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Missouri River Commercial Dredging Final EIS

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Appendix A Geomorphic Analyses Technical Details

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Abbreviations & Acronyms

ADCP	Acoustic Doppler current profiler
AMLE	Adjusted Maximum Likelihood Estimation
BSNP	Missouri River Bank Stabilization and Navigation Project
cfs	cubic feet per second
CRP	Construction Reference Plane
D_{10}	the particle size where 10 percent of the sediment is finer than the D_{10} particle size
EIS	environmental impact statement
LOADEST	Load Estimator
HBED	Hydroacoustic Bed Elevation Data
LOMR	lower Missouri River
MEP	modified Einstein procedure
mg/l	milligrams per liter
mm	millimeters
RM	river mile
Ro	Rouse number
SEMEP	Series Expansion of the Modified Einstein Procedure
SEP	standard error of prediction
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

A.1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) has received permit applications from eight companies to dredge sand and gravel from selected locations between river mile (RM) 0.0 and RM 447.7 on the lower Missouri River (LOMR) for commercial uses. As part of its review of the permit applications, the USACE is preparing an environmental impact statement (EIS). The EIS examines the potential environmental impacts of the proposed dredging activities and any related actions.

The USACE has previously found that the river bed has lowered along significant portions of the LOMR because of river bed degradation, a geomorphic process (USACE 2009). Among the important secondary impacts of river bed degradation are effects on infrastructure and flood control structures on the LOMR.

This appendix describes the data sources and methods used to analyze potential impacts of dredging on river bed degradation. This includes the analysis performed to estimate bed material load as a component of the sediment budget, the analysis of hydroacoustic bed elevation data, and an analysis to determine whether segments at three gage locations were in equilibrium. The data and details in this appendix support the geomorphic descriptions and analyses in Sections 3.4 and 4.2 of the EIS.

The bed material load is composed of sediment very similar in size to the sediment removed from the LOMR by commercial dredging. Bed material load is composed of sediment from the river bed that moves along the river bed as bed load and in the water column as suspended sediment. The portion of the bed material load transported as bed load versus the amount transported in suspension depends primarily on the velocity of the water flowing in the river. Because the bed material load is composed of the same material as the river bed, understanding this aspect of the sediment budget is key to understanding why some segments of the river are degrading and others are aggrading.

Because of its particle size, some portion of the suspended sediment is always transported in suspension (the wash load) versus being transported as part of the bed material load. Determining the boundary between when particles will be transported solely as wash load and when they will be transported as part of the bed material load is an important factor in the sediment budget analysis (see Figure A-1 and Section A.2 below for details). As discussed below, the majority of the Missouri River's sediment supply is clay and silt-size wash load that is transported in continuous suspension and is not available as a sediment supply for maintaining the river bed or for removal by dredging.

The amount of sediment moving as bed load is difficult to measure. Little bed load data are available for the LOMR, although it is known that migrating dunes on the river bed transport a significant amount of sediment (Gaeuman and Jacobson 2007). In the absence of adequate data regarding bed load transport, equations based on flow, channel geometry, and other variables are typically used to estimate bed material load.

More data are available regarding suspended sediment. U.S. Geological Survey (USGS) gages at Nebraska City (RM 562.6), St. Joseph (RM 448.2), Kansas City (RM 366.1), and Hermann (RM 97.9) have recorded suspended sediment data since the 1940s. The most up-to-date data from the USGS (unpublished) were used to estimate bed material loads in this analysis.

One previous study includes bed material load estimates on the LOMR. It was prepared in 1999 as part of a USACE dredging project to build the L-385 levee (West Consultants 1999). It used methods similar to this analysis and yielded similar results for a reach of the river between St. Joseph and Kansas City (see Section A.5.2).

It should be noted that the estimates of bed material load and the sediment transport equations used in this analysis simplify the complex dynamics of sediment transport on the LOMR. A one-dimensional model of the river was used, which averages cross sections and flow rates. This is appropriate for answering broad questions regarding bed stability, sediment transport, and water surface elevations at the project-area scale. It is not, however, sufficiently detailed to describe or estimate change occurring at the local level in terms of geomorphology or aquatic habitat.

A.1.1 Organization of the Appendix

This appendix is divided into the following sections:

- Particle Size – Section A.2 analyzes particle sizes in the river bed and in suspension to determine how sediment of different sizes moves in the LOMR system. The delineation between sediment that occurs only in suspension (wash load) versus sediment that interacts with the bed (bed material load) is important for estimating bed material loads.
- Sediment Loads – Section A.3 reviews the available sediment load data. Most of the available data are for suspended sediment, which is composed of wash load and a portion of the bed material load. The amount of bed material in suspension is used by some bed material load equations to estimate the total bed material load.

- Bed Material Load Estimates – Section A.4 describes the hydraulic models developed at locations with suspended sediment data in order to estimate the total bed material load. Data from the hydraulic models were used in the bed material load equations at four USGS gage locations. The four locations were selected based on available data.
- Estimates of Accuracy and Comparison with Other Studies – Section A.5 places the results of the bed material load estimates in context with flows and watershed characteristics on the LOMR. The results of the estimates are compared with results from previous studies and measured suspended sediment data.
- Results Compared to Flows and Drainage Area – Section A.6 compares the bed material load estimates generated from this study with reported results from other studies.
- Analysis of Bed Elevation Change Using Hydroacoustic Data – Section A.7 describes the methods used to analyze USACE hydroacoustic data collected throughout the LMOR in 1998, 2007, 2008, and 2009 to detect trends in river bed elevation change.
- Equilibrium Slope Analysis – Section A.8 describes the analysis performed to estimate whether the channel slope and dimensions at the St. Joseph, Kansas City, and Hermann gages are close to equilibrium conditions with regard to sediment supply.
- Linear Regression Analyses of Local Bed Degradation – Section A.9 presents the estimated effects of dredging amounts and dredging intensity on local bed degradation by using linear regression to analyze changes in local bed elevations in relation to historical dredging intensities and total dredging amount as a percent of bed material load.

A.2 PARTICLE SIZES OF MATERIAL IN THE RIVER BED AND SUSPENDED IN THE WATER COLUMN

Determining the dominant particle size fraction in the river bed and in the sediment suspended in the water column was necessary for a comparison with the size fraction removed by commercial dredging. Delineating the distribution of river bed sediment sizes is also important for determining how sediment is transported in the river, either along the river bed as bed load or in suspension as suspended sediment.

The Wentworth particle size scale defines particle sizes smaller than 0.063 millimeters (mm) as silt or clay, particles sizes between 0.063 and 2.0 mm as sand, and particle sizes from 2 to 64 mm as gravel (Figure A-1). Figure A-1 shows the relationship between particle size and its: (1) transport mechanism and (2) source.

In general, clay, silt, and fine sand particles are transported in suspension in the Missouri River's water column. Turbulent eddies keep these particles suspended in the flow, allowing minimal interaction with the active channel bed. Deposition of the suspended load primarily occurs in low-velocity zones typical of backwater areas and on floodplains. The source of sediment transported in suspension is largely wash load that predominantly consists of sediment derived from sources other than the bed, such as channel bank erosion and runoff from contributing hill slopes. The upper limit of wash load particle size, or "D_{10}" of the bed sediment, has been defined as that grain size where 10 percent of the bed material (bed substrate) mixture is finer (Einstein 1950). Although the exact value can vary at different locations on the river, the emphasis is that wash load particle sizes are rarely found in the bed material. The volume of wash load transported in the river is principally limited by the supply of material, not the transport capacity related to the river's available energy. Because wash load is transported in suspension at nearly the same velocity as the river's flow, it can be transported through the system during one runoff event. Importantly, increases or decreases in wash load rarely result in significant morphological responses or appreciable changes in channel stability (Biedenharn et al. 2006).

In general, medium to coarse sand and gravel particles are transported as bed load in migrating dunes on the Missouri River. Bed load consists of particles moving along or near the bed by rolling, sliding, or saltating (hopping) depending on flow strength and random flow turbulence. The source of bed load is scour of the bed material; thus, the same particle sizes moving as bed load compose the vast majority of the particle sizes in the bed substrate. Unlike wash load, the river's capacity to transport particles as bed load is limited by the amount of energy available to move the sediment. Because bed load particles are constantly interacting with the channel bed, changes in bed load transport rates directly influence channel morphology and channel stability. An imbalance of the river's capacity to transport sediment with its bed material supply results in morphologic change. If the energy available to transport bed material exceeds the sediment supply, the river will scour the bed; conversely, if the energy for transport is less than the sediment supply, sediment will deposit on the bed.

Bed material load refers to sediment derived from the bed material (bed substrate). Bed material can be transported as bed load or as suspended load depending upon particle size and flow strength. The sum of the bed material load and wash load is termed the "total sediment load."

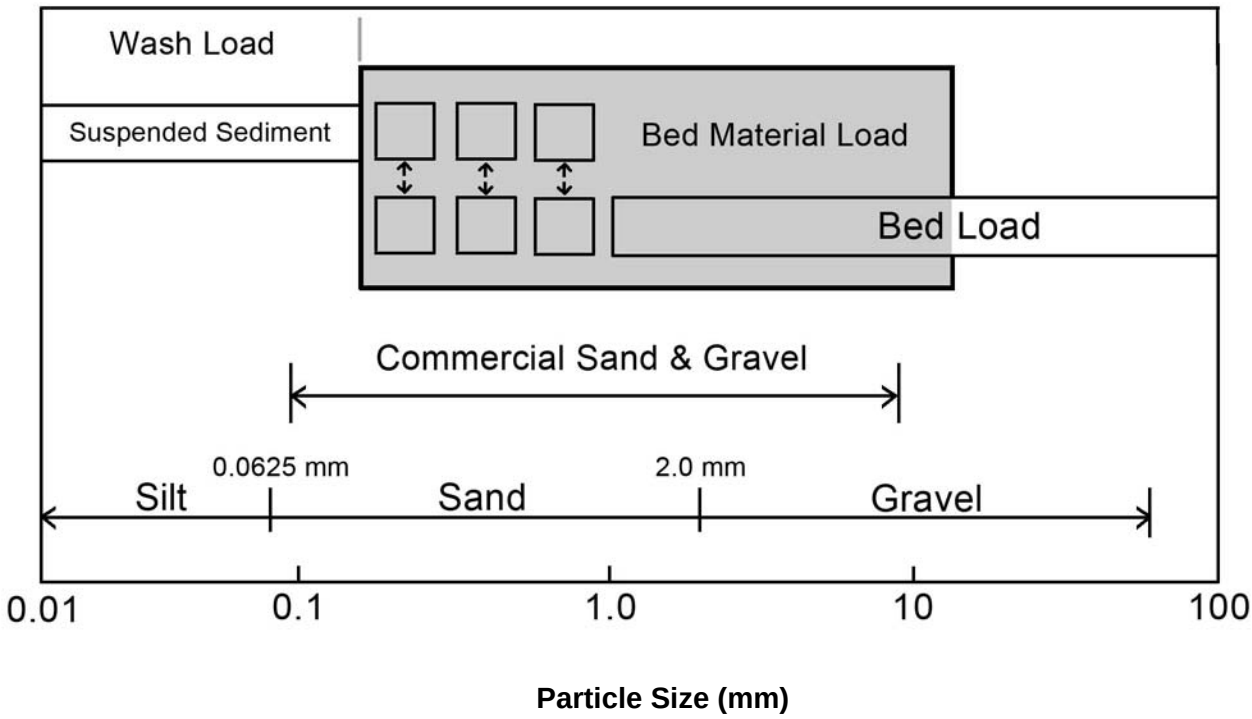

Figure A-1 Illustration of Diffuse Boundaries Defining Sediment Transport Mechanism (Bed Load or Suspended Load) and Sediment Source (Bed Material Load or Wash Load)

The arrows in Figure A-1 indicate that the boundaries between suspended load and bed load transport mechanisms are diffuse and are related to flow strength. At low to moderate flows, turbulent eddies may not have sufficient energy to transport fine and medium sand particles in suspension; consequently, the sand is transported as bed load. As flow strength increases with higher flow, turbulent eddies will bring the sand from the bed up into suspension in the water column.

Determining the boundary between when particles will be transported predominantly in suspension versus as bed load is a key factor in the sediment supply analysis. As discussed below, the majority of the Missouri River's total sediment supply is clay and silt-size wash load that is largely transported in continuous suspension, with little importance to channel stability. To quantify the percentage of the total sediment load that is bed material load, and thus important to channel morphology and stability, it is necessary to determine more specific boundaries between wash load and bed material load. To accomplish this task, Rouse number (*Ro*) calculations were performed at four locations on the Missouri River. This analysis is presented in Section A.3.3.

When sediment samples are collected and analyzed, a particle size distribution is created by calculating the cumulative percent of the sediment finer than a given grain size (Figures A-2 through

A-6 are examples). At certain points on the cumulative scale, the particle size can be significant to geomorphic processes. For example, the D_{10} (which is the particle size where 10 percent of the sediment is finer than the D_{10} particle size) is significant because in large, alluvial rivers it often represents the portion of the sediment that is transported primarily as wash load and has minimal interaction with the river bed (Einstein 1950, Biedenharn et al. 2006). Similarly, the D_{50} refers to the median particle size where 50 percent of the sediment is finer than the D_{50} particle size and indicates the mid-point in the size distribution of particles in a sample.

A.2.1 Measured River Bed Sediment Particle Sizes

Several times a year, the USGS collects and analyzes river bed sediment at the main gage sites on the LOMR, including those at Nebraska City, St. Joseph, Kansas City, and Hermann. Every 4–6 years, the USACE also samples bed sediment longitudinally every few miles along the LMOR at locations in the left, center, and right of the channel bed. The plots in Figures A-2 through A-6 show the average particle size cumulative frequency curves based on the USGS and USACE bed material sample data. These curves are created by calculating the cumulative percent of the sediment finer than a given grain size. The particle size at certain points on the cumulative scale can be significant to geomorphic processes. As noted, the D_{10} often represents the portion of the sediment that is transported primarily as wash load and has minimal interaction with the river bed; and the D_{50} refers to the median particle size where 50 percent of the sediment is finer than the D_{50} particle size, indicating the mid-point in the size distribution of particles in a sample. These gradations are representative of the typical bed sediment sizes at three gage locations on the LOMR, and one site above the Project area at Nebraska City (see Table 3.4-14 in the main volumes).

Detailed results of all the USGS bed sediment samples from 2001 to 2009 and the most recent 2004 USACE results are plotted for the Nebraska City, St. Joseph, Kansas City, and Hermann gages in Figures A-2 through A-5. Table A-1 lists the standard deviations of each particle size class used to create the average gradation in Figures A-2 through A-5. These figures show the size distribution of bed sediment for each year the USGS sampled as colored lines, and the thick black line represents the average of the USGS measurements. The red and green lines show the USACE measurements for locations near the USGS gage sites, except for the Nebraska City gage for which USACE data are not available. The curves are different shapes for the USGS and USACE data because different sieve sizes were used to determine the particle size distribution. The maximum particle size measured for the USGS data for the St. Joseph, Kansas City, and Hermann gages is 2 mm. The plots show that the particle size gradations for the USGS and USACE data are similar. Figure A-6 shows representative

bed material particle size gradations used in the sediment transport modeling compared to Missouri State Concrete Sand minimum (blue line) and maximum (red line) specification gradations. These curves represent the target particle sizes dredged from the river bed for use in concrete sand.

Table A-1 Standard Deviations of the "Percent Finer Than" Values for the Particle Size Classes Used To Estimate the Average Gradation in Bed Material Cumulative Frequency Curves in Figures A-2 through A-5 (%)

	Location			
Particle Size	Nebraska City	St. Joseph	Kansas City	Hermann
0.062 mm (clay/silt)	0.00	0.08	0.42	0.08
0.125 mm (very fine sand)	0.32	0.50	0.81	0.28
0.25 mm (fine sand)	6.05	9.91	11.28	9.63
0.5 mm (medium sand)	13.31	9.70	10.91	15.62
1 mm (coarse sand)	9.93	3.68	7.38	14.81
2 mm (very coarse sand)	5.82	2.62	7.61	10.76

Note:

mm = Millimeter(s).

The cumulative frequency curves for the minimum concrete sand specifications are similar to the representative bed sediment gradations, indicating that the river's bed sediment tends to be similar or finer than the minimum sand specification, and that the upper specification for concrete sand is coarser than the typical bed sediment at those locations.

A.2.2 Measured Suspended Sediment Particle Sizes

Measurements of suspended sediment describe the range of sediment sizes transported in the water column. More data are available for suspended sediment loads than for bed load; however, only a portion of the suspended sediment is considered bed material load and is large enough to be dredged for commercial sand and gravel production. This section reviews available data for suspended sediment and suspended sand.

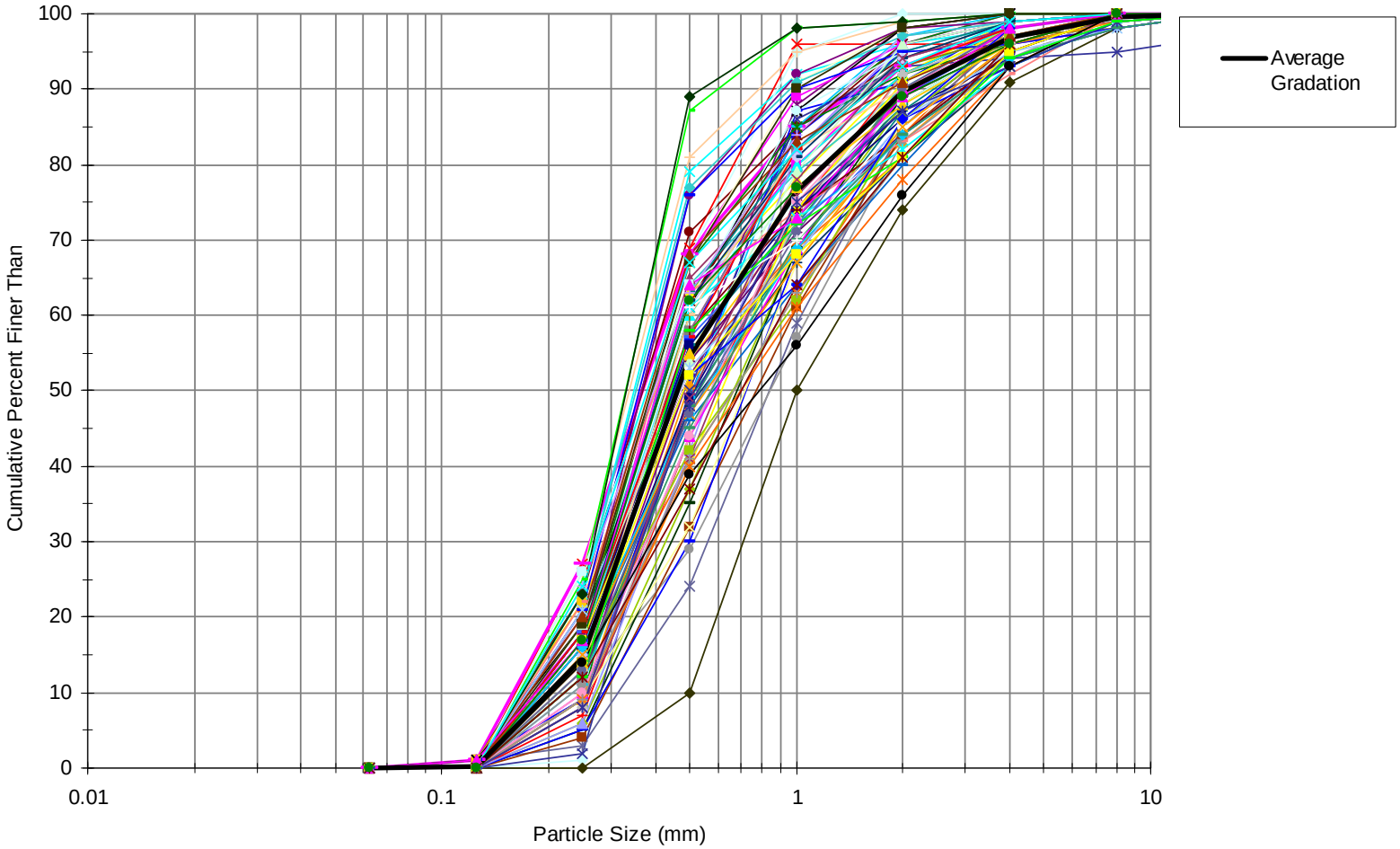

Figure A-2 USGS Bed Material Samples – Nebraska City Gage #06807000 (2001–2009)

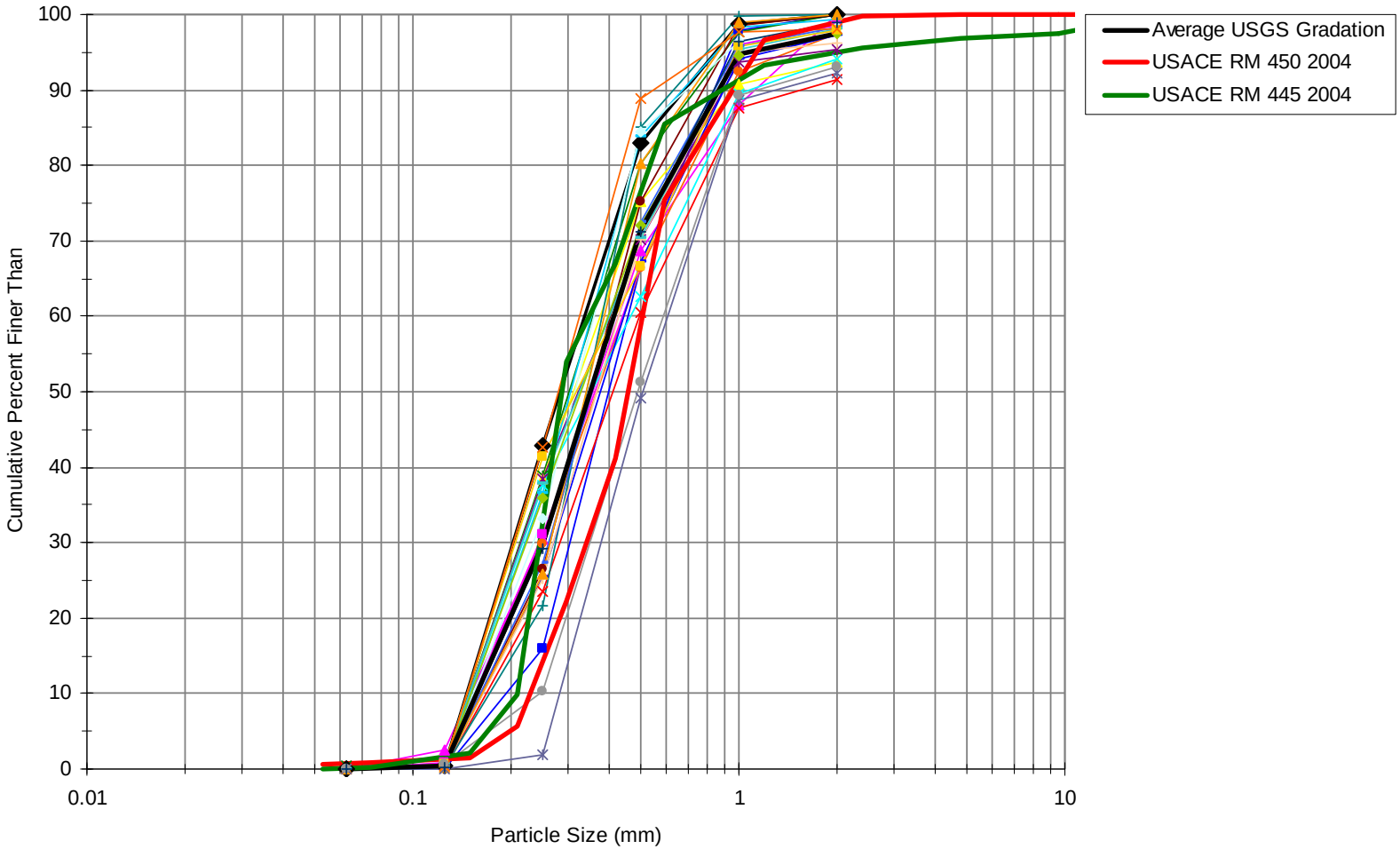

Figure A-3 USGS and USACE Bed Material Samples – St. Joseph Gage #06818000 (2002–2009)

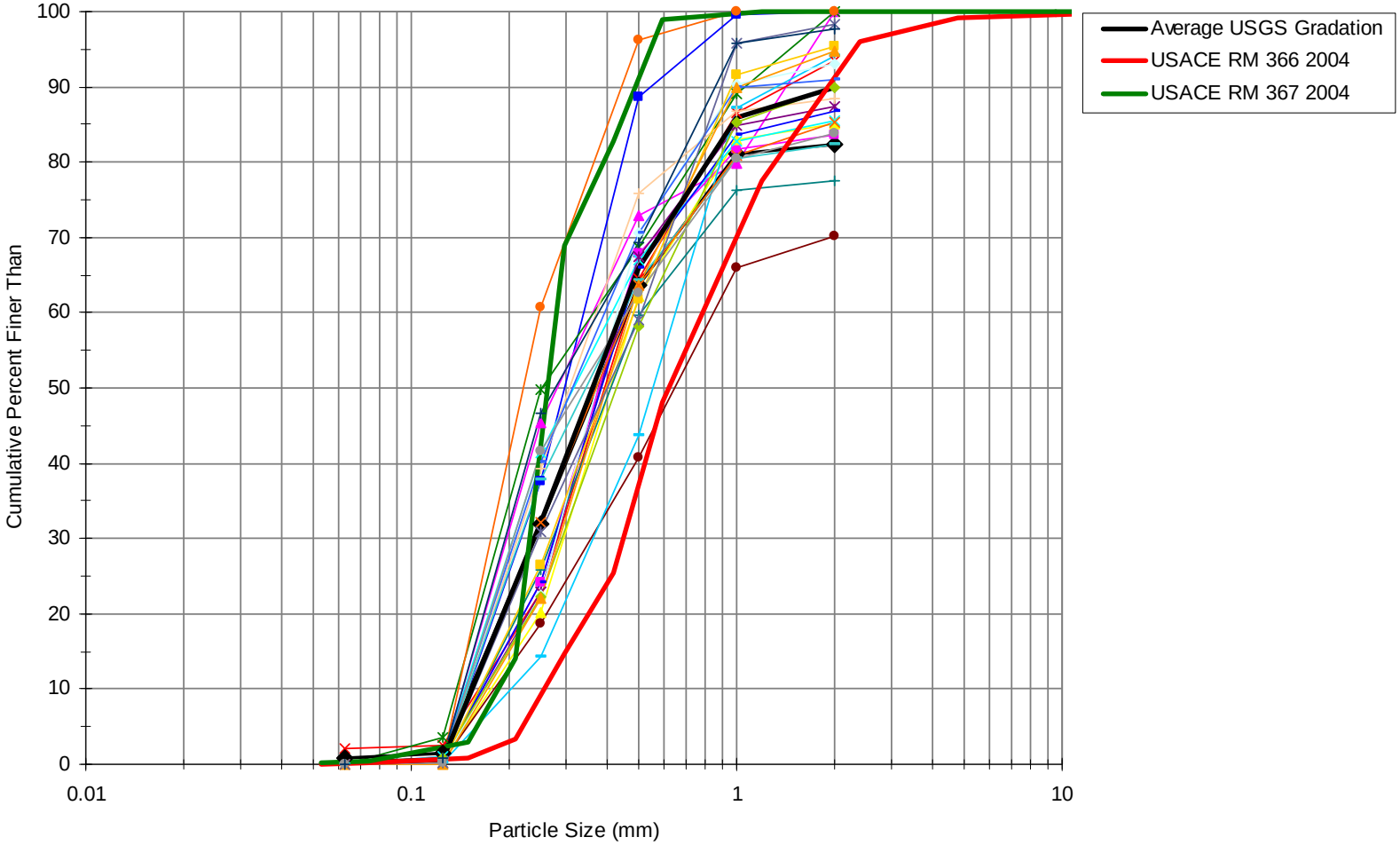

Figure A-4 USGS and USACE Bed Material Samples – Kansas City Gage #06893000 (2002–2009)

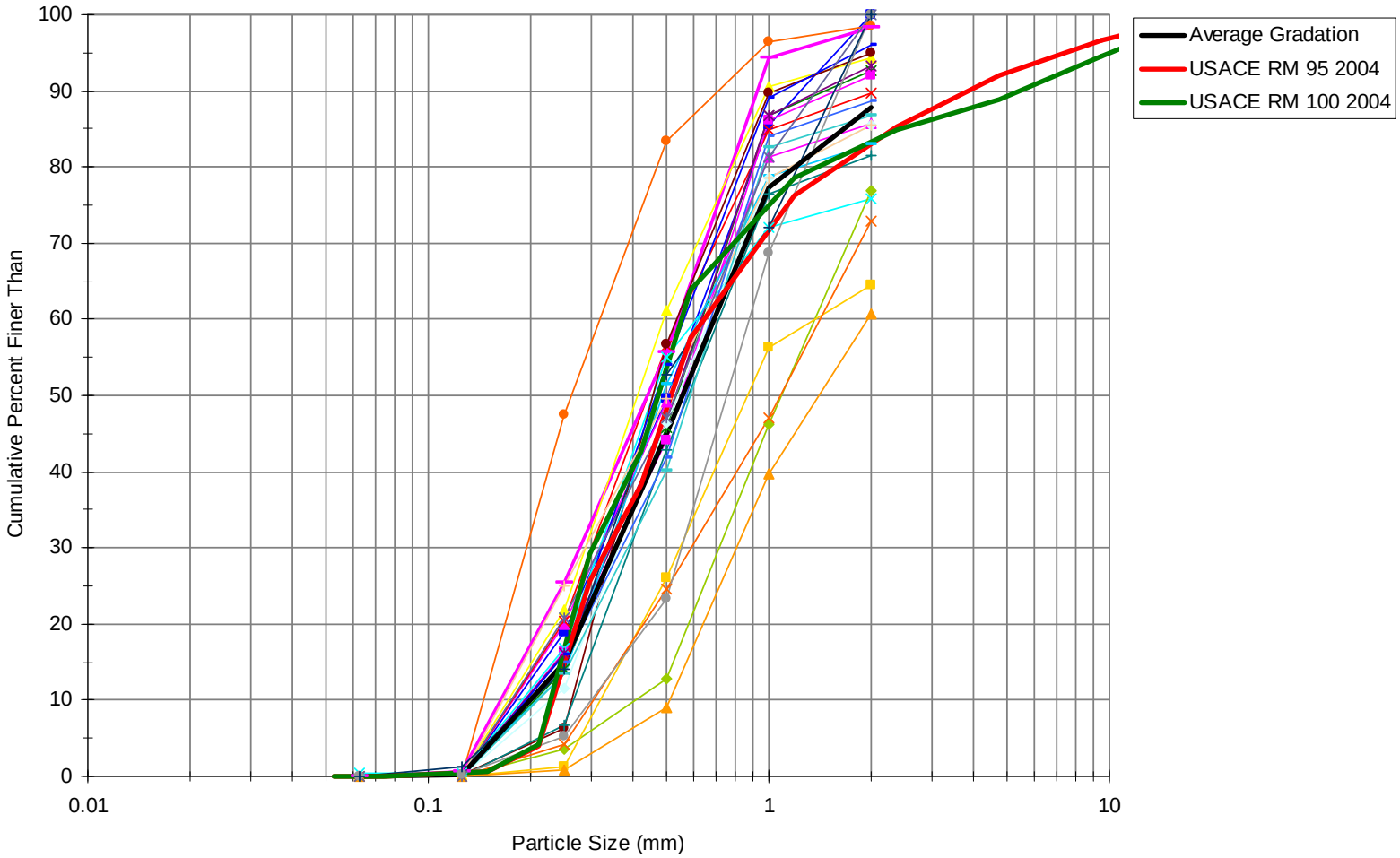

Figure A-5 USGS and USACE Bed Material Samples – Hermann Gage #06934500 (2002–2009)

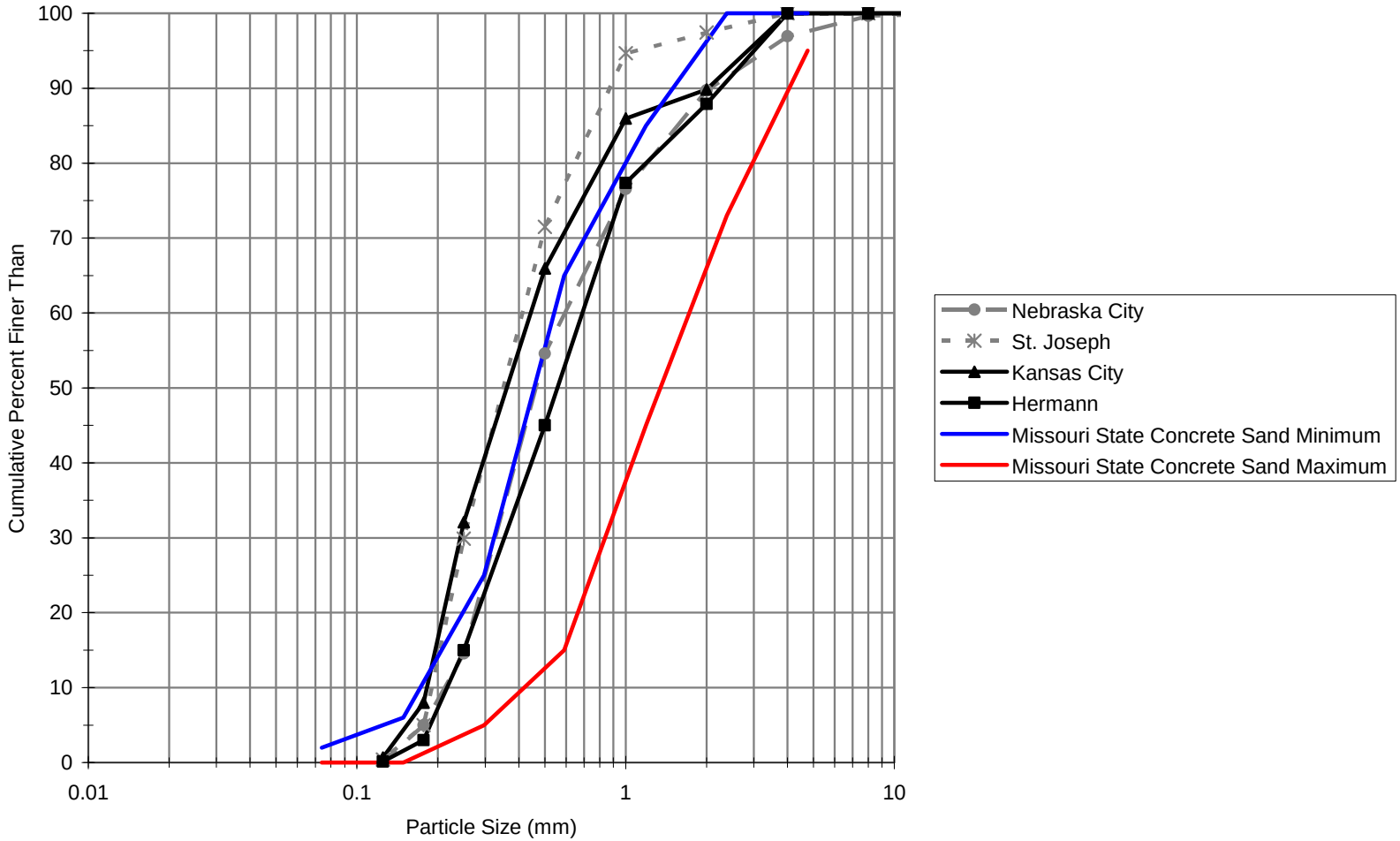

Figure A-6 Representative Bed Material Particle Size Gradations at Missouri River Gaging Sites (2001–2009)

The USGS periodically collects and analyzes the particle sizes of the suspended sediment when measuring suspended sediment loads at gage sites. All of the most recent particle size data (available dating from 1981 to1991 at Nebraska City, from 1994 to 2005 at St. Joseph, from 1994 to 2002 at Kansas City, and from 1994 to 2005 at Hermann) are plotted as cumulative frequency distribution curves in Figures A-7 through A-10. The colored lines in the plot represent each year of data, and the average of all the gradations is plotted as a thick, solid black line. The D_{10} of the river bed is shown on each plot for comparison purposes and indicates that the finest 10 percent of the river bed is coarser than approximately 85–90 percent of the suspended sediment. Table A-2 lists the standard deviations of each particle size class used to create the average gradation in Figures A-7 through A-10.

The average gradations for each location are plotted in Figure A-11 to show the representative particle size cumulative frequency curves for each location. At each gage location, the D_{50} value is finer than the finest particle size analyzed by the USGS, which is the boundary between silt and very fine sand at 0.063 mm. Thus, the median grain diameter for suspended sediment is in the clay/silt fraction.

Table A-2 Standard Deviations of the "Percent Finer Than" Values for the Particle Size Classes in the Suspended Sediment Cumulative Frequency Curves in Figures A-7 through A-10 (%)

	Nebraska City	St. Joseph	Kansas City	Hermann
0.062 mm (clay/silt)	15.8	15.6	16.0	10.7
0.125 mm (very fine sand)	12.8	14.1	15.1	10.3
0.25 mm (fine sand)	3.5	5.2	4.6	4.9
0.5 mm (medium sand)	0.6	1.2	0.6	2.4
1 mm (coarse sand)	0.1	0.2	0.0	1.6
0.062 mm (clay/silt)	15.8	15.6	16.0	10.7

Note:

mm = Millimeter(s).

In Figures A-12 through A-15, the percent sand in suspended sediment loads was plotted against river discharge at the time of measurement for the years with available data. The results do not indicate a strong correlation between percent sand content and discharge. The Kansas City plot (Figure A-14) shows that, when flows exceed approximately 85,000 cubic feet per second (cfs), the sand content remains less than 30 percent—suggesting that the particle sizes available for transport may not change at different discharges.

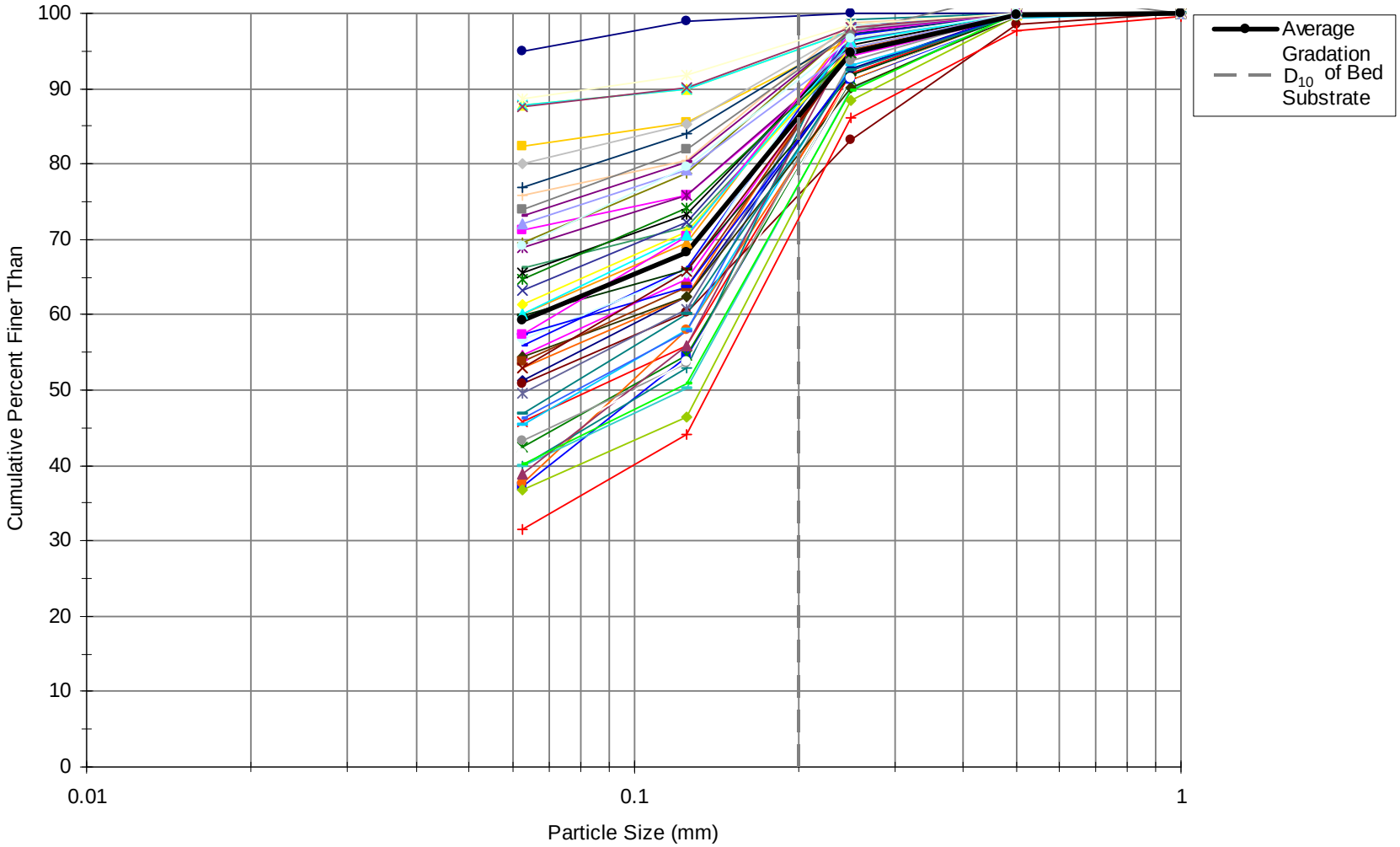

Figure A-7 USGS Total Suspended Sediment Particle Size Gradations – Nebraska City Gage #06807000 (1981–1991)

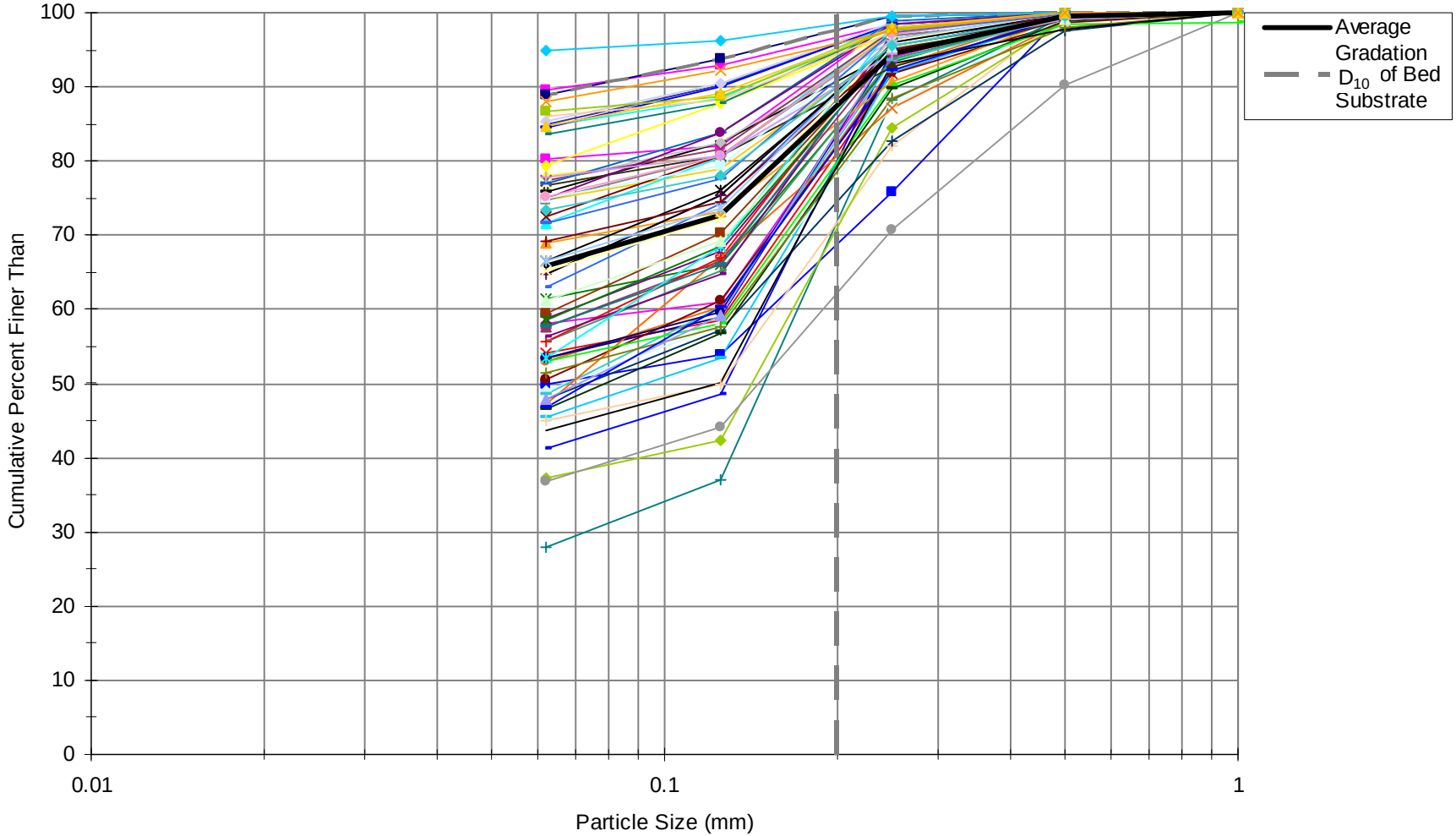

Figure A-8 USGS Total Suspended Sediment Particle Size Gradations – St. Joseph Gage #06818000 (1994–2005)

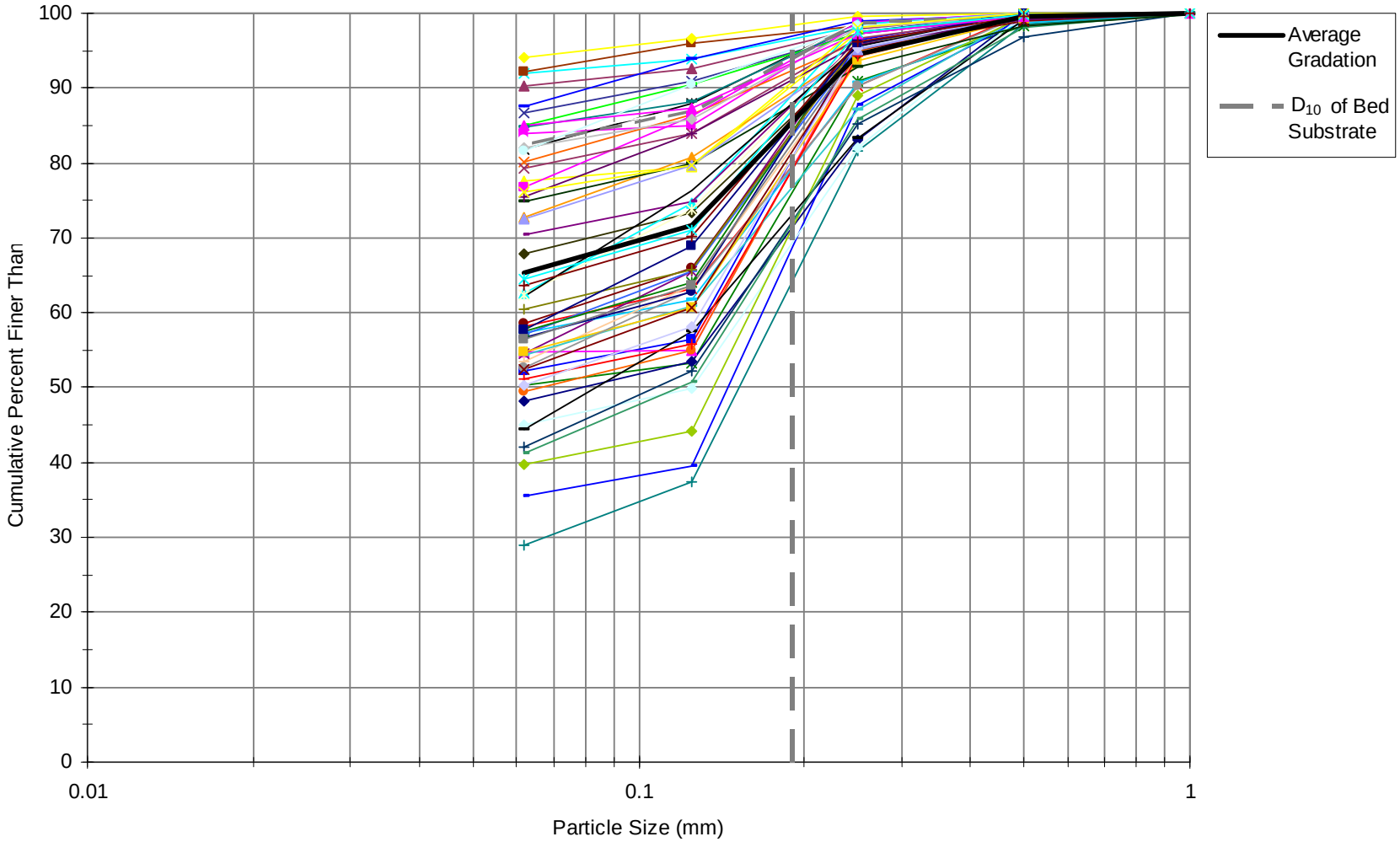

Figure A-9 USGS Total Suspended Sediment Particle Size Gradations – Kansas City Gage #06893000 (1994–2002)

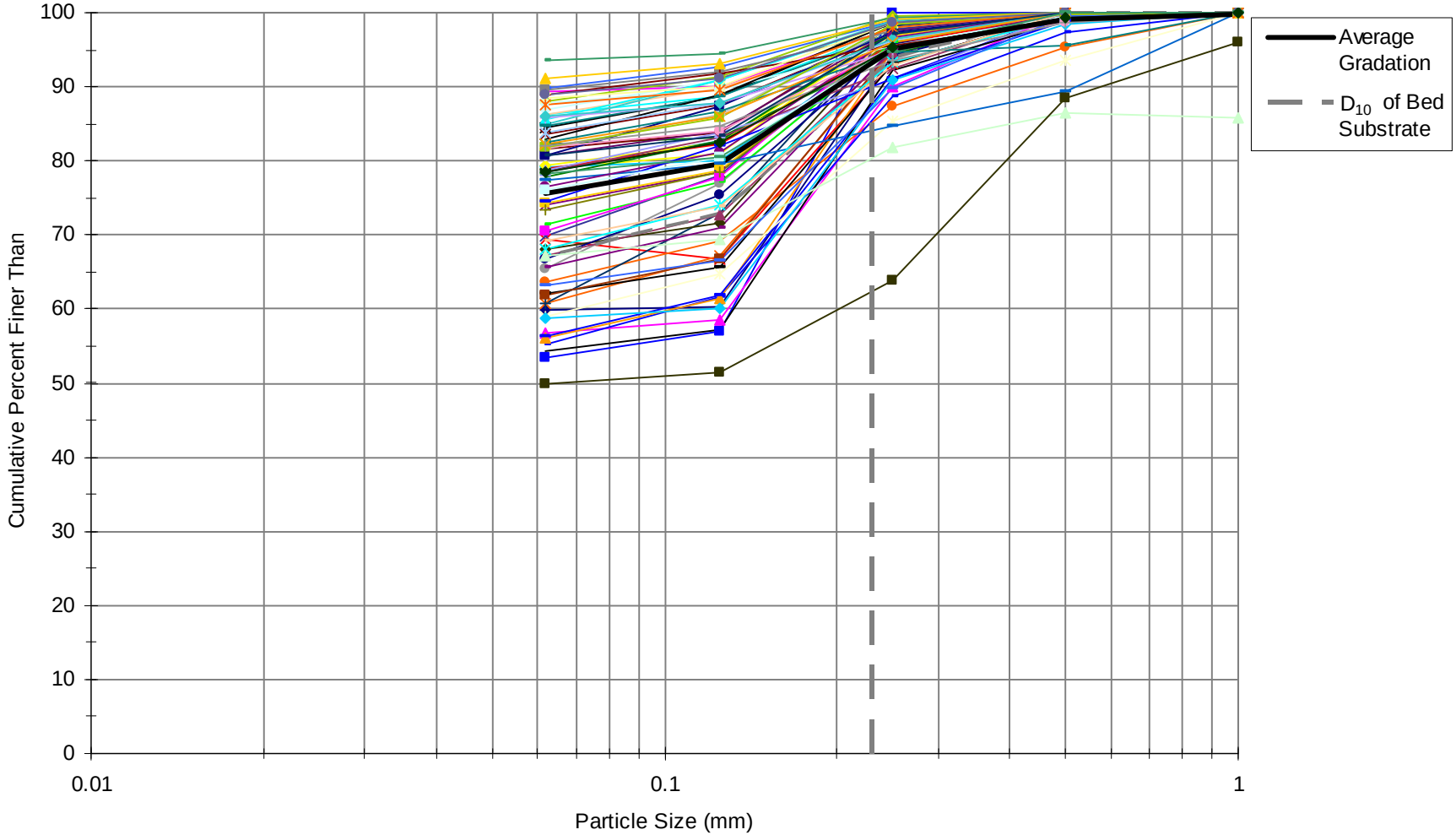

Figure A-10 USGS Total Suspended Sediment Particle Size Gradations – Hermann Gage #069345000 (1994–2005)

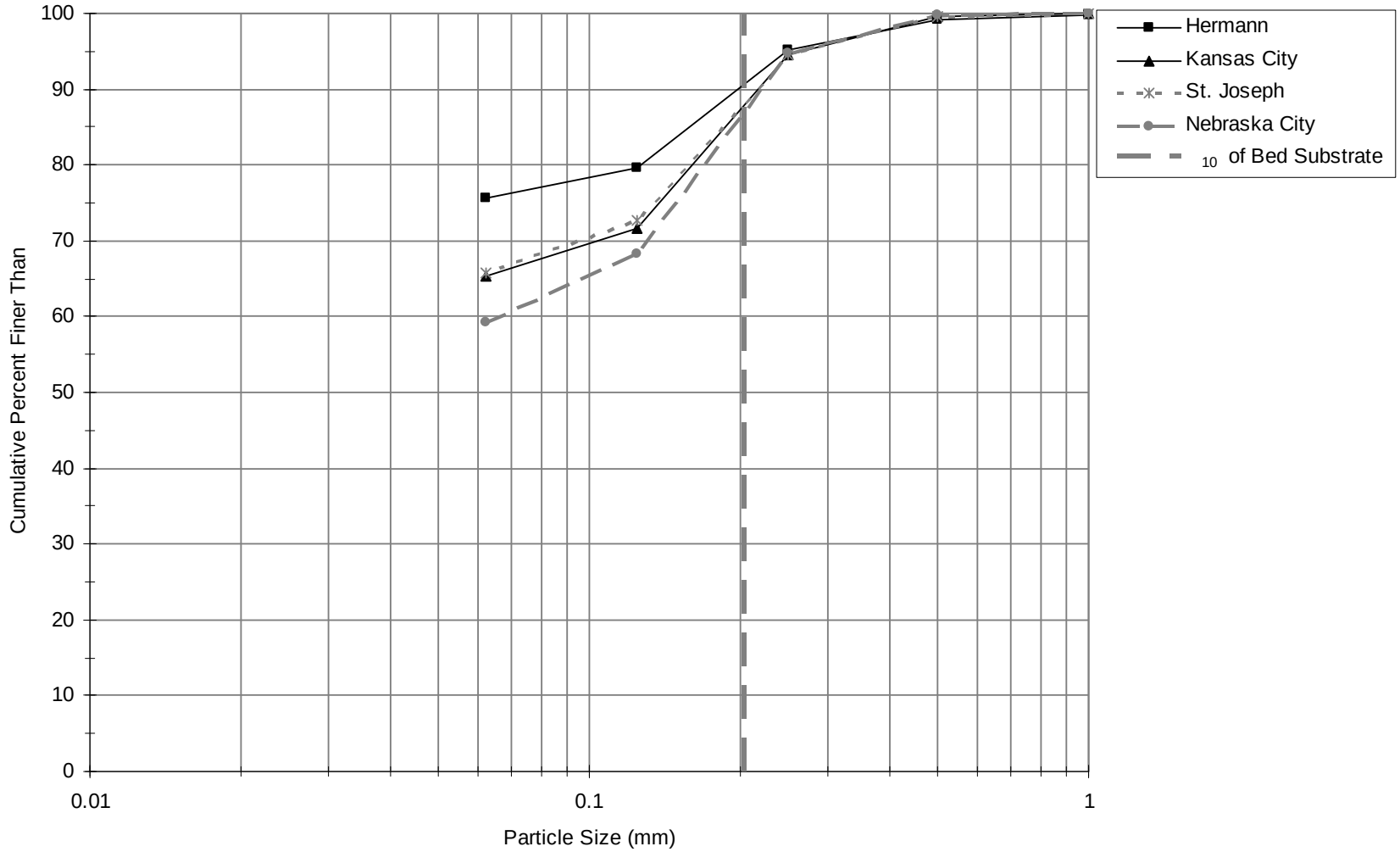

Figure A-11 Representative Total Suspended Sediment Particle Size Gradations at Missouri River Gage Sites

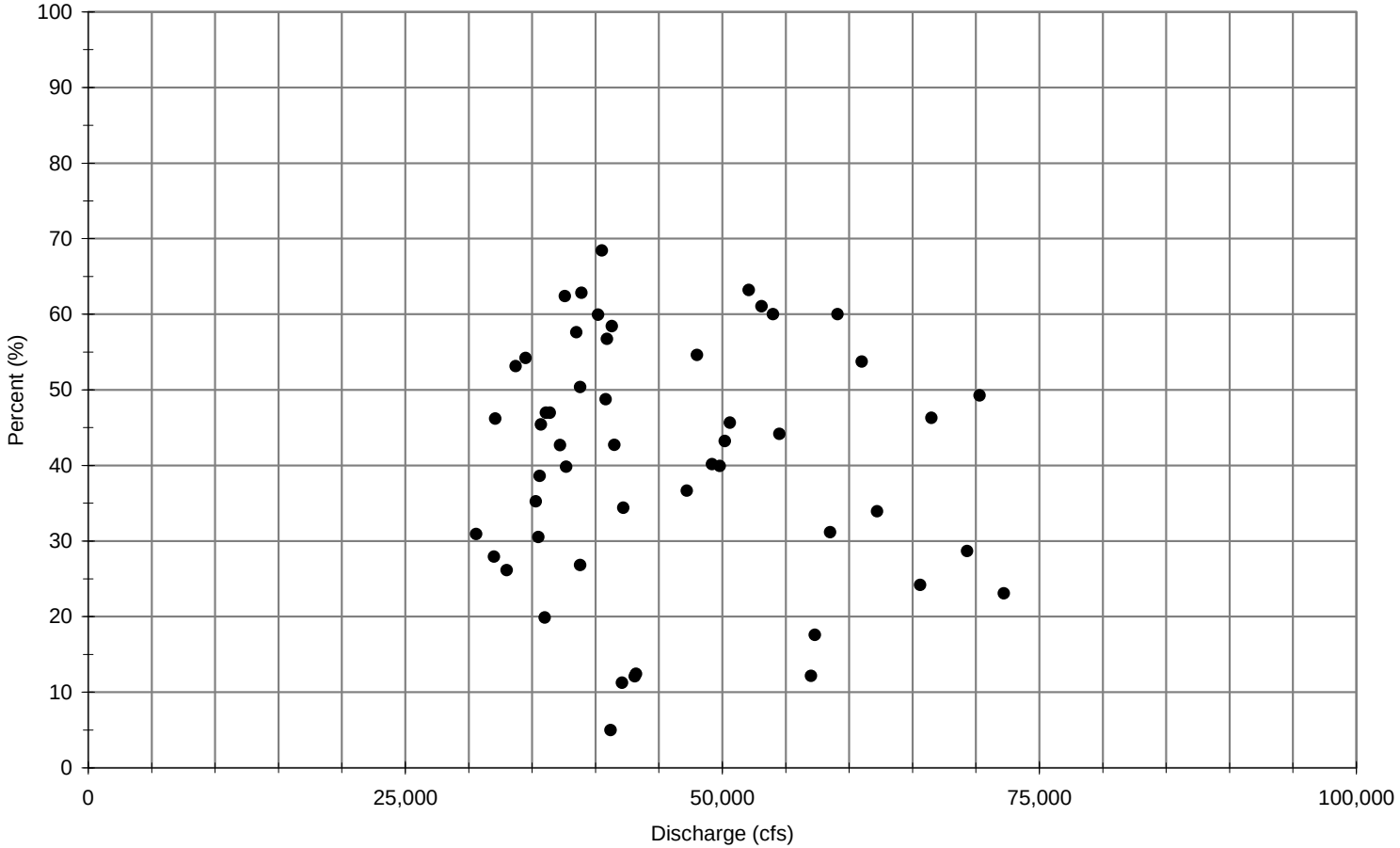

Figure A-12 USGS Total Suspended Sediment Percent Sand Content – Nebraska City Gage #06807000 (1981–1991)

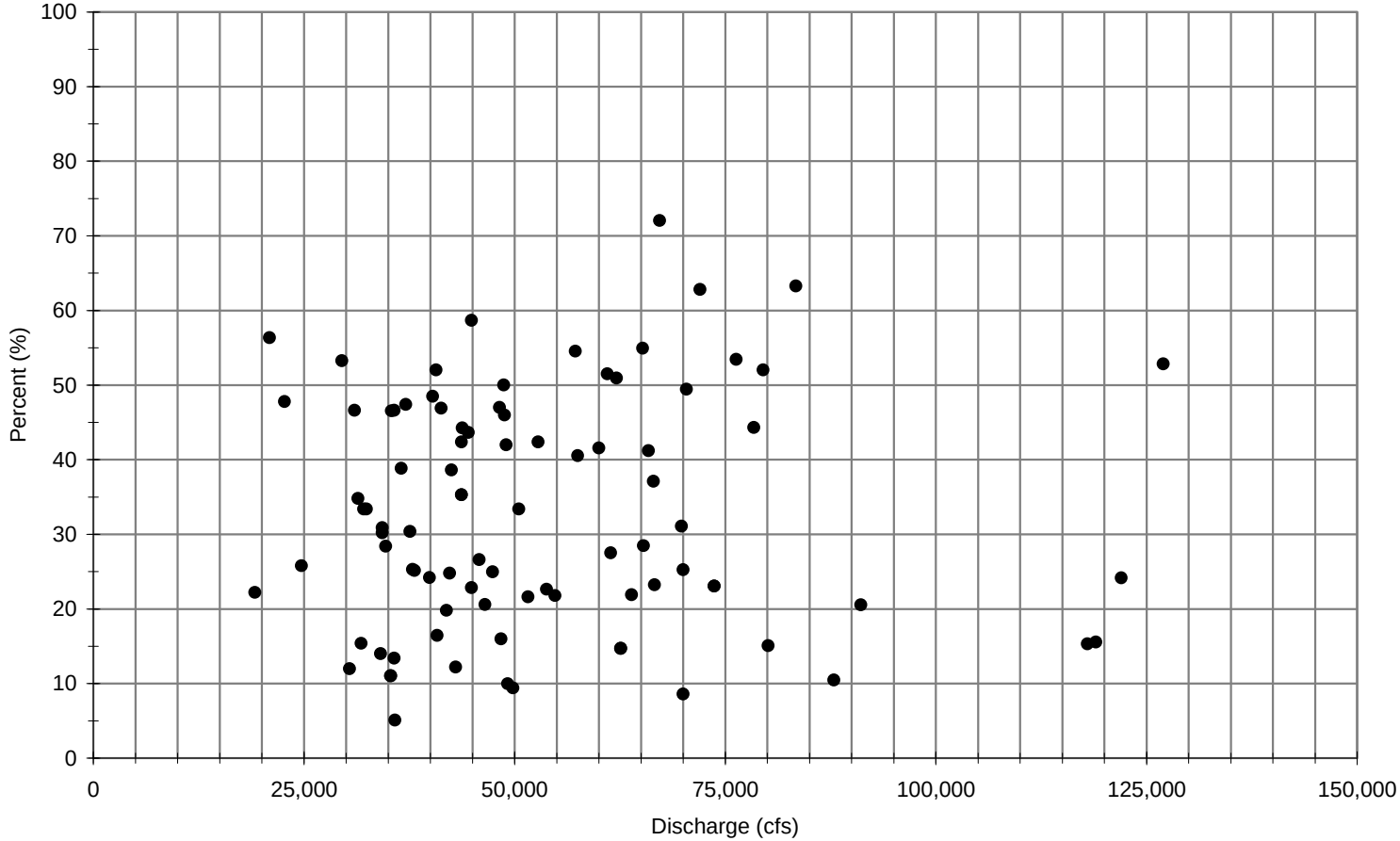

Figure A-13 USGS Total Suspended Sediment Percent Sand Content – St. Joseph Gage #06818000 (1994–2005)

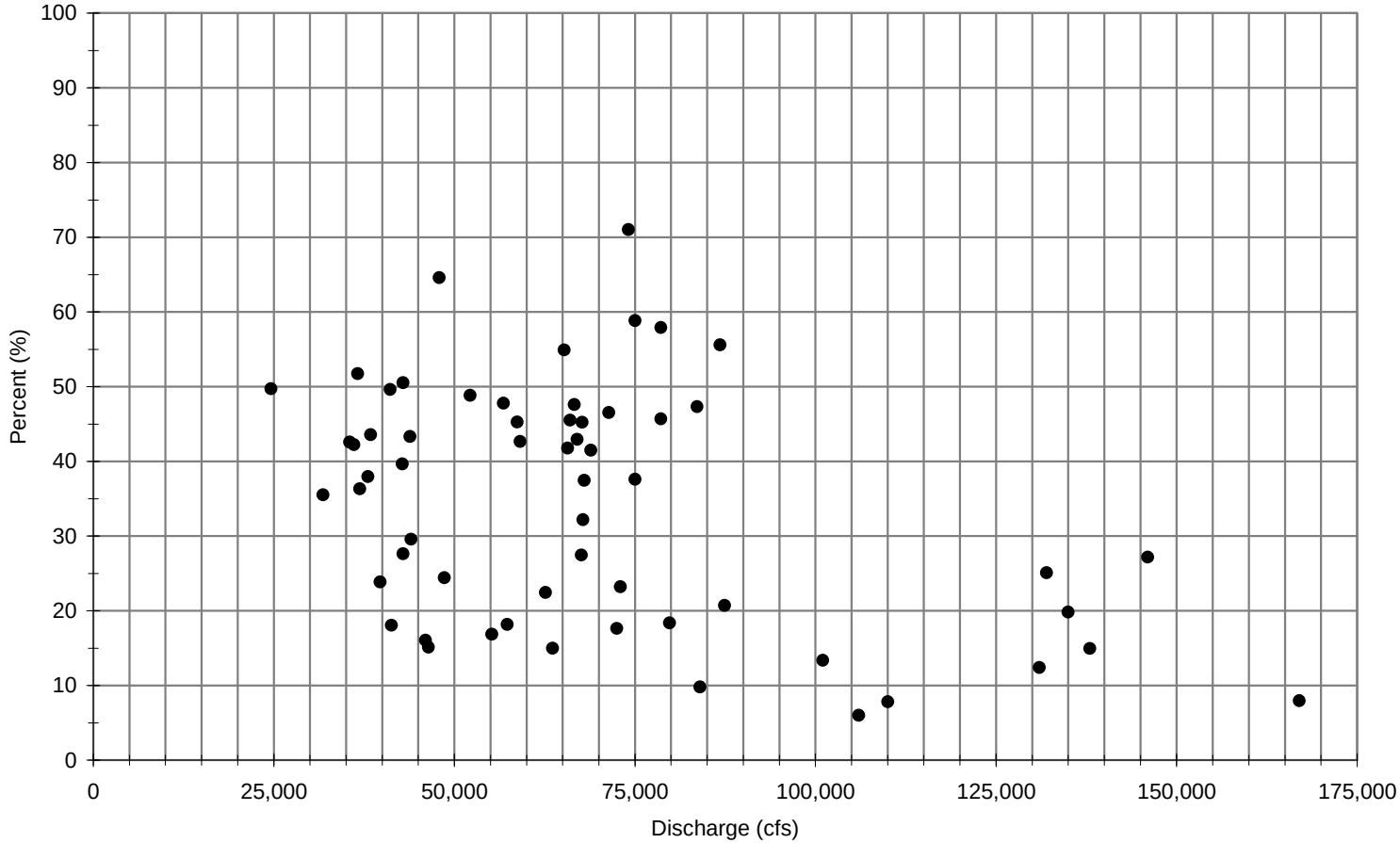

Figure A-14 USGS Total Suspended Sediment Percent Sand Content – Kansas City Gage #06893000 (1994–2002)

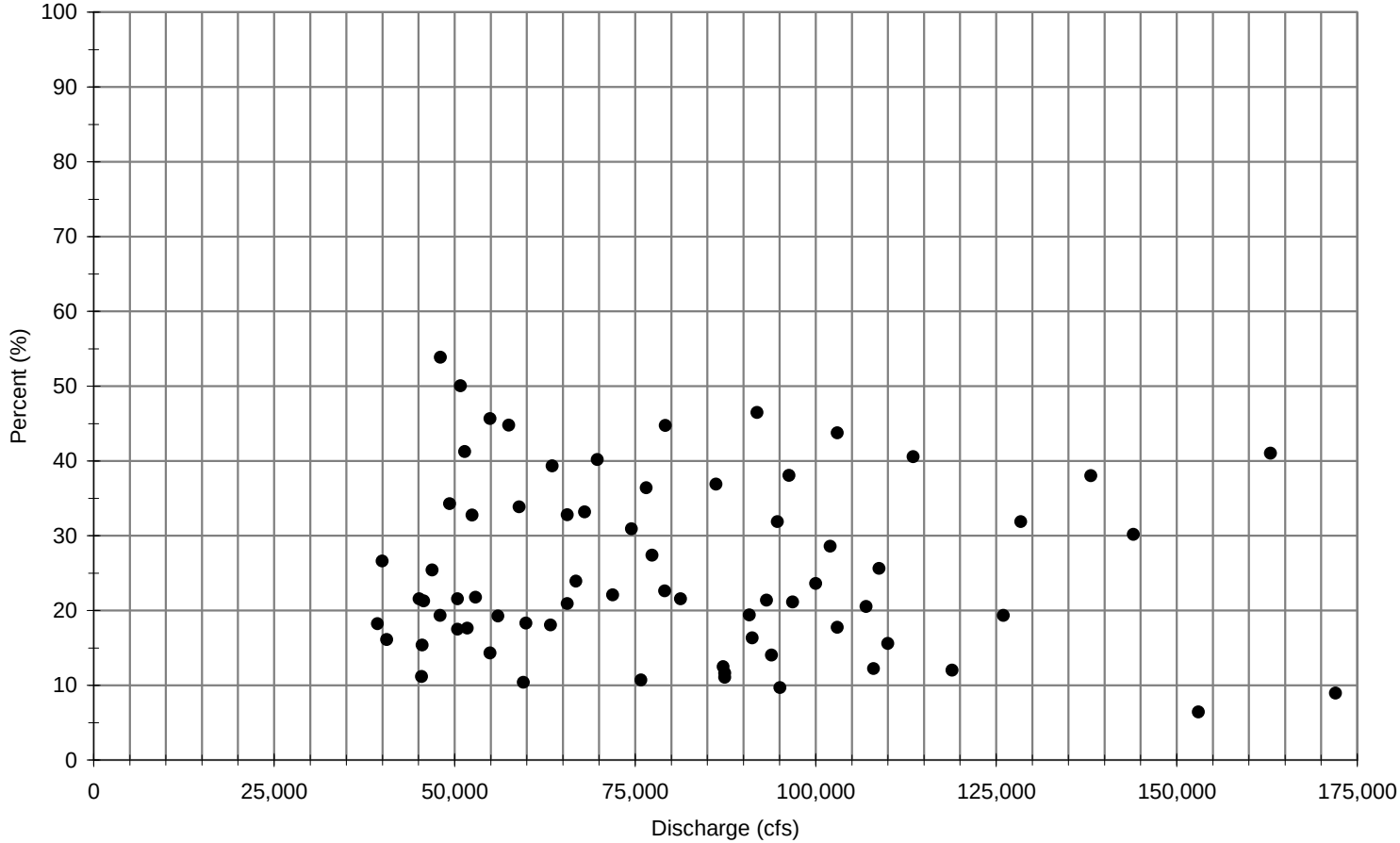

Figure A-15 USGS Total Suspended Sediment Percent Sand Content – Hermann Gage #06934500 (1994–2005)

A.3 SEDIMENT LOADS

A.3.1 Methods of Measuring Suspended Sediment Loads

Measurements of suspended sediment have been collected at various locations on the Missouri River over the past 100 years. Suspended sediment measurements are typically made at channel cross sections by the USGS, at bridges near their gaging stations. A suspended sediment sampler is lowered through the water column to collect either depth-integrated or point samples of suspended sediment. Samples are collected at multiple verticals along the sampling cross section, and then the sample is composited into a cross section average sample. The concentration (typically reported in milligrams per liter [mg/l]) of collected sediment particles is determined, from which a daily suspended sediment load (typically reported in tons of sediment per day) associated with the flow during the time of measurement can be calculated. Because of the configuration of the sampler, it cannot be lowered completely to the bed (see Figure A-16). Consequently, a small portion (typically less than 0.5 foot) of the flow depth is not sampled, creating an "unsampled zone." On the Missouri River, the unsampled zone is typically only 1–3 percent of the total flow depth, depending on flow. Because the concentration of transported sediment is typically greatest near the river bed, however, the amount of sediment in transport in the unsampled zone can be high relative to the size of the unsampled zone. In particular, the coarser fraction of the bed material load that is transported along or near the bed may not be captured by the suspended sediment sampler.

Bed load sampling on large rivers such as the Missouri is difficult with a traditional bed load sampler, such as a Helley-Smith model. Because the bottom of the channel cannot be seen and the river bed elevation is constantly changing due to sand dune migration, high inaccuracies can be associated with Helley-Smith or similar-type bed load sampling. Thus, only a few measurements of the bed load component of the total sediment load have been made. Rather than measuring the bed load, it is more common on the Missouri River to use numerical techniques that relate the particle sizes composing the bed substrate and the hydraulic energy of the river's flow to calculate the amount of bed material transported in the unmeasured and measured sediment sampling zones.

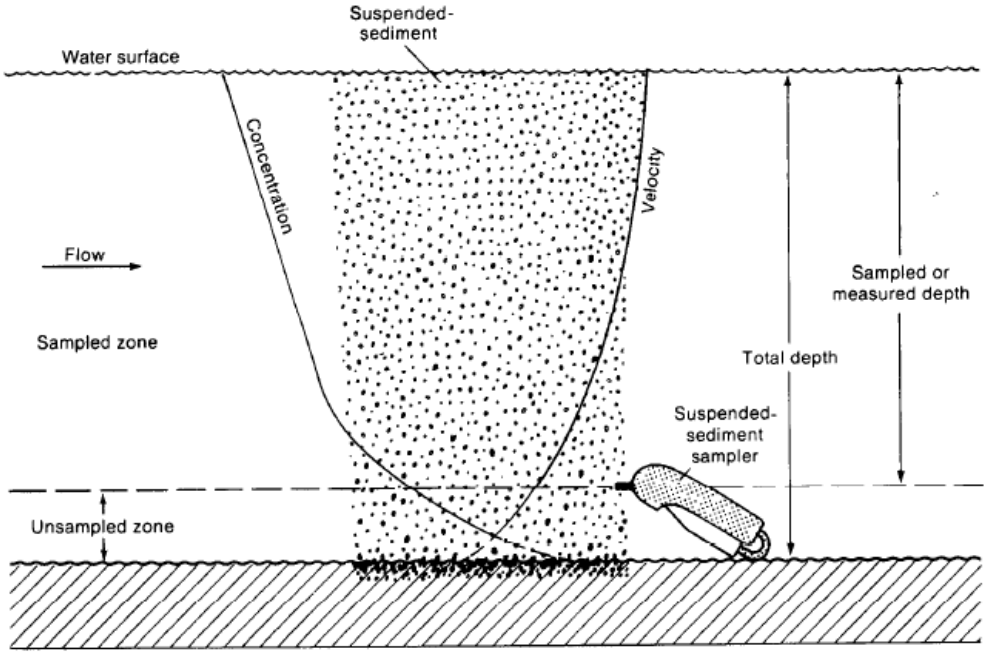

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Figure A-16 Measured and Unmeasured Suspended Sediment Sampling Zones

Source: Edwards and Glysson 1999.

A.3.2 Existing Measurements of Suspended Sediment

The USGS has worked with the USACE to compile, analyze, and calculate total suspended sediment and suspended sand loads using all available measured data on the LOMR and its major tributaries (Heimann et al. 2010). The USGS has compiled measurements of suspended sediment, including measurements by the USACE and the USGS and other measurements reported in concentrations and daily loads. The effort also included compilation of information on bed material and suspended sediment particle size gradations.

Using these data, the USGS has calculated annual total suspended sediment and suspended sand loads at the St. Joseph, Kansas City, and Hermann gage locations. Calculations were made only at these locations because they were the only gages on the LOMR with sufficient measurement records. Results from the USGS study are presented in Table A-3. Total suspended annual loads are displayed

for water years 1994–2008[1]. The suspended sand loads were not available after 2005 at the St. Joseph and Kansas City gages because insufficient particle size information was available to calculate sand loads. Therefore, the suspended sand averages are shown for years 1994–2005 in Table A-3 to provide a consistent time comparison. It should be noted that the suspended sand loads include both wash load (fine-grained sand) and bed material load (coarse-grained sand). The upper and lower 95-percent confidence intervals and the standard error of prediction (SEP) also are presented in the table to show the variability in the data. The confidence intervals and SEP were generated by the USGS in LOADEST. Runkel et al. (2004), the authors of the LOADEST model, state that:

> "Calculation of the SEP begins with an estimate of parameter uncertainty (the Standard Error) and adds the unexplained variability about the model (random error). Because SEP incorporates parameter uncertainty and random error, it is larger than Standard Error and provides a better description of how closely estimated loads correspond to actual loads." (p. 6)

The values shown in Table A-3 for Nebraska City were based on USGS published daily total suspended load values at the Nebraska City gage. Since these data are available, the LOADEST analysis was not performed for the Nebraska City location. Because the annual loads were obtained by summing all the daily loads, trend lines did not need to be fit to the data; therefore, no error estimates are given. Suspended sand loads are not reported because particle size data have not been available at the Nebraska City gage since 1991.

[1] A water year is different from a calendar year in that it runs from October 1 through September 30 and is commonly used in hydrologic analyses in North America. For example, water year 2008 began on October 1, 2007, and concluded on September 30, 2008.

Table A-3 USGS Preliminary Annual Total Sediment and Suspended Sand Loads Based on Measured Data at Four Gage Locations on the Lower Missouri River

Water Year	Total Suspended Sediment Load (tons)
Nebraska City Gage[a]	
1994	26,211,430
1995	29,085,000
1996	51,447,590
1997	41,179,300
1998	38,692,400
1999	31,539,700
2000	14,220,600
2001	22,966,140
2002	11,192,140
2003	14,685,110
2004	16,315,440
2005	14,343,880
2006	9,329,500
2007	22,087,110
2008	33,751,800
Average Total Suspended Sediment (1994–2008)	25,136,476

[a] The values shown for the Nebraska City gage are based on U.S. Geological Survey published daily total suspended load values at the Nebraska City gage. Because these data are available, the LOADEST analysis was not performed for the Nebraska City location. Because the annual loads were obtained by summing all the daily loads, trend lines did not need to be fit to the data; therefore, no error estimates are given. Suspended sand loads are not reported because particle size data have not been available at the Nebraska City gage since 1991.

Source: Heimann et al. 2010.

Table A-3 USGS Preliminary Annual Total Sediment and Suspended Sand Loads Based on Measured Data at Four Gage Locations on the Lower Missouri River (continued)

Water Year	Total Suspended Sediment Load (tons)	Suspended Sand Load (tons)	Percent of Total Sediment Load as Sand	Lower 95% Confidence Interval for Total Suspended Sediment (tons)	Upper 95% Confidence Interval for Total Suspended Sediment (tons)	Standard Error of Prediction for Total Suspended Sediment (tons)
St. Joseph Gage						
1994	26,900,000	8,880,000	33%	21,800,000	32,700,000	2,690,000
1995	31,900,000	10,600,000	33%	24,400,000	41,100,000	4,147,000
1996	38,800,000	14,800,000	38%	32,700,000	45,600,000	3,492,000
1997	60,600,000	22,800,000	38%	48,700,000	74,600,000	6,666,000
1998	47,700,000	14,700,000	31%	38,100,000	58,900,000	5,247,000
1999	61,500,000	13,300,000	22%	46,500,000	79,900,000	8,610,000
2000	15,600,000	6,120,000	39%	12,900,000	18,800,000	1,560,000
2001	37,400,000	7,400,000	20%	24,900,000	53,900,000	7,480,000
2002	13,600,000	3,790,000	28%	10,700,000	17,200,000	1,632,000
2003	20,700,000	3,910,000	19%	--	--	--
2004	26,200,000	4,840,000	18%	--	--	--
2005	16,100,000	2,860,000	18%	13,300,000	19,400,000	1,610,000
2006	11,500,000	--	--	9,890,000	13,200,000	805,000
2007	29,200,000	--	--	24,300,000	34,700,000	2,628,000
2008	39,300,000	--	--	31,600,000	48,200,000	4,323,000
Total Suspended Sediment Average (1994–2008)	31,800,000			26,138,000	41,400,000	3,915,000
Suspended Sand Average (1994–2005)		*9,500,000*	*30%*			

Table A-3 USGS Preliminary Annual Total Sediment and Suspended Sand Loads Based on Measured Data at Four Gage Locations on the Lower Missouri River (continued)

Water Year	Total Suspended Sediment Load (tons)	Suspended Sand Load (tons)	Percent of Total Sediment Load as Sand	Lower 95% Confidence Interval for Total Suspended Sediment (tons)	Upper 95% Confidence Interval for Total Suspended Sediment (tons)	Standard Error of Prediction for Total Suspended Sediment (tons)
Kansas City Gage						
1994	35,600,000	11,900,000	33%	29,100,000	43,100,000	3,560,000
1995	59,000,000	14,200,000	24%	42,600,000	79,800,000	9,440,000
1996	40,200,000	20,700,000	51%	32,100,000	49,800,000	4,422,000
1997	94,000,000	31,200,000	33%	71,400,000	122,000,000	13,160,000
1998	68,500,000	18,000,000	26%	54,300,000	85,200,000	8,220,000
1999	114,000,000	16,500,000	14%	80,200,000	157,000,000	19,380,000
2000	16,800,000	5,380,000	32%	13,600,000	20,500,000	1,176,000
2001	43,200,000	6,000,000	14%	31,300,000	58,200,000	4,752,000
2002	15,600,000	3,480,000	22%	--	--	--
2003	17,300,000	3,550,000	21%	14,800,000	20,200,000	1,384,000
2004	30,700,000	5,400,000	18%	25,400,000	36,700,000	2,763,000
2005	30,200,000	4,300,000	14%	--	--	--
2006	15,000,000	--	--	12,800,000	17,600,000	1,200,000
2007	56,300,000	--	--	36,200,000	83,600,000	12,386,000
2008	59,200,000	--	--	--	--	
Total Suspended Sediment Average (1994–2008)	46,373,000			36,983,000	64,475,000	6,820,000
Suspended Sand Average (1994–2005)		*11,717,500*	*25%*			

Table A-3 USGS Preliminary Annual Total Sediment and Suspended Sand Loads Based on Measured Data at Four Gage Locations on the Lower Missouri River (continued)

Water Year	Total Suspended Sediment Load (tons)	Suspended Sand Load (tons)	Percent of Total Sediment Load as Sand	Lower 95% Confidence Interval for Total Suspended Sediment (tons)	Upper 95% Confidence Interval for Total Suspended Sediment (tons)	Standard Error of Prediction for Total Suspended Sediment (tons)
Hermann Gage						
1994	58,300,000	20,900,000	36%	43,500,000	76,400,000	8,162,000
1995	103,000,000	25,600,000	25%	79,800,000	132,000,000	13,390,000
1996	63,500,000	14,400,000	23%	53,500,000	74,700,000	5,715,000
1997	96,000,000	27,600,000	29%	82,500,000	111,000,000	7,680,000
1998	75,200,000	21,000,000	28%	64,400,000	87,300,000	6,016,000
1999	110,600,000	30,400,000	27%	89,900,000	135,000,000	11,060,000
2000	14,100,000	4,700,000	33%	12,200,000	16,200,000	987,000
2001	69,200,000	13,900,000	20%	54,900,000	86,000,000	8,304,000
2002	44,700,000	8,290,000	19%	33,100,000	59,000,000	6,705,000
2003	11,500,000	3,070,000	27%	9,430,000	13,900,000	1,150,000
2004	40,500,000	8,920,000	22%	31,100,000	51,900,000	5,265,000
2005	51,900,000	13,900,000	27%	37,000,000	70,900,000	8,823,000
2006	8,880,000	2,770,000	31%	68,500,000	113,000,000	1,154,400
2007	36,200,000	10,200,000	28%	28,900,000	44,700,000	3,982,000
2008	88,600,000	20,400,000	23%	59,000,000	128,000,000	17,720,000
Total Suspended Sediment Average (1994–2008)	58,145,000			49,849,000	80,000,000	7,074,000
Suspended Sand Average (1994–2005)		*15,070,000*	*26%*			

[a] The values shown for the Nebraska City gage are based on U.S. Geological Survey published daily total suspended load values at the Nebraska City gage. Because these data are available, the LOADEST analysis was not performed for the Nebraska City location. Because the annual loads were obtained by summing all the daily loads, trend lines did not need to be fit to the data; therefore, no error estimates are given. Suspended sand loads are not reported because particle size data have not been available at the Nebraska City gage since 1991.

Source: Heimann et al. 2010.

A.3.3 Suspended Bed Material Load

The total suspended sediment data presented in the previous section includes particle sizes ranging from clay to coarse sand. However, all of the clay and silt and some of the finer sand in the measured suspended sediment loads remain in permanent suspension as wash load and should not be considered bed material load. The wash load portion must be subtracted from the measured suspended sediment load to obtain a better estimate of the suspended bed material load. The values shown in Table A-4 represent the bed material load-sized fraction of the suspended sediment load after subtracting the wash load; they range from 6 percent at the Hermann gage to 15 percent at the Kansas City gage and are indicated on Figures A-7 through A-10 by the intersection of "D_{10} of the substrate" with the "average gradation" on each graph. The fractions were obtained by retaining only sediment coarser than the river bed D_{10} from the suspended sediment loads for the indicated time periods with sediment size data.

Table A-4 Percentage of Total Suspended Sediment Load with Particle Sizes Coarser Than the Bed Material D_{10}

	Location			
	Nebraska City	St. Joseph	Kansas City	Hermann
Time period of available data	1981–1991	1994–2005	1994–2002	1994–2005
Percent of total suspended load coarser than the bed material D_{10}	13%	13%	15%	6%
Standard deviation	6.7%	8.2%	9.2%	5.3%

To ensure that the river bed D_{10} is a valid estimate of the transition between wash load and bed material load, a separate analysis was conducted based on the "Rouse number" method. The Rouse number is the ratio of particle settling velocity to the shear velocity and indicates whether a particle will be transported and how. Rouse number calculations were performed at the Nebraska City, St. Joseph, Kansas City, and Hermann hydraulic modeling reaches (see Section A.4.1).

Table A-5 shows the dominant sediment transport mechanism expected for a given Rouse number. For Rouse number transport mechanisms, suspended sediment is equivalent to wash load, and bed material load is a combination of the mixed load and bed load categories shown in Table A-5. The values in Table A-5 were determined by Shah-Fairbank (2009) from examination of similar values presented in research by Julien (1998) and Dade and Friend (1998).

