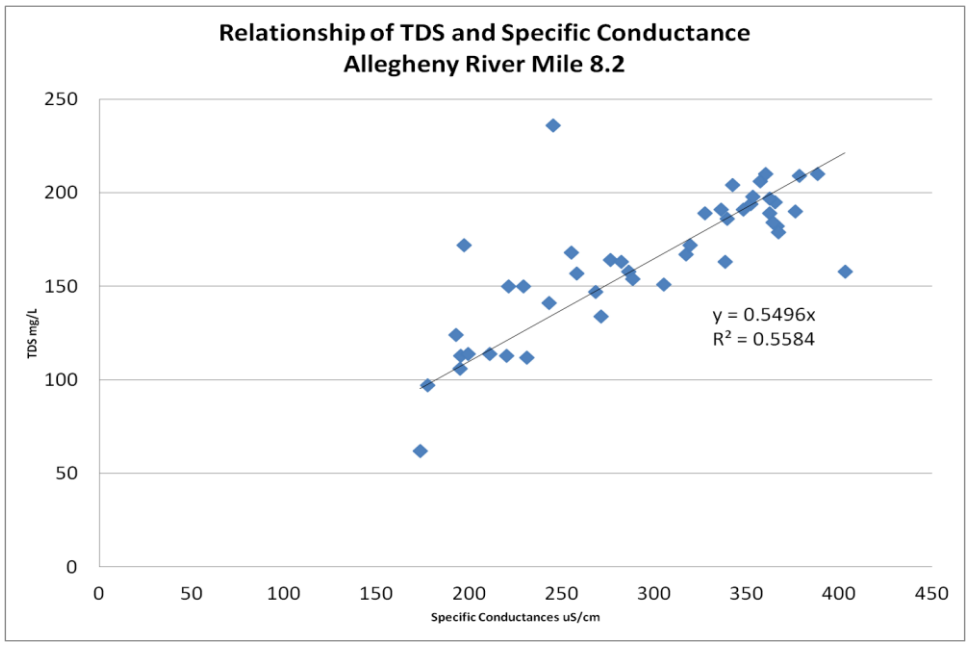
Appendix A: Dissolved Solids Monitoring Results