Table A-5 Relationship between the Rouse Number and the Dominant Sediment Transport Mechanism

Rouse Number	Dominant Sediment Transport Mechanism
> 12.5	No motion
5 – 12.5	Bed load
1.25 – 5	Mixed load
< 1.25	Suspended load

Notes:

Values were determined by Shah-Fairbank (2009) from examination of similar values presented in research by Julien (1998) and Dade and Friend (1998).

[a] Combination of bed and suspended loads.

Particle settling velocities were calculated using Dietrich's (1982) equation for natural particles. Output from the hydraulic modeling described in Section A.4.1 was used to perform the Rouse number analysis. Results from the Rouse number calculations are presented in Figures A-17 through A-20 for each hydraulic modeling reach. The graphs show the behavior of different particle sizes at different discharges. For example, 1-mm particles will move as bed load at flows up to approximately 25,000 cfs and as mixed load (as suspended load and as bed load) at higher flows. The Rouse number analysis shows that sand particles finer than approximately 0.25 mm at the Nebraska City, St. Joseph, and Kansas City gages—and finer than approximately 0.2 mm at the Hermann gage—remain in suspension at all discharges and should be considered wash load.

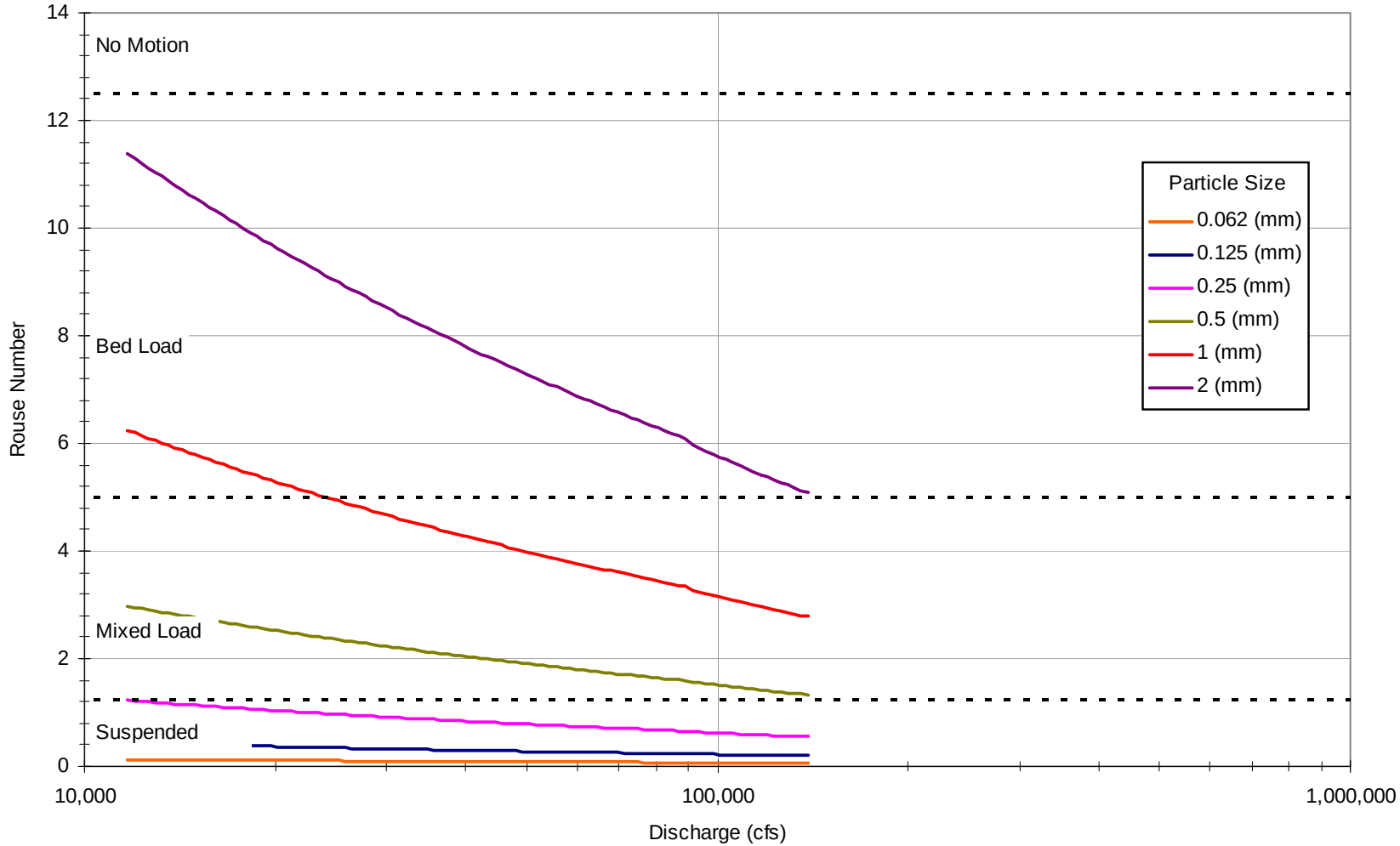

Figure A-17 Mode of Sediment Transport Predicted from Rouse Number Analysis at the Nebraska City Hydraulic Modeling Reach

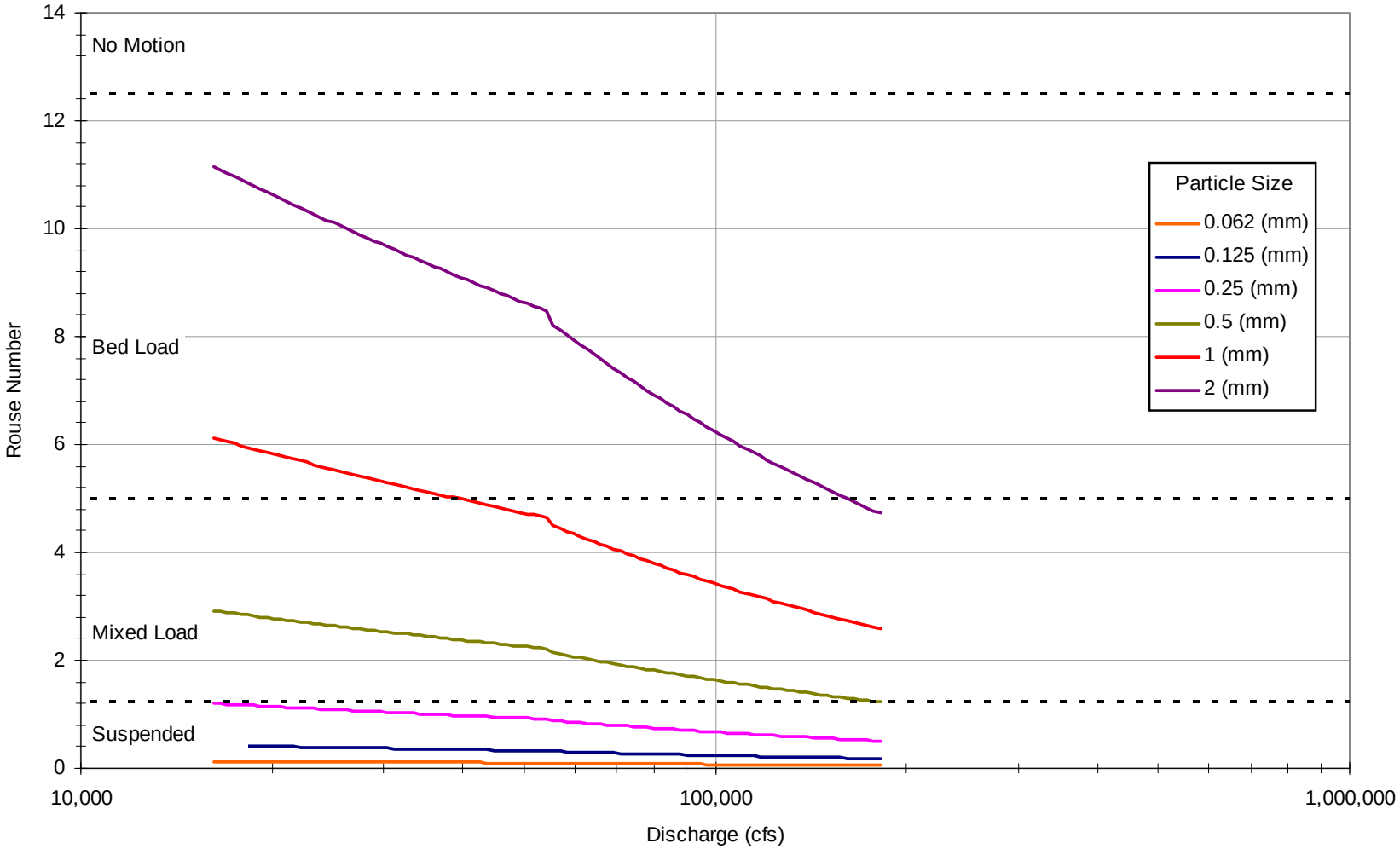

Figure A-18 Mode of Sediment Transport Predicted from Rouse Number Analysis at the St. Joseph Hydraulic Modeling Reach

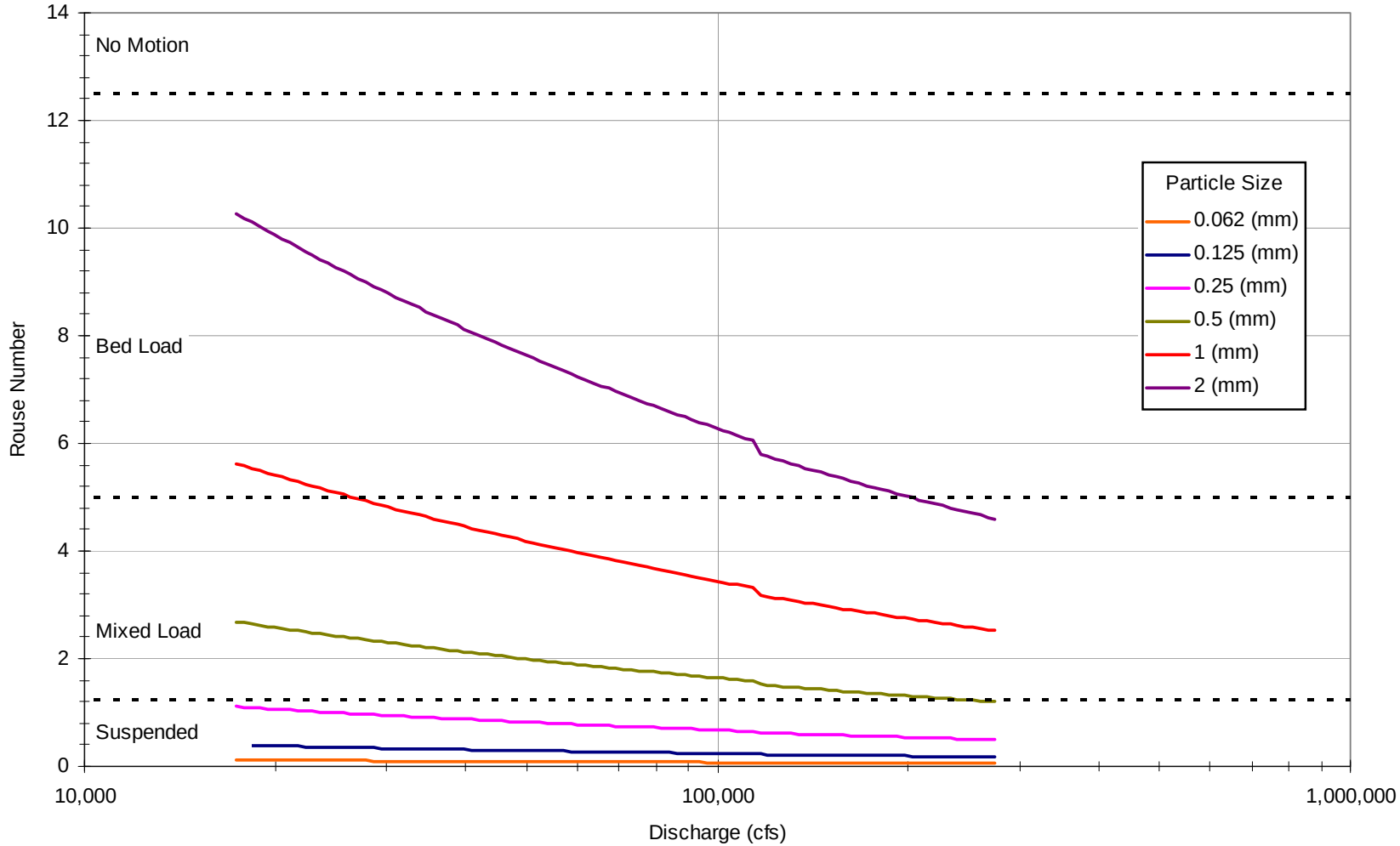

Figure A-19 Mode of Sediment Transport Predicted from Rouse Number Analysis at the Kansas City Hydraulic Modeling Reach

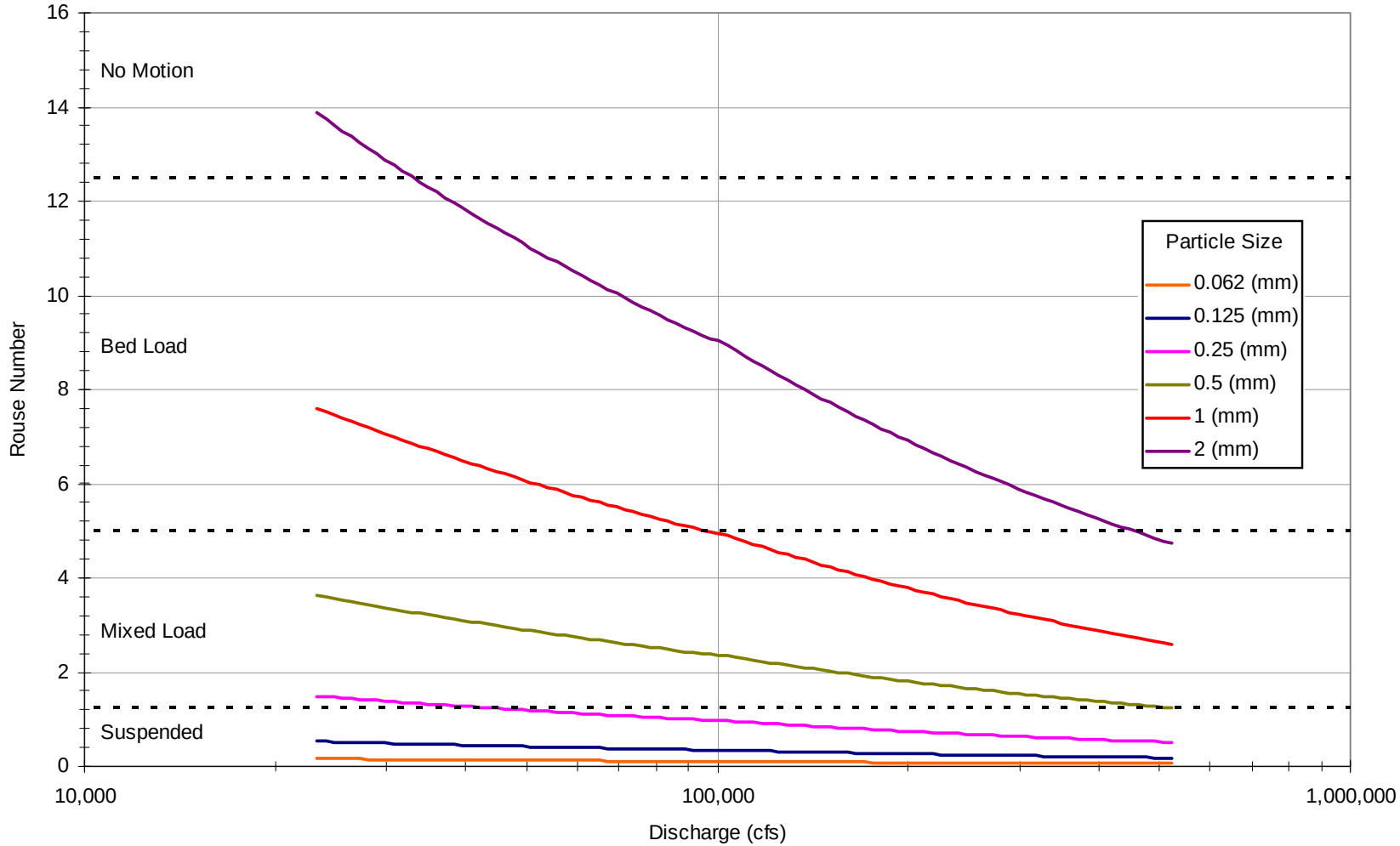

Figure A-20 Mode of Sediment Transport Predicted from Rouse Number Analysis at the Hermann Hydraulic Modeling Reach

A.4 ESTIMATING BED MATERIAL LOADS FOR THE LOWER MISSOURI RIVER

The previous sections describe the particle sizes of the sediment in the river bed and in suspension, and summarize the available data for suspended sediment loads and the bed material load-sized sediment. Because no data are available regarding the sediment moving along the bed as bed load and in the bottom portion of the water column in the unsampled zone, values for these components of bed material load must be estimated. Appropriate equations for use on large sand-bed rivers were reviewed and used to calculate bed material loads. Each equation required input of several measured or estimated parameters to calculate the bed material load, including the physical geometry of the channel, a range of flows and velocities, and sediment size distributions and loads. Sufficient data were available from the USGS gage sites at St. Joseph, Kansas City, and Hermann to meet the input requirements of the equations. The gage at Nebraska City, upstream from the Project area, was included because daily suspended sediment load measurements were available for that gage and can be used to check the results of the calculations.

Bed material loads for the LOMR were estimated using the following procedure:

- Modeling reaches were established at the four USGS gage locations using measured channel cross sections;
- A hydraulic model was developed at the modeling reaches and calibrated with measured water stage, flows, and velocities to estimate the amount of energy available to transport sediment;
- A suspended sediment rating curve was developed to determine daily loads based on a range of flows;
- Appropriate equations were selected and used to calculate average bed material loads for two representative time periods; and
- The results were compared with previous studies and existing data on suspended sediment loads.

Each of these steps is described in the following sections.

A.4.1 Hydraulic Modeling to Support Bed Material Load Calculations

A hydraulic model was created to determine the hydraulic properties of the river channel and to define the amount of flow energy available to transport the bed material load. The bed material load equations presented below require hydraulic input values, such as flow velocity, flow depth, and channel width.

The procedure to establish modeling reaches, calibrate the models with measured hydraulic data, and analyze the data for use in the bed material load calculations is described below.

Hydraulic modeling sites were established at the Nebraska City (RM 562.6), St. Joseph (RM 448.2), Kansas City (RM 366.1), and Hermann (RM 97.9) gaging sites to model steady and gradually varied flow conditions using USACE HEC-RAS software. These locations were selected because (1) they are the sites with the most sediment records (as discussed above); and (2) measurement data are available to calibrate the hydraulic and sediment models. The hydraulic output from the models was used in bed material load equations to determine the sediment supply for the LOMR.

At the St. Joseph, Kansas City, and Hermann gages, approximately 1,500-foot-long modeling reaches were created using the 2008 USACE hydroacoustic cross section bed elevation data. These cross sections were supplemented with USGS digital elevation data for the banks and floodplain for elevations outside of the range of the hydroacoustic data (see Table A-6 for details of modeling sites). The Nebraska City modeling site is over 3,500 feet long and uses USGS acoustic Doppler current profiler (ADCP) data supplemented with digital elevation data at higher elevations to create modeling cross sections. Recorded depths in the Nebraska City ADCP data were converted to river bed elevations based on the river's stage at the time of measurement and the distance of the measurement cross section from the gage. At all four locations, the highest-resolution digital elevation data available were used for the cross section upland elevations.

Table A-6 Descriptions of the Four HEC-RAS Modeling Reaches in the Lower Missouri River

	Location			
	Nebraska City	St. Joseph	Kansas City	Hermann
Length	3,600	1,480	1,530	1,430
Number of cross sections	4	7	7	7
Source of bed elevations	USGS ADCP	USACE 2008 Hydroacoustic	USACE 2008 Hydroacoustic	USACE 2008 Hydroacoustic
Source of bank and upland elevations	USGS 1/3 and 1/9 Arc Second NED	USGS 1/9 Arc Second NED	USGS 1/9 Arc Second NED	USGS 10m DEM

Notes:

ADCP = Acoustic Doppler current profiler.
DEM = Digital elevation model.
NED = National elevation dataset.

The modeling cross sections and Missouri River Bank Stabilization and Navigation Project (BSNP) channel engineering features for each location are shown in Figures A-21 through A-24. The figures

illustrate the locations of the cross section survey points used in the model, as well as physical features such as dikes, revetments, and bridges. The USGS ADCP cross section survey points at Nebraska City (Figure A-21) are so close together that they appear as a thick dark line on the map.

The steady flows modeled in HEC-RAS range from the minimum to maximum mean daily discharge recorded for the period from 1994 to 2009 at each location. This period corresponds with the period analyzed in the sediment transport analysis. Each of the modeling sites was created with the most upstream cross section located near the USGS gage (except for the Nebraska City gage, see below) so that the model could be started downstream and the measured stages at the gage could be used to calibrate the modeled stages at the gage cross section. Table A-7 lists the corresponding stages based on the most recent USGS data of the modeled discharges available online in the USGS National Water Information System (NWISWeb) (USGS 2001).

Table A-7 Discharges and Stages Used at the Modeling Sites in the Lower Missouri River (USGS Gage Data)

Nebraska City		St. Joseph		Kansas City		Hermann	
Discharge (cfs)	Stage (NGVD 29 ft)	Discharge (cfs)	Stage (NGVD 29 ft)	Discharge (cfs)	Stage (NGVD 29 ft)	Discharge (cfs)	Stage (NGVD 29 ft)
10,000	907.9	17,000	790.7	20,000	711.0	23,000	481.7
15,000	909.2	25,000	793.0	25,000	711.9	35,000	485.1
20,000	910.6	37,500	796.6	37,500	714.8	50,000	487.6
25,000	911.9	50,000	799.0	50,000	717.4	63,000	489.6
30,000	913.1	62,500	801.4	62,500	719.9	75,000	491.4
35,000	914.4	75,000	803.3	75,000	721.8	100,000	494.5
40,000	915.5	87,500	805.2	87,500	723.4	150,000	499.4
50,000	917.6	100,000	806.6	100,000	725.0	200,000	503.0
60,000	919.6	125,000	809.2	125,000	727.6	250,000	506.1
80,000	922.7	150,000	811.5	150,000	730.4	300,000	509.1
100,000	925.2	175,000	813.2	175,000	732.9	350,000	511.1
125,000	927.4	182,000	813.4	200,000	735.4	400,000	512.6
139,000	928.7			250,000	739.9	523,000	516.8
				275,000	740.8		

Notes:

cfs = Cubic feet per second.
ft = Feet.
NGVD = National geodetic vertical datum.

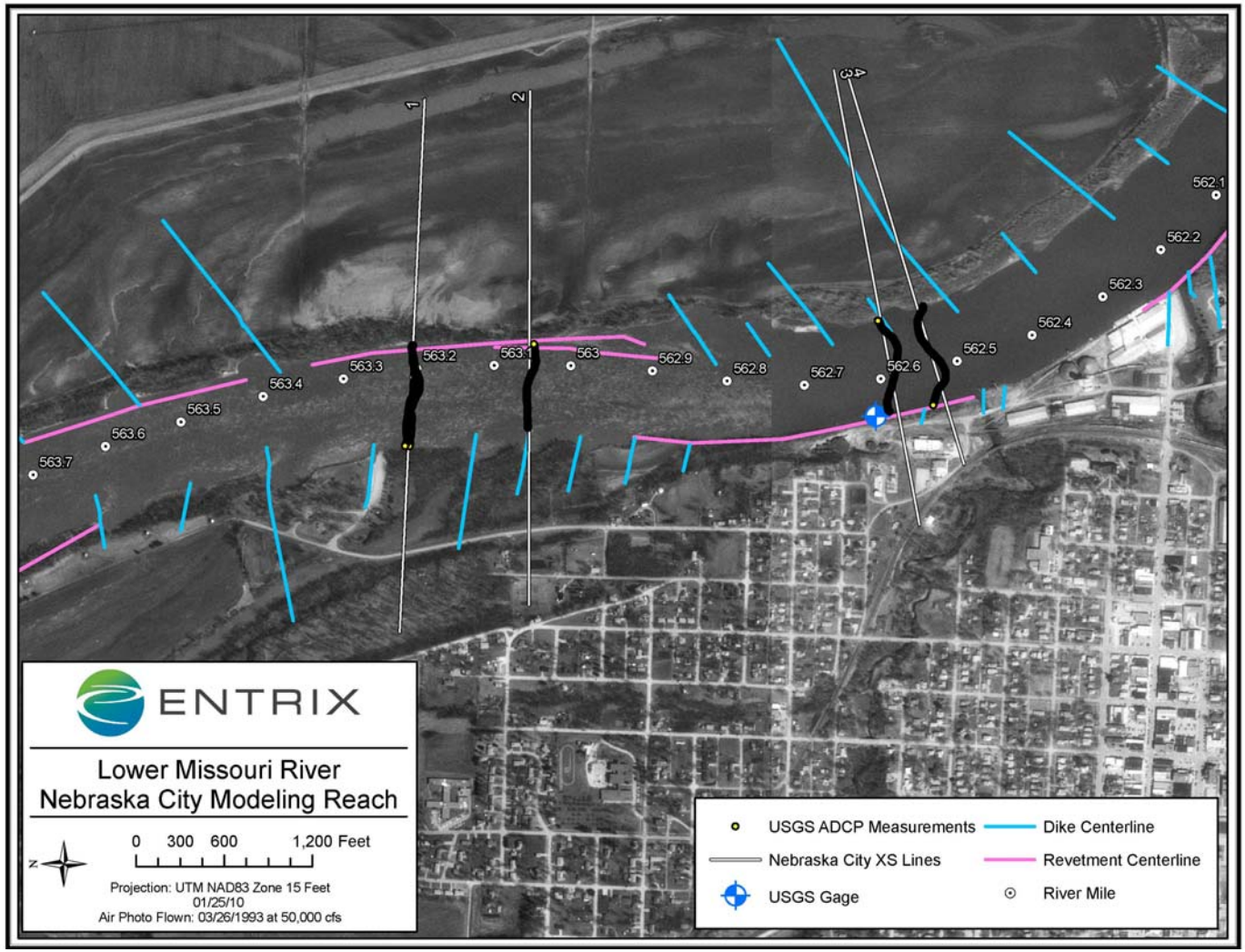

Figure A-21 Overview of the Nebraska City Hydraulic Modeling Reach

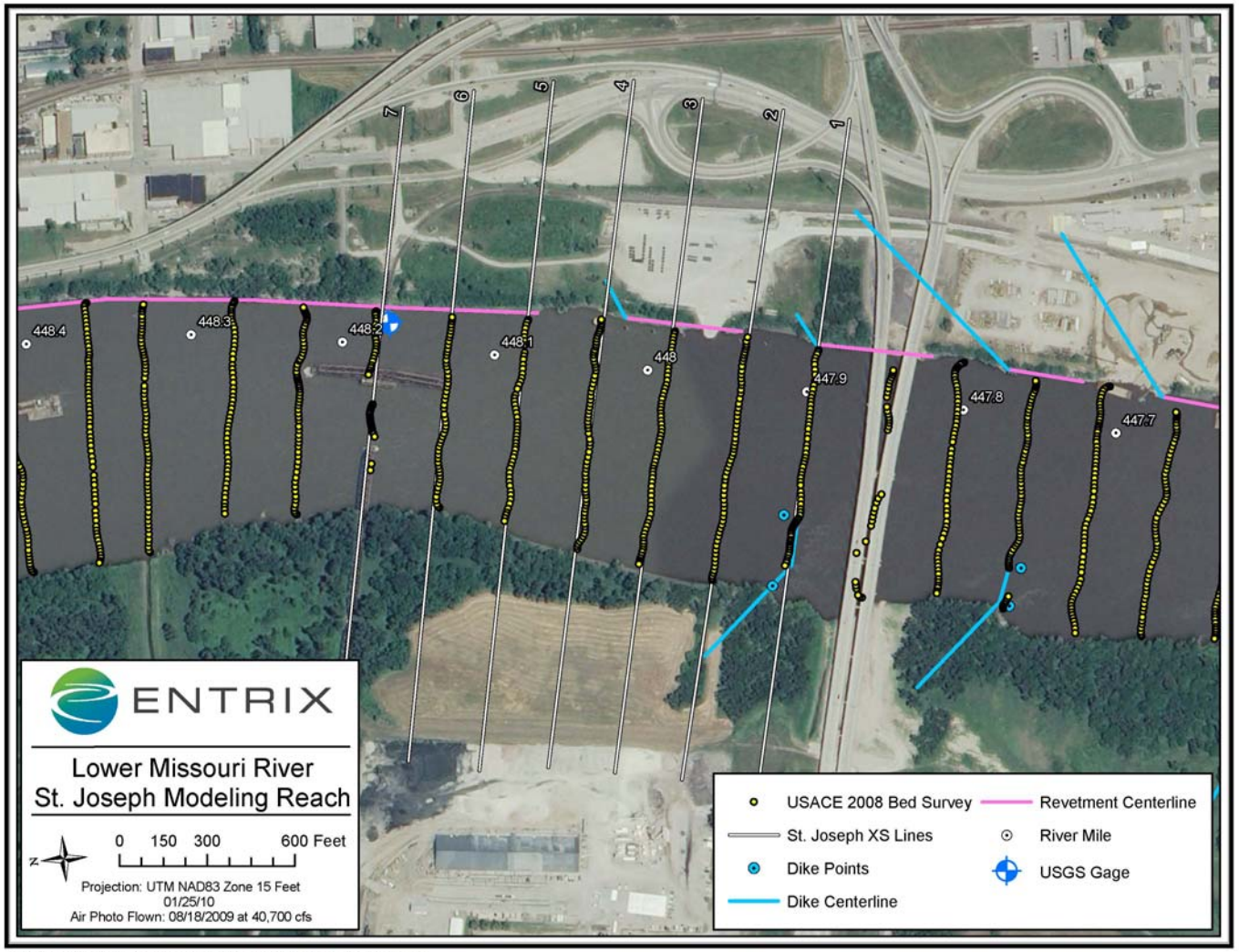

Figure A-22 Overview of the St. Joseph Hydraulic Modeling Reach

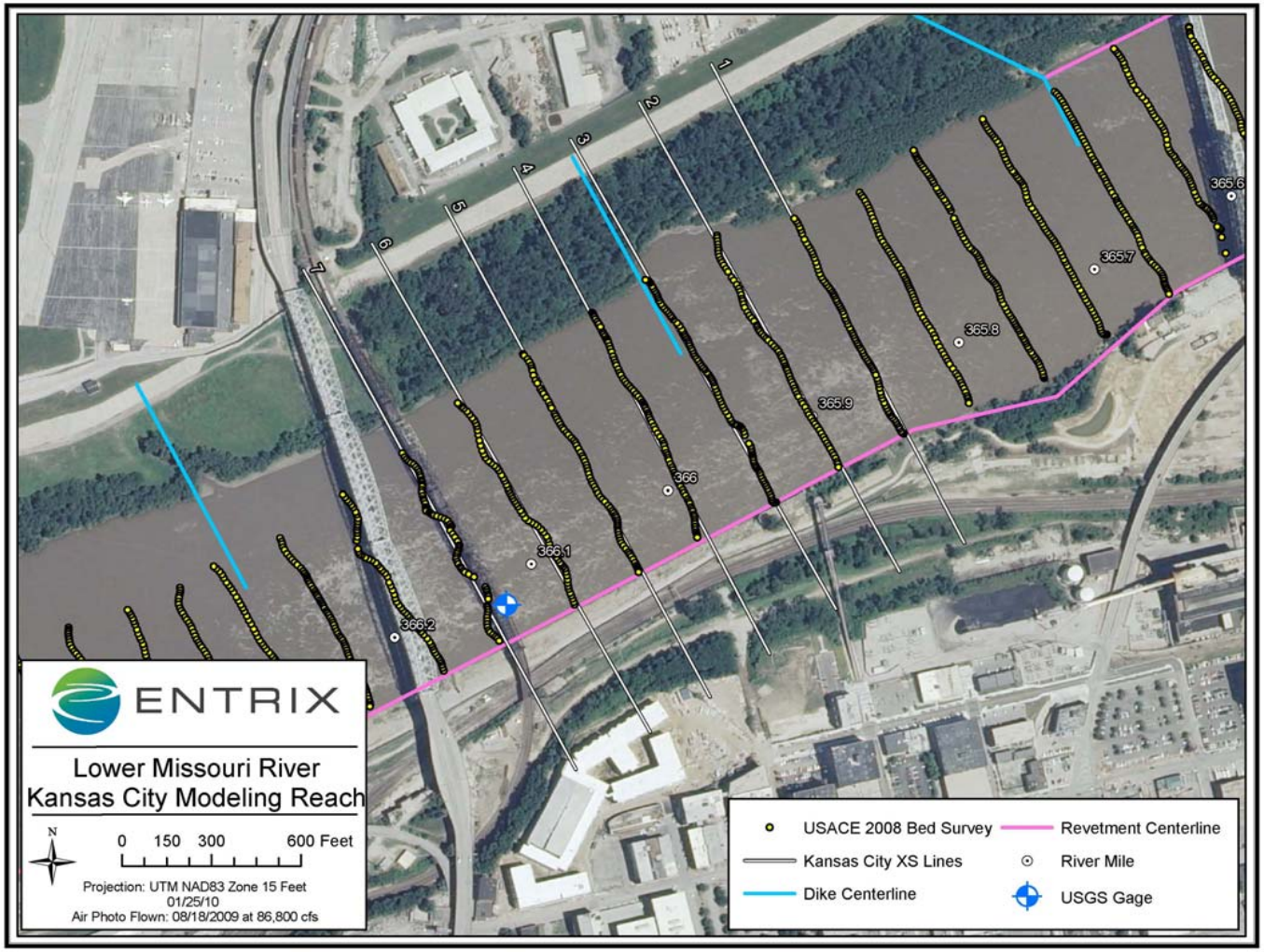

Figure A-23 Overview of the Kansas City Hydraulic Modeling Reach

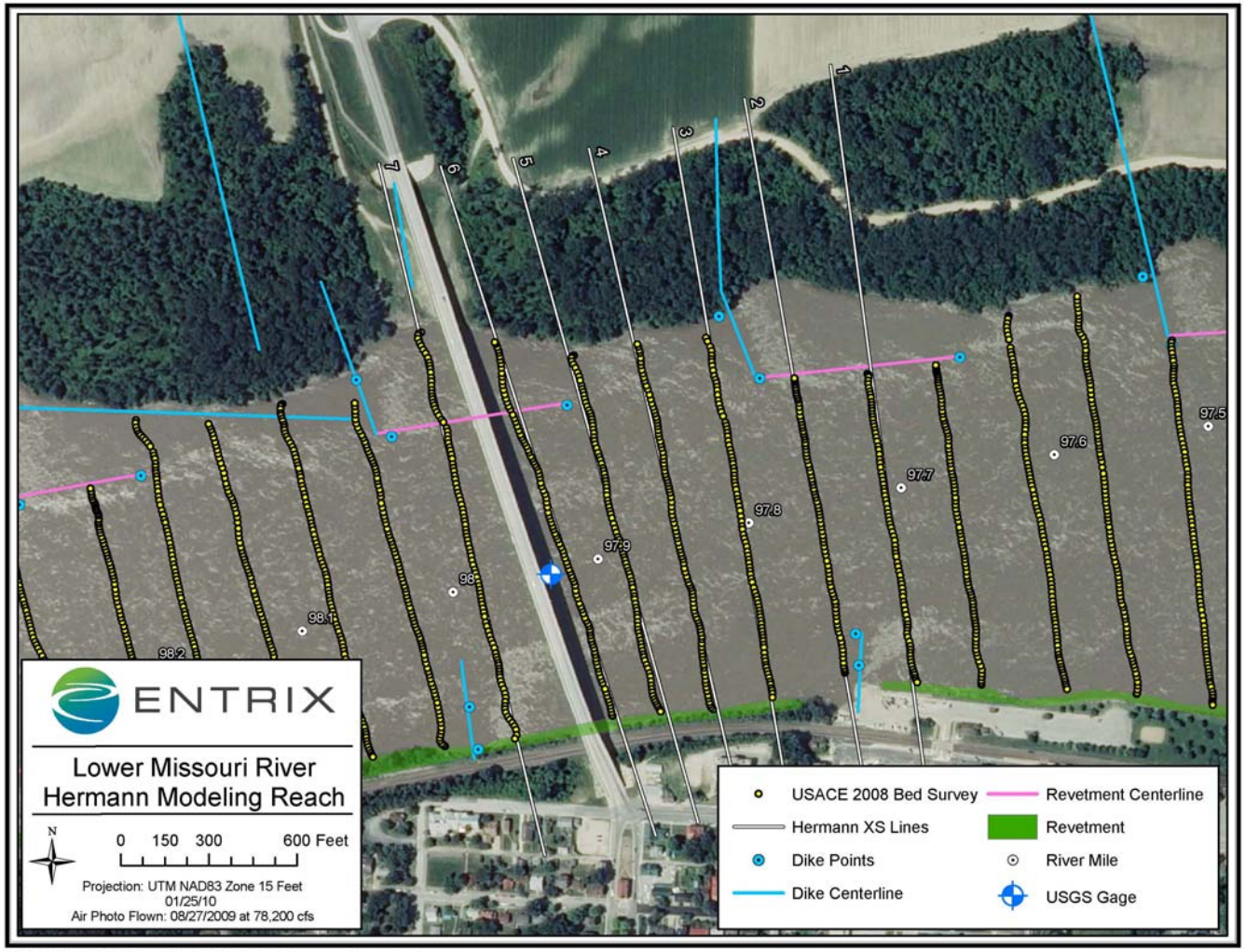

Figure A-24 Overview of the Hermann Hydraulic Modeling Reach

Because the Nebraska City gage is located in the middle of the modeling reach, observed water surface elevations for the most upstream cross section were created by increasing the stage at the gage based on the distance and slope of the river. Manning's roughness values[2] of 0.03 in the active channel and 0.08 in vegetated channel margins produced the best match between measured and modeled water surface elevations. A review of the plotted model output indicated that the modeled and measured water surface elevations were typically within a few tenths of a foot from each other, indicating that the model accurately replicates measured water surface elevations.

Example cross section plots from the Hermann reach showing modeled water surface elevations and Manning's "n" roughness values are shown in Figure A-25. The cross sections were plotted without vertical exaggeration to show their dimensions at a one-to-one scale. The red circles on the cross sections represent the boundaries chosen to delineate the channel in HEC-RAS from the left and right overbank areas. The "channel" was defined as the width over which most of the bed material load is transported. The channel designated for bed material load transport did not include BSNP infrastructure such as dikes or revetments. Including these structures in the wetted width of the channel would have resulted in unrealistic modeled bed material load transport rates, because the model simplifies the complex transport processes occurring in and around the BSNP structures. For example, at cross section six at Hermann (see Figure A-24), the left descending bank (looking downstream) is set approximately 300 feet from the left edge of water at the revetment or L-dike centerline, which is 300 feet from the left edge of water. At cross sections without BSNP infrastructure, the entire wetted width of the channel bed was used (see cross section four in Figure A-24). The hydraulic output specific to the HEC-RAS channel was used in the sediment transport calculations because it defines the energy available in the zone where bed material load is moving.

Measured and modeled velocities and measured and modeled water surface elevations were compared to determine the accuracy of the model. The USGS periodically measures the discharge at their gaging stations to verify and update stage-discharge rating curves. These data are available online in NWISWeb (USGS 2001). In addition to reporting the measured discharge and other factors related to the measurement, the USGS reports the mean flow velocity and channel width at the time of measurement.

[2] Manning's roughness "n" is an empirical coefficient used to estimate the resistance of a river to the flow of water and is used in the Manning's equation, which is a relationship between flow rate and parameters such as channel slope, channel size and shape, channel roughness, and flow depth.

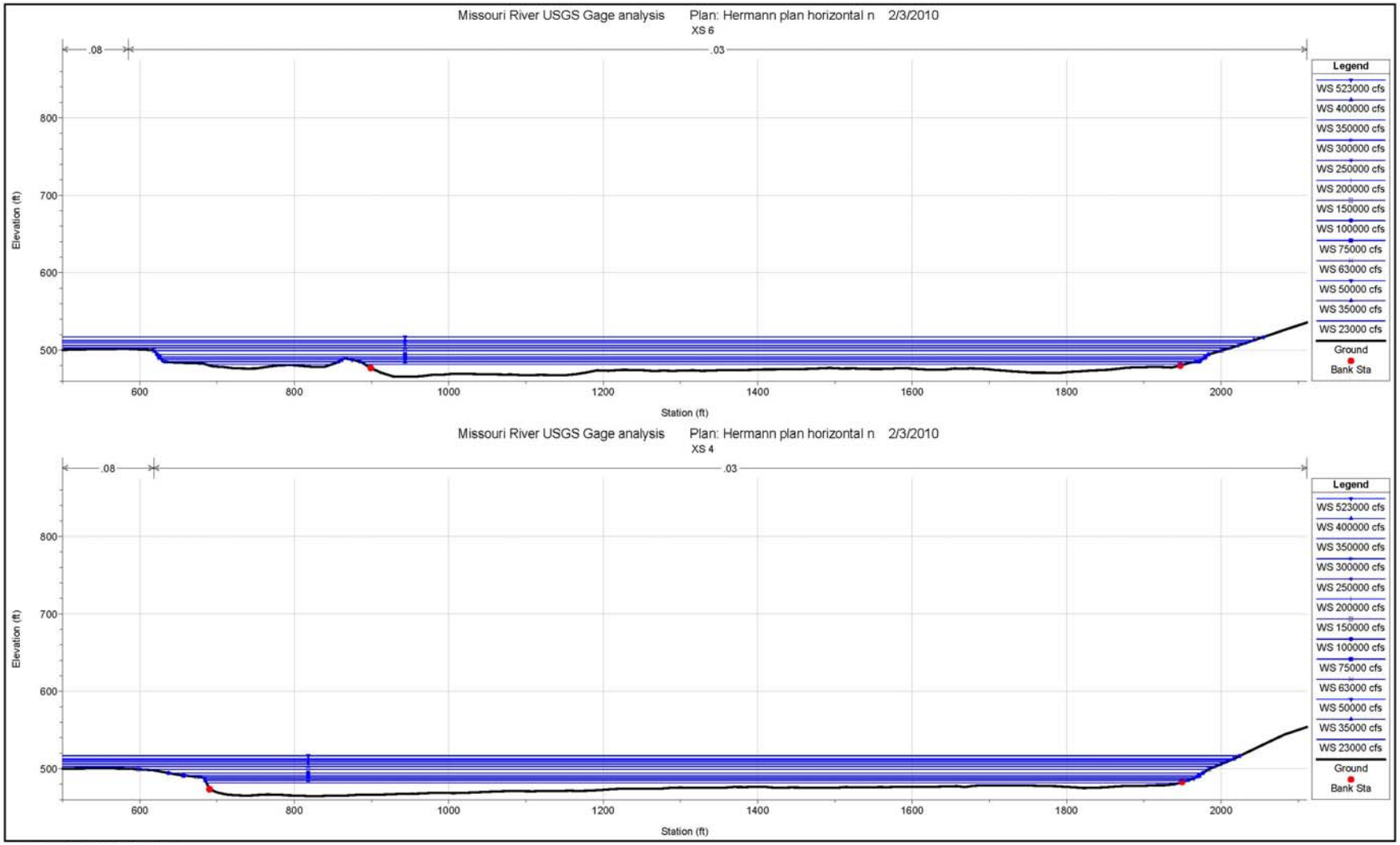

Figure A-25 Example HEC-RAS Cross Section Plots Showing Bed Material Transport Widths for a Cross Section with (XS 6 top) and without (XS 4 bottom) Missouri River Bank Stabilization and Navigation Project Revetments

Historically, the USGS measured discharges by lowering flow meters from a crane mounted on a bridge at or near the gaging site. In recent years, the USGS has changed from bridge measurements to ADCP measurements taken from boats moving on a transect across the channel. The transect is near the gage, but not always at the same exact river location. The measurement location may vary between measurements, depending on flow level. Therefore, when comparing the trend of mean velocities with time, it was noted that the crane measurements were not exactly comparable to the ADCP measurements because they were not all collected at precisely the same cross section. They were determined to be sufficiently similar for the purposes of the analysis and are the only data available.

Plots showing mean flow velocity versus discharge are shown for the St. Joseph, Kansas City, and Hermann gages in Figures A-26 through A-28. Each plot shows measured velocities from 1990 to 2009. All of the measurements taken with a crane were plotted as one series, and all recent ADCP measurements from 2007 to 2009 were plotted as a separate series. The separate plots distinguish between the two measurement methods and show trends in velocity for the previous 2 years. The plots also show the modeled results for comparison purposes.

The modeled results were found to compare well with the measured data. At St. Joseph, Kansas City, and Hermann, the modeled velocities follow the trend of the 2007–2009 measured data instead of the older measured velocities dating back to 1990. This is expected because the channel elevation data are based on 2008 surveys, and the stages used to calibrate the model were determined from the most recent stage-discharge curves. At Nebraska City, the modeled velocities were not plotted; they can be directly compared with measured ADCP velocities because the cross sections were generated from depths recorded by the ADCP during the same measurement. Results in Table A-8 show that the modeled velocities are within 0.1–0.2 feet per second of the ADCP velocities.

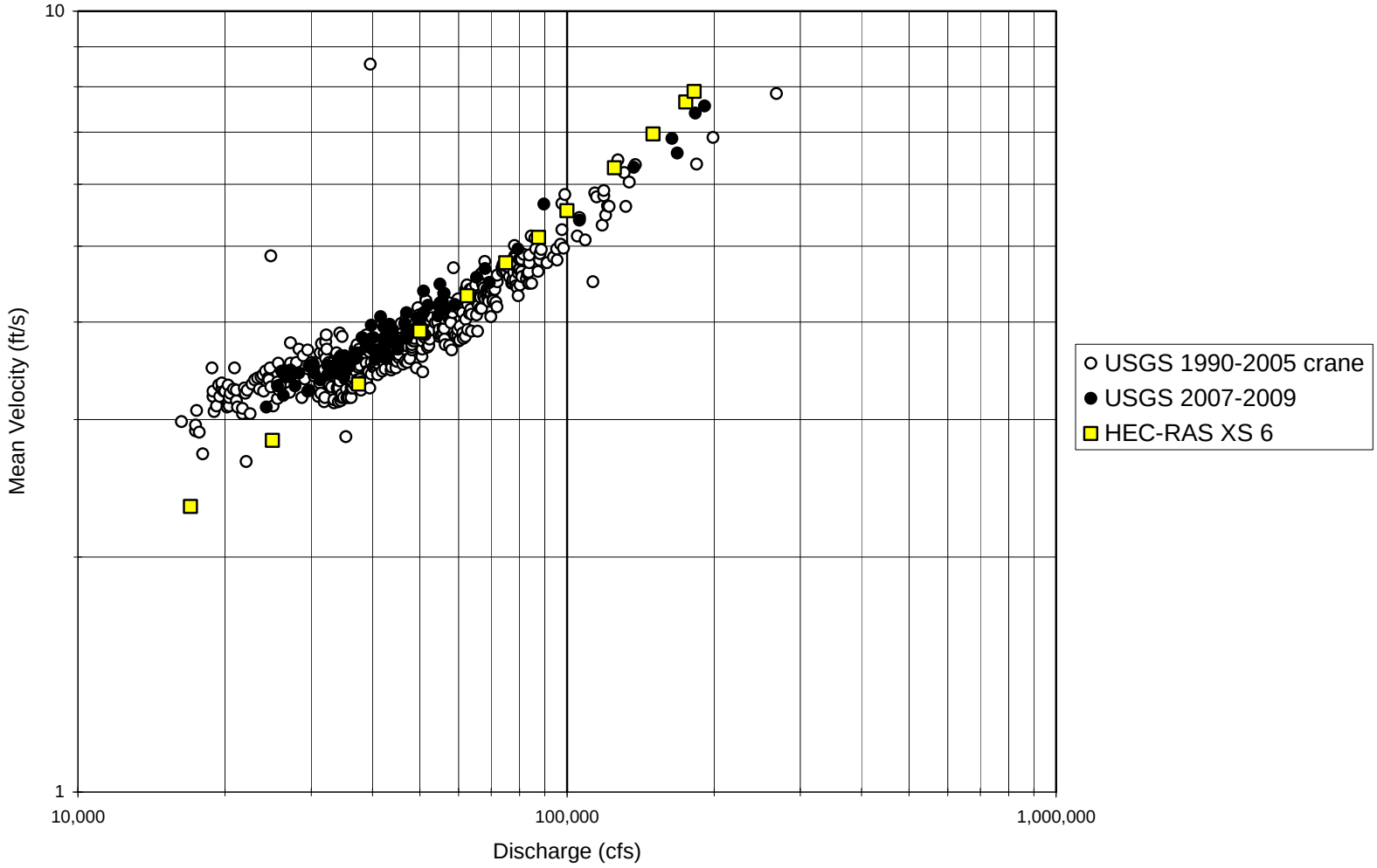

Figure A-26 Comparison of USGG Measured and HEC-RAS Modeled Mean Channel Velocities at the St. Joseph Gage

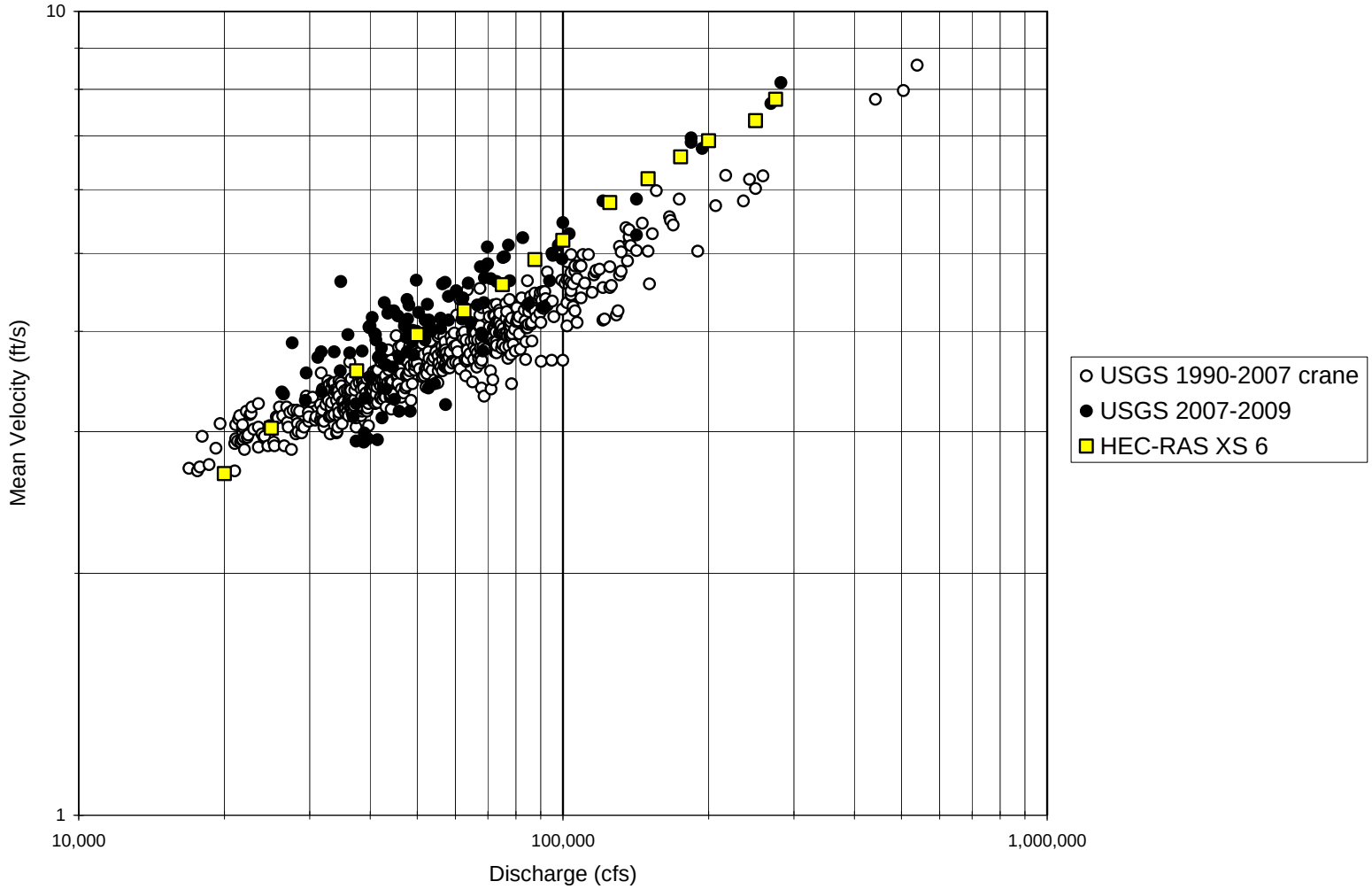

Figure A-27 Comparison of USGG Measured and HEC-RAS Modeled Mean Channel Velocities at the Kansas City Gage

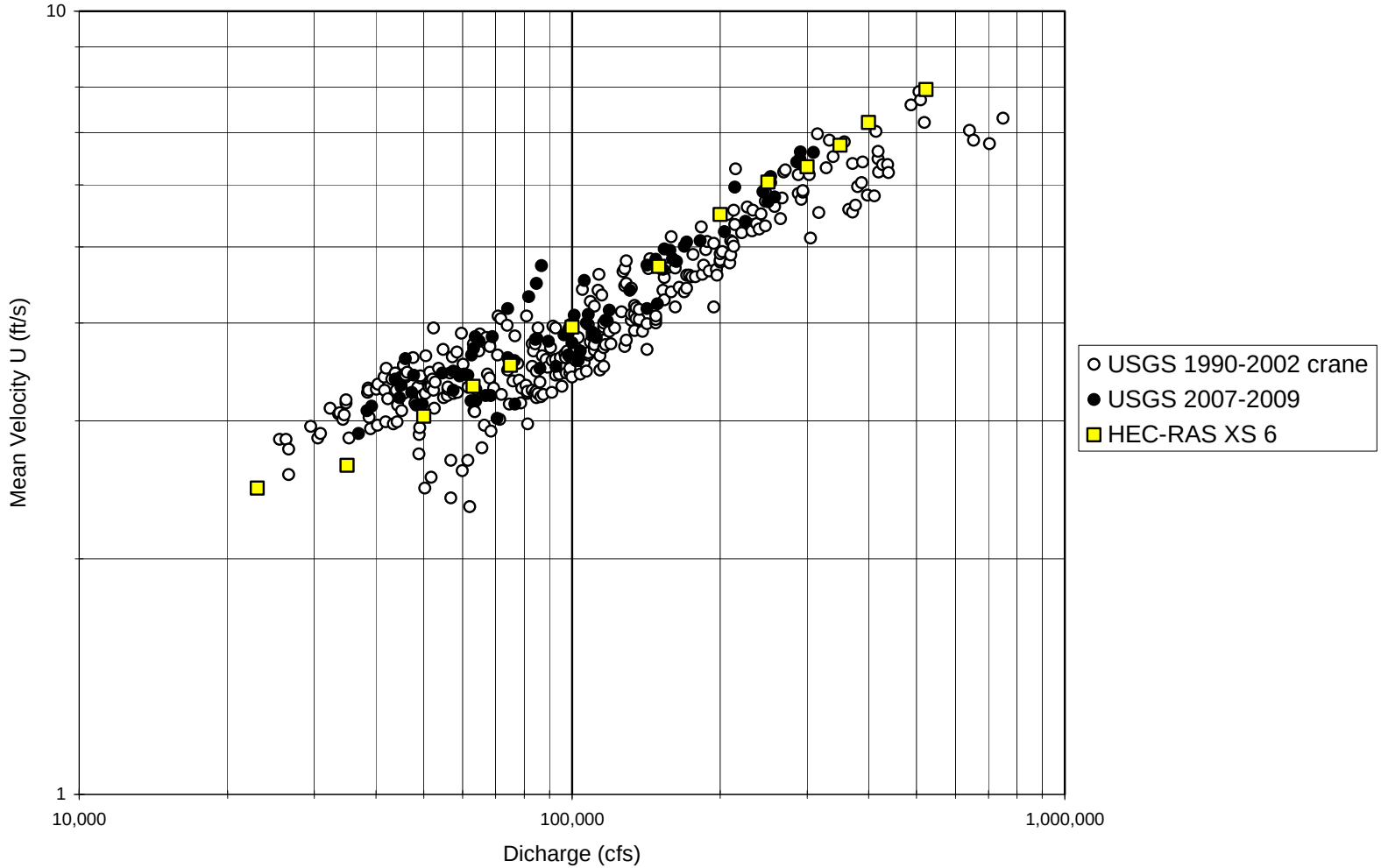

Figure A-28 Comparison of USGG Measured and HEC-RAS Modeled Mean Channel Velocities at the Hermann Gage

Table A-8 Comparison of Measured and Modeled Velocities at the Nebraska City Modeling Reach

HEC-RAS Cross Section	Discharge (cubic feet per second)	Velocity (feet per second)	
		USGS Acoustic Doppler Current Profiler	HEC-RAS Modeled
4	53,700	4.4	4.6
4	78,300	5.5	5.4
3	39,700	4.3	4.3
2	109,000	6.1	6.0
1	116,000	6.3	6.2

Note:

USGS = U.S. Geological Survey.

A.4.2 Total Bed Material Load Calculations

This section describes the methods used to calculate total bed material loads based on the output from the hydraulic models and the measured sediment particle size data presented above. Total bed material loads were calculated at the four gage locations using five different equations:

1. Ackers and White (1973) with HR Wallingford (1990) adjusted coefficients;
2. Engelund and Hansen (1967);
3. Molinas and Wu (2001);
4. Yang (1973); and
5. Series Expansion of the Modified Einstein Procedure (SEMEP) (Shah-Fairbank 2009, Guo and Julien 2004).

All five equations predict total bed material load, which is the sum of the bed load and bed material component of the suspended load. These five equations were selected for the analysis because they are commonly used by both researchers and practitioners to estimate total bed material loads on large sand-bed rivers with relatively uniform bed sediment, such as the Missouri River (García 2008, Molinas and Wu 2000). Because there is no consensus in the field of sediment transport on which equation is the best predictor of bed material load transport, all five equations were used in the study to show the range of loads predicted. As discussed below, an average result of the equations was used to form the result.

Descriptions of the equations and the actual equations are presented below. The notation for the equations is based on Parker (2005).

A.4.2.1 Ackers and White (1973) with HR Wallingford (1990) Adjusted Coefficients

This equation is based on Bagnold's stream power concept, in which general physical principles are used to state that the energy to transport sediment is determined by the available power of the flow. Ackers and White applied dimensional analysis to express sediment mobility using dimensionless parameters (García 2008). Several of the equation's parameters were originally determined using best-fit laboratory data. In 1990, HR Wallingford developed new coefficients for the original equation to prevent it from overestimating transport for fine sediments less than approximately 0.2 mm. The revised coefficients were used in this study.

q_t - unit volume total bed material transport rate per unit width [L2/T] is

$$q_t = \frac{1}{(R+1)} \frac{X_t}{(1-X_t)} q_w$$, and

flux-based mass concentration of total bed material sediment X_t [1] is

$$X_t = \frac{R+1}{\hat{H}} (Cz)^n C_{aw} \left(\frac{F_{gr}}{A_{aw}} - 1 \right)^m$$, where

the sediment mobility number F_{gr} is

$$F_{gr} = \sqrt{\tau^*} \, (Cz)^{1-n} \left(\frac{1}{\sqrt{32} \, \ell og_{10}(10\hat{H})} \right)^{1-n}$$, and

the dimensionless Chezy resistance coefficient C_z [1] is

$$C_z = \frac{U}{u_*}$$, and

$$\hat{H} = \frac{H}{D}$$

The coefficients are defined as:

$$n = \begin{cases} 1.00 - 0.56\,\ell og_{10}\left(\mathbf{Re}_p^{2/3}\right) & , \quad 1 < \mathbf{Re}_p^{2/3} \le 60 \\ 0 & , \quad 60 < \mathbf{Re}_p^{2/3} \end{cases}$$

$$m = \begin{cases} \dfrac{6.83}{\mathbf{Re}_p^{2/3}} + 1.67 & , \quad 1 < \mathbf{Re}_p^{2/3} \le 60 \\ 1.78 & , \quad 60 < \mathbf{Re}_p^{2/3} \end{cases}$$

$$A_{aw} = \begin{cases} 0.23\mathbf{Re}_p^{-1/3} + 0.14 & , \quad 1 < \mathbf{Re}_p^{2/3} \le 60 \\ 0.17 & , \quad 60 < \mathbf{Re}_p^{2/3} \end{cases}$$

$$\ell og_{10} C_{aw} = \begin{cases} 2.79\,\ell og_{10}(\mathbf{Re}_p^{2/3}) - 0.98[\ell og_{10}(\mathbf{Re}_p^{2/3})]^2 - 3.46 & , \quad 1 < \mathbf{Re}_p^{2/3} \le 60 \\ -1.60 & , \quad 60 < \mathbf{Re}_p^{2/3} \end{cases}$$

Where:

$R = (\rho/\rho_s - 1)$, sediment submerged specific gravity [1]
ρ = water density [M/L^3]
ρ_s = sediment material density [M/L^3]
$Re_p = \sqrt{RgD}\,D/\nu$ [1]
g = acceleration of gravity [L/T^2]
D = grain size [L]
ν = kinematic viscosity of water [L^2/T]
q_w = water discharge per unit width [L^2/T]
U = depth- or cross sectionally-averaged flow velocity [L/T]
$u_* = \sqrt{\tau_b/\rho}$, shear velocity [L/T]
H = cross sectionally averaged flow depth [L]
$\tau_b = \rho g H S_f$, bed shear stress [M/L/T^2]
S_f = down-channel friction slope [1]
$\tau^* = \tau_b/(\rho RgD)$, Shields number [1]

A.4.2.2 Engelund and Hansen (1967)

This equation applies Bagnold's stream power concept and the similarity principle in which a series of non-dimensional parameters are obtained to characterize sediment transport. The relatively simple equation was formulated from a small set of laboratory data but has been shown to perform well as a field predictor (García 2008).

q_t - unit volume total bed material transport rate per unit width [L^2/T] is

$q_t = q_t^* \sqrt{RgD}D$, where

Einstein number q^*_t for total bed material load [1] is

$q_t^* = \frac{0.05}{C_f}(\tau^*)^{5/2}$, and

the total resistance coefficient C_f [1] is

$C_f = \frac{2(gR_h S_f)}{U^2}$, and

the Shields number τ^* [1] is

$$\tau^* = \frac{\tau_b}{\rho RgD} = \frac{u_*^2}{RgD}$$

Where:

g = acceleration of gravity [L/T^2]
R_h = hydraulic radius [L]
S_f = down-channel friction slope [1]
U = depth- or cross sectionally-averaged flow velocity [L/T]
$\tau^* = \tau_b/(\rho RgD)$, Shields number [1]
$\tau_b = \rho gHS_f$, bed shear stress [$M/L/T^2$]
$R = (\rho/\rho_s - 1)$, sediment submerged specific gravity [1]
ρ = water density [M/L^3]
ρ_s = sediment material density [M/L^3]
D = grain size [L]
H = cross sectionally averaged flow depth [L]
$u_* = \sqrt{\tau_b / \rho}$, shear velocity [L/T]

A.4.2.3 Molinas and Wu (2001)

Molinas and Wu state that many sediment transport equations are derived from laboratory studies with shallow flow depths where Reynolds numbers are much lower; Froude numbers are much higher; and water surface slopes are steeper when compared to conditions in large, natural rivers (Molinas and Wu 2001). Molinas and Wu (2001) used the universal stream power concept to develop a bed material

load equation for large sand-bed rivers. An advantage of their equation is that the energy slope (S_f) is not a required input, which can be difficult to accurately measure on large low-gradient rivers (Molinas and Wu 2001).

q_t - unit volume total bed material transport rate per unit width [L^2/T] is

$q_t = .0027 q_w C_t$, where

flux-based volume total bed material concentration C_t [ppm] is

$$C_t = \frac{1430\left(0.86 + \sqrt{\Psi}\right)\Psi^{1.5}}{0.016 + \Psi}$$, and

Ψ = universal stream power [1] is defined as

$$\Psi = \frac{U^3}{gRHv_s\left[\log_{10}\left(\frac{H}{D}\right)\right]^2}$$

Where:

U = depth- or cross sectionally-averaged flow velocity [L/T]
g = acceleration of gravity [L/T^2]
R = ($\rho/\rho_s - 1$), sediment submerged specific gravity [1]
ρ = water density [M/L^3]
ρ_s = sediment material density [M/L^3]
H = cross sectionally averaged flow depth [L]
v_s = particle terminal fall velocity in quiescent water [L/T]
D = grain size [L]
q_w = water discharge per unit width [L^2/T]

A.4.2.4 Yang (1973)

This equation is based on dimensional analysis and unit stream power theory, with coefficients determined from multiple regression analysis of laboratory flume data (García 2008). Yang and Molinas (1982, as cited in García 2008) report good results when comparing the Yang (1973) equation with 166 river measurements, although no large rivers were included in the analysis (García 2008).

q_t - unit volume total bed material transport rate per unit width [L^2/T] is

$$q_t = \frac{1}{(R+1)} \frac{X_t}{(1-X_t)} q_w \text{ , and}$$

Flux-based mass concentration of total bed material sediment X_t [1] is

$$\ell og_{10}(X_t \cdot 10^6) = 5.435 - 0.286\ell og_{10}(\mathbf{R}_f \mathbf{Re}_p) - 0.457\ell og_{10}\left(\frac{u_*}{v_s}\right) + \left[1.799 - 0.409\ell og_{10}(\mathbf{R}_f \mathbf{Re}_p) - 0.314\ell og_{10}\left(\frac{u_*}{v_s}\right)\right]\ell og_{10}\left(\frac{US_f}{v_s} - \frac{U_c S_f}{v_s}\right)$$

where

$$\frac{U_c}{v_s} = \begin{cases} \dfrac{2.5}{\ell og_{10}\left(\dfrac{u_* D}{\nu}\right) - 0.06} + 0.66 & , \quad 1.2 < \dfrac{u_* D}{\nu} < 70 \\ 2.05 & , \quad 70 \le \dfrac{u_* D}{\nu} \end{cases}$$

and

$$\mathbf{R}_f = \frac{v_s}{\sqrt{RgD}}, \ \mathbf{Re}_p = \frac{\sqrt{RgD}\, D}{\nu}$$

Where:

$R = (\rho/\rho_s - 1)$, sediment submerged specific gravity [1]
ρ = water density [M/L^3]
ρ_s = sediment material density [M/L^3]
$Re_p = \sqrt{RgD}\, D/\nu$ [1]
g = acceleration of gravity [L/T^2]
D = grain size [L]
ν = kinematic viscosity of water [L^2/T]
q_w = water discharge per unit width [L^2/T]
v_s = particle terminal fall velocity in quiescent water [L/T]
$u_* = \sqrt{\tau_b / \rho}$, shear velocity [L/T]
$\tau_b = \rho g H S_f$, bed shear stress [$M/L/T^2$]
H = cross sectionally averaged flow depth [L]

S_f = down-channel friction slope [1]
U = depth- or cross sectionally-averaged flow velocity [L/T]

A.4.2.5 Series Expansion of the Modified Einstein Procedure (SEMEP) (Shah-Fairbank 2009, Guo and Julien 2004)

Hans Albert Einstein (1950) developed a method to determine a channel's total sediment load by calculating the bed load transport and integrating the suspended sediment discharge equation to compute the amount of sediment in transport in the channel's unmeasured zone. Suspended sediment discharge was determined by integrating the product of the theoretical velocity profile (Keulegn 1938, as cited in Shah-Fairbank 2009) and suspended sediment concentration profile (Rouse 1937, as cited in Shah-Fairbank 2009).

The Einstein (1950) method is beneficial when the majority of the transported sediment is near the bed. Colby and Hembree (1955) developed a modified Einstein procedure (MEP) that is better suited than the original Einstein (1950) method for application at cross sections in sand-bed rivers where the majority of the sediment is transported in suspension throughout the water column. The MEP requires measurement of suspended sediment that is then extrapolated throughout the unmeasured zone to determine total sediment load. Numerous improvements have been made to the MEP, including the update of Colby and Hubbell (1961) and Burkham and Dawdy (1980).

Shah-Fairbank (2009) developed a new version of the MEP that includes improvements to make it more user-friendly and to eliminate some of the empiricism of selecting input parameters.

Four of the stated (Shah-Fairbank 2009) major improvements to the MEP include:

1. Incorporation of an algorithm developed by Guo and Julien (2004) to quickly and accurately solve the Einstein integrals based on a series expansion method.
2. Basing total sediment discharge calculations on the median particle size of the suspended sediment (D_{50ss}) rather than dividing the bed material and suspended sediment gradations into particle size classes.
3. Determining Rouse numbers directly for depth-integrated suspended sediment samples by calculating particle fall velocities based on D_{50}, shear velocity, and assuming a constant value for the von Kármán constant. Therefore, it is no longer necessary to determine Rouse numbers for each overlapping class and fit power regressions to the data.

4. Use of measured suspended sediment discharge and Rouse numbers to calculate the bed load component of the total sediment discharge directly instead of using Einstein's probability of entrainment.

The SEMEP equation differs from the other four equations in that it calculates the amount of bed material in transport using a relationship between the material in the bed substrate and the particle size and concentration of material measured in suspension. It is designed to estimate the actual amount of sediment in transport rather than an equilibrium sediment load, which is the maximum amount of sediment that could be transported at a location if the sediment was available. The equation uses measured total suspended sediment concentrations, bed (D_{10}, D_{50}, D_{65}) and suspended sediment (D_{50}) particle sizes, and channel hydraulics to determine the amount of sediment being transported in the unmeasured zone (see Figure A-16). The unmeasured zone includes bed load and suspended sediment in transport near the channel bottom beneath the maximum depth that a suspended sediment sampler can sample (typically less than 0.5 foot). The bed material portion of the total suspended load is based on the percent of the total suspended load that is coarser than the D_{10} of the bed material. The MEP, on which the SEMEP is based, is well established and a recommended approach where most of the sediment is transported in suspension (as on the LOMR) and where the sand supply may be restricted (Hicks and Gomez 2003). The MEP was used in the only other study to calculate bed material loads on the LOMR, the 1999 *Missouri River Levee Unit L-385 Sediment Analysis* (West Consultants 1999).

Suspended sediment concentrations on the Missouri River at the four gaging locations are known because of the point-sampler and depth-integrated measurements made by the USGS. If a sample was collected with a point-sampler, then integrating the point concentration and point velocity data produces the unit measured sediment discharge q_m [M/LT]

$$q_m = \int_{d_n}^{H} c u_y \, dy$$

Where:

d_n = nozzle distance from the bed, unmeasured depth [L]
H = cross sectionally averaged flow depth [L]
c = flux-based volume suspended sediment concentration [ppm]
u_y = point velocity at depth y [L/T]
y = vertical distance from water surface [L]

The Rouse number Ro is calculated from

$$Ro = \frac{v_s}{\kappa u_*}$$

Where:

v_s = suspended sediment D_{50} particle terminal fall velocity in quiescent water [L/T]
κ = von Kármán constant (set at 0.4)
$u_* = \sqrt{ghS_f}$, shear velocity [L/T]
g = acceleration of gravity [L/T^2]
h = flow depth [L]
S_f = down-channel friction slope [1]

Once q_m and Ro are known, then unit bed load discharge q_b is determined directly from q_m by using the Guo and Julien (2004) algorithm to solve the Einstein integrals with series expansion

$$q_m = 0.216 q_b \frac{E^{Ro-1}}{(1-E)^{Ro}} \left\{ \ln\left(\frac{30h}{y_0}\right) J_{1a} + J_{2a} \right\}$$

Where:

$E = 2D_{50}/h$
D_{50} = median bed grain size [L]
y_0 = vertical distance where velocity is zero = D_{65}

and where the integrals J_{1a} and J_{2a} are

$$J_{1a} = \int_A^1 \left(\frac{1-y'}{y'}\right)^{Ro} dy'$$

$$J_{2a} = \int_A^1 \ln y' \left(\frac{1-y'}{y'}\right)^{Ro} \ln y' \, dy'$$

Where:

$A = d_n/h$
$y' = y/h$

The total suspended sediment discharge q_s that includes the unmeasured zone is then determined by integrating the measured suspended sediment load from the water surface to the top of the bed load layer, defined as twice the depth of the bed sediment D_{50}

$$q_s = 0.216 q_b \frac{E^{Ro-1}}{(1-E)^{Ro}} \left\{ \ln\left(\frac{30h}{y_0}\right) J_1 + J_2 \right\}$$, where the integrals J_1 and J_2 are

$$J_1 = \int_E^1 \left(\frac{1-y'}{y'}\right)^{Ro} dy'$$

$$J_2 = \int_E^1 \ln y' \left(\frac{1-y'}{y'}\right)^{Ro} dy'$$

The total sediment discharge q_t is then determined from

$$q_t = q_b + q_s$$

As stated above, the SEMEP equation requires input of total suspended sediment load. As evident in the scatter of the USGS measured total suspended sediment and suspended sand load data plotted in Figures A-29 through A-32, a given discharge can have wide variability in the measured load. A best-fit line through the scattered data was created to develop a rating curve in which only one sediment load is associated with any given discharge. The best-fit line reduced the scatter into one typical load for a given discharge to represent the 1994–2009 data.

Two methods were used to develop the sediment rating curves, and an analysis was performed on each rating curve to determine which curve provides the best fit to the measured data. As discussed above, the USGS used LOADEST (Runkel et al. 2004) to calculate annual total suspended sediment and suspended sand loads. In the first method, all the USGS total suspended sediment and mean daily discharge measurements from 1994 to 2008 at the four gages were input into LOADEST so that LOADEST could determine the best-fit rating curve to the sediment and discharge data using the Adjusted Maximum Likelihood Estimation (AMLE) technique (Runkel et al. 2004). In the second method, the same discharge and sediment data were used to develop power function rating curves in spreadsheet software. The power function rating curves were visually fit to the data using multiple linear segments to provide a better fit with the data, as opposed to using one power function for all the data that can lead to overestimates or underestimates (Simon et al. 2004). Figures A-29 through A-32 show the resulting rating curves developed with AMLE and power functions for the gage locations. For

each sediment rating curve, the total load obtained by summing the predicted load for each mean daily discharge for years 1994–2008 was compared with the sum of all the 1994–2008 annual total sediment loads reported by the USGS (or against the published daily loads at Nebraska City).

Results of the rating curve analysis are presented in Table A-9. The sediment loads are reported as 1994–2008 average annual loads. The percent difference is listed between the average annual load obtained by summing the individual mean daily loads predicted by each rating curve and the USGS annual loads (or published daily loads at Nebraska City). The loads predicted by the rating curve with the lowest percent difference were used as the total suspended sediment load input in the SEMEP analysis[3]. The coefficient of determination r^2 values of the selected rating curve for each gage are also listed in Table A-9 to show how well the measured data fits the best-fit trend line. The results show that the power functions produced good results at the St. Joseph, Kansas City, and Hermann gages, in which the rating curve values are within 5 percent of the USGS preliminary values. At Nebraska City, the LOADEST AMLE rating curve provides the best fit to the measured data and therefore was selected for the SEMEP analysis.

The SEMEP calculation requires the D_{50} of the suspended sediment load (as does the Molinas and Wu equation). As described above, the recent USGS particle size analysis of their measured suspended loads did not include the clay and silt fraction, which typically represents more than one-half of the total suspended load. Therefore, older suspended sediment particle size curves created by the USACE on the LOMR were analyzed to determine the D_{50} of the suspended load. Figure A-33 is an example of a curve in which the D_{50} of the measured suspended load is fine silt. The USGS analyzed all the mechanical analysis curves available to determine the suspended sediment D_{50}. The results used in the SEMEP calculation are listed in Table A-10. Because no data were available at Nebraska City, the D_{50} from St. Joseph (0.018 mm) was used.

Values used in the SEMEP calculation for the percent of the total suspended load coarser than the D_{10} of the bed material are listed in Table A-4. Because the percent sand content in the total suspended load does not show a correlation with discharge, the same average gradation for each location was used for the entire range of discharges modeled with the SEMEP.

[3] The rating curves were selected based on the preliminary USGS data rather than the final data, which is why the power function rating curve function was selected for St. Joseph and Kansas City rather than the AMLE rating curve. The difference between the two curves is so small that it had little effect on the result.

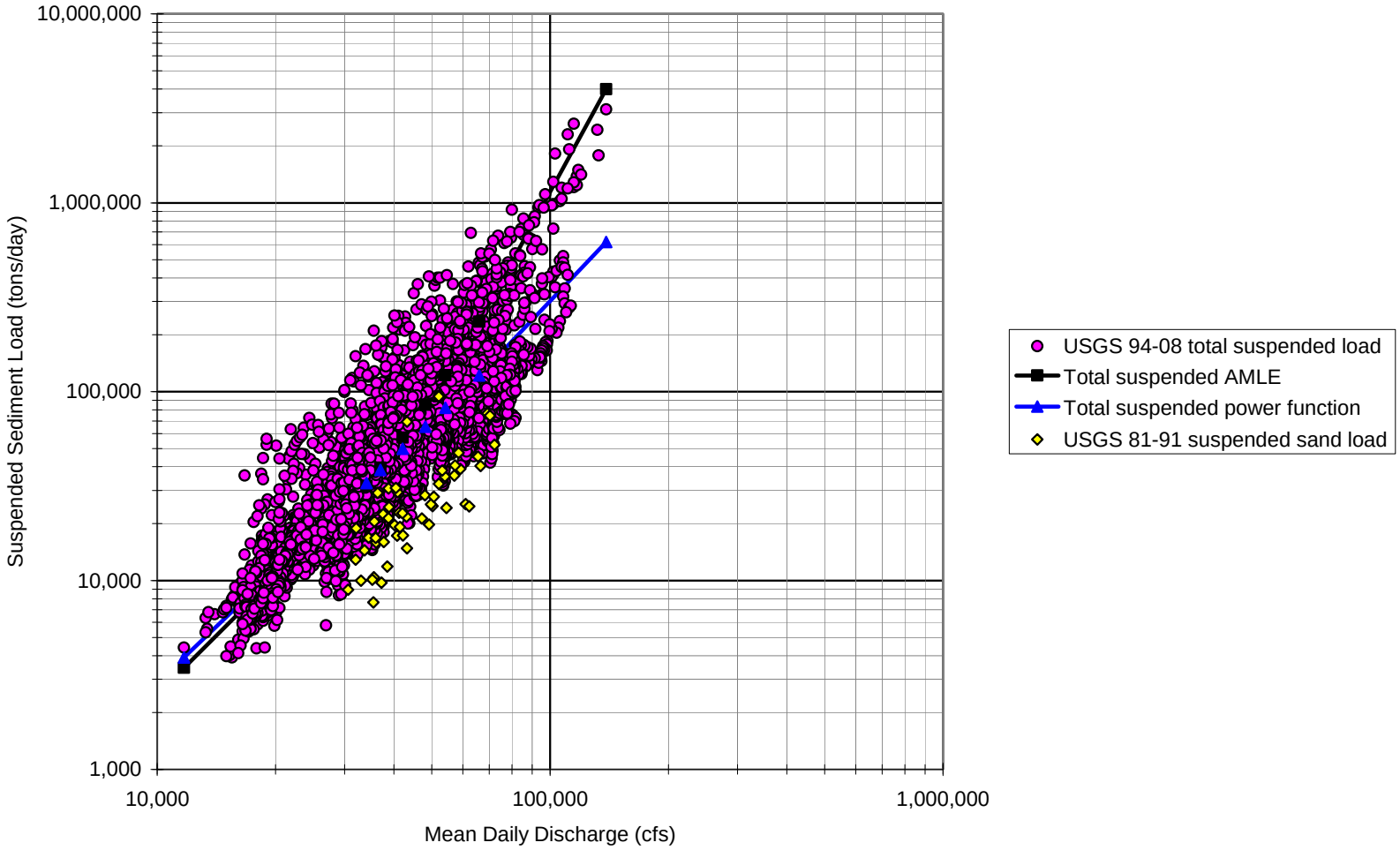

Figure A-29 USGS Measured Total Suspended Sediment and Suspended Sand Loads with Comparison of AMLE and Power Function Total Suspended Sediment Rating Curves at the Nebraska City Gage

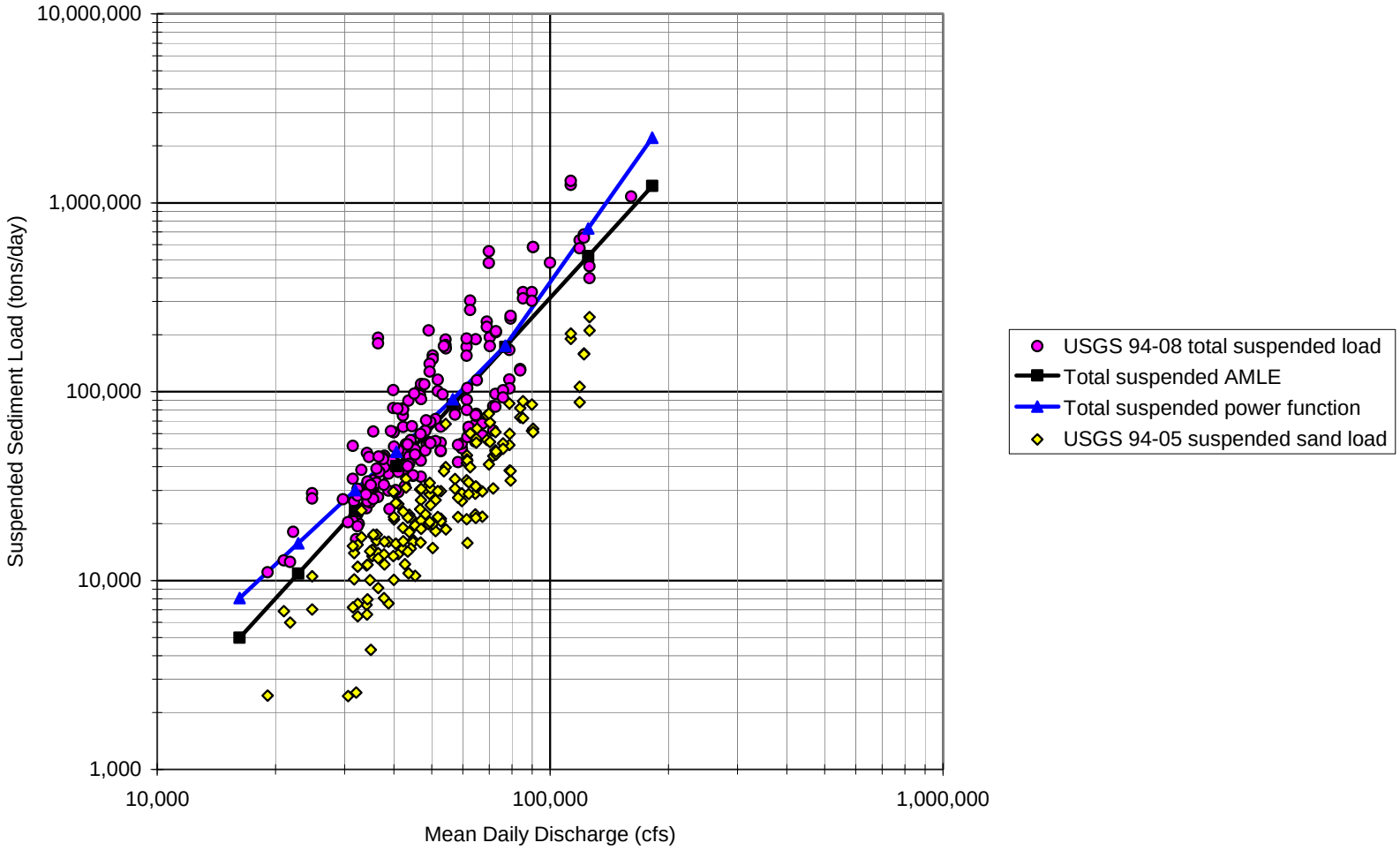

Figure A-30 USGS Measured Total Suspended Sediment and Suspended Sand Loads with Comparison of AMLE and Power Function Total Suspended Sediment Rating Curves at the St. Joseph Gage

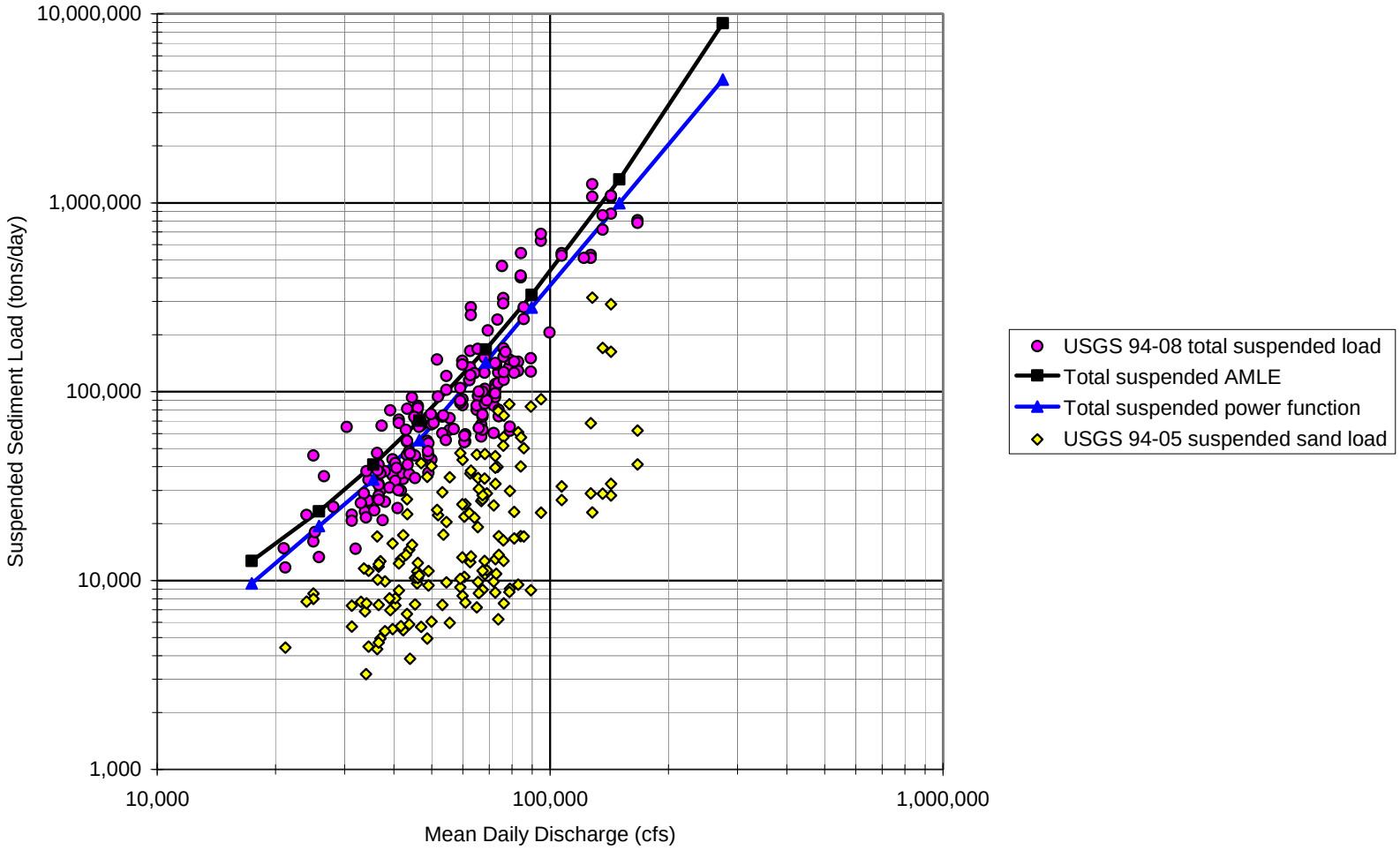

Figure A-31 USGS Measured Total Suspended Sediment and Suspended Sand Loads with Comparison of AMLE and Power Function Total Suspended Sediment Rating Curves at the Kansas City Gage

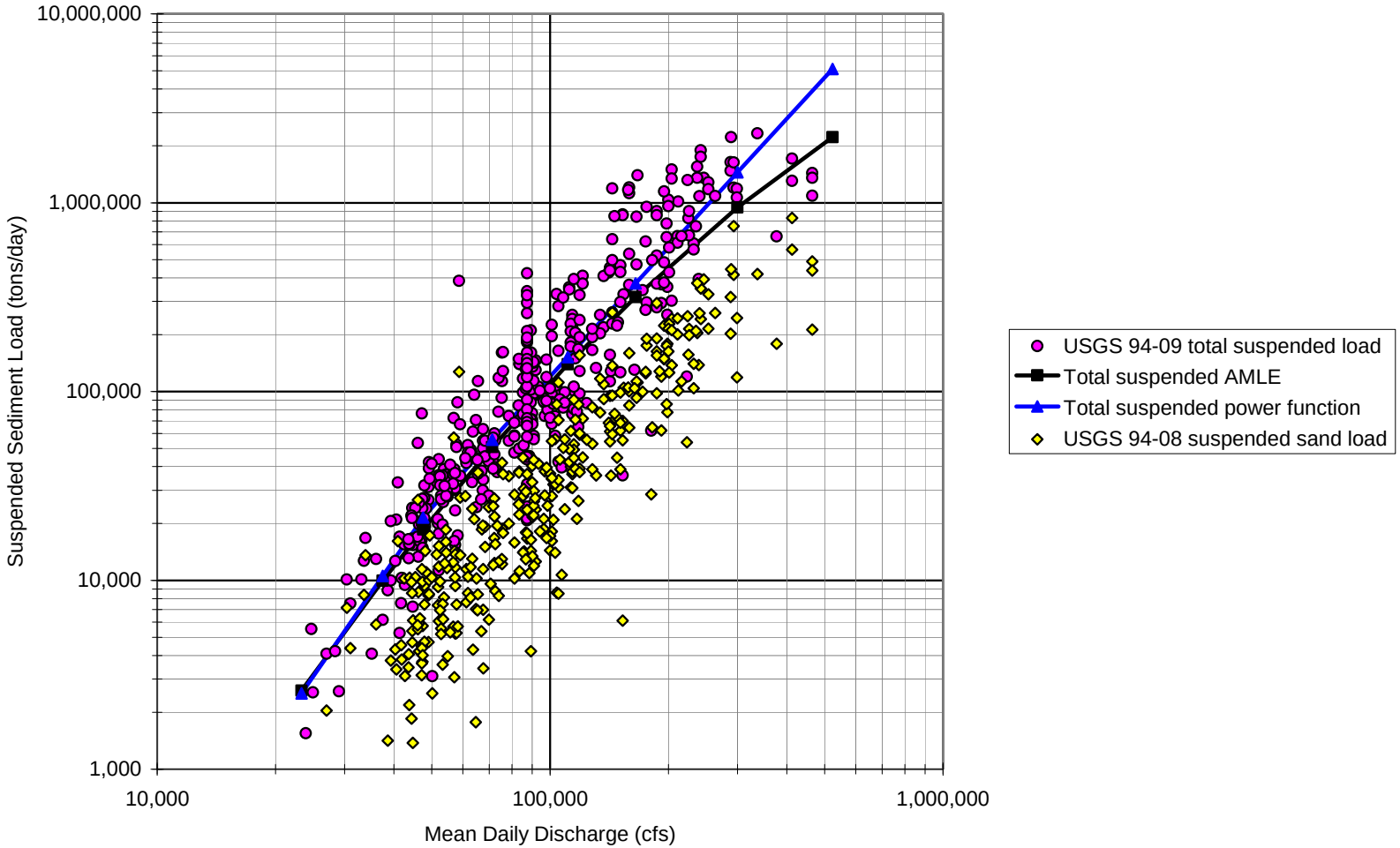

Figure A-32 USGS Measured Total Suspended Sediment and Suspended Sand Loads with Comparison of AMLE and Power Function Total Suspended Sediment Rating Curves at the Hermann Gage

Table A-9 Comparison of Sediment Rating Curve Predictions for Average Annual Total Suspended Sediment Loads (1994–2008)

Method	Nebraska City (tons/year)	Percent Difference of Rating Curve from USGS	St. Joseph (tons/year)	Percent Difference of Rating Curve from Published USGS	Kansas City (tons/year)	Percent Difference of Rating Curve from Published USGS	Hermann (tons/year)	Percent Difference of Rating Curve from Published USGS
USGS published data	25,136,476	-	31,800,000	-	46,373,000	-	58,145,000	-
USGS preliminary data	-	-	34,555,758	-	48,724,550	-	57,777,344	-
AMLE rating curve	22,726,508	-9.6%	31,492,698	-1.0%	44,779,810	-3.4%	52,237,144	-10.2%
Power function rating curve	20,511,116	-18.4%	32,561,942	-2.4%	48,467,340	-4.5%	57,402,506	-1.3%
r^2 of selected rating curve	-	0.81	-	0.63 (lower trend) 0.57 (upper trend)	-	0.69 (lower trend) 0.62 (upper trend)	-	0.59 (lower trend) 0.65 (upper trend)

Notes:

N/A = No data available.
USGS = U.S. Geological Survey.