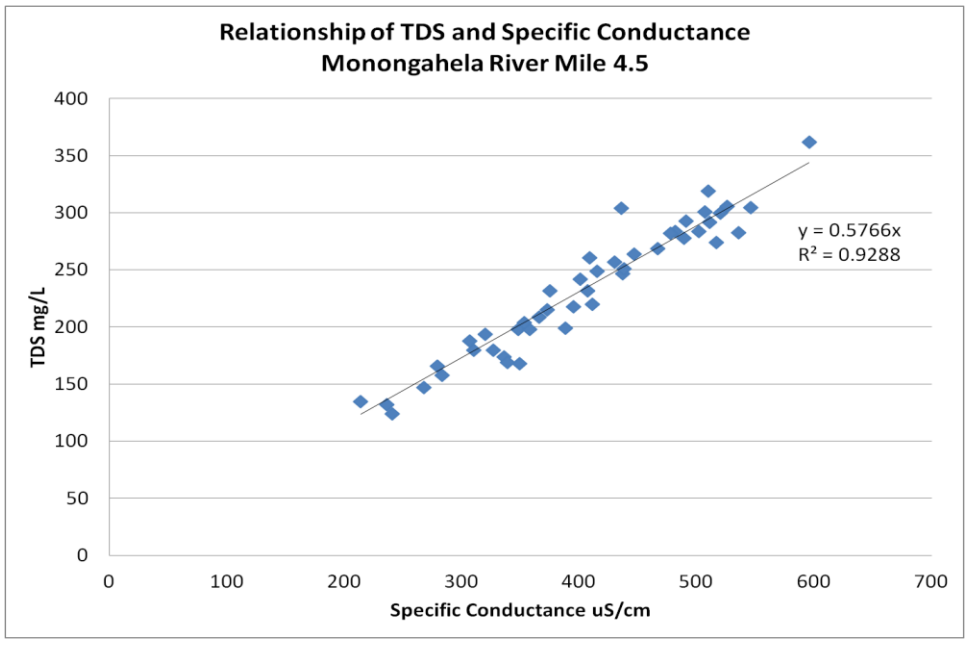
Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
EVANSVILLE	OH792	Ohio	1	12/05/11	7:40			0.125	11.734	0.008	<RL	4.544	39.877	<RL	<RL	9.114	<RL	2.370	8.660	33.854	287.0
EVANSVILLE	OH792	Ohio	2	12/12/11	7:45			0.124	12.858	0.010	<RL	5.158	34.519	<RL	<RL	8.785	<RL	2.402	8.782	34.547	298.0
EVANSVILLE	OH792	Ohio	3	12/19/11	8:25	166	78	0.112	12.778	<RL	<RL	4.106	40.482	<RL	<RL	9.431	<RL	1.969	8.744	31.253	289.0
EVANSVILLE	OH792	Ohio	4	12/27/11	7:50	170	98	0.141	16.568	0.027	<RL	5.726	47.090	<RL	<RL	11.294	<RL	1.965	10.939	39.204	346.0
EVANSVILLE	OH792	Ohio	5	01/03/12	7:50	198	82	0.117	16.086	0.039	<RL	4.450	67.097	<RL	<RL	12.419	<RL	1.879	10.657	36.754	333.0
EVANSVILLE	OH792	Ohio	6	01/09/12	7:50	163	80	0.112	14.398	0.017	<RL	4.577	46.494	<RL	<RL	11.363	<RL	1.621	10.078	34.643	311.0
EVANSVILLE	OH792	Ohio	7	01/17/12	7:50	196	88	0.124	17.841	0.018	<RL	5.211	54.840	<RL	<RL	14.105	<RL	1.616	11.262	38.657	356.0
EVANSVILLE	OH792	Ohio	8	01/23/12	8:30	212	80	0.159	19.614	0.082	<RL	4.246	47.429	<RL	<RL	13.094	<RL	1.598	9.432	33.007	345.0
EVANSVILLE	OH792	Ohio	9	01/30/12	8:15	179	74	0.123	17.425	0.029	<RL	4.042	40.033	<RL	<RL	11.169	<RL	1.281	7.601	28.407	297.0
EVANSVILLE	OH792	Ohio	10	02/06/12	7:50	208	80	0.135	20.214	0.030	<RL	3.601	45.120	<RL	<RL	14.379	<RL	1.727	9.755	35.337	330.0
EVANSVILLE	OH792	Ohio	11	02/13/12	8:00	217	84	0.126	20.220	0.032	<RL	4.678	47.569	<RL	<RL	14.522	<RL	1.699	10.516	27.708	343.0
EVANSVILLE	OH792	Ohio	12	02/26/12	8:00	235	90	0.142	23.441	0.054	<RL	4.996	60.721	<RL							389.0
EVANSVILLE	OH792	Ohio	13	02/27/12	8:00	223	90	0.142	23.004	0.030	<RL	4.641	60.828	0.191	<RL	17.960	<RL	1.835	12.250	38.984	392.0
EVANSVILLE	OH792	Ohio	14	03/05/12	8:20	236	78	0.134	31.113	0.028	0.058	3.918	66.639	0.239	<RL	15.701	<RL	0.559	10.667	30.930	385.0
EVANSVILLE	OH792	Ohio	15	03/13/12	8:40	187	68	0.099	18.483	0.079	<RL	2.768	46.851	0.936	<RL	30.506	<RL	4.848	17.379	28.069	313.0
EVANSVILLE	OH792	Ohio	16	03/19/12	8:00	173	70	0.160	15.966	0.057	0.090	3.636	42.958	0.192	<RL	12.490	<RL	0.824	8.684	31.533	299.0
EVANSVILLE	OH792	Ohio	17	03/26/12	8:00	189	72	0.114	17.318	0.047	<RL	3.615	49.149	0.099	<RL	14.220	<RL	1.796	9.960	33.198	322.0
EVANSVILLE	OH792	Ohio	18	04/06/12	11:20	207	82	0.164	17.254	0.046	<RL	3.676	50.367	<RL	<RL	12.485	<RL	1.635	9.416	30.539	339.0
EVANSVILLE	OH792	Ohio	19	04/09/12	7:30	184	88	0.150	18.656	0.055	0.042	3.972	53.361	<RL	<RL	15.275	<RL	1.949	11.569	37.755	362.0
EVANSVILLE	OH792	Ohio	20	04/16/12	7:50	205	92	0.177	19.575	0.069	<RL	3.538	56.401	<RL	<RL	16.202	<RL	1.913	12.083	39.811	337.0
EVANSVILLE	OH792	Ohio	21	04/23/12	7:30	228	90	0.250	22.441	0.100	0.037	3.058	67.229	<RL	<RL	18.292	<RL	2.092	12.764	39.681	401.0
EVANSVILLE	OH792	Ohio	22	04/30/12	7:45	245	98	0.210	26.089	0.046	0.036	3.662	69.881	<RL	<RL	21.993	<RL	2.290	14.141	41.822	433.0
EVANSVILLE	OH792	Ohio	23	05/07/12	7:50	223	82	0.164	19.361	0.052	<RL	3.144	60.936	<RL	<RL	18.277	<RL	2.216	11.481	34.507	361.0
EVANSVILLE	OH792	Ohio	24	05/14/12	7:50	160	74	0.197	15.899	0.018	<RL	4.521	47.577	0.072	<RL	13.483	<RL	2.336	9.971	32.733	316.0
EVANSVILLE	OH792	Ohio	25	05/22/12	10:50	210	76	0.325	17.850	0.187	<RL	4.769	61.973	<RL	<RL	17.411	0.071	2.379	10.173	36.480	357.0
EVANSVILLE	OH792	Ohio	26	05/29/12	12:55	227	84	0.190	17.010	0.042	<RL	4.229	67.685	<RL	<RL	16.879	<RL	2.323	11.211	38.022	361.0
EVANSVILLE	OH792	Ohio	27	06/04/12	13:35	227	80	0.238	18.698	0.027	<RL	4.556	75.348	<RL							363.0
EVANSVILLE	OH792	Ohio	28	06/12/12	8:00	215	82	0.305	20.550	0.122	<RL	4.002	68.629	<RL	<RL	19.037	0.296	2.505	11.405	35.847	336.0
EVANSVILLE	OH792	Ohio	29	06/18/12	7:45	197	90	0.218	20.884	0.128	0.116	4.009	58.916	0.075	<RL	18.208	<RL	2.456	11.734	36.028	361.0
EVANSVILLE	OH792	Ohio	30	06/25/12	7:40	201	90	0.208	21.316	0.055	<RL	3.300	58.914	<RL	<RL	17.762	<RL	2.302	11.678	35.023	347.0
EVANSVILLE	OH792	Ohio	31	07/09/12	7:00	213	90	0.314	23.992	<RL	0.040	4.004	56.577	<RL	<RL	20.703	0.034	2.549	12.257	36.453	386.0
EVANSVILLE	OH792	Ohio	32	07/09/12	7:46	222	88	0.212	22.645	<RL	<RL	3.320	54.790	0.072	<RL	19.599	<RL	2.543	11.945	35.922	337.0
EVANSVILLE	OH792	Ohio	33	07/16/12	7:40	190	84	0.225	24.028	0.039	0.217	2.996	60.180	0.220	<RL	20.165	<RL	2.368	11.743	34.926	386.0
EVANSVILLE	OH792	Ohio	34	07/23/12	7:40	231	86	0.329	27.533	0.149	0.057	3.609	66.452	<RL	<RL	35.136	0.393	3.039	10.809	36.590	403.0
EVANSVILLE	OH792	Ohio	35	07/30/12	7:30	249	86	0.291	33.238	0.081	0.077	3.576	71.391	0.186	<RL	27.900	<RL	2.899	14.519	38.287	446.0
EVANSVILLE	OH792	Ohio	36	08/06/12	7:30	263	88	0.310	33.462	0.075	0.063	2.871	82.724	0.107	<RL	32.397	<RL	3.093	15.346	39.095	470.0
EVANSVILLE	OH792	Ohio	37	08/13/12	7:50	249	84	0.268	33.932	0.046	0.079	2.956	79.520	<RL	<RL	31.466	0.123	3.213	14.204	39.146	465.0
EVANSVILLE	OH792	Ohio	38	08/20/12	7:50	297	96	0.295	37.062	0.058	0.088	3.010	83.581	<RL	<RL	33.747	<RL	3.420	14.609	42.175	447.0
EVANSVILLE	OH792	Ohio	39	08/27/12	7:45	329	90	0.328	37.609	0.056	0.089	2.430	88.240	<RL	<RL	34.495	<RL	3.523	15.586	42.739	495.0
EVANSVILLE	OH792	Ohio	40	09/08/12	6:45	259	86	0.298	37.441	0.075	0.075	3.589	91.000	<RL	0.025	34.132	<RL	3.027	16.135	43.490	497.0
EVANSVILLE	OH792	Ohio	41	09/10/12	7:30	243	84	0.292	36.993	0.093	0.071	3.776	89.589	<RL	0.025	33.309	0	2.842	15.346	26.904	499.0
EVANSVILLE	OH792	Ohio	42	09/17/12	7:35	262	88	0.295	36.155	0.094	0.085	3.659	87.008	<RL	<RL	33.426	<RL	3.658	15.580	44.135	489.0
EVANSVILLE	OH792	Ohio	43	09/26/12	9:30	267	84	0.326	39.979	<RL	0.106	4.079	87.326	<RL	<RL	35.822	<RL	3.463	15.637	42.843	493.0
EVANSVILLE	OH792	Ohio	44	10/02/12	8:30	283	85	0.287	42.200	<RL	0.107	5.016	95.404	2.112	<RL	38.393	<RL	3.827	16.785	43.249	511.0
EVANSVILLE	OH792	Ohio	45	10/08/12	7:40	278	82	0.272	39.987	0.075	0.104	5.171	91.711	0.353	<RL	36.907	<RL	3.593	16.298	44.801	511.0
EVANSVILLE	OH792	Ohio	46	10/15/12	8:20	325	93	0.284	38.315	0.067	0.104	4.389	103.422	0.091	<RL	35.705	<RL	3.822	18.334	47.558	542.0
EVANSVILLE	OH792	Ohio	47	10/22/12	8:15	325	94	0.280	38.358	0.069	0.120	4.525	107.259	1.549	<RL	36.330	<RL	3.755	18.379	51.649	552.0
EVANSVILLE	OH792	Ohio	48	10/29/12	7:45	341	91	0.348	50.439	0.110	0.126	5.092	114.345	<RL	<RL	44.938	<RL	3.556	17.559	45.637	599.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