Bolded items indicate rating curve selected (Adjusted Maximum Likelihood Estimate [AMLE] or power function) for input in the Series Expansion of the Modified Einstein Procedure (SEMEP) analysis.

Ratings curves were selected based on preliminary USGS data, which varied slightly from published values, resulting in curves for St. Joseph and Kansas City being selected from the power function rating curve rather than the AMLE rating curve. The difference is minor and had little effect on the final result.

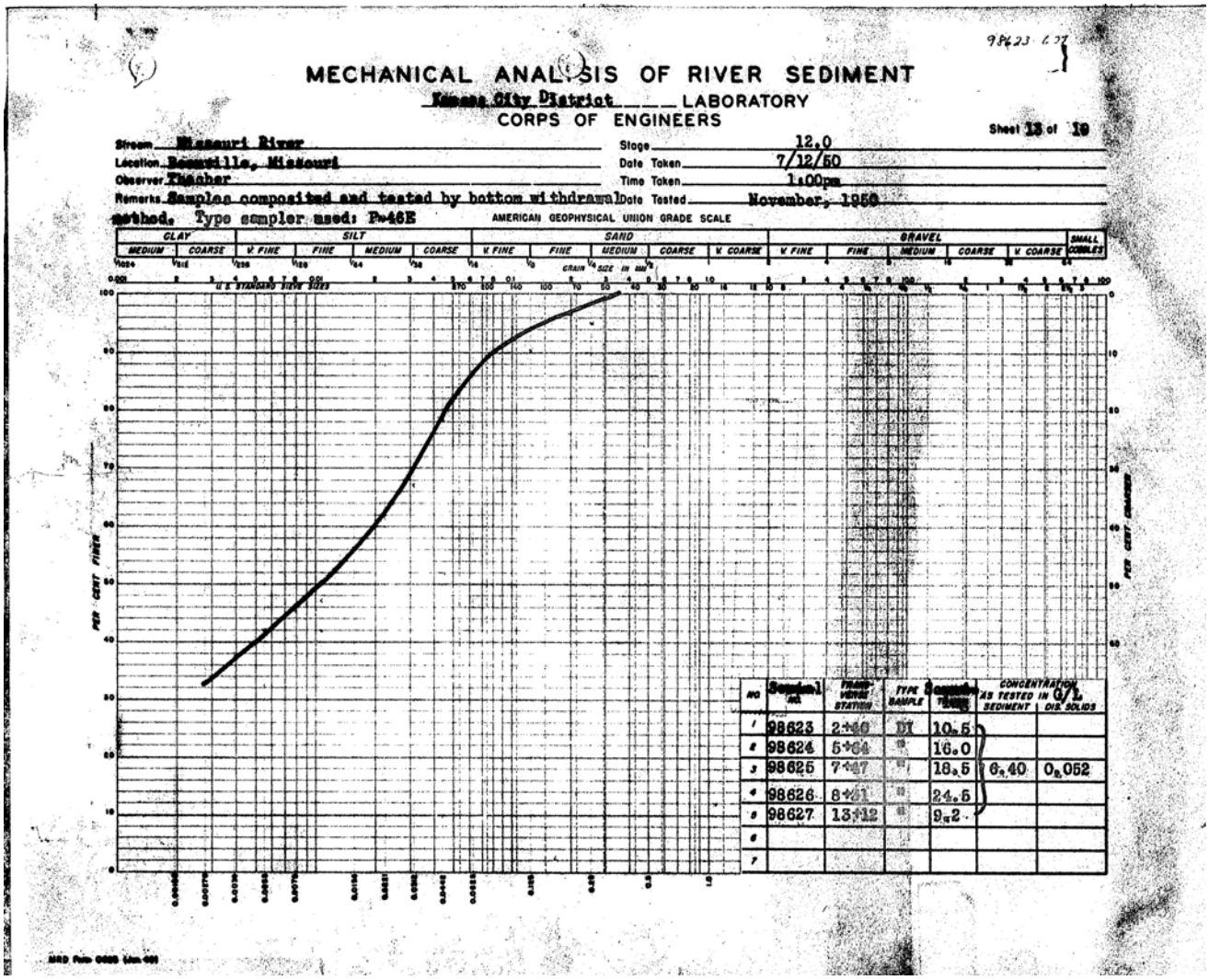

Figure A-33 Example of USACE Mechanical Analysis Curve That Includes Particle Size Analysis for the Clay and Silt Fraction of the Suspended Load

Table A-10 Suspended Sediment D_{50} Values Obtained from USACE Mechanical Analysis Curves

	Location		
	St. Joseph	Kansas City	Hermann
Years	1948–1950; 1963–1965	1949; 1963–1965	1963–1965
Number of samples	88	12	6
Average D50 (mm)	0.018	0.016	0.012
Particle class	Silt	Silt	Silt
Standard deviation (mm)	0.004	0.011	0.0016

Notes:

mm = Millimeter(s).
USACE = U.S. Army Corps of Engineers.

The unmeasured depth d_n, or distance of the sediment sampler's nozzle from the bed when lowered to its maximum depth, was set at 4.3 inches in the SEMEP calculations. This corresponds to the nozzle distance specified for the P-61 sediment sampler (Edwards and Glysson 1999), which was the sampler model most commonly used to collect the suspended sediment measurements.

As is commonly done (Molinas and Wu 2000), the Yang, Ackers and White, and Engelund and Hansen equations were used in fractional form to estimate the transport for each particle size fraction D_i of the bed material at the gage location rather than the D_{50}. Table A-11 illustrates the geometric mean D_i determined from the class sizes used in the fractional analysis.

Table A-11 Grain Sizes Classes Used in the Fractional Bed Material Load Equations

Grain Size (millimeters)	Class (millimeters)	D_i (millimeters)
32	16–32	22.63
16	8–16	11.31
8	4–8	5.66
4	2–4	2.83
2	1–2	1.41
1	0.5–1	0.71
0.5	0.25–0.5	0.35
0.25	0.177–0.25	0.21
0.177	0.125–0.177	0.15

The transport rates for each particle fraction were summed to obtain the total bed material load from

$$q_t = \sum_{i=1}^{N} q_{ti}$$

Where:

q_t = bed material load per unit width
N = number of size fractions in the sediment mixture
i = size fraction within a mixture

The bed material particle size gradations (Figure A-6) and average hydraulic output (including channel depths, velocities, shear stresses, energy slopes, and widths) for the several cross sections that comprise the HEC-RAS modeling reach at each location were used in the calculations. Because hydraulics, and thus bed material load estimates, can vary between nearby cross sections, the average of several cross sections was used to best represent the typical hydraulic conditions in the reach.

Results of the SEMEP analysis are listed in Tables A-12 through A-15 for each gage. The total sediment load (Q_t) is the sum of the measured (Q_m) and unmeasured sediment loads (Q_{um}), and includes all the material moving in transport as either suspended load or bed load. The fraction of the total sediment load composed of wash load and bed material load is also listed. The total amount of sediment moving in the unmeasured zone is typically 1–2 percent and is inversely related to flow magnitude. The bed material load as a percentage of total sediment load is also listed in Tables A-12 through A-15. Depending on flow magnitude, the bed material load is generally less than 14–16 percent of the total load, except for Hermann where it is 6–8 percent.

A.4.3 Total Bed Material Load Equation Results

Total bed material load transport rating curves for the four gages are displayed in Figures A-34 through A-37. The curves show how much sediment (in tons/day) each equation predicts can be transported for a given discharge (in cfs). The Yang, Ackers and White, Molinas and Wu, and Engelund and Hansen equations all predict similar total bed material loads. The SEMEP equation consistently predicts less total bed material load than the other transport capacity equations at low to moderate discharges. At Nebraska City and Kansas City, SEMEP predicts higher loads for high-flow events.

The bed material rating curves were used to calculate sediment loads for each mean daily discharge for the period from 1994 to 2009. The mean daily loads were summed to obtain average annual loads, which are summarized in Table A-16. The period from 2000 to 2009 was selected for analysis because it is comparable to detailed dredging data from the same period, but the mean annual flows in this period tend to be lower than the long-term mean (see Figure 3.4-14 in the main volume of the EIS). The period from 1994 to 2009 includes higher than average flows during the 1990s and, when combined with the drier years from 2000 to 2009, represents average conditions.

Although each of the five equations uses different methods and makes different assumptions, each is calculating the same value—the total amount of bed material transported by the Missouri River at the four gage locations. The SEMEP calculation yielded similar results as the other four equations for each gage location, except for the Hermann gage, for which SEMEP yielded slightly more than one-half of the average of the other four equations (Table A-16). Because the SEMEP equation uses measured suspended sediment data and represents an actual estimate of bed material load rather than transport capacity, it was given greater weight when compared with the other four equations. To obtain a representative value of the bed material load at each gage location, a weighted average was used that combines the average of the four transport-based equations with the result of the SEMEP equation. The SEMEP result averaged with the average of the other four equations is reported in Table A-16.

Table A-12 Results of the SEMEP Calculations at the Nebraska City Hydraulic Modeling Reach

Discharge (cfs)	Measured Sediment Load Q_m (tons/day)	Unmeasured Sediment Load Q_{um} (tons/day)	Total Sediment Load ($Q_t = Q_{um}+Q_m$) (tons/day)	Percent Unmeasured Q_{um}/Q_t (%)	Wash Load Q_w (tons/day)	Bed Material Load Q_{bm} (tons/day)	Percent Bed Material Load Q_{bm}/Q_t (%)
11,700	3,447	110	3,557	3.1%	2,999	558	15.7%
34,100	31,614	547	32,161	1.7%	27,504	4,657	14.5%
37,000	39,437	652	40,089	1.6%	34,310	5,779	14.4%
42,150	56,999	875	57,874	1.5%	49,589	8,285	14.3%
48,200	84,922	1,210	86,132	1.4%	73,882	12,249	14.2%
54,125	121,807	1,626	123,432	1.3%	105,972	17,460	14.1%
66,050	234,309	2,797	237,105	1.2%	203,849	33,257	14.0%
139,000	3,983,036	31,355	4,014,391	0.8%	3,465,241	549,150	13.7%

Notes:

cfs = Cubic feet per second.
SEMEP = Series Expansion of the Modified Einstein Procedure.

Table A-13 Results of the SEMEP Calculations at the St. Joseph Hydraulic Modeling Reach

Discharge (cfs)	Measured Sediment Load Q_m (tons/day)	Unmeasured Sediment Load Q_{um} (tons/day)	Total Sediment Load ($Q_t = Q_{um}+Q_m$) (tons/day)	Percent Unmeasured Q_{um}/Q_t (%)	Wash Load Q_w (tons/day)	Bed Material Load Q_{bm} (tons/day)	Percent Bed Material Load Q_{bm}/Q_t (%)
16,200	8,070	196	8,265	2.4%	7,021	1,245	15.1%
22,850	15,721	319	16,040	2.0%	13,677	2,362	14.7%
31,900	30,022	511	30,534	1.7%	26,119	4,414	14.5%
40,600	47,920	720	48,641	1.5%	41,691	6,950	14.3%
56,500	90,950	1,151	92,101	1.2%	79,127	12,975	14.1%
76,900	174,958	1,885	176,843	1.1%	152,214	24,629	13.9%
125,000	730,201	6,112	736,313	0.8%	635,275	101,038	13.7%
182,000	2,204,470	15,198	2,219,668	0.7%	1,917,889	301,779	13.6%

Notes:

cfs = Cubic feet per second.
SEMEP = Series Expansion of the Modified Einstein Procedure.

Table A-14 Results of the SEMEP Calculations at the Kansas City Hydraulic Modeling Reach

Discharge (cfs)	Measured Sediment Load Q_m (tons/day)	Unmeasured Sediment Load Q_{um} (tons/day)	Total Sediment Load ($Q_t = Q_{um}+Q_m$) (tons/day)	Percent Unmeasured Q_{um}/Q_t (%)	Wash Load Q_w (tons/day)	Bed Material Load Q_{bm} (tons/day)	Percent Bed Material Load Q_{bm}/Q_t (%)
17,400	9,623	211	9,834	2.1%	8,179	1,655	16.8%
25,800	19,377	346	19,723	1.8%	16,471	3,252	16.5%
35,500	34,167	516	34,683	1.5%	29,042	5,641	16.3%
46,500	55,197	725	55,921	1.3%	46,917	9,004	16.1%
68,600	142,759	1,532	144,291	1.1%	121,345	22,946	15.9%
89,800	278,484	2,600	281,085	0.9%	236,712	44,373	15.8%
150,000	994,666	7,127	1,001,792	0.7%	845,466	156,326	15.6%
275,000	4,475,737	23,505	4,499,242	0.5%	3,804,376	694,866	15.4%

Notes:

cfs = Cubic feet per second.
SEMEP = Series Expansion of the Modified Einstein Procedure.

Table A-15 Results of the SEMEP Calculations at the Hermann Hydraulic Modeling Reach

Discharge	Measured Sediment Load Q_m	Unmeasured Sediment Load Q_{um}	Total Sediment Load ($Q_t = Q_{um}+Q_m$)	Percent Unmeasured Q_{um}/Q_t	Wash Load Q_w	Bed Material Load Q_{bm}	Percent Bed Material Load Q_{bm}/Q_t
23,300	2,512	66	2,578	2.6%	2,362	217	8.4%
37,500	10,534	211	10,745	2.0%	9,902	843	7.8%
47,500	21,470	376	21,846	1.7%	20,182	1,664	7.6%
71,200	55,486	774	56,260	1.4%	52,157	4,104	7.3%
111,000	151,847	1,653	153,500	1.1%	142,736	10,764	7.0%
165,000	373,026	3,254	376,280	0.9%	350,645	25,635	6.8%
300,000	1,446,781	9,052	1,455,833	0.6%	1,359,975	95,859	6.6%
523,000	5,101,213	23,469	5,124,683	0.5%	4,795,141	329,542	6.4%

Notes:

cfs = Cubic feet per second.
SEMEP = Series Expansion of the Modified Einstein Procedure.

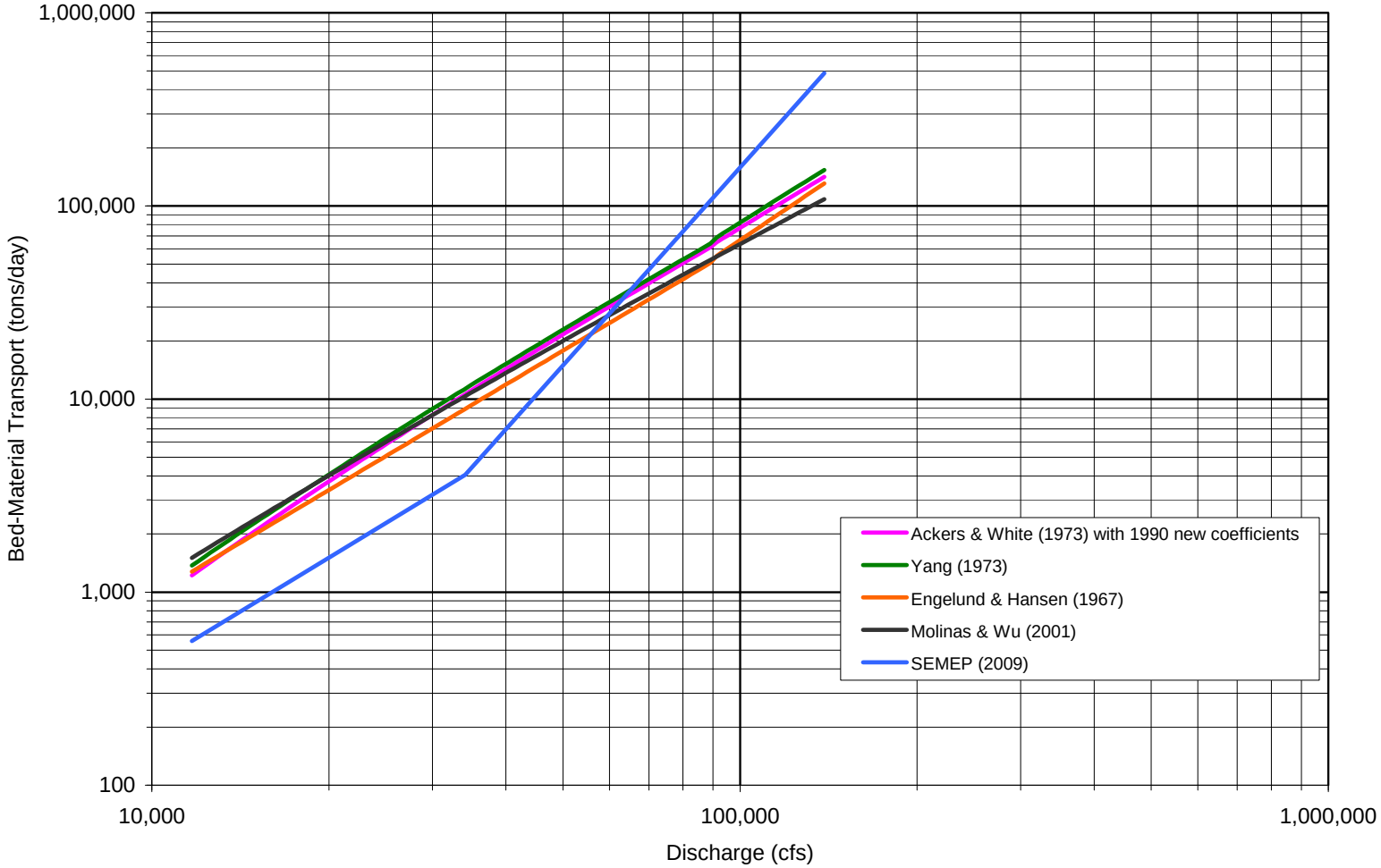

Figure A-34 Total Bed Material Rating Curves Produced by the Five Equations at the Nebraska City Hydraulic Modeling Reach

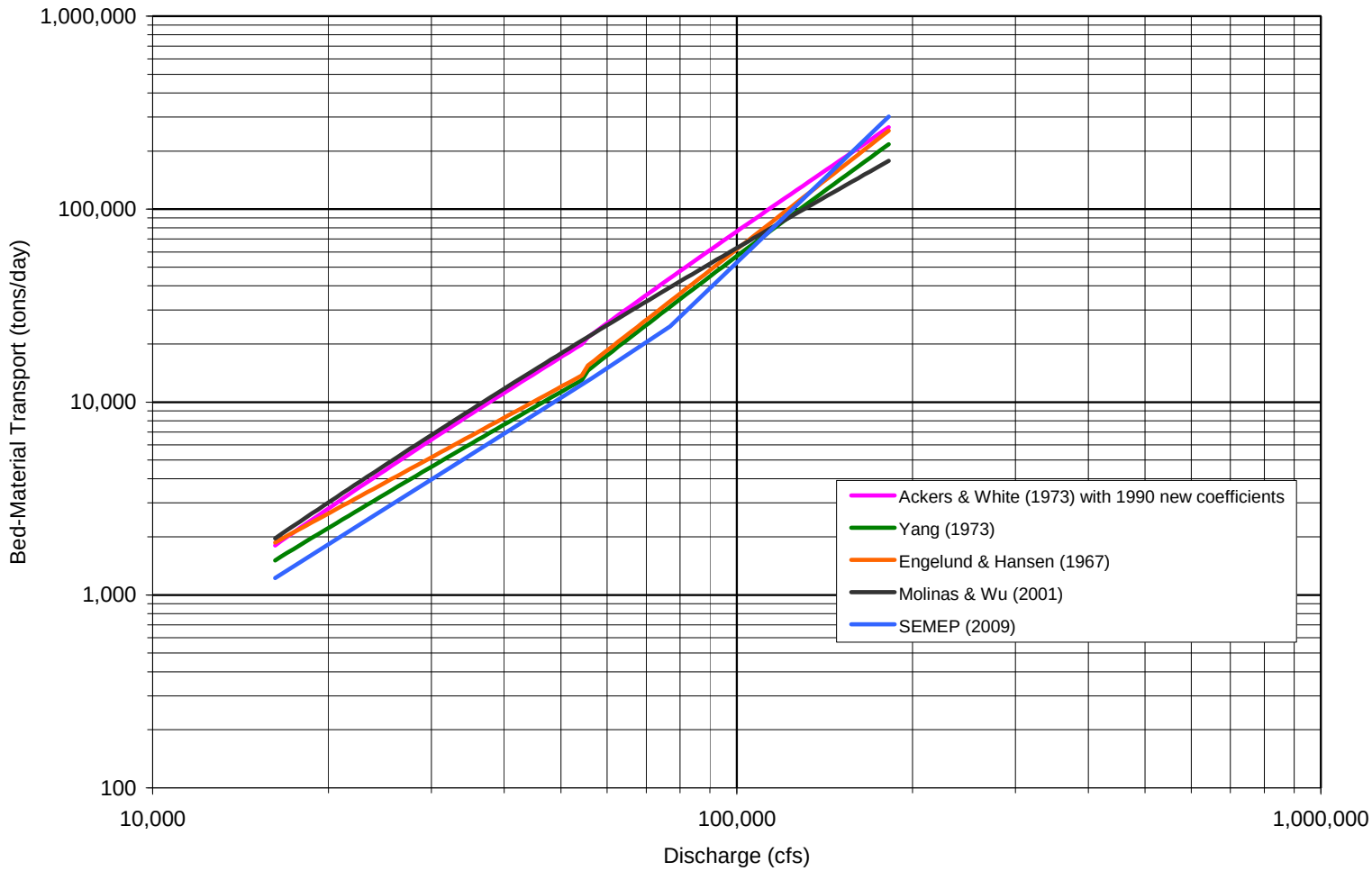

Figure A-35 Total Bed Material Rating Curves Produced by the Five Equations at the St. Joseph Hydraulic Modeling Reach

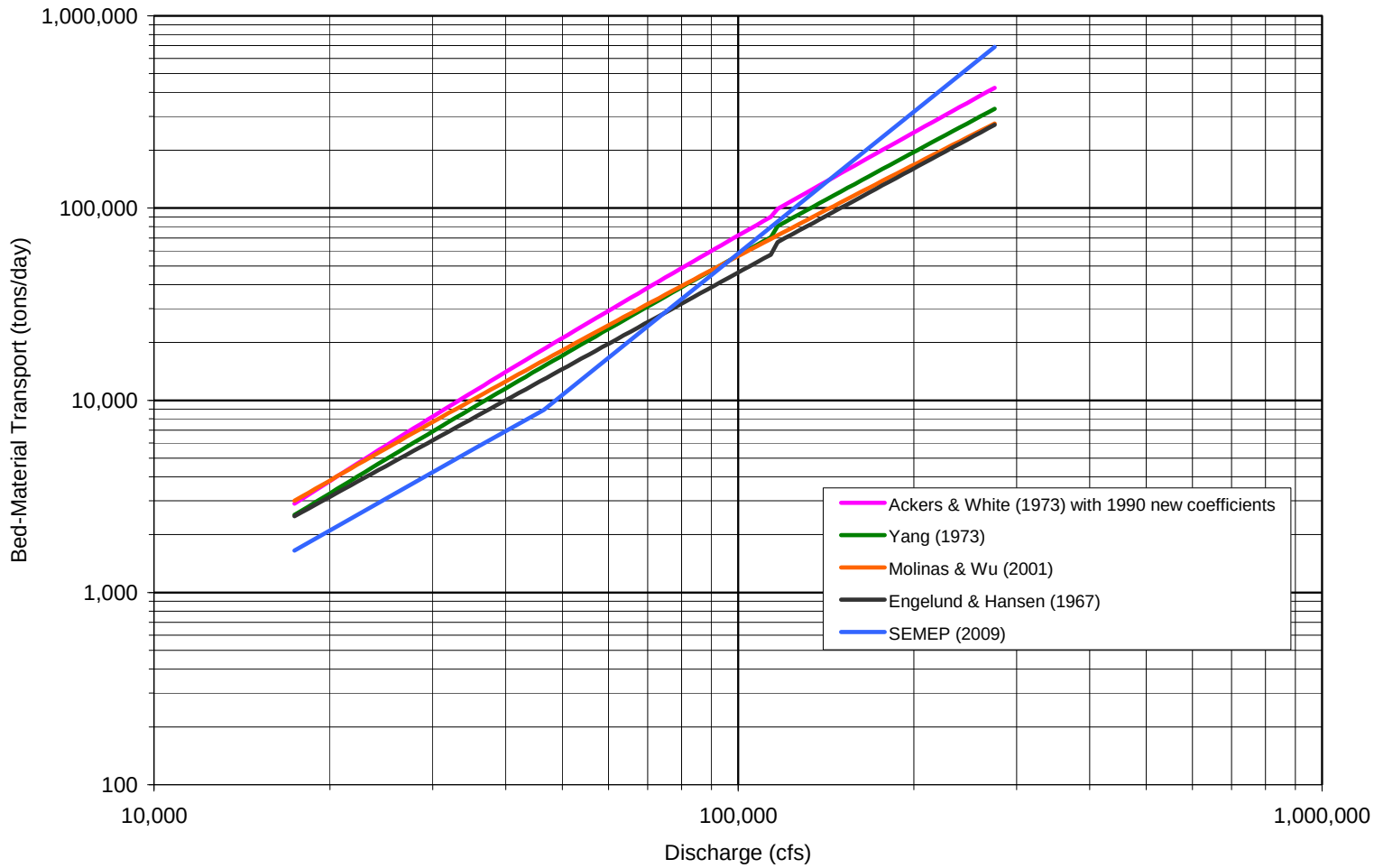

Figure A-36 Total Bed Material Rating Curves Produced by the Five Equations at the Kansas City Hydraulic Modeling Reach

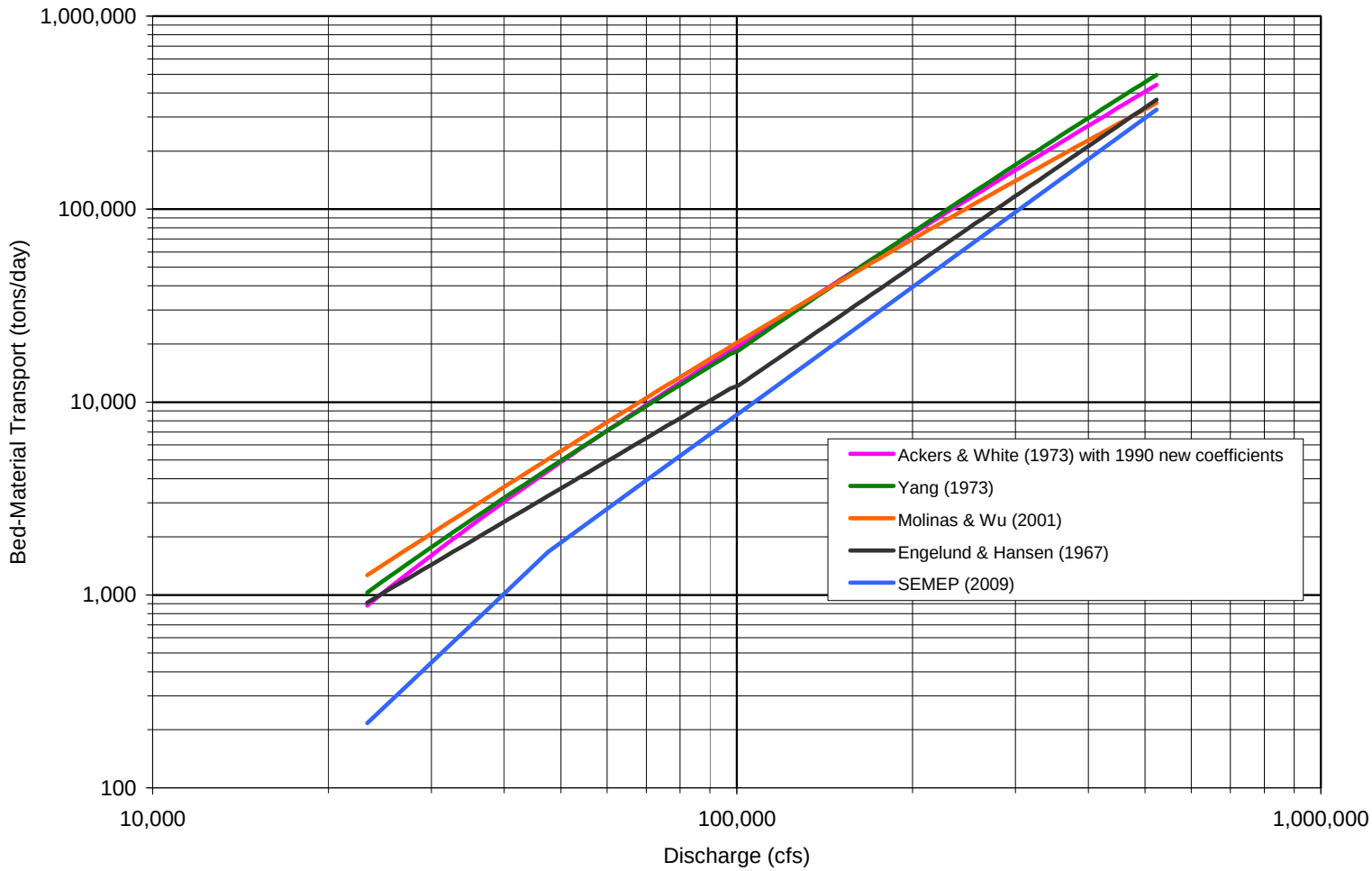

Figure A-37 Total Bed Material Rating Curves Produced by the Five Equations at the Hermann Hydraulic Modeling Reach

Table A-16 Total Bed Material Loads Estimated from Bed Material Load Equations (tons/year)

Location	Ackers & White (1973)	Engelund & Hansen (1967)	Molinas & Wu (2001)	Yang (1973)	Average (AVG) of Four Bed Material Equations (no SEMEP)	SEMEP (2009)	Weighted AVG – AVG of SEMEP and AVG of Four Bed material Equations	SEMEP as Percentage of AVG of Four Bed Material Equations
2000–2009								
Nebraska City	3,858,310	3,345,360	3,735,295	4,289,933	3,807,225	2,442,765	3,124,995	64%
St. Joseph	4,342,438	3,316,504	4,141,181	3,030,405	3,707,632	3,308,508	3,508,070	89%
Kansas City	7,147,775	5,032,985	5,991,383	5,834,135	6,001,569	4,702,736	5,352,153	78%
Hermann	5,303,880	3,726,159	5,187,083	5,301,546	4,879,667	2,517,785	3,698,726	52%
1994–2009								
Nebraska City	5,956,510	5,092,627	5,507,685	6,508,525	5,766,337	5,365,748	5,566,042	93%
St. Joseph	7,144,192	5,455,947	6,467,546	5,020,173	6,021,965	5,410,855	5,716,410	90%
Kansas City	10,584,323	7,305,296	8,550,699	8,576,194	8,754,128	7,650,806	8,202,467	87%
Hermann	7,912,424	5,553,251	7,561,138	7,969,907	7,249,180	3,956,009	5,602,594	55%

Note:

SEMEP = Series Expansion of the Modified Einstein Procedure.

A.5 ESTIMATES OF ACCURACY AND COMPARISONS WITH OTHER STUDIES

A.5.1 Estimates of Equation Accuracy in the Literature

Each of the bed material load equations used in this study are equations commonly referenced in the professional literature and used in similar studies by researchers and practitioners. Because of the variability in several of the inputs into the equations, it is not feasible to track and quantify the potential cumulative error of the sediment rating curves in Figures A-34 through A-37.

Previous studies, however, have performed statistical analyses of estimated bed material loads with measured bed material loads to evaluate the accuracy of the equations. Molinas and Wu (2000) calculated correlation coefficients, *R*, by comparing computed versus measured bed material loads. *R* equals 1 when computed loads perfectly match the measured loads. The Engelund and Hansen (1967), Ackers and White (1973), and Yang (1973) equations used in this study were included in the Molinas and Wu (2000) study. Unlike this study, Molinas and Wu (2000) did not use the HR Wallingford (1990) adjusted coefficients, thus their analysis of the Ackers and White (1973) equation is not directly comparable. Molinas and Wu (2000) calculated *R* values of 0.51, 0.63, and 0.75 for the Engelund and Hansen (1967), Ackers and White (1973), and Yang (1973) equations, respectively. Thus, they determined the Engelund and Hansen equation performed the poorest and the Yang equation performed the best.

In a similar study, Molinas and Wu (2001) compared how their newly developed equation presented in the same paper (the equation used in this study), compared with other bed material load equations. The comparison of computed versus measured bed material loads focused on 414 data points from seven large rivers, including the Amazon and Orinoco Rivers, the Atchafalaya River, the Mississippi River, and the Red River. Molinas and Wu (2001) calculated *R* values of 0.58, 0.25, and 0.49 for the Engelund and Hansen (1967), Ackers and White (1973), and Yang (1973) equations, respectively. The authors calculated an *R* value of 0.81 for their own equation (Molinas and Wu 2001). Thus, they determined the Engelund and Hansen and Ackers and White equations performed the poorest and their equation performed the best for large sand-bed rivers. Molinas and Wu (2001) state that, on average, the Ackers and White and Engelund and Hansen overestimate bed material transport, while the Yang equation underestimates transport in large rivers. Again, note that unlike this study, Molinas and Wu (2001) did not use the HR Wallingford (1990) adjusted coefficients, thus their analysis of the Ackers and White (1973) equation is not directly comparable.

Shah-Fairbank (2009) compared how well the SEMEP equation estimated sediment loads compared with measured sediment load data. Only the values where the ratio of shear velocity to particle fall velocity (u^*/ω) are greater than five are considered here since these are the conditions on the LOMR. Comparison of the SEMEP equation's estimate of measured loads on the Platte River produced an *R* value of 0.71. Comparison of the SEMEP estimates against a set of measured sediment loads from 93 streams in the United States produced an *R* value of 0.99 (Williams and Rosgen 1989). Finally, comparison of the SEMEP against measured sediment loads on the Niobrara River produced an *R* value of 0.48. Shah-Fairbank (2009) concluded that the SEMEP equation performs best when the shear velocity to particle fall velocity ratio is greater than five and the sediment discharge is greater than 10,000 tons day. Both of these conditions are typical of the LMOR.

A.5.2 Comparison with Other Studies and Suspended Loads

The results of the bed material load estimates from this analysis were compared to the L-385 study results (West Consultants 1999) and to the bed material load-sized fraction of the suspended sediment loads to determine whether the results were comparable.

The L-385 study estimated bed material loads to determine the impact of dredging up to 3.5 million cubic yards of sediment from the Missouri River for use in levee construction upstream of the confluence with the Kansas River. They used the modified Einstein procedure to calculate the total bed material load. For the 1967–1997 period, which had higher than average mean annual flows at 59,837 cfs (mean annual flow for the period of record is 51,588 cfs), the study estimated an average bed material load of 10.9 million tons per year at Kansas City and 8.95 million tons at St. Joseph (Table A-17). The estimate between 1994 and 2009 for Kansas City and St. Joseph are 8.2 and 5.72 million tons per year, respectively. Given the difference in analysis periods, flows, and the variability in bed material loads, the results from the L-385 study are comparable to the results from the current analysis. One reason that the bed material loads reported in the L-385 study are higher than the current estimates is because the L-385 study considered particles coarser than 0.125 mm to be bed material load, whereas this study considered particle sizes coarser than approximately 0.2 mm to be bed material load.

Table A-17 Bed Material Load and Bed Material Load-Sized Fraction of the Total Suspended Sediment Estimates at Four USGS Gages (million tons/year)

		Location			
	Period	Nebraska City	St. Joseph	Kansas City	Hermann
This Analysis					
Averaged bed material load estimate	2000–2009	3.12	3.51	5.35	3.70
	1994–2009	5.57	5.72	8.20	5.60
Previous Studies					
L-385 study / West Consultants 1999	1967–1997	N/A	8.95	10.9	N/A
Bed Material Load-Sized Fraction of the Total Suspended Sediment					
USGS, preliminary	1994–2008	3.27	4.49	7.31	3.47
Jacobson adjusted (Jacobson, Blevins, and Bitner. 2009)	1994–2006	2.95	3.96	6.93	3.65

Notes:

NA = No data available.
USGS = U.S. Geological Survey.

Table A-17 also presents unpublished suspended sediment data from the USGS and results from Jacobson, Blevins, and Bitner (2009) adjusted to include only the bed material load-sized fraction. The bed material load-sized fraction of the suspended sediment load is an estimate of the bed material-sized fraction of the total suspended sediment measurements for each site in which all material finer than the D_{10} was removed. This allows a comparison with the bed material estimates, which also consider all material finer than the bed substrate D_{10} to be wash load. Considering the entire measured suspended sediment load as bed material load would overestimate the bed material load because a large percentage of the suspended sediment load is wash load that is continuously transported as wash load even at low velocities. Because bed material load includes sand that moves as bed load in the unmeasured zone and in suspension, the bed material load should be a higher value than the same-sized fraction moving in suspension. The results in Table A-17 indicate that this is the case for all of the estimated values for similar time periods. The table also shows lower values for the bed material load-sized fraction of the total suspended sediment at the Hermann gage compared to the Kansas City gage, providing verification of the trend from an independent data source.

A.6 COMPARISON OF THE RESULTS TO FLOWS AND DRAINAGE AREA

Table A-18 lists the average of the mean annual flows, the drainage areas, and the bed material loads (based on the weighted average of the SEMEP with the average of the four other equations) for the 1994–2008 period of the four gages used in the sediment analysis. Table A-18 also includes the percent change between the gage locations to allow comparison across the different parameters. For example, the increase in mean annual flow between the Nebraska City gage and the St. Joseph gage is 15 percent, between the St. Joseph gage and the Kansas City gage is 17 percent, and between the Kansas City gage and the Hermann gage is 62 percent.

Table A-18 Mean Annual Flow and Drainage Area Values for the Gages Used in the Sediment Load Analysis

	Location			
	Nebraska City	St. Joseph	Kansas City	Hermann
1994–2008 average mean annual flow (cfs)	40,939	46,895	54,975	89,074
1994–2008 mean annual flow range (cfs)	28,340–66,450	29,790–76,050	34,130–82,660	41,690–135,700
Percent increase in mean annual flow	-	15%	17%	62%
Drainage area (mi^2)	410,000	420,100	484,100	522,500
Percent increase in drainage area	-	2%	15%	8%
1994–2009 bed material load (million tons/yr)	5.57	5.72	8.20	5.60
Percent change in bed material load	-	2.7%	43.4%	-31.7%
1994–2008 Total suspended sediment load (USGS preliminary) (million tons/yr)	25.14	34.56	48.72	57.78
Percent change in total suspended sediment load	-	37.4%	41.0%	18.6%

Notes:

cfs = Cubic feet per second.
USGS = U.S. Geological Survey.

For the 1994–2009 period, the total bed material load increases from Nebraska City to Kansas City and then decreases appreciably from Kansas City to Hermann (Table A-18). Between Nebraska City and St. Joseph, the bed material load increases approximately 2.7 percent, and between St. Joseph and Kansas City the bed material load increases approximately 43.4 percent. Increases in bed material load with increasing drainage area downstream are typical of large rivers because of the additional

inputs of sediment and flow from the contributing watershed. Between Kansas City and Hermann, however, the bed material load estimate decreases by approximately 31.7 percent. For comparison, the measured total suspended load data shows an increase of 37 percent between Nebraska City and St. Joseph, and a 41-percent increase between St. Joseph and Kansas City (Table A-18). Even though the amount of total suspended sediment increases 19 percent between Kansas City and Hermann, the rate of increase is lower than expected considering that the 62-percent increase in mean annual flow between the two locations is approximately four times greater than the flow increases associated with the larger sediment increases upstream.

The increase in mean annual flow and a wider channel over which bed material load can be transported at Hermann compared to Kansas City does not translate into increased bed material load estimates. The reason for the decrease in bed material load between Kansas City and Hermann may be attributable to several factors. First, based on the hydraulic modeling results, the Hermann reach has lower flow velocities and boundary shear stresses at a given flow than the Kansas City reach, which results in lower sediment transport rates. Second, based on river bed particle size analysis, the cross section at the Hermann gage has a coarser bed material than Kansas City, which means that it requires more energy or higher flows to mobilize and transport sediment relative to Kansas City. Figure 3.4-18 in the EIS shows the increasing trend in river bed particle sizes moving downriver. Third, an increased ratio of finer wash load to coarser bed load at the Hermann gage could result in higher total sediment yields (18.6 percent higher than the Kansas City gage) but lower bed material load estimates (31.7 percent lower than the Kansas City gage) (Table A-18). Fourth, there is a considerable increase in flows from tributaries between the Kansas City gage and the Hermann gage (Table A-18), but limited tributary sediment load data indicates that the Osage and Gaconade Rivers may not be contributing much sediment relative to their flows (see Table 3.4-17 in the EIS). Increased flows from the Osage and Gasconade Rivers without increased sediment inputs would tend to increase transport capacity at equivalent flows. The higher estimated bed material load estimate of the four transport based equations relative to the SEMEP equation at the Hermann site seems to support this conclusion.

A.7 ANALYSIS OF RIVER BED ELEVATION CHANGE USING HYDROACOUSTIC DATA

A.7.1 Availability of Hydroacoustic Data

Several data sets are available for analyzing changes in river bed elevations on the LOMR. Each has strengths and limitations because most data were not collected for the purpose of assessing river-wide

aggradation or degradation. Two sources of data have been analyzed and presented by the USACE to estimate aggradation and degradation on the LOMR: (1) long-term average river bed cross section elevation data collected at USGS gage locations; and (2) low-water surface elevation changes adjusted to Construction Reference Plane (CRP) data from 1990 and 2005. The cross section data collected at USGS gage locations provide annual estimates dating back to the late 1920s at five gage sites and back to the late 1940s at a sixth gage site. This dataset provides long-term bed elevation trend data, but at only six locations on the river.

The low-flow water surface elevation data set is based on the change in modeled low-flow water surface elevations between 1990 and 2005 and adjusted to CRP flows. This data set provides information on the change in water surface elevations between two points in time, but for the entire length of the river in the study area. Water surface elevations do not parallel river bed elevations exactly because water elevations result from a combination of factors, including discharge, slope, velocity, and channel roughness. The water surface tends to smooth out the highly variable and changing river bed surface. Because the CRP represents the water surface at relatively low flows (a flow exceeded 75 percent of the time), it can be used to estimate river bed elevation changes over time and over the length of the river.

One limitation of the low-flow data set is that it represents only the change between 1990 and 2005, and does not allow analysis of change within that time period or allow averaging of changing river bed elevations over time.

As part of the environmental impacts analysis, a third data set was analyzed. In 1998 and 1999, hydroacoustic bed elevation data (HBED) were collected along the LOMR in a “serpentine” manner, with approximately 50 feet between survey points (Figure A-38). Hydroacoustic data are collected from a moving boat using sound (similar to SONAR used on submarines) to determine the distance between the instrument and the river bed. The precise location of the boat is tracked using a satellite Global Positioning System (GPS). The 1998 data set contains approximately 200,000 bed elevation survey locations. In 2007, 2008, and 2009, the USACE collected hydroacoustic survey data at the same cross sections established every 250 feet at most locations in the river and every 87 feet at Habitat Monitoring Assessment Program locations, with bed elevation points collected every 0.5 feet (Figure A-38). Due to the large number of data points, only one data point was retained every 10 feet in each cross section. The 2007 database contains records from 11,813 cross sections. The 2008 data were collected only at locations with active dredging. The 2009 data set had not been finalized by

the USACE at the time of this analysis, but the draft 2009 data were processed as part of this analysis to obtain results that are comparable to the data from 1999, 2007 and 2008 (see "Methods" below).

All points on each transect within 200 feet of the "sailing line" were selected and averaged to obtain an average bed elevation for each transect and for each year. The sailing line follows the navigation channel and tracks the outside portion of the channel in meander bends where flow strength is greatest and the channel is usually the deepest. The average bed elevation for each transect was then averaged by river mile, and compared by river mile to the survey results from the other years. The results from any given survey year can therefore be compared to other survey years by river mile to determine changes in average bed elevation within 200 feet of the sailing line.

A.7.2 Methods

The USACE made available the hydroacoustic survey data of channel bed elevations for years 1998, 2007, 2008, and 2009. In 1998, the data were collected by a boat moving in a serpentine path along the channel. The cross sections were not perpendicular to the channel centerline. The boat crossed the channel approximately every 300–500 feet along the channel centerline. In 2007, 2008, and 2009, the USACE collected the hydroacoustic data in true cross sections perpendicular to the channel centerline spaced approximately 250 feet apart (Figure A-38).

All of the hydroacoustic survey points have XYZ coordinates of easting, northing, and bed elevation. The 1998, 2007, 2008, and 2009 hydrographic datasets contain 321,222, 1,425,927, 591,862, and 1,927,488 survey points, respectively.

The hydroacoustic survey data were used to generate longitudinal profiles for 1998, 2007, 2008, and 2009 to determine how aggradation and degradation trends vary spatially and in magnitude on the LMOR. The 1998, 2007, and 2009 datasets are nearly continuous throughout the LMOR; while the 2008 dataset has several gaps with no survey data for long reaches of the river.

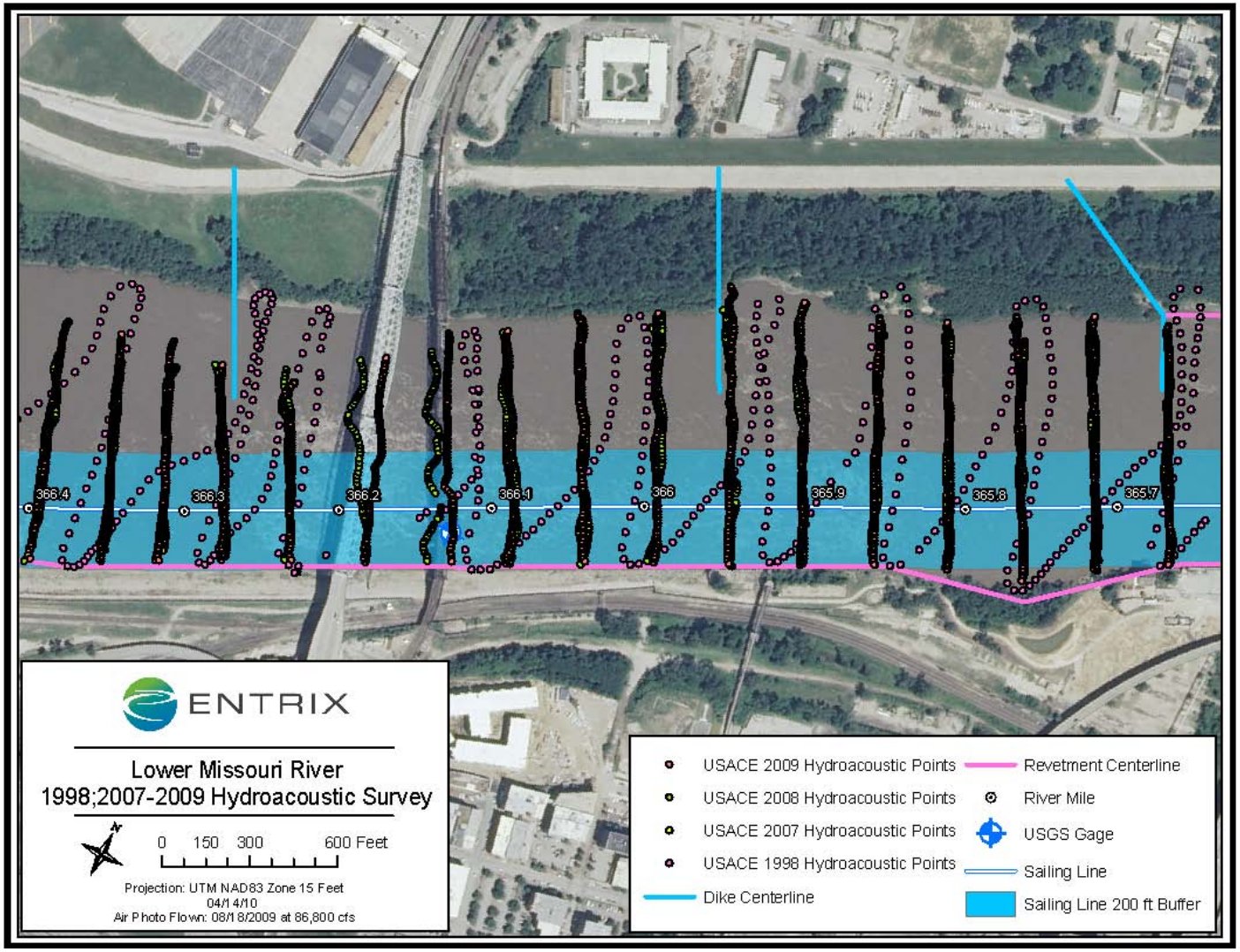

Figure A-38 Hydroacoustic Survey Points in the Kansas City Segment (RM 350 – RM 383) (1998 and 2007–2009)

The first step in creating the longitudinal profile was to select all river bed elevation points within 200 feet of the sailing line for each cross section and use geographic information systems (GIS) software to calculate the river mile location of each data point by assigning the data point to the nearest location on the sailing line and measuring the river mile distance at that location from the river mouth. As a result, the 1998, 2007, 2008, and 2009 survey points can be compared because they use a common distance reference. The 1998, 2007, and 2008 survey points were then imported into Microsoft Access software and sorted by the unique identifier the USACE assigned to each cross section. Because the 2009 data did not have unique cross section identifiers assigned by the USACE, bed elevation points from the 2009 data were assigned the same cross section identifier as the nearest cross section from 2007. The elevation and river mile distance of all points in each cross section were averaged to obtain an average channel elevation and average river mile distance for all cross section points within 200 feet of the sailing line.

A.7.3 Results

The average elevation points for each transect were imported into Microsoft Excel and then averaged for each river mile. For example, average transect elevations between RM 0 and RM 1 were averaged and reported as RM 1 for the 1998, 2007, 2008, and 2009 data. As an example, Figure A-39 shows average transect elevations for the 1998 and 2009 dataset plotted along with the 1-mile averages for the Kansas City segment.

The average river bed elevation for each river mile for the 1998 data was subtracted from the 2007, 2008, and 2009 data to determine the change in elevation between the two time periods for each river mile. A 5-mile moving average was applied to the difference to smooth the data. Figure A-40 shows a plot of the data averaged by river mile and the 5-mile moving average for the Kansas City segment.

The 5-mile moving average of difference between the 2007, 2008, and 2009 data and the 1998 data then were plotted; they are displayed on Figure A-41. This figure shows the increase (aggradation) or decrease (degradation) in average bed elevation along the entire LOMR for three time periods. The results show areas dominated by aggradation between RM 155 – RM 240, RM 255 – RM 360, and RM 400 – RM 498. Areas dominated by degradation occur near metropolitan areas (RM 0 – RM 100, RM 130 – RM 155, and RM 370 – RM 400) and near the confluence of the Grand River (RM 250). The general trend in average river bed elevations between 2007 and 2009 was aggradation above RM 250 and degradation below RM 250.

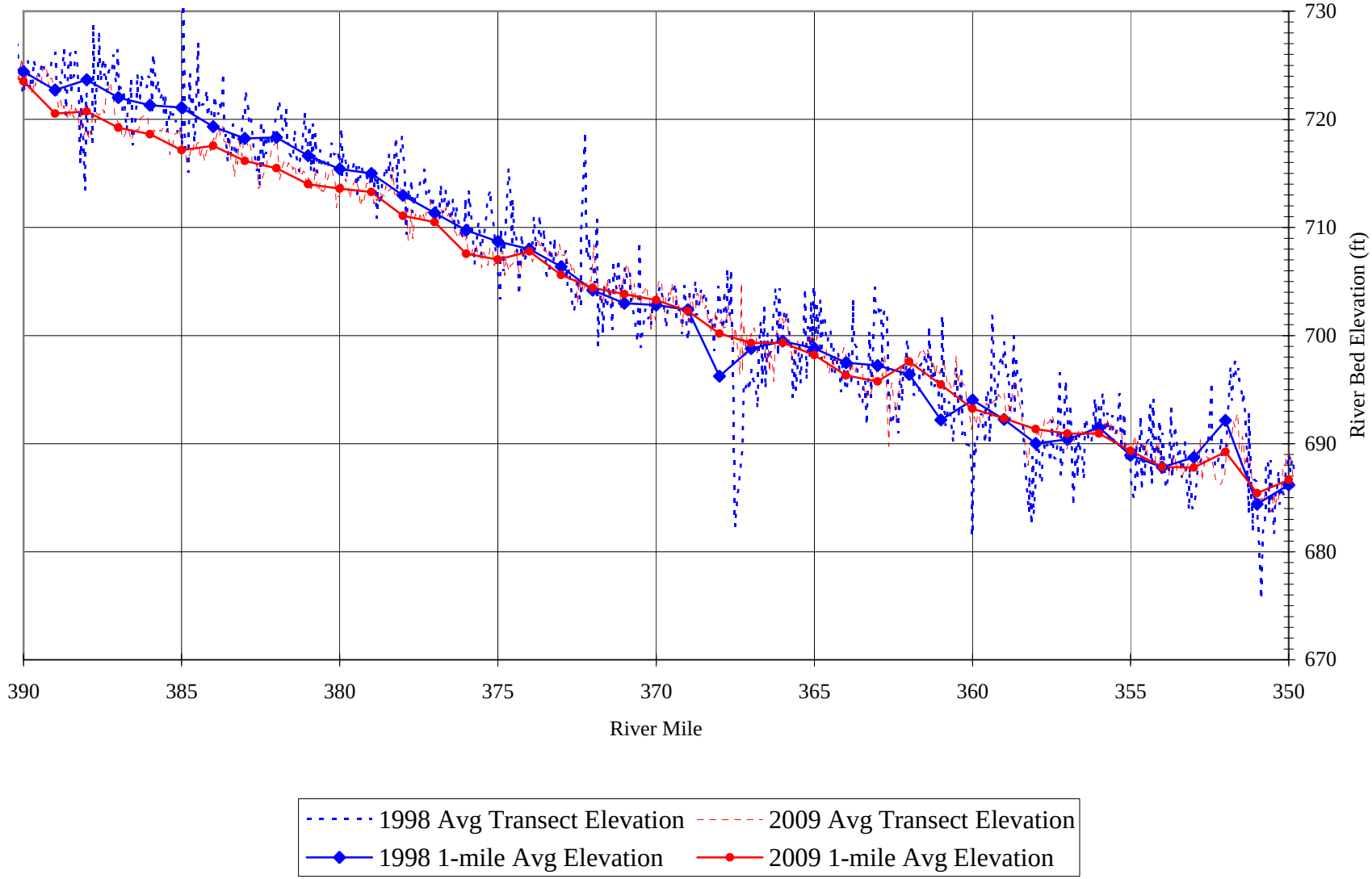

Figure A-39 Average Bed Elevation Points for the 1998 and 2009 Hydroacoustic Surveys Plotted against 1-Mile Average Elevations for the Kansas City Segment

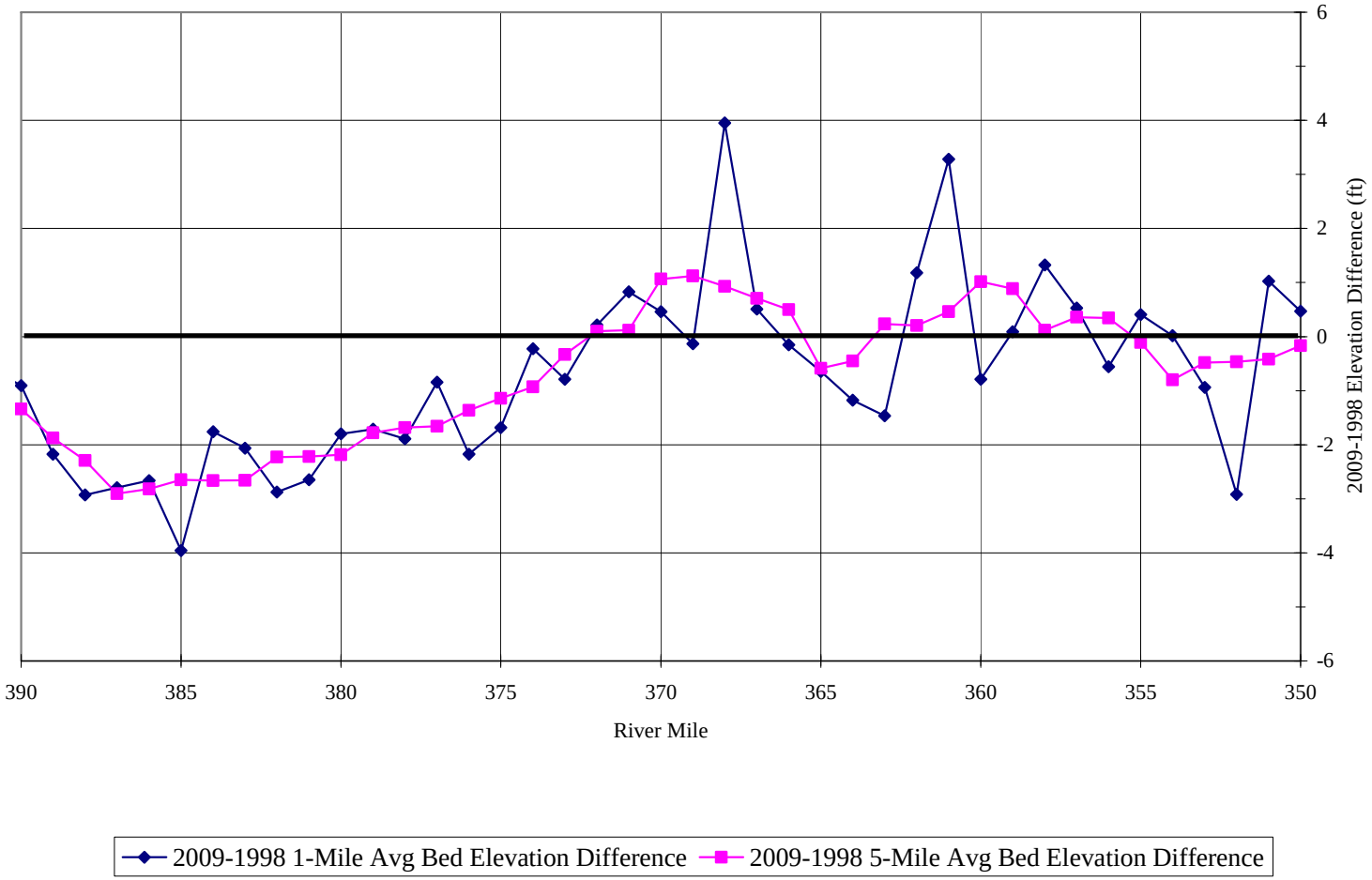

Figure A-40 1-Mile and 5-Mile Averaged Difference between 2009 and 1998 River Bed Elevation Averages for the Kansas City Segment

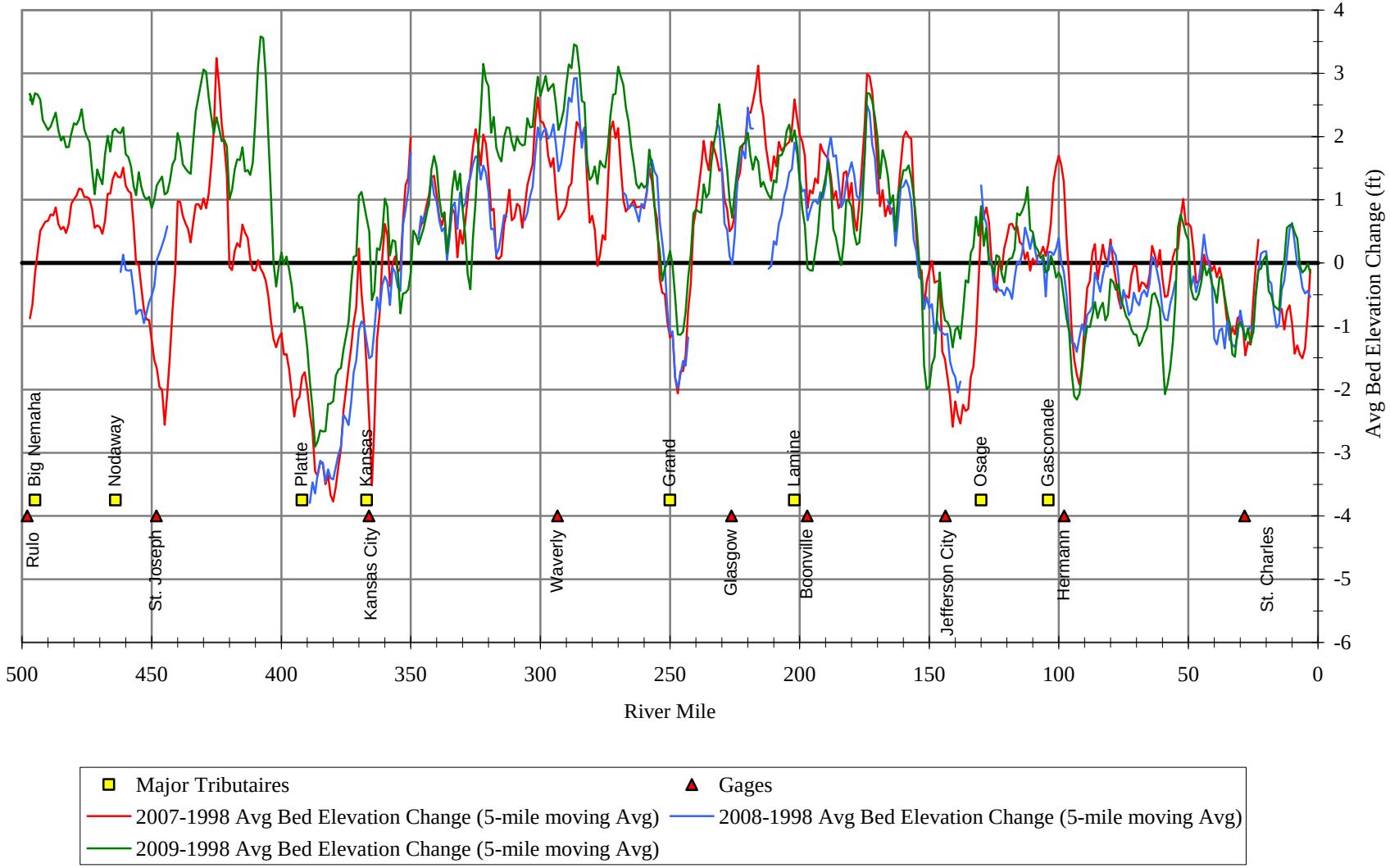

Figure A-41 Change in Average River Bed Elevation between 2007, 2008, and 2009 and 1998 Using 5-Mile Moving Average

A.8 EQUILIBRIUM SLOPE ANALYSIS

The three main data sets available with information regarding past changes in river bed elevations and water surface elevations include the CRP, the HBED, and data from established USGS gage sites. These data sets provide historical information regarding trends and changes in river bed elevations and water surface elevations in response to floods, changes in flows and sediment supply, dredging, and projects such as the BSNP. While these data provide insights regarding past and potential future trends, additional analysis was conducted to help determine whether the river bed at three analysis locations was likely to continue to degrade, aggrade, or remain stable.

The analysis, called "equilibrium slope analysis," indicates whether the bed slope of the LOMR at three gage locations is in equilibrium with the prevailing bed material load and flow regimes. Although the equilibrium slope analysis does not predict the magnitude or rate of change that will occur in the future, it does predict if the existing channel has a stable channel slope, from which conclusions can be drawn about whether the channel is likely to aggrade or degrade. A stable channel slope, or equilibrium slope, is the bed slope required by the Missouri River at a particular location to pass the incoming bed material load with the available flow without the river bed aggrading or degrading.

The equilibrium slope method is commonly used to design new channels. The method used in this analysis is similar to the stable channel design method in SAM hydraulic design software (Copeland 1994, Thomas et al. 2002), available in USACE HEC-RAS software, and the method presented in Wilcock (2004).

In the equilibrium slope analysis, a design flow, bed material supply, and channel width are specified; and iterative calculations are performed to determine the optimal combination of channel depth, slope, and velocity needed to create the hydraulic energy will pass the sediment supply without sedimentation or erosion of the bed. The analysis was performed at the St. Joseph, Kansas City, and Hermann gage locations because bed material loads were calculated for these sites and extensive hydrologic records are available.

The bed material loads predicted by the Ackers and White (1973) equation with HR Wallingford (1990) adjusted coefficients were used in the analysis (see Section A.4.2.1 for more details on this equation, which was one of the five equations used to estimate bed material loads). This equation was selected because the equation can be rearranged to solve for flow velocity (*U*) instead of bed material transport.

$$q_{bm}^{*} = C\frac{U}{\sqrt{RgD}}\left(\frac{U}{u_{*}}\right)^{n}\left(\frac{F_{gr}}{A}-1\right)^{m}$$

The key inputs needed to perform the equilibrium slope analysis are discharge, bed material load, Manning's n value, median grain diameter of bed substrate (D_{50}), and channel width. The inputs correspond with the value associated with the selected discharge. For example, if the equilibrium slope model is to be run at a 50,000 cfs discharge, then the bed material load calculated by the Ackers and White equation for 50,000 cfs is input as the sediment supply, the back-calculated Manning's n value and channel width are determined from the HEC-RAS hydraulic model results, and the D_{50} (which does not change with discharge) is determined from the analysis of bed substrate measurements made by the USGS and USACE. In some equilibrium slope analyses, hydraulic geometry relationships that relate channel width and discharge are used to select a channel width. In this analysis, however, the channel width is confined at the gaging locations and thus is not an adjustable variable.

All of the calculations were performed in a spreadsheet model in which multiple dependent variables, including velocity, depth, hydraulic radius, and slope, were iterated with each other until a solution was found. The solution represents the combination of channel cross section dimensions, velocity, and channel slope that will pass the bed material load in equilibrium.

The model was run at the 25-percent exceedance flow for all three gages. This flow was chosen because it is a relatively high-magnitude flow (approximately equal to the 1-year peak annual return flow) in which a large amount of bed material is in transport and channel-forming processes are occurring. Results from the equilibrium slope analysis are presented in Table A-19. The first group of rows lists the input parameters that include the independent variables associated with the 25-percent exceedance flow. The second group of rows lists the HEC-RAS existing conditions parameters of velocity, depth, slope and mean boundary shear stress (τ_o). These values represent the existing conditions at the gages determined from the calibrated hydraulic model. The third group of rows lists the equilibrium slope output that includes the results of the iterative calculations performed to determine the velocity, depth, and slope needed to pass the bed material supply. The final group of rows list the percent change from the HEC-RAS existing condition to the equilibrium slope estimated results. These percent change values can be interpreted as how different the existing channel is from the estimated equilibrium channel configuration. If there is little difference, the existing channel configuration is at or near the predicted equilibrium condition and can be considered relatively stable. Larger differences indicate that the existing channel configuration is not near the predicted equilibrium condition, and the channel may aggrade or degrade to a more optimal configuration.

Table A-19 Results of Equilibrium Slope Analysis for Three Gage Locations on the Lower Missouri River

	Location		
	St. Joseph Gage	Kansas City Gage	Hermann Gage
Equilibrium Slope Calculation Input Parameters			
Discharge (Q) at 25% exceedance (cfs)	56,500	68,700	111,000
Bed material load (Qbm) (tons/day)	17,168	28,759	16,141
Channel width (ft)	655	525	1,098
Manning's n (dimensionless)	0.028	0.031	0.028
Bed particle size D_{50} (mm)	0.35	0.36	0.55
HEC-RAS Existing Condition			
Velocity (ft/s)	4.2	4.8	4.0
Depth (ft)	19.3	22.5	20.5
Slope (ft/ft)	0.00012	0.00015	0.00010
τo (lb/ft^2)	0.15	0.21	0.13
Equilibrium Slope Estimated Results			
Velocity (ft/s)	4.2	5.0	4.1
Depth (ft)	19.9	21.6	22.3
Slope (ft/ft)	0.00013	0.00019	0.00010
τo (lb/ft^2)	0.15	0.24	0.13
Percent Difference between Existing and Estimated Results			
Velocity	0.5%	4.0%	3.1%
Depth (ft)	3.4%	-4.1%	8.1%
Slope (ft/ft)	4.2%	21.5%	0.3%
τo (lb/ft^2)	1.7%	11.5%	4.6%

At the St. Joseph gage, the predicted equilibrium velocity, depth, and slope are similar to the existing condition. The greatest change is a 4.2-percent difference in slope between the existing and equilibrium conditions. The results indicate that, if conditions remain the same, the channel is relatively stable and unlikely to aggrade or degrade.

At the Hermann gage, the predicted equilibrium channel configuration is similar to the existing condition. The predicted equilibrium channel is 1.8 feet deeper than the existing channel (an

8.1-percent change), and the slopes are nearly identical. The results indicate that, if conditions remain the same, the channel is relatively stable and unlikely to aggrade or degrade.

The greatest differences between the existing condition and the equilibrium condition are at the Kansas City gage. The equilibrium slope estimate predicts a slightly higher velocity (4.0 percent) and slightly lower depth (-4.1 percent). The parameter with the greatest difference between the estimated and actual values is the slope, where the predicted equilibrium slope of 0.00019 is 21.5 percent greater than the existing slope of 0.00015. The model is indicating that the optimal channel configuration to create the energy needed to pass the bed material supply in equilibrium is a steeper and less deep channel. Since the predicted slope is steeper than the existing slope, the slope is inclined to increase from the existing condition.

A.9 LINEAR REGRESSION ANALYSES OF LOCAL BED DEGRADATION

A.9.1 Introduction

To estimate the effects of dredging amounts and dredging intensity on local bed degradation, historical dredging data (1998–2009) were used to determine where dredging occurred and at what intensity. These patterns were then compared with observed patterns of local bed degradation by using linear regression to analyze changes in local bed elevations in relation to dredging intensities and to total dredging amount as a percent of bed material load.

Several terms are important in this section. First, a review of dredging location and volume records for 1998–2009 shows that dredging activities were concentrated in certain areas of the river, herein referred to as “dredging reaches.” As described in Section 2 of the EIS, areas with the most dredging were generally clustered near major urban centers where market demand for sand and gravel is greatest. These dredging reaches were identified and labeled (Figure A-42, Table A-20).

Second, “dredging intensity” is the amount of material dredged per unit length of river per unit of time. In this case, it is expressed as tons per river mile per river year (tons/mile/year) and can be averaged over a period of time or over a dredging reach or river segment.

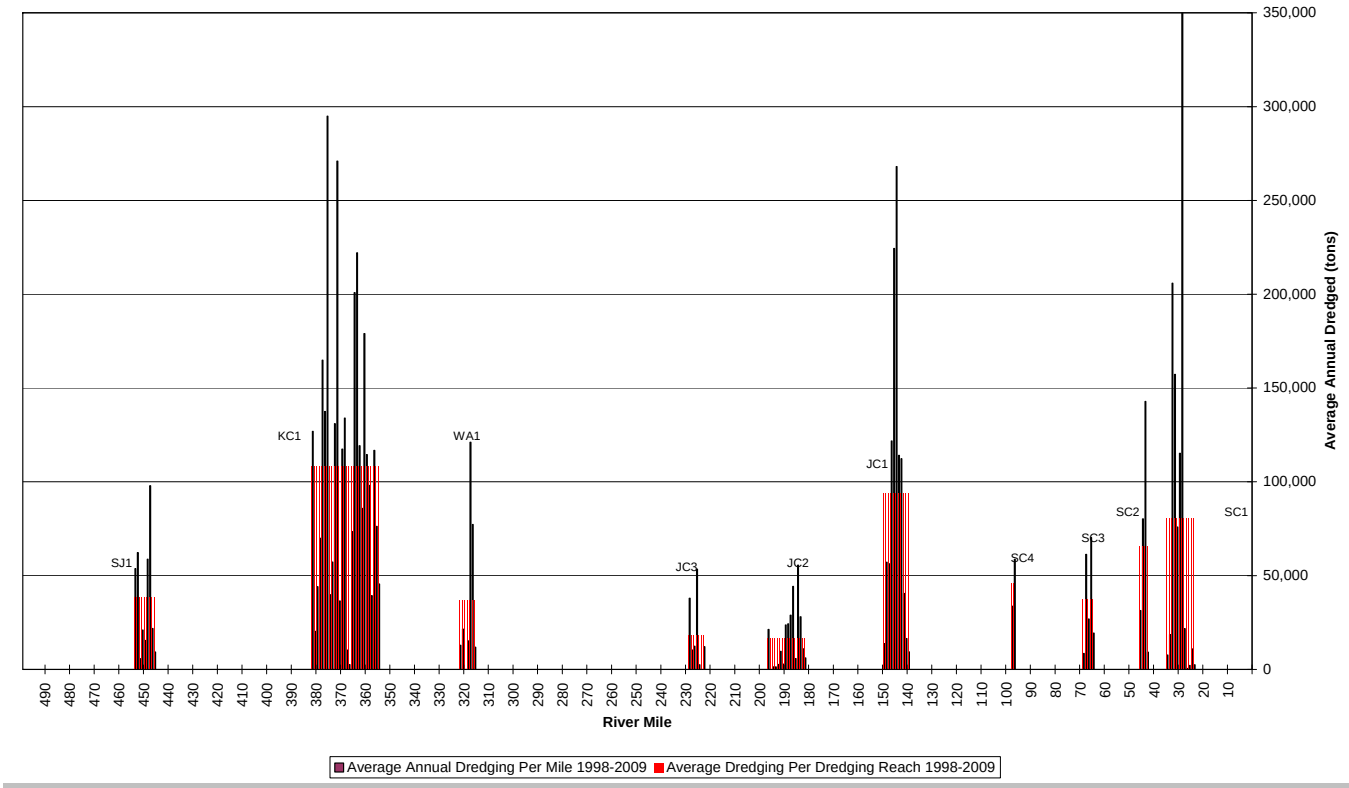

Figure A-42 Average Annual Dredging (1998–2009) by River Mile and Averaged for Dredging Reaches

Third, "total dredging amount as a percent of bed material load" is determined by averaging the annual dredging level over the analysis period (1998–2007 or 1998–2009) per mile, and then summing that average for the number of miles in the dredging reach. The total average dredging amount for the dredging reach as a percent of the bed material load estimate for the segment is then calculated. The result is an estimate of how much of the average annual bed material load is removed in a dredging reach each year.

A.9.2 Dredging Reaches

Eleven dredging reaches were identified that had records for at least 2 consecutive miles and at least 2 years of dredging between 1998 and 2009. The dredging reach identified near the confluence with the Mississippi River was not included in the analysis due to backwater effects near the mouth, resulting in 10 dredging reaches selected for the analysis (Figure A-42). Table A-20 describes the location and length of each dredging reach, and shows the average dredging intensity for the reach for 1998–2007 and 1998–2009.

Table A-20. Dredging Reaches by Segment and Average Dredging Intensity by Dredging Reach and River Mile for 1998–2007 and 1998–2009

Segment	Dredging Reach Code	Dredging Reach Beginning (RM)	Dredging Reach End (RM)	Dredging Reach Length (mi)	1998–2007 Average Annual Amount Dredged per Dredging Reach (Intensity) (tons/mile/year)	1998-2009 Average Annual Dredging per Dredging Reach (Intensity) (tons/mile/year)
St. Charles	SC1	24	35	12	87,207	80,695
St. Charles	SC2	43	46	4	74,449	65,922
St. Charles	SC3	65	69	5	38,462	37,263
St. Charles	SC4	97	98	2	48,893	46,160
Jefferson City	JC1	140	150	11	93,854	94,021
Jefferson City	JC2	182	197	16	17,816	16,686
Jefferson City	JC3	223	229	7	20,428	18,411
Waverly	WA1	316	322	7	35,590	37,120
Kansas City	KC1	355	382	28	115,587	108,196
St. Joseph	JS1	446	454	9	40,104	38,442

A.9.3 Quantifying Amount of Dredging in Dredging Reaches

For each dredging reach, the amount of dredging that occurred from 1998–2007 and 1998–2009 was totaled for each river mile and divided by the number of years in that period to determine the average annual dredging per reach (Table A-21). The 1998–2007 and 1998–2009 dredging data were selected to correspond to the 2007 and 2009 HBED bed profiles, respectively. The average annual amount dredged per dredging reach as a percent of bed material load was calculated. The bed material load estimate for 2000–2009 was used because it best represents bed material loads for the analysis period and is consistent with the analysis in Section 4.2. The dredging intensity per river mile was determined by dividing the average annual dredging per reach by the number of miles in that reach (Table A-21, and Figure A-42, which shows this for dredging years 1998–2009).

Table A-21. Average Annual Estimated Bed Material Load for Each Segment (2000–2009) and Average Annual Dredging as a Percent of Bed Material Load and Dredging Intensity for Each Dredging Reach (1998–2007 and 1998–2009)

Segment	Dredging Reach Code	2000–2009 Average (Avg.) Annual BML[a] for Segment[b] (tons)	1998–2007 Total Avg. Annual Amount Dredged per Reach (tons)	1998-2007 Avg. Annual Amount Dredged as Percent of BML	1998–2007 Avg. Annual Amount Dredged/ Mile (Intensity) (tons)	1998-2009 Avg. Annual Amount Dredged per Reach (tons)	1998-2009 Avg. Annual Amount Dredged as Percent of BML	1998–2009 Avg. Annual Amount Dredged/ Mile (Intensity) (tons)
St. Charles	SC1	3,698,726	1,046,479	28%	87,207	968,336	26%	80,695
St. Charles	SC2	3,698,726	297,795	8%	74,449	263,688	7%	65,922
St. Charles	SC3	3,698,726	192,310	5%	38,462	186,317	5%	37,263
St. Charles	SC4	3,698,726	97,786	3%	48,893	92,320	2%	46,160
Jefferson City	JC1	4,263,390	1,032,399	24%	93,854	1,034,233	24%	94,021
Jefferson City	JC2	4,263,390	285,050	7%	17,816	266,978	6%	16,686
Jefferson City	JC3	4,263,390	142,995	3%	20,428	128,878	3%	18,411
Waverly	WA1	4,955,740	249,130	5%	35,590	259,840	5%	37,120
Kansas City	KC1	5,352,153	3,236,435	60%	115,587	3,029,477	57%	108,196
St. Joseph	JS1	3,508,070	360,933	10%	40,104	345,974	10%	38,442

[a] BML is the estimated bed material load for the period 2000–2009.

[b] BML estimates for the Jefferson City and Waverly segments were interpolated from the BML estimates calculated for the Kansas City and St. Charles segments.

A.9.4 Changes in Local Bed Elevation

To estimate the effects of dredging on local bed elevations, the change in bed elevations in each dredging reach was compared with the average bed elevation of adjacent reaches upriver and downriver from the dredging reach. This was done for the 2007 and 2009 HBED data, which are the only two recent datasets with measurements for most of the LOMR (Figure 3.4-21, Section A.7). The variable length of each dredging reach was addressed in the analysis by using one dredging reach length upriver and one dredging reach length downriver to determine the average bed elevation in the vicinity of the dredging reach.

For example, dredging occurred in the JC1 dredging reach in the Jefferson City Segment on 11 miles of the river (Table A-20). The average bed elevation for the 11-mile dredging reach was compared to the average bed elevation of the 11 mile section of river upstream and the 11 mile section of river

downstream of the dredging reach (a total of 22 miles). The difference between the average bed elevation for the dredging reach and average bed elevation for the same length reach above and below the dredging reach was calculated (Table A-22). This enabled the effects of dredging on average bed elevation to be compared to the average river bed elevation in the vicinity of, but outside of, the area directly affected by dredging.

Table A-22. Average Dredging Reach Elevation, Average Bed Elevation of Adjacent Equivalent-Length Reaches, and Difference in Average Bed Elevation Based on 2007 and 2009 HBED Data

Segment	Dredging Reach Code	Dredging Reach Length (mi)	2007 HBED Average (Avg.) Dredging Reach Elevation (feet)	2007 HBED Avg. Adjacent Reach Elevation (feet)	Difference between Avg. Adjacent Reach Elevation and Avg. Dredging Reach Elevation (feet)	2009 HBED Avg. Dredging Reach Elevation (feet)	2009 HBED Avg. Adjacent Reach Elevation (feet)	Difference between Avg. Adjacent Reach Elevation and Avg. Dredging Reach Elevation (feet)
St. Charles	SC1	12	407.41	412.11	-4.7	407.35	408.33	-0.99
St. Charles	SC2	4	422.52	422.71	-0.2	422.39	422.42	-0.03
St. Charles	SC3	5	444.81	444.21	0.6	444.01	443.53	0.49
St. Charles	SC4	2	472.93	473.02	-0.09	472.09	470.87	1.22
Jefferson City	JC1	11	510.67	511.35	-0.68	510.58	511.86	-1.28
Jefferson City	JC2	16	550.92	550.36	0.56	550.13	550.2	-0.08
Jefferson City	JC3	7	580.14	580.38	-0.24	580.58	580.09	0.49
Waverly	WA1	7	661.98	662.28	-0.31	663.41	662.42	0.99
Kansas City	KC1	28	700.56	705.83	-5.27	701.78	705.75	-3.97
St. Joseph	JS1	9	780.4	782.07	-1.67	782.85	783.35	-0.5

A.9.5 Linear Regression

Linear regression was used to characterize the strength of the relationship between dredging and changes in local bed elevations for dredging reaches. Total dredging amount as a percent was plotted as the independent variable, and local bed elevation change in a dredging reach was plotted as the dependent variable; a best-fit linear regression line was calculated based on the 10 dredging reaches (Figure A-43). A second regression with dredging intensity as the independent variable and local bed elevation change as the dependent variable was also calculated (Figure A-44).