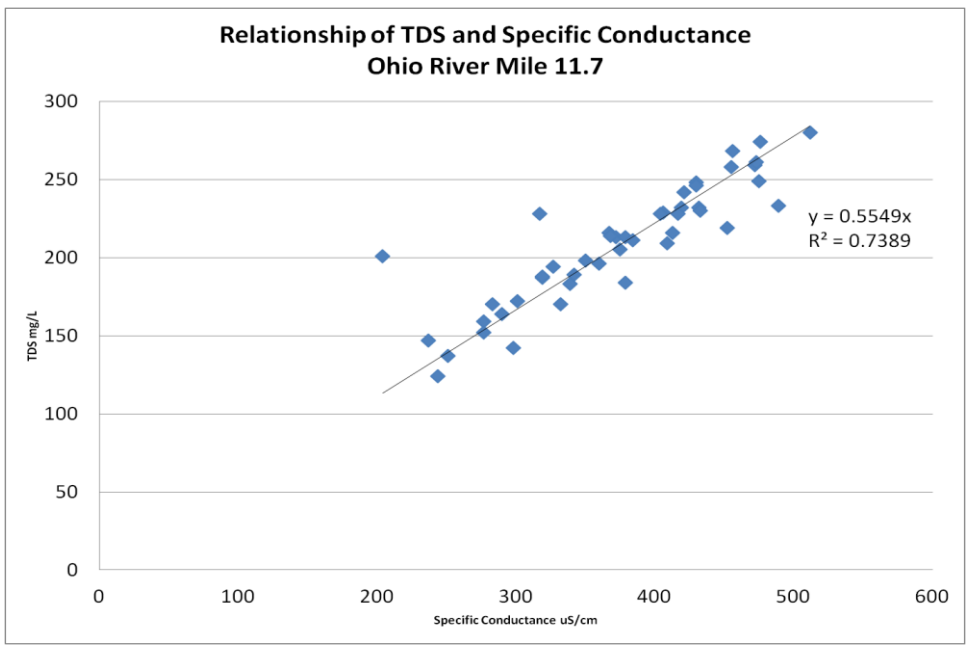
Appendix A: Dissolved Solids Monitoring Results

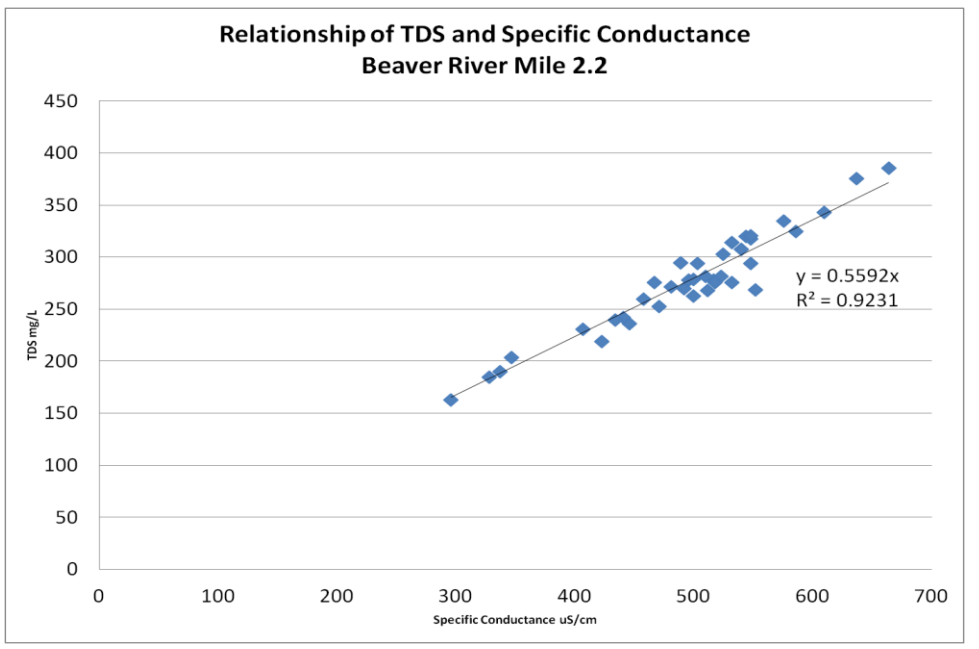
Sampling Location	Sample ID	River	Week #	Sample Date	Sample Time	TDS mg/L	HCO3-* mg/L	Fl- mg/L	Cl- mg/L	NO2- mg/L	Br- mg/L	NO3-- mg/L	SO4-- mg/L	PO4-- mg/L	Li mg/L	Na+ mg/L	NH3+ mg/L	K+ mg/L	Mg++ mg/L	Ca++ mg/L	Sp. cond us/Cm
CAIRO	OH978	Ohio	1	12/06/11	8:15			0.118	11.702	0.024	<RL	4.707	37.683	<RL	<RL	8.582	<RL	2.617	7.862	31.829	274.0
CAIRO	OH978	Ohio	2	12/12/11	8:15			0.127	11.519	0.025	<RL	5.584	35.600	<RL	<RL	8.013	<RL	2.758	8.308	32.275	277.0
CAIRO	OH978	Ohio	3	12/19/11	10:00	142	84	0.118	15.019	0.022	<RL	6.356	37.770	<RL	<RL	9.025	<RL	2.638	9.528	33.927	307.0
CAIRO	OH978	Ohio	4	12/27/11	7:30	148	94	0.132	17.581	0.036	<RL	7.696	39.250	<RL	<RL	9.598	<RL	2.627	10.824	38.474	338.0
CAIRO	OH978	Ohio	5	01/03/12	8:00	212	100	0.127	16.740	0.054	<RL	6.707	63.237	<RL	<RL	12.733	<RL	2.210	12.341	42.813	368.0
CAIRO	OH978	Ohio	6	01/09/12	7:50	196	104	0.121	16.959	0.054	<RL	7.470	44.017	<RL	<RL	11.998	<RL	2.071	12.062	41.713	361.0
CAIRO	OH978	Ohio	7	01/16/12	8:30	216	106	0.108	17.301	0.029	0.282	6.926	50.169	<RL	<RL	12.943	<RL	1.887	12.579	42.464	375.0
CAIRO	OH978	Ohio	8	01/23/12	8:00	231	94	0.149	18.791	0.025	<RL	5.596	48.890	<RL	<RL	12.521	<RL	1.695	10.315	36.072	381.0
CAIRO	OH978	Ohio	9	01/30/12	7:45	206	86	0.131	20.639	0.031	0.135	5.423	41.191	<RL	<RL	14.277	<RL	1.814	10.026	36.369	340.0
CAIRO	OH978	Ohio	10	02/06/12	8:15	199	84	0.135	19.749	0.032	<RL	7.398	37.699	<RL	<RL	12.502	<RL	1.750	9.557	34.138	329.0
CAIRO	OH978	Ohio	11	02/13/12	8:30	252	104	0.142	21.336	0.035	<RL	7.479	43.292	<RL	<RL	14.186	<RL	2.009	12.348	42.450	379.0
CAIRO	OH978	Ohio	12	02/20/12	10:00	225	106	0.123	23.772	0.106	<RL	7.244	48.738	<RL	<RL	15.899	<RL	2.070	13.578	45.015	417.0
CAIRO	OH978	Ohio	13	02/27/12	7:20	237	112	0.139	22.290	0.036	<RL	6.526	56.842	<RL	<RL	18.036	<RL	2.050	14.296	45.522	412.0
CAIRO	OH978	Ohio	14	03/05/12	7:30	248	102	0.203	25.055	0.057	<RL	5.743	65.713	1.053	<RL	19.341	<RL	1.172	16.772	44.702	433.0
CAIRO	OH978	Ohio	15	03/12/12	7:50	200	74	0.106	472.425	<RL	0.294	4.297	47.330	0.137	<RL	16.191	<RL	0.833	10.115	32.683	319.0
CAIRO	OH978	Ohio	16	03/19/12	8:00	195	86	0.110	16.718	0.013	<RL	4.606	45.840	0.074	<RL	13.208	<RL	0.915	10.695	36.489	336.0
CAIRO	OH978	Ohio	17	03/26/12	8:00	204	86	0.135	16.130	0.028	<RL	3.948	46.677	<RL	<RL	12.933	<RL	1.824	10.594	36.623	339.0
CAIRO	OH978	Ohio	18	04/02/12	7:30	197	94	0.158	19.232	0.061	<RL	3.804	48.725	<RL	<RL	14.988	<RL	2.016	11.771	37.960	364.0
CAIRO	OH978	Ohio	19	04/09/12	7:30	183	100	0.209	18.487	0.016	0.382	4.507	47.485	<RL	<RL	14.516	<RL	2.087	12.148	39.283	369.0
CAIRO	OH978	Ohio	20	04/16/12	8:00	200	100	0.158	17.159	0.038	0.065	3.519	44.943	<RL	<RL	<RL	<RL	<RL	<RL	<RL	355.0
CAIRO	OH978	Ohio	21	04/23/12	19:30	225	102	0.199	20.395	0.063	<RL	2.674	52.278	<RL	<RL	16.111	<RL	2.010	13.343	39.421	380.0
CAIRO	OH978	Ohio	22	04/30/12	7:40	228	102	0.162	22.674	<RL	<RL	3.741	48.827	<RL	<RL	15.946	<RL	1.997	12.698	41.812	388.0
CAIRO	OH978	Ohio	23	05/07/12	8:14	253	96	0.214	25.892	0.060	0.044	3.433	68.014	<RL	<RL	22.228	0.081	2.374	14.895	40.702	421.0
CAIRO	OH978	Ohio	24	05/14/12	9:30	211	86	0.185	21.201	0.038	0.038	6.549	58.403	0.112	<RL	17.448	<RL	2.556	12.141	38.232	379.0
CAIRO	OH978	Ohio	25	05/21/12	8:00	201	84	0.184	16.733	0.049	0.139	6.162	52.618	0.148	<RL	13.687	<RL	2.397	11.501	36.871	350.0
CAIRO	OH978	Ohio	26	05/29/12	7:30	220	88	0.161	20.692	<RL	<RL	5.272	54.668	<RL							360.0
CAIRO	OH978	Ohio	27	06/04/12	11:45	210	90	0.164	21.869	0.022	0.047	3.868	52.343	<RL	<RL	16.334	<RL	2.383	11.734	35.810	351.0
CAIRO	OH978	Ohio	28	06/11/12	7:30	194	82	0.160	17.520	0.052	<RL	2.704	52.895	<RL	<RL	15.815	0.053	2.226	10.614	32.537	324.0
CAIRO	OH978	Ohio	29	06/18/12	7:30	158	80	0.198	20.006	0.063	0.072	2.520	45.745	<RL	<RL	14.773	<RL	1.978	9.321	32.888	316.0
CAIRO	OH978	Ohio	30	06/25/12	8:00	190	82	0.163	20.035	0.002	<RL	2.333	46.127	<RL	<RL	13.777	<RL	1.792	8.511	26.892	335.0
CAIRO	OH978	Ohio	31	07/09/12	7:15	186	86	0.187	21.684	<RL	<RL	1.242	39.753	<RL	<RL	15.538	<RL	2.128	10.071	34.791	335.0
CAIRO	OH978	Ohio	32	07/11/12	8:00	174		0.136	23.675	<RL	<RL	1.241	39.753	<RL	<RL	16.572	0.052	2.166	10.923	29.517	323.0
CAIRO	OH978	Ohio	33	07/16/12	8:09	154	82	0.182	23.196	0.024	<RL	2.127	39.828	<RL	<RL	16.339	<RL	2.116	10.428	31.003	332.0
CAIRO	OH978	Ohio	34	07/23/12	7:30	174	80	0.184	24.808	0.030	<RL	2.097	36.638	<RL	<RL	50.181	0.944	5.160	22.597	60.286	331.0
CAIRO	OH978	Ohio	35	07/30/12	8:00	204	94	0.196	26.638	0.116	0.041	2.026	42.982	<RL	<RL	19.315	<RL	2.336	11.481	35.996	371.0
CAIRO	OH978	Ohio	36	08/06/12	7:30	213	88	0.206	26.686	0.018	0.044	2.660	51.723	<RL	<RL	4.926	<RL	0.295	3.079	9.589	388.0
CAIRO	OH978	Ohio	37	08/13/12	7:30	177	74	0.227	26.433	0.051	<RL	1.299	42.998	0.108	<RL	21.303	0.044	2.470	10.277	20.563	340.0
CAIRO	OH978	Ohio	38	08/20/12	7:30	209	76	0.152	27.849	0.004	0.059	1.859	43.250	<RL	<RL	20.076	<RL	2.371	9.835	29.643	346.0
CAIRO	OH978	Ohio	40	09/04/12	8:50	161	76	0.217	25.877	0.082	0.090	1.356	42.790	0.503	<RL	29.352	<RL	1.727	3.813	36.623	306.0
CAIRO	OH978	Ohio	41	09/10/12	7:30	204	32	0.235	27.682	0.085	0.095	0.864	50.624	<RL	0.021	23.721	<RL	2.098	12.189	33.554	370.0
CAIRO	OH978	Ohio	42	09/17/12	8:30	183	76	0.207	25.281	0.059	0.079	1.400	49.346	0	<RL	22.488	<RL	2.798	11.222	31.724	349.0
CAIRO	OH978	Ohio	43	09/24/12	7:40	179	80	0.225	24.396	0.128	0.194	2.011	49.081	0	<RL	22.223	<RL	2.788	10.964	32.113	359.0
CAIRO	OH978	Ohio	44	10/01/12	7:10	210	80	0.157	33.437	0.163	0.100	2.900	52.973	0	<RL	25.076	<RL	3.356	11.894	37.074	406.0
CAIRO	OH978	Ohio	48	10/19/12	7:15	203	82	0.146	26.004	0.028	0.052	2.178	46.776	0	<RL	21.956	<RL	2.686	11.100	33.972	378.0
QUANT MAX								**20.1**	**100**	**102**	**100**	**100**	**100**	**199**	**50**	**201**	**250**	**502**	**251**	**499**	
QUANT MAX								**4=EST**	**20=EST**	**20 EST**	**20=EST**	**20=EST**	**20=EST**	**40=EST**	**10.1**	**40.4**	**50.6**	**100.6**	**50.4**	**100.2**	**ORS LAB**
MIN QUAN LVL TO 3/5/12								**0.02**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	
MIN QUAN LVL FROM 3/5/12								**0.007**	**0.035**	**0.036**	**0.035**	**0.035**	**0.035**	**0.07**	**0.05**	**0.2**	**0.25**	**0.5**	**0.25**	**0.5**	**NA**
MIN QUAN LIMIT 09/04/12:								**0.008**	**0.04**	**0.041**	**0.04**	**0.04**	**0.04**	**0.08**							