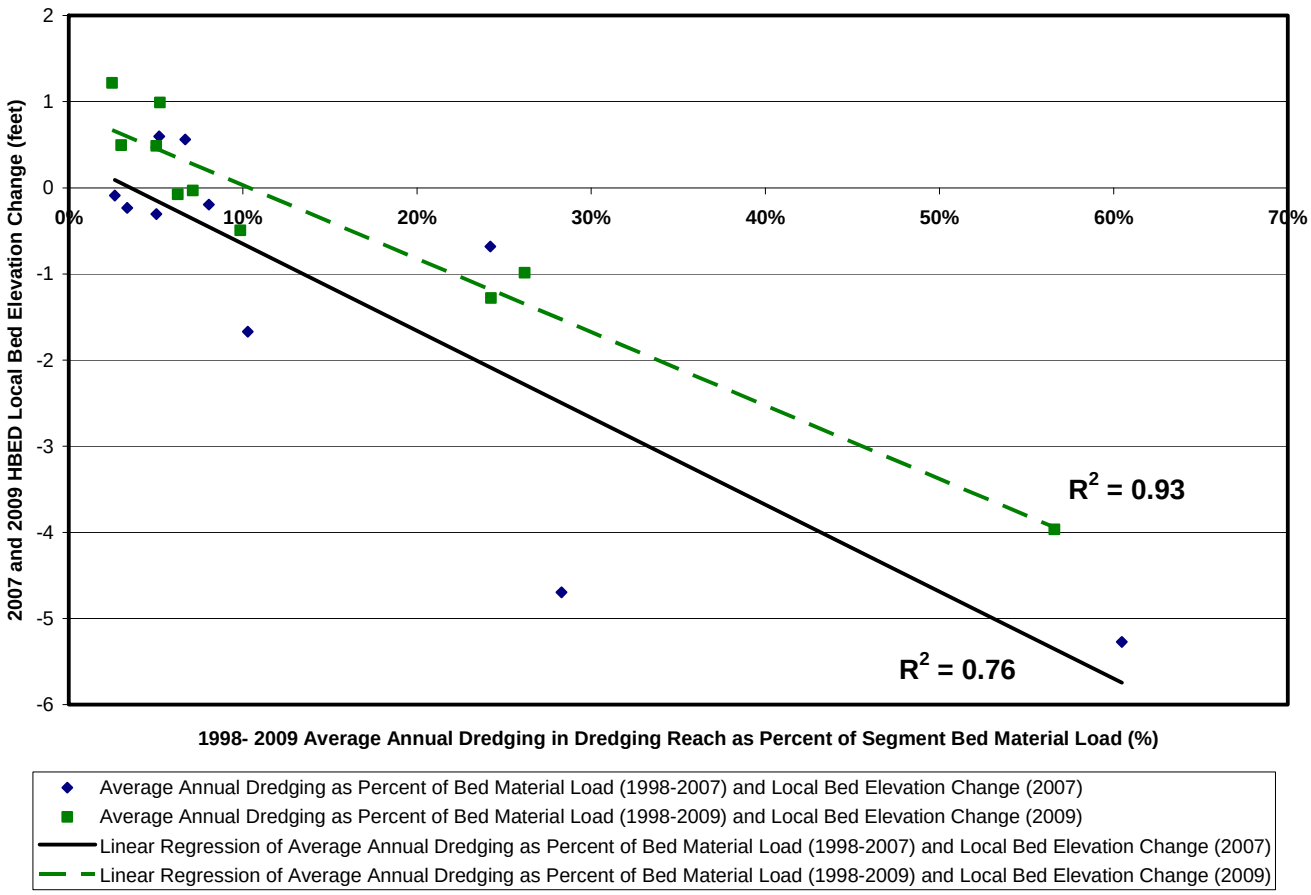

Figure A-43 Linear Regression of Average Annual Dredging in Dredging Reach as a Percent of Bed Material Load and Local Bed Elevation Change for 1998–2007 and 1998–2009

A.9.6 Total Dredging Amount as Percent of Bed Material Load and Local Bed Degradation

The regression results show a strong relationship between the total dredging amount as a percent of bed material load from 1998–2007 and the local bed elevation change for the 2007 HBED data (R^2=0.76), and for the 1998–2009 dredging data and the 2009 bed HBED data (R^2=0.93). R^2 values range between zero and one, and indicate the strength of the relationship, with higher values indicating a better fit (zero = no relationship and 1.0 = perfect correspondence). The results indicate that approximately 76 and 93 percent of the variability in the 2007 and 2009 local bed elevation changes, respectively, can be explained by average annual dredging as a percent of bed material load. The results are significant at the 95-percent confidence level, which indicates that the regression line is unlikely to be the result of chance association (Table A-23). Residual plots were reviewed to ensure that the data were appropriate for regression analysis.

Table A-23 Linear Regression Confidence Level, Significance Level, and R^2

Regression	Observations	Confidence Level	Significance[a]	R^2
1998–2007 Total Average Annual Dredging/Reach as a Percent of Bed Material Load Vs. 2007 Bed Elevation Change	10	95%	0.00	0.76
1998–2007 Total Average Annual Dredging/Reach as a Percent of Bed Material Load Vs. 2009 Bed Elevation Change	10	95%	0.00	0.93
1998–2007 Average Annual Dredging Intensity per Dredging Reach Vs. 2007 Bed Elevation Change	10	95%	0.01	0.55
1998–2007 Average Annual Dredging Intensity per Dredging Reach Vs. 2009 Bed Elevation Change	10	95%	0.01	0.62

[a] Significance levels of less than 0.05 indicate that the result is statistically significant at the 95% confidence level.

The regression line crosses the line of zero bed elevation change (i.e., x-intercept) between 0 and 10 percent of the bed material load, indicating that higher dredging levels would likely result in degradation and that lower dredging levels are unlikely to cause local bed degradation in a dredging reach (Figure A-43). The regression results show a strong ability to explain increased bed degradation as a function of increasing total dredging levels as a percent of bed material load at the dredging reach scale, even though the results do not confirm direct causality.

A.9.7 Dredging Intensity and Local Bed Degradation

In addition to the amount dredged as a percent of bed material load for each dredging reach, intensity of dredging was analyzed. Average annual dredging intensity is the average amount of material dredged per mile per year, expressed as tons per river mile per year.

Figure A-44 shows the relationship between average dredging intensity for each dredging reach and local bed degradation. The regression has an R^2 of 0.55 for dredging data from 1998–2007, and 0.62 for dredging data from 1998–2009 (Table A-23). Although the relationship between average dredging intensity and local bed degradation is statistically significant at the 95-percent confidence level, the ability to explain the variability in local bed degradation is less than for dredging expressed as a percentage of bed material load.

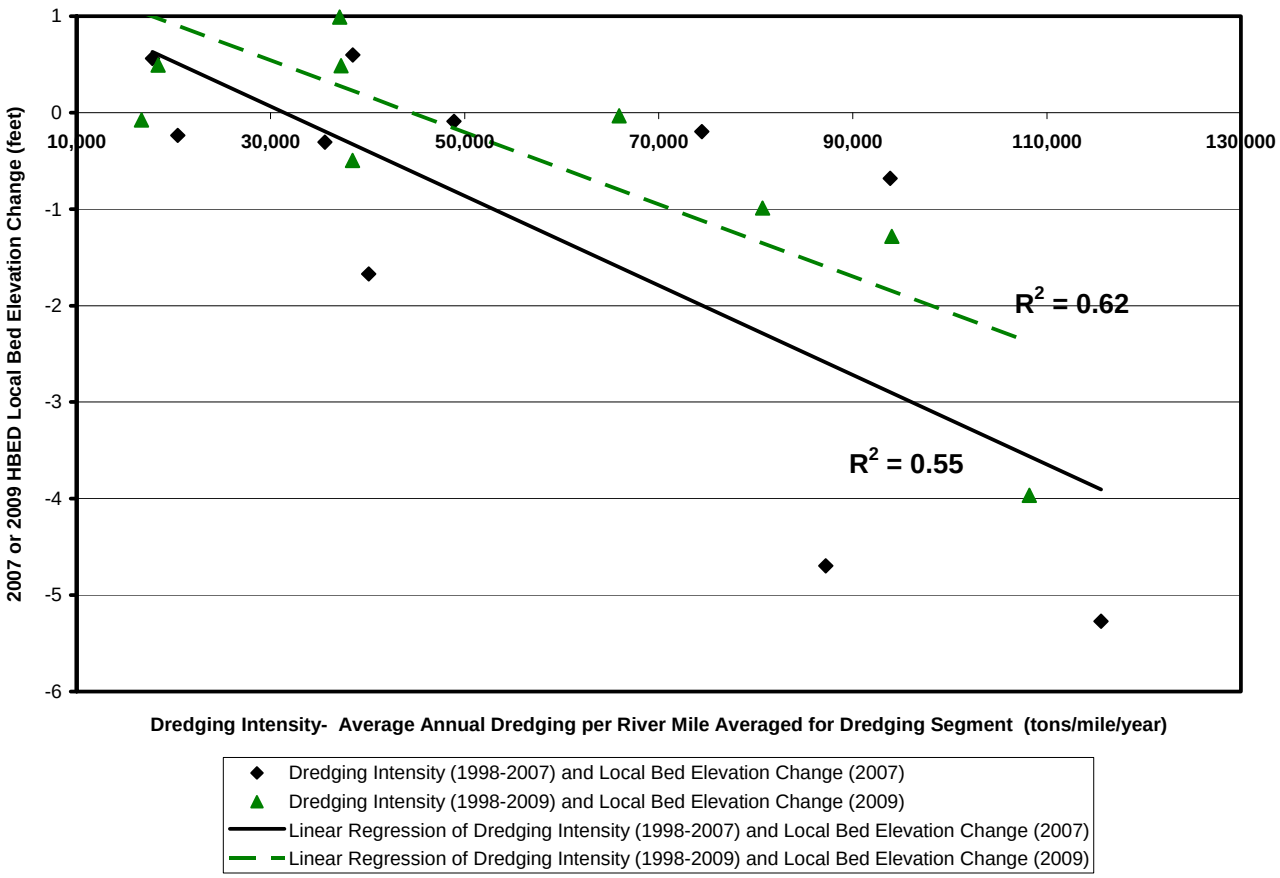

Figure A-44 Linear Regression of Dredging Intensity and Local Bed Elevation Change for 1998–2007 and 1998–2009

The regression line crosses the zero degradation line (i.e., the x-intercept) at approximately 30,000 tons/mile/year for the 1998–2007 dredging data, which can be interpreted to represent the level of dredging intensity that is unlikely to affect bed elevations in a dredging reach (Figure A-44). Although 30,000 tons/mile/year is where the best fit line crosses the zero degradation line for the 1998–2007 data, the 95-percent confidence bands (dashed lines) indicate that dredging in the range of 0 to 61,000 tons/mile/year are statistically similar (Figure A-45).

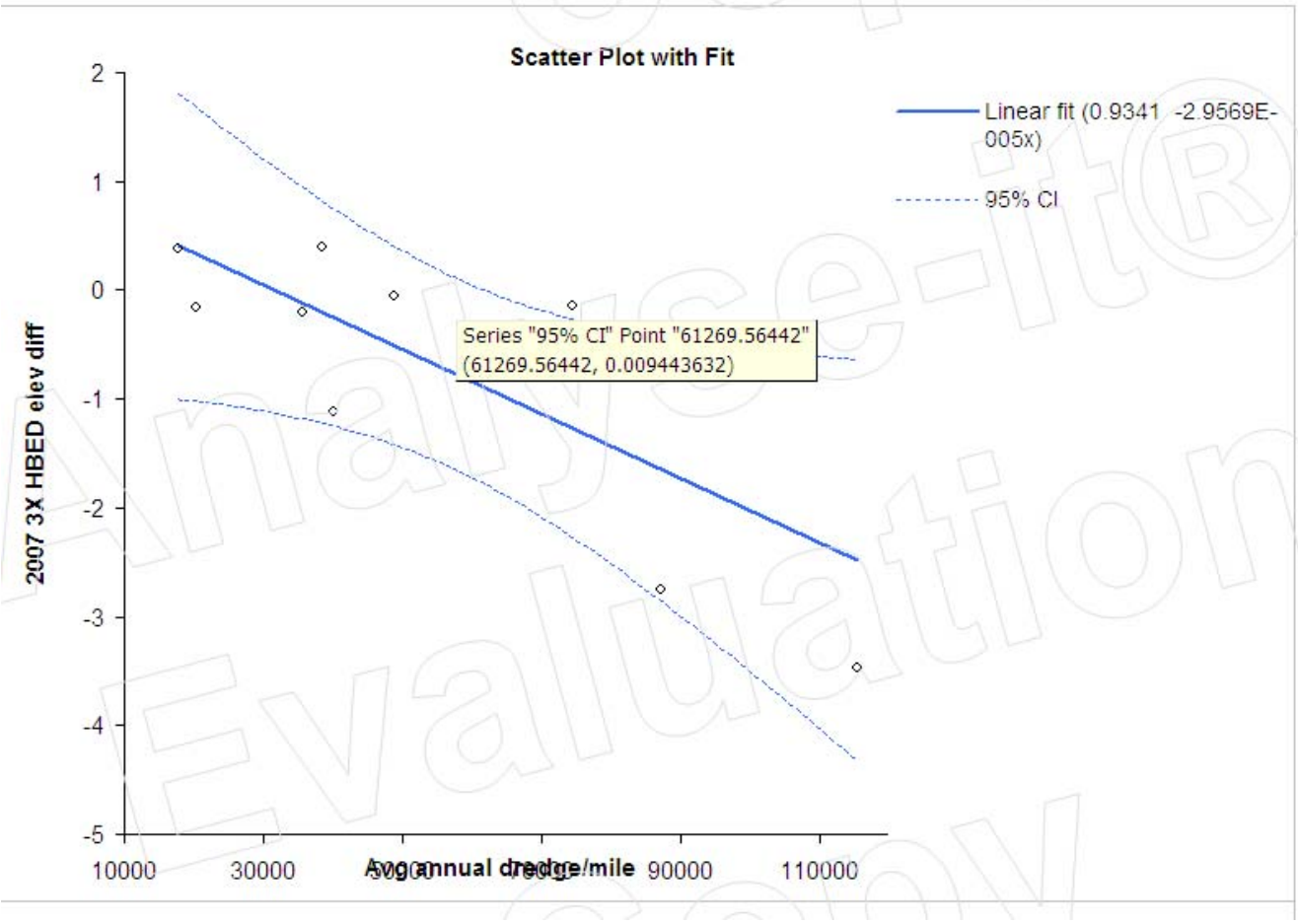

Figure A-45 Linear Regression with Confidence Bands for the 1998–2007 Dredging and 2007 HBED Data

Note: Dashed lines indicate the 95% confidence bands around the solid regression line. The data label on the graph (61,269 tons/mile/year) is where the 95% confidence band intercepts the x-axis and there is no bed elevation change.

The changes in flows, sediment delivery, and dredging levels from 2007 to 2009 represent a divergence from more consistent conditions from 1998–2007 and likely influence the regression relationship and results. The 1998–2007 dredging data and the 2007 HBED were used to establish the dredging intensity guideline for the following reasons: (1) flows in 2008 and 2009 were average to above average relative to the below-average flows from 2000–2007 (Figure 3.4-14); (2) from 2007 through 2009, portions of the river experienced aggradation as shown by the 2007 and 2009 HBED data (likely resulting in the upward shift from 2007 to 2009 in the regression line seen on Figure A-44); (3) there was a 22- and 34-percent reduction in dredging in 2008 and 2009, respectively, when compared to the average for 2004–2008; and (4) the bed degradation analysis conducted in Section 4.2 of the EIS uses a worst-case below-average flow scenario for estimating potential impacts. Using

the 1998–2007 period is consistent with the approach described in Section 4.2. Even though the 2009 regression line intercepts the x-axis (where there is zero bed elevation change) at approximately 45,000 tons/mile/year, it still falls within the confidence bands of the 2007 data.

A.9.8 Summary

The R^2 values and significance levels for total dredging amounts as a percent of bed material load are quite high for a river system of this complexity, indicating a strong relationship between dredging amounts as a percent of bed material load and bed degradation. R^2 values and significance levels are lower for dredging intensity but still show a significant relationship. It should be noted that the results of the local bed degradation analysis described in this section are not directly comparable to the analysis of dredging amounts as a percent of bed material load with degradation over time at a segment scale (Table 3.4-20). That analysis considered changes in bed elevation over a span of 10–15 years, based on the data represented in Figures 3.4-31 and 3.4-32. This analysis considers local change in bed elevation in a dredging reach relative to the adjacent bed elevations and is based on bed elevation data collected during the same year.

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Appendix B
Related Action – Development of New Sand Plants

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Abbreviations & Acronyms

CWA	Clean Water Act
EIS	environmental impact statement
LOMR	lower Missouri River
Master's	The Master's Dredging Company
MDNR	Missouri Department of Natural Resources
MoDOT	Missouri Department of Transportation
Rau	Edward N. Rau Contractor Company
RHA	Rivers and Harbors Act of 1899
RM	river mile
USACE	U.S. Army Corps of Engineers

A P P E N D I X B

Related Action – Development of New Sand Plants

B.1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) has received permit applications from eight companies to dredge sand and gravel from selected locations between river mile (RM) 0.0 and RM 447.7 on the lower Missouri River (LOMR) for commercial uses. As part of its review of the permit applications, the USACE has prepared an Environmental Impact Statement (EIS). The EIS examines the potential environmental impacts of the proposed dredging activities and any related actions. In addition to dredging, facilities for unloading, sorting, and temporarily storing dredged sand and gravel are required. These facilities, located on the shore at various locations along the LOMR are called sand plants.

Two of the applicants—The Master's Dredging Company (Master's) and Edward N. Rau Contractor Company (Rau)—do not presently own or operate sand plants that could serve their proposed dredging operations. If a permit is authorized for either of these applicants, they propose to build sand plants on sites that they presently own or control. While these facilities are not part of the proposed dredging activity, they are a related action as a means of offloading, processing, storing, and distributing commercial sand and gravel produced by the dredging operation as required. Sites have been secured and some preliminary steps have been taken to initiate development of these facilities. The locations of the existing and proposed sand plants are shown in Figure B-1 (Sheets 1–5).

The following sections include descriptions of the preliminary plans for development of sand plants to support dredging operations for Master's and Rau.

B.2 THE MASTER'S DREDGING COMPANY, INC.

Master's proposes to dredge in river reaches from approximately RM 383.1 to RM 390. Master's has control of a property near Waldron, Missouri. Master's plans to develop a sand plant at one of two sites on the Waldron property to support approved dredging operations.

The Master's dredging operation differs from that of all the other applicants in that the dredge slurry is not screened on the dredge and the selected material is not loaded onto a barge. Instead, Master's plans to string a pipeline from the dredge to its sand plant and pipe the dredged slurry to shore, where it would be separated, screened, and dewatered. The processed material then would be stacked for distribution. The site plan shows each of these components (Figure B-2). After the dredged material has been sorted and stacked, the remainder of the operation would be similar to operations at the sand plants of the other Dredgers.

The Master's property at Waldron is located on Morris Ferry Road, as described below. Two separate sites are being considered for the proposed sand plant on the Morris Road property. These sites are shown as Plant Site 1 and Plant Site 2 in Figure B-2. The configuration and permitting requirements for the sites are described below.

Location: 39 deg. 14.25' north, 94 deg. 49.366' west, approximately RM 388.

Size: 20 – 60 acres would be developed depending on the amount of dredging approved.

Site Plan: The site would be developed to include a sand plant configured as shown in Figure B-3. The sand plant would be connected to the dredging operation via a slurry pipeline that carries the dredged material. The slurry pipeline would require an easement over the shoreline and to the sand plant site. At the sand plant, the slurry would be delignified (coal would be removed from the sand and gravel) and dewatered, and then the material would be classified by size and transported via a conveyor/stacker to a storage pile. Depending on the dredging amounts allowed in any approved dredging permit, one of two storage piles would be established with a storage volume of 500,000 tons per pile. The pile could be up to 100 feet high. Although not shown, the site plan would likely include an office/maintenance building and truck scale. Access to the sand plant would be from Morris Road.

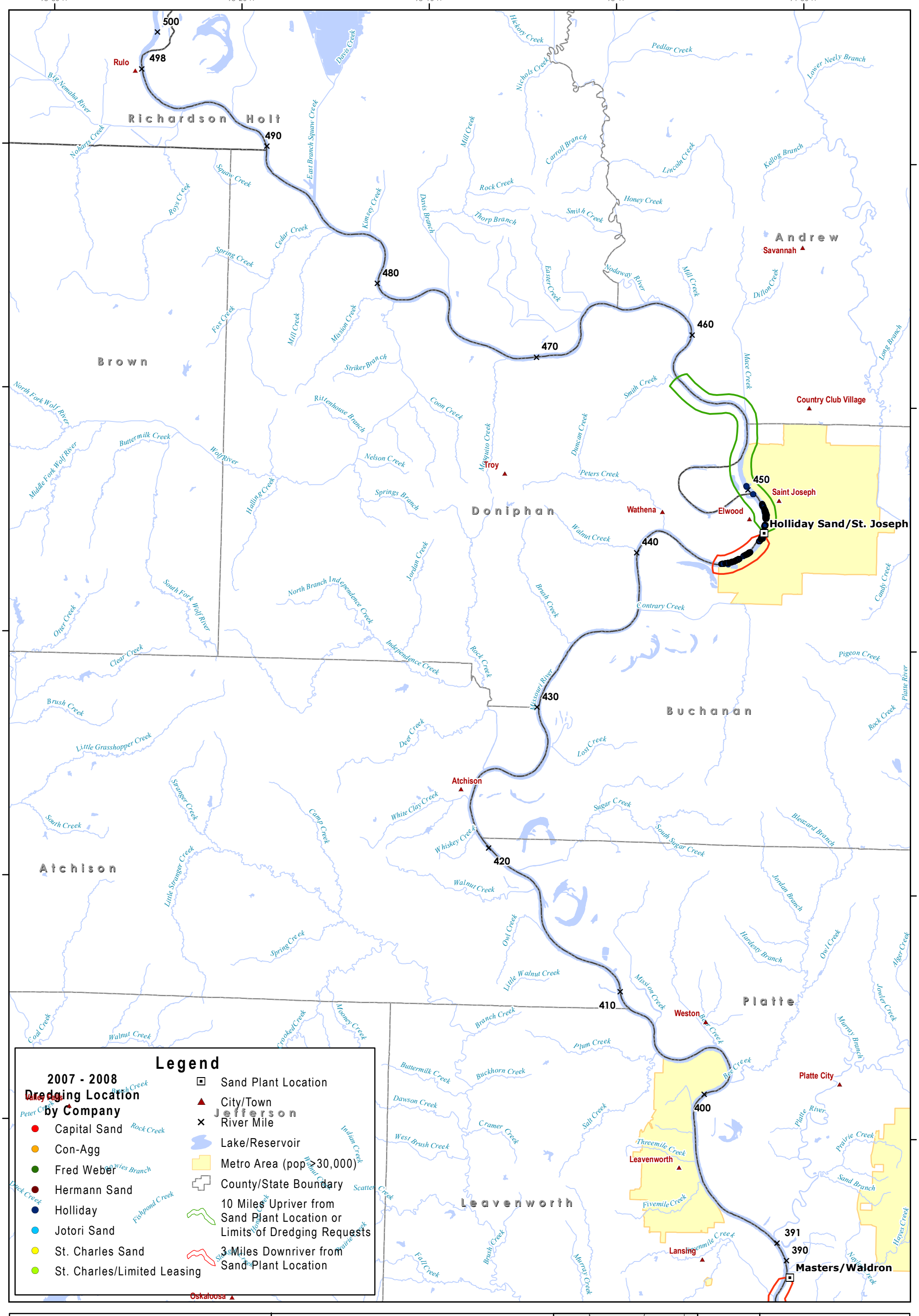
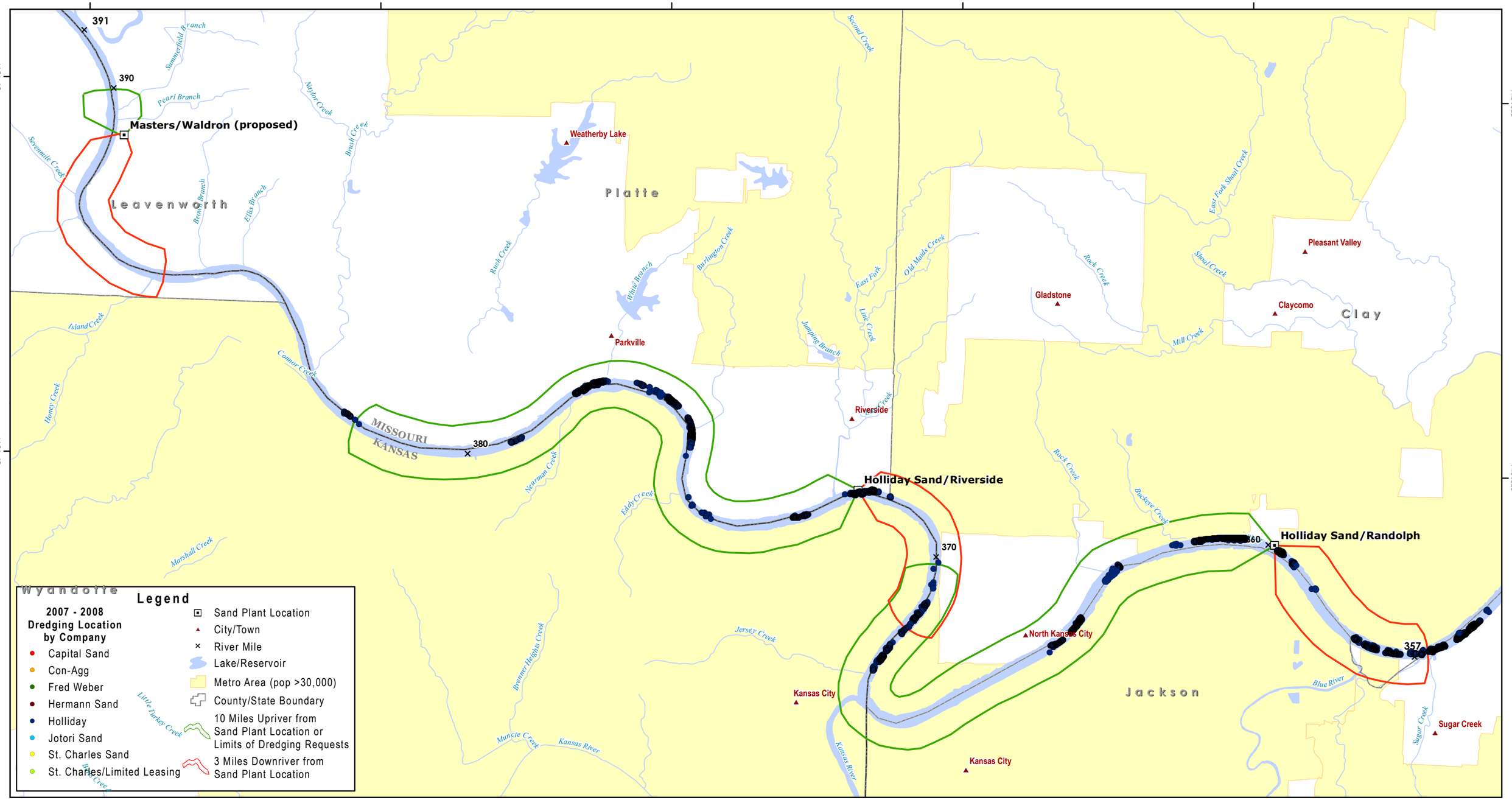


Figure B-1
Dredging Sand Plant Locations
Sheet 1 - St. Joseph Segment
Missouri River Commercial Dredging EIS



0 2.5 5 Miles

0 2.5 5 Kilometers

Figure B-1
Dredging Sand Plant Locations
Sheet 2 - Kansas City Segment

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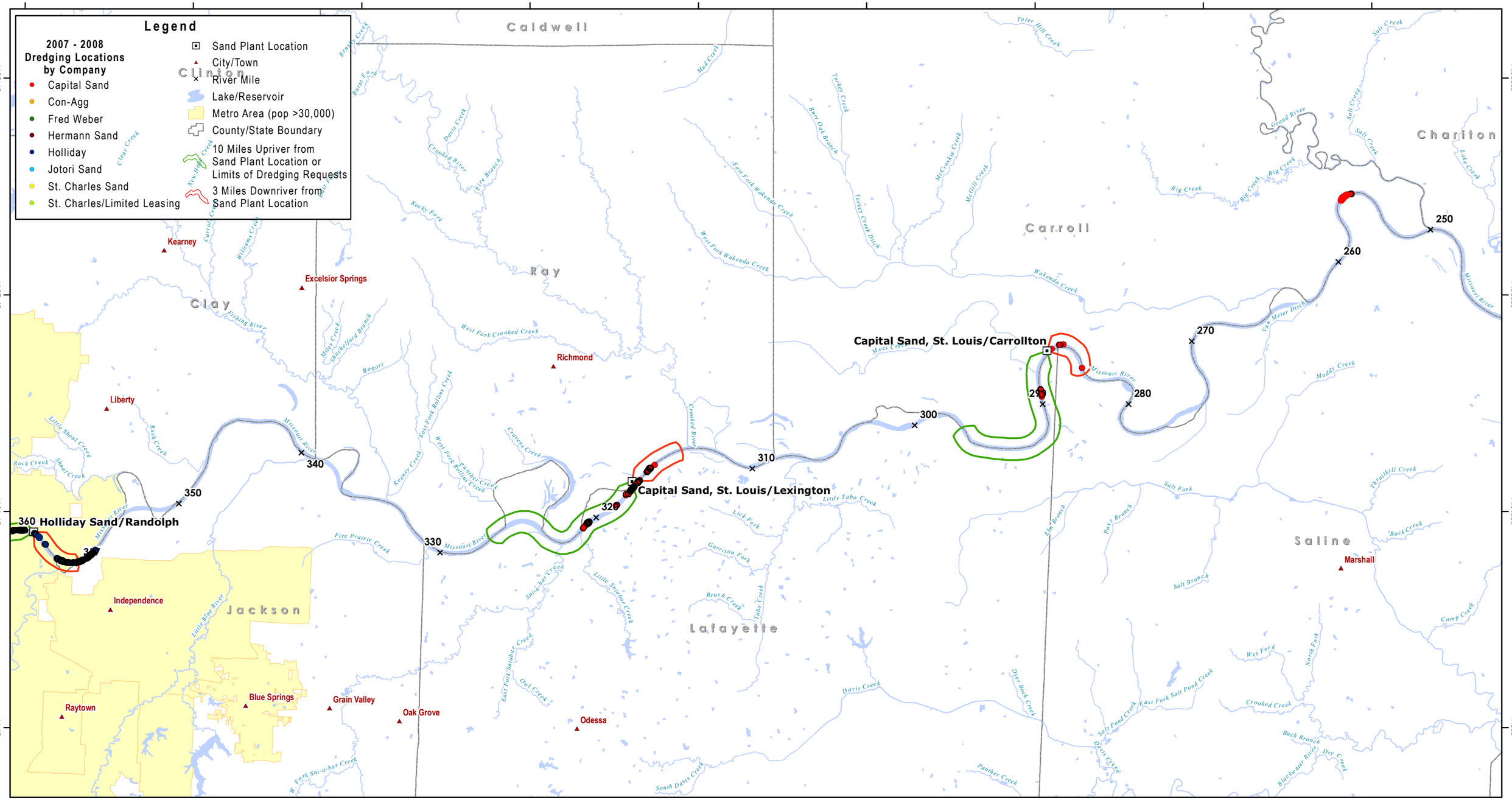
Map Projection: NAD83 UTM Zone15 North



0 5 10 15 20 Miles

0 10 20 Kilometers

Figure B-1
Dredging Sand Plant Locations
Sheet 3 - Waverly Segment

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Map Projection: NAD83 UTM Zone15 North

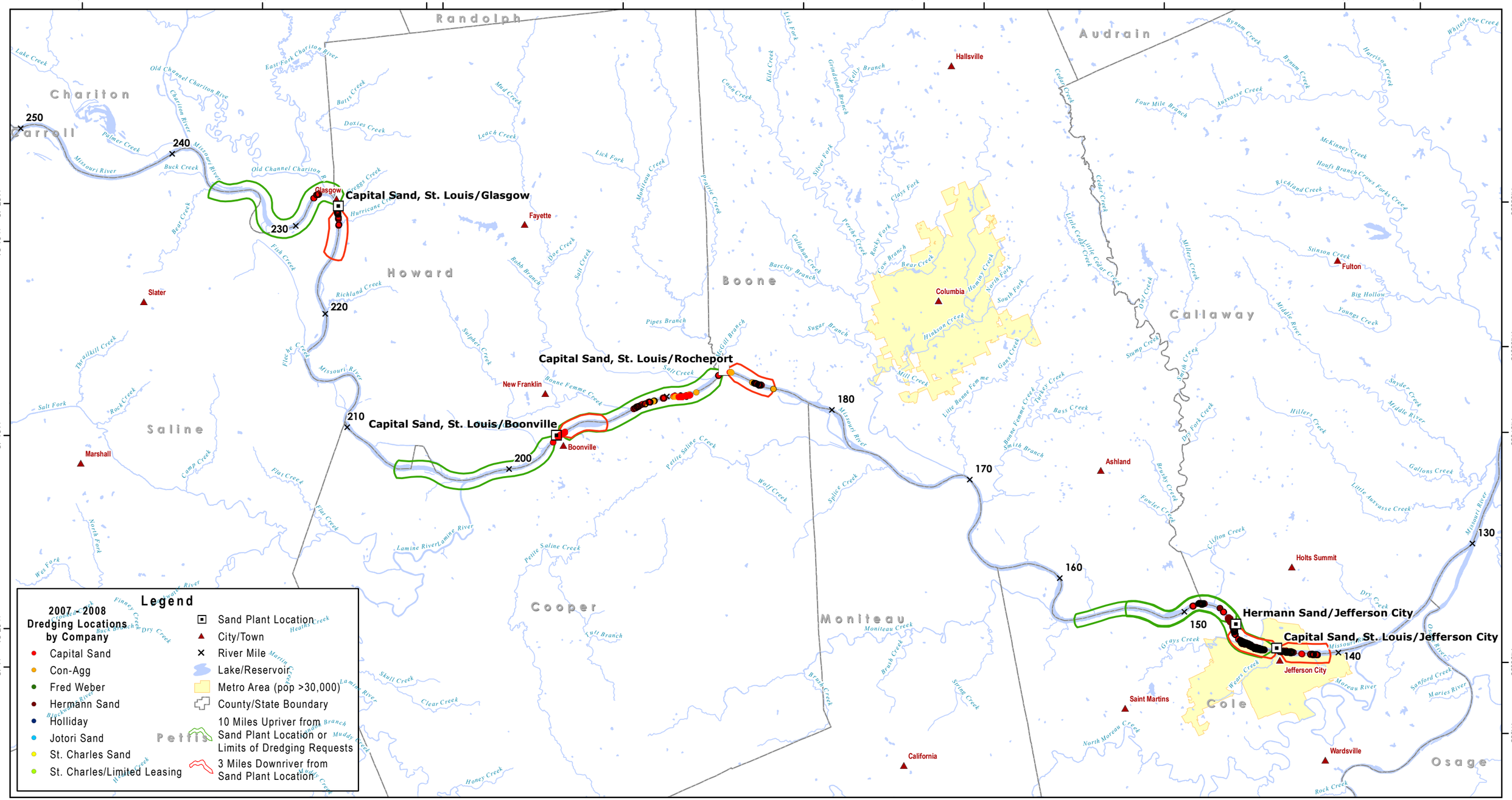

Figure B-1
Dredging Sand Plant Locations
Sheet 4 - Jefferson City Segment

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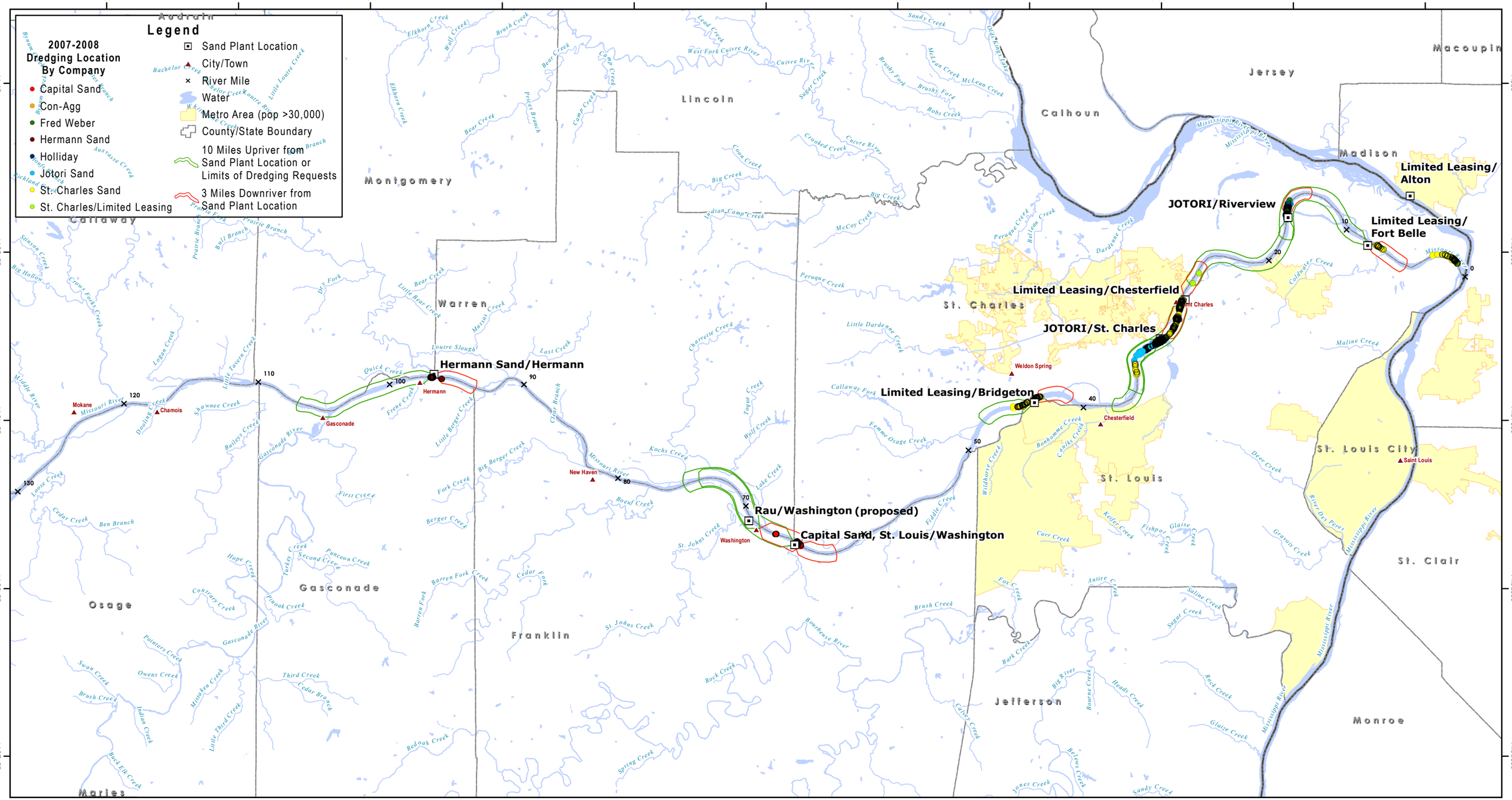

0 5 10 15 20 25 30 Miles

0 5 10 15 20 25 30 Kilometers

Figure B-1
Dredging Sand Plant Locations
Sheet 5 - St. Charles Segment

Missouri River Commercial Dredging EIS

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Map Projection: NAD83 UTM Zone15 North

Figure B-2 Master's Waldron Optional Sand Plant Sites

Source: GoogleEarth.

Site 1 – Site 1 is located on the river side of federal flood control levee L-400**,** maintained by the Waldron Levee District. Master's has indicated that, if they constructed on this site, they would include a boat ramp for marshalling dredging equipment.

Site 2 – Site 2 is located on the upland side of federal flood control levee L-400 and would require a pipeline crossing of the levee.

Adjacent Land Use: Agricultural

Capacity: Operating capacity would range from 1,000 to 3,000 tons/hour depending on the dredge used. Sand storage would range from 0.3 to 1.0 million tons depending on the size of development.

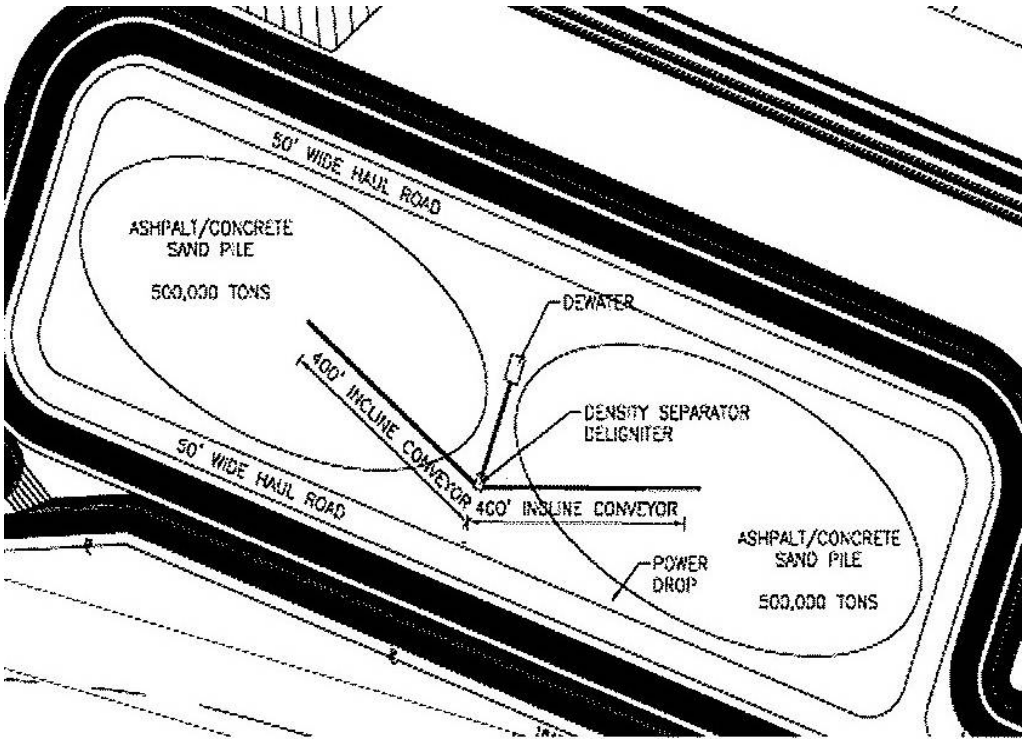

Figure B-3 Master's Waldron Sand Plant – General Site Plan

Site Development Permits, Approvals and Consultations: Federal, state, and local permits, approvals, and consultations that may be required for development of the Waldron facility include:

- County – Conditional Use Permit (zoning);
- Missouri Department of Transportation (MoDOT) – highway access;
- Missouri Department of Natural Resources (MDNR) – air permit, water quality (wastewater discharge) permit;
- USACE– consultation with levee district for construction adjacent to a levee;
- Section 10 of the Rivers and Harbors Act of 1899 (RHA) – permit for construction of facilities below the high water mark;
- Section 404 of the Clean Water Act (CWA) – permit for dredge and fill in the river or fill in wetlands;
- Land owner easements – for pipeline access from the river to the sand plant site; and
- Electric utility – installation of electrical distribution line.

B.3 EDWARD N. RAU CONTRACTOR COMPANY

Rau plans to construct a sand plant on the shore of the Missouri River at Washington, Missouri. If the USACE issues a dredging permit, Rau would contract with an independent dredging contractor for extraction and delivery of commercial sand and gravel to a Rau-owned and -operated sand plant. The proposed site is shown in Figure B-4. The configuration and permitting requirements for the site are described below.

Location: 38 deg. 34.04' north, 91 deg. 1.273' west, approximately RM 67.

Size: 25.6 acres.

Adjacent Land Use: Commercial, industrial, institutional.

Operation: Rau would contract with a dredging company to dredge under Rau permits. The dredging contractor would be responsible for offloading material to conveyors that would handle material during sorting and stacking operations. Because offloaded sand and gravel would have been graded during dredging, minimal processing would occur. The primary activity would be stacking and then loading material onto trucks for distribution.

Onsite facilities are expected to include:

- Delignifier/washer;
- Classifier;
- Stockpile storage area – 100,000 tons;
- Conveyors/stackers;
- Truck scale;
- Portable scale house/office;
- Generator;
- Rubber-tired front-end loader for truck loading; and
- Graveled roadways.

Figure B-4 Rau Washington Sand Plant Site

Source: GoogleEarth.

Potential Site Development Permitting Requirements: Federal, state, and local permits, approvals, and consultations that may be required for development of the Washington facility include:

- City of Washington zoning conformance permit (the site is zoned M-2 Industrial);
- MoDOT – highway access;
- MDNR – air permit, water quality (wastewater discharge) permit;
- USACE– Section 10 of the RHA – permit for construction of facilities below the high water mark; and
- Section 404 of the CWA – permit for dredge and fill in the river or fill of wetlands.

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Appendix C
Noise Ordinances

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Abbreviations & Acronyms

dB	decibel
dBA	A-weighted decibel
Hz	hertz
L_{eq}	equivalent A-weighted sound level

A P P E N D I X C

Noise Ordinances

C.1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) has received permit applications from eight companies to dredge sand and gravel from selected locations between river mile (RM) 0.0 and RM 447.7 on the lower Missouri River (LOMR) for commercial uses. As part of its review of the permit applications, the USACE has prepared an environmental impact statement (EIS). The EIS examines the potential environmental impacts of the proposed dredging activities and any related actions.

As part of the environmental analysis, the effects of the Proposed Action and alternatives on environmental noise were examined. Local jurisdictions adjacent to the LOMR have promulgated standards for noise emissions from industrial activities such as dredging.

This appendix describes noise ordinances that have been considered in the evaluation of noise emissions. It is included in the EIS in support of Section 3.13 in Chapter 3 Affected Environment that describes existing noise conditions and the analysis of noise impacts found in Chapter 4 Environmental Consequences (Section 4.11).

C.2 MISSOURI COUNTIES

In Missouri, Buchanan and Platte Counties have Zoning Orders that reference noise, and St. Louis County has a noise ordinance. Andrew, Atchison, Boone, Callaway, Carroll, Chariton, Clay, Cole, Cooper, Franklin, Gasconade, Hold, Howard, Jackson, Lafayette, Moniteau, Montgomery, Osage, Ray, St. Charles, Saline, and Warrant Counties do not have noise ordinances or regulations.

C.2.1 Buchanan County Zoning Order

Buchanan County does not have a noise ordinance, but the Buchanan County Zoning Order does have noise performance standards for various land uses, as follows:

Business districts: No land use shall emit or provide vibration, concussion, or noise that is detectable from the outside of the building.

Industrial districts: No land use shall be permitted or operated that produces a noise level greater than that level produced by the average traffic of the area discernible at the property and road boundary.

The Buchanan County Zoning Commission may approve a conditional use permit provided the property owner establishes that the requirements listed below have been met or shall be met (Buchanan County n.d.):

- Conformity to plans and drawings submitted with the application;
- Special yards, open spaces, buffer strips, walls, fences, hedges, and landscaping;
- Performance standards relative to emission of noise, vibration, or other potentially dangerous or objectionable elements;
- Limits on time of day for conducting specified activities;
- A period in which the use shall be exercised or the approval shall lapse; and
- Guarantees as to compliance with the terms of approval.

C.2.2 Platte County Zoning Order

Performance standards for all land uses in Platte County are the following:

> No land or building in any district shall be used or occupied in any manner so as to create any dangerous, injurious, noxious or otherwise objectionable fire, explosive or other hazards, including possible potential hazards; noise or vibration; smoke, dust, odor or other form of air pollution; heat, cold, dampness, electrical or other substance, condition or element (referred to herein as "dangerous or objectionable elements") in such a manner or in such amount as to adversely affect the surrounding area or adjoining premises.

In addition, the following performance standards apply to Planned Industrial Districts:

> a. Sound levels shall be measured with a sound level meter and associated octave band filter manufactured according to standards prescribed by the United States Standards Institute. Impulsive type noises shall be subject to the performance standards hereinafter prescribed provided that such noise shall be capable of being accurately measured with such equipment. Noises capable of being so measured, for the purpose of this Order, shall be those noises which cause rapid fluctuations of the needle of the sound level meter with a variation of no more than plus

or minus two (2) decibels. Noises capable of being so measured shall be so muffled or otherwise controlled, as not to become objectionable, due to intermittence, beat frequency, impulsive character (such as hammering), periodic character (humming and screeching,) or shrillness. Sirens, whistles, and bells, which are maintained and utilized solely to serve a public purpose (such as fire, ambulance, Police and air raid warning sirens) shall be excluded from the above regulations.

Table C-1 Platte County Noise Levels

Octave Band (Preferred Center Frequency)	Sound Level in Decibels (RE .0002 Microbar)	
	8:01 a.m. to 9:59 p.m.	10:00 p.m. to 8:00 a.m.
31.5	79	73
63	74	68
125	68	62
250	60	54
500	55	49
1000	50	44
2000	46	40
4000	41	35
8000	36	32

Source: Platte County n.d.

b. No industrial activity shall be responsible for the transmission of noise across any residential or business zoning district boundary line in excess of the levels established above [Table C-1].

The octave band sound levels in Table C-1 correspond to 54 dBA during the daytime hours and 59 dBA during nighttime hours.

C.2.3 St. Louis County Noise Ordinance

Noise within St. Louis County is regulated under the County Code Chapter 625 Noise Control Code. The county noise ordinance sets forth numerical limits for allowable noise levels. Table C-2 lists allowable noise levels for residential land uses, Table C-3 identifies allowable noise levels for commercial land uses, Table C-4 specifies allowable noise levels for industrial land uses, and Table C-5 delineates allowable noise levels for heavy industrial land uses.

Table C-2 St. Louis County Noise Levels – Residential Land Use Category

Tn[a]	(dBA)[b]
Daytime Hours	
60	55 or less
30	56–58
15	59–61
8	62–64
4	65–67
2	68–70
0	71 or greater
Nighttime Hours	
60	50 or less
30	51–53
15	54–56
8	57–59
4	60–62
2	63–65
0	66 or greater

Note: dBA = A-weighted decibel.

[a] Total duration of time noise to be emitted from noise source during period of measurement (minutes).

[b] A-weighted sound pressure level.

Table C-3 St. Louis County Noise Levels – Commercial Land Use Category

Tn[a]	(dBA)[b]
Daytime Hours	
60	65 or less
30	66–68
15	69–71
8	72–74
4	75–77
2	78–80
0	81 or greater
Nighttime Hours	
60	60 or less
30	61–63
15	64–66
8	67–69
4	70–72
2	73–75
0	76 or greater

Note: dBA = A-weighted decibel.

[a] Total duration of time noise to be emitted from noise source during period of measurement (minutes).

[b] A-weighted sound pressure level.

Table C-4 St. Louis County Noise Levels –Industrial Land Use Category

Tn[a]	(dBA)[b]
60	70 or less
30	71–73
15	74–76
8	77–79
4	80–82
2	83–85
0	86 or greater

Note: dBA = A-weighted decibel.

[a] Total duration of time noise to be emitted from noise source during period of measurement (minutes).

[b] A-weighted sound pressure level.

Table C-5 St. Louis County Noise Levels – Heavy Industrial Land Use Category

Tn[a]	(dBA)[b]
60	80 or less
30	81–83
15	84–86
8	87–89
4	90–92
2	93–95
0	96 or greater

Note: dBA = A-weighted decibel.

[a] Total duration of time noise to be emitted from noise source during period of measurement (minutes).

[b] A-weighted sound pressure level.

C.3 KANSAS COUNTIES

In Kansas, Atchison, Doniphan, and Leavenworth Counties do not have noise ordinances or regulations.

C.4 MISSOURI CITIES

Kansas City, Boonville, Jefferson City, St. Charles, Maryland Heights, Florissant, and St. Louis have noise ordinances. Missouri City, St. Joseph, Sibley, Napoleon, Wellington, Lexington, Waverly, Miami, Glasgow, Arrow Rock, Rocheport, Huntsdale, Lupus, Chamois, Gasconade, Hermann, New Haven, and Washington do not have noise ordinances or regulations.

C.4.1.1 Kansas City Noise Ordinance

Noise within Kansas City is regulated under the City Code Chapter 46 Noise Control. The City noise ordinance sets forth numerical limits for allowable noise levels.

According to the Kansas City Noise Ordinance, no person shall operate or cause to be operated on private property any source of sound in such a manner as to create a sound level that exceeds the equivalent A-weighted sound level (L_{eq}) limits set forth in Table C-6 when measured at or within the property boundary of the receiving residential district. A measurement period shall not be less than 2 minutes.

Table C-6 Maximum Permissible Sound Levels in Kansas City by Receiving Residential Districts

Receiving Land Use Category	Time	Equivalent A-Weighted Sound Level Limit (L_{eq})
Any residential district	7:00 a.m. – 10:00 p.m. 10:00 p.m. – 7:00 a.m.	60 dBA 55 dBA

Notes:

dBA = A-weighted decibel.
L_{eq} = Equivalent sound level.

Source: Kansas City 2009.

In addition, no person shall operate or cause to be operated on private property within a commercial/light industrial district any source of sound in such a manner as to create a sound level that exceeds the L_{eq} limits set forth in Table C-7 when measured at a distance of 25 feet from the structure

wherein the source of sound is located, or at the real property boundary of the property whereon the sound is generated, whichever is greatest. A measurement period shall not be less than 10 minutes (Kansas City 2009).

Table C-7 Maximum Permissible Sound Levels in Kansas City by Receiving Commercial/Light Industrial Districts

Receiving Land Use Category	Time	Equivalent A-Weighted Sound Level Limit (L_{eq})
Any commercial/industrial district	80 dBA	Any commercial/industrial district

Notes:

dBA = A-weighted decibel.
L_{eq} = Equivalent sound level.

Source: Kansas City 2009.

C.4.1.2 Boonville Noise Ordinance

According to the Boonville Noise Ordinance, any uses permitted in Districts C-1, C-2, C-P, and M-1, and all City zoning districts except residential and agricultural, shall be subject to such controls as may be imposed by the City Council if such uses are or become noxious or offensive by reason of vibration, noise, odor, dust, smoke, gas, glare or heat, perceptible at the property lines, if such uses generate an amount of traffic so as to cause traffic congestion in the streets, or if covered by Subsection 2.95(b)(3)a., b., or c. With the exception of District M-1, inoperative vehicles may not be stored or repaired, other than in closed garages on the premises.

C.4.1.3 Jefferson City Code

The Jefferson City Code, Chapter 21 Nuisances states:

> …It shall be unlawful for any person to make, continue, or cause to be made or continued any excessive, unnecessary, raucous, or unusually loud noise which terms shall mean any sound which, because of its volume level, duration and character, annoys, disturbs, injures or endangers the comfort, health, peace or safety of reasonable persons of ordinary sensibilities within the limits of the city. The term includes the kinds of noise generated by the activities enumerated in Section 3 of the code. The terms shall be limited to noise heard upon the public streets, in any public park, in any school or public building or upon the grounds thereof while in use, in any church or hospital or upon the grounds thereof while in use, upon any parking lot open to members of the public as invitees or licensees, or in any occupied residential unit which is not the source of the noise or upon the grounds thereof, and in any event from a location not less than 50 feet from

the source of the noise, measured in a straight line from the radio, loudspeaker, motor, horn or other noise source.

C.4.1.4 St. Charles Noise Ordinance

Noise within the city of St. Charles is regulated under the Noise Ordinance, Chapter 97 Noise Control. The city noise ordinance sets forth numerical limits for allowable noise levels.

As stated in the St. Charles Noise Ordinance, in I-1 Light Industrial zoning districts, at no point on the boundary of a residence, business, or commercial district shall the sound pressure level of any individual operation or plant, or the combined operations of any person, firm or corporation, exceed the decibel levels in the designated octave bands shown in Table C-8 for the zoning districts indicated—as measured using test equipment per ANSI Standards S1.1 1960, S1.4 1961, S1.11 1966, and S1.12 1967, and SAE J 184, and with reference to sections 10-141 and 20-142.

Table C-8 Maximum Sound Pressure Levels for Light Industrial Districts in St. Charles

Octave Band Center(dB) along District Boundaries		
Frequency (Hz)	Residence	Business-Commercial
31.5	72	79
63	71	78
125	65	72
250	57	64
500	51	58
1000	45	52
2000	39	46
4000	34	41
8000	32	39

Notes:

dB = Decibel.
Hz = Hertz.

In M-2 Heavy Industrial zoning districts, at no point either on the boundary of a residence, business or commercial district, or at 125 feet from the nearest property line of a plant or operation, whichever distance is greater, shall the sound pressure level of any individual operation or plant, or the combined operations of any person, firm or corporation, exceed the decibel levels in the designated octave bands shown in Table C-9 for the zoning districts included—as measured using test equipment per ANSI

Standards S1.1 1960, S1.4 1961, S1.11 1966, and S1.12 1967, and SAE J 184, and with reference to Sections 97.06 and 97.07.

Table C-9 Maximum Sound Pressure Levels for Heavy Industrial Districts in St. Charles

Octave Band Center(dB) along District Boundaries		
Frequency (Hz)	Residence	Business-Commercial
31.5	75	80
63	74	79
125	69	74
250	64	69
500	58	63
1000	52	57
2000	47	52
4000	43	48
8000	40	45

Notes:

dB = Decibel.
Hz = Hertz.

C.4.1.5 Maryland Heights Noise Ordinance

The Maryland Heights Noise Ordinance states that every use shall be so operated that the pressure level of sound or noise generated does not exceed the limitations of the county revised ordinances governing noise control. (See Tables C-2 through C-5 for the St. Louis County revised ordinances.)

C.4.1.6 Hazelwood Noise Ordinance

Article XV of the Hazelwood City Code presents environmental performance standards. It states that noise that is objectionable due to volume, frequency, or heat shall be muffled or otherwise controlled so that there is no production of sound discernible at lot lines in excess of the average intensity of street and traffic noise at the lot lines. Every use shall be so operated that the pressure level of sound or noise generated does not exceed the limitations of the Noise Control Code, Chapter 625, St. Louis County Revised Ordinance. Emergency warning sirens and related apparatus used solely for public purposes shall be exempt from this requirement. (Ord. No. 3674 §§1–3, 8-17-05) (See Tables C-2 through C-5 for the St. Louis County revised ordinances.)

C.4.1.7 St Louis Noise Ordinance

Noise within the city of St. Louis is regulated under the Noise Ordinance, Chapter 97 Noise Control. The City noise ordinance sets forth numerical limits for allowable noise levels, which are the same as those presented above in Tables C-8 and C-9 of the St. Charles Noise Ordinance.

C.5 KANSAS CITIES

The cities of Elwood and Leavenworth have noise ordinances. The cities of White Cloud, Atchison, and Kansas City do not have noise ordinances or regulations.

C.5.1.1 Elwood Noise Ordinance

The city of Elwood's noise ordinance states that noises such as stereos and loud music should not be heard from 75 feet away. The ordinance does not limit noise from construction or heavy equipment.

C.5.1.2 Leavenworth Noise Ordinance

Noise within the city of Leavenworth is regulated under the Noise Ordinance, in Sections 46-76 through 46-88. Section 46-83 (Pile drivers and hammers) states that operation between the hours of 10:00 p.m. and 7:00 a.m. of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist, or other appliance, the use of which is attended by loud or unusual noise, shall be deemed a violation of this article.

C.6 REFERENCES

Buchanan County. No Date. Zoning Order, as amended. Website (http://vivid.phpwebhosting.com/~buchcomo/offices/planning_zoning/zoning.pdf) accessed on December 16, 2009.

Kansas City. 2009. Code of Ordinances, City of Kansas City, Codified through Ordinance No. 091074, enacted Dec. 17, 2009. (Supp. No. 76.) Website (http://library3.municode.com/default-test/home.htm?infobase=10156&doc_action=whatsnew) accessed on December 17, 2009.

Platte County. No Date. Chapter 400: Zoning Regulations. Website (http://www.co.platte.mo.us/docs/planning_zoning/zoning_order.pdf) accessed on December 16, 2009.

UNITED STATES ARMY CORPS OF ENGINEERS

Missouri River Commercial Dredging
Final EIS

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Appendix D
Air Quality and Climate Change Technical Information

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List of Acronyms

Capital Sand	Capital Sand Company, Inc.
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2s}	carbon dioxide equivalent
Con-Agg	Con-Agg of MO, L.L.C
EIS	environmental impact statement
g	gram(s)
GHG	greenhouse gas
Hermann Sand	Hermann Sand & Gravel, Inc.
Holliday Sand	Holliday Sand & Gravel Company, L.L.C.
HP	horsepower
J.T.R.	Jotori, Inc.
kW	kilowatt(s)
l/CD	cylinder displacement
Limited Leasing	Limited Leasing Company
LOMR	lower Missouri River
Master's	The Master's Dredging Company, Inc.
MDNR	Missouri Department of Natural Resources
N_20	nitrous oxide

NO_x	oxides of nitroxen
PM	particulate matter
Rau	Edward N. Rau Contractor Company
RIA	U.S. Environmental Protection Agency Regulatory Impact Analysis
RM	river mile
ROG	reactive organic gas
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

A P P E N D I X D

Air Quality and Climate Change Technical Information

D.1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) has received permit applications from eight companies to dredge sand and gravel from selected locations between river mile (RM) 0.0 and RM 447.7 on the lower Missouri River (LOMR) for commercial uses. As part of its review of the permit applications, the USACE has prepared an environmental impact statement (EIS). The EIS examines the potential environmental impacts of the proposed dredging activities and any related actions.

As part of the environmental analysis, the potential effects of the Proposed Action and alternatives on air quality and climate change were examined. This appendix provides technical information in support of Section 3.16 in the Affected Environment chapter of the EIS, which describes existing air quality conditions, and Section 4.14, the analysis of air quality impacts and effects on climate change in the Environmental Consequences chapter of the EIS.

This technical appendix describes the methodology used to estimate criteria pollutant and greenhouse gas (GHG) emissions generated under the Proposed Action and alternatives, based on information received from the permit applicants. In addition, emissions factors and methodologies were obtained from the following previous studies: *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories* (ICF International 2009), the *Puget Sound Maritime Air Emissions Inventory* (Starcrest Consulting 2007), and the *2007 Good Movement Air Emissions Inventory at the Port of Houston* (Starcrest Consulting 2009).

As discussed in Section 4.14 in the EIS, the following three activities were considered:

- Dredging (removal of sand and gravel from the river bed and the transport of that material onshore),

- Onshore materials handling (use of earth-moving equipment to transport and process the dredged material) and sand plants, and
- Transportation of sand and gravel to local market areas.

This appendix describes the data and methods used to estimate emissions from these three activities and the procedures for estimating emissions from construction of new facilities. It also discusses why potential emissions generated by facility operations (e.g., fugitive dust from processed materials and air pollutants from the upkeep of offices and employee commute trips) were not quantified and were excluded from the impact analysis.

The following companies were assumed to operate under existing conditions: Capital Sand Company, Inc. (Capital Sand), Con-Agg of MO, L.L.C (Con-Agg), Hermann Sand & Gravel, Inc. (Hermann Sand), Holliday Sand & Gravel Company, L.L.C. (Holliday Sand), Jotori, Inc. (J.T.R.), and Limited Leasing Company (Limited Leasing). These companies, as well as two new applicants (The Master's Dredging Company, Inc. [Master's] and Edward N. Rau Contractor Company [Rau]), were assumed to operate under the Proposed Action and alternatives.

D.2 DREDGING

Primary emissions resulting from dredges and tug boats include reactive organic gases/volatile organic compounds (ROG/VOC), carbon monoxide (CO), oxides of nitrogen ($NO_{X)}$, particulate matter (PM), and GHGs emitted as engine exhaust. Information on engine horsepower, load factor, and hours of operation were provided by the majority of permit applicants. When companies did not supply complete information, assumptions were made using the most conservative scenarios so that potential emissions would not be underestimated. Tables D-1 and D-2 summarize the equipment used in the emissions modeling. The tables indicate where assumptions were made and how they were developed. Note that the operating information (e.g., hours of operation) presented below represents existing conditions unless otherwise noted.

Emission factors summarized in previous studies were used to quantify emissions from the dredge and tug boat engines identified in Tables D-1 through D-3 (ICF International 2009, Starcrest Consulting 2009). The use of a specific emissions factor is dependent upon engine power, model, year, and cylinder displacement (l/Cd). The U.S. Environmental Protection Agency (USEPA) has identified three categories of marine engines (Starcrest 2007):

- Category 1: 1–5 liters per l/Cd;

- Category 2: 5–30 liters per l/Cd; and
- Category 3: over 30 liters per l/Cd.

Marine engine standards are also broken down by engine year, where Tier 0 standards apply to engines 1999 and older, Tier 1 standards apply to engines constructed from 2000 to 2003, and Tier 2 standards apply to engines constructed from 2004 and 2007 (ICF International 2009). New Tier 3 and 4 standards will be required for engines constructed from 2009 to 2013 and after 2014, respectively (USEPA 2008). The emissions factors used in this analysis are organized by engine category and tier, as presented in Table D-4.

Table D-1 Dredge Equipment Assumptions for Existing Companies

Company	Dredge Name	Engine(s)	Engine HP	Engine Year	Load Factor (%)	Hours of Operation[a]
Capital Sand[b]	*Kathy Lee*	Caterpillar 3512[c]	1,150	1996	80	1,920
	Sandy K	Caterpillar C18	450	1987	60	
		Caterpillar 3412	450	1987	80	
	Rae Marie	Caterpillar 3412	450	2004	50	
		Caterpillar 3412	600	2004	65	
		Caterpillar 3406	450	2004	65	
Hermann Sand[d]	*Arl-501*	Cummins	335	2004	50	2,165
Holliday Sand	*Randolph*	EMD 16-645-E6[c]	1,200	2008	30	2,880
	Riverside	EMD 12-645E2	950	2004	38	2,720
	St. Joseph	John Deere 6125AFM	392	2006	30	1,520
J.T.R.	*Queenfish*	Cummins 1710	425	1986	100	974
	Mark V	Caterpillar 3408	455	1986	100	
	JTR	Caterpillar 3408	455	2002	100	
Limited Leasing	*St Charles*	Caterpillar 3406	365	1993	80[e]	2,165
	Traveler	Caterpillar 3406	365	1968	80[e]	
	Chesterfield	Caterpillar 3406	365	1971	80[e]	

Note: HP = Horsepower.

[a] Hours of operation were assumed to represent existing conditions. If permit applicants provided a range of operational hours, engine activity was based on the maximum number of operational hours to ensure that emissions were not underestimated.

[b] Capital Sand is contracted by Con-Agg to perform dredging operations. Capital Sand's fleet therefore was assumed to dredge the amounts requested by Con-Agg under the Proposed Action and alternatives.

[c] Engine horsepower greater than 1,000; Category 2 emissions factors were assumed (refer to Table D-3).

[d] Hermann Sand would be contracted by Rau to perform dredging operations. Hermann Sand's fleet therefore was assumed to dredge the amounts requested by Rau under the Proposed Action and alternatives.

[e] No information was provided. Default load factor was assumed (Starcrest 2009).

Source: Based on interviews with the companies conducted by the USACE for permitting purposes.

Table D-2 Dredge Equipment Assumptions for New Applicants

Company	Dredge Name	Engine(s)	Engine HP	Engine Year	Load Factor (%)	Hours of Operation[a]
Master's	Penny	Caterpillar D 398 TA	825	1990	50	4,209[b]
	Oklahoma	Caterpillar 3516 TA[c]	2,450	2005	50	4,676[b]
Rau[d]	--	--	--	--	--	--

Note: HP = Horsepower.

[a] Master's does not operate under existing conditions. Hours of operation therefore were assumed to represent conditions under the Proposed Action. Refer to Section D.2-1 for a discussion of operating conditions under the Proposed Action and alternatives.

[b] Master's does not operate under existing conditions. Hours of operation therefore were assumed to represent conditions under the Proposed Action. Refer to Section D.2-1 for a discussion of operating conditions under the alternatives.

[c] Engine horsepower greater than 1,000; Category 2 emissions factors were assumed.

[d] Rau does not operate dredging equipment.

Source: Based on interviews with the companies conducted by the USACE for permitting purposes.

Information on the distribution of Category 1 and 2 engines was not provided by the permit applicants. The Puget Sound Air Emissions Inventory indicates that 90 percent of all harbor craft engines are Category 1, and 10 percent are Category 2 (Starcrest 2007). Similarly, the 2007 Goods Movement Inventory conducted for the Port of Houston indicates that 89 percent of all engines are Category 1, and 9 percent are Category 2 (Starcrest 2009). Finally, the USEPA 2008 Regulatory Impact Analysis (RIA), which surveyed a higher number of inland tugs, found that 25 percent of vessels are Category 2 (ICF International 2009). Based on the equipment summarized in these documents and expected under the Proposed Action and alternatives, engines exceeding 1,000 horsepower (HP) were identified as Category 2. Under this assumption, 16 percent of the dredge engines and 22 percent of the tug engines were modeled using Category 2 emissions factors.

Table D-3 Tug Boat Equipment Assumptions

					Activity								
					Upstream Empty		Upstream Full		Downstream Empty		Downstream Full		
Company	Tug Name	Engine(s)	Engine HP	Engine Year	Load Factor (%)	Hours per Year[b]	Load Factor (%)	Hours per Year[b]	Load Factor (%)	Hours per Year[b]	Load Factor(%)	Hours per Year[b]	Trips per Day
Capital Sand[c]	*Marge 1*	(2) Caterpillar 3412	600	2004/2006	55	373[d]	60	496[d]	40	216[d]	60	280[d]	7
	Allison Marie	(3) Caterpillar 3412	600	2001/2002	50	373[d]	60	435[d]	40	216[d]	60	250[d]	
	Tarkio	(2) Caterpillar 3412	600	2006/2007	55	373[d]	60	559[d]	40	216[d]	60	280[d]	
Hermann Sand[e]	*Kathryn*	(2) Cummins N-14	880	2005	50	540	31[f]	573[g]	31[f]	264[g]	25	270	5
	Mel Sue	(2) NH 220 Cummins	400	1954	50	540	31[f]	573[g]	31[ef]	264[g]	25	270	
Holliday Sand	*Chouteau*	(2) Caterpillar C12	680	2006	55	581	70	756	20	423	35	454	14[j]
	Sibley	(2) Caterpillar 3406E	950	2006	55	581	70	756	20	423	35	454	
	Dakota	(2) Caterpillar 3412C[h]	1,040	N/A[i]	60	581	75	756	25	423	40	454	
	Fairfax	(2) Caterpillar 3412C[h]	1,300	2004	60	581	75	756	25	423	40	454	
	Edward Perry	(2) Caterpillar 3406	730	2009	83	816	100	907	45	454	63	242	
J.T.R.	*Barbara Sue*	(2) GM 8V-71	470	2000	100	367	100	918	80	154	50	261	5
	Shelby J	(2) 12V-71	680	2005		305		459	75	140	75	165	
	William Powell	(2) Cummins KTA19[h]	1,200	2001		206		367	75	121	50	140	

Table D-3 Tug Boat Equipment Assumptions

					Activity								
					Upstream Empty		Upstream Full		Downstream Empty		Downstream Full		
Company	Tug Name	Engine(s)	Engine HP	Engine Year	Load Factor (%)	Hours per Year[b]	Load Factor (%)	Hours per Year[b]	Load Factor (%)	Hours per Year[b]	Load Factor(%)	Hours per Year[b]	Trips per Day
Limited Leasing	*Atlas*	(3) Luggar L6140[g]	1,500	1962	31[f]	275	31[f]	367	31[f]	184	31[f]	275	10[k]
	Janet	(2) Detroit 8V71	460	1979		367		551		275		367	
	Joanne	(2) Detroit 8V71	460	1982		367		551		275		367	
	Leona	(2) Detroit 12V71	660	1956		275		367		184		275	
	Patricia	(2) Detroit 12V71	660	1959		275		367		184		275	
	Piasa	(2) Detroit 12V71	660	1959		275		367		184		275	

Note: HP = Horsepower.

[a] Master's does not use tugs to transport dredged materials to shore.

[b] Hours were assumed to represent existing conditions and were calculated according to the following formula: (hours per day) X (days per year) X (number of trips per tug) where the hours per day were provided by the permit applicants, days per year were assumed to be 216 (unless otherwise noted), and number of trips per tug were assumed to equal the number of trips per day divided by the number of tugs. The annual number of operating days (216) is based on dredging occurring 5 days per week from March to December (see Chapter 2).

[c] Capital Sand's fleet was assumed to dredge amounts requested by Con-Agg.

[d] Number of operational days per year was assumed to be 160 per information supplied by Capital Sand.

[e] Hermann Sand's fleet was assumed to dredge amounts requested by Rau under the Proposed Action and alternatives.

[f] Default load factor (Starcrest 2009).

[g] Information was not supplied by the permit applicant. Hours represent an average of the information provided by all applicants listed in the table.

[h] Engine horsepower greater than 1,000; Category 2 emissions factors were assumed (see Table D-3).

[i] Not available; no information received.

[j] Based on seven barges being unloaded per shift, with two shifts per day.

[k] Based on 10 barges being unloaded per day, assuming that one barge requires one tug trip.

Source: Based on interviews with the companies conducted by the USACE for permitting purposes.

Table D-4 Emissions Factors for Dredge and Tug Boat Engines (grams/kilowatt-hour [g/kW-hr])

Engine Power (kW)	VOC	NO_X	CO	PM	SO_2[a]	CO_2	N_2O	CH_4
Tier 0 Engines								
37	0.27	11	2	0.9	0.21	690	0.02	0.09
75	0.27	10	1.7	0.4	0.21	690	0.02	0.09
130	0.27	10	1.5	0.4	0.21	690	0.02	0.09
225	0.27	10	1.5	0.3	0.21	690	0.02	0.09
450	0.27	10	1.5	0.3	0.21	690	0.02	0.09
560	0.27	10	1.5	0.3	0.21	690	0.02	0.09
1,000	0.27	13	2.5	0.3	0.21	690	0.02	0.09
Category 2	0.5	13.2	1.1	0.72	0.21	690	0.02	0.09
Tier 1 Engines								
37	0.27	9.8	2	0.9	0.21	690	0.02	0.09
75	0.27	9.8	1.7	0.4	0.21	690	0.02	0.09
130	0.27	9.8	1.5	0.4	0.21	690	0.02	0.09
225	0.27	9.8	1.5	0.3	0.21	690	0.02	0.09
450	0.27	9.8	1.5	0.3	0.21	690	0.02	0.09
560	0.27	9.8	1.5	0.3	0.21	690	0.02	0.09
1,000	0.27	9.8	2.5	0.3	0.21	690	0.02	0.09
Category 2	0.5	9.8	1.1	0.72	0.21	690	0.02	0.09
Tier 2 Engines								
37	0.27	6.8	5	0.4	0.21	690	0.02	0.09
75	0.27	6.8	5	0.3	0.21	690	0.02	0.09
130	0.27	6.8	5	0.3	0.21	690	0.02	0.09
225	0.27	6.8	5	0.3	0.21	690	0.02	0.09
450	0.27	6.8	5	0.3	0.21	690	0.02	0.09
560	0.27	6.8	5	0.3	0.21	690	0.02	0.09
1,000	0.27	6.8	5	0.3	0.21	690	0.02	0.09
Category 2	0.5	9.8	5	0.72	0.21	690	0.02	0.09

Notes:

CH4 = Methane.
N_2O = Nitrous oxide.
VOC = Volatile organic compounds.
CO = Carbon monoxide.
NO_X = Oxides of nitrogen.
CO_2 = Carbon dioxide.
PM = Particulate matter.
kW = Kilowatt.
SO_2 = Sulfur dioxide.

[a] Based on U.S. Environmental Protection Agency emission standard of 500 parts per million sulfur content of marine diesel fuel. Calculated using the following equation: (500 grams S/1,000,000 grams fuel) X (210 grams fuel/kW-hour) X (2 grams SO_2/grams S).

Sources: ICF International 2009, Clean Air Task Force n.d.

The following equation was used to calculate emissions from each of the engines identified in Tables D-1 through D-3 (ICF International 2009, Starcrest 2009). Because the emissions factors summarized in Table D-4 are in grams/kilowatt-hour (g/kW-hour), the engine HP ratings provided by the permit applicants were converted to kilowatts, assuming that one HP is equal to 0.746 kilowatt. It was assumed that all engines would use off-road diesel fuel.

$$E = (kW) \times (Activity) \times (EF) \times (LF) \times (\# ENG)$$

Where:

E	=	Emissions, grams per year
kW	=	Kilowatts (one HP is equal to 0.746 kilowatt)
Activity	=	Activity, hours per year
EF	=	Engine emissions factor (see Tables D-1 through D-3)
LF	=	Engine load factor
# ENG	=	Number of vessel engines (see Tables D-1 through D-3)

The calculated emissions (in grams per year) were converted to tons per year by dividing emissions by the conversion factor, which is 907,184 grams/ton. Emissions for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) were converted to metric tons, assuming that 1 ton is equal to 0.907 metric ton.

D.2.1 Dredging Scaling Factors

Emissions from dredging activities are highly dependent on the number, type, and age of the dredging equipment, as well as the intensity (e.g., the hours of activity and distance of tug trips) of the dredging operation. Because this information is not available for each alternative, the rate at which emissions are affected by changing dredging amounts is currently unknown. For the purposes of this analysis, emissions generated by dredging activities were assumed to be proportional to permitted sand and gravel amounts, on a ton-for-ton basis. In other words, a 50-percent increase in dredging amounts, relative to existing conditions, was assumed to correspond to a 50-percent increase in dredging emissions.

The following sections describe the methodology used to estimate dredging emissions under the Proposed Action and alternatives. The reader is directed to Tables D-1 through D-3 for information on the dredger and tug boat equipment assumed in the analysis. Note that this information is presented by company, rather than by river segment. Consequently, emissions were calculated for each

company and then apportioned by river segment for use in the impact analysis. Figure D-1 illustrates the steps taken to estimate dredging emissions.

D.2.1.1 Emissions Calculations for Existing Companies

Existing emissions generated by Capital Sand, Con-Agg, Hermann Sand, Holliday Sand, J.T.R., and Limited Leasing were calculated using the information summarized in Section D.2. To determine emissions generated by these companies under the Proposed Action and alternatives, existing emissions were multiplied by the percent change in sand and gravel amounts between existing conditions and the alternative in question (see Table D-5). For example, under the Proposed Action, permitted tonnage would increase by 74 percent in the Jefferson City segment. Existing dredging emissions generated by companies operating in the Jefferson City segment were multiplied by 1.74 to obtain dredging emissions for the Proposed Action.

D.2.1.2 Emissions Calculations for Master's and Rau

Master's and Rau are the only companies not part of existing conditions that would be permitted under the Proposed Action and alternatives. The methodology used for Table D-5 was not used to estimate emissions for these companies because it is based on existing dredging amounts by river segment. Separate scaling factors therefore were used to estimate emissions generated by the two proposed companies.

The emissions calculated for Master's and Rau using the information listed in Tables D-1 through D-3 were assumed to represent conditions under the Proposed Action because these companies do not operate under existing conditions. The estimated dredging emissions calculated for Master's and Rau were used as a basis for estimating dredging emissions under Alternatives A, B, and C. More specifically, calculated emissions under the Proposed Action were scaled by the percent change in dredging amounts between the Proposed Action and each of the alternatives in order to determine emissions associated with these companies for each alternative (see Tables D-5 and D-6). As for existing companies, this approach assumes that emissions generated by dredging activities would be proportional to permitted sand and gravel amounts.

Table D-5 Scaling Factors for Emissions Generated by Existing Companies

		Proposed Action		No Action Alternative		Alternative A		Alternative B		Alternative C	
Segment	Existing Dredging[a]	Dredging [b]	% Change	Dredging [b]	% Change	Dredging [b]	% Change	Dredging [b]	% Change	Dredging [b]	% Change
St. Joseph	326,928	1,150,000	251.76	0	-100.00	350,000	7.06	860,000	163.05	330,000	0.94
Kansas City	2,658,831	4,060,000	52.70	0	-100.00	540,000	-79.96	1,230,000	-53.74	2,660,000	0.04
Waverly	677,987	1,005,600	48.32	0	-100.00	500,000	-26.25	1,140,000	68.14	680,000	0.30
Jefferson City	1,578,858	2,750,000	74.18	0	-100.00	430,000	-72.77	980,000	-37.93	1,580,000	0.07
St. Charles	1,649,326	4,384,400	165.81	0	-100.00	370,000	-77.57	840,000	-49.07	1,650,000	0.04
Total[b]	6,891,930	13,350,000	93.70	0	-100.00	2,190,000	-68.22	5,050,000	-26.73	6,900,000	0.12

[a] Represents average annual dredging for the last 5 years (2004–2008). See Table 2.4-1 in the main volume.

[b] Values represent sand and gravel amounts requested by the existing companies under the Proposed Action and alternatives. In other words, amounts requested by Masters and Rau, the two new dredgers (see Table 2.2-1 in Chapter 2), have been removed from the segment totals.

Table D-6 Scaling Factors for Emissions Generated by New Companies

		No Action Alternative		Alternative A		Alternative B		Alternative C	
Company/Segment	Proposed Dredging Amount	Dredging Amount	% Change	Dredging Amount	% Change	Dredging Amount	% Change	Dredging Amount	% Change
Master's/Kansas City	1,000,000	0.00	-100.00	133,005	-86.70	302,956	-69.70	731,527	-26.85
Rau/St. Charles	100,000	0.00	-100.00	8,439	-91.56	19,159	-80.84	37,633	-62.37

D.2.1.3 Dredging Percentages by River Segment

Three companies—Capital Sand, Hermann Sand, and Holliday Sand—would operate in more than one segment (see Table 2.2-1 in the EIS). Emissions generated by these four applicants were apportioned by segment using the breakdown of annual dredging amounts by river segment summarized in Table 2.2-5 in the EIS because emissions were calculated for a company's entire fleet and information on the operational location of individual dredges and tugs is not available. Emissions calculated for these companies were multiplied by the percentage of each company's total requested permit amounts expected to occur in each segment. For example, Hermann Sand has requested a permit for 1,000,000 tons per year. One-half of this amount is expected to be dredged in the Jefferson City segment, and the remaining one-half in the St. Charles segment. It was assumed therefore that one-half of the emissions calculated for Hermann Sand would occur in the Jefferson City segment and the remaining one-half would occur in the St. Charles segment.

D.2.1.4 Calculation of Tonnage Ratios

A breakdown of company dredging amounts by river segment under Alternatives A, B, and C is currently not available. Consequently, the ratio of dredged materials between companies in each river segment under the Proposed Action (as presented in Table 2.2-5 in the EIS) was used to determine tonnage estimates by company and river segment for the alternatives. This approach assumes that the breakdown of company dredging amounts will remain constant between the Proposed Action and alternatives. For example, the ratio of dredging amounts between Holliday Sand and Master's in the Kansas City segment is 3,060,000 to 1,000,000 for the Proposed Action (see Table 2.2-5 in the EIS). It therefore was assumed that Holliday Sand would dredge approximately 75 percent of the permitted tonnage in the St. Joseph segment under Alternatives A, B, and C.

D.2.1.5 Total Emissions by Company by River Segment

Once tonnage amounts by company and river segment were estimated for the Proposed Action and alternatives, total dredging emissions by river segment were calculated. This step was completed by multiplying the total emissions estimated for each company under the Proposed Action and alternatives by the percentage of each company's permitted dredging amount expected to occur in the river segments. For example, because 45.46 percent of all activities within the Jefferson City segment under the Proposed Action were associated with Herman Sand, emissions calculated for Hermann Sand under the Proposed Action were multiplied by 45.46 percent (see Table D-7) to determine the company's contribution to emissions in the Jefferson City Segment.

Table D-7 summarizes the dredging amounts under the Proposed Action requested by the companies in their permit applications, as well as the tonnage breakdown calculated for Alternatives A, B, and C (refer to Section D.2.1.4). Segment percentages used in this analysis are also presented.

D.2.1.6 Total Emissions by River Segment

When company emissions had been quantified, scaled, and appropriated among segments, total emissions generated by river segment were calculated for the Proposed Action and the alternatives. This was completed by summing the emissions produced by each company operating in each segment.

Figure D-1 illustrates the steps taken to estimate dredging emissions.

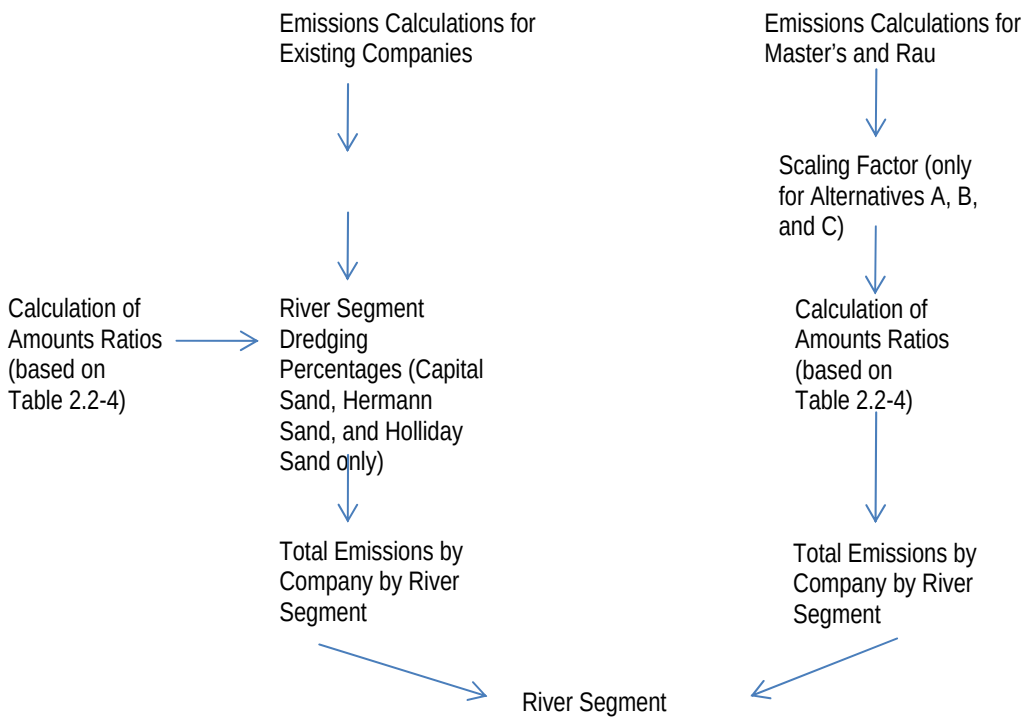

Figure D-1 Dredging Emissions Methodology

Table D-7 Dredging Breakdown by River Segment and Company Contribution Percentages

	Capital Sand[a]		Hermann Sand[b]		Holliday Sand	
Segment	Amount Requested (tons/year)	Percent of Company Total	Amount Requested (tons/year)	Percent of Company Total	Amount Requested (tons/year)	Percent of Company Total
Proposed Action[c]						
St. Joseph	--	--	--	--	1,150,000	25.28
Kansas City	--	--	--	--	3,060,000	67.26
Waverly	665,600	16.85	--	--	340,000	7.47
Jefferson City	2,250,000	56.96	500,000	45.46	--	--
St. Charles	1,034,400	26.19	600,000	54.55	--	--
Alternative A[d]						
St. Joseph	--	--	--	--	350,000	37.80
Kansas City	--	--	--	--	406,995	43.95
Waverly	330,947	42.98	--	--	169,053	18.26
Jefferson City	351,818	45.69	78,182	60.69	--	--
St. Charles	87,293	11.34	50,634	39.31	--	--
Alternative B[d]						
St. Joseph	--	--	--	--	860,000	39.59
Kansas City	--	--	--	--	927,044	42.67
Waverly	754,559	43.01	--	--	385,442	17.74
Jefferson City	801,818	45.70	178,182	60.79	--	--
St. Charles	198,179	11.30	114,953	39.22	-	-
Alternative C[d]						
St. Joseph	--	--	--	--	330,000	11.79
Kansas City	--	--	--	--	2,238,473	79.99
Waverly	450,088	21.11	--	--	229,912	8.22
Jefferson City	1,292,727	60.63	287,273	55.99	--	--
St. Charles	389,280	18.26	225,801	44.01	--	--

[a] Amounts include tonnage requested by Con-Agg.