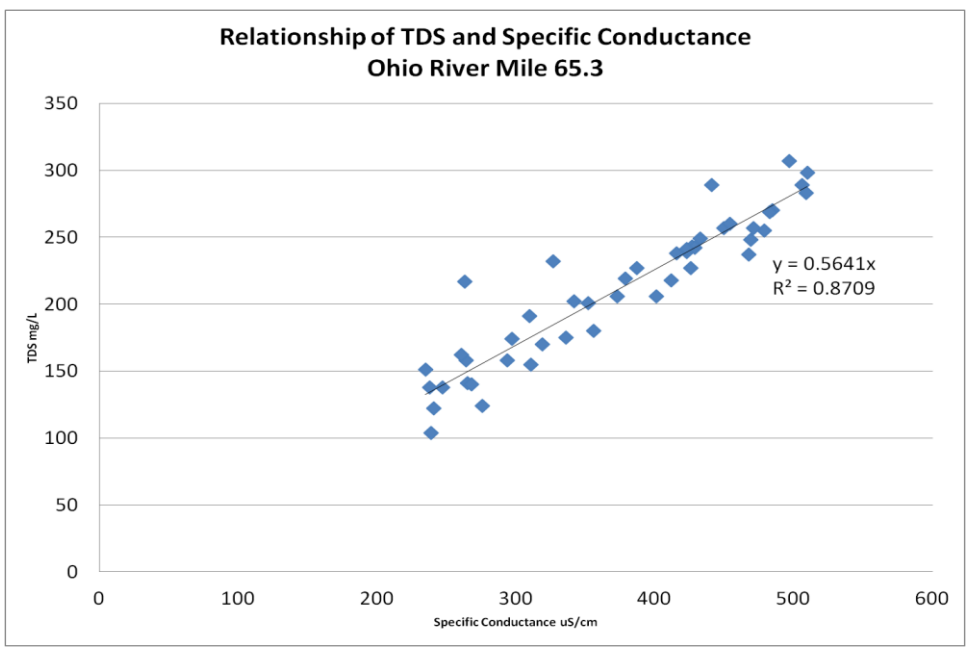
Appendix B: Comparison of TDS and Specific Conductance