[b] Amounts include tonnage requested by Rau.

[c] Breakdown is based on Table 2.2-4 in the EIS. Values are based on the ratio of dredging amounts between companies in each segment.

[d] Values for J.T.R., Limited Leasing, and Master's Dredging are not shown as these companies operate in only one segment. Consequently, 100 percent of the emissions calculated for these companies were assumed to occur in their segment of operation.

D.3 MATERIALS HANDLING

The USEPA NONROAD2008 model was used to estimate emissions from materials-handling equipment operating at each of the onshore facilities identified in Figure 2.2-1 in the EIS. NONROAD is

a USEPA-approved emissions model that calculates emission inventories (i.e., tons of pollutants) for user-specified off-road equipment in a given geographic area rather than emissions associated with specific equipment associated with a specific activity. For example, the model generates an emissions inventory for Missouri associated with certain equipment pieces that can be used to calculate equipment-specific emissions factors; the emissions inventory can then be used to generate emissions associated with this Project.

A detailed description of the type and amount of equipment was not provided by the permit applicants. Equipment estimates therefore were based on conversations with the Missouri Department of Natural Resources (MDNR) (Zeaman pers. comm.). For this analysis, one crane (399 HP), one dozer (357 HP), one crusher (300 HP), and four loaders (108 HP) were assumed to operate at each onshore facility.[1,2]

Emissions inventories for these four pieces of equipment were generated using NONROAD based on the following inputs: (1) geographic location: Missouri; (2) year: 2011; and (3) time period: typical weekday. Based on the inventories (i.e., the total emissions for each piece of equipment in Missouri) produced by NONROAD, emissions factors were calculated for each piece of equipment using the following equation.

$$EF = (Tons/Day) \times (1/Activity) \times (1/HP) \times LF$$

Where:

EF	=	Emissions factor, tons per horsepower-hour
Tons/Day	=	NONROAD emissions inventory for each pollutant
Activity	=	NONROAD output for activity (i.e. equipment use)
HP	=	NONROAD default for equipment horsepower
LF	=	Load factor (model default: crane 0.43, loader 0.21, dozer 0.59)

Table D-8 summarizes the calculated emissions factors. The emissions factors summarized in Table D-8 were multiplied by the company hours of operation and maximum horsepower of each piece of equipment in order to estimate emissions. Operating assumptions were based on information supplied by the permit applicants (see Table D-9). As a worst-case scenario, each piece of equipment was

[1] While conveyors are common pieces of equipment, the MDNR indicated that most are electric powered and therefore do not produce direct emissions (Zeaman pers. comm.). Although operation of these conveyors would generate indirect GHG emissions through electricity usage, given the speculative nature of the amount of electricity consumed by individual conveyors, GHG emissions associated with these pieces of equipment were not quantified.

[2] No equipment would operate at the Waldron (Master's) or Washington (Rau) facilities under existing conditions because they do not exist under existing conditions.

assumed to operate during the entire operating period. Note that the assumptions summarized in Table D-9 represent existing conditions, unless otherwise noted.

Table D-8 Emissions Factors for Materials-Handling Equipment (tons/horsepower-hour)

Equipment	VOC	NO_X	CO	PM_{10}[a]	CO_2[b]
Crane	3.17E-07	4.41E-06	9.38E-07	2.25E-07	6.30E-04
Crusher	3.16E-07	4.41E-06	9.34E-07	2.24E-07	6.17E-04
Dozer	3.81E-07	4.87E-06	1.68E-06	3.63E-07	8.19E-04
Loader	1.00E-06	4.44E-06	5.48E-06	8.36E-07	5.06E-04

Notes:

CH4 = Methane.
CO = Carbon monoxide.
CO_2 = Carbon dioxide.
NO_X = Oxides of nitrogen.
N_2O = Nitrous oxide.
$PM_{2.5}$ = Particulate matter less than 2.5 microns.
PM_{10} = Particulate matter less than 10 microns.
SO_2 = Sulfur dioxide.
VOC = Volatile organic compounds.

[a] NONROAD does not provide emission outputs for $PM_{2.5}$. An emissions factor therefore was not calculated. Instead, $PM_{2.5}$ emissions were assumed to equal 92 percent of PM_{10} emissions (SCAQMD 2006).

[b] NONROAD does not provide emission outputs for CH_4 and N_2O. An emissions factor therefore was not calculated. Instead, emissions were determined by scaling calculated CO_2 emissions by the ratio of CH_4/CO_2 and N_2O/CO_2 emissions expected per gallon of diesel fuel according to the Climate Action Registry (California Climate Action Registry 2009).

D.3.1 Materials-Handling Scaling Factors

Limited information is currently available on how implementation of the Proposed Action and alternatives would affect the operation and number of materials-handling equipment. As discussed above, the assumptions summarized in Table D-9 represent existing conditions, except in the case of Master's and Rau, where they represent conditions under the Proposed Action. emissions calculated for materials-handling equipment were scaled by the factors presented in Tables D-5 and D-6 because this analysis assumes that emissions are proportional to the amount of sand and gravel permitted, and the use of onshore equipment is required to process any sand and gravel removed from the river.

Unlike the locations of dredges and tugs, the locations of onshore facilities and associated materials-handling equipment are fixed and known. Therefore, emissions produced by companies permitted in more than one river segment did not require further calculations. Once the appropriate scaling factors were applied, total emissions estimates for each river segment were obtained by adding the emissions calculated for equipment operating at each onshore facility within the segment.

Table D-9 Materials-Handling Operating Assumptions

Company	Hours per year
Capital Sand	1,600[a]
Hermann Sand	2,160[b]
Holliday Sand	2,160[b]
J.T.R.	2,052[c]
Limited Leasing	2,160[b]
Master's	2,160[b, d]
Rau	2,160[d, e]

Notes:

[a] Based on a 10-hour work day and 160 work days per year. Assumed to represent existing conditions.

[b] Based on a 10-hour work day and 216 work days per year. Assumed to represent existing conditions, unless otherwise stated.

[c] Based on a 9.5-hour work day and 216 work days per year. Assumed to represent existing conditions.

[d] Hours assumed to represent conditions under the Proposed Action.

[e] No information was provided. The maximum number of hours provided by any one applicant was assumed as a worst-case scenario. Hours were assumed to represent conditions under the Proposed Action.

Source: Based on interviews with the companies conducted by the USACE for permitting purposes.

D.4 TRANSPORTATION OF SAND AND GRAVEL

Transportation of sand and gravel produces emissions of ROG/VOC, CO, NO_X, PM, and GHGs as vehicle exhaust. Emissions of these pollutants were estimated using emissions factors generated by the USEPA MOVES2010 model and information summarized in Sections 3.13 and 4.11 (Noise) and Section 3.12 (Economics and Demographics) in the EIS.

MOVES2010 calculates emissions factors for on-road vehicles based on user-specified vehicle types, time periods, geographical areas, and operating characteristics. All vehicles were assumed to be single-unit short-haul diesel trucks operating in the State of Missouri. Table D-10 summarizes the emissions factors used in this analysis.

Haul truck characteristics, such as number of trips and distance traveled, were based on information presented in Sections 3.12, 3.13, and 4.11 in the EIS. Table 3.13-6 and Tables 4.11-5 through 4.11-8 in the EIS summarize the estimated number of truck trips under existing conditions, the Proposed Action, and the alternatives. As discussed in Section 3.12, the market area served by sand plants

along the Missouri River is within a 25-mile radius of the sand plant. It therefore was assumed that each of the trips summarized in Table 3.13-6 and Tables 4.11-5 through 4.11-8 were 25 miles.[3]

Table D-10 Emissions Factors for Vehicles Hauling Sand and Gravel (grams per kilometer for one single-unit short-haul diesel truck)

VOC	NO_X	CO	PM_{10}[a]	$PM_{2.5}$[a]	CO_2e
0.2018	2.5918	0.7546	0.1364	0.1221	0.2348

Notes:

CO = Carbon monoxide.
CO_2e = Carbon dioxide equivalent.
NO_X = Oxides of nitrogen.
$PM_{2.5}$ = Particulate matter less than 2.5 microns.
PM_{10} = Particulate matter less than 10 microns.
VOC = Volatile organic compounds.

Emissions factors include emissions from brakeware, tireware, and exhaust.

Emissions factors based on MOVES2010. The U.S. Environmental Protection Agency model MOVES2010 calculates emissions factors for on-road vehicles based on user-specified vehicle types, time periods, geographical areas, and operating characteristics. All vehicles were assumed to be single-unit short-haul diesel trucks operating in the State of Missouri.

The following equation was used to calculate emissions from sand and gravel hauling operations.

$$E = (\#\ of\ trips)\ X\ (trip\ distance)\ X\ (EF)\ X\ (CON)$$

Where:

E = Emissions, tons per year

# of trips = Estimated truck deliveries per year (based on Table 3.13-6 and Tables 4.11-5 through 4.11-8 in the EIS)

Trip distance = 25 miles (40.23 kilometers)

EF = Emissions factor, grams/kilometer (see Table D-10)

CON = Conversion from grams to tons (907,184 grams is equal to 1 ton)

D.4.1 Materials-Handling Scaling Factors

As discussed above, haul truck characteristics for existing conditions, the Proposed Action, and the alternatives are provided in Section 3.13 in the EIS. Consequently, emissions generated by sand and gravel hauling operations were not scaled, as emissions could be independently calculated for each alternative.

[3] The 25-mile figure represents an approximation of the primary market area for construction material extracted from the Missouri River. Note that the market area, and thus haul trips, extends beyond 25-miles. However, this distance was assumed to represent the upper bound for shipping distance.

D.5 CONSTRUCTION EMISSIONS

Construction activities, which can generate fugitive dust and exhaust emissions, can result in substantial temporary impacts on local air quality (i.e., exceed state air quality standards for ozone, CO, PM_{10}, and $PM_{2.5}$). Such emissions result from earthmoving and use of heavy-duty equipment. Emissions can vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing weather.

Under the Proposed Action and Alternatives A, B, and C, Rau and Master's would construct a new sand plant. Rau's facility would be approximately 25.6 acres and would be located in Franklin County. Master's facility would be 20–60 acres and would be located in Platte County. In addition to these facilities, increased demand on alternate sources of sand and gravel may require construction of new or expanded facilities at alternate source locations. The size and number of these facilities are currently unknown.

Limited information is available on the schedule and types of equipment that would be used to construct the new facilities. This analysis therefore relies heavily on professional judgment and air quality model default values. Actual emissions may vary depending upon specific construction information.

The URBEMIS2007 (Version 9.2.4) and NONROAD2008 emissions models were used to estimate emissions from construction activities. URBEMIS2007 is an emissions model that analyzes construction-, area-, and mobile-source emissions from land use development projects. Based on a specific type of land use, URBEMIS can estimate construction exhaust and fugitive dust emissions based on default assumptions regarding construction types and numbers of construction equipment, equipment activity data (i.e., number of hours per day and the load factor), and earth disturbance. URBEMIS was developed for use in California because it takes into account fuel regulations and vehicle characteristics specific to the state. Emissions estimates generated by URBEMIS for construction equipment therefore were not used for this analysis because fuel regulations and emission control technologies are more stringent in California than in other parts of the United States. Instead, URBEMIS was used to estimate fugitive dust emissions and to develop an equipment inventory for construction activities. NONROAD2008 emissions factors then were used to calculate emissions from each of the equipment pieces identified by URBEMIS.

Table D-11 lists the assumptions used in the URBEMIS modeling for construction activities and the basis for those assumptions.

The assumptions in Table D-11 were input into the URBEMIS model, the result of which was the equipment inventory, which is listed in Table D-12. Construction of Master's and Rau's facilities would require use of the equipment identified in Table D-12 for each facility.

Table D-11 URBEMIS Modeling Assumptions for Construction Activities

	Assumption	Rationale
Property size (number of acres graded)	Master's: 60	Permit applicant
	Rau: 25.6	Permit applicant
Number of acres disturbed per day	25 percent of total property area	Model default
Building construction	1,000-square-foot general office building	GoogleEarth aerials of existing facilities and photographs supplied by permit applicants
Construction schedule[a]	Master's: site grading (3/1/2011 – 7/30/2011); building construction (7/15/2011 – 7/30/2011)	Professional judgment
	Rau: site grading (3/1/2011 – 5/15/2011); building construction (5/1/2011 – 5/15/2011)	Professional judgment

[a] Construction activities were assumed to take place 5 days per week.

Emission factors for the equipment inventory in Table D-12 were calculated from the NONROAD model using the equation identified in Section D-3. Table D-13 summarizes the calculated emissions factors. These factors were multiplied by the maximum horsepower of each piece of equipment and the total number of hours operating for the entire construction period (see Table D-11). Calculated emissions for construction equipment were then combined with fugitive dust emissions generated by URBEMIS to obtain a total emissions estimate for construction of each of the facilities.

D.6 FACILITY OPERATIONS

The primary emissions generated by sand and gravel facilities are fugitive dust from processed materials and air pollutants from the upkeep of offices, and employee commute trips. Dust emissions can occur during materials processing. Generally, these materials are wetted or moistened for handling, which suppresses dust emissions. All commercial dredging operations must also abide by MDNR Regulation 10 CSR 10.6.170 (see Table 3.16-9 in the EIS), which restricts fugitive dust emissions beyond the premises of origin. Consequently, implementation of the Proposed Action or alternatives is anticipated to result in negligible fugitive dust emissions. No further analysis is required.

Table D-12 URBEMIS Modeling Assumptions for Construction Equipment

Phase	Equipment	Number	Horsepower	Hours/Day
Site grading	Grader	1	174	8
	Dozer	1	357	8
	Tractor	2	108	7
	Water Truck	1	189	8
Building construction	Crane	1	399	4
	Forklift	2	145	6
	Tractor	1	108	8

Table D-13 Emissions Factors for Construction Equipment (tons/horsepower-hour)

Equipment	VOC	NO_X	CO	PM[a]	CO_2[b]
Grader	4.56E-07	5.57E-06	2.31E-06	1.05E-06	8.62E-04
Dozer	1.73E-05	2.21E-04	7.63E-05	1.65E-05	3.72E-02
Tractor	1.00E-06	4.44E-06	5.48E-06	8.36E-07	5.06E-04
Water truck	7.24E-07	9.09E-06	4.53E-06	1.13E-06	1.68E-03
Crane	3.17E-07	4.41E-06	9.38E-07	2.25E-07	6.30E-04
Forklift	3.22E-07	4.01E-06	1.57E-06	3.45E-07	5.31E-04

Notes:

CO = Carbon monoxide. CO_2 = Carbon dioxide. NO_X = Oxides of nitrogen.
PM = Particulate matter. VOC = Volatile organic compounds.

[a] NONROAD does not provide emissions outputs for $PM_{2.5}$. An emissions factor therefore was not calculated. Instead, $PM_{2.5}$ emissions were assumed to equal 92 percent of PM_{10} emissions (SCAQMD 2006.

[b] NONROAD does not provide emissions outputs for CH_4 and N_2O. An emissions factor therefore was not calculated. Instead, emissions were determined by scaling calculated CO_2 emissions by the ratio of CH_4/CO_2 and N_2O/CO_2 emissions expected per gallon of diesel fuel according to the Climate Action Registry (California Climate Action Registry 2009).

Upkeep of the commercial offices and natural gas combustion for heating are sources of additional air pollutants from onshore facilities. In addition, GHG emissions would be generated through electricity usage, water consumption, and wastewater production. Employee travel to and from the property also would generate criteria pollutants and GHG emissions through vehicle exhaust. These emissions would be minimal compared to those produced by other dredging activities. Moreover, in response to data requests posed by the USACE, several permit applicants indicated that operational changes would be minimal with implementation of the Proposed Action. It is therefore unlikely that changes in the level of permitted sand and gravel volumes would result in a substantial increase or decrease in operational

activities. Consequently, office operations under the Proposed Action and alternatives would result in a negligible impact on air quality and climate change. No further analysis is required.

D.7 REFERENCES

D.7.1 Printed Literature

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D.7.2 Personal Communication

Zeaman, Bill. Chief, Non-Coal Unit. Missouri Department of Natural Resources, Jefferson City, Missouri. Email message to Laura Smith, ICF International. February 9, 2010.

UNITED STATES ARMY CORPS OF ENGINEERS

Missouri River Commercial Dredging
Final EIS

FEBRUARY 2011

Appendix E
Distribution List
for the Draft EIS

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A P P E N D I X E

Distribution List for the Draft EIS

Prior to the creation of the Final Environmental Impact Statement (EIS), the U.S. Army Corps of Engineers (USACE) prepared a Draft EIS which was distributed to the contacts listed in the table that follows.

Table E-1 Distribution List for the Missouri River Commercial Dredging Draft Environmental Impact Statement

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UNITED STATES ARMY CORPS OF ENGINEERS

Missouri River Commercial Dredging Final EIS

FEBRUARY 2011

Appendix F Comment Letters on the Draft EIS

PREPARED BY

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A P P E N D I X F

Comment Letters on the Draft EIS

Prior to the creation of the Final Environmental Impact Statement (EIS), the U.S. Army Corps of Engineers (USACE) prepared a Draft EIS for public and agency review. At the close of the comment period, 84 individual letters had been received from governmental agencies, environmental organizations, and interested citizens. Table 10.2-1 in the EIS identifies the groups and individuals who commented on the Project. This appendix includes all written comments received on the proposed Project.

Congress of the United States
Washington, DC 20515

September 2, 2010

The Honorable Jo-Ellen Darcy
Assistant Secretary of the Army (Civil Works)
108 Army Pentagon
Room 3E446
Washington, DC 20310-0108

Colonel Anthony J. Hofmann
U.S. Army Corps of Engineers, Kansas City District
601 East 12th Street
Kansas City, MO 64106

Re: Commercial Dredging on the Missouri River

Dear Ms. Darcy and Colonel Hofmann:

The U.S. Army Corps of Engineers Kansas City District (USACE) is currently reviewing permit applications for the continuation of commercial dredging for sand on the Missouri River. As part of this review, the Kansas City District has required a third-party Environmental Impact Statement paid for by the six existing commercial dredgers on the Missouri River. The health of the river is of vital importance to our state, our constituents, and our commerce, and we appreciate the efforts of the commercial dredgers and USACE in examining potential environmental impacts of dredging. It is likewise important that all factors that potentially contribute to bed degradation be fully and fairly examined so that an effective mitigation strategy can be developed.

The basis of the concern from the Kansas City District has been bed degradation in the main channel of the Missouri River. At the direction of Congress, USACE has constructed six major dams and their appropriate reservoirs in the upper portion of the Missouri River basin which provide valuable opportunities for our northern neighbors and flood control throughout the basin. We are grateful for their efforts, particularly given this year's extensive rains. We also appreciate your Agency's development of the Bank Stabilization and Navigation Project (BSNP) which ensures opportunities for navigation and agriculture on the lower part of the river.

It is our understanding that the two principal reasons for bed degradation in the lower channel are: (1) the retention of sediment behind the major dams and, (2) the design of the BSNP to assure a "self-scouring channel." While we acknowledge that commercial dredging may have an influence on bed degradation, the substantial differences, namely scope and scale, between the removal of seven million tons of sand and the major engineering efforts of USACE to modify the behavior of the river are indisputable. We recognize and understand the need to address the impact of commercial dredging; however, when placed in the context of the significant engineering projects by USACE, we cannot reconcile an impact on this private commercial industry without an examination of the impact of your own actions that result in potential bed degradation.

Accordingly, we are troubled to learn of the potential for the reduction or elimination of commercial sand dredging on the Missouri River when USACE has not yet evaluated the impact of the retention of sediment behind the dams and has failed to analyze whether modifications to the BSNP are necessary to reduce the risk of bed degradation.

To that end, we encourage you to address the impact of your own engineering efforts before considering a further reduction of commercial sand dredging on the Missouri River that will result in reduced availability of the principal material for aggregate within the boundaries of the State of Missouri and parts of the State of Kansas. Until such time as USACE has evaluated the implications of its own actions, we cannot support further reductions based on conjectures and possible correlations.

We respectfully request that you respond with a schedule regarding the Corps' re-evaluation of its own actions and your timeline for reissuance of permits at the current levels for the extraction of commercial sand. Thank you for your attention to this matter. We look forward to your response.

Very truly yours,

Blaine Luetkemeyer
Member of Congress

Roy Blunt
Member of Congress

Russ Carnahan
Member of Congress

W. Todd Akin
Member of Congress

Sam Graves
Member of Congress

Jo Ann Emerson
Member of Congress

Lynn Jenkins
Member of Congress

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cc: Brigadier General John R. McMahon
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MISSOURI SENATE
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KURT U. SCHAEFER
19TH DISTRICT

September 2, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Comment on Commercial Dredging Draft Environmental Impact Statement

Dear Mr. Wheeler:

I represent the State 19th Senatorial District. Where the Missouri River forms the western boundary of Boone County, it also forms the western boundary of my Senate District.

As you are aware, Boone County includes the City of Rocheport, where there is located a commercial sand facility owned by Con-Agg of MO, L.L.C. which is supported by Capital Sand Company, Inc. Both Con-Agg and Capital Sand have rights to sand from the River in current permits.

In my capacity as Vice Chair of the Senate Commerce, Consumer Protection, Energy and Environment Committee, I have reviewed the Corps' DEIS. After doing so, it appears clear to me that the DEIS grossly understates the importance of commercial river sand in the State of Missouri. This understatement, along with the accompanying dubious economic assumptions, jeopardize both the objectivity and accuracy of the DEIS. The direct impact of commercial river sand on the cost of concrete in the State of Missouri is significant, and its importance to the concrete industry in Missouri cannot be understated.

Additionally, commercial sand dredging in the River is a significant component of maintaining navigation on the River. As the DEIS states, eliminating dredging would result in an 84% reduction in river navigation traffic. However, the DEIS fails to adequately address all adverse impacts that any reduction in dredging will have on navigation. Sustaining the navigation industry on the River with this level of dramatic and direct loss would be difficult, if not impossible.

The resulting future loss of viable navigation on the River will result in more goods being transported by road. This, in turn, will result in an unacceptable increases in vehicle emissions and related road traffic costs. Ironically, the cost of all road maintenance and new road construction would greatly increase due to the increased cost of new and more distant sand sources necessary to produce the needed concrete.

River transportation is the only form of transportation which offers the potential of increased capacity with relatively little cost to Missourians. At a time when we in the State of Missouri are attempting to increase navigation, we continue to be thwarted by the Corps' policies and practices, both directly and indirectly, limiting such an increase. The impacts of this limitation are ascertainable and must be addressed in the DEIS in order to establish an accurate picture of the Corps' policies and determinations on the State of Missouri.

I question, as should my colleagues in the Missouri Legislature, who has the legal authority to make determinations regarding commercial dredging in the Missouri River. While I respect the Corps' jurisdiction over the water in the River, precedent establishes that the river bed is the property of the State of Missouri. As a resource belonging to the State of Missouri, there is at a minimum ambiguity surrounding what authority the Corps actually has over the riverbed itself. While I appreciate Corps' efforts, I do not believe that decisions regarding the bed are exclusively the purview of the Corps or the United States.

For these reasons, I request that the Corps address the issues raised above in the record of decision and in the DEIS, and that the Corps reissue the permits for commercial sand dredging at a volume no less than the volume in the currently-issued permits.

Very truly yours,

Kurt U. Schaefer
Senator, 19th Senate District

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

SEP 07 2010

OFFICE OF
THE REGIONAL ADMINISTRATOR

Colonel Anthony Hofmann
District Engineer
U.S. Army Corps of Engineers
601 East 12th Street
Kansas City, MO 64106

Dear Colonel Hofmann:

RE: Draft Environmental Impact Statement on Missouri River Commercial Dredging, Proposal to Extract Sand and Gravel from the Missouri River, U.S. Army Corps of Engineers Section 10 and Clean Water Act 404 Permits, Kansas City, Central Missouri and Greater St. Louis, Missouri, CEQ # 20100270

The U.S. Environmental Protection Agency (EPA) has reviewed the U.S. Army Corps of Engineers' (Corps) referenced Draft Environmental Impact Statement (DEIS) pursuant to our authorities under the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), Section 309 of the Clean Air Act, and Section 404 of the Clean Water Act.

The DEIS describes the Proposed Action and four alternatives; the Proposed Action is the approval of all eleven permit applications for the extraction of 11,615,000 tons per year of main channel river bottom material and return of rejected material back to the river. The Proposed Action would increase the current levels of dredging by approximately 70 percent. In addition to the 'no action' alternative, the DEIS identifies three alternatives with differing extraction volumes. Because the Corps is neither an opponent nor a proponent of the applicants' proposals, a recommended or preferred alternative is not identified.

According to data presented in the DEIS, the lower Missouri River has experienced significant bed degradation (i.e., lowering of the river bed) over the past ten years, with bed loss accelerating in the reach near Kansas City (which has lost approximately four feet since 1995). In addition, the great majority of the sand and gravel extracted from the lower Missouri River comes from three reaches near St. Charles, Jefferson City and Kansas City, which also coincides with the greatest amount of river bed degradation. Replacement sand and gravel into the lower Missouri River has been curtailed by mainstem dams, tributary dams, and erosion control practices implemented in the headwaters. Further, the transport of sediments from unimpeded sources has been reduced due to diminished tributary flow caused by lowered water tables and recent droughts.

GLOBE RECYCLED FIBER

EPA is concerned over the potential for dredging to contribute to bed degradation, which can have many adverse impacts, including significant damage to public infrastructure. For example, bed degradation is increasing the risk of catastrophic failure of bank stabilization features and levees along the Missouri River, and requiring increased public expenditures to address modifications to drinking and cooling water intakes due to reduced low-flow river stages. Impacts to water quality and fish and wildlife habitat can also be extensive, including the loss of shallow water habitat and floodplain wetlands due to de-watering associated with lowering of the water surface.

EPA is also concerned that the DEIS does not provide sufficient information to fully assess environmental impacts that should be avoided in order to fully protect the environment. Most importantly, we believe additional information is necessary to develop a sediment budget which would account for sediment transport, erosion and deposition. With a sediment budget, development of sustainable approaches to sediment management in the river would be significantly improved.

Based on our review, we have rated the Proposed Action and Alternative C as EU ("Environmentally Unsatisfactory"), and recommend that a permit not be issued for these alternatives. Alternative B is rated as EO ("Environmental Objections"), and we also recommend that a permit not be issued for this alternative. Alternative A is rated as EC ("Environmental Concerns"), and the No-action Alternative is rated as LO ("Lack of Objections"). We have also rated the adequacy of the DEIS as 2 ("Insufficient Information"). Additional detailed comments are also enclosed, as well as a "Summary of Rating Definitions and Follow-Up Actions."

Thank you for the opportunity to comment on the DEIS. We look forward to continuing to work with you and the applicants to address the issues that we have identified. Please note that if we are unable to resolve our concerns regarding the proposed action and Alternative C, this matter may be a candidate for referral to the CEQ for resolution. In light of these concerns, EPA also believes that the proposed action and Alternatives B and C may result in substantial and unacceptable impacts to aquatic resources of national importance, as covered in Part IV, paragraph 3(a), of the 1992 Clean Water Act Section 404(q) Memorandum of Agreement between the U.S. Environmental Protection Agency and the Department of the Army.

If you have any questions regarding these comments, please contact Joe Cothern, NEPA Team Leader, at (913) 551-7148, cothern.joe@epa.gov, or Larry Shepard at (913) 551-7441, shepard.larry@epa.gov.

Sincerely,

Karl Brooks
Regional Administrator

Enclosures

U.S. Environmental Protection Agency
Detailed Comments- Missouri River Commercial Dredging DEIS

Environmental Impact of the Actions

Bed degradation in heavily dredged reaches of the river present risks to the aquatic ecosystem and to critical infrastructure. EPA agrees with the potential impacts outlined in the DEIS, as well as the August 2009 "Missouri River Bed Degradation Reconnaissance Study" conducted by the Corps' Kansas City District. These potential impacts can be summarized as follows:

- Water supply intakes for water supply entities and public utilities have been lowered by degradation of the Missouri River channel. The potential exists for these structures to require total replacement with continued bed lowering;

- Erosion of foundation materials caused by bed degradation threatens bank stability, affecting the primary levee system along the Missouri River in Kansas City, water intakes, and drainage outfall structures. Toes of revetments supporting critical levee structures have eroded due to the degraded channel conditions. The condition of the eroded revetments poses a significant risk for failure of the levee system. During a major flood event, sloughing or a series of successive bank failures could result in partial or sudden and total failure of the affected levee segment;

- Head cuts are occurring on several of the tributaries. These head cuts are affecting bank stability, causing scour and exposure of bridge piers, and causing potential loss of habitat as banks of tributary streams erode. Habitat on tributary streams is potentially affected by the sloughing of banks that occurs as head cuts migrate. As this occurs, trees and vegetation along the slopes are lost and may not be reestablished. In both urban and rural areas, these vegetated areas are important habitat resources;

- Bridges and utility crossings located on the main stem and/or tributaries in close proximity to degrading reaches of the river may be affected. These include state and local bridges, railroad bridges, and numerous public and commercial pipeline crossings;

- Environmental impacts of riverbed degradation include potential loss of shallow water habitat due to the lowering of surface water levels;

- Analysis conducted using existing data shows a correlation between commercial dredging activities and the riverbed degradation;

- Bank erosion is resulting in loss of land;

- Degradation, by eroding the riverbank, sets in motion a chain of events that includes progressive bank instability and failure, failure of the levee foundation, soil weakening, and catastrophic scouring and erosion, culminating in levee failure; and

- At river mile 364.5, a 15-foot drop in the riverbed already has occurred. An additional drop of 10 feet in the riverbed's future condition is currently assumed, raising the already significant danger of levee undermining. Degradation would eventually undermine these three federal levee units of the Kansas City's Metropolitan Levee System. It is anticipated that a levee failure in this context would result in major destruction in the short term and continuing catastrophic economic impacts in the long term.

Loss of life. More than 8,000 people reside in these three areas and more than 57,000 people work in these levee units' protected areas. The serious public safety concerns inherent in any major flood event would be exacerbated in this case by the unseen character of erosion and scour beneath the surface of the river, which could result in little or no warning time in advance of levee failure. Significant loss of life could occur.

Single-event damages. In these three areas alone, levee failure from undermining during a major flood event could potentially cause $7.6 billion in damages and threaten $12.4 billion in investment, based on October 2008 prices.

Levee reconstruction costs. These three levee units would be severely damaged in a major flood event and would require major repairs.

Annual flood damage reduction benefits lost. In addition to the single-event damages, the long-term annual benefits provided by these three levee units would be lost until completion of reconstruction.

Environmental quality effects. Degradation could result in a number of environmentally destructive effects, of which the most important might be the threat to shallow water habitat in the Kansas City reach, including habitat restored under the Missouri River Recovery Program. This habitat is important to native river fish, including the endangered pallid sturgeon.

Infrastructure impacts. In addition to federal levees, other types of infrastructure threatened by riverbed degradation include bridges, water intakes, and utility crossings. Within the Kansas City District, there are 25 highway bridges and nine railroad bridges crossing either the Missouri River or tributaries near the confluence with the Missouri River. Bridges over rivers are held up by pylons that extend deep into the ground, using the stability of the earth to strengthen foundational support. Degradation erodes the riverbed, exposing pylons and diminishing support for the bridge, with obvious consequences for the risk of bridge failure. The total number of Missouri River bridges currently threatened by riverbed degradation is not known, but several currently show obvious effects of erosion from degradation. There are 11 water supply plant intakes on the Missouri River within the Kansas City District, serving an estimated 2.25 million people. There are also11 power plant intakes. These power plants have a gross generating capacity of 6,046 megawatts. In addition, there are at least 38 pipelines, cables, or power lines crossing the Missouri River between Rulo, Nebraska, and St. Louis (28 petroleum pipelines, 4 water and sewer pipelines, 3 power lines, and 3 telephone cables).

Alternatives and their specific impact potentials

EPA is concerned that the propose activity may not comply with Section 404 of the CWA. The Clean Water Act's (CWA) 404(b)(1) Guidelines (Guidelines), prohibit avoidable or significant adverse impacts to the aquatic environment and outlines the criteria for evaluating discharges of dredged or fill material. These Guidelines require applicants to follow a sequence of avoidance, minimization and compensation in planning for the development of aquatic sites and to ensure that proposed projects do not cause or contribute to the significant degradation of waters of the U.S. The Guidelines prohibit any discharge of dredged or fill material where: (1) there is a less environmentally damaging practicable alternative (LEDPA) to meet the project purpose; (2) the proposed project would violate other environmental standards, including applicable water quality standards; (3) the proposed project would cause or contribute to significant degradation of the Nation's waters; or (4) the proposed project fails to adequately minimize and compensate for wetland and other aquatic resource losses (see 40 CFR 230.10(a)-(d) and 230.11(g) and (h)). A 404(b)(1) analysis should be performed prior to the selection of the preferred alternative.

Proposed Action

Reach-specific quantities of dredged material proposed to be extracted by the applicants constitute a significant increase over amounts currently permitted. Under currently permitted practices, bed loss is expected to continue as the river seeks equilibrium through agradation and degradation of sediment. As proposed under this alternative, total dredging volumes for the lower Missouri River would increase substantially from approximately 6.9 million tons to 11.6 million tons with accompanying increases for each of the five reaches. For the upper reaches, dredging would extract 33% of the bed load at St. Joseph (a 252% increase from the volume currently dredged), 76% of the bed load in the Kansas City reach and 20% of the load in the Waverly reach.

The DEIS acknowledges that bed material in the three upstream reaches is finer than is required for construction, requiring that as much as two-thirds of the extracted load to be placed back into the river. Therefore, the estimated dredging amounts for the upstream reaches underestimate the actual volume of material extracted. The amounts proposed for the St. Joseph reach, as a percentage of bed load, match those currently dredged from the Jefferson City reach which has, according to the DEIS, experienced dredging-related degradation. Under this alternative, the Kansas City reach is projected to experience "substantial" river bed degradation at these proposed permit volumes and it would be expected that head cutting up the Kansas River would worsen. Proposed amounts for the Jefferson City and St. Charles reaches constitute 65% and 119% of the bed load, respectively. Bed degradation is expected to be "substantial" in the immediate segments near Jefferson City (RM 140-150) and St. Charles (RM 0-50). The St. Charles reach has experienced a steadily declining river bed elevation since 1959.

The DEIS also describes the potential for head cutting in the St. Charles reach which would move upriver under these dredging volumes. This alternative is approximately a 70% increase in the volume of sediment extracted from the lower river from currently permitted amounts and will cause an unacceptable amount of river bed loss with commensurate impacts to infrastructure and the ecosystem.

No Action

We understand from the DEIS that regional short-term demand for sand and gravel could be satisfied by existing operations other than those on the Missouri River, but long-term demand will likely require new sources. In our review of the Corps' 2008 Supplemental Permit Evaluation and Decision Document, we noted that at least one applicant had already initiated development of floodplain deposit mining options as an alternative to dredging. Although the DEIS did not evaluate the potential impacts to the floodplain environment or to small streams resulting from a shift from in-channel Missouri River dredging, we recognize that this represents a potentially significant threat to ecological health of those off-channel communities.

Alternative A

This alternative would permit an extraction volume of approximately 10% of the estimated bed load under existing river conditions. In the three river reaches experiencing the greatest incision, there would be a 70 to 80% reduction in sediment extraction from current practice and a 26% reduction in the Waverly reach for which data appears to suggest bed stability. Only the St. Joseph reach would be dredged to a greater degree than currently occurs, but constituting an increase of only 7%. Comparatively, this alternative represents a more reasoned approach to continuing to permit sand and gravel extraction in the lower river while the Corps proceeds with its other assessments and studies, particularly the planned feasibility study for the lower river. The total amount of bed material extracted from the lower river constitutes a smaller percentage of river bed transport, but it is not known whether the extraction of this quantity would provide for a sustainable condition both in each of the five reaches or the lower river as a whole. In addition, given the condition of the river bed in Kansas City and continuing bed loss in Jefferson City and St. Charles, EPA recommends further limiting dredging at locations within those reaches until more information can be collected which would ensure these management decisions do not exacerbate this condition or cause immediate threats to infrastructure and flood risk management.

Alternative B

This alternative would permit total amounts of material dredged from the lower Missouri River to be moderately reduced and would constitute approximately 23 to 25% of the estimated bed load in the five reaches under existing river conditions. In the three river reaches experiencing the greatest incision, there would be a 38 to 54% reduction in sediment extraction from current practice. In the Waverly and St. Joseph reaches there would be a 68% and 163% increase, respectively, in dredging amounts from current practice.

While constituting a reduction in the total amount of sediment dredged within the lower Missouri River, the individual extraction volume reductions within the three reaches experiencing the most bed loss are significantly smaller than Alternative A and the increase in the St. Joseph reach is 18 times greater than current dredging practice. As mentioned previously, the gross amounts extracted from the 3 upstream reaches exceed those extracted from the 2 lower reaches as more sediment material is rejected in those upper reaches. As a result, the elevated amount of sediment extracted from the St. Joseph reach under this alternative would be even greater than described by the DEIS. The DEIS states that past dredging has occurred primarily within a ten mile segment of the St. Joseph reach (RM 445-455) and that a more even distribution of dredging throughout the reach would likely dampen the bed degradation impacts.

We recommend considering opportunities to modify this alternative with regard to the St. Joseph reach so as to require a more broad distribution of dredging in order to moderate potential impacts within the area of concentrated dredging. In general, however, without additional information supporting these extraction quantities as sustainable and not likely to cause further bed loss, we believe it is more prudent to further limit extractions from all five reaches than has been proposed in this alternative. In addition, we would carryover our recommendation from Alternative A regarding further limiting dredging at locations within the three reaches experiencing acute bed loss.

Alternative C

This alternative would permit total amounts of material dredged to remain at levels equivalent to 2004 to 2008. This alternative, based on information presented in the DEIS, would have limited impact on the river bed in the St. Joseph and Waverly reaches. Continuing extraction at current levels would be expected to continue serious bed loss in the Kansas City reach which is both uniformly and heavily dredged throughout the entire reach. Head cutting issues on the Kansas River associated with continuing incision in the Kansas City reach of the Missouri River would also be expected to continue.

Status quo dredging under this alternative, according to the DEIS, would not be expected to significantly increase bed loss in the Jefferson City and St. Charles reaches but only if dredging is spread more evenly throughout these reaches and not concentrated, as is the current practice, in segments with significant bed loss (i.e., RM140-150 in Jefferson City reach and RM 0-50 in St. Charles reach). Our previous recommendations regarding increased dredging limitations in the Kansas City, Jefferson City and St. Charles reaches and more uniform dredging in the other two reaches are also pertinent to this alternative.

Mitigation/Recommendations

The Corps has identified permit conditions from the current permits which are to be carried over into all action alternatives. EPA strongly supports the Corps' intent to carry those permit conditions over into any future permits as a baseline for a more expansive mitigation strategy.

Pursuant to 33 CFR §332.4 and 40 CFR §230.94, *Compensatory Mitigation for Losses of Aquatic Resources (Mitigation Rule)*, a compensatory mitigation plan must be submitted and approved by USACE before issuance of an individual CWA Section 404 permit. EPA recommends that the USACE/EPA regulations that address compensatory mitigation for losses of aquatic resources be reviewed, and that compensatory mitigation consistent with these regulations (73 Fed. Reg. 19594, April 10, 2008, http://www.usace.army.mil/CECW/Pages/final_cmr.aspx) be developed that will adequately compensate for impacts due to dredging activities along the entire project. Additionally, we recommend that the Final EIS include a conceptual monitoring plan that will, throughout a period of time (normally five years), direct field evaluations to assure aquatic functions and values are recovering. The monitoring plan should also include the compensation sites. EPA prefers mitigation take place in areas as close to the project site as practicable (i.e., in close proximity and, to the extent possible, the same watershed).

EPA supports the Corps' consideration of several other specific measures, including the restriction of concentrated dredging in portions of each segment, prohibition of cutter-head dredging and limiting dredging during times of the year when larval pallid sturgeon entrainment is more likely. We believe that the Kansas City reach is most critical based on existing and projected future impacts to infrastructure along the lower Missouri River and the significant head cutting on the Kansas River. The Kansas City District's River Engineering Section commented in a November 5, 2009 memorandum that any dredging quantities during 2010 in the Kansas City reach should be limited to the "computed bed load" of 1.3 million tons. Only Alternatives A and B include quantities below that value and only Alternative A includes an amount significantly below that value. Other reaches experiencing significant bed loss over portions of their length include St. Joseph, RM 445-455; Jefferson City, RM 140-150; St. Charles, RM 0-50.

Head cutting would be expected to proceed both up- and downstream from a dredge location resulting in an expansion of the zone of bed loss. These processes work counter to approaches which would not limit the overall extraction amount in the lower river and suspend dredging in only small segments of a larger river reach (e.g., Jefferson City RM 140-150, St. Charles RM 0-50) while allowing dredgers to simply shift concentrated dredging to just outside a degrading segment. We also suggest that any dredging in the lower Missouri River exclude any use of cutter heads which provide access to more consolidated sediment and exacerbate bed loss.

The DEIS states that uncertainties associated with estimating changes in water surface elevation under low and high flows resulting from dredging activities are greater than for other parameters. High-flow surface water elevations have been shown to be historically increasing in all reaches and, to a greater or lesser degree among the alternatives, this trend is expected to continue. This would be expected to place more stress on river infrastructure, including federal and non-federal levees throughout the lower river. Low-flow surface water elevations are expected to fall with increasing bed loss and would be more significant in those reaches, and heavily dredged segments within those reaches, experiencing greater bed loss. Falling low-flow surface water elevations further isolate the river's floodplain and eliminate channel-margin habitat, affecting survival of riverine and semi-aquatic organisms. Falling low-flow surface water also lowers alluvial groundwater, potentially causing additional loss of floodplain wetlands and reduced access to water by alluvial public water supply wells. In addition, with falling low-flow surface water elevations, vegetation growth along newly dried banks will slow river flow under high-flow conditions causing episodic threats to flood risk management structures.

The absence of a sediment budget limits the ability to effectively manage the river's resources. The Missouri River's need for sediment is no less critical than its need for flow, and the association between sediment and flow define the ecological character of this river. Given the lack of data, we recommend that any permits are cognizant of the need to ensure that the data needed to determine whether this activity can be conducted in a sustainable manner is acquired and evaluated. We recommend that the Corps consider an approach to permitting that allows for incorporation of the results of the ongoing Missouri River Authorized Purposes Study, the planned feasibility study of possible solutions to the bed degradation problem in the Kansas City metropolitan area and the comprehensive Missouri River Ecosystem Restoration Plan.

We also recommend that the Corps consider including reach-specific limitations for the dredging alternatives. Specifically, we recommend that dredging exclusion areas include the mouth of the Blue River at RM 358 to the confluence of the Little Blue River at RM 340 in order to minimize the extraction and mobilization of potentially contaminated sediment from the Blue River urban watershed. More generally, we recommend that dredging within the three reaches identified as experiencing acute bed loss be suspended until survey data confirms that these areas have recovered. The Kansas City (RM 357 to 391), Jefferson City (RM 140 to 150) and St. Charles (RM 0 to 50) reaches have experienced large scale bed loss and the potential for an increase in flood risk and costly infrastructure failure is significant enough to warrant a conservative approach to permitting.

Without sufficient replacement material, mining of bed material from the lower river could preclude the Corps from complying with the requirements of the 2003 Biological Opinion regarding the operation of the Missouri River and the recovery of listed species. Further, incising segments isolate the floodplain and make ecologically-desirable reconnections between channel and floodplain nearly impossible. Habitat restoration projects on the channel margin (e.g., shallow water habitat) also become more isolated from flow during low-flow or average-flow conditions. The bulk of the restoration project sites (Figure 5.3-1) appear to be located within the St. Joseph and Jefferson City reaches and largely outside of the specific segments within these reaches which are experiencing significant bed loss. According to the DEIS, these two reaches contain wider river valleys and softer substrate. This geomorphology better supports channel margin and floodplain restoration projects. As the Corps evaluates the permitting of dredging within these two reaches, it would be prudent to avoid segments with restoration areas. We recommend that the Corps provide an analysis, with data supporting a high degree of confidence, that permitted dredging locations and quantities, will not negatively affect the design and performance of these projects.

Adequacy of the Impact Statement

Information Regarding Sediment Transport in the Lower Missouri River

Sediment transport in rivers is composed of two major components: a suspended sediment fraction which includes a wash load of finer material (e.g., silt, clay) and bed-material load of coarser material carried under higher energy flows (e.g., sand); and a bed load fraction which is coarser material which moves along the river bottom by rolling and saltating (e.g., sand, gravel, rock). Bed load typically constitutes less than 10% of the total sediment load in large, lowland rivers like the Missouri River. Contemporary data on sediment transport in rivers relies upon measures of sediment transported in the water column as a general indicator of overall sediment movement, but does not represent a measure of bed sediment transport. Very little data exists on the character of bed load transportation in large rivers, sediment fluxes from tributaries and interactions between river sediment and floodplains. Sediment budgets which account for sediment transport, erosion and deposition are dependent upon this data. Absence of a budget for the Missouri River precludes a determination of what could constitute a sustainable approach to sediment management in the river.

Threats to Infrastructure and Flood Risk Management

The Kansas City District's River Engineering Section, in its November 5, 2009 memorandum, specifically stated that the condition of most infrastructure is unknown, including Corps constructed levees. The Corps also acknowledges that "the problem [of structure failure] is very complex" and significant uncertainty remains. Given the number of flood control levees along the lower river, we recommend that the Corps provide a characterization of the lower river levee system and the risk potential (toe integrity, certification standard, protection levels of 25 to 500 years) of those levees placed along the three reaches with the highest amount of bed loss.

Tributary Head Cutting

The analysis of cumulative impacts does not address those multiple impacts to tributary rivers resulting from bed loss and head cutting. The DEIS describes the potential for heading within downstream portions of tributary streams within each Missouri River reach, but provides no characterization of that potential or its impacts for individual tributaries. This is particularly troublesome with regard to the Kansas River which has documented severe head cutting problems associated with both bed loss in the Missouri River and its own sand dredging activities. The DEIS acknowledges that severe bed loss within the Kansas City reach creates the potential for expanded head cutting in the Kansas River. At a minimum, we recommend that the Corps evaluate the potential for increasing head cutting in tributary streams within Missouri River reaches which have suffered increasing bed loss, particularly with regard to the Kansas River for which exists a significant amount of data.

Impacts Associated with Two New Sand Plants

The DEIS does not address impacts associated with the construction and operation of two proposed sand plants by two of the applicants. Master's Dredging Company is proposing to build a sand plant at approximately River Mile 388 which would cover 20 to 60 acres of floodplain. In addition, this applicant proposes to utilize a slurry pipeline from dredging operations to the plant which would extend across a portion of the channel and shoreline. Edward N. Rau Contractor Company proposes to build a sand plant at about River Mile 67 on a 25.6 acres site. As these are new facilities whose construction is dependent upon the Corps' decision to issue permits to new dredging operations, we recommend that the Corps evaluate the impacts of their construction and operation as a "connected action" as defined in CEQ's regulations (40 CFR 1508.25(a)(1)).

Water Quality

The DEIS's conclusions regarding the potential impact of suspended sediments from both shallow water habitat restoration projects and dredging on the river's nutrient loads would not exceed water quality criteria (DEIS, Section 5.3.3.1). As neither Kansas nor Missouri have adopted numeric water quality criteria for nitrogen or phosphorous, we recommend that the Corps instead clarify that testing results or ambient measurements were found to be not significantly different from or less than background nutrient concentrations. References to "water quality standards" could be interpreted as meaning state-adopted numeric water quality criteria which could serve as the basis for state water quality certification under section 401 of the Clean Water Act.

Draft Environmental Impact Statement Rating Definitions

Environmental Impact of the Action

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative. EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

United States Department of the Interior

OFFICE OF THE SECRETARY
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Denver, Colorado 80225-0007

September 2, 2010

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ER 10/642

Mr. Cody Wheeler
Regulatory Project Manager
Kansas City District
U.S. Army Corps of Engineers
700 Federal Building
Kansas City, Missouri 64106-2896

Dear Mr. Wheeler:

The Department of Interior has reviewed the July 2010 Draft Environmental Impact Statement (DEIS) for Missouri River Commercial Dredging which addresses U.S. Army Corps of Engineers' (Corps) permitting program for commercial dredging of the Missouri River in both the Kansas City and St. Louis Districts. The Department's response includes comments from the U.S. Fish and Wildlife Service and the National Park Service. We submit these comments pursuant to the Fish and Wildlife Coordination Act (FWCA)(16 U.S.C. 661 et seq.) and the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1544), and the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4327).

GENERAL COMMENTS on DEIS

The Fish and Wildlife Service agreed to be a cooperating agency on the EIS because of their shared responsibilities with the Corps related to Missouri River fish and wildlife. We see this effort as a Corps programmatic evaluation of commercial dredging activities permitted under both the Rivers and Harbors Act and the Clean Water Act in the Missouri River. In addition, the Corps has other responsibilities along the river (i.e., flood control, navigation, bank stabilization) that also must be met and are important considerations in the various analyses used to evaluate program effects from commercial dredging. Although it is not explicitly stated, rather than authorizing specific permits *per se*, we see the EIS addressing commercial dredging at a programmatic level, taking into account existing and future conditions along the river, including sediment transport, sustainability, habitat maintenance, infrastructure, etc. Ideally, the final EIS would identify conditions (i.e., environmental conditions, performance metrics, total allowable material withdrawals) within which the Corps would evaluate specific permit applications. If future conditions warrant, those conditions could be adjusted as appropriate. Also, as we

understand from the August 26, 2010, interagency meeting, the Corps will develop a preferred alternative for each river segment rather than selecting one of the identified alternatives across all segments. That may assist the Corps in selecting the most appropriate option that will minimize adverse effects to riverine habitats and communities, as well as be sustainable over the long term.

The National Park Service administers the Lewis and Clark National Historic Trail (the Trail) and is charged with the identification and protection of the historic route, remnants, and artifacts of the Lewis and Clark Expedition (the Expedition) for public use and enjoyment. The Trail follows the outbound and inbound routes of the Expedition, from Wood River, Illinois to the Mouth of the Columbia River in Oregon. In the project area, the Expedition followed the Missouri River across the state of Missouri and along the Kansas/Missouri border on both their outbound and return journeys.

In February 2009, the National Park Service provided comments, a list of Land and Water Conservation Fund grants in the study area, and geographical information on the probable locations of Lewis and Clark campsites for use and consideration in development of the Environmental Impact Statement (EIS) for Missouri River Commercial Dredging in Kansas and Missouri. Twelve Lewis and Clark campsites and the Trail are identified as cultural resources in the project Area of Potential Effect. Since the National Park Service provided more than one interpretation of campsite locations, we request further information on how this data was used. Please contact Trail Geographer Ryan Cooper at 402-661-1868, or Ryan_M_Cooper@nps.gov.

As the Corps is keenly aware, many organizations and agencies are actively involved in efforts to restore or reclaim the natural conditions and ecological functions of the Missouri River, its floodplain and tributaries. Restoration of the river's natural form and function is congruent with the mission of the National Park Service and could add substantially to the historic setting and visitor experiences along the Trail. Streambed degradation due to dredging will affect floodplain wetlands, ground water levels, riparian areas, and fish and wildlife using these areas. Continued mining of aggregates from the river bed will make efforts to preserve natural resources, protect endangered species and provide recreational opportunities more difficult and more costly. The draft EIS acknowledges the difficulty in estimating the economic impacts related to riverbed degradation. Despite this difficulty, careful consideration must be given to the potential for society to incur substantial costs along the entire river system from continued sand and gravel removal.

Alternative A will result in fewer negative impacts to the Lewis and Clark National Historic Trail than the other action alternatives considered. However, all action alternatives will result in further river bed degradation and changing water surface elevations. The potential adverse geomorphological and biological impacts of this degradation are far reaching, both in terms of the ecosystem effects and the human uses that rely on this ecosystem. If the Corps authorizes commercial dredging permits on the Missouri River in Missouri and Kansas, the National Park Service recommends that impacts be closely monitored over the life of the permits and that permits include a reopener clause that allows modification of permit terms and conditions based on new information.

SPECIFIC COMMENTS on DEIS

Page ES-12 Section 8.2.1 - Current and reasonably foreseeable restoration activities under the Missouri River Restoration Program are designed to compensate only a *portion* of the habitat losses incurred through constructions and operation of the navigation channel. They are not designed, nor will they compensate for the additional affects of commercial dredging in the Missouri River.

Page xiii, List of Appendices - The appendices should include previous agency coordination (i.e., letters, emails, etc.) that are summarized in the text.

Page 1-2, Section 1.2.1 and 1.2.2 - Contrary to the second paragraph, the purpose and need for an action is developed *before* alternatives are formulated, not vice versa. The purpose and need set the conditions for a suite of actions to be considered as alternatives. They are not identified solely to justify an existing action. In addition, including in the proposed action "…authorization of any as yet unforeseen proposed dredging permits..." would appear difficult, if not impossible to analyze at this point.

Over the last two decades, commercial dredging in the Lower Missouri River has increased dramatically. At the same time, the Corps has detected bed degradation, head cutting, and potential implications to public infrastructure that could be attributed in some part to commercial sand and gravel removal from the River. Furthermore, the Corps has embarked on a significant habitat restoration project pursuant to their responsibilities under the ESA. Both infrastructure and habitat restoration depend on a stable river bed and adequate sediment supply long-term. This will be the first comprehensive evaluation of all those factors.

Page 1-3, third full paragraph **-** This section, which focuses on the commercial dredging industry, should be revised to include the Corps' need for this EIS. This paragraph should explain why the Corps prepared an EIS on commercial dredging in the Kansas River and why the very lowest sections of the Kansas River are no longer available for commercial mining.

Page 1-4, Section1.3 - First sentence has the purpose clearly laid out. We recommended the authors paste this sentence into the previous sections.

Page 1-8 Third paragraph **-** Please revise the text to include that the Fish and Wildlife Service also comments on Section 10 and 404 permits under the FWCA.

Page 1-11, Section 1.5.2, Commercial Sand and Gravel Dredging - The second paragraph notes 2009 dredging quantities as 4.5 million tons, but information on Page 1-3 indicates almost 5.5 million tons. The text should include the correct amount.

Page 1-14 Section 1.5.3, Missouri River Bed degradation - This section should also note an indirect effect of bed degradation is the need to modify flows from the dams to meet the needs of water intakes in the lower river. We believe that information can be found in the Missouri River Master Manual EIS.

Page 2-3, Table 2.2-1 - Figure 2.2-1 indicates the proposed site of Master's Dredging Company is in the St. Joseph reach of the project area. The table should be revised accordingly.

Page 2-40, first paragraph - See previous comments regarding consistent quantity of material dredged in 2009.

Page 2-43, Table 2.4-1 - This is a helpful table, which clarifies the alternatives.

Page 2-77, Federally listed species - The Fish and Wildlife Service does not anticipate any local improvement in habitat conditions for endangered species with the Proposed Action. Rather, that alternative has the potential to more rapidly degrade the habitats and ecological processes that support federally listed species within the project area.

Page 2-80, Aquatic Resources/Wetlands, Floodplains….. - This section states there would be no change. However, Table 2.6-1 indicates stabilizing to increasing amounts of these resources by retarding or reversing some of the bed degradation. This should be clarified.

Page 2-18, Infrastructure - It is not clear in this section if Alternative B is being compared to the No Action, Alternative A, Alternative B, Alternative C, or Proposed Action. The final EIS should clarify this.

Page 2.81 - This section appears to have eliminated Aquatic Resources/Wetlands, Floodplains, etc….

Page 3.2-10, last paragraph - According to numerous Corps documents, the CWCP is not an attempt to mirror pre-dam (natural) flows, but rather to dampen high spring flows to reduce flooding and augment low summer flows to provide navigation support, ideally through November. We recommend removing that sentence from the text. This would also be an appropriate section to note that bed degradation in the lower river can affect the releases, both total amount and rate, from the upstream dams to meet water supply needs.

Page 3.5-28, Water Supply Wells - This section should include a discussion of the City of Columbia's water supply well field adjacent to the Missouri River at McBaine.

Page 3.9, Wetlands, Floodplains, and Terrestrial Resources, last paragraph - There is no single federal definition of wetlands. Several agencies have definitions based on the particular programs they administer that affect wetlands. The definitions can be very different depending on the approach. The Fish and Wildlife Service developed what is known as the Cowardin system based on functional aspects. It should be kept in mind that the system often does not adequately reflect agricultural or farmed wetlands, the vast majority of wetlands in the project area. As noted on page 3.9-7, in addition to this limitation, recent study documented misclassifications. Lastly, pre-1993 wetland estimates that do not incorporate more recent habitat restoration activities, likely underestimate the true amount of wetlands in the project area and potentially affected by the proposed alternatives.

Page 3.9-14, Special Status Wildlife Species and Management Lands - This section should also include other conservation lands including Missouri Department of Conservation lands, State Parks, and Corps Mitigation lands. Not only will this provide vital information and context regarding public investment in fish and wildlife resources, but it will also show many of the areas subject to special conditions in the existing permits related to areas of high habitat value.

Page 3.9-16, Bald Eagle - They are increasingly common breeders in Missouri, including throughout the project area. The text should be revised accordingly.

Page 3.10-2, Consultation with USFWS - Please revise the text to indicate the Corps, as the federal action agency, makes the determination of project effect to federally listed species.

Page 3.10-7, Fourth paragraph - The text should note that a recently identified threat to the Indiana bat is White Nose Syndrome (WNS). The Fish and Wildlife Service's website contains comprehensive information on WNS that could be incorporated into the EIS.

Page 3.12-29, Infrastructure Costs - The information on existing maintenance needs for infrastructure is helpful in framing the economic aspects of current dredging operations.

Page 4.2-19, St. Charles Segment - It is not feasible to dredge more than 100% of the bed load. The text appears to indicate that there is not enough bed load to satisfy this option, or that this option would lead to mining ancient deposits in this reach. Neither alternative is sustainable.

Page 4.3-11, Impacts to Water Supply Wells - This section should include an evaluation of effects to the City of Columbia's well field in McBaine.

Page 4.6-5, Third paragraph - The effects to shallow-water habitats are likely one of the most profound effects of the alternatives under consideration. While the precise relationship between those habitats and the alternatives may not be well understood, a qualitative evaluation would be warranted. This evaluation would be especially useful in developing a rationale pertaining to the pallid sturgeon. When a river has lost sediment to the point that it begins to erode its channel, effects to surrounding shallow habitats have already occurred. A bed load too limited to support a stable channel is unlikely to support the geomorphological processes that form and maintain diverse aquatic habitats.

Page 4.6-17, Alternate sources - The Corps stated during the August 26, 2010 interagency meeting, that they considered only existing, currently permitted sites as alternative sources. Therefore, there should be no additional effects beyond those already considered in the permits. Conversely, if new sites are considered, then this section should include the potential to increase aquatic habitats within the river and the floodplain.

Page 4.7-5, Table 4.7-1 - Given the significant limitations on the available data, the figures in this table are not helpful. Quantifying impacts to two decimal places implies far more precision than is the case. We recommend you delete the table and include a qualitative evaluation, similar to shallow water habitat.

Page 4.8-6, Second paragraph - The text should include the river stage that corresponds to 75,517 acres of water surface (?) in the project area. In addition, 25% of the project area under dredging permits seems quite large considering the number of conditions on the permit. The final document should confirm this figure.

Page 4.8-10, Indiana bat - As previously noted, include White Nose Syndrome as an additional threat to the species.

Page 4.9-8, Wetlands - Changes in water surface elevations will affect wetlands, as well as, changes in the water table. The duration, season, and source of water to wetlands determine their functions and values. Both should be evaluated in project effects.

Page 4-13-15, Indirect Effects - According to the draft EIS, one Lewis and Clark campsite located in the Saint Charles segment may be adversely affected by head cutting and erosion attributable to dredging under the proposed action. We recognize that this alternative is under consideration but may not be implemented. Should the Corps choose this alternative, the National Park Service should be consulted on ways to avoid, minimize, or mitigate impacts to the campsite prior to approving this undertaking. Further, it is suggested in the draft EIS that this and other indirect impacts to cultural resources from any of the action alternatives could be evaluated and assessed under a Programmatic Agreement (PA). The National Park Service should be consulted during the development of a PA to address cultural resources along the Lower Missouri River.

Page 5-16, Geomorphology - Much of the information in this section would be better presented in Affected Environment. We recommend that this material be moved and this section focus on effects to these resources, rather than description of the resources themselves.

The Department has a continuing interest in working with the Corps and the applicants to ensure that project impacts to resources of concern to the Department are adequately addressed. For matters related to threatened and endangered species and other fish and wildlife resources in Missouri, please continue to coordinate with the Field Supervisor, U.S. Fish and Wildlife Service, 101 Park DeVille Drive, Suite A, Columbia, Missouri 65203, telephone (573) 234-2132. If you have any questions regarding National Park Service responsibilities or the Lewis and Clark National Historic Trail please contact Dan Wiley, Chief of Resources Stewardship, Lewis and Clark National Historic Trail at 402-661-1830 or at Dan_Wiley@nps.gov.

Robert F. Stewart
Regional Environmental Officer

Sincerely,

Missouri Department

MoDOT

Kevin Keith, Interim Director

105 West Capitol Avenue
P.O. Box 270
Jefferson City, MO 65102
(573) 751-2551

September 3, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 E. 12th Street, Room 402
Kansas City, MO 64106-2896

Dear Mr. Wheeler,

The Missouri Department of Transportation has grave concerns about the direction in which the U.S. Army Corps of Engineers' Missouri River EIS is moving, specifically as it relates to additional restrictions on, or even elimination of, dredging. Such actions could have devastating effects on MoDOT's ability to cost-effectively deliver projects that satisfy its customers and to the development of freight navigation on the Missouri River that grows Missouri's economy and benefits the environment by reducing greenhouse gas emissions.

Sand from the Missouri River is needed in MoDOT's construction program to produce concrete and asphalt. Missouri River sand is preferred because of its abundant availability and high quality that requires minimal processing. Its use allows us to receive competitive bids on construction projects that allow Missouri taxpayers to receive the greatest value for every dollar spent on transportation improvements.

MoDOT's annual need for sand approaches 2 million tons per year. So far in 2010, 60 percent of the natural sand used on MoDOT projects has been Missouri River sand. These projects were located in 61 counties representing nine of MoDOT's 10 districts. If that demand could be met by other suppliers it could cost the taxpayers millions of additional dollars in the form of added project cost due to the loss of the state's most economical sand source from the Missouri River.

Every dollar we would need to spend on unnecessary hauling of sand is one less dollar spent on building projects that save lives and put people to work. We do not believe that this type of expense to the Missouri taxpayer is justified, nor is it adequately reflected in the EIS.

Your document refers to off-river sources of sand that purportedly can more than pick up the slack. Although MoDOT has used other sources of sand, it is doubtful they could produce the quantities needed. Plus, instream gravel mining in the Ozarks can produce more intense localized environmental effects than Missouri River dredging, and the list of federally threatened and endangered species to be considered for instream mining in Missouri is longer than the list for dredging in the Missouri River.

We also find it illogical to separate degradation of the river from dredging from other causes, which is how the issue is portrayed in the EIS. Many different actions – most of them perpetrated by the COE themselves – have been taken over time in the Missouri River channel and its floodplains. They have all contributed to degradation. We believe the degradation study must be completed in order to fully analyze the cause and effect of degradation, and the interrelationship of all these various contributors, in order to ultimately arrive at the correct solution for the river's future.

MoDOT is not a state highway department – it is a total transportation agency. Because of the presence of more than 500 miles of the Missouri and Mississipppi Rivers bisecting and bordering our state, waterway freight has tremendous potential to benefit Missouri and the Upper Plains states economically, while taking trucks off of our already congested highways. Moving goods by barge uses considerably less fuel than truck and rail transport thereby reducing U.S. dependence on foreign oil, improving air quality, and reducing greenhouse gas emissions, all of which promote public health.

As the 2014 completion of the Panama Canal expansion approaches, barge traffic will become even more important on our two largest rivers. Large container ships from Asia will finally be able to utilize the Panama Canal to access the Port of New Orleans. Many more goods will be able to be transported up the Mississippi River to St. Louis. The yet untapped market is the Missouri River, with access upstream to Kansas City, Omaha and points north.

We fully support navigation on the Missouri River. Minimizing or eliminating dredging will seriously affect the ability to navigate and reap the benefits described above, since a 300-foot channel of adequate depth must be maintained.

MoDOT does not support any restriction on dredging of the Missouri River beyond what is currently in place. MoDOT likewise is not in support of the "No Action" alternative, Alt A or Alt B. Before taking a rash action that puts dredgers out of business, the COE needs to look at the full package of changes that it and others have done to the Missouri River and the full range of solutions to the degradation problem to maximize the resource for what it can become.

Perhaps it would be discovered that modifications to the COE's own structures could fix the problem without imposing hardships on the dredging industry.

Attached are some additional detailed comments on the document text from my staff.

Sincerely,

Kevin Keith
Interim Director

cc: Governor Jeremiah W. (Jay) Nixon
Kip Stetzler, acting director, Missouri Department of Natural Resources

Attachments

MoDOT Bridges

MoDOT has the following information about the historic structures in its system that should be included to bring the EIS up to date.

There were 32 MoDOT bridges from the Rulo Bridge to the Mississippi River in St. Louis, the area now comprising the five dredging segments in the EIS. Ten of these are now gone or soon will be. Nine existing National Register-Eligible or Listed Bridges were identified in Fraser's 1996 Draft Missouri Historic Bridge Inventory, which addressed 50-year-old bridges built before 1951:

- Rulo Bridge (L0097), 1939
- Atchison Bridge (K0697), 1937
- Fairfax Bridge (K0456), 1933
- A.S.B. Bridge, 1911
- Paseo Bridge (L0734), 1954
- Liberty Bend Bridge (L0568), 1947
- Glasgow Bridge (G0069), 1925
- Washington Bridge (K0969), 1936
- Daniel Boone Bridge (J01000), 1935

A further examination of bridge data has revealed six additional bridges that were built from 1951 through 1960, are currently at least 50 years old, but were not included in Fraser's original survey. These six currently have the potential for National Register eligibility, and are considered to be eligible by some:

- Leavenworth Bridge (K0941), 1953
- Fairfax Bridge (A0450), 1955
- Broadway Bridge (A4649), 1955
- Rocheport Bridge (L0962), 1959
- Jefferson City Bridge (L0550), 1953
- Blanchette Bridge (L0561), 1957

Additional information:

- Atchison Bridge K0697 is currently being replaced with a new bridge on adjacent alignment and will be removed.
- Paseo Bridge L0734 is being replaced on new alignment and may soon be removed.
- Glasgow Bridge G0069 has been replaced (the deck/superstructure) and has undergone an "adverse effect" making it no longer National Register Eligible as historic.
- Miami Bridge K-999R has been replaced (the deck/superstructure) and has undergone an "adverse effect" making it no longer National Register Eligible as historic.
- Washington Bridge K-969 is currently under study in an EA for possible replacement.
- Weldon Spring Bridge J-1000R is currently under study in an EIS reevaluation for possible replacement.

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Kip A. Stetzler, Acting Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

September 3, 2010

Colonel Anthony J. Hofmann, PMP
U.S. Army Corps of Engineers
601 E. 12th Street,
Kansas City, MO 64106

RE: Commercial Dredging of Sand & Gravel from the Missouri River

Dear Colonel Hofmann:

I appreciate and share your concerns regarding channel degradation in the Missouri River. However, taking action to severely limit the dredging of sand and gravel from the Missouri River based on a partial analysis of the impacts would not be in the best interest of the State of Missouri or the federal government. The draft Environmental Impact Statement (EIS) provides only a partial evaluation of the causes of Missouri River bed degradation. The importance of this decision requires that it be based on a comprehensive analysis. Therefore, I urge you to allow the continued extraction of sand and gravel from the Missouri River at the current rate until a comprehensive evaluation of bed degradation can be completed.

The U.S. Army Corps of Engineers (Corps) has acknowledged in this EIS and in the Missouri River Bed Degradation Reconnaissance Study that there are other factors in addition to commercial dredging that contribute to channel degradation. The study ignores the upstream dams that deprive the lower river of huge volumes of sediment, the Corps' river training structures that are part of the Bank Stabilization and Navigation Project, and the reduction in sediment from soil and water conservation efforts. The EIS fails to comprehensively evaluate these other potential causes of degradation along with the effect of dredging.

I am also concerned that increases in the cost and availability of construction materials may needlessly hamper Missouri's economic recovery in the event commercial dredging on the Missouri River is significantly curtailed. The Missouri Department of Transportation (MoDOT) utilizes natural river sand from the Missouri River to produce concrete and asphalt for many of its transportation improvement projects. Indeed, sand for MoDOT projects comes almost exclusively from two sources, the Mississippi and Missouri Rivers. If the Missouri River is unavailable as source for needed materials, then transportation construction costs will skyrocket, particularly in the greater Kansas City metropolitan area. Simply stated, increases in the costs of construction materials will result in more costly construction and put improvements in jeopardy. Accordingly, the Corps should reconsider the economic impacts to taxpayers, MoDOT and other commercial users of Missouri River sand and gravel and ensure that all the potential economic

impacts have been thoroughly analyzed. In the opinion of state experts who have reviewed the supporting documentation, the Corps has not properly analyzed these projected impacts resulting in an understatement of the impacts. For example, the Corps does not appear to consider the volatility of transportation fuel prices in its estimations of costs. Additionally, the Corps' analysis of the availability and location of alternate sources fails to address all of the additional costs of processing pit run sand and gravel.

Another significant flaw in the EIS is that the Corps bases the need for this study on the risks to infrastructure, yet the Corps only uses anecdotal examples of impacts that it attributes to commercial dredging. If there is a significant risk that a levee or a pipeline will fail, these risks should be identified and addressed. The Corps fails to provide a comprehensive and quantitative analysis of risk.

Again, I urge the Corps to first complete a comprehensive analysis of Missouri River bed degradation that identifies all of the specific contributions to bed degradation on the lower Missouri River. Until such an analysis has been completed, the Corps should select an alternative that allows dredging to continue at its current levels with appropriate restrictions that will ensure protection of public health, safety and the environment.

We are providing additional comments on the draft EIS in the attachment to this letter.

Thank you for your attention to this important matter. If you have questions, please contact Mike Wells at 573-751-4732.

Sincerely,

DEPARTMENT OF NATURAL RESOURCES

Kip A. Stetzler
Acting Director

Enclosure

c: B.G. John R. McMahon, Commander

MDNR Supplemental Comments -- Missouri River Dredging DEIS

After reviewing the draft of the Environmental Impact Statement (EIS) from the US Army Corps of Engineers (USACE) for the continuation of commercial dredging along the Missouri River, the Missouri Department of Natural Resources is providing the following additional comments:

1. **Section 3.4.6.1 – Methods of Measuring River Bed Changes**

   The Construction Reference Plane (CRP) was updated in 2010. This information should be incorporated into the analysis to evaluate recent trends from 2005 to 2010. Based on the hydroacoustic bed elevation data (HBED) analysis shown in Figure 3.4-21, and the stage trends shown in Figure 3.4-24, there has been aggradation occurring in the Kansas City reach in 2008 and 2009. Incorporating the 2010 updated CRP into the analysis and comparing it with the 1990-2005 change in CRP water surface elevations (Figure 3.4-20 and other locations in DEIS) might provide further insight into how extensive this aggradation has been. Another benefit of incorporating the 2010 CRP would be to analyze the effectiveness of the restrictions put in place in August 2007, which were "*intended to allow dredging to continue...with less-than-significant impacts...*"

   Also, it would be beneficial to have a table or chart of the amount dredged annually in each, rather than a sum total as shown in Figure 1.5-2. This would allow for easier interpretation and analysis of the stage trends charts, allowing for correlation between lower (or higher) dredging rates and river bed change.

2. **Section 3.4 – Conflicting data that requires further explanation.**

   The data displayed in Figure 3.4-20 and Figure 3.4-21 contain conflicting results, primarily at the confluence of the Grand River. Although Figure 3.4-20 displays water surface elevation, and Figure 3.4-21 displays average bed elevation both are used to interpret whether aggradation or degradation is occurring. Figure 3.4-20 shows a significant amount of aggradation occurring at this location, while Figure 3.4-21 displays degradation occurring at this location. This discrepancy is not addressed in the document, but it would be beneficial to have an explanation.

3. **Section 3.4.6.1 – pg 3.4-71 (last sentence prior to Section 3.4.6.2) and Section 3.4.6.3 - pg 3.4-89 *Commercial Dredging***

   "Figure 3.2-2" does not exist. This reference should be removed, or corrected with what I believe is the correct reference of Figure 1.5-1. Also "Figure 3.2-3" does not exist and should be corrected with 1.5-2.

4. **Section 3.16 – Table 3.16-2**

   Page 3.16-5, the first bullet point under Table 3.16-2 incorrectly states the State's Construction Permit rule. It is listed in the draft EIS as 10 CSR 10-6.050 Construction Permits. This should be corrected to read, 10 CSR 10-6.060 Construction Permits Required.

5. **Section 4.2 – pg 4.2-25 – Section 4.2.6 and Table 4.2-4**

   Under the description of Alternative A the statement is made: *"would increase the amount dredged in the St. Joseph and Waverly segments."* Table 4.2-4 shows a decrease from existing conditions in the amount dredged under Alternative A in the Waverly segment.

6. **Section 4.3 – Infrastructure**

   The Department recommends that the DEIS includes an analysis of potential impacts to contaminated sites located along the lower Missouri River that may be impacted by dredging. Potential threats to facilities that are located immediately adjacent to the Missouri River should be evaluated. The DEIS lacks specific quantitative analysis of threats to infrastructure. A more comprehensive analysis of threats supported by data and modeling would provide a better basis for evaluating alternatives.

7. **Section 4.4 – Table 4.4.2**

   The value shown under Alternative C for *Estimated Tons Delivered Per Day* in the Kansas City Segment *Total* row is incorrect. It is not a valid number.

8. **Section 4.5 – Water Resources**

   The DEIS discusses that a Total Maximum Daily Load (TMDL) has been written for the Missouri River for the pollutants chlordane and PCB. Two sections of the Missouri River have an additional pollutant impairment. Water Body Identification (WBID) #0226 (Kansas River to Iowa Stateline) and WBID #1604 (Mississippi River to Gasconade River) are both listed as impaired for bacteria on the 2009 assessment sheets (proposed 2010 303(d) list).

   The issue of water quality impacts that would result from opening new pit mines to augment Missouri River sand and sediments is not adequately addressed in the DEIS. These facilities would result in significant land disturbance, can involve impacts to wetlands, streams and groundwater. A more detailed analysis of these impacts should be included in the evaluation of alternatives that call for development of alternative sources. The Department suggests that the Corps should examine information and data related to existing similar facilities.

   The Missouri River has a U.S. Environmental Protection Agency approved Total Maximum Daily Load for Chlordane and Polychlorinated Biphenyls due to bioaccumulation of these contaminants in fish tissue. All allocations were set at zero pounds per day; which means, no new loading of these contaminants in the Missouri River is allowed. The Department would need to complete an Antidegradation review as part of the Section 401 Water Quality Certification.

9. **Section 4.10 – Economics and Demographics**

   The DEIS fails to consider the volatility of motor fuel prices in its consideration of alternatives that would require long distance hauling of sand and gravel from distant sites. The economic analyses of the No Action Alternative and Alternative A would be significantly impacted by dramatic increases in transportation fuel costs. The Department recommends that the Corps modifies the transportation cost model to acknowledge the potential for variations in fuel costs.

   The Transportation Cost Model was used to develop estimates of the short-term costs of construction sand and gravel. *"The model estimates the current transportation costs of shipping the approximately 6.9 million tons of LOMR sand and gravel; then as necessary for various alternatives, the model predicts production levels at alternate supply sources based on available supplies, relative prices, and transportation costs."* The model chooses alternate sources by assuming that *"demand centers will purchase sand and gravel from the least expensive sources..."*

   It would be beneficial to see more than the average short term cost of sand and gravel produced by the Transportation Cost Model. A table could be provided for each segment of the alternate sources chosen by the model, the amount of sand and gravel produced under each alternative from that source, the transportation cost, and the distance from the demand center.

   These alternate sources chosen by the Transportation Cost Model could be used throughout the EIS to provide a quantification of several of the analysis categories, and could significantly strengthen the economic analysis. For example, under Section 4.04: Navigation and Transportation, this information could be used to provide some base estimate of the effects from truck transportation on surface roads from alternate sources, such as maintenance and repair costs. This information would also have a significant impact on the air quality and climate change analysis due to the extended travel time from many of the alternate source locations. Although these alternate sources may not be the ultimate source chosen if a reduction in dredging is implemented and it cannot be known what kind of production increase may occur at these sources, they would at the very least provide a limited quantified view of a possible scenario, rather than solely a qualitative view for several areas of the DEIS.

10. **Section 4.14 – Air Quality and Climate Change**

    On pg 4.14-8,9 – Table 4.14-3 The Federal de minimis threshold is exceeded for NOx in St. Charles as well as St. Louis County. In the text following the table only St. Louis County is acknowledged.
    On page 4.14-6, Table 4.14-1 Summary of Criteria Pollutant and Greenhouse Gas Emissions from Construction of the Master's Dredging Company Sand Plant at Waldron (tons/year), the construction emissions of the following emission categories are not listed: volatile organic compounds, oxides of nitrogen (NO_X),

and carbon monoxide. These emissions should be listed and compared with the threshold emissions listed in the table.

On page 4.14-9, Table 4.14-3 Conformity Analysis for the Proposed Action (tons/year), states that the increased emissions in St. Louis County for NO_X are 144.42 tons/year. It is advised that if practical, diesel towboat and dredge boat operations should use diesel engines meeting at least tier II emission levels. This will dramatically reduce emissions of both diesel particulate matter as well as NO_X compared to the use of a lower tier emission level engine.

NAAQS – The St. Charles segment of this project is in nonattainment of the National Ambient Air Quality Standards for ozone and Particulate matter 2.5 microns or less (PM2.5). It is also a maintenance area for Carbon Monoxide. In addition, it is noted that U.S. Environmental Protection Agency (EPA) is currently revising the eight-hour ozone standard, which has been proposed at a range between 60 and 70 ppb. Depending on the value of the standard selected by EPA, more areas along the Missouri River could potentially be designated nonattainment under the revised standard.

The Department recommends, to the extent practicable, that the use of heavy construction equipment and commercial towboats and dredge boats should be limited on days with orange or red Air Quality Indices (AQI). High AQI represent potentially poor air quality days in the St. Louis area. This action would ensure that these diesel engines do not contribute to future ozone and PM2.5 exceedances. Additionally, if practical, the use of diesel engines and equipment that have been retrofitted with a diesel oxidation catalyst or other air pollution control device would further reduce the mobile source emissions related to the project.

General Conformity – Any non-transportation project of the federal government located in the counties of Franklin, Jefferson, St. Charles, St. Louis and the City of St. Louis in the St. Louis nonattainment areas for ozone and PM2.5 and the maintenance area for carbon monoxide, which does not conform to an applicable implementation plan, is subject to the general conformity process found in10 CSR 10-6.300 Conformity of General Federal Actions to State Implementation Plans. It is noted that the USACE has made the general conformity determination for ozone in the St. Charles segment of the proposed project as well as the alternative projects; however, no conformity determination has been made for PM2.5 or carbon monoxide in the St. Charles segment of the proposed project or the alternatives.

Heavy Duty Diesel Vehicle Idling – State regulation 10 CSR 10-5.385 restricts heavy duty diesel vehicles with a gross vehicle weight greater than 10,000 pounds that operate in the counties of Franklin, Jefferson, St. Charles and St. Louis, and the City of St. Louis from idling more than five (5) minutes in any sixty (60)-minute period except as otherwise exempted from the rule.

Fugitive Dust - In regards to all proposed construction, and the dredging and transporting of sand and gravel, state regulation 10 CSR 10-6.170 restricts the emissions of particulate matter to the ambient air beyond the premises of origin. Efforts should be made to control any potential fugitive dust that may result from any proposed construction as well as the dredging and transportation of sand and gravel that will be associated with this project.

Open Burning – In regards to any open burning that might be planned to dispose of vegetative debris, state regulation 10 CSR 10-6.045 prohibits the open burning of tires, petroleum-based products, asbestos containing materials, and trade wastes. It also does not allow open burning that causes or contributes to a public health hazard, nuisance, or a hazard to vehicular or air traffic. An open burning permit must be obtained from the department to burn untreated wood waste or vegetative debris from land clearing operations. For projects that fall within a nonattainment area, the application for an open burning permit must also include a demonstration that the emissions from the open burning of the specified material would be less than the emissions from any other waste management or disposal method.

Odor – While it is not expected that any odor violations will occur through the dredging operations in the Missouri River, it is noted that no person may cause, permit or allow the emission of odorous matter in concentrations and frequencies or for durations that odor can be perceived when the air is diluted to 7:1 volumes of odor-free air to odorous air for two separate trials not less than 15 minutes apart within 1 hour. Specific requirements can be found in area specific rules 10 CSR 10-10-2.070 for Kansas City, 10 CSR 10-3.090 for Outstate Missouri, 10 CSR 10-4.070 for Springfield/Greene County, and 10 CSR 10-5.160 for St. Louis.

MISSOURI DEPARTMENT OF CONSERVATION

Headquarters
2901 West Truman Boulevard, P.O. Box 180, Jefferson City, Missouri 65102-0180
Telephone: (573) 751-4115 ▲ www.MissouriConservation.org

ROBERT L. ZIEHMER, Director

September 7, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, Missouri 64106-2896

Dear Mr. Wheeler:

The Missouri Department of Conservation (MDC) appreciates the opportunity to review the Draft Environmental Impact Statement (DEIS) for Missouri River Commercial Dredging. MDC is responsible for the conservation and restoration of the fish, forest and wildlife resources in the state and finds it important and beneficial to evaluate and comment on projects and activities affecting these public resources. Based on this unique role, MDC provides the following comments related to the DEIS.

The DEIS evaluated a proposed action (11.6 tons/year distributed amongst 11 permit applications) and a set of more restrictive alternatives or actions for a stretch of the lower Missouri River from the mouth near St. Charles, MO to river mile 498 at Rulo, NE. The DEIS found significant degradation of the river bed has occurred near urban centers along the river and is most pronounced near active dredging areas. Other portions of the river were found to be relatively stable to slightly aggrading. The U.S. Army Corps of Engineers has made no decision regarding the DEIS and will still need to evaluate all options, as required by NEPA, in order to take a federal action.

MDC recognizes the value of Missouri River's sand and gravel resources to the overall economy of the state and the importance of its geographic location to deliver a low-cost and efficient commodity to satisfy regional demand. However, the proposed action and a few of the alternatives do not appear to be sustainable, both to the users and to the natural resource, and will result in further degradation of the river bed. MDC would support a federal action for the continuance of sand and gravel dredging on the Missouri River, if it does not cause continual river bed degradation, if it would not have significant impacts to species of conservation concern or their habitats, and if adjacent lands and associated infrastructure are protected. MDC would agree with a flexible solution, perhaps based on river segments, where adequate safeguards and adaptive management strategies would minimize cumulative impacts and mitigate for habitat losses.

COMMISSION

DON C. BEDELL
Sikeston

DON R. JOHNSON
Festus

CHIP McGEEHAN
Marshfield

BECKY L. PLATTNER
Grand Pass

If you need clarification, please call me at (573) 522-4115 ext. 3355 or through email at Doyle.brown@mdc.mo.gov.

Sincerely,

DOYLE F. BROWN
POLICY COORDINATOR

KANSAS
DEPARTMENT OF WILDLIFE AND PARKS

Mark Parkinson, Governor
J. Michael Hayden, Secretary

www.kdwp.state.ks.us

September 7, 2010

Mr. Cody Wheeler
Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Ref: D5.0900
Doniphan, Atchison, Leavenworth, Wyandotte
Track: 20100354

Ref: Project No. MO River Commercial Dredgers

Dear Mr. Wheeler:

We have reviewed MO River Commercial Dredgers, sand dredging in the Missouri River Wyandotte, Leavenworth, Atchison and Doniphan Counties. The project was reviewed for potential impacts on crucial wildlife habitats, current state-listed threatened and endangered species and species in need of conservation, and public recreation areas for which this agency has some administrative authority.

Project plans indicate that there will be construction activity within the active channel of the Missouri River. As such, an Action Permit will be required from our department. Several fish species; Chestnut Lamprey, *Ichthyomyzon castaneus*; Flathead Chub, *Platygobio gracilis*; Pallid Sturgeon, *Scaphirhynchus albus*; Sicklefin Chub, *Macrhybopsis meeki*; Silver Chub, *Macrhybopsis storeriana*; Silverband Shiner, *Notropis shumardi*; Sturgeon chub, *Macrhybopsis gelida*, and the Western Silvery Minnow, *Hybognathus argyritis*; all have critical habitat designated at some or all of the locations indicated in the Draft Environmental Impact Statement (Draft EIS). Permit conditions will protect peak spawning dates for the fish species mentioned above. To date an application for Action Permit has not been applied for. Project activity should not commence until more details are provided for the project.

A copy of the permit application can be obtained at
http://www.kdwp.state.ks.us/news/other_services/threatened_and_endangered_species/action_permit

Thank you for the opportunity to provide these comments and recommendations

Sincerely,

David Bender

David Bender, Ecologist
Environmental Services Section

Pratt Operations Office
512 SE 25th Ave., Pratt, KS 67124-8174
Phone 620-672-5911 Fax 620-672-6020 www.kdwp.state.ks.us

KANSAS
WATER OFFICE

Mark Parkinson, Governor
Tracy Streeter, Director

www.kwo.org

September 7, 2010

Mr. Cody Wheeler
Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Dear Mr. Wheeler:

The Kansas Water Office (KWO) asks that you consider the following comments about the Missouri River Commercial Dredging Draft EIS and proposed dredging permits. Our most pressing concern lies with the recent and ongoing bed degradation of the Missouri River limiting the ability of water suppliers and power utilities to access water and threatening to undermine flood protection levees and walls, and transportation infrastructure.

The KWO is opposed to approval of permits that would exacerbate the degradation of the Missouri River in the Kansas City segment. This segment should be allowed to recover and be reassessed after the degradation feasibility study is complete. It seems that, in all reaches, permits should be conditioned with degradation limits similar to those found in the Kansas River regulatory program, which appears to be successful.

If permits are granted in the Kansas City segment the KWO requests that an adequate no dredging buffer zone be established above and below for intakes and wells for the WaterOne and Kansas City BPU facilities. Likewise a no dredging zone should be established above and below segments of flood protection levees and walls that are being undermined by bed degradation.

Thank you for the opportunity to provide comments related to commercial dredging on the Missouri River. Please feel free to contact my office if you have questions regarding this issue.