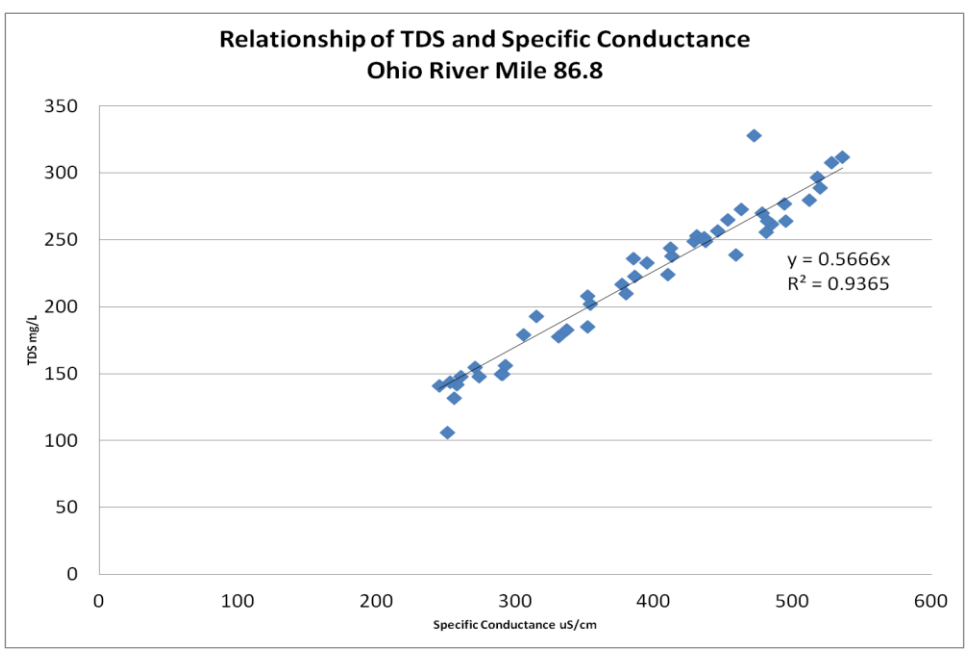


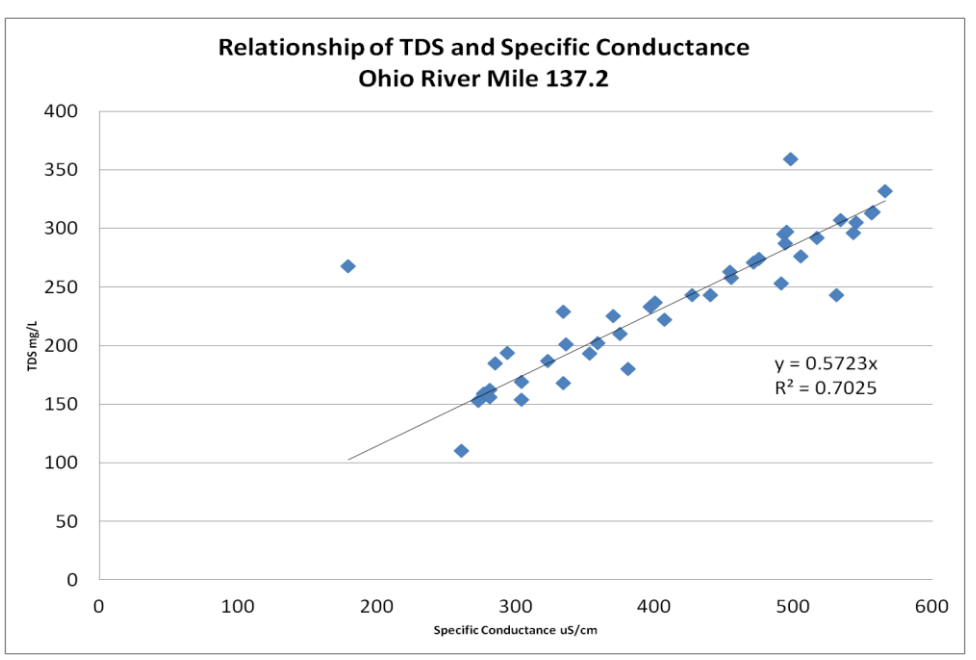


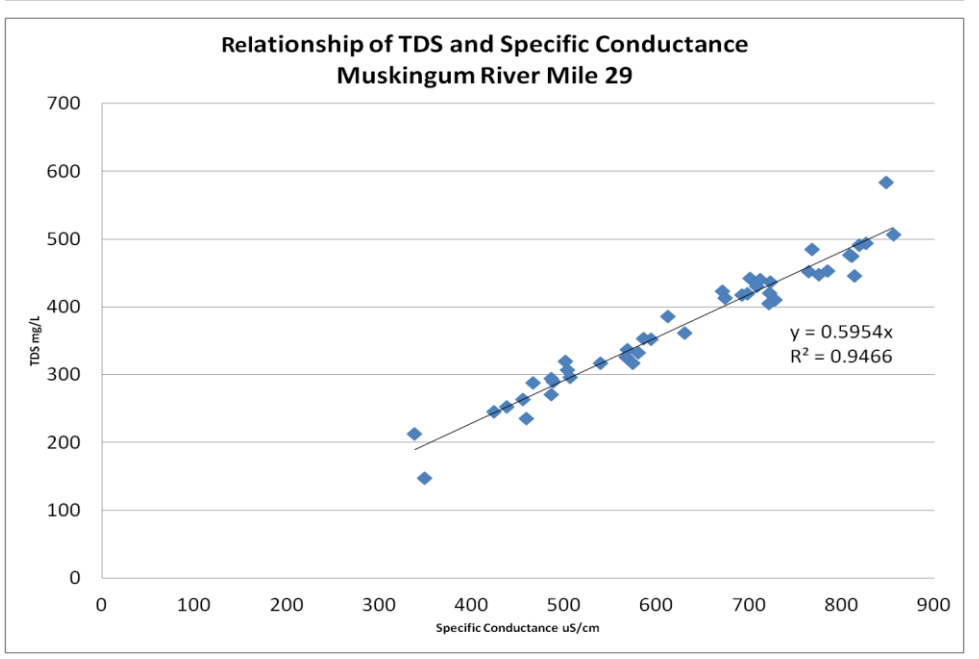




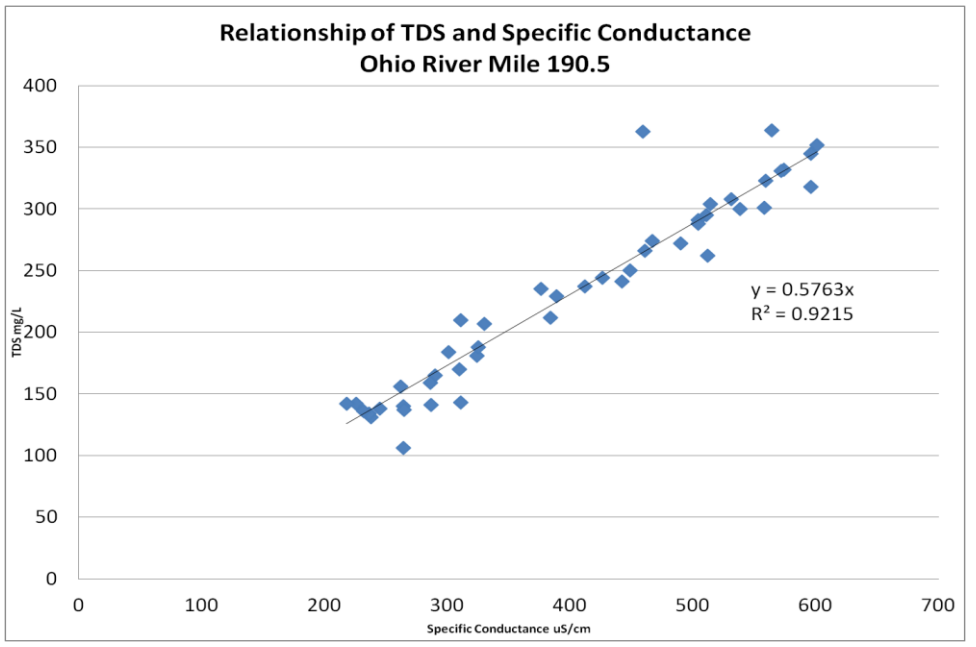


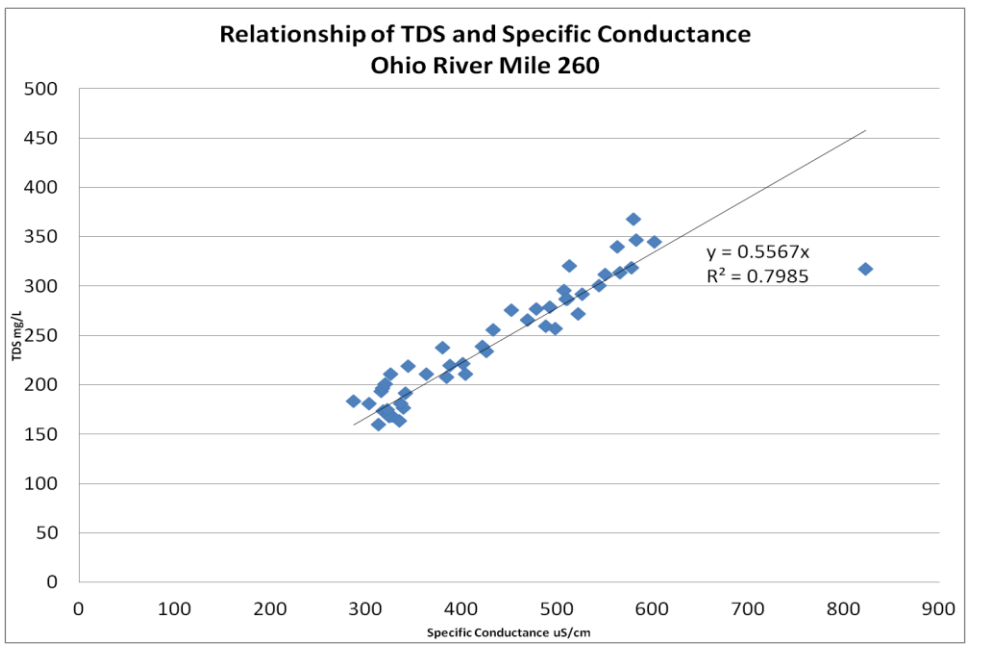