Respectfully,

Tracy Streeter

Tracy Streeter
Director

901 S. Kansas Avenue, Topeka, KS 66612-1249 • Phone: (785) 296-3185 • Fax: (785) 296-0878

KANSAS

KSR&C No. 10-08-044

Kansas Historical Society
Jennie Chinn, *Executive Director*

MARK PARKINSON, GOVERNOR

August 4, 2010

Cody Wheeler
Regulatory Project Manger
U.S. Army Corps of Engineers
601 East 12th Street, Room 402
Kansas City, Missouri 64106-2896

RE: Draft Environmental Impact Statement (DEIS)
Missouri River Commercial Dredgers
Atchison, Doniphan, Leavenworth, and Wyandotte Counties

Dear Mr. Wheeler:

The Kansas State Historic Preservation Office has reviewed your public notice dated July 15, 2010 presenting a Draft Environmental Impact Statement (DEIS) relating to renewal and issuance of dredging permits along the Missouri River. The DEIS describes five alternatives: (1) ceasing all Missouri River dredging, (2) accepting the level of sand and gravel removal currently being proposed by several dredging companies, and (3-5) alternatives A, B, and C that propose progressively higher levels of sand and gravel removal.

Channel degradation is clearly of greatest concern regarding dredging operations at any level of sand and gravel removal. As the DEIS points out, the main considerations for cultural resources in and along the Missouri River (tied to channel degradation) are the integrity of historic bridge piers and potential impacts to archeological sites from tributary head cutting. We note that exclusion zones near bridge piers are already in place, and would continue under any of the proposed scenarios. From our perspective, lower levels of sand and gravel dredging would be preferable so as to lessen the potential for head cutting and erosion of tributary streams that possess good potential for archeological sites. We assume that should such erosion occur, cultural resource investigations would be undertaken. As the DEIS indicates, reduced levels of dredging would likely result in additional open pit sand and gravel mining operations along the Missouri River floodplain. Should that be the case, our office assumes that cultural resource investigations (including consideration of known shipwreck locations) would be undertaken.

If you have questions regarding Section 106 procedures in Kansas, please contact SHPO Archeologist Tim Weston at 785-272-8681 (ext. 214) or Review & Compliance Coordinator Kim Gant at 785-272-8681 ext. 225.

Sincerely,

Jennie Chinn
Executive Director and
State Historic Preservation Officer

Patrick Zollner
Deputy State Historic Preservation Officer

RECEIVED
REGULATORY BRANCH
2010 AUG -9 AM 9:43

6425 SW 6th Avenue • Topeka KS 66615-1099
Phone 785-272-8681, ext. 205 • Fax 785-272-8682 • jchinn@kshs.org • TTY 785-272-8683
kshs.org

Montgomery County Commission

Rich Daniels
1st District Commissioner

Charles Korman
Presiding Commissioner

John W. Noltensmeyer
2nd District Commissioner

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:39

September 2, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, Mo.

RE: Comment by the Montgomery County Commission on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the County of Montgomery, we are expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, Mo.

We at the county realize the importance of sand dredging to our county. This local source for sand helps to stabilize the cost of concrete, asphalt, and masonry products used in and by our county. All of the mentioned products would increase in cost should we be forced to truck sand long distance for those products. There is also the loss of employment in our community should dredging be eliminated. In a time of budget short falls and high unemployment, it would seem counter productive to eliminate sand dredging on the Missouri river.

We at the Commission support the continuation of commercial sand dredging on the Missouri River and surrounding reaches at levels no less than current production. We appreciate the opportunity to comment on this very important matter.

Sincerely,

Charles W. Korman
Presiding Commissioner

Rich Daniels
First District Commissioner

John Noltensmeyer
Second District Commissioner

211 East Third Street, Montgomery City, MO 63361
Office 573-564-8091 Fax 573-564-8088
Email: cocom@mccountymo.com

CITY OF
HERMANN
1902 JEFFERSON STREET ▲ HERMANN, MO 65041

September 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Comment by the City of Hermann MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler:

On behalf of the City of Hermann MO, I am expressing our support for commercial sand dredging on the MO River in Reaches surrounding Hermann MO.

The City of Hermann realizes the importance of commercial sand dredging to our local economy. MO River Sand provides us and central MO with high quality, low cost aggregate to produce concrete and asphalt. Which helps keep building cost lower and provides residents with high quality good paying jobs.

We support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the MO River at levels no less than current production. We appreciate the opportunity to comment on this very important matter.

Yours truly,

Larry Miskel
Mayor

RECEIVED
REGULATORY BRANCH
2010 SEP -3 AM 11:30

VOICE 573-486-5400 ▲ FAX 573-486-5432 ▲ WEBSITE WWW.HERMANNMO.COM

City of Saint Louis
DEPARTMENT OF PUBLIC UTILITIES
—WATER DIVISION—

FRANCIS G. SLAY
MAYOR

Office of the Water Commissioner
1640 So. Kingshighway Blvd.
Saint Louis, Missouri 63110
(314) 633-9000
FAX: (314) 664-6786

CURTIS B. SKOUBY, P.E.
WATER COMMISSIONER

September 7, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: City of St. Louis Water Division – Impacts to facilities
Commercial Sand Dredging Environmental Impact Statement

Dear Mr. Wheeler:

The City of St. Louis Water Division understands that an Environmental Impact Statement has been prepared regarding the reissuance of commercial dredge permits on the Missouri River.

The City of St. Louis Water Division supplies water to the City of St. Louis. One of the City's two treatment plants is located on the Missouri River drawing water directly from the river.

I would like to take this opportunity to thank you and the Corps for the opportunity to comment as well as the opportunity to meet with my staff and discuss the various aspects of the Draft Environmental Impact Study (EIS). The Corps role in managing our rivers, lock and dams and levees is paramount, and I commend you for your efforts.

Dredging material from the Missouri River significantly contributes to the availability of concrete in our region and keeps costs at a reasonable level. Commercial dredging of sand in our area delivers positive economic benefits, but should be done so that it does not negatively impact the infrastructures of others. We do not believe our customers should bear the burden of increasing water rates required to make modifications to our intake or levees. It would seem that optimization of the interests of and outcomes impacting dredging contractors and water facility operators would be to not allow any degradation in the vicinity of water facilities.

In the Draft EIS, Section 4.3 Infrastructure describes serious short-term and long-term effects to water intakes in the St. Charles Segment. The City of St. Louis' Water Treatment Plant Intake is within this Segment as described in the Draft EIS. The Draft

EIS further states that the cost to modify this structure would be within the $1 - $2 million range with that cost being passed on to the large customer base. Our intake structure is an integral part of our pumping station and our costs would more likely be in the $25 - $35 million range. Our customers would rightly object to this extra expense.

The Draft EIS describes serious short-term and long-term effects on levees and riverbank stabilization due to potential Missouri River dredging. Our facility on the Missouri River is protected by a levee. Any permit issued should safeguard these levees.

Again, I appreciate the Corps efforts and look forward to future endeavors with the Corps.

Respectfully yours,

Curtis B. Skouby, P.E.
Water Commissioner
City of Saint Louis

CITY OF
WASHINGTON
MISSOURI

August 12, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Comment by the City of Washington on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler:

On behalf of the City of Washington, Missouri ("Washington"), with the support and direction of our City Council, I write expressing our support for commercial sand dredging in the Missouri River in the reaches surrounding Washington.

Washington recognizes the importance of commercial sand dredging to our local economy. Missouri River sand is processed adjacent to our River and provides us quality material to produce concrete and asphalt. Missouri commercial sand keeps our cost to build infrastructure reasonable, and having immediate access to it here in Washington reduces our overall transportation costs for numerous construction projects.

Dredgers in the Washington area are barely noticeable, do not cause excessive noise or disruption to our community, and provide valuable jobs locally.

Our dredgers are an important element of navigation on our River. This is an area that Washington has a continued interest. Increasing navigation on our River is a priority, and the development of ancillary facilities in our area is of great interest. Having the dredgers as a resource and their knowledge of shipping bulk materials is of great value to Washington.

For the reasons so stated, we support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels no less than current production. We appreciate you placing this comment in the administrative records.

Very truly yours,

Sandy Lucy
Mayor

405 JEFFERSON STREE
WASHINGTON, MO 63090
CITY CLERK/HR (636) 390-1006 • COLLECTOR'S OFFICE (636) 390-1048 • ACCOUNTS PAYABLE (636) 390-1042 • FINANCE MANAGER (636) 390-1040 • UTILITY CUSTOMERS (636) 390-1045
FAX: (636) 390-1068

C: MDNR Water Pollution Control Program
PO Box 176
Jefferson City, MO 65102

KDHE Bureau of Water
Watershed Management Section
1000 SW Jackson Street, Suite 420
Topeka, KS 66612-1367

BILL NO. 10-10782 INTRODUCED BY: BRINKER

ORDINANCE NO. 10-10751

AN ORDINANCE AUTHORIZING AND DIRECTING THE SUBMITTAL OF A COMMENT LETTER IN SUPPORT OF COMMERCIAL SAND DREDGING ON THE MISSOURI RIVER TO THE U. S. ARMY CORPS OF ENGINEERS.

BE IT ORDAINED by the Council of the City of Washington, Missouri, as follows:

SECTION 1: The Mayor and City Clerk are hereby authorized and directed to send the attached letter to the Regulatory Project Manager of the Kansas City District of the U. S. Army Corps of Engineers in support of commercial sand dredging as a formal comment to the Environmental Impact Statement for the renewal of permits for the commercial sand dredging industry on the Missouri River. A copy of said letter is marked Exhibit I and attached hereto and incorporated herein by reference.

SECTION 2: That this Council hereby supports commercial sand dredging on the Missouri River along with navigation on the Missouri River and the continued expansion of navigation on the Missouri River including ancillary facilities for navigation at the City of Washington, Missouri.

SECTION 3: That this Council hereby states and recognizes that the act of dredging for commercial sand on the Missouri River is an asset that reduces costs for development of infrastructure made of concrete and asphalt, and that dredging operations do not produce excessive noise or observable air or water pollution in the reaches adjacent to the City of Washington.

SECTION 4: All ordinances or parts of ordinances in conflict herewith are hereby repealed.

SECTION 5: This ordinance shall be in full force and effort from and after its passage and approval.

PASSED: 08-16-10

ATTEST: _____ City Clerk

_____ President of the City Council

APPROVED: 08-16-10

ATTEST: _____ City Clerk

_____ Mayor of Washington, Missouri

City of Independence

WATER DEPARTMENT
11610 E. TRUMAN ROAD • P.O. BOX 410 • INDEPENDENCE, MISSOURI 64051-0380
www.ci.independence.mo.us/waterdept/

(816) 325-7700
FAX (816) 325-7699

U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street
Room 402
Kansas City, MO 64106-2896

September 3, 2010

Dear Sirs,

The City of Independence Water Department owns and operates 41 drinking water wells that supply water to the City of Independence, Missouri and 11 wholesale entities. The total population served by this water plant is approximately 250,000 people in Eastern Jackson County. One of the City of Independence wells is a horizontal collector well whose arms collect water from beneath the Missouri River at approximately River Mile 353.5. This well produces 6,940 gallons per minute which accounts for a significant percentage of the water we provide to our customers.

We share the concerns of other water suppliers regarding the potential that dredging could negatively impact this collector well. We are concerned that ongoing dredging could reduce the permeability of the aquifer which could reduce the amount of water that can be obtained from this well. We are also concerned that reduced levels of river bed material could provide less riverbank filtration for the water entering the well and thus increase the turbidity, pathogens, bacteria and viruses in the water coming from that well into our treatment plant.

We would respectfully request that a no-dredge zone be created 2,000 feet upstream and 2,000 feet downstream from our well at River Mile 353.5 to reduce possible impact to this well.

If you would like additional information, please free to contact me at 816-325-7698.

Sincerely,

Karen Kelley
Production Manager

MISSOURI FARM BUREAU FEDERATION
P.O. Box 658, 701 South Country Club Drive, Jefferson City, MO 65102 / (573) 893-1400

September 2, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Comments on the EIS for Commercial Sand Dredging on the Missouri River

Dear Mr. Wheeler:

On behalf of Missouri Farm Bureau, the state's largest agricultural organization, I am writing in support of continued sand dredging on the Missouri River. Our organization has been involved in issues surrounding the Missouri River for many years and our members continue to be strong proponents of a multiple use management strategy that incorporates commercial navigation and associated industries.

Commercial sand dredging plays an important role on the Missouri River. For example, sand mined from the Missouri River is critical to the enhancement of our region's roads and bridges. Sand is a vital component of many construction projects and generates substantial economic activity.

The U.S. Army Corps of Engineers' (Corps) ongoing inquiries and analyses have created an unnecessary cloud of uncertainty over the sand dredging industry. The industry has been tasked to fund the pending Environmental Impact Study at considerable expense.

It is our belief the Corps should be making every effort to promote commercial navigation on the Missouri River and the many benefits of our inland waterway system. This includes associated industries, such as sand dredging, that provide much-needed materials and yield significant economic benefits.

Like many others, we remain hopeful the Corps' Environmental Impact Statement will investigate all possible explanations for bed degradation and incorporate science-based recommendations that allow for a continuation of the dredging industry.

Sincerely,

Charles E. Kruse
President

From: Randy Asbury
To: Commercial Dredge, Missouri River
Subject: Mo River Commercial Dredgers
Date: Friday, September 03, 2010 2:38:00 PM

September 3, 2010

Mr. Cody Wheeler
Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street,
Room 402
Kansas City, Missouri 64106-2896

Dear Mr. Wheeler:

Thank you for the opportunity to provide comments in regard to the Missouri River Commercial Dredgers Environmental Impact Statement (EIS). My comments are provided on behalf of the Coalition to Protect the Missouri River (CPR). CPR represents the diverse interests of agricultural, navigational, industrial, utility and business-related entities. CPR supports responsible management of Missouri River resources and the maintenance of congressionally authorized purposes of the river including flood control and navigation.

I urge the continuation of commercial dredging at the current permitted volume levels. Degradation issues are not fully understood. The degradation study should provide answers to the causation of degradation; but, until such time as those answers are known, no restrictions should be imposed upon any entity. For that reason, commercial dredgers should not be singled out for restrictions during this EIS process.

Commercial sand dredging is critical to Missouri's economy. A reduction or elimination in the volume of sand dredging would adversely impact the State's ability to meet its highway infrastructure and general construction needs in a cost effective manner. Higher priced and lower quality materials would increase the burdens on a state already suffering in this economic downturn.

Therefore, I reiterate the importance of maintaining commercial dredging at the current permitted volumes levels.

Sincerely,

Randy Asbury
Executive Director
Coalition to Protect the Missouri River (CPR)
4849 Hwy B
Higbee, MO 65257
660-273-9903 Phone
660-273-2124 Fax
573-823-7906 Cell
moriver@howardelectricwb.com
www.ProtectTheMissouri.com

From: Chris Stewart
To: Commercial Dredge, Missouri River
Cc: Durward M. Johnson; James Epp
Subject: Public comments for Commercial Dredging EIS
Date: Wednesday, September 08, 2010 6:40:12 AM
Attachments: Collector Wells letter to BPU on dredging.pdf
BPU Dredging letter to Corps.pdf
B&V letter to BPU on dredging.pdf

Comments concerning dredging activities: The Board of Public Utilities in Kansas City Kansas prepared comments in 2005 concerning dredging operations in the vicinity of the BPU intakes and collector wells. Attached is a copy of the correspondence. The BPU position remains the same as indicated in the previous letters. However, our preference is to increase the distance to 1 mile upstream and downstream to ensure the continued protection of the BPU water supply and intakes structures.

Chris Stewart
Director of Civil Engineering
Board of Public Utilities
KCK 913 573 9894

BLACK & VEATCH

8400 Ward Parkway
P.O. Box 8405
Kansas City, Missouri 64114 USA

Tel: (913) 458-2000

Black & Veatch Corporation

Board of Public Utilities
Kansas City, Kansas

B&V Project 83104.611
B&V File B-1.1
February 7, 2005

Mr. Lanny Uden
Director of Civil Engineering
Board of Public Utilities
300 N. 65th Street
Kansas City, Kansas 66102

RE: River Dredging – Potential Adverse Impacts

Dear Mr. Uden:

It is our understanding that dredging of the Missouri River bed has occurred in the vicinity of your collector wells. While dredging to maintain the navigation channel is to be expected, any dredging outside of the navigation channel may adversely impact BPU's water supply system and the power plant cooling water supply.

Degradation of the Missouri River bed and consequent lowering of water levels in the river during low flows has been documented in the Kansas City area for some time. The rate of degradation appears to have increased since the 1993 flood. The occurrence of riverbed degradation indicates that sediments are being removed from the area. Dredging outside of the navigation channel will increase the rate of degradation. This has the adverse impact of lowering water levels, especially during low flows, in the river.

The lowering water levels reduce the saturated thickness in the aquifer which will reduce the capacity of your horizontal collector wells. As you are aware, these wells are the only raw water source for the Nearman Water Treatment Plant which serves over 145,000 residents in Kansas City, Kansas and Wyandotte County. In addition, the lower river levels caused by streambed degradation will lower the submergence on the Nearman Power Plant's raw water pumps at the power plant intake which will increase operational costs and reduce the capacity of the pumps. If river levels drop below the intake ports, the cooling water supply may not be functional and the power plant may have to shut down, as has been the concern this winter due to the extremely low levels on the Missouri River. In addition, riverbank filtration relies upon the riverbed material to reduce turbidity, pathogens, bacteria, and viruses. Reduction of the riverbed through dredging increases the possibility that these contaminants can pass through the river to the treatment plant and reduce the quality of water.

Board of Public Utilities
Mr. Lanny Uden

B&V Project 83104.611
February 7, 2005

The U.S. Army Corps of Engineers (COE) is aware of the degrading riverbed. They are considering conducting a study of the river to determine the causes of the increased rate of degradation and potential solutions. It is our recommendation that dredging of the Missouri River, except for that required for navigation, be prohibited in the Kansas City area until the COE determines the causes of the degradation and recommends solutions to the problem. Until this study is completed, a permanent no dredge zone should be established a minimum of 2,000 feet upstream at Collector Well No. 1, the space between the wells and 2,000 feet downstream of Collector Well No. 2.

If you have any questions relating to our recommendation, please contact us.

Sincerely,

BLACK & VEATCH CORPORATION

Michael G. Orth

Michael G. Orth

Collector Wells International, Inc.

6360 Huntley Road • Columbus, Ohio 43229
Tel: (614) 888-6263 • Fax: (614) 888-9208
email: collectorwells@collectorwellsint.com

December 15, 2004

Lanny L. Uden
Director of Civil Engineering
Board of Public Utilities
540 Minnesota Avenue
Kansas City, Kansas 66101

RE: River Dredging – Potential Adverse Impacts
Riverbank Filtration - Collector Well Nos. 1 & 2

Dear Mr. Uden:

It is understood that a river barge dredging operation was observed today in the Missouri River very close to your existing horizontal collector wells. It has been our experience that in-river dredging operations can be detrimental to riverbed filtration (RBF) conditions and therefore potentially adversely impact the water quality/quantity available from high-yielding horizontal collector wells such as yours.

It is understood that some dredging may be required to maintain navigational channels or control bank erosion and is therefore unavoidable. Others for sand and gravel mining should be avoided near RBF collection systems, such as yours. These operations can remove significant amounts of permeable aquifer materials and disrupt the natural filtration capacity of the streambed. Generally the depressions, which are developed as the streambed materials are removed, are filled by finer-grained deposits of silt and clay. These deposits reduce the permeability of the stream and aquifer and reduce the amount of water that can be pumped by your collector wells. Additionally the fine-grained materials may lead to reducing conditions and oxygen reduction in the aquifer. These conditions can result in poorer quality water being pumped by your wells.

Additionally, the dredging operations can accelerate the natural process of down-cutting (degrading) of the streambed. This leads to lower water levels in the river (and aquifer) and less available drawdown and therefore reduced yields.

For the reasons discussed above, it is recommended that steps be taken prohibit the dredging of the river for the exploitation of sand/gravel deposits (mining) near the existing collector wells. We would recommend a NO-DREDGE ZONE for mining be established that would extend a minimum of 2000 feet upstream of Collector Well No. 1

to 2000 feet downstream of Collector Well No. 2. Also, we recommend that BPU contact the Corp of Engineers to be placed on contact list for prior notification if dredging for navigational purposes (or any purpose) is scheduled within five miles of your facility.

The NO-DREDGE ZONE concept near an existing collector well is not new to the Kansas area. A no-dredging zone was established over five years ago for the first Olathe, Kansas collector well installed along the Kansas River near DeSoto. Additionally, it is understood that in-river mining has been significantly curtailed/eliminated along the Kansas River in recent years by the Corp of Engineers as the adverse impacts of this process have become more evident.

In summary, river dredging/mining can have adverse impacts upon RBF systems such your horizontal collector wells. Your system, once HCW-2 is completed and on-line, will be the largest two-well RBF system in the world, with a pumping capacity of over 100 MGD. It is prudent to take precautions to protect this valuable asset and resource. It is recommended that the wellhead protection plan for the collector wells be expanded to prohibit in-river mining within a minimum of 2000 feet and preferably within a mile.

If you have any questions or comments regarding this letter, please contact us.

Sincerely,

COLLECTOR WELLS INTERNATIONAL, INC.

Samuel M. Stowe
Technical Director

cc: D. J. Johnson, BPU
James A. French, Jr., CWI

FILE COPY

Kansas City Board of Public Utilities 540 MINNESOTA AVENUE • KANSAS CITY, KANSAS 66101 • (913) 573-9000

February 16, 2005

Mr. Mark D. Frazier
U.S. Army - Corps of Engineers
Kansas City District
700 Federal Building – 601 E. 12th Street
Kansas City, Missouri 64106-2896

Re: Missouri River Dredging

Dear Mr. Frasier:

The Board of Public Utilities provides drinking water to over 180,000 customers in Wyandotte, Johnson and Leavenworth Counties in Kansas. The utility has major concerns about the ramifications of dredging operations occurring in the vicinity of our Nearman Water Treatment Plant raw water supply source.

Our raw water supply comes from two horizontal collector wells. These are the two largest alluvial water producing wells in the world. Both wells can produce in excess of 40 million gallons of source water per day. Collector well #1 is approximately 850.feet northeast of the Nearman Creek Power Plant surface water intake and collector well #2 is 1000 feet northeast of the first. The State of Kansas has approved water rights for these wells based on scientific data demonstrating that the wells acquire 90% of their water from surface water, the Missouri River, and the remainder from groundwater. Within the next two years, these two wells will become our sole source for water. I have included Figures 1, 2 and 3 to help you in locating the wells.

We were first alerted of the potential adverse impact of dredging in the attached letter from our collector well contractor, Collector Wells International, Inc (CWI). CWI is a nationally known specialist in collector wells due to their 30 years of experience in site selection, well construction, and operation and riverbank filtration research. They write that "... (dredging) can remove significant amounts of permeable aquifer materials and disrupt the natural filtration capacity of the streambed." We know that this disruption not only affects the rate of water flowing down through the streambed and into our laterals, but also changes the

ability of the streambed to filter out river borne pathogens. In discussing our concerns with our engineering consultant, Black & Veatch, we were presented with similar arguments about the adverse impact of river dredging in the entire area of our Nearman Power Plant surface intake and the collector wells. In their letter, they write that "…riverbank filtration relies upon the riverbed material to reduce turbidity, pathogens, bacteria, and viruses. Reduction of the riverbed through dredging increases the possibility that these contaminants can pass through the river to the treatment plant and reduce the quality of water." From our further investigations, we know that the U.S. Geological Society, the Environmental Protection Agency, and the American Water Works Association Research Foundation are studying riverbed degradation affecting riverbank filtration systems.

The Board of Public Utilities believes that current scientific data provides justification to demand the immediate discontinuance of dredging from 2000 feet upstream of our Nearman Power Station surface water intake to 2000 feet beyond our well #2. Our concerns are great enough that Johnson County Water District No. 1 will be joining us as members of the American Water Works Association brief legislators on water issues in Washington, D.C. this April.

Sincerely,

Lanny L. Uden, P.E.
Director of Civil Engineering

Attachments

c: Leon Daggett
Tony Pike
Don Gray
Frank Yau
Darrell Dorsey

Douglas L. Baker
Attorney at Law
300 Boulder Street
Lawrence, Kansas 66049
Phone & Fax: (785) 841-8600
E-mail: doug@dbakerlaw.com

September 28, 2010

Cody Wheeler
Corps of Engineers
700 Federal Building
601 E. 12th Street
Kansas City, MO 64106-2896

Re: Missouri Sand Company, LLC

Dear Mr. Wheeler:

I write today per our telephone conversation of Thursday, September 16, 2010 regarding the above referenced company. As you are aware, Missouri Sand Company [MSC] is presently producing sand from property located in the Southeast quadrant of the intersection of Hwy 291 and Hwy 210. MSC owns approximately 360 acres of ground near that intersection, of which approximately 125 acres is mineable south of Hwy 210. In addition, MSC has leased the adjacent 120 acres to the south, or which approximately 75 acres is mineable. Both properties have been permitted through the local regulatory authorities and the Missouri Department of Natural Resources.

MSC is presently producing Missouri Department of Transportation [MoDOT] approved specification sand and a high grade lignite free C-33 concrete sand through a new state of the art classifying tower. The sand is being stockpiled in anticipation of the 2011 construction season. The response from Kansas City area concrete and asphalt producers has been very encouraging, with most taking samples of the C-33 sand to prepare their mix designs for 2011.

Notwithstanding comments from another area sand producer, MSC has a significant producible deposit of readily marketable sand. A half dozen bore holes to bedrock [up to 120 feet deep] on both the owned and leased property show a consistent sand deposit with reserves of 26 – 38 million tons. The variance in the estimated reserves is due to two factors: 1) whether the KCPL power transmission lines are relocated; and, 2) the final slope of the excavated pit. Because this is a pit operation the gradation of the deposit is well known and the processes used to mine the property yield a more consistent product than that material produced from the Missouri River.

I hope this letter has been helpful in your consideration of the various alternatives for dredging on the Missouri River. If you need copies of the bore holes referenced herein, or any other information germane to your considerations, please do not hesitate to inquire.

Sincerely,

Douglas Baker

DLB:cl

McCAFFREE & LANDOLL
ATTORNEYS AT LAW

WM. G. McCAFFREE
ERIC M. LANDOLL*
*ALSO ADMITTED IN KANSAS

LEGAL ASSISTANTS:
LISA GREENLEE
DEBBIE HUGHES
TOM ADDINGTON
SHERYL KNOLL

ROCKWOOD BUILDING
128½ WEST WALNUT
P. O. BOX 244
NEVADA, MISSOURI 64772

TELEPHONE (417) 667-2211
FAX (417) 667-6111

03 September 2010

Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Capital Sand Company, Inc. – Lexington Operations
Environmental Impact Statement

Dear Mr. Wheeler:

I contact you as special counsel for the City of Lexington, Missouri. My office represents Lexington in the purchase of assets from U.S. Water Company.

The Mayor has requested that I advise the Corps that the City of Lexington strongly supports the need for the permit issued to Capital Sand Company. This company has reportedly in the past assisted the City of Lexington in removing materials to provide for better intake at the river that provides water for all of the residents in the area of Lexington, Missouri. The purchase of these assets is subject to the final approval of the Missouri Public Service Commission, which we anticipate will be granted promptly.

We hope you make a favorable determination in granting Capital Sand the necessary permit extensions.

Very truly yours,

Wm. G. McCaffree

WGM:lm
cc: Jerry Brown, Mayor
City of Lexington, MO
919 Franklin Avenue
Lexington, MO 64067

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:34

Missouri Asphalt
Pavement Association

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:51

August 31, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Dear Mr. Wheeler:

I am writing this letter with regard to the U.S. Army Corps of Engineers Missouri River Commercial Dredging Draft Environmental Impact Statement (EIS).

The Missouri Asphalt Pavement Association (MAPA) represents over 75 companies engaged in highway construction, public works and commercial/private development. The reduction of or ban on dredging operations in the Missouri River will have a devastating economic impact, not only on our industry, but on the customers we serve.

This letter serves as official notice that MAPA opposes a ban or reduction in supply of dredged sand from the Missouri River. There are a number of reasons for our opposition to the findings of the report. The following is a summary of our comments:

- Dredging is not only important to the asphalt paving industry, it is also important to the State of Missouri. The study underestimates the impact of dredging on Missouri's economy and the impact of dredged sand as a resource.
- There are factual errors and conclusions about Missouri construction, shipping and transportation that significantly bias the outcomes of the analysis to the detriment of Missouri's construction industry.
- The presumption that 7 million tons of sand will be available from the Mississippi River, Kansas River and out-state sand and gravel operations is not correct and is inaccurate.
- Out-state sand and gravel sources do not provide the same volume, type, grade and quality of material available from the Missouri River. Even if they could, the shipping costs alone would drive up the cost of the end product.
- Retention of sediment behind Missouri River main stem dams and the design of the Bank Stabilization and Navigation Project are the principal causes of the lack of material in the Missouri River and the largest contributors to bed degradation. To blame the dredgers as the cause of bed degradation is simply factually inaccurate.
- Loss of dredging will ultimately lead to the demise of river navigation for barges. This will cause an increased unnecessary truck traffic load on an already congested interstate system.

Reducing production from or eliminating dredging operations on the Missouri River will have a significant impact on the cost of asphalt construction projects. In an economic period, such as the one we are in, when public agencies are looking to stretch their dollars, we can simply not afford to increase construction costs based on the inaccurate findings of the draft EIS.

For the reasons stated, any further reduction in the total amount of material currently authorized for Missouri River dredgers is detrimental to the construction industry in the State of Missouri and is a direct contradiction to Missouri's and the country's efforts to stimulate the economy. We support the issuance of permits for dredging on the Missouri River at quantities not less than currently authorized.

Sincerely,

David M. Yates

David M. Yates
Executive Director
Missouri Asphalt Pavement Association

Cc: Governor Jay Nixon
216 Capitol Bldg.
Jefferson City, MO 65101

MDNR Water Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102

KDHE Bureau of Water
Watershed Management Section
1000 S.W. Jackson Street, Suite 420
Topeka, KS 66612-1367

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President
Andy D. Ernst - Pace Construction Company

Vice-President
Tom Milne - Oreo & Botta Concrete Company

Secretary/Treasurer
Peggy McGrath - TraMar Contracting, Inc.

Executive Director
Jay Schultehenrich

September 3, 2010

Mr. Cody Wheeler, Regulatory Project Manager
United States Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Dredging Permits on the Missouri River

Dear Mr. Wheeler:

The SITE Improvement Association, a construction trade association consisting of 200 contractor members and businesses associated with the construction industry in Eastern Missouri, requests the U.S. Army Corps of Engineers extend the permits of the current dredging contractors operating on the Missouri River for five years without changes. These permits are under consideration for renewal and without the sand the dredging operators generate, it could jeopardize the construction industry in our region.

Because sand is a raw material used in many aspects of construction, its continued availability at a reasonable cost is vital to this industry. The economic conditions currently experienced in this country have been especially harsh in the construction industry. If the dredging permits are changed, it could increase supplier's costs and these expenses will surely be passed along to contractors, causing even further concern in an already depressed industry.

I know financial impact is just one of the criteria used in evaluating the permits, but our membership would hope it is balanced as strongly as the environmental issues are by the Corps of Engineers during its review process. SITE believes dredging the Missouri River in an environmentally safe and prudent manner can continue to be achieved without altering the current dredging permits.

Sincerely,

Jay Schultehenrich

Jay Schultehenrich, Executive Director
SITE Improvement Association

2705 Dougherty Ferry Road, Suite 203 • St. Louis, MO 63122
Phone (314) 966-2950 • Fax (314) 966-2999 • website: www.sitestl.org

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August 30, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Dara Page Genny
Cedar Knoll Farm
4360 Lyon School Road
Berger, MO 63014
573.834.5388

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2010 SEP -7 PM 4:04

Sept 3, 2010

HASENJAEGER TRUCKING, INC.
Lulu-Allan-Darrell
P O Box 78
Marthasville, MO 63357-0078

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Allan T. Hasenjaeger

RECEIVED
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2010 SEP -7 PM 4:03

Hasenjaeger Trucking, Inc.
Sept. 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Lulu Hasenjaeger
President
Hasenjaeger Trucking, Inc
PO Box 78
Marthasville MO 63357

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2010 SEP -7 PM 4:03

Sept 3, 2010

HASENJAEGER TRUCKING, INC.
Lulu-Allan-Darrell
P O Box 78
Marthasville, MO 63357-0078

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Darrell Hasenjaeger

DAVID J. PETERS TRUCKING, INC.

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September 2, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, Mo. 64106-2896

RE: Comment by the Residents of Hermann, Mo. on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,
On behalf of the City of Hermann and everyone in the local community, as well as everyone that makes their living in the dump truck industry and sand & gravel industry, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, Mo. We in the community realize the importance of commercial sand dredging to the local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.
We support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter. Thank You!

David J Peters

Ren Potterfield Trucking, Inc.

404 U.S. Hwy. 24 & 36 East. Monroe City, MO 63456
(573) 735-4528 • FAX (573) 735-4399

RECEIVED
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2010 SEP -7 PM 3:52

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the Hermann community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

In a time when it is imperative that we keep funds locally in order to stimulate the growth in our community, we need every single job for people to survive in this difficult economic time. Dredging Missouri River Sand provides Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within Hermann and counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Ren Potterfield

Ren Potterfield

Utility Trailer Sales of Kansas City, Inc.

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2010 SEP -7 PM 3:53

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comments on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO, my many customers, and everyone in that local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Regards,

Ronald J. Rowland / Sales Manager

8915 Woodend, Kansas City, KS 66111 Phone: (913) 441-2020 Toll free: (800) 874-6807 Fax: (913) 441-9590

WaterOne
Setting the Standard for Utility Excellence
Water District No. 1 of Johnson County

August 30, 2010

Mr. Cody Wheeler
Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Dear Mr. Wheeler:

On behalf of Water District No. 1 of Johnson County, Kansas, ("WaterOne"), I offer the following comments for consideration related to dredging permits and the preparation of the final Missouri River Environmental Impact Statement (EIS).

GENERAL COMMENTS

WaterOne believes that any dredging permits need to target an extraction quantity that will not result in additional degradation to the river channel and will improve those areas that experienced degradation. Water Intakes are typically designed for a 100 year life so even a 20 year degradation estimate is a short term estimate. It appears that Alternative A would be the most appropriate Alternative for the St. Joseph and Kansas City segments.

Because of uncertainties of dredging impacts on degradation to the river, WaterOne believes the permits should include ongoing monitoring of the impacts and provisions to suspend extraction in certain reaches of the river if ongoing degradation due to sand dredging is observed. The permits should be modeled after the permits issued on the Kansas River for sand dredging.

Given the close proximity of the Kansas City BPU Horizontal Collector Well's, the Kansas City BPU Nearman Bottoms Intake and the WaterOne Intake, a continuous no dredge band should extend from above the WaterOne Intake at 379.9 through the Kansas City BPU Horizontal Collector Well #2 at 378.3 with suitable buffer zones upstream and downstream because of uncertainties of dredging impacts on degradation to the river.

WaterOne believes a no dredging buffer zone for intakes and wells should be increased to 1 mile upstream and 1 mile downstream of these facilities.

WaterOne believes the proposed extraction rate for The Master's Dredging Company, Inc. is far too high for the 7 mile reach from Mile 383 to 390. WaterOne's new Horizontal Collector Well is located in the reach and WaterOne has plans for 3 more of these wells in its Master Plan.

WaterOne believes the EIS should explore synergistic extraction opportunities where off channel dredging connected to the river could be used to create amenities while meeting the sand supply needs. This type of dredging could create marinas and harbors for both recreation and barge traffic that would make recreation and navigation more attractive in these stretches of the river. Perhaps recreation access could be tied to the riverboat casinos and hotels constructed along the river.

WaterOne believes that water quality monitoring of the discharge from dredges should be required to protect drinking water supplies along the river

COMMENTS RELATED TO DRAFT EIS

1. **Page 4.3-6** -Typical costs for new water pumps and modifications to existing intake structures can range between $1 and $2 million (Schrempp comment).

   WaterOne expended over $2 million on emergency low water pumps. Those pumps were only sufficient to meet average day demands and would be totally inadequate in the summer. Typical costs have probably been higher for Kansas City BPU or Kansas City MO Water Services Department. The improvements represent "band-aids" and not replacement of the high and dry intake facilities.

2. **Page 4.3-7** - In 2004, Water One completed installation of emergency low-level pumping units at their Missouri River intake (RM 380) at a cost of approximately $2 million (Schrempp comment).

   On further evaluation, WaterOne expended closer to $2.5 million on emergency low water pumps. We have also concluded that degradation on the Missouri River has also caused a headcut and degradation on the Kansas River. WaterOne spent over $14 million on a new weir on the Kansas River at mile 13 to protect its intake on the Kansas River from degradation impacts. The EIS has not given adequate consideration to impacts to the tributaries.

3. **Page 4.3-11** – Impacts to Water Supply Wells

   The entire Kansas City segment from RM 391 to RM 357 clearly includes the WaterOne Horizontal Collector Well and narrowly misses the Independence Wellfield. Dredging restrictions should apply to these locations as well as the ones listed.

4. **Page 4.3-22** – Impacts to Bridge, Pipeline, and Cable Crossings.

   No mention is made of the bridge, pipeline and cable crossings near the mouths of tributaries where headcutting can and will occur.

5. **Page 4.3-35** - Intake facilities located in all segments except the Waverly segment could require modifications or installation of additional pumps to ensure sufficient water supplies. The cost of new pumps and modifications to existing intake structures can range between $1 and $2 million.

   Many of the water intakes have already spent money on "band-aid" modifications. Additional modifications will cost more and even at a 4 ft degradation in 20 years, some, if not all intakes, may require replacement at much greater expense. As mentioned in comment #1 the cost range appears to be low.

6. **Page 4.3-36** – Alternate B, Impacts to Water Supply Wells-St. Joseph and Kansas City Segments

   As in comment #3, there are other wells, not mentioned in this discussion.

7. **Page 4.3-39** - Intake facilities located in all segments, except the St. Joseph and Waverly segments, could require modifications or additional pumps to ensure sufficient water supplies under Alternative C. The cost of new pumps and modifications to existing intake structures can range between $1 and $2 million.

   The degradation impacts to water intakes will be greater than Alternate B indicates and the likelihood of replacement of an intake increases. The cost would appear to be significantly understated.

8. **Page 4.3-40** – Alternate C, Impacts to Water Supply Wells, St. Joseph and Kansas City Segments

   Same as comment #3 and #6.

In conclusion, WaterOne is not opposed to dredging in the river, but believes that activities must be limited and regulated to ensure that public water supply and other critical uses of the river are not forced to expend large amounts of dollars due to the dredgers activities. Our concerns and comments are primarily directed at the permits covering the St. Joseph and Kansas City segments. WaterOne realizes that dredging is not the sole cause of degradation in the river and requests that the Corps take corrective measures to address the other causes. Opportunities exist to find win-win solutions to these problems and we encourage the Corps needs to find ways to encourage those solutions to happen.

Thank you for the opportunity to provide these comments. Please contact me at (913) 895-5517 if you should have any questions.

Very truly yours,

Michael J. Armstrong
General Manager

MJA/jb

cc: Tom Schrempp
WaterOne Board
Col. Hofmann

U. S. WATER COMPANY

1023 Franklin, P. O Box 56
Lexington, MO 64067

TELEPHONE: (660) 259-29212 **FAX:.(660) 259-3729**

August 31, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RECEIVED
REGULATORY BRANCH
2010 SEP -2 AM 10: 37

Re: Capital Sand Company, Inc., Lexington Operations
Environmental Impact Statement

Dear Mr. Wheeler:

We understand that an Environmental Impact Statement was prepared concerning the issuance of commercial dredge permits on the Missouri River. As the water supplier for the City of Lexington (Lafayette County), we wish to express our support for the issuance of permits in the Lexington area for Capital Sand Co.

We utilize the Missouri River as our water source. We also own acreage along the Missouri River and our intake lines extend into the river. In our years of experience in dealing with Capital Sand, we have not been negatively impacted by the dredging operations but rather have benefitted by their endeavors as we continue to provide quality water to our customers. They have repeatedly assisted us with the issues regarding our intake including removing materials to provide for better performance, especially following low and high water conditions. We rely on Capital Sand to assist us with river issues and are grateful for the longstanding relationship.

As you know, we have authorized Capital Sand to mine material near our intake structures and inside the zone designated for protection under its permit. We have confidence in their ability. The sand that they dredge also benefits the local construction trade. In our view, the impact on the environment and, in particular, on our operation has been positive.

We hope that the Corps will make a favorable determination and grant Capital Sand the necessary permit extensions. Thanks for your consideration.

Sincerely,

Steven J. Schleicher
President

MRPWSA

Missouri River Public Water Supplies Association

ASSOCIATION OFFICERS
Association President:
Tom Schrempp
WaterOne of Johnson County, KS

Association Vice-President:
Joel G. Christensen
Metropolitan Utilities District, Omaha, NE

Association Secretary:
Curt Skouby
City of St. Louis, MO

Association Treasurer:
Bob Fuerman
Missouri American Water, MO

ASSOCIATION MEMBERS
Gene Schroeder
Lewis & Clark Nat. Res. Dist., NE

Ricky Mach
Sioux City Utilities Dept., IA

Doug Drummey
Council Bluffs Waterworks, IA

Jim Urfer
Higginsville, MO Municipal Util.

Vacant
City of Atchison, KS Water Dept.

John Kaufman
Leavenworth, KS Waterworks Dept.

Chris Stewart
Board of Public Utilities, KC, KS

John Luehrs
US Water, Lexington, MO

M.L. Cauthon III
Boonville, MO Bd. Of Public Works

Mike Klender
KCMO Water Services Dept.

Karen Kelley
City of Independence, MO

September 7, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Missouri River Public Water Supply Association – Impacts to facilities
Commercial Sand Dredging Environmental Impact Statement

Dear Mr. Wheeler

The Missouri River Public Water Supply Association (MRPWSA) understands that an Environmental Impact Statement has been prepared regarding the reissuance of commercial dredging permits on the Missouri River and would like to express our position for the reissuance of permits.

MRPWSA is an organization formed to protect the interests of drinking water supply utilities that draw their water source from the Missouri River or its alluvial deposits. It has over a dozen member utilities from the mouth of the Missouri River to Gavin's Point Dam supplying over 3.7 million persons with drinking water daily. Many of our members' intakes pull directly from the river and are at a fixed elevation.

We are aware that the material dredged from the Missouri River significantly contributes to the availability of concrete in our region and keeps costs at reasonable levels. We believe that commercial dredging of sand in our area delivers positive economic benefits, but also may be causing negative impact due to river bed degradation. We do not believe our customers should bear the burden of increasing water rates required to make modifications to our intake structures necessitated by river bed degradation. Should degradation occur due to commercial dredging, MRPWSA believes that any modification of intake structures to deal with degradation must be paid for by the companies that dredge material from the river. It would seem that optimization of the interests of and outcomes impacting dredging contractors and water intake facility operators would be to not allow any degradation in the vicinity of water intake facilities or water wells.

In Section 4 of the Environmental Impact Statement, the cost to modify any intake was stated as $1 million to $2 million. We believe this cost was grossly understated. Missouri American reports that they are currently replacing their

Jefferson City intake structure and pumps and the total cost is $10.7 million. WaterOne reports that a weir to protect its Kansas River Intake from degradation due to head cutting from the Missouri River cost over $14 million. All of our members' river intake structures are at a fixed elevation and modifying them for degradation would be costly. Water intake structures are designed to last at least 100 years, so even the 20 year degradation estimate in the EIS is a short term impact. The dredging permits must be designed to be sustainable over the long term.

Because of the uncertainties of dredging impacts on degradation to the river, MRPWSA believes the permits should include ongoing monitoring of the impacts and provisions to suspend extraction in certain reaches of the river if ongoing degradation due to sand dredging is observed. The permits should be modeled after the permits issued on the Kansas River for sand dredging. MRPWSA believes that no dredging zones for public water supply intakes and wells should be expanded to 1 mile upstream and 1 mile downstream of these facilities.

The EIS failed to identify several critical utility water sources including the new WaterOne Horizontal Collector Well and the City of Independence Well Field. It also gave very limited consideration impacts to tributaries to the Missouri River that would be impacted by head cutting due to degradation.

MRPWSA believes that the EIS should explore synergistic extraction opportunities where off channel dredging connected to the river could be used to create amenities while meeting the sand supply needs. This type of dredging could create marinas and harbors for both recreation and barge traffic that would make recreation and navigation more attractive in these stretches of the river. Perhaps recreation access could be tied to the riverboat casinos and hotels constructed along the river.

MRPWSA believes that water quality monitoring of the discharge from dredges should be required to protect drinking water supplies along the river.

In conclusion, we support the Corps' reissuance of commercial sand dredging permits at a level that will either not impact degradation of the river or would restore some of those areas impacted by degradation from past dredging. In the event that degradation does occur, any impacts caused by dredging must be paid for by the commercial dredging industry and their customers. The operators of water intake facilities on the Missouri River and their customers must not be forced to bear the burden of another industry.

Sincerely,

Tom Schrempp, P.E.
President
Missouri River Public Water Supply Association

MISSOURI LEVEE AND DRAINAGE DISTRICT ASSOCIATION

TOM WATERS, CHAIRMAN
36257 HIGHWAY Z
ORRICK, MISSOURI 64077
(816) 770-5562

LANNY FRAKES, VICE-PRESIDENT
13371 SW ST., RT. KK
RUSHVILLE, MISSOURI 64484
(816) 688-7820

CARL LENSING
CHAIRMAN EMERITUS
447 HIGHWAY 94
RHINELAND, MISSOURI 65049
(573) 236-4577

www.mldda.org

BILL LAY, SECRETARY
ROUTE 3, BOX 119
FAYETTE, MISSOURI 65248
(660) 248-3068

PAUL SEIGFREID, ATTORNEY
108 NORTH JEFFERSON
MEXICO, MISSOURI 65265
(573) 581-8888

WRITTEN COMMENTS:

DRAFT ENVIRONMENTAL IMPACT STATEMENT
MISSOURI RIVER
COMMERCIAL DREDGING
PROPOSED RENEWAL AND ISSUANCE
OF
DREDGING PERMITS
September 6, 2010

I would like to provide the following comments on behalf of the Missouri Levee and Drainage District Association. Our Association consists of levee districts, drainage districts, associations, businesses and individuals affected by the Missouri River and its tributaries. The Missouri Levee and Drainage District Association supports the renewal and issuance of dredging permits on the Missouri River.

Important to Our Economy

We believe the dredging of sand, gravel and other material used for construction and manufacturing plays a vital role in supplying the economic needs of our region. As stated in the Executive Summary of the Draft Environmental Impact Statement, "Dredging in the LOMR (Lower Missouri River) represents one of the most cost effective methods for supplying sand and gravel because the river provides sorted sand and gravel that does not require certain types of additional processing". The material found in the Missouri River has, for decades, provided sufficient quantities and quality aggregate for construction projects throughout the region. Dredging in the Missouri River is good for the regions economy, provides jobs and helps fuel the construction and manufacturing industries.

Dredging is not new to the Missouri River. Since the 1930's and maybe even before, dredging has been taking place on the Missouri River. Dredging materials from the Missouri River helped build roads, buildings, and other critical infrastructure in communities throughout the Midwest. Today, sand and gravel from the Missouri River continues to be used in projects across our region. This is an important industry. Failing to renew and issue permits for dredging the necessary quantities to supply the construction and manufacturing industries would have dramatically negative impacts to these industries and increase cost to the consumers of the region.

Bed Degradation and Dredging

Throughout the Executive Summary of the Draft Environmental Impact Statement references are made to bed degradation. While some areas along the Missouri River are seeing bed degradation, it is wrong to assume and more importantly blame the cause of the degradation on the dredging industry. The United States Army Corps of Engineers is in the beginning stages of a bed degradation study. Currently, there is NO EVIDENCE the dredging industry is to blame for the bed degradation. In fact, there are most likely many factors contributing to the degradation of the riverbed.

As stated in the Executive Summary, dredging has been taking place since the 1930's or before. Yet, the bed degradation concerns have only recently been observed to be accelerating (USACE 2010). The Lower Missouri River exhibited some riverbed degradation in the latter 1900's and now in the early 2000's. During the same time, dredging has been reduced, rock dikes and structures in the river have been eroding, major flooding has occurred, the creation of aquatic and terrestrial habitats has increased, and the management of the water released from flood control dams in the upper basin has changed. It is also important to note: Some areas of the Missouri River have seen increased riverbed elevations during the same time period others have seen degradation.

Referring to areas near St. Joseph, Kansas City, Jefferson City and St. Charles, the Executive Summary states, "Those areas where river bed degradation is most pronounced were found to be the same areas where commercial dredging has been most active". The Executive Summary fails to point out these are also areas where the channel is not as wide causing flows to be higher and the U.S. Army Corps of Engineers has done extensive dike notching in these locations. In addition, high flows and flooding over the past 15 years has eroded riverbanks, dikes and revetments, which may cause much more degradation than the limited dredging occurring.

Statements indicating dredging on the Missouri River has caused the bed degradation we are seeing today are misleading, irresponsible, and false representations of the many factors causing the degradation. Until the Corps of Engineers completes its study and we have a better idea of the true reason for the bed degradation, the dredging industry should not be blamed or singled out as the cause. Certainly, permits should not be denied due to bed degradation when the true cause of the degradation is still unknown.

Development of New Floodplain Open-pit Mines

New open-pit mining in the floodplain was listed in the Executive Summary as a possible alternate source to obtain sand and gravel material for the construction industry. The Missouri Levee and Drainage District Association is concerned with open-pit mining in the Missouri River floodplain. Mining areas near levee systems can weaken levees, increase under-seepage and reduce flood control protection. Transportation cost associated with longer haul distances would not only increase costs to the consumer, but also add additional traffic to our already over-crowded and deteriorating highway and rural roadway system.

Good Neighbors

The Missouri Levee and Drainage District Association has a good relationship with dredgers on the Missouri River. We believe dredgers are good neighbors who support agriculture, and the economy of our region with very little to no impact on local levees, groundwater, noise levels and air quality. We believe dredging sand and gravel from the Missouri River is cleaner and safer for the environment, more economically sound and has fewer impacts on the surrounding farmland, businesses and communities along the river. Dredging is important to Missouri and our economic growth.

We Support the Renewal and Issuance of Dredging Permits

The Missouri Levee and Drainage District Association fully supports the renewal and issuance of dredging permits on the Missouri River. We believe it is in the best interests of the State of Missouri and the United States to continue to allow sand and gravel material to be dredged from the River in quantities large enough to supply the construction and manufacturing industries in Missouri and throughout the Midwest.

Thank you for this opportunity to provide comments regarding the dredging permits.

Sincerely,

Tom Waters, Chairman
Missouri Levee and Drainage District Association

MISSOURI
AMERICAN WATER

Frank L. Kartmann
President
frank.kartmann@amwater.com

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St. Louis, MO 63141

www.amwater.com

P 314.996.2325
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C 314.630.5945

August 28, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Missouri American Water – Impacts to facilities
Commercial Sand Dredging Environmental Impact Statement

Dear Mr. Wheeler:

Missouri American Water Company understands that an Environmental Impact Statement has been prepared regarding the reissuance of commercial dredge permits on the Missouri River. I would like to express our position for the reissuance of permits.

Missouri American is the water supplier for the City of Jefferson City, St Joseph, MO, Parkville, Mo, St. Louis County, MO and portions of St. Charles County. We utilize the Missouri River as our water source with alluvial wells in St. Joseph and Parkville. Our water intake facilities on the Missouri River in Jefferson City and St. Louis County pull directly from the Missouri River and are at fixed elevations.

We are aware that the material dredged from the Missouri River significantly contributes to the availability of concrete in our region and supports maintaining construction costs at reasonable levels. We believe that commercial dredging of sand in our area delivers a positive economic benefit, but must take into account any negative aspects of degradation on other users of the river. Water intake facility operators and their customers must not bear the burden of increasing water rates required to make modifications to their intake facilities necessitated by river bed degradation. The cost of any river bed degradation related water intake facility modifications must be the responsibility of the companies that dredge material from the river. It would appear that optimization of the interests of and outcomes impacting dredging contractors and water intake facility operators would be to not allow any degradation in the vicinity of water intake facilities.

In Section 4 of the Environmental Impact Statement, the cost to modify the Jefferson City intake facility was stated as $1 million to $2 million. We believe this cost was grossly understated. We are currently replacing our Jefferson City intake structure and pumps and the total cost is $10.7 million. The cost stated in the EIS to modify the water intake facilities in St. Louis County was $1 million to $2 million each. All of our water intake facilities are at fixed elevations and modifying them for degradation would be costly. While it would require engineering studies and detailed design projects to develop firm estimates of the cost to modify our water intake facilities, our experience in constructing and operating such facilities indicates modification costs in excess of $11 million for each of the three intake facilities in our St. Louis County operation. What is more, these modifications would require the construction of additional structures in the Missouri River.

As you are aware, we have authorized and approved Capital Sand to mine material near our water intake facility and inside the zone designated for protection under the permit at our Jefferson City location. This authorization is based on an evaluation of the dredging operation's impact on the quality of the water entering our intake structure and the water we treat for potable purposes. It does not take into account any degradation of the river bottom.

In conclusion, we support the Corps' reissuance of commercial sand dredging permits at a level that will not cause degradation of the river. None the less, the cost of any modifications to or replacements of our facilities necessitated by degradation caused by the dredgers of aggregate material dredged from the LOMR must be the responsibility of those dredging operations and not the operators of water intake facilities and their customers.

Sincerely,

Frank Kartmann
President
Missouri American Water Co.

From: Lewis-Bade Engineering, Inc
To: Wheeler, Cody S NWK
Subject: Missouri River Dredging
Date: Monday, September 06, 2010 10:17:33 PM

Mr. Wheeler:

I would like to offer support for the dredging requesters. Dredging allows for sand and gravel material to be used in concrete. Concrete is a widely used building material for residential, commercial and municipal infrastructure projects. It is important for Missouri's economy to have materials such as concrete available at a feasible and reasonable cost.

Pea gravel is also used for recirculating sand filter waste water treatment systems. The sand filter systems allow for an efficient treatment of waste water through a natural media such as pea gravel. Close availability is important to keep transportation and fuel costs for this treatment to be a feasible option when small communities are making decisions about central wastewater treatment. We are currently constructing an ARRA project for the Village of Pendleton using pea gravel from Hermann Sand & Gravel.

If you have any questions feel free to contact me.

Thank You,

Bart Korman, PE, PLS

Lewis-Bade, Inc.
101 E. Walton Street
Warrenton, MO 63383
(636)456-2615
Fax: (636)456-7252
www.lewisbade.com <http://www.lewisbade.com/>

International Union of Operating Engineers

AFFILIATED WITH THE AFL-CIO

LOCAL NO. 101

6601 WINCHESTER, SUITE 280
KANSAS CITY, MO. 64133

OFFICE (816) 737-8600
FAX (816) 737-8700

RODGER KAMINSKA, Business Manager and International Vice President
SCOTT RETTIG, President
KURT CHAFFEE, Vice President

MIKE CHARLTON, Recording Secretary
TIM GOOCH, Financial Secretary
TERRY SIMPSON, Treasurer

International Union of Operating Engineers
Local No. 101
6601 Winchester, Suite 280
Kansas City, MO 64133

September 2, 2010

U.S. Army Corps of Engineers, Northwestern Division
Kansas City Division
601 E. 12th Street
Kansas City, MO 64106

Dear Sir or Madam:

Local No. 101 of the International Union of Operating Engineers currently represents 61 employees involved in commercial dredging operations in the Kansas City area. Local 101 submits this letter on behalf of those individuals and in response to the request for comments regarding proposed regulatory changes affecting commercial dredging operations on the lower Missouri River (LOMR).

Local No. 101 objects to the transfer of commercial dredging operations to rural sand pits for several reasons. Local 101 is primarily concerned with the deleterious economic impact a transfer or minimization of commercial dredging operations would have on labor and employment conditions in Missouri. Local 101 is most vehemently opposed to the proposed No Action Alternative. Although the Executive Summary to the Environmental Impact Statement (EIS) asserts that the No Action alternative would result in the greatest net economic gain statewide, the readily foreseeable impacts of the proposed geographic and industry shift to rural areas suggest otherwise. Commercial dredge operations in river locations near urban centers normally involve between 7 and 10 employees, whereas rural sand pit operations only require 2 employees per operation. The EIS contends that the No Action Alternative would result in the greatest net economic gain statewide because of geographic and industry shifts. The report however disregards the fact that these shifts are slow to progress and, while the detrimental impact to those whose jobs were displaced would be swift and dramatic, any conceivable benefits would not, if at all, be seen for some time. Accordingly, the No Action Alternative and any other proposal involving the reduction of commercial dredging operations on the LOMR is certain only to result in a significant loss of employment to the state of MO and the members of Local 101. In view of the current economic recession, preservation of existing employment should, one would think, be of primary concern to the Corps and to the state of Missouri.

Any decrease in or limitation on commercial dredging operations on the LOMR would also adversely affect related industries in the area. Sand acquired via commercial dredging is used as a raw material for production of other goods in several industries. The construction sector that relies on sand and gravel as a production input represents approximately 6.4 percent of the employment base in Missouri. (ES-8). A decrease in sand collection would particularly harm industries involving cement production, which rely on sand as a principal ingredient in cement manufacture. These industries, which are primarily located in urban areas, rely on the cheaper prices of sand collected through nearby commercial river dredging operations that do not carry the high transportation costs associated with rural sand pit operations. An increase in the cost of raw materials translates into increased costs to consumers.
As to the adverse environmental effects attributed to maintenance of the *status quo*, it does not appear that implementation of the No Action Alternative would necessarily produce a better result. Under the proposed No Action Alternative, sand and gravel collection operations would be shifted to rural locations distant from the urban centers and would, therefore, require greatly increased transportation of supplies and product. While the No Action Alternative might affect river bed degradation, it would certainly contribute to increased air pollution and infrastructure deterioration resultant from increased trucking. Heavy duty and medium heavy duty diesel vehicles used in the trucking industry generate the highest emission levels of harmful pollutants such as sulfur dioxide, carbon monoxide and nitrous oxides. THE ENVIRONMENTAL EFFECTS OF FREIGHT 22-23 (Organization for Economic Co-Operation and Development) (1997). The EIS mentioned a concern for greenhouse gas emission in its report (ES.8.2.6), but failed to account for the prospective increase in emissions due to the need for added trucking services. The additional transportation renders the No Action Alternative neither environmentally friendly nor efficient.

Additionally, any environmental concerns associated with commercial river dredging are best addressed by alternative measures. The Missouri River Recovery Program (MRRP) has the potential in the long term to offset impacts associated with commercial dredging. After weighing the environmental and economic impacts of the competing alternatives, it becomes clear that preservation of current commercial dredging operations on the LOMR best protects the interest of Missouri and its citizens.

In summary, Local 101 submits that in balancing the certainty of the current economic recession against the limited, and speculative, environmental benefit from diminution of commercial dredging operations on the LOMR, continuation of commercial river dredging operations at their current level is the alternative which bests serves the public interest.

Respectfully Submitted

Rodger Kaminska
Business Manager
and International Vice President

HBA
HOME BUILDERS ASSOCIATION
OF CENTRAL MISSOURI

August 31, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Dear Sir,

It is with great interest, the Home Builders Association of Central Missouri (HBA) has drafted this correspondence regarding the potential denial or reduction in quantity of permits by the U.S. Army Corps of Engineers for dredging operations along the Missouri River. The residential construction industry throughout Central Missouri relies heavily on the sand and gravel extracted from the Missouri River and object to reducing or eliminating dredging operations.

Restricting or prohibiting dredging operators along the Missouri River for sand and gravel would provide substantial harm to the home building industry throughout Central Missouri and to the State of Missouri. This change would create an immediate work stoppage due to limited supply and increase the construction material costs significantly. Without sand and gravel from the local area, raw materials would then be shipped from Mississippi and Kansas Rivers or from an out-of state operation causing unnecessary delay and increased costs.

The Home Builders Association request that the issuance of permits for dredging on the Missouri River remain at quantities not less than those currently authorized. Any future decisions regarding dredging activities along the Missouri River should be solely based on sound science and consider the economic impact upon the community to which the River resides.

Respectfully submitted,

Home Builders Association of Central Missouri
Vickie A. Muldoon, Executive Officer

Cc: Home Builders Association of Missouri
Cc: National Association of Home Builders
Cc: The Honorable Jay Nixon, Governor, State of Missouri
Cc: The Honorable Kit Bond, United States Senator
Cc: The Honorable Claire McCaskill, United States Senator
Cc: The Honorable Ike Skelton, United States Representative
Cc: The Honorable Blaine Luetkemeyer, United States Representative

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September 3, 2010

Mr. Cody Wheeler, Regulatory Project Manager
United States Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Dredging Permits on the Missouri River

Dear Mr. Wheeler:

As a construction contractor working in Eastern Missouri, my business, as are many other contractors, is dependant upon having a ready supply of raw materials from which my company can build improvements. One of the materials most often used is sand for concrete, asphalt production and other construction related activities. Being by two large rivers, there is an abundance of this material that can be safely extracted from the rivers by dredging at a relatively inexpensive price.

The permits of several of the companies that dredge the Missouri River for sand are up for renewal soon. It is my hope that the U.S. Army Corps of Engineers would renew these permits as is, without any changes. To change the permits by increasing regulatory constraints would have an adverse affect on an already fragile construction industry. Not being able to secure sand from the Missouri River would increase construction costs, which in turn would depress the construction industry even further.

Dredging the river to extract sand would not, in my opinion, adversely impact the ecological condition of the river. These types of operations have been on-going for decades along the Missouri River and the river still seems to host an abundance of wildlife and vegetation.

I would hope you take these comments into consideration before deciding on the dredging permits. There are many individuals dependent upon these operations for their livelihood.

Sincerely,

Joe Hoette
President

HERMANN Sand & Gravel, Inc.

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2010 SEP -3 PM 1:09

9-1-10

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Mr. Wheeler,

Our company is a small family business that has been in business since 1978. We have never had a complaint about what we do. We currently have 10 employees that depend on the river for their employment. We have over 3 million dollars of equipment invested that we use to provide our customers with quality products. We are what is left of a struggling navigation industry that was heavily scared from the Endangered Species Act (split nav season).

I believe the draft EIS is weak on economics. The fact that the pit mines around the State of MO would be able to take up the short fall is ridiculous. The sand would have to come from the Mississippi River and would have a major effect on price comparison and emissions that would come from the extra truck traffic. We deliver sand within a 120 mile radius of the MO River because the river is the best place to go. Economics has already drove us to the river. If there was an easier more profitable place to get the sand from we would be doing it already.

Some questions I have that shore up the fact that there is plenty of sand in the MO River. Why does the St. Louis District do maintenance dredging down river from the mouth of the MO River? Where does that sediment come from? Why did the St. Louis District spend millions to add dikes and chevrons in the Mississippi River below the old chain of rocks dam at approximately mile UMR 185 to keep it from shoaling in? Where did that sediment come from?

The bed degradation problem has been blown way out of proportion. In Hermann there is not a bed degradation problem. When you look at 80 years instead of 5 there is no change. There has been someone dredging in Hermann since the 1950's and no change.

Please take another look at the economics and look at more of a timeline in the river history. I have submitted elevation data and suspended sediment data that showed more sediment and a graph on river bed elevation in Hermann over the past 80 years to the corps in previous documents. We support commercial dredging at nothing less than current production

Yours truly,

Steven W. Engemann
President
Hermann Sand & Gravel, Inc.

ASSOCIATED GENERAL CONTRACTORS OF MISSOURI, INC.

P.O. BOX 94, 1221 JEFFERSON STREET
JEFFERSON CITY, MISSOURI 65102-0094
573-636-3188 • FAX 573-634-3510
WWW.AGCMO.ORG

Chairman: STEVEN J. SCHRIMPF
Vice Chairman: PATRICIA A. SCHAEFFER
Treasurer: MARK C. GAMES
President: DOUGLAS L. SMITH

August 30, 2010

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Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Dear Sir,

I am writing this correspondence to address consideration by the U.S. Army Corps of Engineers a denial, or a reduction in quantity of permits, which would constitute a ban on dredging operations on the Missouri River.

Our Organization represents over 235 companies engaged in public works, heavy and highway construction. Our members are directly involved with, and utilize the products which come from the dredging operations. These operations allow our membership to provide quality, long term/low cost products to the citizens of Missouri.

An increase in cost and a reduction in product, is not what the construction industry needs at this time. Our Membership, and Missourians as a whole, would be directly and adversely affected by any proposed ban on dredging operations.

I would like to go on record that our Association would oppose such a ban or a reduction in permits based on the following criteria:

- Dredging is important to Missouri. The economic analysis provided in a Draft Environmental Impact Study performed by representatives of the Corps is not correct and is inaccurate. This economic analysis understates the impact of sand on Missouri's economy and the impact of dredged material as a resource.

- The presumption that 7 million tons of sand will be available from the Mississippi River, Kansas River and out-state sand and gravel operations is not correct and is inaccurate. The Mississippi and Kansas Rivers are not available as sources, and the presumption is just incorrect.

- Out-state sand and gravel operations do not provide the same volume of material, cannot provide the same grade of material, and cannot provide the same volume of material and if they could, they would be doing so because of transportation costs at present.

- Retention of sediment behind Missouri River main stem dams and the design of the Bank Stabilization and Navigation Project are the principal causes of the lack of material in the Missouri River are the largest contributors to bed degradation. To blame the dredgers as the cause of bed degradation is simply factually inaccurate.

- There are factual errors and conclusion about Missouri Construction, shipping, and transportation that significantly bias the outcomes of the analysis to the detriment of Missouri Construction Industry.

By reducing a reliable source of sand for producing asphalt and concrete in meeting project specification, the quality and timely completion of construction projects will be harmed. Increased costs of production from a prohibition or severe limitation of Missouri River sand will hamper a Missouri Construction Industry which is already in crisis due to recession, declining funding and other factors which add to an already very uncertain future. Restricting sand production adds another barrier to recovery of the Construction Industry.

For the reasons stated, any further reduction in the total amount of material currently authorized for Missouri River Dredgers is detrimental to the Construction Industry in the State of Missouri and is direct contradiction to Missouri's and the country's efforts to stimulate the economy. We support the issuance of permits for dredging on the Missouri River at quantities not less that currently authorized.

Sincerely,

ASSOCIATED GENERAL CONTRACTORS of Missouri
Douglas L. Smith, President

DS/jlw

Cc. Missouri Department of Natural Resources, Water Pollution Control Program
KDHE Bureau of Watershed Management
The Honorable Jay Nixon, Governor, State of Missouri

EMERY SAPP & SONS, INC.

140 Walnut St.
Kansas City, MO 64106
O: 816.221.3500
F: 816.421.9333

2602 N. Stadium Blvd.
Columbia, MO 65202
O: 573.445.8331
F: 573.445.0266

5350 E. State Hwy. AA
Springfield, MO 65803
O: 417.833.9915
F: 417.833.9981

August 31, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

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REGULATORY BRANCH
2010 SEP -3 AM 11:30

Ref: Draft Environmental Impact Statement
Missouri River Commercial Dredgers

Dear Mr. Wheeler:

The following comments are made in reference to the Draft Environmental Impact Statement concerning renewal of permits for Missouri River Commercial Dredging Operations:

1. Emery Sapp & Sons, Inc. is one of the state's major concrete paving and bridge contractors with it's main office in Columbia, MO and branch offices in Kansas City and Springfield. The use of concrete, either from local ready mix plants or our own plants, is the main, and most important, construction material used in all of our projects. We are very aware of the costs of obtaining high quality sand in all of these market areas that meets the MoDOT specifications for use in structural and pavement concrete.

2. All of the sand that we use in these three market areas, as well as all of our jobs in central, southwest and northwest Missouri, comes from Missouri River Commercial Dredging Operations. The economic analysis provided in the Draft EIS is not correct and is inaccurate. In particular, the 25 mile radius for market area is extremely misleading and wrong and results in significant errors in the economic analysis of the various alternatives. For example, we purchase sand in the Springfield area from Capital Sand in Jefferson City which is a 130 mile haul, considerably more than the 25 mile radius that considered in this report.

3. The Draft EIS presumes that alternative land based sources will immediately replace dredged sand if dredging operations are stopped on the Missouri River. These alternative sources will result in higher prices and less supply. These alternative land base sources have never been an alternative for Missouri River dredged sand. We have never received a quote from a land based source for MoDOT concrete sand on any job. These alternative sources do not have the quality, reliability or capacity to step in and supply current requirements for the construction industry. If these alternative sources could meet these requirements, they would already be doing so because of the cheaper transportation costs associated with their product.

4. The Draft EIS lists a number of causes of channel bed degradation of the Missouri River. The retention of sediment behind the Missouri River main stem dams and the design of the Bank Stabilization and Navigation Project are the principal causes of the lack of material in the Missouri River and the largest contributors to bed degradation. It is factually inaccurate to place blame on the Dredgers as the cause of bed degradation. The COE should examine it's own role in the bed degradation argument and make changes in it's design and management of the Missouri River prior to completely eliminating key private enterprises that are a part of the economic engine across a wide swath of central Missouri that has as it's bookends the state's two largest metropolitan areas.

5. As stated above, there are many factual errors and conclusions about Missouri construction, shipping and transportation that significantly bias the outcomes of the analysis to the detriment of Missouri's construction industry. Until these misrepresentations are corrected, a true analysis based on facts cannot be made. It is incomprehensible that the COE would make such a potentially devastating decision that would affect not just the Missouri Construction Industry but also the economic well being of all of the citizens of the State of Missouri.

For the reasons stated above, any further reduction in the total amount of material currently authorized for Missouri River dredgers is detrimental to the construction industry in the State of Missouri and is a direct contradiction to Missouri's and the country's efforts to stimulate the economy. We support the issuance of permits for dredging on the Missouri River at quantities not less than currently authorized.

EMERY SAPP & SONS, INC.

Glen Robertson
Vice President of Operations

Cc: MDNR Water Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102

KDHE Bureau of Water
Watershed Management Section
1000 SW Jackson Street, Suite 420
Topeka, KS 66612-1367

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• SNOW PLOWS • ICE CONTROL EQUIPMENT • WHEELCHAIR LIFTS • TRUCK TARPS • HYDRAULIC PUMPS
• HYDRAULIC HOSE & COUPLERS • VAN INTERIORS • TOOL BOXES • ACCESSORY LIGHTS
• PICKUP BED LINERS • PICKUP BUMPERS • RUNNING BOARDS • GRILLE GUARDS

P.O. Box 290 • 2431 No. 5th Street • Quincy, IL 62306 • (217) 222-2743

Mr. Cody Wheeler, Regulatory Project Mgr.
U.S. Army Corps of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, Mo. 64106, 2896

RE: Comment on EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of my friends and customers at Herman Sand and Gravel, I am expressing support for commercial sand dredging on the Missouri River and reaches surrounding Hermann, Mo. I understand that some bird or frog or fish may need to move up or down river a block or two, but this is not too much to ask to keep families employed in these trying times. We at Knapheide are all for the conservation efforts that all states are engaged in to keep from eliminating species, but in the end we must have people with jobs that pay taxes to support the efforts of people such as yourself in taxpayer supported jobs. I appreciate your time and support in this matter.

Thank you...

Brian Osborne
Sales at Knapheide - Quincy

DAVID A. SHORR
DIRECT LINE: (573) 761-5005
EMAIL: DSHORR@LATHROPGAGE.COM
WWW.LATHROPGAGE.COM

314 EAST HIGH STREET
JEFFERSON CITY, MISSOURI 65101
PHONE: (573) 893-4336
FAX: (573) 893-5398

September 7, 2010

VIA ELECTRONIC TRANSMISSION
and FEDERAL EXPRESS

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Comments on the Draft EnvironmentalImpact Statement for Commercial Sand Dredging by the Applicants Holliday Sand & Gravel Company, LLC; Capital Sand Company, Inc.; Con-Agg of MO, L.L.C.; Hermann Sand & Gravel, Inc.; Limited Leasing Company (St. Charles Sand Company); and J. T. R., Inc. (Jotori Dredging)

Dear Mr. Wheeler:

The undersigned represents the following applicants: Holliday Sand & Gravel Company, LLC; Capital Sand Company, Inc.; Con-Agg of MO, L.L.C.; Hermann Sand & Gravel, Inc.; Limited Leasing Company (St. Charles Sand Company); and J. T. R., Inc. (Jotori Dredging). For purposes of this comment letter, the six existing commercial sand dredgers herein represented are often referred to as "dredgers."

As you and the U. S. Army Corps of Engineers ("Corps" or "USACE") Kansas City District ("KCD") Regulatory Program are aware, the above six commercial sand dredgers, consistent with guidelines for a third-party Environmental Impact Statement ("EIS"), have provided the necessary financial resources in excess of $2.4 million to cause the preparation by the Corps. ENTRIX has been the author, contractor, and principal preparer of the Draft EIS ("DEIS") document.

That expenditure having been tendered, the existing Missouri River dredgers must generally express their disappointment regarding the depth of the examination of their industry, the limited communication with the various existing dredgers who have different methods of performance, and the unchallenged presumptions presented as fact

throughout the document. We recognize that the timeline for this exercise has been compressed and that the compressed timeline results in some need for presumption. However, as will be discussed more below, the extent of which presumptions are taken as gospel throughout this document compromises the prospects and/or appearances of our industry. The risks relating to our livelihood are too high to ignore this point.

In addition and for the record, and acknowledging that it is not necessary to remind staff and the command, two applicants considered in this study have not participated in this study, have not paid for an element of the study, and do not have any current legal rights to the river. As such, we believe that removing the tonnage requests of those non-participating applicants is appropriate, significantly reducing the maximum demand stated in the document.

In addition, we must remind the Corps that any allocations to applicants outside the scope of this study will be subject to the greatest scrutiny of the participating group.

With those initial comments having been stated, we wish to thank the KCD's coordinating team for their efforts to shepherd the document toward this draft completion phase. While we may disagree with presumptions, conclusions, and correlations presented in this document, the efforts of the KCD staff have been significant, cordial, professional, and must be acknowledged.

STRUCTURE OF THIS COMMENT LETTER

This comment letter is structured in four sections.

Section One, General Comments, presents general issues of concern that permeate the document, addresses concerns of policies presented, and presents items which we believe are strategic flaws with regard to the completion of the EIS.

Section Two contains specific comments based on specific sections of the DEIS. These comments represent line-by-line errors, policy statements that we believe are inaccurate, conclusions which are not substantiated, and errors and concerns regarding the information presented.

Section Three contains Suggestions, Recommendations, and/or Conclusions regarding this document and issues relating to the renewal of commercial sand dredging permits.

Section Four contains the appendices. These appendices represent reviews of specific sections of the document where the applicants have acquired the services of experts because we believe them crucial to the final conclusion. The appendices reflect our concerns regarding the quality of the analyses in the areas of (a) geomorphology, (b) economics, and (c) legal policy.

The DEIS is extensive and voluminous. There is no dispute that the country is in a major recession, and that recession has impacted the six existing dredgers as principal suppliers to the construction trades. The cost of this EIS, regulatory negotiations, and regulatory compliance, when coupled with this economic downturn, have resulted in a significant financial strain on the dredgers. Generally, none of the dredgers have been able to invest in capital improvements or reinvest in their operations. Many have been forced into a layoff position, further increasing the enormity of the cost of this exercise. This is their livelihood. Our scrutiny is justified, and cursory conclusions and hypothetical correlations will not be accepted.

SECTION ONE – GENERAL COMMENTS

There are 12 areas of general concern with the content, policy, and interpretations of the DEIS. They are:

1. There are factual errors and conclusions about dredge operations and methodologies.
2. We do not agree with the findings and conclusions, presumptions, correlations, and assumptions in the geomorphology section.
3. The economic analysis understates the impact of sand on Missouri's economy and the impact of dredged material as a resource.
4. Segments in the document do not correlate with permit property rights presently existing.
5. The document relies on "Reports from USACE" and internal communications that are not peer reviewed or subject to external analysis. Many have not even been published.
6. Cutter heads.
7. Congressional Authorized Purposes establish the baseline criteria for evaluation.
8. Water quality and the states' 401 certifications.
9. Endangered pallid sturgeon.
10. Infrastructure does not have an entitlement to "certainty."
11. There is no proof that dredging leads to bed degradation.
12. The States of Missouri, Kansas, and Nebraska own the bed.

General comments are presented separately with the basis for our concerns.

1. **There are factual errors and conclusions about dredge operations and methodologies.**

There are numerous errors regarding dredge operations and methodologies.

There are multiple operational strategies and methodologies employed by the six existing dredgers on the River. These include significantly different strategic philosophies.

The values and differences relating to the different types of operations are vast. They are understated by the discussions presented in the document, are generalized to a point that the differences are non-existent, and result in incorrect assumptions regarding impact to the bed, trucking transportation, processing, cost projections, and operational methodology.

The understanding of the difference between suction demands and cutter head demands are equally misinterpreted within the confines of the document. The impacts of flow, flood stage, spring pulse, velocity, and other issues are also understated. Simply put, the authors attempt to interpret 100 years of dredging methodologies with two months of knowledge, and they have not been successful.

2. **We do not agree with the findings and conclusions, presumptions, correlations, and assumptions in the geomorphology sectio**n.

Our analysis of the geomorphology sections appears in Appendix A. Our analysis raises direct concerns with the conclusions in this section. The gaps in the analysis presented in this DEIS are significant and ripe for challenge.

The geomorphology sections speak in absolutes. While we recognize the need for some extrapolation, the far-reaching conclusions are neither justified nor documented.

The Corps has recently conducted a recon study with regard to bed degradation. The conclusion of the recon study is that further study by the Corps is appropriate. The Corps has requested millions of dollars and additional years to study this issue. The authors allegedly resolve this matter in two months.

This issue was raised at the public meeting held in Jefferson City on August 26, 2010. The response received was that there was no further need under the Bed Degradation Study to further evaluate dredging because of this EIS. It was implied that they had "found their culprit."

Be advised that if no further evaluation of bed degradation and the involvement of the dredging community is appropriate, we immediately demand transparency of this fact, the decency of advising that there will be no further review because of this alleged scientific document called a DEIS, and an appropriate pronouncement in the Federal Register and/or by rule so that an appeal can be tendered as to the conclusion.

With this statement having been tendered at the public meeting, our objections to this section are only intensified and our determination to publicly present its failures more determined.

We are particularly troubled by two sets of issues:

A. As it applies to the geomorphology of the river, the document clearly indicates the two most significant issues relating to the river are sediment

retention behind the dams and the design of the Bank Stabilization and Navigation Project ("BSNP"). The failure of the system to provide adequate sediment load by capture behind the dams affects bed quality and integrity. It is the greatest single factor in the disruption of bed development and delta formation on the river system. The actions of dredging are miniscule compared to this system oversight.

The failure to address, discuss, or evaluate the effect of the design of the BSNP and its self-scouring properties is of great concern. To compare the operations of dredging in such a finite mode without addressing the ultimate results of the BSNP design, scour rates, structure failures, and its intended congressional purpose is fatal error.

The design of the BSNP is also lost in the context of this DEIS. The design of the BSNP controls velocity, volume, width, elevation, head cut, erosion, and failure of sediment loading. This is just to name a few. While we support the BSNP and congratulate the Corps on its excellent effort, we must also admit that the design and control of the largest river system in North America is untested. This "grand experiment" by the Corps is far from perfect, far from precise, and an ongoing work in progress. To treat this as a minor item is disingenuous, and to place the burden for the entire bed development on the mere dredging of less than 7 million tons of bed material is an outrage of priority. It defies common sense.

We contend that the design of the BSNP, if it stays in its current position with the current loads of sediment from up north, will naturally degrade the river to bedrock over a given period of time with or without dredging. That is the design of the BSNP. To argue it is at stasis is untruthful as it cannot be at stasis without the load from behind the dams. To argue that the velocities created in the BSNP cannot cause adjustments to the bed, both positive and negative, is untruthful. To argue that the design is sustainable assumes that no scour will ever occur that is in excess of annual input. None of these positions were analyzed, noted, considered, or presented as having an impact.

B. When citing communications and memoranda from the Corps, there is no evaluation of the underpinnings, purpose, flaws, or integrity of the underlying work. The authors rely on unpublished, non-peer reviewed communications and compound their error by advancing those unpublished, non-peer reviewed conclusions as underpinnings throughout this document. By doing so, they unfairly represent the interests of the dredgers and bias the entire outcome of the analysis.

Finally, as stated more fully below, the dredgers believe that we have a right to this bed material. The failure of the system to provide the material to the dredgers is presumption not explored in this document. We contend that it is the Corps' obligation as part of the control of BSNP and the dams to assure the states of Nebraska, Kansas and Missouri have their expected resources. Nowhere in the document is the sand product considered that – a product – and a rightful possession of the citizens of the Lower Missouri River ("LOMR") states. The ownership of the bed is discussed in Appendix C.

To assume that extraction is a nemesis throughout this document is a one-sided story, especially when the Authorized Purposes provide for a requirement of flood control throughout the system.

3. **The economic analysis understates the impact of sand on Missouri's economy and the impact of dredged material as a resource.**

Our analysis of the economics sections appears in Appendix B. Our analysis raises direct concerns with the conclusions in this section. The gaps in the analysis presented in this DEIS are significant and ripe for challenge.

The presumptions in the economic analysis of the DEIS are not real. The economic analysis is predicated upon a theory that all sand lost from the river can be "made up" by pit mining in the flood plain, pit mining from other sources, and substitutions from the Mississippi and Kansas Rivers. In the temporal timeframe of this DEIS, it is reasonably certain that this conclusion is erroneous.

It is the dredgers' position that:

A. Existing sources cannot fulfill the demand (as more fully described in Appendix B) as the available volume, available quality, transportation distance, and available resources does not exist and only exists in the presumptions of the authors.

B. Availability of sand from the Mississippi and Kansas Rivers DOES NOT EXIST as no new permits have been issued on either watercourse and additional available authorizations may not be obtainable or transportable. Additional permits on the Kansas River are not available. Additional permits on the Mississippii River are not available. Limited Leasing (St. Charles Sand) has had a pending Mississippi River permit since 1999 that remains unfulfilled.

C. Flood plain open pit mines will not be available in the urban areas as replacement supply as zoning, levees, levee districts, and hydrologic concerns will not allow them to be developed.

The presumptions in the DEIS are naïve, lack support in fact, and are clearly derived by individuals who spent less than a month in Missouri.

Capital funding for such operations is limited. The present economy is not favorably situated for capital investments of this type with this kind of risk.

Finally, the economic analysis fails to recognize the costs in both dollars and time of extended litigation.

4. **Segments in the document do not correlate with permit property rights presently existing.**

The issue of segments is particularly troublesome for Capital Sand, the dredger which mines the longest distances on the river. Essentially, the authors have determined to split Capital Sand's operation for their convenience, not the convenience of the operational capability of Capital Sand or its business model.

Segments do not recognize that the reaches are the creature of the Corps and are already arbitrary and capricious in their own right. They have not been challenged to date because of an effort to cooperate to achieve a joint goal.

The segments proposed in the analysis of the document make presumptions that do not fit business models or business operations. They set arbitrary and theoretical constraints inconsistent with current practice and current property rights. Use of segments in a permitting strategy will result in objections by the parties. While segments are potentially convenient for this document, they are <u>not</u> acceptable with regard to permit analysis or issuance.

5. **The document relies on "Reports from USACE" and internal communications that are not peer reviewed or subject to external analysis. Many have not even been published.**

The analysis of bed degradation relies upon correlations and constructs that have not been subject to peer review or published. The reliance in this report of "communications" with the Corps' KCD is presumptuous, arbitrary, and not scientific.

6. **Cutter heads.**

The authors do not understand the use and design of cutter heads. Their conclusions regarding cutter heads are inaccurate.

7. **Congressional Authorized Purposes establish the baseline criteria for evaluation.**

Congress has set forth eight Authorized Purposes for the operation of the Missouri River system. The two primary Authorized Purposes are, in order of priority, navigation and flood control. The Authorized Purposes and the legislation that supports them have been extensively litigated, and the conclusions are well documented. Like other laws cited in the DEIS as "controlling," these congressional actions are the law of the land and mandate the acceptable public policy of the river system.

As such, these over-arching criteria dictate what constitutes the acceptable uses, and the EIS must conform with those legal realities, just as it must conform with the Endangered Species Act, the Clean Water Act, the Clean Air Act, and the National Environmental Policy Act ("NEPA") itself.

Congress has also dictated, along with the general requirements of Authorized Purposes, the general dimensions of the LOMR through its authorization language and direction regarding the BSNP.

So, as an example, when comparing recreational use on the LOMR to that of navigation, Congress has determined by law the priority established for the river. In the case of the example, navigation is a higher priority than recreation. Therefore, the analysis places those benefits for navigation over the benefits for recreation.

In comparison after comparison in this document, the failure to recognize the Authorized Purposes contained in the Flood Control Act of 1944 provides analyses not meeting priority under law. While the authors may believe that, for example, a man in a canoe has a greater right to a view of the bank of the Missouri River than a navigator on a tug pushing five barges, Congress has already decided that the priority view is that for navigation.

As NEPA is an analysis of the human environment, the congressional priority should be clearly established within the confines of this document.

8. **Water quality and the states' 401 certifications.**

As indicated in the document, the states of Missouri, Kansas, and Nebraska have issued 401 certifications under the Clean Water Act that commercial sand dredging will not violate water quality standards if operated consistent with their permits. As this is an integral portion of the 404 analysis, it should be clearly noted in the beginning sections involving water quality.

9. **Endangered pallid sturgeon.**

Included in present permits for commercial sand dredging are exclusion zones to benefit propagation of the endangered pallid sturgeon. Commercial sand dredgers believe they have worked diligently and cooperatively with the U. S. Fish and Wildlife Service ("USFWS") and the USACE to make adjustments to dredging operations to benefit the survival of the pallid sturgeon.

Commercial sand dredgers support the development of shallow-water habitat in the LOMR provided it is developed consistent with the standards for preservation of the BSNP. We support the introduction of additional sediment into the system in order to enhance the recovery of the pallid sturgeon. The commercial sand dredgers actively participate in the Missouri River Recovery Implementation Committee ("MRRIC"), proudly serving since its inception, and support this novel exercise in consensus on the river.

10. **Infrastructure does not have an entitlement to "certainty."**

While the DEIS discusses impacts on infrastructure, it does not discuss the fact that all capital improvements are also required to be "sustainable" economically. As such, they must include OM&R: Operation, Maintenance and REPLACEMENT. This includes water intakes, bridge abutments, levees and dyke structures.

Each of these infrastructure improvements receive the benefit of the BSNP in that they are not required to "chase the river." Had the river been in its original condition, those who own intakes, have bridge abutments, and create levees would all have to attempt to constrain the river on their own, to keep the river in a path, to make those improvements viable. The Corps provides a service through the BSNP that reduces (not increases) the cost of infrastructure through the ability to amortize the cost of improvements and their replacement over time. The expectation that the river will remain static is unreasonable. The failure to provide funds for replacement or modification is irresponsible.

11. **There is no proof that dredging leads to bed degradation.**

As stated at the beginning of this comment, the two principal actions that affect sediment load and the bed were the construction of the dams and the retention of sediment behind them, and the construction of the BSNP. The only specification relating to the river's operation that we can find from Congress is for a channel 300 feet wide and 9 feet deep. Nowhere do we find, nor is it addressed in the DEIS, the specification of a hypothetical elevation of the river bed. In fact, it is quite the contrary.

The Corps' design specification called for a self-scouring river, which implies that a portion of the bed will be removed constantly. The bed will be removed until such time as the river bottom hits bedrock. It is a function of rate of removal versus time. The longevity of that system and when the bed reaches bedrock is a function of the design scour, the introduction of new material (or lack thereof), and intervening circumstances (such as dredging). Yet, we can find no regulatory or design requirement other than an anecdotal conclusion by the KCD that the river bed must maintain a specific elevation. This theory was introduced following the successful reissuance of permits to the dredgers in 2003. This was a conclusion derived without public comment, without rulemaking, and without the participation of parties on the river.

12. **The States of Missouri, Kansas, and Nebraska own the bed.**

As discussed in Appendix C, the resource is the property and asset of the states. In fact, the State of Kansas receives a royalty for the extraction of sand. Nowhere in the document is ownership of the bed discussed nor is the ownership of any adjacent property rights considered.

The states have the legal right to exhaust their resource. Should they choose to take all sand down to bedrock that would meet specifications for current road building throughout the system and utilize it for the benefit of its citizens, it is their right. Any inhibition of that right constitutes a taking.

SECTION TWO – SPECIFIC COMMENTS

CHAPTER 1
INTRODUCTION

General Concerns or Comments

Chapter 1 presents general context with regard to the DEIS. In addition, it cites regulatory authority. The dredgers do not concede legal authority or jurisdiction with regard to any of the laws cited in Chapter 1. The dredgers continue to be cooperative in anticipation of a conclusion that meets all legal requirements and is reasonable and economically viable.

Specific Concerns or Comments

Chapter 1.2 PURPOSE AND NEED

Section 1.2.2 Project Purpose and Need

Page 1-3. Alternatives for No Action, Alternative A, and Alternative B do not meet the project purpose and need and should be removed from the document.

Page 1-4, end of paragraph. "The market area is determined largely by the shipping costs for the finished sand and gravel, which is primarily the cost of hauling by truck." We suggest the following addition at the end of the sentence, "*and by the location of the proposed major projects.*"

Chapter 1.4 DECISIONS TO BE MADE

Page 1-7, paragraph 1. The dredgers do not concede jurisdiction under the sections of law cited and specifically state that the concept of incidental fallback is germane to the discussion in the paragraph.

Page 1-8, paragraph 1. The proposed action is identified in this section, and its designation as the "applicants' preferred alternative" is incorrect. The proposed action was identified by the USACE KCD as the proposed action by calculating tonnage of permits at a specific point in time. It does not include other negotiations that occurred prior to the introduction of those applications and following those applications. The document fails to properly represent the dredgers' preferred alternative and also fails to properly represent total tonnage by including applicants not eligible for participation on the river under the presumptions currently pending.

Page 1-8, paragraph 5, first bullet point. It is the dredgers' position that there is no practicable alternative. The objective is to mine the assets of the States of Kansas and

Missouri (paying a royalty where appropriate). There is no other alternative which provides the assets of those states (bed of the river).

Page 1-8, second bullet point. A 401 certification has been issued by the states of Missouri, Kansas, and Nebrasks, demonstrating there is no violation of water quality standards. There is no jeopardy provided the existing conditions present in current permits remain in place with regard to endangered species.

Chapter 1.5 HISTORY OF COMMERCIAL DREDGING, PERMITS AND DECISIONS

Section 1.5.1 History of Missouri River Development

Page 1-11, top of page. "…self-maintaining navigation channel…." – Also referred to as a "self-scouring channel," a river designed to remove material from its bed in order to maintain navigation.

Page 1-11, first paragraph "The BSNP is operated and maintained by the USACE Kansas City District." – What is the USACE KCD's plan to take responsibility for their designed bed degradation (self-scouring) and the bed degradation that accompanies the existing BSNP (design)? Nowhere in the document is there any information on plans by the Corps to address its responsibilities for alleged bed degradation.

Section 1.5.2 Commercial Sand and Gravel Dredging

Page 1-11, paragraph 2. "…at approximately 8.7 million tons which included 1.7 million tons used by the USACE for a levee construction project." – All references to the USACE's 1.7 million tons should be removed from this document and an accurate representation of sand and gravel dredging demand presented. Based on the numbers, sand and gravel dredging peaked at 7 million tons.

Page 1-13, paragraph 1. "With construction of the dams, sediment sources became limited to bank erosion along the LOMR and sediment inputs from tributaries to the LOMR." – The limiting of sediment by the dams is a major factor in bed load. The document creates inconsistencies with its geomorphic analysis to this obvious statement. There is continual bias in this document that runs contrary to this sentence.

Page 1-13, last paragraph. "Soon after conclusion of that ESA consultation, the USACE Kansas City District determined that observed river bed degradation associated with commercial dredging was a serious concern." – This conclusion was neither peer reviewed nor subject to public comment. It is an internal evaluation not corroborated by any outside source. This evaluation is relied upon repeatedly in the DEIS. The DEIS evaluation is predicated on this foundation, which is flawed, and as a result should cause the entire geomorphic analysis in this document to be questioned. In Appendix A, we provide comments from consultants regarding the perpetuation of this myth.

Section 1.5.3 Missouri River Bed Degradation

Page 1-14, paragraph 1. "The BSNP included dikes and revetments (to shape the waterway and stabilize the banks), cutoffs (to eliminate sharp and protracted horseshoe bends), chute closure dikes (to close minor and diverted channels); snag removal, and dredging where necessary." – We suggest the addition of the following sentence: *These activities were conducted at the direction of Congress.*

Page 1-14, paragraph 3. "River bed degradation has been demonstrated to result in extensive impacts on the characteristic of the river channel…." – Delete *extensive*. Extensive impacts are not documented. Degradation creates problems. The river meandering throughout the valley without the BSNP would create more impacts to infrastructure, water intakes, agriculture, and industry. There has been no demonstration of (a) bed degradation or (b) that bed degradation relates to an impact. It is a presumption that remains untested over time. The authors and the USACE presume bed degradation to be permanent and ongoing. There is no demonstration of such an impact. The authors and the USACE speculate. The dredgers do not concur with internal USACE determinations that have not been peer reviewed. For purposes of this document and evaluation, they represent bad science and only evidence, mostly circumstantial and speculative.

Page 1-14, last paragraph. There is not bed degradation in all areas where there is dredging by the document's own admission.

Page 1-14, last paragraph. "The greatest degradation has taken place in those portions of the LOMR that have experienced the greatest amount of dredging." – The greatest degradation will occur in Kansas City, with or without dredging. This statement is an overstatement and should be deleted or qualified.

Page 1-15, paragraph 1. "Recognizing the importance of the river bed degradation problem, the USACE Kansas City District initiated the Missouri River Bed Degradation Reconnaissance Study in 2008." – Delete *the importance of.* In the scope of the problems and concerns of the Missouri River Basin, there is little importance to the issue of bed degradation. As an example, the loss of flood control capacity in Lewis and Clark Lake by the retention of sediment behind the dam creates considerably more important issues than bed degradation.

Page 1-15, paragraph 1. General comment. Dredging could go away tomorrow and the two principal factors on river mechanics will be the construction of the dams which deny sediment and the construction of the BSNP. The efforts of the authors on these reports are compounded by the reliance on USACE non-peer reviewed conclusions.

Section 1.5.4 2006/2007 Permit Decision

Page 1-15. This section does not accurately reflect the negotiations on the permit decisions and efforts to avoid costly appeals and shutdowns by both the USACE and the commercial sand dredgers.

Page 1-15, paragraph 2. "Because dredging in these areas was considered by the USACE Kansas City District to be one of the contributing causes of river bed degradation, the reauthorized permits limited and restricted approved dredging activity." – This conclusion was objected to in comments by the dredging applicants, but accepted due to the cooperative efforts and the cost of appeals. There was never an acquiescence regarding the conclusions or the authority.

Page 1-16, first paragraph. The actions identified in the paragraph were agreed to by the dredgers in an effort to assure "no significant impact." It does not mean these conclusions were accepted as fact.

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

General Concerns or Comments

The dredgers disagree with the delineation of the "Proposed Action." The Proposed Action was determined by the Corps and not the dredgers and is merely a calculation of permits that have been previously negotiated downward as a result of negotiations indicated in Chapter 1. In addition, the Proposed Action reflects additional dredgers on the river. The only reason for this EIS is consideration of bed degradation. That premise and hypothesis establishes a baseline that could not allow for additional dredging activity, especially in the realm of 1.5 million tons. The Proposed Action and other alternatives should remove approximately 1.5 million tons and remove applicants not existing on the river.

In addition, alternatives presented are not practicable. The No Action Alternative is not an alternative that could meet the purpose and need statement. The same is true for Alternative A and Alternative B.

We take particular umbrage of the rejection of the "mine-and-relax" strategy. The rejection of this strategy clearly demonstrates the authors' failure to understand and comprehend dredging on the Missouri River. The mine-and-relax strategy can and does modify bed behavior and provides potential opportunities to the alleged problem.

To that end, the authors added in the mitigation section a reasonable respect for this as mitigation. Its rejection out of hand in this section is inappropriate.

In addition, tonnages have already been reduced since the original applications in the KCD. This includes caps and other structural changes to the permits in an effort to mitigate the alleged problem. During this timeframe, tonnage amounts were not necessarily reflective of actual demand at the locations. In some areas, they were aligned and in others they were not.

Specific Concerns or Comments

Chapter 2.2 PROPOSED ACTION

Page 2-2. As stated earlier, the dredgers dispute the Proposed Action, in particular the addition of two additional dredging operations on the river. The reasons are more thoroughly stated in comments to Chapter 1. There is an excess 1.5 million tons in the Proposed Action that is should not be included.

Section 2.2.1 Overview of Sand and Gravel Dredging

Page 2-3. Sand dredging on the Missouri River is not universal. There are different means and methodologies and completely different business strategies and scenarios. Some operate their business strategies based on product; others base their business strategies on project location. Distribution throughout the state and methodologies thereto are varied. Distances and distributions are varied. Efforts to simplify and homogenize sand dredging on the Missouri River are not appropriate.

Chapter 2.3 NO ACTION ALTERNATIVE

Section 2.3.2 Alternate Sources of Sand and Gravel

Page 2-28, paragraph 1. "New mining operations could be located in the floodplain adjacent to the Missouri River …." – This is not realistic. The ability to acquire permits and not impact levee district performance is remote. The majority of urban counties would already have this capacity if it were easy to obtain and sustainable.

Page 2-28, paragraph 1. "…dredging equipment that is currently used in river dredging cannot be easily transported overland…." – This conclusion is also not realistic. There is no opportunity to use existing dredges on inland pits. Some of the dredges are in excess of 300 feet long and would occupy the entire pit. This again represents a lack of understanding of methodologies of dredging currently in use on the river.

Section 2.3.2.1 Description of Alternate Sources

Page 2-28, paragraph 1. There is no additional capacity in the Kansas River. No new permits have been issued. There is no additional capacity in the Mississippi River. No new permits have been issued. These are not alternative sources.

Subsection *Dredging from Other Rivers*

Page 2-29, paragraph 2. "…these sources represent a clear option to offset changes in Missouri River supplies, particularly in the urban areas located in the eastern (Kansas City) and western (St. Louis) regions of Missouri." – This is not an accurate statement. For reasons previously stated, there is no available surplus of material in the Kansas River. There is no available surplus of material in the Mississippi River that is available. No new permits have been issued on either river.

2.3.2.2 Available Capacity of Existing Alternate Sources

Subsection *Floodplain Open-Pit Mines and Quarries*

Page 2-40. This theory of expansion capability assumes the availability of capital and a willingness to expand. This is presumptuous. Many of these mines are small operations that are open only on demand or are captive for specific purchases. In addition, many have compliance issues relating to the Clean Water Act and storm water and are subject to closure. There is no basis to assume that such a ramp up for the estimated tonnage discussed in this section exists nor the capital to create it.

Page 2-41, top of page. By admission of the authors, the numbers for Illinois capacity are speculative. Highway projects are contracted on multi-year cycles. Such a gamble can be fatal for a contractor.

Subsection *Instream Mining*

Page 2-41. "The available capacity of instream mining.…" – Missouri is not encouraging the expansion of instream sand and gravel operations. The Missouri Legislature has debated instream mining requirements in three of the last five legislative session. Environmental groups in Missouri have attempted to stop instream sand and gravel mining repeatedly. The majority of instream mining is not for sale or distribution, but is for use by counties and directly adjacent neighbors.

Section 2.3.2.3 Capacity of Sources to Meet Road Construction Material Specifications

Page 2-41. We do not concur that there is the capacity of sources to meet road construction material specifications. We believe the summary provided by the authors does not reflect the position of the Missouri Department of Transportation ("MoDOT").

Section 2.3.2.4 Summary of Available Capacity

Page 2-43, top of page. "With an available capacity of approximately 7.9 million tons, the alternate sources would be able to produce the required amount of replacement sand and gravel supplies under all of the alternatives, including the No Action Alternative (where dredging of the LOMR would cease entirely)." – If this statement were factual,

then these sources would already be filling the demand. The market would meet the requirement. As evidenced in Appendix B of our comment letter, this is just not factually true. It once again reflects the authors' inexperience in Missouri and a lack of understanding of the relationship between outstate and urban Missouri.

Page 2-43, last paragraph. "Accordingly, this likely would result in the need for new mining operations to restore long-term equilibrium in the sand and gravel market in Missouri." – The asset in question, the bed, is owned by the States of Missouri and Kansas. The argument demonstrates a taking.

It is suggested that the dredgers may also have a cause of action under this theory and available actions before the Court of Claims if reductions should come to pass.

Chapter 2.4 DEVELOPMENT OF ALTERNATIVE ACTIONS

Page 2-46, first bullet point, Alternative A – This alternative will eliminate dredging on the river and is the equivalent of the No Action Alternative. There is not sufficient tonnage to support the operation of any company.

Page 2-47, first bullet point, Alternative B. "reasonably expected." – The terminology in this section demonstrates the biased position with regard to this analysis. It is the dredgers' position that there has been a predetermination.

Page 2-47, first paragraph, Alternative C. – The tonnage presented, 6.9 million tons per year, was negotiated in response to alleged bed degradation. The authors make it as if this number was pulled out of the sky, never discussed, and never debated. This number represents the reasonable amount of tonnage with caps that would not exacerbate the problem that is allegedly presented in this document. It is convenient the fact is not included that this number was a significant reduction from previous permit levels. Millions of tons previously authorized have been removed from permits.

Section 2.4.1 <u>Rationale for Setting Alternative Dredging Amounts</u>

Page 2-47, paragraph 1. "Available evidence suggests that commercial dredging has exacerbated river bed degradation on the Missouri River…." – We do not agree with this conclusion. See Appendix A of this comment letter. The river bed is, in fact, aggrading. The statement is wrong. Even the Kansas City section shows a stabilized and increasing bed. The year 2010 represents the first full-service navigation season in decades. If anything, this further demonstrates the design issues regarding the BSNP to not properly perform in limited water scenarios if bed degradation is truly an issue.

Page 2-47, paragraph 1. "…analyses to date show a strong correlation between the locations, time frames, and quantities of dredging in the LOMR and degradation of the river bed." – We do not concur. We believe the analysis is weak. We believe the analysis does not demonstrate the full range of water flow characteristics. We do not believe that it demonstrates a true cause as the Corps limits the ability of the river to

receive sediment in flow in massive quantities. In addition, the BSNP robs the river of available material through the Corps-designed structures. There are other equally strong correlations, including the number of registered vehicles, the number of hair dryers, the number of pennies in circulation, and our personal favorite, the number of USACE employees by office location. The analysis to date targets dredging. It is an answer seeking a question.

Section 2.4.2 Replacement of Missouri River Sand and Gravel from Alternate Sources

Page 2-48. See Appendix B, Economic Analysis, incorporated into this comment letter.

Section 2.4.3.1 Proposed Action

Page 2-51, first bullet point, Annual tonnage. The annual tonnage listed in the Proposed Action unnecessarily limits the review and applies a presumption of bias that a problem actually exists. We contend that the proposed alternative should allow for unlimited tonnage and should base tonnage on projected demand over the next 20 years. Since the dredgers did not request this Proposed Action in its context, the analysis forces business presumptions and presumes bed degradation is an absolute reality. The river is aggrading. See Appendix A.

Page 2-51, second bullet point, Dredging locations. This is an unnecessary restriction. Limitations of reaches is an arbitrary decision made by the Corps years ago with demonstrated negative consequences, if you presume that bed degradation does in fact occur. The Corps' previous policy decisions regarding bed degradation by concentrating dredging in specific reaches has potentially increased bed degradation, if in fact it does occur.

Section 2.4.3.3 Alternative A

Page 2-52, first bullet point, Annual tonnage. The choice of tonnage is arbitrary and presumes bed degradation has a negative consequence. This presumption is subject to public debate, which is not being permitted or discussed as a result of how these alternatives are being characterized. Missourians, owner of the bed, should be able to decide the appropriate choices of public policy whether their bed can be used for the benefit of reduced road improvement prices.

Section 2.4.3.4 Alternative B

Page 2-52, first bullet point, Annual tonnage. The choice of tonnage is arbitrary and presumed bed degradation has a negative consequence.

Chapter 2.5 ALTERNATIVES CONSIDERED BUT NOT INCLUDED IN DETAILED ANALYSIS

Section 2.5.1 No Cap Mine-and-Relax Strategy

Page 2-54, paragraph 1. The proposal submitted years ago was a hypothetical. The principle was to expand reaches, allow a rest period for recovery, and reduce the concentration of dredging. The distances and time frames were suggestions for beginning discussions on the topic. This does not actually reflect the alternative's theory.

Page 2-54, paragraph 2. "…some assumption would be needed concerning how much dredging would actually occur under this strategy." – The current permits limit dredging to 1.2 million tons per any 10-mile reach per year. The "no cap" reflected the total tonnage that could be mined by the applicant.

Page 2-54, paragraph 2. "…would not differentiate it sufficiently from the other alternatives and would not meet the first element of the proposed strategy." – We do not concur with this statement. It is significantly different. It has the potential to spread the concentration of dredging out over the entire river while not limiting yield and preserving recovery. Again, this demonstrates the authors' bias against any strategy that may increase dredging while eliminating current concerns.

Page 2-54, paragraph 3. "…spreading dredging operations out over a 5-mile reach would not make a sufficient a difference to warrant analysis under an additional alternative." – This conclusion is wrong because the authors never investigated the proposal.

Page 2-55, paragraph 1. "The response of the river to localized dredging is eventually to spread out the degradation from local areas to broader segments of the river." – The river is designed as a self-scouring system. Everything stated in this paragraph will occur with or without dredging. The bed is not the property of the Corps. The owners have a right to transfer their mineral rights. This presumes that dredging is illegal and that any impacts are not permitted. This is not the law.

Page 2-55, paragraph 2. "…dredging represents a long-term cumulative loss to the reach even when it is being dredged only 1 of every 5 weeks." – A cumulative loss is inherent in the design of the BSNP as a self-scouring system. A loss is permitted under law and is permitted by the owners, the States of Kansas and Missouri.

Section 2.5.4 Increasing Sediment Supply in the Lower Missouri River

Page 2-56, paragraph 2. "This alternative does not meet the Project purpose and need because it does not supply the sand and gravel to support the regional construction and manufacturing needs." – From a sediment load perspective, the dams and the BSNP are complete failures. To ignore the obvious flaws in the system to the detriment of the dredgers, while demanding performance by the dredgers that cannot be met without

correcting the problem, is the definition of bias. The Corps is essentially given a free pass in this entire analysis that its design, regardless of its failures, will not be addressed.

Chapter 2.6 SUMMARY OR ENVIRONMENTAL CONSEQUENCES – PROPOSED ACTION AND ALTERNATIVES

Section 2.6.1.1 Overview

Page 2-57, paragraph 3. This paragraph does not say anything and is not clear. It needs to be rewritten.

Section 2.6.1.2 Comparison of Impacts of the Proposed Action and Alternatives

Page 2-57, paragraph 2. The No Action Alternative moves the environmental issues to more locations throughout the states with greater risk of consequences to the environment. In addition, this alternative creates greater impact on wetland-related areas and a greater regulatory effort on the part of regulatory agencies that are not included in any of the economic analyses.

Page 2-59, top of page. "…would be expected to continue where dredging is most concentrated." – This assumes the exact same logistical situation will occur. As an example, the mine-and-relax strategy changes the logistical situation and discourages concentration without a period of recovery. It is apparent that the authors do not understand the mine-and-relax alternative and have determined to ignore its potential value. The dredgers are the most knowledgeable parties on the river dynamics. Their knowledge and experience is even greater than that of the Corps. To ignore their observations and alternatives undermines the scoping and public participation process.

Section 2.6.2.1 Summary of Impacts for the Proposed Action

Page 2-76, paragraph 4. "Infrastructure - Increases in maintenance costs…." – This is a basic risk element of any operation and should be included in Operation, Maintenance and Replacement ("OM&R"). If the BSNP did not exist, these intakes would be modified continually. This is a cost of doing business, whether an operation is public or private.

Page 2-76, paragraph 4. "The risk of failure of levee and BSNP structures.…" – With the elimination of dredging under the No Action Alterative or Alternative A, there will be an 84% loss of navigation. There will be no need for the BSNP. There will be no need for its supporting levees for navigation, and they can fall into the river because there is no need to maintain them.

Page 2-76, paragraph 4. "The risk of structural damage to bridge, pipeline, and cable crossings…." – This presumes that the conditions of the BSNP are stagnant. This concludes that changes in water flow or additional introduction of material will not

change anything. There is no discussion of the impact of the BNSP assuming the No Action Alternative of whether these conditions will remain constant. The analysis and therefore its conclusions are unfair.

Page 2-76 paragraph 6, Water Resources. "…suspended sediment in the water column would increase at dredging sites…." – A 401 certification that dredging at current levels will not result in violations of water quality standards has been issued by all states. The USFWS Biological Opinion ("BIOP") requires increase in sediment load to assist the recovery of the pallid sturgeon and is the reason for the current notching program to increase bank erosion.

Page 2-77, tope of page, Wetlands, Floodplains, and Terrestrial Ecology. "…associated groundwater and wetland impacts." – There is no economic or public health analysis inside the context of this document regarding either (a) the loss of farmland and its impact on public health or (b) the reduction of mosquito populations and their impact on future health scenarios.

Page 2-77, paragraph 1, Federally Listed Species. For the pallid sturgeon, the Proposed Action would result in increased entrainment in dredge intakes…." – The dredgers say two words with regard to the issue of entrainment, "Prove it." The entrainment argument is speculative at best, crying wolf at least. Introduction of additional sediment into the system is a documented benefit under the BIOP and addresses the issue of bed degradation, if such degradation does exist. In addition, the restriction of sediment runoff from upland areas as a result of EPA's regulation of storm water and Missouri's soil and water conservation tax limit the introduction of additional sediments into the watershed to the detriment of the pallid sturgeon.

Page 2-77, paragraph 2, Land Use and Recreation. "The increase in dredges and barges under the Proposed Action would result in an increased conflict with recreational boaters." – An increase in navigation will have the same effect. There is no mention of increased navigation as an Authorized Purpose of the 1944 Flood Control Act and the BSNP. In addition, the BSNP is designed based on a greater number of barges on the river, not a lesser number. This does not represent an increase against the design of the BSNP and is not mentioned within the context of this document. The BSNP is designed for this purpose and authorized by Congress.

Page 2-77, paragraph 2, Land Use and Recreation. "A minor increase in the risk of washout of land-based recreation trails during high-flow events would take place in Jefferson City…." – This is simply not factual.

Page 2-77, paragraph 3, Economics and Demographics. "Under the Proposed Action, economic output, labor income, and employment would change little from existing conditions." – If 11 million tons of material were used in concrete and asphalt, the increase in the number of projects would be substantial and the resulting economic impact noticeable. This is not factual.

Page 2-77, paragraph 4, Noise. "…increase in long-term noise exposure…." – This will not result in any increase in noise when using the highway standards from the MoDOT or the Kansas Department of Transportation ("KDOT").

Page 2-77, paragraph 7, Air Quality and Climate Change. The impacts on the St. Louis air shed would strictly be involving those dredgers who are in the St. Louis SIP area. St. Louis dredgers are already authorized for the amounts in the proposed alternative. There is no increase. This is not accurate.

Section 2.6.2.2 Summary of Impacts for the No Action Alternative

Page 2-78, paragraph 1. "…result in new impacts at the alternate source locations." – The failure to recognize the ability to gather capital makes this a fatal flaw in the analysis.

Page 2-79, paragraph 1, Land Use and Recreation/Wetlands, Floodplains, and Terrestrial Ecology/Federally Listed Species. "…alternate sources of sand and gravel are developed in the long term to offset losses of production for the LOMR…." – Development of pit mines behind levee areas in levee districts will result in increased risk of failure that must be presented inside the scope of this document. Increased risk of failure as a result of pits behind levees was well documented in 1993.

Page 2-79, paragraph 2, Economics and Demographics. "…shifting of employment to the transportation sector (trucking)." – A shift to the transportation sector, particularly trucking, is relevant. An increase in GHGs and NOx needs to be addressed.

Page 2-79, paragraph 3, Noise/Visual and Aesthetic Resources. "…new facilities that are developed." – There are no known noise complaints in any jurisdiction relating to current dredging on the river.

Section 2.6.2.3 Summary of Impacts for Alternative A

Page 2-79, paragraph 1. This alternative will result in the elimination of dredging on the river due to economic consequences. This is a non alternative. This alternative is no different than the No Action Alternative.

CHAPTER 3
AFFECTED ENVIRONMENT

General Concerns or Comments

There are three general comments relating to Chapter 3. Specifically:

1. The congressional Authorized Purposes provided for under the Flood Control Act of 1944 are no different or less powerful than NEPA, the Endangered

Species Act, the Rivers and Harbors Act, or the Clean Water Act. The document tends to downplay the importance of the priorities established by Congress which have been fought over in litigation repeatedly by the various states' interests. The Authorized Purposes are exceptionally germane to the congressional intent of navigation, flood control, and the lower purposes provided for in priority. This prioritization elevates commercial sand dredging and associated navigation to the highest of priorities and cannot be downgraded as a result of NEPA. As such, with navigation the highest priority of Authorized Purposes, commercial sand dredging and its consummate 85% navigational interest is the single highest priority of the river. Efforts of the Corps to diminish that fact are inconsistent with the law. The various laws must be read *in pari materia*. The document fails to recognize navigation's specified Authorized Purpose and the fact that Congress has authorized this river to be engineered, corralled, restricted, and inhibited from its natural course and condition for the benefit of navigation and the other seven Authorized Purposes. This is a fundamental failure in the document.

2. The BSNP, by repeated admission in this document, is designed to scour the bed. It is designed to remove a portion of the bed. It is designed to compromise bed integrity. This fact is clearly stated in the context of Chapter 3. It, too, cannot be ignored. The failure to recognize the design of the BSNP as a priority action compromising bed integrity far in excess of commercial sand dredging, once again, cannot be ignored.

3. Segmentation presented in this document is a convenience. This does not meet or follow any current protocol and is a fabrication for the benefit of the authors in order to expedite analysis. The commercial sand dredgers object to and will oppose any efforts to combine any calculations regarding adjustments to permits or restrictions in the current segmentation format. We believe the segments are, for all practical purposes, incorrect as it applies to operational characteristics of the river and once again clearly illustrate the failure of the authors and the regulators to not understand the differences in commercial sand dredging of the various applicants. While the segmentation has provided a valuable convenience for this analysis, it fails in all other purposes and should be so noted in the document. This objection cannot be understated by the dredgers.

Specific Concerns or Comments

Chapter 3.2 OVERVIEW OF PROJECT AREA

Section 3.2.3 Major Uses of the Lower Missouri River

Page 3.2-5. The Authorized Purposes of the river are clearly delineated by Congress and should be listed in this section for the reader to understand the weighing and priority intended by Congress.

Page 3.2-5, paragraph 1. "The USACE must weigh each of these factors and others, including flood control, when evaluating river management strategies or permit

applications." – The USACE must weigh each of these factors consistent with the authorization and direction of Congress.

Section 3.2.4 Channel Modification

Page 3.2-6, paragraph 1. "These modifications include (1) construction of six dams on the upper river, which occurred between 1933 and 1963; and (2) construction of the BSNP, which occurred between 1945 and 1981." – These changes are significant with regard to the river. This is noted in the document and ignored in future sections.

Section 3.2.4.1 Upper Missouri River Dam and Reservoir Development

Page 3.2-7, paragraph 1. This paragraph is not correct. There are eight Authorized Purposes of the reservoirs and dams system and operation of the Missouri River specifically delineated by Congress. The reservoir system was designed and built to serve all eight purposes consistent with their priority as directed by Congress. The highest priority Authorized Purposes in order are navigation and flood control. The original paragraph should be deleted.

Section 3.2.4.2 Missouri River Bank Stabilization and Navigation Project

Page 3.2-8, paragraph 1. "The BSNP structures were designed to direct river flows in order to prevent sediment accumulation in the main channel." – This sentence should be placed in bold. They were designed to cause limited bed removal and therefore degradation.

Subsection *River Cutoffs*

Page 3.2-8. River cutoffs cause bed degradation. See Appendix A in our review of geomorphology. This is not adequately noted and, in fact, ignored.

Subsection *River Bed Degradation in the Lower Missouri River*

Page 3.2-9, paragraph 3. "Construction and maintenance of the BSNP for barge traffic and navigational use has resulted in straighter and faster flows that tend to prevent sediment accumulation in the channel bottom." – See Appendix A for our detailed comments on geomorphology. The design of the BSNP as stated in this sentence is to cause removal of sediment accumulation on the channel bottom. The channel bottom is also known as the bed. Preventing sediment accumulation equals causing degradation. The Corps' design is purposeful in creating bed degradation as recognized by the authors. This paragraph should also note that barge traffic and navigational use are the highest priority Authorized Purposes as designated by Congress.

Page 3.2-9, paragraph 3, last sentence. "Erosion of stream banks can result in (1) compromised use and value of adjacent riparian property; and (2) the need to rebuild sophisticated intake structures at the river's edge belonging to municipal, commercial,

and industrial water users." – The same can be said of the Corps' notching program, which is specifically designed for the erosion of stream banks. The notching program causes compromised use and value of adjacent riparian property and the need to rebuild sophisticated intake structures at the river's edge belonging to municipal, commercial, and industrial water users. The USACE is affirmatively taking these actions to increase the amount of sediment in the lower channel. The failure to recognize the notching program is at best an error, at worst purposeful, in an effort to compromise commercial sand dredging. If these two purposes are so important, then the Corps should rebuild all the notches they have created in their structures that cause the erosion of stream banks.

Section 3.2.6.1 Missouri River Recovery Program

Subsection *Potential Sediment Contribution*

Page 3.2-12. "The USGS has preliminarily estimated that, for a 700-mile stretch of river, approximately 37 million tons of sediment per year and 562 million tons of sediment over 15 years could be released through ongoing and reasonably foreseeable restoration projects…." – This DEIS clearly establishes that substantial additional volume could be generated toward the river in order to support the pallid sturgeon with regard to its recovery. If 37 million tons of material were added per year by the Shallow-Water Habitat Program, 562 million tons over 15 years would result in a 457 million ton surplus over the temporal time frame of this EIS. A conclusion that a portion of this material will not support additional bed development is inconsistent with the data. At a minimum, these contributions would slow bed degradation and assist in sustaining a balance to support the current 7 million ton demand by the six existing dredgers. The persons with the most knowledge of size, fraction, and material on the river, the six existing commercial dredgers, do not concur with the conclusion reached by the authors that such projects are likely to be predominantly the wrong size fraction that is desirable for dredging. See Appendix A of this comment letter for analysis of the geomorphology of the river.

Section 3.2.6.8 Missouri River Bed Degradation Study

Page 3.2-15. The USACE should, at a minimum, await the outcome of the bed degradation study prior to taking action contrary to the existing legal interests of commercial sand dredgers on the LOMR. In the alternative, this EIS reaches the **ABSOLUTE** conclusion that Missouri River commercial sand dredgers are the cause of bed degradation. Since we disagree that bed degradation even exists, either this study should be brought to conclusion or the Corps should withdraw any request to Congress regarding the need for this study. We believe that the pre-existing bias of the USACE with regard to this issue is cause for Congress to withdraw this study from the control of the USACE and require its entire evaluation to be restarted under the guise of either the U. S. Geological Survey ("USGS") or the National Academies of Science. As we believe that the entire geomorphology section is flawed and should be removed from this

document, we cannot concur with any conclusion regarding the continuation of the bed degradation study until further details are presented.

Section 3.2.6.10 Missouri River Recovery and Associated Sediment Management Study

Page 3.2-17. We believe that this study should have been completed before reaching any conclusions regarding permitting of commercial sand dredging on the LOMR.

Chapter 3.4 – GEOLOGY AND GEOMORPHOLOGY

General Concerns or Comments

We believe this section to be substantially flawed. We believe the conclusions to be entirely incorrect. The river is aggrading. The data provided in this section substantiate that fact. This section is simplistic and does not take into account the two largest contributors to bed degradation, namely (1) the main stem dams and (2) the design of the BSNP. While we acknowledge that the dams and the BSNP are a substantial work of superior engineering, they continue to be an experiment in process. Adjustments both to the design structure of the dams for their failure to provide continuous sources of material and the BSNP for its continued robbing of material have been grossly understated in this document. This document admits those factors as being major contributors. The conclusion that commercial sand dredging is the major cause of bed degradation is flawed. Appendix A provides contrary information and conclusions regarding this issue.

In addition, as has been stated in previous sections on general terms, the six existing commercial dredgers paid to have a third-party Environmental Impact Statement conducted with a review of existing materials and data. The USACE was unable to acquire sufficient funds to complete a bed degradation study of their own. We believe that this EIS extends far beyond the requirements, context, and deliverables required under NEPA, and the exercise regarding an alleged scientific analysis presented in this section has been a substantial diversion of funds provided by the dredgers.

Further, this entire section is predicated on internal reports that have not received external peer review or, if such peer review has occurred, have not been provided contrary to the requirements of FOIA and its responsibility to supplement. These internal reports make a conclusion that there is a correlation between bed degradation and commercial dredging. This position has been refuted. The references in this section to USACE documents and USACE material provides loose circumstantial correlations that are not documented by either the USACE efforts or efforts on behalf of these authors.

This section does not provide adequate citations to track the logic and methodology of the authors with regard to the geomorphology examination.

Our rebuttal is included in Appendix A with a review of this section conducted by Dr. Charles Patterson of Allgeier, Martin and Associates and John C. Doyle and Henry S. Hauck, former USGS research scientists and bed surveyors, of JD-Mc Engineering LLC.

The conclusions presented in this section should be completely rejected and balanced for the experiment that is the BSNP.

Specific Concerns or Comments

Section 3.4.1 Introduction

Page 3.4-1, paragraph 2. "In its 2006/2007 dredging permit decision (see Section 3.2.6), the USACE determined that geomorphologic river bed degradation has occurred along major portions of the LOMR." – This position was challenged by the commercial sand dredgers and a compromise was reached to balance the USACE concerns against dredgers requests. The mere fact that the 2006-2007 dredging permit decision was not legally challenged does not mean that it was concurred.

Page 3.4-1, paragraph 2. "The river bed degradation identified by the USACE has lowered water levels, undermined certain revetments, and left some municipal water intakes above the waterline at low flows." – This is not accurate. At best, specific locations on the river may be degrading; however, the river is accruing when taken as a whole system, especially during the period 1995 to present. There is not bed degradation in the system.

Page 3.4-1, paragraph 3. "This assessment can be used to determine a sustainable level of annual river bed dredging in key river reaches." – See Appendix A of this comment letter. This assessment cannot be used to determine "sustainable levels." If this is the decision of the USACE, it will be challenged as it is flawed reasoning and does not take into account the failure of the USACE to address the performance of the BSNP and the capture of sediment behind the dams.

Page 3.4-1, paragraph 3. "These sustainable dredging levels…." – There is no such thing as a sustainable dredging level. Current efforts on other rivers to determine sustainable dredging levels have not proven successful nor has the ability of the USACE to correctly engineer the BSNP based upon changing sediment loads and flow contributions.

Section 3.4.2.1 Bedrock Geology and Valley Widths

Subsection *Bedrock Control on Valley and Floodplain Widths*

Page 3.4-5, paragraph 1. "An extensive system of federal levees and floodwalls protects this low-lying area from flooding (Figure 3.4-2, Kansas City Segment, Sheet 2)." – The design of the river, its protection and training structures, its velocity and volume all affect the conditions in the Kansas City metro area. To argue bed degradation is caused

solely by dredging is inaccurate. The design, curvature, centrifugal force, velocity, speed, volume, material, and structures all impact the alleged bed degradation. To put the entire burden on commercial dredging is irresponsible in all segments of the Missouri River.

Section 3.4.3.1 The Missouri River prior to Development

Page 3.4-18, paragraph 1. "It transported approximately five times the amount of suspended sediment as the modern river and was often obstructed by snags and trees that had eroded from the river banks." – This statement is conclusive of the dams' impacts upon the LOMR.

Section 3.4.3.2 Alterations of the Missouri River

Subsection *Dams*

Page 3.4-20. "Although the effects of the dams diminish farther downriver as numerous tributaries contribute sediment and flows to the main stem, hydrographs and suspended sediment loads are still affected all the way to the confluence with the Mississippi River." – Other sections of this document directly contradict this statement.

Subsection *The Bank Stabilization and Navigation Project*

Page 3.4-20. "To meet the BSNP objectives of bank stabilization and navigation, the river was trained into a series of smoothly curved bends of the appropriate radii and channel width." – As stated by the authors, the river was trained. As this is a dynamic system, we have contended from day one that it is the Corps' responsibility to make necessary adjustments in the river design to address some areas having deleterious impacts. We believe and continue to acknowledge that there are design issues with the BSNP. We believe the "trained" river, like the bad dog, is digging its way out under the fence. The USACE should look to its own actions before blaming others. They have the ability to slow the river down, speed the river up, increase the volume and flow, and change its centrifugal effects.

Subsection *Cutoffs*

Page 3.4-24. "This typically results in headcuts moving upriver from the cutoff and aggradation occurring downriver from the cutoff as the river adjusts to a new slope." – The BSNP influences the headcutting of tributaries by its design. See Appendix A.

Subsection *Current Channel Configuration of the Lower Missouri River*

Page 3.4-26. "The BSNP created a navigation channel on the LOMR that is a minimum of 300 feet wide and 9 feet deep during a typical navigation season (Table 3.4-7). The BSNP, in combination with the levee system and controlled releases from the upstream reservoirs, **has fundamentally changed the geomorphic nature of the river**."

– This section confirms our position and our geomorphic analysis that the dams and the BSNP and the various designs and releases are the major cause of bed degradation, if any.

Section 3.4.4.3 Flow Modifications

Page 3.4-33. "Because flow is a key variable in sediment transport, long-term changes in flow regime can result in significant changes in sediment loads, particle sizes, and channel shape." – This statement again demonstrates the control that the USACE has upon the outcomes of the LOMR basin and the BSNP. We acknowledge that during low river flows and drought periods the river has unique situations that are inconsistent with the norm. However, data in this document and as stated in Appendix A demonstrates that the river is aggrading as flows have increased and the basin has emerged from a drought period.

Section 3.4.4.4 Flow Regime

Subsection *Navigation Flows*

Page 3.4-38. "The USACE regulates releases from upstream dams to support navigation in the LOMR, one of the congressionally Authorized Purposes of the upstream dams." – While this is functionally accurate, navigation is the primary Authorized Purpose consistent with direction from Congress and court decisions involving releases of water for navigation. Navigation is the primary Authorized Purpose.

Section 3.4.4.5 Droughts and Floods

Page 3.4-41, paragraph 1. "Droughts and floods are significant because they affect flows that govern sediment transport and storage." – As stated earlier, substantial drought periods have created difficult situations on the river for both the northern and southern portions of the basin. Navigation has been curtailed for a long period of time, with 2010 being the first full season of navigation in years. Concurrently, load has also been diminished during the drought periods that were used for the correlations generated by the USACE. Since 1995, the river is aggrading.

Section 3.4.5.2 Historical Sediment Loads

Page 3.4-44. This entire section demonstrates the impacts of dams and the BSNP upon sediment load and its contribution to the bed. This section provides substantial evidence of the existing dredgers' position that the Corps projects influence bed degradation far more than any influence that dredging may have on the LOMR. See Appendix A.

Section 3.4.5.3 Sources of Sediment

Page 3.4-46, paragraph 4. "Other sources of material include coarser sand and cobbles deposited as glacial outwash in the glacially carved bedrock canyon, and sediment delivered by tributaries such as the Osage River (now blocked by dams)…." – Other dam projects operated by the USACE also contribute to sediment loss, further restricting the availability of material for bed enhancement. While we have focused the majority of our attention on the six main stem dams, other dams within the system create the same effect and their TOTAL reduction influences bed quality.

Section 3.4.5.4 Sediment Particle Sizes and Transport Mechanisms

Subsection *Suspended Sediment and Bed Load*

Page 3.4-48, paragraph 1. "At low to moderate flows, turbulent eddies may not be sufficiently strong to transport fine- and medium-sized sand in suspension; thus, the sand is deposited on the river bed and transported as bed load." – This section repeatedly attempts to characterize a huge differentiation in load for contribution to the bed. In reality, the equation is quite simple—more material, more bed. See Appendix A.

Chapter 3.5 INFRASTRUCTURE

General Concerns or Comments

This section presumes that these enterprises are given an entitlement to the status quo and are not required to make adjustments or replace facilities over a given life expectancy. This is a fatal flaw in the analysis and fails to take into account the fact that at any time the BSNP can be eliminated by a simple act of Congress or its provisions modified by the Corps.

The commercial sand dredgers have had to repeatedly adjust their operations due to changes in flow, endangered species, Coast Guard regulations, and modifications in their permits. This section presumes that any owner of infrastructure, especially public, does not have to take any steps to make adjustments in that infrastructure resulting from the same conditions requiring changes by the dredgers. These enterprises should expect to make adjustments due to repeated changes in the system, including flow, endangered species, Coast Guard regulations, modifications in permits, changes in depth, or provisions in permitting.

Inherent with infrastructure comes the concept of OM&R - "R" meaning replacement. The BSNP provides a degree of certainty for intake operators, road builders, farmers, railroads, recreationalists, and others. The consistency of a channel reasonably certain to be in the same location is subject to some variability. As has been noted in the document, variability exists during drought periods. In ice periods, variability exists. For the success of the pallid sturgeon, variability has existed. There is no requirement for the BSNP to remain static.

The concept of OM&R requires owner-operators to provide for the replacement of their structures due to failure of life expectancy or other circumstances over a reasonable period of time. The BSNP has remained relatively constant, and the expectation should be that replacement of infrastructure, at a minimum on 20-year cycles, is appropriate. "R" should be included in rate for the various infrastructure owners and funds would be available for periodic adjustments.

We greatly respect those operators who have provided for OM&R and work with many to enhance the life expectancy of their river-related operations.

In fact, many dredgers have worked with intake operators to remove material from intakes because the river is aggrading. Contrary to this document's analysis, intakes along the river have problems with material, not just the loss of material. We continue to emphasize that this river is aggrading. The facts are presented in this document.

Throughout our comments on this document, we note that the design of the BSNP is an issue. For the authors to specify in this document that dredging is the sole threat where diminishing bed may be a problem is disingenuous and self-serving. A better question would be, "What is the Corps' plan for the inevitable failure of their structures due to loss of sediment in the system?" This is conveniently overlooked.

Provisions in permits already exist to protect intakes from dredging risks.

All levees were built after the start of dredging on the Missouri River. The failure to take into account the impact of dredging is a design error.

Bridges do not appear to be threatened as they were designed to bedrock and assume loss of material. This is what all infrastructure should have anticipated.

The bed is owned by the States of Missouri, Kansas, and Nebraska. This fact is not acknowledged within the confines of the document and dramatically changes the legal structure with regard to decision making on this matter.

Specific Concerns or Comments

Section 3.5.2.2 Water Supply Wells

Page 3.5-4, lateral or horizontal collector wells. – This section should note that dredging has been in operation on the Missouri River for over 100 years. Not one of these projects was in existence. The providers knew about the risk of dredging and moved their operations to the risk. The risks are their own, and the costs should be theirs as well--just like the dredgers' risk of operating on a river which may change elevation or have different requirements for endangered species than originally intended.

Section 3.5.2.3 Levees

Subsection *Federal Levees*

Page 3.5-4, last paragraph. "Maintenance responsibilities in these instances have been generally defined by the sloping reference plane called the CRP…." – The CRP is an arbitrary delineation adjusted periodically. Its methodology and its consistency are variable, which is too inconsistent to be considered a standard.

Section 3.5.2.4 Bank Stabilization and Navigation Project

Page 3.5-5, paragraph 2. "These structures are maintained to achieve the design function (i.e., a self-maintaining navigation channel) as measured against the CRP." – The BSNP's "design function" causes bed degradation. See Appendix A.

Chapter 3.6 NAVIGATION AND TRANSPORTATION

General Concerns or Comments

There are significant indirect effects that have not been evaluated in this document regarding navigation, the impact on future navigation, and the success of the congressional Authorized Purposes as compared with the BSNP. Impacts related to transportation are further explained and compared in our commentary on the economics sections of this document in Appendix B to our comment letter.

FHWA and MoDOT, after the release of this DEIS, have recently designated the Missouri River as Marine Highway 70 in anticipation of increasing volume of traffic on the river.

The volume of navigation presently on the river is substantially less than originally projected by the design of the system and the BSNP. The additional capacity of the river is significant and understated in the document. A change in one factor can result in a four-fold increase in traffic on the river, that factor being consistency of water volume and full-term navigation season.

As stated in the document, the transport of sand as aggregate and other aggregate materials transported by the Missouri commercial sand dredgers is in excess of 85% of current navigation on the LOMR. Consistent with the economics evaluation in Appendix B of this comment letter, the No Action Alternative, Alternative A, and Alternative B will result in elimination of the majority of the 85%. Other indirect effects were not reviewed by the authors.

NAVIGATION IS THE PRIMARY AUTHORIZED PURPOSE AS DIRECTED BY CONGRESS. This is grossly understated in this document and it is the defining factor with regard to the mission of the USACE. For all practical purposes, this

fact has been ignored, resulting in conclusions that cannot be implemented without the direct contravention of Congress.

Appendix B relates to this comment letter's economic analysis impacts on transportation issues.

Specific Concerns or Comments

Specific comments on this chapter appear in Appendix B.

Chapter 3.7 WATER RESOURCES

General Concerns or Comments

As is recognized in this section, the States of Missouri, Kansas, and Nebraska have all issued 401 certifications recognizing that instream commercial sand dredging does not impact the water quality standards of any of the states. All the sand plants of interest are eligible for the Missouri River General Sand Plant Permit, which permits the discharge of Missouri River sand back into the river.

Specific Concerns or Comments

There are no specific comments on this chapter.

Chapter 3.8 AQUATIC RESOURCES

General Concerns or Comments

The are no general comments on this chapter.

Specific Concerns or Comments

There are no specific comments on this chapter.

Chapter 3.9 WETLANDS, FLOOD PLAINS AND TERRESTRIAL RESOURCES

General Concerns or Comments

We believe there are no wetland impacts as a result of commercial sand dredging on the LOMR.

Specific Concerns or Comments

There are no specific comments on this chapter.

Chapter 3.10 FEDERALLY LISTED SPECIES

General Concerns or Comments

The commercial sand dredgers have worked with both the USFWS and the USACE in an effort to reduce potential impacts to the endangered pallid sturgeon. These provisions were added to permits negotiated previously and include the protection of potential risk areas for the fish. We believe that substantial risks to the pallid sturgeon or its progeny have been reduced to provide for its success.

The commercial sand dredgers support the efforts of the USACE to develop reasonable shallow-water habitat improvements in the LOMR.

Specific Concerns or Comments

There are no specific comments on this chapter.

Chapter 3.11 LAND USE AND RECREATION

General Concerns or Comments

This chapter does not recognize that the primary Authorized Purpose of the LOMR, consistent with act of Congress, is navigation. The river has been designed for navigation. By act of Congress, where there is a conflict between navigation and recreation, navigation has the priority. In other sections of this document, navigation is treated as a nemesis versus the priority which it holds. All sections in this document, including Chapter 3.11 and the review and evaluation of all alternatives, must be reprioritized to reflect this fact. This position is consistent with NEPA, which requires the evaluation to be conducted consistent with all relevant laws. The authors failed to recognize the priority established by the Authorized Purposes of the Flood Control Act of 1944 and the authorization of the BSNP that establish a factual context which cannot be ignored.

Specific Concerns or Comments

There are no specific comments on this chapter.

Chapter 3.12 ECONOMICS AND DEMOGRAPHICS

General Concerns or Comments

We believe the economics and demographics chapter and the economics and demographics analysis of alternatives are flawed and inaccurate. We believe the assumptions to be misguided and inappropriate. Our analysis of economics appears in Appendix B. Our analysis of economics was prepared by Edward Howard Robb, Professor Emeritus, University of Missouri. His conclusion is that the authors erred in

their methodology, conclusions, and most importantly the ability of tonnage lost from the Missouri River to be supplanted and replaced by sand tonnage from the Kansas and Mississippi Rivers and other alternative outlying sources.

In particular, alternative outlying sources do not exist. The conclusion generated by the authors are not consistent with the real world. Reasons are more fully stated by Edward Robb in his analysis. In summary, there is not sufficient quantity and type of material to meet the requirements.

In addition, Edward Robb has determined that the transportation theory is flawed.

We believe the economic section needs to be withdrawn and revised with real Missouri presumptions added based on actual Missouri data. As we have stated previously in this document, while we understand there was a compression of time in an effort to accomplish the goal and objective of getting this completed, this area in particular has serious defects that affect the outcome, impacts, and decision making for the USACE.

Specific Concerns or Comments

Specific comments are included in Appendix B.

Chapter 3.13 NOISE

General Concerns or Comments

We believe the appropriate methodology for comparison of noise limits is that of the State of Kansas DOT and the State of Missouri DOT. In both cases, single sources, while a receptor, would not be the benchmark and that either state would prepare a noise reduction strategy for an individual unit.

We believe the appropriate method for this analysis is actual sampling. Pilot studies could have also further verified comparisons. We believe the noise analysis provided in this study is exaggerated. The methodology for potential increase in production and its extrapolation is not consistent with the nature of the floodplain and obstructions within the floodplain.

There is no complaint analysis or any effort to determine actual complaints by citizenry throughout the basin. We are not aware of any dredger having a noise complaint regarding its operations.

In addition, no comparisons appear to be used to contrast potential noise factors.

As an example, Capital Sand's plant is located immediately adjacent to the Jefferson City Municipal Airport. This airport handles private aircraft, both propeller and jet driven, and helicopters for the Missouri Air National Guard. The plant is located

immediately adjacent to U. S. Highway 54 and a bridge crossing the Missouri River with four lanes of traffic at 60 mph. The Union Pacific main line and rail yard is immediately adjacent to the river on the opposite bank. In addition, U. S. Highway 63 with four lanes of traffic at 70 mph parallels the river way. Other facilities are similarly situated.

The BSNP is presently under capacity. This analysis should have assumed full capacity for navigation and full operational capability. The addition of the nominal number of barges and tows, conveyors, trucks, and loaders is likely to be lost in the din of the other activities.

At a minimum, these factors should be noted in the document and qualifying statements provided.

Specific Concerns or Comments

There are no specific comments on this chapter.

Chapter 3.14 VISUAL AND AESTHETIC RESOURCES

General Concerns or Comments

This section makes the presumption that barges, tows, dredges, and other water-borne activity are visually unattractive. We disagree. Barges and tows are heavily photographed and are part of the landscape and Americana. People line banks as the tows go by and, like trains and river boats, they are considered highly photographic. These transportation icons break up the monotony and provide alternative views that stimulate the senses. The river itself is designed for these views and it is part of the congressional Authorized Purpose of navigation.

The authors make a presumption that the existing landscape is desirable and that their choice of representations or representations out of a book are more attractive than those of Missourians. We believe all statements regarding barges, tows, and dredges should be eliminated as negative visual resources.

In the segment analysis, the authors give great deference to recreationists and owners of great visual capability on tops of banks. They give deference to undeveloped land. This is a very biased view of life. Urbanization in itself represents contrast. Humans require contrast. Architecture can be satisfying, structures rewarding and inspiring. The authors' attempt to characterize visual acuity without a context of location.

In addition, in their evaluation of segments, the authors cast judgments throughout, judgments that cannot be necessarily reconciled with the residents of specific communities. Like any nuisance, it is the values of the community at that location that best judge topics such as aesthetics.

Specific Concerns or Comments

Section 3.14.1 Introduction

Page 3.14-1, paragraph 4. "These operations introduce barges and heavy equipment into the view shed of the river, a valued visual resources, and detract from views associated with the river itself." – We disagree. Barges and tows are heavily photographed and are part of the landscape and Americana. The river itself is designed for these views.

Page 3.14-1, paragraph 4. "Viewer groups affected by dredging activities include residents in riverside communities and recreationists along the Project segments in rural and developed areas, who have a higher sense of ownership of views of the river." – This statement should be removed from this document. We are not aware of one complaint by "residents in riverside communities and recreationists" regarding visual impairment. In addition, once again, these individuals are cast in God-like priority. Congress has determined that the very items presented in this paragraph are what the river is designed to serve. The differentiation of activities throughout the river are inconsequential and overstated in this section.

Page 3.14-1, paragraph 4. "Those employed at riverside places of business and industrial areas and motorists using adjacent roadways are moderately affected by dredging operations because, thought they value views of the river, they are more focused on work or driving activities when viewing dredging operations. Agriculture areas are least affected by dredging operations because visual access to dredging operations is often limited by the presence of vegetation along the riverbanks and the absence of visual access points." – This assessment is misguided. Missouri water quality standards were designed to discourage recreational boating on the river due to the risk with the primary Authorized Purpose—barges and tows. This mentality is exactly what Missourians object to. This section should be removed from the document.

Section 3.14.2.2 Missouri

Subsection *Missouri Statewide Comprehensive Outdoor Recreation Plan*

Page 3.14-3. The authors mischaracterize the expectation with regard to the SCORP. They represent that the SCORP is a decision document when comparing other economic uses. It is a mischaracterization that the SCORP represents the views of the combined citizens of this state as a decision document.

Section 3.14.5 Viewer Groups and Viewer Responses

Page 3.14-9. Dredgers have the most dominant view of the river. No dredgers were interviewed during this exercise.

Section 3.14.5.4 Recreationists

Page 3.14-11. "Viewer sensitivity is high among recreationists because they are more likely to regard the natural and built surroundings as a holistic visual experience." – The river was "built" for the Authorized Purpose of navigation and flood control. There is no explanation of the highest visual and aesthetic navigation and flood control scenario in the document.

Section 3.14.6.1 Visual Condition of St. Joseph Segment

Page 3.14-12, paragraph 2. "Residential areas along the river tend to be large, stately homes that are located higher up on the river's banks, with elevated views out over the river and its lush riparian corridor." – These large homes block the view of the river and dominate the river's skyline. While they admire the view, they rob others of the visual aesthetic and grace of the bank. Those who impair the view should not be given deference for the view they have taken.

Chapter 3.15 CULTURAL RESOURCES

General Concerns or Comments

There are no general comments on this chapter.

Specific Concerns or Comments

There are no specific comments on this chapter.

Chapter 3.16 AIR QUALITY AND CLIMATE CHANGE

General Concerns or Comments

Direct contributions from dredging operations are not significant and have little consequences on the primary regulated pollutants with the possible exception of particulate.

As it applies to greenhouse gases, commercial sand dredging has a net benefit when compared with the number of trucks which would be necessary to replace the current yield.

Specific Concerns or Comments

Section 3.16.5.1 Existing Emissions from Current Dredging Operations

Page 3.16-12, paragraph 1. "While the precise contribution to the deterioration of ambient air quality is difficult to quantify, it is reasonable to assume that the monitored levels presented above are influenced by existing dredging operations." – We do not

concur with this statement. This statement makes a leap that does not match the data and the first part of the sentence. Just the number of pieces of equipment involved in a commercial sand dredging operation would make it reasonable to assume that the monitored levels presented are not influenced by existing dredging operations. This sentence should be deleted.

CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

Chapter 4.1 INTRODUCTION

General Concerns or Comments

This section has to be read with all the comments combined. We object to the structure of the alternatives. We object to the structure of the Proposed Action. The Proposed Action does not properly carry forth the existing status of permitting along the Missouri River. While valuable for discussion purposes, the segments neither correlate with the property rights vested in current permits nor correlate with business operations amongst some of the parties. The Proposed Action should not include speculative dredgers, especially with the initial premise presented by the USACE that there is "bed degradation" along the river caused by dredging.

The Proposed Action should delete or provide a subset with the two non-existing dredgers' tonnage deleted in this analysis. An additional 1.5 million tons are included in the analysis that are unnecessary, not existent and, with the premise presented in the document, inappropriate. The breadth of the alternatives do not provide for a likelihood of success for the dredgers. The No Action Alternative, Alternative A, and Alternative B all result in elimination or severe contraction of dredging and navigation on the Missouri River. This is not consistent with the purpose and need statement.

As more specifically stated in the individual sections, we believe severe gaps exist in the analysis to the detriment of the dredgers.

The entire chapter on Environmental Consequences is filled with adjectives, adverbs, and speculation that are inappropriate in such a document.

Specific Concerns or Comments

Section 4.1.1. Summary of Proposed Action and Alternatives Evaluated in Detail

Page 4-1, first bullet point. "Permit applications for commercial sand and gravel dredging would be approved at the levels requested by the eight companies…." – A subset of this alternative is to delete the two companies who are not on the river and a more accurate reflection of tonnage demand would be presented. Over 1.5 million tons were added to the alleged Proposed Action while an assumption that bed degradation exists and is a negative consequence presented as fact. The two non-existing companies

should be deleted from this analysis. The two non-existing companies should be deleted from all other portions of analysis in this document. The Proposed Alternative should reflect negotiations that have already occurred, further constraining commercial sand dredging on the Missouri River.

Page 4-1, first bullet point., Proposed Action. "Permitted dredging from the LOMR would equal or exceed recent demand levels; therefore, no increased utilization of alternate supplies would likely be necessary." – There is not a representation of "exceeding recent demand levels" by the applicants. There is no formal methodology. Different conditions existed between the Kansas City District and the St. Louis District at the time of application. At the time of application, the issue of bed degradation had not been presented. As such, the "Proposed Action" is a fabrication of applications submitted prior to negotiations that have already occurred.

Page 4-1, second bullet point., No Action Alternative. "Alternate sources of commercial sand and gravel would be relied on to fulfill demand." – Any statement that alternative sources could fulfill the demand requirements is pure speculation and is not supported by fact. See Appendix B.

Page 4-1, third bullet point, Alternative A. "Allowable commercial dredging tonnages would be set at levels at the lower end of the range that is reasonably expected to reduce the contribution of sand and gravel dredging to continued river bed degradation." – This document does not adequately confirm that dredging is a cause of bed degradation. We do not believe that the USACE has the ability to determine in a fair, non-biased methodology what is "reasonably expected to reduce the contribution of sand and gravel dredging to continued river bed degradation." We do not believe that bed degradation continues. In fact, the river is aggrading. See Appendix A of this comment letter.

Page 4-1, third bullet point, Alternative A. "Alternate sources of commercial sand and gravel would fulfill the remaining demand." – The alternative sources presented in the document, including the Mississippi and Kansas Rivers, cannot fulfill the remaining demand. See Appendix B.

Page 4-1, fourth bullet point, Alternative B. The same comments apply to Alternative B as above for Alternative A.

Page 4-1, fifth bullet point, Alternative C. "Permitted dredging from the LOMR would equal or exceed recent demand levels…." – The authors' analysis of "recent demand levels" and whether they would or would not be exceeded depend on one's perspective and point of view. One project could change recent demand levels. Historically, demand consistently rose until the recent economic slowdown. It is reasonable to expect that demand would have followed the same curve. Applications were requested consistent with that demand increase. It is our job and responsibility to provide material to meet demand.

Section 4.1.3.1 Baseline Conditions

Page 4-3, first full paragraph, "…commercial dredging of sand and gravel in the LOMR would cease…." – The bed of the Missouri River and the sand and gravel therein are all the property of the States of Missouri and Kansas. It is not the exclusive decision of the USACE with regard to the termination of sand and gravel operations on the Missouri River.

Page 4-3, second paragraph, "The response of the river would generally follow its current trajectory, and ongoing impacts to resources would generally continue." – As with the majority of this document, the bias has been toward the negative and the presumption of the authors that they can comprehend and understand the responses of the river. If this were the case, the USACE could have projected in advance the response of the river to lack of sediment and the design of the BSNP. We contend that the river will change regardless of the actions of the Corps, and the "current trajectory" and "ongoing impacts" may or may not continue. As stated in this document, the river is subject to many impacts and is "a great experiment." As previously stated, the river is currently aggrading. Under Alternative C, based on the statement of the authors, that ability to aggrade will continue. The rest of their presumptions, therefore, fail.

Page 4-3, third paragraph, Socioeconomics. We do not concur with the economic analysis presented in this document. See Appendix B for a partial analysis contrary.

Section 4.1.3.3 Alternate Sources

Page 4-4. "Therefore, the impact analysis for alternate sources is general and based on existing information about the most probable types and locations of sand and gravel sources (e.g., open-pit mines, instream mining, and dredging in other rivers)." – We believe all the assumptions regarding alternative sources are flawed and erroneous. See Appendix B.

Chapter 4.2 GEOLOGY AND GEOMORPHOLOGY

General Concerns or Comments

We believe Chapter 4.2 and its analysis is flawed. Appendix A, which includes an analysis of Chapter 4.2 by Dr. Charles Patterson of Allgeier, Martin and Associates and Mr. John Doyle and Mr. Henry Hauck of JD-Mc Engineering. Both reached the conclusion that the analysis has significant concerns. Some of the concerns are as follows:

1. The DEIS repeatedly refers to unpublished data and reports as sources.

2. An analysis of the figures in the document demonstrates that the river clearly shows aggradation in the overall LOMR. Even the Kansas City segment, which is

admitted by all parties to have stress, shows aggradation from 2007 to 2008 and again from 2008 to 2009.

3. There are contradictions in the description of sources of degradation in the Kansas City segment.

4. Cited reports suggest that bed degradation in the Kansas City reach and other reaches of the lower 498 miles of the Missouri River is the result of a combination of causes. This document points the finger at only one—commercial sand dredging.

5. The term "flow" is used in various ways. Likewise, the term "sediment" is used in multiple contexts with different meanings.

6. The analysis is not objective and uses words with no specific meaning, such as "slight, slightly, moderate, long-term, short-term, extensive, significant, major, substantial, substantially, etc."

7. There are a number of errors in graphs and figures.

8. The DEIS states dredging causes bed degradation because of the volume of material removed from the LOMR. The same argument can be applied to the construction of dikes in the LOMR. Sediment is removed from the LOMR by deposition behind the dikes. The material captured from the sediment stream and deposited behind the dikes is estimated at approximately 1 billion tons. If the removal of sediment occurred over a period of 50 years, that would correspond to an average of 20 million tons per year. Sediment removed by commercial dredging is a fraction of the sediment removed from the main channel during the implementation and continuation of the BSNP. Numerous other conclusions can be made from the very same data presented by the authors.

The work of Patterson, Doyle, and Hauck is attached hereto and fully incorporated, both generally and specifically, as Appendix A. Given the timeframe allotted for a review of the DEIS, there is sufficient commentary for the USACE to move cautiously regarding the geomorphic analysis.

In addition, as stated in the general comments, we must comment regarding our view of the bias directed in this document. The failure to discuss the impacts of the affects of the dams and the BSNP is quite troubling. While there is the potential for the localized impact as a result of dredging, the impacts pale in comparison to the USACE's own responsibilities. If bed degradation is the issue as described, then it is incumbent upon the Corps to provide appropriate analysis of its conduct and its impact on this bed before compromising the rights of others.

We recognize in working with the USACE for decades that this will be—forever—a work in progress.

We believe this section is flawed. It should be reconstructed with the Corps' data regarding their impacts, with the preconceived biases removed, and an objective analysis in its place.

Specific Concerns or Comments

Specific comments can be found in Appendix A and are fully incorporated herein.

Chapter 4.3 INFRASTRUCTURE

General Concerns or Comments

We reincorporated our general comments from Chapter 3.5 and our general discussion under this section. We reemphasize that there is no entitlement with regard to infrastructure and the Missouri River. Adjustments to infrastructure are necessary and required with a dynamic system such as the river. Holders of infrastructure are required to make adjustments as part of Operation, Maintenance and Replacement. The BSNP provides river infrastructure users with a greater degree of reliability regarding the river system. It is not a guarantee. Commercial sand dredgers have been required to make adjustments in their systems due to numerous issues, including high and low flows introduced into the system, as a result of requirements under the Endangered Species Act for the benefit of the pallid sturgeon. No one provided dredgers with a subsidy, a reconciliation, or a "consistency." The dredgers were expected to make adjustments to their systems, to their business plans, and to their operating strategies. The same can be said for infrastructure holders. The presumption in this document that holders of infrastructure are given a consistent operation is an underlying flaw. The members of the navigation community, who are the priority Authorized Purpose in the river, can attest to this failure. The lack of certainty on the river most dramatically affects the priority Authorized Purpose. The majority of the infrastructure allegedly impacted are lesser Authorized Purposes in the hierarchy established by Congress. This chapter should be reassessed and its priorities reestablished in its evaluation.

The arguments relating to structural failure due to bed degradation are not substantiated by the facts. As indicated previously, the river is aggrading. As such, the calamities and exaggerations presented in this section are mere speculation and, quite frankly, fear mongering which, if reasonably certain, would require the USACE to demand sufficient funds to provide a remedy. No such demand has been made.

Specific Concerns or Comments

Section 4.3.1 Introduction

Page 4.3-1, paragraph 2. "Water suppliers and electric utilities commented that declining low water levels from ongoing dredging has compromised the performance of water intakes that provide cooling and process water to several electric generating stations." – There is no citation to the location of the commenter. It appears that

everything said about the Kansas City reach is assumed to be universal. This is not the case. In many cases, dredgers have been requested to dredge around intakes. In addition, there is no discussion about the obligation for the holders of infrastructure to plan for changes in their placement. The BSNP provides the holders of infrastructure the stability to not have to regularly relocate structure and "chase the river." The entire infrastructure argument is disingenuous as they benefit from the navigation created by the dredgers and the concrete created by the resource. The argument is circular and the logic presumptive.

Page 4.3-1, paragraph 2, "…reducing the effectiveness of river bed filtration." – If this statement is fact, then the providers of water supply have failed the public in their mission as they were aware of the design of the BSNP, were aware that commercial sand dredging existed on the river, were aware of the risks, and failed to account for the risks in their selection process. If this statement is factual, which since there is no cited party for the response, it is a classic case of moving toward a problem. Commercial sand dredgers have been on the river for over 100 years. The only ones with the right to speak are those with intakes over 100 years young.

Page 4.3-1, paragraph 3, "…a process referred to as headcutting." – If this statement is factual, it is the basic argument against the spring rise and its consummate summer fall. The spring rise with the summer fall are conveniently allowed in spite of the fact that they may cause headcutting.

Page 4.3-2, bullet point six, "Wharf and dock facilities." – No dredgers were interviewed regarding their docks and facilities on this issue. The cumulative sand plants may represent the greatest number of large docking facilities on the river.

Chapter 4.4 NAVIGATION AND TRANSPORTATION

General Concerns or Comments

The BSNP is designed for significantly more navigation traffic than is on the river. Any increases in navigation are irrelevant as a result of the proposed alternative or other economic actions that may result in additional shipping. In fact, increased shipping will maximize the federal investment, improve the economy of the adjacent states, and provide for competition on costs in the form of water-compelled rates. This document implies that increased navigation and increased transportation on the river is a negative effect. There is no justification for that bias.

As stated in this document, commercial sand dredging accounts for 85% of the total navigation on the Missouri River. The No Action Alternative, Alternative A, and Alternative B will result in indirect effects and direct effects which will alter the economic character of the Missouri River basin. Considering the fact that Congress has endorsed navigation as the primary Authorized Purpose of the Missouri River system, actions contrary to that position violate congressional intent, are not the decision of the USACE or others, and violate the mission intent.

The majority of commentary in this section is presumptive, without citation, and with limited evaluation.

Economic impacts are further addressed in Appendix B. Issues on geomorphology and the presumptions employed in this document are provided in Appendix A.

Specific Concerns or Comments

Section 4.4.2.2 Surface Road Traffic

Page 4.4-2, paragraph 1. "Daily haul truck trips for each of the five river segments…." – River segments as proposed in this document are irrelevant. What are relevant are actions by MoDOT regarding project selection, and FHWA and actions of Congress regarding the highway program. Sand plant activity is directly related to project location. Choices of delivery will be dictated by project, not by sand plant.

Page 4.4-2, paragraph 2. "…an approximately 25-mile radius." – Use of a 25-mile radius is effective for some urban projects. Rural projects travel greater distances in the realm of 65 miles. Contract shipments may exceed 100 miles. This presumption is in error. This information was provided to the authors.

Page 4.4-2, paragraph 2. "…new sand plants proposed in the St. Joseph and St. Charles segments." – As previously stated, with the presumptions presented in this document, the inclusion of any new sand plants as a probable presumption, is not reasonably certain, and should not be included in this evaluation.

Section 4.4.3.1 Changes in Navigation Traffic

Subsection *St. Joseph Segment*

Page 4.4-2. "This increase in river traffic could potentially limit the river area available for other navigation traffic, including commerce-related tugs and barges and recreational boats, and could result in congestion on the river." – Commercial sand dredging represents 85% of the tonnage hauled on the river. Even presuming that the presumption is correct, which we do not believe, it would be equally presumptive to assume that the commercial sand dredgers who operate in specific reaches could coordinate their activities to assure limited congestion. In addition, the Coast Guard presents no evidence or expression of concern regarding river traffic congestion anywhere in the river. Clearly, there is no citation to this commentary in the document. Presently, permits require dredging to accommodate other shipping as a priority. As stated in the document, the channel is over 300 feet wide by design. It is designed to accommodate this presumption.

Section 4.4.3.2 Changes in Navigation Hazards

Subsection *St. Joseph Segment*

Page 4.4-3, paragraph 1. "Continuing river bed degradation could result in hazards to navigation…." – The appraisal that is "could result in hazards to navigation" is not especially illuminating. There could also not be hazards to navigation. We note no opinion by the Coast Guard or any other agency on this theory. We do not consider the 2009 report of USACE to be unbiased.

Page 4.4-3, paragraph 2. "Some of these pipelines were installed many decades ago." – These pipelines have the obligation to adjust their operations under other statutes.

Page 4.4-5, paragraph 1. "There are numerous abandoned sunken barges and other vessels and large objects in the Missouri River (USACE 1991a, 1991b; Wheeler pers. comm.. 2010)." – No captain of any tug or vessel owned or operated by the applicants was interviewed for their opinions regarding operations on the river.

Page 4.4-5, paragraph 1. "…the shelves may become more exposed (Chapman pers. comm.. 2010, USCG 2009)." – Mr. Chapman's experience operating tugs on the river is nominal. No captain of any tug or vessel owned or operated by the applicants was interviewed for their opinions regarding operations on the river.

Page 4.4-5, paragraph 2. The entire paragraph is speculative and relies on anecdotal information. No person involved in the drafting of this section has extensive time navigating the river or would they qualify as a deckhand on one of the tugs. They have limited knowledge of the river and the operational requirements of tugs and barges.

Subsection *Kansas City, Jefferson City, and St. Charles Segments*

Page 4.4-5, paragraph 1. "…near the Charles B. Wheeler Downtown Airport (RM 368). This area becomes impassable during periods of low water (Wheeler pers. comm.. 2010)." – The USACE was advised that additional water being provided during the summer low flow period would address numerous navigational issues regarding compliance with the 9-foot deep channel requirement.

Page 4.4-5, paragraph 2. "This increase would likely contribute to moderate additional degradation in the short term…." – There is no supporting evidence of this fact other than speculation.

Section 4.4.3.3 Changes in Truck Traffic

Page 4.4-6. In this section, the calculations of traffic projections are not sufficiently detailed or consistent with MoDOT, KDOT, or FHWA standards. The traffic analyses throughout the document do not represent detailed models that would be employed by MoDOT, KDOT, or FHWA in the analysis for road building purposes.

Subsection *St. Joseph Segment*

Page 4.4-6. "…this increase in haul truck traffic is considered adverse because it could contribute to congestion and traffic delays." – This conclusion is a dramatic leap with no substantiation. It is, at best, an educated guess. It is presumptive and speculative.

Subsection *Kansas City Segment*

Page 4.4-6. "…originate from the Master's-Waldron sand plant." – Master's volume should be deleted from the analysis or a sub analysis developed based only upon existing dredgers.

Subsection *Waverly and Jefferson City Segments*

Page 4.4-9. Increased dredging in the central part of the state is subject to project identification and cannot be estimated using a universal distribution method. The comments provided in the proposed alternative are applicable to Alternative A, Alternative B, and Alternative C.

Chapter 4.5 WATER RESOURCES

General Concerns or Comments

401 certifications by the States of Missouri, Kansas, and Nebraska for commercial sand dredging indicate that there will be no impact on water quality standards.

Specific Concerns or Comments

Section 4.5.3 Proposed Action

Page 4.5-2. "Direct impacts to groundwater would include local short-term alterations to river bed hydraulic conductivity…." – Short-term alterations to river bed hydraulic conductivity occur with the spring rise and the accompanying summer fall on adjacent wetlands and farmland.

Page 4.5-2. "…increased dredging would result in an elevated potential for vessel collisions or leakage of fuels, oils, and chemicals." – This statement is not realistic. The river is designed for increased shipping. It is currently underutilized. An increase in general shipping would have the same result, and the river is currently underutilized based upon the design criteria. Tomorrow, 30 tows and 180 barges could be contracted to come up the river. The risk does not change. Increased dredging would not change any of the risk. This statement continues to demonstrate bias against commercial sand dredging in the drafting of this document.

Section 4.5.3.1 Suspended Sediment

Page 4.5-2, paragraph 1. "Existing dredging operations result in suspended sediment at and downstream of the dredge site." – This is beneficial for the pallid sturgeon. An increase in suspended sediment is the objective of the current notching program. This document indicates that sediment is over 70% below its pre-dam levels. 401 certifications have been issued by Missouri, Kansas, and Nebraska indicating no impact on water quality standards. There is no threat to water quality standards or impact on the Missouri River.

Page 4.5-3, paragraph 1. "Note that suction-head dredges produce substantially lower levels of suspended sediment compared to cutter-head dredges because cutter-head dredges extract glacial deposits that are not part of the base load." – This statement is not correct as it applies to cutter-head dredges. Cutter-head dredges do not extract glacial deposits that are not part of the base load. Cutter-head dredges do not go deeper than suction head dredges. It is the position of the cutter-head operators that the authors do not understand how cutter heads work or their use on the river.

Subsection *All Segments*

Page 4.5-4, paragraph 2. "Suction dredges that extract only bed load, opposed to cutter-head dredges that cut into glacial deposits, typically produce less sediment suspension at the dredge head…." – We do not concur with this statement and presumption in that cutter-head dredges do not cut into glacial deposits.

Page 4.5-4, first full paragraph. "…would contribute to continued or increased tributary headcutting, which would add sediment to the LOMR." – The notching program adds increased sediment to the LOMR. The BIOP requires increased sediment. Tributary headcutting, as the analysis stated, increases turbidity and is beneficial to the pallid sturgeon. If the facts are as indicated, then the USACE should be demanding credit under the BIOP for this contribution of sediment to the system.

Page 4.5-4, first full paragraph. "Under the Proposed Action, tributary degradation and associated headcutting would likely increase or remain at current levels in all river segments, which would result in long-term continued or increased rate of sediment delivery." – This meets the requirements of the BIOP. If this is a factual statement, an effort to stop bed degradation and tributary headcutting will be detrimental to the pallid sturgeon. If the authors believe this statement of fact to be true, efforts to stop bed degradation violate the Endangered Species Act as it applies to the pallid sturgeon.

Section 4.5.3.3 Alluvial Aquifer Levels and Interactions

Page 4.5-11, second full paragraph. "USGS studies conducted in Platte County, Missouri indicated that lowering the groundwater table by as little as 3 feet could make

the study wetland drier and result in corresponding changes in vegetative and soil characteristics (Blevins 2004)." – The inverse is also true. Increased elevations make wetlands wetter and farmlands wet. This did not seem to be an issue of concern in the implementation of the spring rise and its accompanying summer fall. This can also cause changes in the wetland community, but is not mentioned. In addition, a lower water table can have a beneficial economic impact. For example, a lower water table can result in an increased yield of cropland by farmers having greater consistent opportunity to farm. Municipalities who utilize bottomland farmland for the application of wastewater treatment plant sludges will have more consistent operations and opportunities. None of these attributes are included in the economic analysis or are compared at all against the discussion of infrastructure.

Section 4.5.5 <u>Alternative A</u>

Section 4.5.5.3 Alluvial Aquifer Levels and Interactions

Subsection *Alternate Sources*

Page 4.5-18. "Groundwater contamination associated with the use of alternate sources would be similar…." – Open pit mining in the floodplain will result in greater risk of flood hazard through the loss of integrity of inner basins protected by levees. Flood events will surface in the pit mines, undermining flood control. This has been documented numerous times, including during the major floods in 1993 and 1995.

Chapter 4.6 AQUATIC RESOURCES

<u>General Concerns or Comments</u>

The applicants acknowledge that they may have an impact on aquatic resources. However, the impact on aquatic resources as presented in this analysis is exaggerated.

The authors use undefinable terms that can easily be contested or create undefinable qualifications.

While the document does note that the Missouri River is highly altered, it fails to state and endorse the obvious—natural habitat is limited. While we recognize that this is a DEIS for commercial dredging permits, the existing system, its massive alteration, and that alteration's potential impact on aquatic resources is vastly understated. Comparisons and contrasts are limited. Blame is allocated disproportionately upon the dredgers.

The failure to recognize the extent of the altered environment when comparing the impact of dredging is a vast oversight. It reflects a bias in favor of the USACE and its projects, including the BSNP.

The document should properly reflect the impacts of the BSNP and the alterations to flow dynamics caused by the dams and reservoir system in the review of any potential impacts under any alternative in this study. It fails to do so.

The majority of the river has no dredge activity. Dredge activity is not universal across the river. The presumption of bed degradation is not universal across the river. In fact, the river is aggrading, even in the most likely areas of potential specific site bed degradation.

The document presumes that the species composition will not change as a result of modifications to the operation of the BSNP. It appears to also presume that the BSNP has no consequence and that the only consequence to this man-made river is commercial sand dredging. The USFWS has determined, with no documentation or citation in this document, that the six main stem dams and the BSNP impact endangered species and other habitat issues, and the BIOP requires reasonable modifications in order to enhance that habitat. This appears ignored in the aquatic resources chapter.

Specific Concerns or Comments

Section 4.6.1 Introduction

Page 4.6-1, paragraph 2. "Dredging directly affects fish and benthic invertebrates by capturing and removing aquatic organisms via the dredge head or dredging vessel propeller (entrainment), causing injury or mortality." – There is no documentation or reference to this statement.

Page 4.6-1, paragraph 2. "Potential indirect effects include changes to aquatic habitats due to river bed degradation." – The majority of the river has no dredge activity. It is undisputed that major portions of the river are aggrading.

Section 4.6.2 Potential Impacts on Aquatic Habitat

Page 4.6-1, paragraph 1. "In addition to direct habitat disturbance from dredging, potential indirect impacts to aquatic habitat—particularly shallow-water habitat—may be associated with river bed degradation…." – This is an unsubstantiated statement. The cause of bed degradation is the conduct of the USACE, its operation of the dams and reservoirs, and the BSNP.

Page 4.6-1, paragraph 1. "…the potential dredging-related effects of dredging and river bed degradation cannot be fully quantified at this time." – The document provides information that clearly indicates significant portions of the river are aggrading and that the river as a whole is aggrading.

Section 4.6.2.2 Indirect Alteration of Shallow-Water Habitat Abundance

Page 4.6-5, first full paragraph. "As sediment is removed from active transport, the river erodes material from the river bed downriver from the dredged area to replace the material removed from active transport…." – The failure of the dams and reservoirs to allow sediment transport causes this situation. The design of the BSNP exacerbates it.

Page 4.6-5, second paragraph, references to USACE 2009 reports. The USACE 2009 reports, those that have been peer reviewed, state that studies are necessary. Yet, this document solves all the issues in two months and blames dredging for all ills. The dredgers refute the position of the authors and believe the content is biased and directed.

Section 4.6.3.1 Dredge Entrainment

Page 4.6-7, first full paragraph. "Fish may swim toward the dredge head for various reasons including visual, electro-receptive, or audible stimulation…." – Maybe the fish are just stupid. These are the same fish that bite on hooks and can't speak English.

Page 4.6-8, first full paragraph. "No definitive mortality estimates are available for the potential quantity or rate of fishes or their larvae that could be subject to entrainment from dredging in the LOMR. The most conservative assumption is that 100 percent of all entrained animals die…." – The most liberal assumption is that none are impacted with zero mortality.

Section 4.6.3.2 Propeller Entrainment

Page 4.6-8, paragraph 1. "The effect of tugboat propellers on fishes and other aquatic resources between the dredging sites and various sand plants is a concern associated with the magnitude of tugboat traffic and the river channel geometry." – This should be deleted.

Page 4.6-9, top of page. "If vessel traffic is high, the impacts to fish species could be considerable." – Considerable should be deleted and replaced with the word *increased*. It is a function of the baseline condition. How do you know if it is "considerable?" We note, again, that the river has been designed for the Authorized Purpose of navigation, and the amount of navigation is not at maximum. Therefore, additional propellers, even those not of dredgers, can be on the river with the expectation of the same condition. This is not an increase.

Section 4.6.3.4. Elevated Suspended Sediment and Turbidity

Page 4.6-11, paragraph 2. "…suspended solid concentrations typically returned to background concentrations within approximately 1,300 feet (USACE 1990)." – Add: "*The reader is reminded that dredge methods vary and, as such, impacts may vary as well*."

Page 4.6-11, paragraph 3. "Information is limited about the incubation success of fish spawning in the LOMR in aggregate habitat." – Add: "*Increased sediment may therefore reduce the reproductive capacity of non-native species in the system*."

Section 4.6.5 Proposed Action

Pages 4.6-14 and following. This section and subsequent sections, including the No Action Alternative (**Section 4.6.6**), Alternative A (**Section 4.6.7**), Alternative B (**Section 4.6.8**), Alternative C (**Section 4.6.9**), and Summary of Impacts and Table 4.6 (**Section 4.6.10**). – The entire sections relating to alternatives are speculative, presumptive, and rife with subjectivity. The entire section should be deleted.

Chapter 4.7 WETLANDS, FLOOD PLAINS AND TERRESTRIAL RESOURCES

General Concerns or Comments

Nowhere in the document is there a discussion of the potential public health impact of expanded wetlands nor the historical underpinning for their contraction. While the document enthusiastically embraces an expansion philosophy, it does not define the consequences of that philosophy, the requirements for additional pesticides, or the loss of farmland production to the international food supply. The current policy of increasing wetlands has a negative public health scenario that is never discussed in the document.

Other sections in this document indicate that there is nominal groundwater influence away from the channel itself. (See Chapter 3.9) In spite of other statements in the document, this section presumes that bed degradation will undermine the entire wetlands construct of the LOMR. There is little dredging on the river and fewer areas degrading, assuming the authors' standards.

Assuming bed degradation, which we directly dispute, there are other positive benefits should the factors presented in this section be real. There is no accounting for the potential increase in agricultural production, the increased ability of the beneficial use of bio solids from local wastewater treatment plants, and potential reduced flooding scenarios of lower water elevations. The second primary Authorized Purpose of the dams and reservoir system and the BSNP is flood control. An EIS is an evaluation of the impact on the human environment. Nowhere is there a discussion of that fact.

We note for the record our objection to the entire section, its conclusions, its interpretations, and its presumptions. We note no science of value. We note no proper analysis. We note conjecture and speculation. We note no foundation. This entire section should be redrafted with speculation removed and detailed science reestablished.

Specific Concerns or Comments

Section 4.7.1 Introduction

Page 4.7-1, paragraph 4. "Commercial dredging is likely to have contributed to the loss of LOMR wetlands indirectly through river bed degradation." – We dispute this position. As stated previously by the authors, there is a direct relationship to water elevation. If there is more water, there will be more wetlands. Missouri has argued for over 20 years for the greater release of water downstream and has been rejected. The statement is pure presumption, not substantiated by data. The cause of concerns and issues on the LOMR are the result of the retention of sediment behind the dams in the reservoirs upstream and the design of the BSNP. Congress has authorized a non-natural system for the benefit of eight Authorized Purposes. There is no proof to support this statement.

Page 4.7-2, first full paragraph. "Continued dredging would contribute to further river bed degradation, leading to lower river stages and lowered groundwater levels, which could cause both a decrease in wetland acreage and a change in wetland type in groundwater-dependent wetlands." – There is no scientific evidence presented for this statement. It is mere presumption. The underpinnings that could be presented are a series of internal document from the Corps and a recon study that has not been peer reviewed or challenged. We challenge the authors to prove the nexus and then prove that it is any different than the LOMR flows when the river was not channelized. Unsubstantiated claims are rife throughout this document, and this is an example of one.

Page 4.7-2, second full paragraph. "This effect would be most pronounced during summer and drought periods, when river stages are lowest, and when wetlands are most dependent on groundwater." – Earlier sections of this document indicated that the reach of the effect is limited and that the groundwater table further from the channel was not significantly impacted. The document is in conflict.

Page 4.7-3, paragraph 1. "…lowered groundwater levels could affect wetland restoration and preservation efforts being conducted under the Missouri River Recovery Program and various USDA wetland and habitat programs." – The previous comment is re-noted. Other portions of the document contradict this presumption.

For the record, we note a numbering discrepancy in this section as there are two sections numbered "4.7.1."

Section 4.7.1 Assessment Methods

Page 4.7-4, paragraph 1. "…an accurate estimate of the quantity of converted wetlands along the LOMR." – The assessment only presumes wetlands are an asset and have no negative consequences. This is not true.

Section 4.7.2 Proposed Action

Pages 4.7-8 and following. This section and subsequent sections, including the No Action Alternative (**Section 4.7.3**), Alternative A (**Section 4.7.4**), Alternative B (**Section 4.7.5**), and Alternative C (**Section 4.7.6**). – The analysis is a simple one—wetlands good, dredging bad. There is no mention in any alternative analysis of the effects of the BSNP on the results. Reading this document one would think that the channel operates in perfection and in complete equilibrium but for the dredgers. The river is aggrading. See Appendix A of this comment letter.

This section retains no objectivity.

Chapter 4.8 FEDERALLY LISTED SPECIES

General Concerns or Comments

Commercial sand dredgers note that negotiations were held with the USFWS in an effort to assist species protected under the Endangered Species Act. No action was requested by the USFWS for the least tern, the piping plover, or the Indiana bat. Extensive negotiations occurred in an effort to improve potential propagation for the pallid sturgeon. The result of that discussion and negotiation appear as general exclusion zones in the commercial sand dredging permits. The exclusion zones generally exclude tail ends of chutes and tributaries believed to be desirable for the pallid sturgeon. They are specifically delineated. The effort was cooperative and consistent with Section 7 of the Endangered Species Act, Informal Consultation.

The commercial sand dredgers are direct participants in the MRRIC. The MRRIC is responsible for assisting the Corps and the USFWS in their decisions regarding adaptive management to benefit the various species. The intent is to provide direction and guidance on the Missouri River Recovery Plan ("MRRP") and Missouri River Environmental Restoration Plan ("MRERP").

To date, there have been no presentations or suggestions at any MRRIC-related function that commercial sand dredging, under its current restrictions, creates a substantial impact to the pallid sturgeon.

The BIOP specifically cites the lack of sediment in the Missouri River system is a major reason for the decline of the pallid sturgeon. The BIOP requires the addition of shallow-water habitat and increased erosion of the banks, which is developed through a notching program. Commercial sand dredgers concur that the failure to provide adequate sediment not only impacts the potential success of the pallid sturgeon but also contributes to bed degradation, loss of flood control, and loss of high-quality material in the LOMR.

We emphasize that no presentation, request, or demand, even inferred, has been presented before the MRRIC and the MRRP relating to commercial sand dredging as a threat provided areas are preserved for propagation.