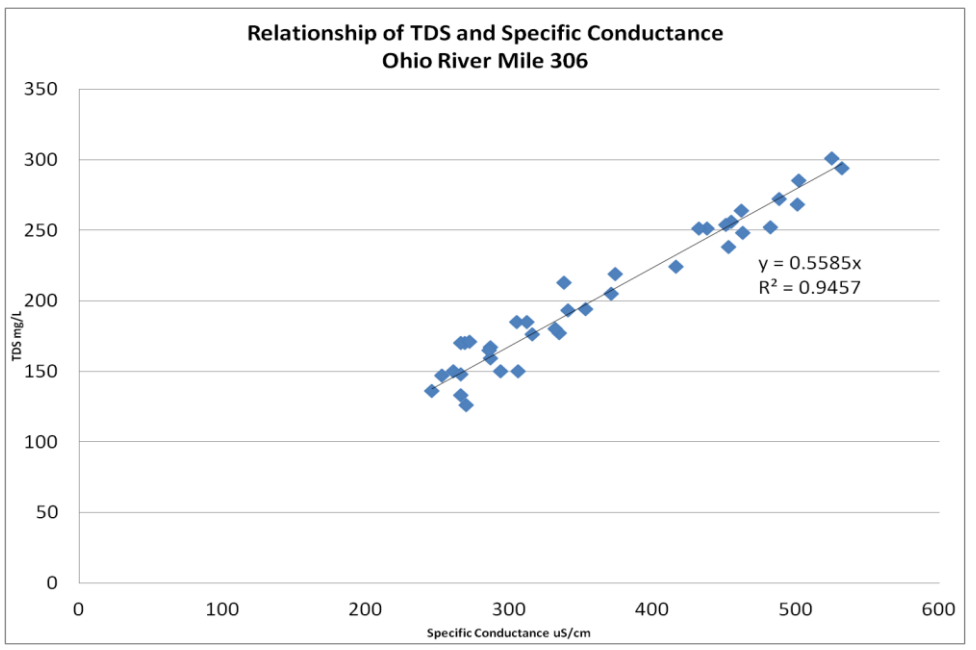


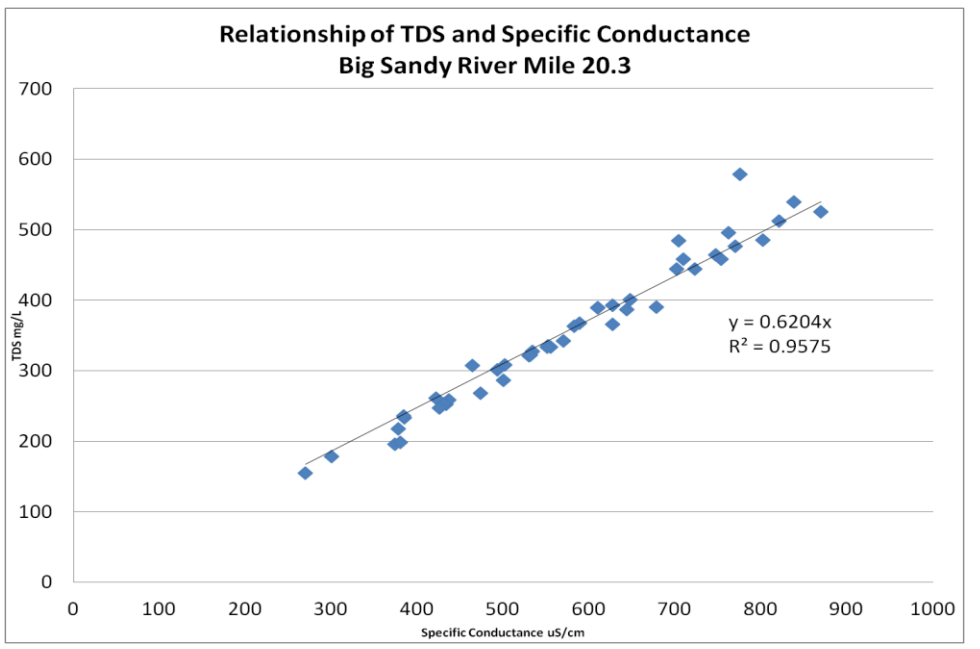


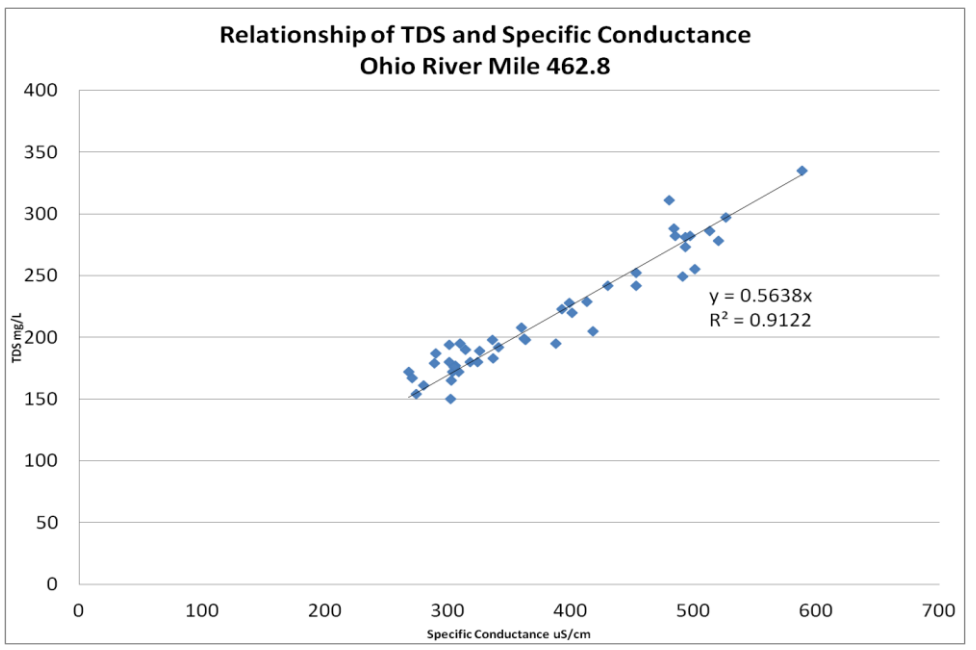
Appendix B: Comparison of TDS and Specific Conductance

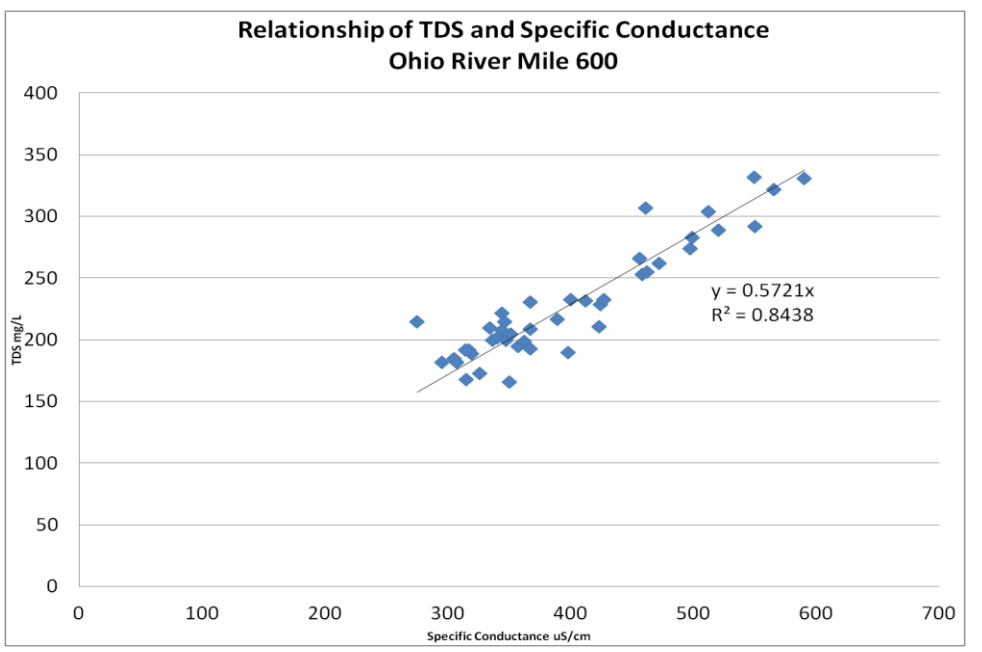


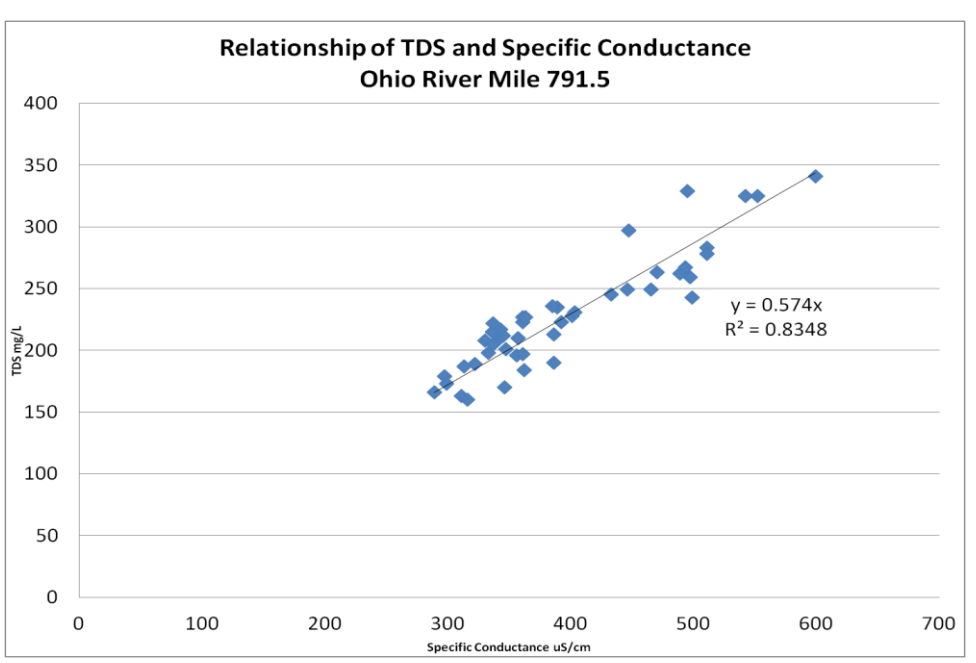


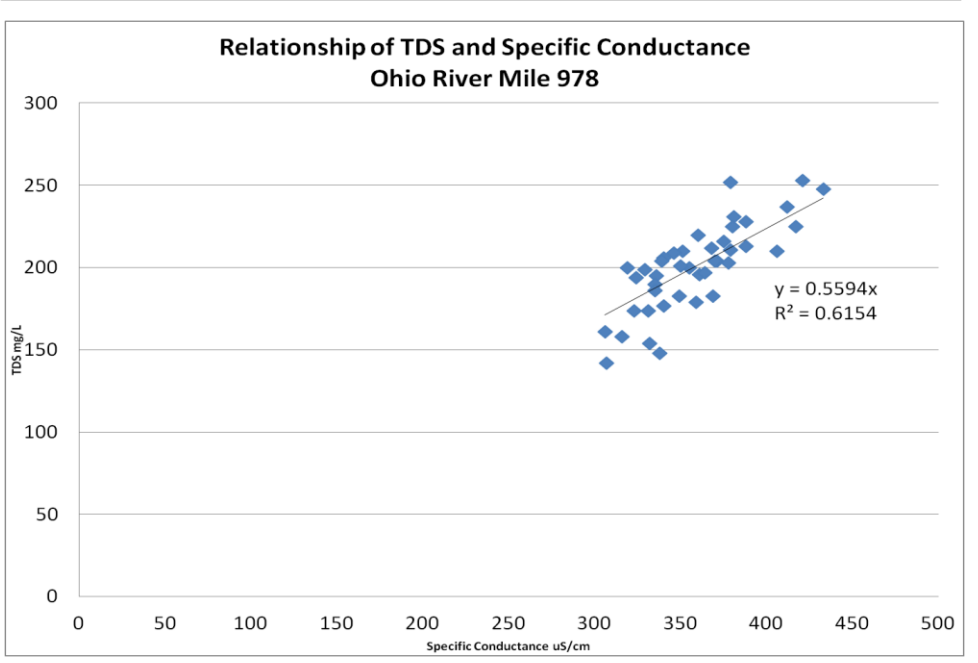












Appendix B: Comparison of TDS and Specific Conductance