Specific Concerns or Comments

Section 4.8.3.1 Pallid Sturgeon

Page 4.8-5, first full paragraph. "These geomorphic changes may result in decreased tributary habitat connectivity through tributary headcutting (as described in Section 4.2), which could slightly reduce tributary availability for pallid sturgeon feeding." – This statement does not reconcile with the current dredging restrictions approved through informal consultation. Specifically, areas downstream of chutes and tributaries were excluded to protect spawning of the pallid sturgeon. In addition, increased turbidity as a result of headcutting is consistent with the demand in the USFWS's BIOP for more turbidity to support the success of the pallid sturgeon. This conflict regarding headcutting represents an inconsistency with regard to protection of the pallid sturgeon.

Page 4.8-6, first full paragraph. "…entrainment could occur if pallid sturgeon are present within the dredge suction field or eggs or larvae are present in the propeller inflow zone." – No evidence is cited for this presumption, and no demonstration of an actual problem exists.

Subsection *Alternate Sources*

Page 4.8-7, paragraph 2. "Increasing the dredging or degradation limits in the Kansas River dredging permits would require a new EIS and consultation with the USFWS regarding potential impacts to federally listed threatened and endangered species, including the pallid sturgeon." – Add the following sentence: "*As a result, the Kansas River is not an available alternative source to replace Missouri River sand.*" In addition, you will note that the informal consultation on the Missouri River issues on the pallid sturgeon took over two years.

Section 4.8.3.3 Interior Least Tern

Subsection *Alternate Sources*

Page 4.8-10, first full paragraph. "Overall, the use of floodplain and instream open-pit mines along major rivers would result in the creation of low-quality interior least tern nesting habitat." – There is no least tern or piping plover habitat proposed in the MRRP for the river. One can assume that the USFWS and the USACE saw no benefit in an effort to concentrate federal resources in these areas.

Section 4.8.3.4 Indiana Bat

Page 4.8-11, top of page. "…therefore, neither the Proposed Action nor the alternatives would affect designated critical habitat for the Indiana bat." – The USFWS required surveys for the Indiana bat on the proposed expansion of the Rocheport sand

storage facility in 2008. Apparently, the USFWS does not agree with the conclusion presented in this document.

Chapter 4.9 LAND USE AND RECREATION

General Concerns or Comments

This section is not reconciled with the Authorized Purposes determined by Congress. Recreation is below navigation and flood control in priority. Dredging is 85% of navigation on the Missouri River. The congressional priority cannot be ignored and has already been determined as precedential. An EIS defines the impact on the human environment. The human environment has been dictated by the congressional Authorized Purposes.

Specific Concerns or Comments

Section 4.9.2.2 Recreation

Page 4.9-2, third full paragraph. "Therefore, impacts on recreationists using the river portion of the Historic Trail are categorized with direct impacts to recreational boating from the presence of dredges and barges." – Congress has established the priority of activity on the river. Navigation is given the primary priority of the Authorized Purposes. This has been supported by the courts. Therefore, recreational boating is actually a direct impact on dredges and barges, potentially creating hazards for navigation and the desire for operators to protect individuals.

Section 4.9.3 Proposed Action

Section 4.9.3.1 Changes in Existing or Planned Land Uses

Subsection *Kansas City Segment*

Page 4.9-3, paragraph 1. "Platte County would require a zoning change and a special use permit." – This is a subjective decision for Platte County and will not likely be approved.

Section 4.9.3.2 Changes in Recreational Boating

Subsection *St. Joseph Segment*

Page 4.9-4. "…an increase in barge trips on the river related to the increase in material dredged could affect recreation boating, both in terms of the area available for boating and the quality of experience." – Navigation is a priority authorized by Congress. The question is not, "What is the impact of tows and dredges on the boating recreational experience?" Rather, it is the other way around, "How do additional recreational boats affect navigation?"

Section 4.9.3.3 Changes in Access to Boat Ramps

Subsection *Jefferson City Segment*

Page 4.9-6, paragraph 1. "…required closure during low-flow periods because of scour damage, no other public access points would be available near the reach." – This is not accurate. The Capital View Access provides access to the river in this area with a safer entry location.

Page 4.9-6, paragraph 1. "Under the Proposed Action, the likelihood of boat ramp access disruptions in the Jefferson City segment would increase in the long term." – This also assumes that the ramps were not built with this contingency in mind. Newer ramps account for changes in flow and low summer flow restrictions. This also assumes that there is not high flow. This year no ramp was threatened because there was no low flow period.

Section 4.9.3.4 Changes in Wetlands-Related Recreational Opportunities

Subsection *St. Joseph, Kansas City, Jefferson City, and St. Charles Segments*

Page 4.9-7, paragraph 1. "…changes in groundwater levels could result in conversion of forested wetlands…." – We do not concur with this presumption as this document points out that the impact of degradation on groundwater is mostly near the edge and declines substantially moving inland.

Page 4.9-7, paragraph 1. "Conversion of wetlands to uplands also could remove these areas from federal regulation under Section 404 of the CWA and allow them to be cleared, filled, and used for agriculture, residential or commercial development." – Life is about perspective. These could also be used for recreational purposes, such as baseball fields, soccer areas, trails, public parks, etc. Preservation of the regulatory environment is not a concern of this EIS.

Page 4.9-7, paragraph 1. "Conversion of wetland habitat to upland habitat could reduce recreational opportunities specifically related to wetlands…." – Conversion also reduced the risk of West Nile virus, malaria, yellow fever, and mosquito populations and, therefore, a reduction in urban pesticide use. This is not cited in the document.

Section 4.9.3.6 Changes in Recreational Fishing Opportunities

Subsection *Kansas City Segment*

Page 4.9-10, paragraph 1. "Localized increases in suspended sediment downstream of the dredge would benefit species that are associated with turbid environments and would potentially adversely affect those species with greater sensitivity to increased levels of suspended sediment (such as non-native species)." – This item is noted as it is actually the only item in the document honest about risk.

Page 4.9-10, paragraph 1. "Sand plant construction under the Proposed Action would require land-clearing activities that could result in overland runoff or erosion from uncontained storm water." – Under current law, provided appropriate zoning, assessments, and Best Management Practices are followed. These activities are legal. Speculation that some harm will occur is acute paranoia and pure presumption. In fact, the Corps, in notching river structures in the immediate area of this proposal, increase the amount of erosion and sediment runoff into the river. This is a completely legal act. Humans have a right to do something. This section should be deleted.

Subsection *St. Charles Segment*

Page 4.9-10, paragraph 1. "The Proposed Action would substantially increase the number of dredging areas in the St. Charles segment, with a corresponding increase in the potential for entrainment, elevated noise, and elevated turbidity." – The St. Charles segment is the only area with available excess capacity. How does this argument work for the Kansas River and not here? This document directs that removal of dredging from the Missouri River will be made up by increased dredging in the Kansas and Mississippi Rivers. This again demonstrates a conflict in philosophy.

Section 4.9.4 No Action Alternative

Section 4.9.4.2. Changes in Recreational Boating

Subsection *All Segments*

Page 4.9-12, paragraph 1. "Barge traffic in the river would be substantially reduced, increasing the river area available for recreational boaters and increasing recreational opportunities." – Another wrong presumption presented by the authors. With an 84% reduction in navigation, the BSNP may be terminated and all federal levees allowed to collapse as they have no further purpose. The river will once again become a high-risk waterway and recreational boating will actually decrease. The authors are reminded that the Authorized Purposes as provided for by Congress place a primary Authorized Purpose for navigation, not recreation. This has been litigated and decided. It is not a question.

Section 4.9.4.3 Changes in Access to Boat Ramps

Subsection *Alternate Sources*

Page 4.9-13, paragraph 1. "Under the No Action Alternative, dredging activities likely would increase on the Kansas and Mississippi Rivers." – As repeatedly stated, the use of the Kansas and Mississippi Rivers as potential sources are unlikely and not reasonably certain in any way. It is a presumption with a prospect of zero.

Section 4.9.4.4 Changes in Wetlands-Related Recreational Opportunities

Subsection *Alternate Sources*

Page 4.9-13, paragraph 1. "The potential indirect effects of using alternate sources have not been quantified because the locations of alternate sources are not known at this time." – Add: "*and it cannot be implemented with the current specifications for concrete*."

Chapter 4.10 ECONOMICS AND DEMOGRAPHICS

General Concerns or Comments

We believe the economics analysis included in the DEIS to be flawed. Our analysis of the economics portion of this document appears as Appendix B. The finding of the economics appendix is as follows:

1. The choice of primary market area to be analyzed by the DEIS is not consistent with actual markets now served by dredging operations on the LOMR. As a consequence, the DEIS underestimates the importance of this source of construction sand and gravel production in Missouri.

2. The DEIS fails to accurately distinguish between the supply and demand for sand versus the supply and demand for gravel. The shortcomings of this oversight are most pronounced in the discussion of alternative sources of sand if the No Action Alternative was adopted. To the contrary of the results of the DEIS, there is no reasonable certainty that there are alternative sources of sand available in Missouri and the surrounding states to replace the estimated 6.9 million tons currently produced from the LOMR. As a result, sand would have to be shipped from even more distant sites than those listed in the DEIS, resulting in even higher delivered prices.

3. Because individual mine output and capacity are unknown, the DEIS estimates these data using a series of debatable assumptions, particularly with regard to the availability of alternate sources of sand.

4. Distances between mines and demand centers are estimated using great circle distances—or as the bird flies. This technique probably underestimates true travel distance and cost by 20-25% for some mines. The true travel distances for some mines could be considerably longer due to the limited number of bridges across the Missouri River outside of the St. Louis and Kansas City metro areas.

5. The possibility of new sources of sand in Missouri being established near existing urban centers is extremely small. As a result, the long-run cost of sand may be even higher than the short-term estimates contained in the DEIS. Further, even if such new sources could be developed, off-river mining is subject to land reclamation expenses

(the DEIS estimates these at over $4/ton) resulting in even higher long-term costs for sand, concrete, and asphalt.

6. The economic impact analysis contained in the DEIS fails to quantify the effects upon the two industries (concrete manufacturing and construction) that would be most seriously impacted by the meteoric price increases that would result from the adoption of the No Action Alternative. The resultant short-term increase in the cost of sand, and as a consequence, both concrete and asphalt prices, would be devastating to Missouri's economy. This is in stark contrast to the economic bonanza reported in the DEIS, which only directly analyzes the effects on mining and truck transportation industries.

7. Alternative A, which reduces allowable output by nearly 75%, would most likely force all current facilities to cease operations. Although the consequences of Alternative B are less certain, it is very likely that some facilities would cease operations and as a consequence require even greater reliance on alternative sources of sand and gravel than set out in the DEIS.

8. Another issue not addressed in the DEIS is that MoDOT requires that all sand for a project come from a single plant. Thus, for large projects, the Kansas and Mississippi Rivers would probably be the only sources available.

9. The current FOB prices for sand presented in the DEIS are significantly lower than actual prices charged at existing sand plants on the LOMR.

10. The No Action Alternative prices and cost figures assume that the alternative sources for sand and gravel actually have viable quantities of sand available. This assumption is open to considerable skepticism.

11. As discussed in Appendix B, the availability of "alternative sources, including current mines, Missouri and Kansas Rivers, and open-pit mines in the floodplain, are not evident." They are certainly not reasonably certain. Timeframes for their availability are grossly understated and available reserves questionable.

While understanding the desire for a simplistic methodology, the primary market area approach is a misnomer. There are different business models for urban, suburban, and rural sand supply chains. We believe that the market area is larger in all circumstances. The market area serving the rural counties is especially larger where transportation is longer with greater frequency. A market area of 65 miles or greater is applicable for rural use. This was previously explained to the authors. Contract load haul for regular demand can exceed 100 miles. You are directed to the Texas County example provided in Appendix B.

We believe the numbers utilized for demand of material by both MoDOT and KDOT are understated. In fact, demand numbers for these state agencies may be 100%

higher than in the analysis. In addition, county and local government demand is given lip service, which is not the case.

The states of Missouri, Kansas, and Nebraska own the bed. This fact is not exhibited in the document. The closest reference relates to the royalty payments paid to the State of Kansas at a rate of 15¢/ton. Nowhere is there a discussion regarding the obligations and the mineral rights of the citizens of the state and the right to demand their assets be available for their use.

Caps change the demand on the bed. It is an economic formula, and it is not discussed in the document. A cap causes material that is not needed to be removed from the bed and warehoused on land. The document does not take into account the unintended consequences of this policy on the bed. It is an economic equation.

Demand centers are predicated upon MoDOT and KDOT project locations. While it is fair to assume that urban areas will have greater demand, major projects skew that premise. For example, if MoDOT were to decide to bid contracts for I-70 in Saline County, Lexington would be the major demand center.

The economic presumptions for time relating to new facilities are naïve. The analysis only reviews hypothetical timeframes for mythical sand plants in the floodplain. It discounts the impact of litigation. It discounts the impact of local community planning and zoning. It discounts the objections of levee districts and established body politics within the various states.

There is no discussion of probability. There is also no discussion of the availability of capital for such a risk. Capital markets have changed, and availability for a high-risk operation such as this is limited.

Specific Concerns or Comments

Specific comments for this section are incorporated in Appendix B.

Chapter 4.11 NOISE

General Concerns or Comments

The analysis for noise lacks a comparative analysis against existing noise pressures. For example, the document indicates that Capital Sand's Jefferson City River Terminal may have increased noise levels at various alternatives. The facility is located adjacent to an airport that far exceeds any noise level impacts. In addition, this location has a major rail yard immediately across the river, a sewage treatment plant directly adjacent, and two access limited four-lane highways directly adjacent to the site. Even if the noise level for Capital Sand were to increase, the increase would not be discernable based upon the background. The same is true for numerous other locations where interstates, rail, and other facilities with higher noise impacts occur.

Both MoDOT and KDOT noise guidelines, which are approved by FHWA, provide for specific mitigation for adjacent noise sources. The limited number of sensitive receptors presented in the report can be mitigated. MoDOT and KDOT standards should be applicable for all items for noise in this document.

There are no known complaints in any public record of noise from either river-based or land-based operations for the dredgers. This is not noted in the document.

Residences exposed to increased tug noise will experience such increased tug noise any time river flow increases and tonnage returns. This is the primary activity of the river under the Authorized Purposes and is not even discussed.

Appropriate comparative analysis and assessment of cumulative impacts and whether any increases would cause a discernable difference is a necessary element for this study. The lack of complaints is evidence that the public expectations have been met. These are not pointed out in this analysis, and it should be corrected accordingly.

Specific Concerns or Comments

There are no specific comments on this Chapter.

Chapter 4.12 VISUAL AND AESTHETIC RESOURCES

General Concerns or Comments

The majority of the comments in the general context appear under Section 3.14. There are some basic elements, however, that need to be repeated.

The presumption that dredges and dredge structures are a negative visual and aesthetic impact is inappropriate. Navigation structures, boats, dredges, tows, and barges are some of the most photographed and painted views.

The document in its analysis confuses different with ugly and consistency as beautiful.

We believe sand plants, dredges, tows, tugs, and barges each have their own intrinsic beauty and geometric form and that each is a unique form of industrial artwork, adding to the local riverfront and its diversity. The majority of sand plants are located in already developed areas and provide appropriate diversions for the eye. Dredges, tugs and barges provide a distraction that has traditionally been welcomed and pursued in both photographic and general artwork.

In order for there to be a "change" in visuals' character, it has to be seen. Huge deference in this document is given to recreationists who represent a nominal part of the population. Yet this document's deference to them, to their experience, and to their personal satisfaction is disproportionate and far outweighs that of the normal "public."

We recognize that this chapter is highly subjective and falls heavily into the realm that "beauty lies in the eye of the beholder." However, the primary Authorized Purpose for this river is navigation. Navigation is expected on this river. We contend that the lack of navigation is the view shed abnormality, not increase in navigation.

Specific Concerns or Comments

4.12.3 Proposed Action

4.12.3.2 Changes to Scenic Vistas, Scenic Routes, or Visual Character or Quality

Subsection *St. Joseph Segment*

Page 4.12-4, paragraph 1. "More tugs and barges on the river under the Proposed Action also would affect views by recreationists on the river." – Tugs and barges are quality aesthetic views much as the views of steamboats and over vessels.

Page 4.12-4, paragraph 3. "In addition, indirect visual impacts may result from changes in river bed elevations." – Bed degradation has absolutely no impact on visual aesthetics.

Subsection *Jefferson City Segment*

Page 4.12-6, paragraph 2. "The noise and movement associated with dredging operations would draw viewers' attention to these areas." – The authors fail to recognize that the base visual acuity is an airport, a sewage treatment plant, and two major four-lane highways along with a major rail yard which already alter the visible landscape. This is a typical example of the failure to recognize the existing realities and over-exaggerating a problem.

Subsection *St. Charles Segment*

Page 4.12-6, paragraph 1. "The Proposed Action would increase the occurrence of tugs and barges in views from nearby bridge crossings, roadways, trails, residences, and businesses…." – All these prior uses degrade the visual quality of the surroundings according to this analysis. Tugs and barges improve the visual quality by diversifying the movement in the area.

Section 4.12.4 No Action Alternative

4.12.4.1 Visual Impacts from New Construction

Subsection *Alternate Sources*

Page 4.12-8, paragraph 1. "Construction of any new facilities needed to support long-term demand would create temporary changes in views…." – These views are as permanent as the sand plants. We do not understand why these temporary views and the sand plants are not both considered permanent.

Section 4.12.4.2 Changes to Scenic Vistas, Scenic Routes, or Existing Visual Character or Quality

Subsection *All Segments*

Page 4.12-8, paragraph 1. "…bridge crossings and roadways…." Ugly bridges and ugly roadways impact the scenic view from the tows, barges, dredges, and recreational boats.

Section 4.12.4.3 Changes in Light or Glare

Subsection *All Segments*

Page 4.12-9, paragraph 1. "The absence of barges and dredges on the LOMR would improve visual resources because glare-causing elements…would no longer be present." – The removal of tugs and dredges would make the river boring and lacking diversity. There is no difference in the glare created by barges hauling sand than sand bars and banks emerging from the river at low water flow. There is little difference in the glare created by recreational boats. We acknowledge this analysis is subjective.

Chapter 4.13 CULTURAL RESOURCES

General Concerns or Comments

Comments in this section appear are noted in Section 3.15. We note the following:

1. The operation and design of the BSNP equally affects the cultural resources in this APE.

2. Dredging is not the sole cause of bed degradation, if bed degradation does in fact exist. The river is aggrading. The impacts to cultural resources relating to headcutting of tributaries, scour, and revelation of existing resources are equally caused by the actions of the Corps in its operations of the river system. Efforts to try to tag the dredgers with the consequences of these presentations in the APE are objected to and are

not consistent with the known facts of this scenario. Resource inventories in the area of the APE are only as good as the strength of the SHPO offices in the various states.

3. To presume that cultural resources have not previously been impacted by the construction of the BSNP, federal levees, local levees, and other improvements while making alleged bed degradation some massive new event is an effort to place responsibility on only one of numerous parties. Commercial sand dredgers object to the representation.

Specific Concerns or Comments

There are no specific comments to this Chapter.

Chapter 4.14 AIR QUALITY AND CLIMATE CHANGE

General Concerns or Comments

Numerous objections exist and are set out in Section 3.16, Air Quality and Climate Change. These are incorporated into this section.

The following additional general comments are included:

Shipping aggregate product by barge reduces GHGs. The authors' attempt to attribute any net GHG increase appears inappropriate. The more shipped on river, the better signature for the movement of sand appears. Attempts to move sand traffic to trucks will increase GHGs.

Truck fleet conversion with the new 2007 diesel requirements will improve overall air quality over time. As the fleet is improved, diesel emissions will be reduced.

The proposed action is in Missouri, Kansas, and Nebraska. None of these states have requirements for DPM. California's position on this issue is disputed. The document should only reflect applicable law. California presumptions are inappropriate.

The lowering of the federal ozone standard will impact the major metropolitan areas.

The No Action Alternative will increase over-arching air quality concerns and increase the GHG signature in the affected states. Much of the analysis provided is speculative.

Specific Concerns or Comments

There are no specific comments in this section.

CHAPTER 5
CUMULATIVE IMPACTS

General Concerns or Comments

The cumulative impacts must be reconciled with the construction of the dams and reservoirs, the BSNP, and the operation and flow control of the USACE. They must also be reconciled with the mandated Authorized Purposes set forth by Congress. The document tends to ignore the congressional authority. Congressional direction provides that navigation and flood control are the primary purposes. This has been confirmed in the courts. An analysis of the cumulative impacts without the Authorized Purposes as a prominent issue is irrelevant.

The USACE's control of flow and the timing and volume of water provided the BSNP is the greatest influence on river bed load. A single decision that alters flow regime will change the cumulative effects.

The removal of commercial sand dredging has extensive indirect and cumulative impacts beyond those related to dredging. These are not discussed in this document and can result in indirect impacts such as reducing navigation on the Mississippi River. The Corps should incorporate its knowledge presented under MRAPS in revision of this cumulative impacts analysis.

Specific Concerns or Comments

Chapter 5.2 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Section 5.2.1 Past Actions

Page 5-3, first full paragraph. "The dams and BNSP structures have reduced the sediment availability to the LOMR by almost six-fold…." – This six-fold impact in sediment load impacts the bed, the quality of material, and its rate of regeneration.

Section 5.2.2 Present and Future Actions

Section 5.2.2.1 Master Water Control Manual

Page 5-5, first full paragraph. "The criteria for unbalancing are based on recommendations provided by the Missouri River Association of States and Tribes…." – Missouri, the primary state affected by this evaluation, is not a member of the MORAST and has objected to numerous efforts of the MORAST relating to the river. The MORAST does not represent all the interests in the basin.

Section 5.2.2.2 Bank Stabilization and Navigation Program

Page 5-5, paragraph 1. "The BSNP structures (i.e., revetments, dikes, and levees) were constructed to restrict lateral movement of the river channel with the intent of maintaining a navigation channel…." – As such, the dredgers are confined to this channel and forced to dredge in this area only. Original river dynamics would have provided numerous alternative dredge zones throughout the river valley. The BSNP directly impacts the availability of sand and the size of the bed.

Section 5.2.2.4 Missouri River Recovery Program

Page 5-7, last paragraph. "On March 12, 2008, the Missouri Clean Water Commission ordered the immediate cessation of the discharge of sediment and topsoil into the waters of Missouri by the USACE in connection with all Missouri River shallow-water habitat construction project." – It is the position of the commercial sand dredgers that the USACE has preemptive authority over the decisions of the Missouri Clean Water Commission as they apply to the BIOP and restoration of the river. The failure to exercise that authority has reduced sediment contribution to the river by over 30 million tons per year.

Section 5.2.2.8 Other Potential Actions in the Lower Missouri River

Subsection *Transportation Improvement Projects*

Page 5-10, paragraph 1. "By 2011, transportation funding drops by more than one-half and will continue falling to only one-third of the 2010 amount in subsequent years (MoDOT 2010)." – In contrast, planning continues for the expansion of I-70 to six or eight lanes of traffic. This single project would result in sand demands far in excess of the discussions in this document.

Subsection *Energy Development Projects*

Page 5-10, paragraph 1. "Although the project has not been cancelled, it is not considered a reasonably foreseeable action and therefore is not included in the cumulative effects analysis." – The fact remains that repowering and air quality modifications, including turbine replacement, require Missouri River navigation to transport the necessary equipment.

For the record, we note a numbering discrepancy in this section. The section immediately preceding is "5.2.3 Potential Future Actions Associated with Study Recommendations." The section numbers used below are identical to those in the document provided.

Section 5.2.2.9 Missouri River Bed Degradation Feasibility Study

Page 5-11, paragraph 1. "The USACE estimates that it likely would take from 10 to 15 years to achieve this; if the river is widened 150 feet through a 30-mile reach, for example, up to 25 million tons of sediments could be reintroduced into the river…." – This represents confirmation that modifications to the USACE design to the BSNP can affect the bed. This has been the position of the dredgers for over ten years. This is consistent with the information presented in Appendix A.

Chapter 5.3 CUMULATIVE IMPACT ASSESSMENT

Section 5.3.1 Identification of Cumulatively Affected Resources

Page 5-13, paragraph 2. "Projects and programs that similarly affect sediment dynamics and channel degradation include the BSNP and maintenance program; and creation of habitat under the MRRP, which is discussed in subsequent sections along with other programs that could influence sediment dynamics in the LOMR." – This includes the six major dams retaining sediment in the upper reaches of the river system.

Page 5-14, first full paragraph. "Dredging does not create water quality conditions that violate state or federal standards…." – This item should be placed in bold and underlined.

Page 5-14, first full paragraph. "…attention that has been directed in recent years to the nutrient contributions of the Missouri and Mississippi Rivers to the anoxic zone conditions in the Gulf, the analysis considers the contribution of dredging as a potential cumulative impact on water quality, specifically nutrients." – As stated in this paragraph, we believe that since the dredgers do not impact water quality, the cumulative impact should not extend past the free flowing reach of the Mississippi River. This is consistent with the review required under section 404 of the Clean Water Act.

Page 5-15, top of page. "…or no other reasonably foreseeable future projects or programs would interact with dredging to create impacts that would be synergistic on these resources." – We disagree with this conclusion. Should the No Action Alternative be implemented, navigation on the river will be cut by 84%. How does that not have a cumulative effect upon the system?

Section 5.3.2 Geomorphology

Page 5-16, top of page. "…resolving issues associated with the concerns of the Missouri Clean Water Commission about sediment effects on water quality." – See our previous comment on preemptive authority of the USACE with regard to implementation of the MRRP over the Missouri Clean Water Commission

Page 5-19, top of page. "Initially, most deposition would occur immediately downriver from project sites, but over time, the increased sediment load would be

transported downriver as material was deposited and remobilized repeatedly." – There is limited discussion in this report of the loss of mass balance following the closing of the Gavins Point Dam in 1955. The river has exhausted available material over the next 55 years.

Page 5-23, top of page. "If the moratorium on sediment disposal into the main stem LOMR is resolved and construction of restoration projects resumes in the short term, the effect of the additional sediment on the impacts from dredging described in Section 4.2 likely would be minor for several reasons." – We do not agree with this position. See Appendix A.

Section 5.3.3 Water Quality

Page 5-25, paragraph 1. "In addition, nutrient loading from the Mississippi River, into which the Missouri River basin empties, has been implicated as one of the primary causes of hypoxia in the Gulf…." – If the commercial sand dredgers meet water quality standards now, and we are going to be capped at current rates, how is there an increase in the cumulative impact? We believe there is actually a decrease based upon four of the five alternatives presented.

Section 5.3.3.2 Hypoxia in the Gulf of Mexico

Page 5-27, paragraph 1. "Because of the role of these nutrients in hypoxia, the USEPA scientific advisory board has called for reductions in both nitrogen and phosphorous (USEPA 2007)." – We note there is a hypoxic zone at the mouth of the Amazon River and the Rhine River. The Amazon River has limited "human development." There is insufficient evidence that hypoxia is a non-natural condition.

Section 5.3.4 Aquatic Resources

Page 5-30, paragraph 2. "However, it is recognized that the response of shallow-water habitat to river bed degradation and flows in the LOMR is complex and poorly understood." – We agree.

Page 5-30, paragraph 2. "Nevertheless, it is anticipated that river bed degradation associated with commercial dredging has the potential to counteract some of the positive benefits associated with the habitat creation programs." – The authors wish to have everything both ways. This statement must be weighed against propagation factors such as cues produced by increased suspension in the water column and its impact on the pallid sturgeon's reproduction. In addition, the degradation discussion is not reconciled with the spring rise and flow modification provisions suggested in the BIOP. Finally, the high flow and low flow scenarios are just that—extremes. Comparison on this question is best considered on the mean, which is the more prevalent position. There is absolutely NO data that demonstrates the statement regarding potential to counteract positive

benefits of habitat creation. Quite the contrary, it has the potential of increasing positive benefits associated with habitat creation programs.

Section 5.3.5 Economics

Page 5-31. Our position on economics is provided in Appendix B to this comment letter. We disagree with the economic analysis presented with Chapter 4 and its original underpinnings presented in Chapter 3.

Page 5-31, paragraph 2. "In response to reduced supplies from the LOMR, it is also likely that new sand and gravel operations would be developed in the Missouri River floodplain over the long term to meet future demand more cost efficiently." – There will be no development of floodplain mining. Available lands are acquired by the Corps or the USFWS. Pit mining has an impact on flood control and will be opposed by the levee districts. Local zoning in urban areas has the potential to prevent ANY pit mines along the Missouri River valley and any urbanized areas.

Page 5-31, paragraph 2. "…new floodplain sources would result in an increase in the average cost of sand and gravel relative to existing conditions." – Introduction of floodplain mining, should it be successful, will increase valley land prices. It will make it harder for the Corps and the USFWS to acquire land for habitat development.

Page 5-32, paragraph 2. "Therefore, the extent of cumulative impacts on economic conditions is best represented by the analysis presented in Chapter 4." – We disagree. Our rebuttal to the analysis presented by the authors is provided in Appendix B. We also note that one toll road project can change the demand structure entirely of sand. The analysis of impacts in Chapter 4 is flawed and understated.

Section 5.3.7.1 Impacts of the Proposed Action on Global Climate Change (Project Impacts)

Page 5-35, top of page. "Consequently, because the Proposed Action and alternatives would result in a net increase in GHG emissions compared to baseline conditions, impacts on climate change are considered cumulatively adverse." – This is simply wrong. First, the conversion of the truck fleet coincides with this action. It is accepted in numerous environmental assessments produced by the Corps that GHGs and NOx will be reduced based upon EPA actions in fleet conversion alone. Therefore, it can be anticipated that as a cumulative effect, truck emissions as they apply to GHGs will remain stable. Second, as transportation costs increase, the use of barge transportation will increase. This also reduces GHG signature. This is well documented. Third, the only alternative that results in increased production is the proposed alternative. That means that all alternatives besides the proposed will not have an increase in signature, but a decrease.

CHAPTER 6
POTENTIAL MITIGATION MEASURES

General Concerns or Comments

Numerous mitigation measures have been implemented as part of the December 18, 2009 and 2007 Combined Decision Documents on Missouri River Commercial Dredging. These are documented in this chapter and are significant.

We believe implementation of a mine-and-relax strategy continues to have merit with regard to mitigation.

We emphasize that mitigation should occur where documented, scientifically-based conclusions exist. The DEIS bases much of its determinations on presumption.

The applicants have demonstrated their repeated willingness to make adjustments with regard to operational criteria when an appropriate and delineated significant impact is presented. This is well evidenced by the negotiations with the pallid sturgeon and the permit additions in the existing permit documents. We note that the dredgers have given considerably, whether warranted or unwarranted, in an effort to be cooperative. Mere speculation will not be sufficient evidence for the commercial sand dredgers to concede after the expenditure for this EIS.

Specific Concerns or Comments

Chapter 6.2 POTENTIAL DREDGINGRESTRICTIONS AND OPERATIONAL CONDITIONS

Section 6.2.1 Restrict Concentrated Dredging

Page 6-4, paragraph 1. "Given the extent of river bed degradation that has occurred in areas of concentrated dredging to date, a more conservative approach may be warranted." – First, restricting dredging has not demonstrated a success. Second, a conservative approach is not warranted and the data does not support the conclusions drawn by the authors. See Appendix A.

Page 6-4, paragraph 1. "Restricting concentrated dredging would require that the permitted dredging amount be apportioned throughout a permitted segment and would allow up to a set percentage of the annual permit amount for the segment to be dredged in a given portion of the segment." – As stated earlier in the document, while the segments may be useful for characterizing effects and development of the DEIS, it is not an acceptable scenario for permitting. If segments are used for permitting or attempted to be used for permitting, appeals will be forthcoming from all six existing dredgers. Tonnages addressed into segments and the segments overall construction are immaterial, misguided, and just plain stupid. We trust this adequately addresses our consternation with the subject of segments and their allocation. We continue to be open to discussions

of reaches and alternatives which allow for the appropriate business organizations to carry forth the purpose and need. Our objection to the use of segments presented in this DEIS for permitting purposes is quite clear. It is unacceptable.

Page 6-4, paragraph 1. "If this approach was to be used, the specific parameters would be determined during the decision regarding permitted dredging tonnages and permit conditions." – The bed is owned by the states. This is not simply a Corps' decision.

Page 6-4, paragraph 2. "This mitigation likely would require Dredgers to travel longer distances to dredge locations and would require longer tow hauls to ship sand and gravel to land-based plants, increasing production costs." – This is also known as mine-and-relax.

Section 6.2.2 <u>Prohibit the Use of Cutter-Head Dredges</u>

Page 6-5. The authors do not understand the use and purpose of cutter heads on the Missouri River. This has been previously stated. Prohibiting the use of cutter heads will be challenged, appealed if in a permit, and will be a difficult discussion with regard to mitigation.

Section 6.2.3 <u>Limit the Dredging Season</u>

Page 6-5, paragraph 1. "Potential impacts to pallid sturgeon include mortality of eggs and larvae that may be entrained and pass through the dredge." – This has never been an issue with previous negotiations with the USFWS. This was not brought up during negotiations and informal consultation. It has not ever been presented as an issue before the MRRIC or any associated committees of the MRRIC in evaluating the pallid sturgeon. Surely, the USFWS would have brought this issue up during informal consultation on these permits over the last seven years.

Page 6-5, paragraph 1. "Prohibiting dredging operations from May 15 to July 15…." – This represents the most important construction period of the year.

Page 6-6, top of page. "For these reasons, an option to this measure is to first monitor dredges for entrainment…." – Dredges on the Mississippi River have been monitored for entrainment for over six years.

Section 6.2.4 <u>Use a Mine-and-Relax Strategy to Limit Dredging Intensity</u>

Page 6-6, paragraph 1. "The strategy would limit the period during which an area is dredged and would require sufficient time for its 'recovery' before it is dredged again." – This was introduced by some of the dredging interests during the 2007 and 2009 permit negotiation. It remains a viable discussion of interest to the applicants.

Page 6-6, paragraph 1. "However, the proposed mine-and-relax strategy included no cap on the total amount dredged in a reach, and it would not limit the amount dredged by segment or by dredger." – This is not accurate. The current permits include a limitation of 1.2 million tons per 10-mile reach per year. This is cumulative and, according to the USACE, the maximum total per reach. Therefore, multiple dredgers would be subject to the 1.2 million ton reach cap. In addition, the USACE has granted some extensions of reaches in order to further advance such a policy. The tools are in place to implement this strategy, and the no cap 1.2 million ton per reach scenario provides the greatest opportunities to adjust business operational planning.

Chapter 6.3 MONITORING AND ADAPTIVE MANAGEMENT

Page 6-6, paragraph 1. "Adaptive management strategies use monitoring and feedback to adjust the management of resources." – Commercial sand dredgers have supported adaptive management of the Missouri River as it applies to pallid sturgeon recovery in the MRRIC. Commercial sand dredgers have supported and have spent hundreds of thousands of dollars on additional monitoring on the dredges in support of better data. Commercial sand dredgers have supported additional surveys on the river in reaches where dredging occurs to provide better data and currently agree with the position of the USACE that once every five years is adequate for collecting such data due to variability. The remainder of this section complicates a relatively easy effort by many difficult and non-practical concepts.

Chapter 6.4 OTHER MITIGATION MEASURES

Section 6.4.1 <u>Repair or Stabilize Affected Infrastructure</u>

Page 6-9, first bullet point, Water intake structures. "Funding for the design and implementation of erosion countermeasures, rehabilitative construction, or other measures could be required before dredging could continue in that area to maintain the stability and continued operation of water intake facilities." – Water companies are required to do OM&R where the "R" constitutes replacement after reasonable life expectancy. "R" or replacement should be included in their rate structure. These providers receive massive benefit from the public in that the BSNP eliminates their requirement to "chase the river." They have an obligation to replace when the BSNP conditions change, just like the dredgers were required to adjust to the "spring pulse" (and summer fall) strategy implemented by the Corps. Individual dredging operations spent in excess of $3 million merely to adjust to the changes in hydrology.

In addition, the design of the BSNP is equally at fault, so why should the dredgers have to bear responsibility?

Page 6-9, second bullet point, Levee foundations. No erosion countermeasures or other measures are being required of the USACE while they implement the notching program to erode channel or bank. The rules should be equal.

Page 6-9, third bullet point, Pipeline crossings. "Dredging activities could erode the river bed and cause exposure of buried pipelines." – Denial of pipeline crossing permits would be equally effective or changes in design requirements appropriate.

Section 6.4.2 Develop a Programmatic Agreement for Cultural Resources

Page 6-9, paragraph 1. "To address these potential adverse impacts, a PA may be developed." – Commercial sand dredgers would consider participation in a PA for cultural resources provided others who have indirect effects which may result in head cutting, erosion, scour and fluctuations in high and low water surface elevations also are obligated to participate. While we do not agree with the specific recommendations provided in this section, a coordinated effort would make sense.

Section 6.4.3 Dredge in Dike Fields/Bank Line to Create Shallow-Water Habitat

Page 6-10, paragraph 1. "The USACE has considered excavating sediments from the dike fields/bank line under the MRRP, or requiring Dredgers to do so, to create shallow-water habitat for nursery and refugia for young pallid sturgeon and other native fish." – A cooperative effort to enhance tonnage, increase reaches, and provide for supplemental environmental projects for other credit-like experience in support of the BIOP would be considered.

CHAPTER 7
ENVIRONMENTAL STATUTES, EXECUTIVE ORDERS, AND GOVERNING AGENCIES

General Concerns or Comments

There are no general comments to this chapter.

Specific Concerns or Comments

There are no specific comments to this chapter.

CHAPTER 8
LIST OF PREPARERS

General Concerns or Comments

There are no general comments to this chapter.

Specific Concerns or Comments

There are no specific comments to this chapter.

CHAPTER 9
LIST OF REVIEWING AGENCIES, ORGANIZATIONS, AND INDIAN TRIBES

General Concerns or Comments

There are no general comments to this chapter.

Specific Concerns or Comments

There are no specific comments to this chapter.

APPENDIX A
GEOMORPHIC ANALYSES AND TECHNICAL DETAILS

General Concerns or Comments

A review of geomorphic-related materials appears in Appendix A of the comment letter.

Specific Concerns or Comments

There are no specific comments on this appendix.

APPENDIX B
RELATED ACTION – DEVELOPMENT OF NEW SAND PLANTS

General Concerns or Comments

There are no general comments on this appendix.

Specific Concerns or Comments

There are no specific comments on this appendix.

APPENDIX C
NOISE ORDINANCES

General Concerns or Comments

There are no known complaints regarding noise from any of the existing dredge operations.

Specific Concerns or Comments

There are no specific comments on this appendix.

APPENDIX D
AIR QUALITY AND CLIMATE CHANGE TECHNICAL INFORMATION

General Concerns or Comments

The dredgers reserve the right to review this appendix depending on outcomes related to air quality.

Specific Concerns or Comments

There are no specific comments on this appendix at this time.

APPENDIX E
DISTRIBUTION LIST FOR THE DRAFT EIS

General Concerns or Comments

There are no general comments on this appendix.

Specific Concerns or Comments

There are no specific comments on this appendix.

SECTION THREE – SUGGESTIONS, RECOMMENDATIONS, AND/OR CONCLUSIONS

The document does not include final suggestions, recommendations, or conclusions. Having extensively reviewed the DEIS and provided extensive comments, including additional specific reviews of sections relating to geomorphology, economics, and legal perspectives, and having negotiated for the last decade for the six existing commercial sand dredgers, we provide the following suggestion, recommendation, or conclusion:

1. We believe that a modified version of Alternative C meets the greatest number of requirements including, but not limited to, economic risk, transportation risk, risks relating to the endangered pallid sturgeon, compliance with the Clean Water Act, and adequate concern for those who believe that the bed is at risk.

2. As indicated, we do not concur with all the elements of Alternative C presented in the DEIS. We believe, however, that the conclusions from the Decision Document on Missouri River commercial dredgers permit extensions dated October, 2007, reasonably addresses the majority of the risk.

3. The alternative should retain all tonnage caps as presented in the Decision Document dated October, 2007.

4. Proposed permits should retain the existing restrictions negotiated during the extension of the Combined Decision Document dated December, 2009. These include:

   A. Reach caps of 1.2 million ton per 10-mile reach per year;

   B. Restrictions for the protection of the interest of the pallid sturgeon;

   C. Retention of protections for BSNP infrastructure, water supply infrastructure, pipeline infrastructure, and other related limitations; and

   D. Retain existing terms from the 2009 negotiations.

5. We believe that incentives should be incorporated into the USACE strategy for improving bed performance.

6. We encourage the Corps to convene an external work group, including members of the dredging community, to evaluate adjustments to the BSNP in reaches with the greatest stress. This would encourage (a) a greater exchange of joint knowledge, (b) an enhanced business relationship between the parties, and (c) the introduction of new ideas and potentially cost-saving strategies for adjustments to the BSNP that may reduce bed stress.

7. The permits should include provisions for surveying the bed on a five-year cycle as previously discussed with the USACE KCD. A more coordinated approach that includes elements of adaptive management is of interest.

8. No new operations should be added to the river under this alternative as it acknowledges there are river stresses.

9. Commercial sand dredgers encourage a dialogue on the best method for utilizing data collected under the current permit regimes and surveys. Presently, data collection appears to be a one-way dialogue where information is provided to the Corps with little return compilation or discussion.

10. We support the USACE efforts to develop strategies to remove sediment buildup in the upstream reservoirs and move the material into the LOMR.

11. We support the USACE efforts to examine and, where appropriate, redesign and modify the BSNP to support the Authorized Purposes while improving overall river dynamics.

12. We support the USACE receiving a greater budgetary support for operation and maintenance of the BSNP as the amounts in recent years have not been generous.

13. We support the USACE efforts under the MRRP to increase shallow-water habitat in the lower basin provided the BSNP is preserved to meet its Authorized Purpose. We support the USACE and the USEPA enforcement relating to the introduction of sediment into the river is consistent for other parties such as Missouri farmers, levee and drainage districts, state transportation agencies, and commercial sand dredgers, if appropriate.

In closing, while our review of the DEIS is critical, we understand the necessity to review under NEPA. We also understand that the Corps has the obligation to take into account factors other than the DEIS in its ultimate decision, such as directions and authorizations of Congress regarding the Missouri River system, and the health and economic interests of the citizens of the basin.

We continue to appreciate efforts by command to increase dialogue and information exchange between the USACE and the commercial sand dredgers. We look forward to continued discussion regarding this document, the USACE Record of Decision and Decision Document, and ultimate permit issuance.

Once again, while we may not always agree with the conclusions and decisions, we wish to acknowledge and recognize the superior efforts to this point and express our appreciation for those efforts, recognizing the appropriate deadlines.

On behalf of the commercial sand dredgers existing on the Missouri River, Holliday Sand & Gravel Company, LLC; Capital Sand Company, Inc.; Con-Agg of MO, L.L.C.; Hermann Sand & Gravel, Inc.; Limited Leasing Company (St. Charles Sand Company); and J. T. R., Inc. (Jotori Dredging); I am

Very truly yours,

LATHROP & GAGE LLP

By:
David A. Shorr

DAS/jf
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cc: MDNR Water Pollution Control Program
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SECTION FOUR – APPENDICES

SECTION FOUR – APPENDICES

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- Resume of Charles E. Patterson, Ph.D., P.E., CFM
- Review of Chapters relating to Geology and Geomorphology in the Missouri River Commercial Dredging Draft EIS by John C. Doyle, P.E. and Henry S. Hauck, USGS (Ret), JD-MC Engineering
- Resume of John Doyle, P.E., Project Manager/Professional Engineer
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APPENDIX B - ECONOMICS

- "Responses to the Missouri River Commercial Dredging EIS prepared by ENTRIX," Review of Chapters 2, 3.12, and 4.10 of the Missouri River Commercial Dredging Draft EIS by Edward Howard Robb, Professor Emeritus, University of Missouri, Columbia
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APPENDIX C – LEGAL REVIEW

- Memorandum: Title to the bed of the Missouri River and the sand constituting a part thereof, by Andy Crossett, Lathrop & Gage LLP

APPENDIX A – GEOLOGY AND GEOMORPHOLOGY

Review of Chapters relating to Geology and Geomorphology
in the Missouri River Commercial Dredging Draft EIS

by Charles E. Patterson, Ph.D., P.E., CFM
Allgeier, Martin and Associates, Inc., Hydro Division

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August 31, 2010

Lathrop & Gage
Mr. David Shorr
314 E. High Street
Jefferson City, MO 65101

RE: Missouri River Commercial Dredging
Draft Environmental Impact Statement (Draft EIS)

Dear Mr. Shorr:

The initial review of the Draft EIS has been completed. The Draft EIS considers as fact; a) Lower Missouri River (LOMR) bed is degrading, b) stream bed degradation (BD) is accelerating and c) stream BD is caused by commercial dredging. The scope of comments are limited to the geomorphologic issues that affect the conclusions presented in the of Draft EIS. The comments regarding the hypothesized cause and effect relationship between commercial dredging and BD on the LOMR are as follows:

1. The Draft EIS repeatedly refers to unpublished data and reports as sources. This precludes an in-depth analysis and a conclusive commentary on the Draft EIS.
2. Page ES-2 states:

   > "Recent observations near Kansas City indicate that the rate of degradation is accelerating (USACE 2010)."

   Analysis of Figure 3.4-21, *Changes in Average River Bed Elevation between 1998 and 2007-2009 Using a 5-Mile Moving Average* clearly shows aggradation in the overall LOMR. The Kansas City segment shows aggradation from 2007 to 2008 and again from 2008 to 2009.
3. There is a contradiction in description of the source of degradation in the Kansas City Segment. Commercial dredging is attributed as the primary cause however the USACE *Missouri River Bed Degradation Reconnaissance Study* addresses the degradation due to cutoffs.

"The maximum total slope correction would result in a maximum degradation roughly equal to change in slope over the length of the cutoff multiplied by the length of the cutoff. Between Kansas City and Waverly, that maximum would be approximately 14 feet total for the four cutoffs...."

4. Introduction page 1-15 states:

"The Missouri River Bed Degradation Reconnaissance Study Report (Reconnaissance Study Report) (USACE 2009b) describes the many potential causes of river BD and concludes that river BD in the Kansas City reach and other reaches of the lower 498 miles of the Missouri River is the result of a combination of causes. ...However, data collected over the last 15 years suggest that increased removal of river bed sediment by dredging, working in concert with the BSNP, has become the dominant cause of river BD (USACE 2009b)."

Changes in the stream hydrograph (waterdata.usgs.gov) for the LOMR at Kansas City clearly shows a reduction in low flowrates and high flowrates during the aforementioned 15-year period. Therefore changes in bed elevations cannot be attributed directly to dredging activities.

5. The river bed elevations were computed using hydraulic depth. Hydraulic depth is computed as the cross sectional flow area divided by the top width. There are an infinite combination of cross sectional geometries that have the same hydraulic depth. Example: A rectangular channel 300 ft wide and 20 feet deep has the same hydraulic depth as a triangular channel 300 ft wide and 40 feet deep. Therefore hydraulic depth is not a true indicator of channel BD.

6. The term "flow" is used in various ways, the meaning is not always clear based on context. Specific scientific terms such as: instantaneous flowrate, average daily flowrate, total volume of flow, velocity, etc. would provide the reader with a clearer understanding of the writer's intent.

7. Likewise the term "sediment" is used synonymously as suspended sediment, total sediment, and material bed sediment.

8. Difficulties understanding the specifics of the Draft EIS stems from the use of word with no specific meaning such as slight, slightly, moderate, long term, short term, extensive, significant, major, substantial, substantially. Terms used with no specific values were

used throughout the document. Using a term such as "significant flood events" without mention of statistical probability is perplexing.

9. There are a number of errors in graphs and figures. Figure 3.4-24 shows Elevation and Stage. The stage is based upon an arbitrary datum, and in the Kansas City U.S. Geological Survey (USGS) gage, had a 10 ft shift in 1989 so stage can not be used synonymously with elevation over time at the Kansas City USGS gage. Also, the figure has Stage (feet) and Elevation (feet) that do not agree in length, 28.0 ft on the Stage axis equals 29.6 ft on the Elevation axis. The USGS data for this location was downloaded from the USGS web site and plotted to reproduce Figure 3.4-24, the plot of the USGS data does not match Figure 3.4-20. The plotted average bed approximates the average bed in Figure 3.4-20 from 1980 to 1992. Deviations between the plotted average bed and Figure 3.4-20 occur from 1993 to present. The plotted flowrates do not match Figure 3.4-20. This raises questions as to the validity of the conclusions presented in the Draft EIS.

10. The USGS considers a 3% variation in flowrate the same number. When creating a new graph using the publicly available USGS data, a range of plus and minus 3% was used. Plotted data varied as much as 2.5 feet from the Fig 3.4-24. As with many items in the Draft EIS, reproduction of graphs and figures are not possible because methodologies were not give nor discussed.

11. The Draft EIS states dredging causes BD because of the volume of material removed from the LOMR. The same argument can be applied to the construction of dikes in the LOMR. Sediment is removed from the LOMR by deposition behind the dikes, possibly resulting in BD. The material captured from the sediment stream and deposited behind dikes is estimated at approximately one billion tons. If the removal of sediment occurred over a period of 50 years, that would correspond to an average of 20,000,000 tons per year. Sediment removed by commercial dredging is a fraction of the sediment removed from the main channel during the implementation of the BSNP.

12. Page 1-13 of the Introduction, expresses a foregone conclusion that:

" ...bed degradation associated with commercial dredging was a serious concern."

BD, where present, is the result of numerous activities in combination with the hydrologic, hydraulic and geomorphic response of the LOMR. This is not substantiated by the remainder of the Draft EIS.

13. Section 2.4.1 states:

    "...suggest that increased dredging, combined with BSNP and changes in flow regime, are likely the dominant causes of degradation."

    This statement neglects continuing impacts of meander bend cutoffs on the Kansas City Reach, it also neglects the frequency and magnitude of flood events on the LOMR during the study time frame.
14. Quantitative comparisons of data (bed elevations, sediment loads, flowrates, magnitude and frequency of flood events) for the period prior to the Missouri River Mainstem Reservoir System to data collected after completion of the Mainstem Reservoir System are inappropriate for predicting change in the BD.
15. The procedure of averaging the five equations given in Section 3.4 and Appendix A.4 for computing Bed Material Transport is not a standard analysis technique. The equations should be evaluated for their underlying assumptions and proper application and the equation best representing the physical properties of the LOMR should be used. If the intent is to define a range of reasonable Bed Material Transport values then a confidence interval analysis should be applied to the selected methodology.
16. Section 2.4.2 states:

    "...estimates were made for two time periods, 2000-2009 (representing below average flow conditions) and 1994-2009 (representing average flow conditions)."

    Overlapping and inconsistent time frames raise questions as to the validity of the conclusions presented in the Draft EIS.
17. Flow Duration Curves on the LOMR shown in Figure 3.4-11 show an increase in the annual probability of frequency of low flowrates of 20,000 cfs from 74% to 98%. Stream flowrates of 40,000 cfs increase in annual probability from 35% to 75%. The changes in flowrate frequency will have a pronounced impact on sediment transport volumes and composition. The changes in flowrate frequency have not been sufficiently addressed in the Draft EIS.
18. Page 3.4-90 shows the "Evidence of Degradation Caused by Commercial Dredging" with no considerations given to velocities in the specific reaches or changes in the hydrograph for the years in question.

19. A visual inspection of the dredging volumes on Fig 3.4-30 shows BD upstream of the dredge and some show downstream BD. If BD were occurring from dredging activities, BD should be greater downstream of the dredging operations due to lack of sediment in the water column.
20. Page 3.4-58 states:

    "...sediment load is a function of flows and flows vary overtime, comparisons of these data must consider the effects of flow variations over time."

    Yet no attempt is made to statistically evaluate the frequency and magnitude of stream discharge associated with sediment transport. The quoted statement uses the ambiguous term "flow". We can assume the writer intends to describe changes in flowrate with time or it could be flow volume, velocity, etc.
21. The short and long term impacts on sediment transport of the U.S. Fish and Wildlife Service adaptive management technique for spring pulse releases initiated in 2003 cannot be determined.
22. The use of CRP flow profiles are of little or no value to most readers outside of the Corps of Engineers. Attempts to reconstruct, verify or duplicate the CRP would be impractical and likely irrelevant.
23. Stream bed depths were often measured around bridge piers. Local scour at the piers does not extrapolate to general BD.
24. Data from the USGS gage site at Kansas City on the LOMR, indicates the current average bed elevation as of August 2010 is 706 feet. The average bed elevation at Kansas City in Figure 3.4-24 in the Draft EIS is elevation 706 in 1992, (pre-1993 flood). This clearly shows the segment is aggrading. This does not support the claim that BD is accelerating in the Kansas City segment.

The LOMR is an extremely complex system. The combination of continuing impacts of meander bend cutoffs, BSNP impacts, periodic modification of navigation structures, MRRP activities, Corps of Engineers dredging, commercial dredging, natural variations of stream flowrate and volume, regulation of stream discharge from upstream reservoirs, sediment capture at upstream reservoirs, spring pulse releases and natural erosion processes all impact streambed formation, degradation and aggradation. The information in the Draft EIS infers a correlation between all of

the above and stream BD but does not clearly define a cause and effect relationship between BD and commercial dredging.

Please call if you have any questions.

Sincerely,
Allgeier, Martin and Associates, Inc.
Hydro Division

CHARLES EDWARD PATTERSON NUMBER E-27241 8/31/2010

Charles E. Patterson, Ph.D., P.E., CFM

Resume of Charles E. Patterson, Ph.D., P.E., CFM

Education

Doctor of Philosophy
Civil Engineering
University of Missouri-Rolla
1998

Master of Science
Civil Engineering
University of Missouri-Rolla
1995

Bachelor of Science
Civil Engineering
University of Missouri-Rolla
1988

Registrations

Professional Engineer
Missouri, EN 027241

ASFPM Certified Floodplain Manager, US-05-01474

Memberships

- American Society of Civil Engineers
- Missouri Floodplain and Stormwater Managers Association
- Board of Directors of the Missouri Floodplain and Stormwater Managers Association
- Chi Epsilon, Civil Engineering Honor Society

Charles E. Patterson, PhD, PE, CFM

ALLGEIER, MARTIN AND ASSOCIATES, INC.
Consulting Engineers, Hydrologists, and Surveyors
cpatterson@amce.com

Professional Experience

Dr. Patterson is a Senior Hydro Engineer of Allgeier, Martin and Associates, Inc., Rolla, Missouri, where he is responsible for hydrologic and hydraulic analysis and design and construction plan development.

Duties include design of stormwater works such as open channels, lakes, detention basins, spillways, detailed culvert and bridge analysis, floodplain and floodway mapping. Other duties include plan review of hydraulic and hydrologic reports for stormwater works, culverts, and bridges, and expert witness research.

Dr. Patterson also serves as an Adjunct Assistant Professor, Missouri University of Science and Technology (formerly University of Missouri-Rolla), Rolla Missouri (August 1998 to present). He has taught graduate courses of Open Channel Hydraulics, Hydraulic Engineering & Advanced Hydraulics, Water Infrastructure, Hydraulic Structures, undergraduate Fluid Mechanics and undergraduate Water Resources. He has also completed research projects including storm grate flow analysis and storm grate design.

Prior to joining Allgeier, Martin and Associates, Inc. He was a senior engineer at WILSON HYDRO, LLC (July 2000 - July 2006), and was the sole proprietor of Civil Engineering Professionals, Rolla, Missouri (July 1995 to July 2000). Projects included specialty work in the area of hydraulics and hydrology as well as general civil projects. Clients included the engineering firms of S&V Consultants, Hydro-Engineers, Camp Dresser & McKee, Picket Ray and Silver, Roseland Engineering, and Design 9. Work included hydraulic transient modeling and analysis of water supply lines and deep wells for sewage injection, design of equipment to reduce hydraulic transient pressures, design and analysis of water supply networks for new systems and modifications of existing systems, design and analysis of sanitary sewer systems for new communities, including gravity lines and low pressure sewer lines, design of pump stations, detailed hydrologic modeling of watersheds ranging in area from 0.2 acres up to 150 square miles, determination of water surface profiles, and design of detention basins and energy dissipation structures.

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APPENDIX A – GEOLOGY AND GEOMORPHOLOGY

Review of Chapters relating to Geology and Geomorphology in the Missouri River Commercial Dredging Draft EIS

by John C. Doyle, P.E.
and
Henry S. Hauck, USGS (Ret)
JD-MC Engineering

JD-MC ENGINEERING

TO: DAVID SHORR

FROM: JOHN C. DOYLE, P.E. – HENRY S. HAUCK, USGS (RET)

SUBJECT: MISSOURI RIVER COMMERCIAL DREDGING EIS REVIEW

DATE: 8/25/2010

CC: MIKE ODELL

Dear Mr. Shorr,

This letter represents our comments on the July, 2010 DEIS on Missouri River Commercial Dredging. Should you wish to discuss these comments, we will be glad to meet with you at your convenience.

GENERAL COMMENTS

1) Informational data, graphs and charts found within the DEIS were obviously not peer reviewed and contain major errors from which inaccurate correlations were drawn. This incorrect data was found in charts, graphs and assumptions within the DEIS.

2) The only river characteristic that moves sediment is VELOCITY. Flow rate and stage mean nothing and are NOT a contributing factor to sediment transport. These two characteristics (flow rate and stage) can occasionally be directly correlated to velocity; however they alone cannot be correlated to sediment transport.

3) Definitions. The DEIS makes numerous "general" comments about the LOMR. The DEIS does not differentiate along the LOMR. For example, the DEIS uses "low flow" to describe flow events within the LOMR. What does this mean? Low flow at St. Joseph is much different than low flow at St. Charles. These generalized situations need to be more defined for readers to better understand which flow range is being referenced.

   Table 3.4-10 show average flows at the gage sites but the generalization of the LOMR average flow changes from Rulo at 42470 cfs to Hermann at 87950 cfs .

4) The data interjected into the DEIS has come mostly from previous USACE reports. The DEIS contains the same errors these Corp reports contain.

5) The DEIS uses questionable timelines to compare and analyze data.

6) The DEIS overlooks current dredge hole studies provided with state of the art data collection equipment and procedures, and chooses to use the findings of studies completed in the past with "outdated" data collection procedures and equipment. The older studies were based upon inaccurate assumptions and outdated data collection capabilities when compared to data collection capabilities provided by multi-beam data.

SPECIFIC COMMENTS

1) Figure 3.4-5 These time series photos demonstrate the erosive power the BSNP's have created on the Lower Missouri River. The DEIS does not mention the estimated increase in velocity from the first time-stamped photograph to the last time-stamped photograph. The USACE is mandated to maintain a navigation channel on the Missouri River. This channel is to be 9.0' deep and 300' wide. In looking at the LOMR cross section data as a whole, the channel is 20' deep and 500' wide.

2) Table 3.4-4 shows 25 miles of cutoffs between St. Joseph and Kansas City. In previous Corp studies, it was reported these cut-offs will contribute up to 14' of bed degradation through the Kansas City reach. The DEIS states the Missouri River slopes near these cut-off locations "stabilized" at almost double the existing slope. This slope phenomenon is not explained in the EIS and is not possible without a permanent and major grade control structure located within the reach.

3) Figure 3.4-10 The DEIS states that flow is a key variable in sediment transport. This statement is not exactly true. Velocity is a key variable in sediment transport. Therefore, a reasonable correlation between flow rate and velocity is made e.g. increased flow rate correlates to increased velocity within the channel. With that correlation made clear, the DEIS does not elaborate on the effects the increase base flow has on bed load, sediment transport, and scouring/bed erosion.

4) Table 3.4-11 lists Minimum Daily, Maximum Daily, and Average Seasonal Discharges. This table has confused monthly mean discharges with daily mean discharges.

5) On page 3.4-43 of the DEIS the introduction states "Water flows and sediment transport are the primary variables that govern river bed aggradation and degradation, <u>as well as the volume of sediment that may be available for commercial sand and gravel dredging.</u>" The DEIS should remove the underlined portion of this statement, as it is not proven and is false. The DEIS should also add something about velocity in this statement. The DEIS totally misses the point that **VELOCITY** is a primary variable that governs river bed aggradation and degradation.

6) Table 3.4-13 This table shows that during the time period 1981-1993. St. Joseph had 85 million tons per year in suspended sediment load, and Kansas City had 58 million tons/year in suspended sediment load and Hermann had 80 million tons/year in suspended sediment load over a 12-year time period. Combine this data with the data provided on Table 3.4-17. Table 3.4-17 shows the Platte River at Sharp Station had 6 million tons per year suspended sediment load and the Kansas River shows approximately 10 million tons per year suspended sediment load for this time period. Therefore, Kansas City had 58 million tons/year in suspended sediment load during this time frame. The Platte River at Sharp Station accounts for 6 million tons per year and the Kansas River accounts for 10 million tons per year therefore, the Missouri River accounts for the balance or remaining 42 million tons per year. If the Missouri River then accounts for 42 millions tons per year in suspended sediment during this time period at Kansas City and it shows 85 million tons per year in suspended sediment at St. Joseph this would imply that 43 million tons per year went into storage between St. Joseph and Kansas City for this time period. These figures seem unreasonable and need to be reviewed.

7) Table 3.4-13 is comparing sediment from 1949-1952 to sediment from the 1968-1980 and 1981-1993. The 1949-1952, 4 year time frame consist of extremely high flows on the Missouri River. During this period 1949-1952, according to Table 3.4-12 record floods ranking in the Top 10 were recorded as follows;

   Rulo - 1949, 1950, 1951, 1952

   St. Joseph - 1952

Kansas City – 1951, 1952

Hermann – 1951

It would be safe to assume that in the 1949-1952 time frame, the Missouri River experienced record floods ranking in the Top 20 to Top 25 every year at every location. Comparing sediment from the previously mentioned high flow years to the targeted time frames leads to inaccurate conclusions and correlations.

8) Table 3.4-13. Why weren't the "low flow" years of 2000, 2003, and 2006 considered when suspended sediment loads at Kansas City were noticed to be higher than the suspended sediment loads at Hermann? This data would suggest more scouring is occurring at Kansas City than at Hermann during "low flows". What does this information say about the velocity at these two locations?

9) Table 3.4-17, The Gasconade River at Jerome does represent the majority of the watershed. 79% of the drainage area is represented at Jerome. The drainage area at the mouth is 3582 square miles and at Jerome the drainage area is 2840 square miles.

10) Table 3.4-18 shows higher bed loads at Kansas City than any other location along the Missouri River given within the table. Sediment is transported by velocity; therefore much higher velocities through this reach must exist.

11) Page 3.4-62 the DEIS states that "The estimated bed material loads **(Table 3.4-19)** show similar trends to the measured total suspended sediment loads **(Table 3.4-14)**. Both parameters increase between Nebraska City and St. Joseph and between St. Joseph and Kansas City. **Between Kansas City and Hermann, however, the bed material load estimate decreases by approximately 32 percent. Although the cause of the decrease in bed material load between the Kansas City gage and the Hermann gage is unclear**, it may partially result from the contribution of flows from the Osage and Gasconade Rivers without an equivalent contribution of sediment, or a difference in sediment sizes from sites upriver and their allocation between wash load and bed material load." From the figures, tables and graphs within the DEIS, the cause of the decrease in bed material load between the Kansas City gage and the Hermann gage is not unclear. The given information is showing a potential velocity issue within the Kansas City reach.

12) Page 3.4-65 Influence of Dredging on Estimated Bed Material Loads – In each case, the gage locations used for bed material load estimations and measurements of suspended sediment loads are downriver from commercial dredging operations that occurred during the period used for analysis. Although commercial dredging represents a removal of bed material load sized sediment from the system, the amount dredged upriver from the gage locations was not added back into the calculations estimating bed material loads. There is a dynamic equilibrium between the bed material load and the transport capacity of the river (Lane 1955). As sediment is removed from active transport (for example, as a previously dredged area refills), the river erodes material from the river bed downriver from the dredged area to replace the material removed from active transport (Kondolf 1997; Simons, Li, and Associates 1985). Therefore, the transported sediment that is removed from active transport above the gage location because it fills in a dredged area is replaced by sediment recruited from the bed between the dredged area and the gage, causing river bed degradation (Simons, Li, and Associates 1985). For recruitment of sediment from the river bed into active transport to occur, bed material load-sized sediment in the river bed must be readily available. Because the banks of the LOMR are largely protected by revetments and vegetation and are generally stable, evidence of river bed degradation at locations near dredging operations indicates that dredged material is primarily being replaced by sediment recruited from the bed.

This portion of the DEIS should be reviewed. A study completed in 2007 by the USACE clearly shows dredge holes monitored using a multi-beam echo sounder did NOT erode material from the river bed downriver from the dredged area to replace the material removed from active transport. This recent study clearly demonstrated dredging did not have any short term impacts on the Missouri River bed. The study did not show any type of erosion in, around, or near the dredged location. Furthermore, this study should be used to verify that the initial assumptions made in 1985 by Simons, Li, and Associates are correct.

The assumptions made by (Kondolf 1997; Simons, Li, and Associates 1985) and (Simons, Li, and Associates 1985) appear to be the basis for several conclusions in the DEIS. These assumptions should have been verified by evaluating the 2007 multi-beam dredge hole studies completed by the USACE.

13) Page 3.4-68 To evaluate changes in river bed elevation and low-flow water surfaces, data with a common datum is required. One such dataset is the low-flow water surface elevation data collected in 1990 and 2005 adjusted to the Construction Reference Plane (CRP) established by the USACE. The CRP is an imaginary sloping plane that extends the length of the LOMR and is used by the USACE as a benchmark for building and maintaining structures in the river (USACE 2005). The CRP has been revised periodically due to changing conditions on the river, the most recent change occurring in 2005. Recent revisions have based the CRP on the 75-percent exceedance flow, or a flow determined from flow records over the past approximately 30 years. This is likely to be exceeded approximately 75 percent of the time during the navigation season. The CRP is calculated by measuring the low-flow water elevation of the river at various points along the river, adjusting them to nearby gage benchmarks, and then interpolating water surface elevations between measured locations at 0.1-mile increments (USACE 2005).

The CRP is used as a tool for building and maintaining structures in the river and the CRP is calculated by measuring the low-flow water elevation of the river at various points along the river (Corp Bench Marks) and adjusting them to nearby gage benchmarks. Have these benchmarks been properly established and maintained? Have proper QAQC procedures been followed during the life of these bench marks ensuring data quality?

14) In Figure 3.4-29 the slopes from the Potamology study are combined with the slopes from the CRP. Are these slopes comparable?

15) Figure 3.4-31 This figure shows that there is a strong correlation between degrading reaches of the river and major confluences of the river. Furthermore, the figure shows the LOMR as a whole is aggrading.

16) Figure 3.4-32 Page 3.4-93 the DEIS states "A strong correlation exists between the amount of dredging and change in the 40,000-cfs stage at USGS gage location on the LOMR." This "strong correlation" is made from 5 data points and an R squared value of 0.8524. This is NOT a strong correlation.

The July, 2010 DEIS on Missouri River Commercial Dredging has fundamental inaccuracies that should be corrected prior to finalizing the document. In our opinion the DEIS attempts to draw conclusions and correlations that may or may not exist. Therefore, we believe at best, the DEIS is inconclusive.

Thanks,

John C. Doyle, P.E.

John C. Doyle

Henry S. Hauck USGS (Ret)

Henry Hauck

Resume of John Doyle, P.E., Project Manager/Professional Engineer

JOHN DOYLE, P.E.

PROJECT MANAGER/PROFESSIONAL ENGINEER

EDUCATION:

BS Civil Engineering
University of
Missouri-Rolla

YEARS OF EXPERIENCE:

10

REGISTRATION:

Professional Engineer
Missouri

SUMMARY OF RELEVANT QUALIFICATIONS AND EXPERIENCE

Mr. Doyle is a Professional Engineer/Project Manager. He has over 10 years experience in the consulting industry and has been involved with numerous engineering projects throughout the state of Missouri. Currently John serves as Project Manager on several projects and works as the City Engineer for the City of Dixon.

John has worked with a variety of clientele including city municipalities and governmental agencies, as well as private individuals and developers. John's experience is primarily in the hydrology and hydraulic fields with a strong background in general civil design.

RELEVANT PROFESSIONAL EXPERIENCE

Open Channel Storm Water Capital Improvements – Rolla, MO
Hydrologic Analysis – While employed by another consultant, John served as Project Engineer for this project. Frequent flooding along streams in the City of Rolla promoted the need for a regional floodplain analysis. Upon further investigation, it was determined there were four major watersheds throughout the City of Rolla. With rising concern about the flooding and repetitive complaints, the City decided to evaluate these watersheds and developed an Open Channel Storm Water Capital Improvements project. The scope of the project was to determine the flows from each of the watersheds and eventually map the floodplain for each watershed. The hydrologic analysis was established using a HEC-1 model. The large watersheds were divided into smaller sub-basins for detailed flow analysis throughout the City. Several detention options were evaluated throughout the city to determine the effect they would have on the watershed. Sub-basin delineation and detention options were made possible by the availability of two-foot contours along with orthophotography provided by the City of Rolla. Coordination between client and engineer was an imperative part of the process.

Mace's Town and Country – Cuba, MO – The Mace Town and Country store is located along Hwy. 19 in Cuba, MO. The site was inundated with storm water issues in combination with minimal space requirements that would accommodate the owner and his facility. Upon evaluation of the site, it was decided to install an underground detention structure beneath the proposed parking area of the store. This detention system would be directly connected to the existing MoDOT storm piping system along Hwy. 19 as well as the City of Cuba storm water drainage pipe along Meyers Street. Group participation between the owner, City of Cuba, MoDOT and the engineer was needed to insure all entities were satisfied with the final project.

John Doyle, P.E.

MAC Development – Phelps County, Missouri
John currently works as Project Manager on the MAC Development subdivision. His role on this project consists of sewer & water design as well as storm water mapping & design. JD-MC Engineering is presently designing utility layout locations as well as working with both county and state regulatory branches to provide the owners with construction permits and maintaining the proposed development schedule.

Willow Creek Subdivision – Investment Realty – John served as the Project Engineer responsible for storm water hydraulics/hydrology as well as water system hydraulics for this unique development. With housing demand on the rise so is the need for infrastructure to accommodate these housing needs. Willow Creek is one of the latest subdivisions within the city limits of St. James. The subdivision location created a need for floodplain delineation and mapping along with storm water routing and piping. This moderate size subdivision also required additional demand on the existing elevated water tower in St. James. Hydraulic analyses were performed to determine water main line size for the subdivision while providing sufficient flow for potential future expansion for the City of St. James.

Sandalwood Estates Development – City of Waynesville, Missouri
JD-MC Engineering provided engineering services to Sandalwood Estates Development located in the City of Waynesville, Missouri. This project consisted of a sewer line extension providing sewer service to a 16 lot subdivision. The project design and the construction staking services were provided to the developer, assisting him during utility installation while keeping the project on schedule. Storm water detention facilities were designed to accommodate both the City of Waynesville, and MoDOT design standards. Erosion and sediment control measures were utilized in combination with the detention facilities to further improve the quality of the discharging storm water.

Missouri River Hydrographic Surveying –Missouri River Dredging Association, USACE
JD-MC Engineering provided hydrographic surveying services for the Missouri River Dredging Association and the US Army Corp of Engineers. The surveying data was used in combination with data collected previously to investigate and study the ongoing degradation issue of the Missouri River.

Resume of Henry Hauk, Project Manager

HENRY HAUCK.
PROJECT MANAGER

EDUCATION:
1969 Dixon High School

YEARS OF EXPERIENCE:
40

EMPLOYMENT
USGS 1970-2007

RELEVANT PROFESSIONAL EXPERIENCE

1970-1994 Hydrologic Technician
Worked on many surface-water projects. Made various types of stream flow measurements using mechanical and accusonic devices. Collected sediment, bed material, and water quality samples using various types of samplers and sampling methods. Computed and analyzed stream flow records. Computed and analyzed sediment discharge records, developed sediment transport curves. The records were for various types of streams including the Missouri and Mississippi River. Developed the methodology for computing sediment discharge for the Mississippi River at St. Louis, MO.

1979
Operated the first AVM (accusonic velocity meter) in Missouri *Open*

1995-2007 Supervisor Hydro Tech
Supervised the Rolla and St. Louis USGS field offices.
Supervise data collection and data computation for the State of Missouri.
Publication of Annual Data Report for the State of Missouri for period 1995-2006.

1996
Project chief for hydrographic survey and velocity study on Missouri River at Roche Port, MO. This was completed in cooperation with the US Army Corp of Engineers KC District. This study was the first of its kind where GPS, ADCP, and Hypack were used to collect bathymetry and velocity data. This study was completed on the Missouri River along the Rocheport reach.

1996
Project chief for hydrographic survey and velocity study for fish habitat on Missouri River at Confluence of the Yellowstone River, North Dakota. This was done in cooperation with the US Army Corp of Engineers and US Fish and Wildlife.

1996-2006
Authored the Annual Data Report for Missouri.

1996-2006
Reviewed 22 USGS offices throughout the nation and overseas for policy and procedures in collection and computation of stream flow records and surface water projects.

Henry Hauck

1998-2005
Developed the method for collection of bathymetry data for the purpose of computing lake contents for city water supply lakes throughout the nation. Surveyed various lakes and rivers in Missouri, Nebraska, and Arkansas.

2000-2006
Project chief for bathymetry on small city water supply lakes in Missouri. Maps and lake contents of over 40 lakes were provided to The Missouri Dept of Natural Resources.

2002
Project chief for bathymetry on Pomme de Terre Lake. Map and contents were provided. This was completed in cooperation with the US Army Corp of Engineers, KC District.

2005
Project chief for the collection of bathymetry data for Lower Taum Saulk Lake after the dam failed on upper Taum Saulk Lake.

Missouri River Hydrographic Surveying –Missouri River Dredging Association, USACE
JD-MC Engineering provided hydrographic surveying services for the Missouri River Dredging Association and the US Army Corp of Engineers. The surveying data was used in combination with data collected previously to investigate and study the ongoing degradation issue of the Missouri River.

APPENDIX B - ECONOMICS

Review of Chapters 2, 3.12, and 4.10 of the
Missouri River Commercial Dredging Draft EIS

by Edward Howard Robb
Professor Emeritus, University of Missouri, Columbia

Responses to the Missouri River Commercial Dredging EIS prepared by ENTRIX

The following report contains the author's responses to the EIS prepared by Entrix, Inc. Because of the limited time in which to prepare the response, the majority of the additional information included in the response was obtained from sand and gravel producers and concrete manufacturing facilities in the Mid-Missouri region. However, given the competitive nature of the industry, it was assumed that the data on prices, shipping costs and other factors from these firms would be indicative of other sand and gravel producers in the LOMR and other areas of Missouri.

Summary of Findings

1. The choice of the primary market area to be analyzed by the EIS is not consistent with actual markets now served by dredging operations on the LOMR. As a consequence, the EIS underestimates the importance of this source of construction sand and gravel production in Missouri.

2. The EIS fails to accurately distinguish between the supply and demand for sand versus the supply and the demand for gravel. The shortcomings of this oversight are most pronounced in the discussion of alternative sources of sand if the No Action alternative was adopted. To the contrary of the results in the EIS, there is no reasonable certainty that there are alternative sources of sand available in Missouri and the surrounding states to replace the estimated 6.4 million tons currently produced from the LOMR. As a result, sand would have to be shipped from even more distant sites than those listed in the EIS resulting in even higher delivered prices.

3. Because individual mine output and capacity are unknown, the EIS estimates these data using a series of debatable assumptions, particularly with regard to the availability of alternative sources of sand.

4. Distances between mines and demand centers are estimated using great circle distances - or as the bird flies. This technique probably underestimates true travel distances and costs by 20 to 25 percent for most mines. The true travel distances for some mines could be considerably longer due to the limited number of bridges across the Missouri outside of the St. Louis and Kansas City metro areas.

5. The possibility of new sources of sand in Missouri being established near existing urban centers is extremely small. As a result, the long-run cost of sand may be even higher that the short term estimates contained in the EIS. Further, even if such new sources could be developed, off-river mining is subject to land reclamation expenses (the EIS estimates these at over $4.00 per ton) resulting in even higher long-run costs for sand, concrete and asphalt.

6. The economic impact analysis contained in the EIS fails to quantify the effects upon the two industries (concrete manufacturing and construction) that would be most seriously impacted by the meteoric price increases that would result from the adoption of the No Action alternative. The resultant short-term increase in the cost of sand, and as a consequence, both concrete and asphalt prices, would be devastating to the Missouri economy - gross state product would decline by over $300 million with concomitant losses in earning and jobs of $86 million and 2,830.
This is in stark contrast to the economic bonanza purported in the EIS which only directly analyses the effects on the mining and truck transportation industries.

7. The loss of the LOMR as a significant source of sand would also have very detrimental effects on the environment and other externalities. Average shipping distances would increase from 16.3 miles to103.9 miles, based upon the $0.20 per ton mile shipping cost estimate included in the EIS. Total shipping distances for sand would increase by 558 million miles causing a significant increase in green-house emissions, not to mention additional traffic and road wear.

The following response is limited to only three sections of the EIS - Chapters 2, 3.12 and 4.10. Supplementary information is also contained in the appendices.

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Chapter 3.12 Economics and Demographics

Chapter 3.12 analyzes the economics of the commercial sand and gravel industry in Missouri and demographics and other economic metrics of the study area - the Missouri River between RM 0 and RM 498. The chapter is divided into four major sections.

Section 1 - defines the study area or primary market area for commercial sand and gravel.
Section 2 - presents demographic and other economic data for the study area.
Section 3 - contains an overview of the construction sand and gravel industry in general and additional specifics with respect to current dredging operations on the LOMR.
Section 4 - presents some commentary on possible negative externalities associated with dredging operations on the LOMR.

While educational and required "boiler-plate", sections 2 and 4 contain little or no factual insight into the issue of continued dredging on the LOMR. The gist of the chapter is contained in Section 1 which defines the study area of the EIS and Section 3 which presents a rudimentary discussion of some issues associated with the dredging industry in Missouri. These two sections are the focus of the following comments.

Section 1 - Choice of Market Definition

The economic and demographic analysis contained in the EIS is limited to the 40 county area that was designated as the primary market area served by commercial sand and gravel produced from the LOMR. This study area included all counties with at least 25 percent of their land area that falls within a 25 mile radius of existing or proposed sand plants on the LOMR. The selection criteria was chosen "based on discussions with existing dredge operators and is indicative of the relative low-value product and high transportation costs required to ship aggregates long distances." The choice of the 25 mile criterion deserves comment.

The five river segments identified in the EIS consist of St. Joseph, Kansas City, Jefferson City, Waverly and St. Charles. Two of these segments, Kansas City and St. Charles (which represents the St. Louis metro area) are very urbanized with high population densities. The Kansas City segment includes all of the Missouri counties in the MSA definition for Kansas City except for Bates, Cass, Clinton, Lafayette and Ray counties. Three of these (Clinton, Lafayette, and Ray), however, are assigned to other river segments.

The St. Charles segment includes all the Missouri counties in the St. Louis MSA definition with the exception of Washington County and a portion of Crawford County.

For these two segments, the choice of the 25-mile radius is consistent with other respected measures of market area although a very strong argument could be made for including Washington County in the St. Charles segment.

The latter is not true, however, for the three other segments of the LOMR. While both St. Joseph and Jefferson City are MSAs, they are very different in nature from the State's two major metro areas. The largest population densities in these two segments are respectively 218 and 225 persons per square mile compared to density values over 1,000 persons per square mile for some counties in the in the Kansas City and St. Charles segments. The Waverly segment consists of only three counties, Carroll, Lafayette and Ray counties. While the latter two are part of the Kansas City MSA definition, they are much more rural in their make-up (population densities of 52 and 41 persons per square mile) than the much more densely populated portion of the metro area.

The Jefferson City segment merits special commentary. This segment consists of 11 counties that include the six counties comprising the Columbia and Jefferson City MSAs plus Chariton, Cooper, Miller, Randolph and Saline counties. While the definition of this market area is consistent with the MSA definitions, it fails to include several counties that are included in nearly all other definitions of the Mid-Missouri/US 63 corridor market area. The omitted counties include, at a minimum, Audrain, Johnson, Pettis, Morgan and Camden counties.

Depending upon the particular economic metric under consideration, this market area could also include Adair, Macon, Laclede, Maries, Phelps and Pulaski counties. The addition of these counties plus the omitted counties in the other river segments (Atchison and Nodaway) would increase the total market area to 56 counties and more importantly, serve as a much better definition with regard to the demand for commercial sand and gravel.

Although the definition of any economic or trade area will always be arbitrary, it is somewhat sophomoric to utilize a single criterion for geographic areas that are very dissimilar based upon standard economic and demographic measures. It is even more perplexing given that Capital Sand, the largest dredge operator in the Jefferson City segment, provided ENTRIX with detailed statistics and maps of their market area which spans 43 counties. As a consequence of the choice of a single criterion for the market area definitions, the entire analysis takes on a strong urban bias that has significant implications for many of the study's findings and conclusions.

Section 3 - Overview of the Construction Sand and Gravel Industry

This section of the EIS is divided into two sections. The first presents a statewide overview of the industry and the second, the economic conditions of existing dredging operations on the LOMR.

The first section presents a very generalized description of not only the construction sand and gravel industry, but also the total construction aggregate industry which includes crushed stone (limestone). It sets out three salient characteristics of the industry that are incorporated into all of the ensuing analyses, findings and conclusions.

1. "The market for construction sand and gravel and other aggregates is highly localized (generally within 25-50 miles of operation)."

2. Transportation costs are a significant portion of the price paid by customers.

3. "The length of time needed to put a new operation into production is, on average, approximately 5-10 years."

It also makes note of the fact that the output of the industry is primarily used for concrete and asphalt production. In particular, it is noted that the use of construction sand and gravel in Missouri for concrete accounts for over 79 percent of total reported use.

This section also includes estimates of the direct and total economic benefits of construction sand and gravel production, both statewide and for the dredging operations on the LOMR. These sections are essentially meaningless. The total mining industry in Missouri is small, contributing less that 0.1 percent to Missouri gross state product. The dredging portion (a total of six companies, 19 distribution sites and only 196 employees) is miniscule. The more relevant issue of the forward-linkages of the industry to the intermediate and final products of the manufacturing (concrete in particular) and construction industries is noted but not otherwise quantified or addressed.

The section on the economics of the existing dredging operations contains only two subsections of significant interest. The first is Table 3.13-10 which presents production statistics for construction sand and gravel from the LOMR disaggregated by market area or river segment. This table is crucial to the EIS as it sets the framework for the ensuing analysis of alternative sources of sand and gravel under alternative dredging scenarios. It also contains a table (3.13-11) that purports to place a valuation on the physical production levels.

The problem with the latter, however, is that there is no mention of how or what is actually being measured. While the volume statistics are self-explanatory, the valuation statistics are not. According to footnote c (Table 3.13-11), the average price for construction sand and gravel supposedly reflect prices of sand and gravel used specifically in concrete and asphalt production. However, because they are significantly less than the over-the-scale prices at the existing sand plants they must exclude some component of the true FOB market price.

The valuation estimates are also not consistent with the statewide average prices per ton. The following table was extracted from tables 3.13-10 and 3.13-11 plus Table 3.13-8. Values for the latter table were converted from metric tons to U.S. tons using a conversion factor of 1.10231).

Annual Production of Construction Sand & Gravel
State of Missouri and LOMR

Missouri	2005	2006	2007
Quantity	13,448,000	18,739,000	15,432,000
Value	$61,600,000	$92,100,000	$77,400,000
Price	$4.58	$4.91	$5.02
LOMR			
Quantity	7,684,267	7,467,872	6,251,565
Value	$32,074,127	$33,445,609	$28,571,513
Price	$4.17	$4.48	$4.57
Other			
Quantity	5,763,733	11,271,128	9,180,435
Value	$29,525,873	$58,654,391	$48,828,487
Price	$5.12	$5.20	$5.32

What is puzzling about these data are the wide variance between the prices of sand and gravel from the LOMR compared to other areas in the State. If the market areas for sand and gravel are in fact highly localized these data would suggest that either the demand for the products was much higher in the remainder of the State, which is extremely unlikely, or that the supply of sand and gravel was very limited. Alternatively, the higher prices could also reflect higher transportation costs which are supposedly not included in the prices, which would imply that the shipping distances were much greater that the 25 to-50 mile range assumed for production from the LOMR.

Other prices quoted in the EIS raise even more perplexing questions. For example, the EIS analysis assumes that the current FOB price for sand and gravel in the 40 county study area is $4.91 per ton whereas the quoted FOB price for sand in Jefferson City is in the range of $6.00 to $6.30 per ton. Because the mix of sand and gravel is so heavily weighted by sand, this large discrepancy in estimated FOB prices, over 28 percent, indicates that either the EIS estimates are in error or that prices for sand in other river segments are significantly lower.

There are three other statements of interest included in this section. The first is that natural sand accounts for 90-95 percent of all saleable product extracted from the river. Perhaps the most glaring weakness of the EIS is the treatment of sand and gravel as a single commodity. Assuming that the mix is 92.5 percent sand and 7.5 percent gravel implies that the amount of sand produced by dredging is approximately 6,374,700 tons per year. This is the crucial figure that should be used in analyzing any alternatives, not the total of 6.9 million tons of both sand an gravel. The gravel produced from the LOMR (approximately 517,000 tons per year) is not used primarily for construction purposes, but rather for more specialized purposes such as landscaping and in drainage fields for septic systems.

The other statements concern shipping costs. Page 3.13-14 "In fact, transportation costs in the construction sand and gravel industry as a whole has averaged approximately 50 percent of the price paid by consumers." The value of this snippet of anecdotal information is zero.

Page 3.13-21 "Generally, shipping const for construction sand and gravel in the market area range between $0.10 and $0.25 per ton mile, as estimated by dredgers on the LOMR." Again, it is very unlikely that the dredgers on the LOMR would have hard factual data on the proprietary shipping costs of their customers.

There are two problems with these two statements. First, neither is verified. Secondly, there is much antidotal information that would dispute both of these statements. The validity of the cost per mile estimates is particularly important since it is a critical assumption in the economics of alternative dredging scenarios presented in Chapter 2.

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Chapter 2 - Proposed Action and Alternatives

Chapter 2 of the EIS discusses the proposed action (expansion of dredging operations to a maximum of 11.6 million tons per year) and four alternative scenarios that would place specified limits on the amount of sand and gravel that may be dredged from the LOMR. The most restrictive of these is the No Action Alternative that would cease all dredging operation on the LOMR as of January 1, 2011. The three other alternatives (A, B and C) impose annual dredging limits respectively of 2.2, 5.1 and 6.9 million tons per year. Alternative C is in essence the status quo, since this is the quantity of sand and gravel currently being removed from the LOMR.

The alternative of greatest interest is obviously the No Action alternative. However, alternatives A and B merit some discussion - in particular, the issue of whether the associated dredging limits are sufficient to maintain the economic viability of existing operations, an issue that is given only fleeting mentioned in the EIS.

If one assumes that the construction sand and gravel industry approximates a competitive market, then each facility is operating at a level of output where price is equal to marginal cost and close to average total cost (including normal profit). The imposition of restrictions on output would, in general, create a situation where average total cost exceeds price, thereby causing current facilities to operate at a loss. However, the imposition of output limits would also put upward pressure on the market prices for construction sand and gravel. While the net effect of these off-setting pressures would be dependent upon the actual costs of each producer, the greater the restriction the more likely that the facility would not be economically viable. Alternative A which reduces allowable output by nearly 75 percent would most likely force all current facilities to cease operations. Although the consequences of Alternative B are less certain, it is very likely that some facilities would cease operations and as a consequence require even greater reliance on alternative sources of sand and gravel than set out in the EIS.

Alternative Sources of Sand and Gravel

This section of the EIS describes the potential alternative sources of sand and gravel if either the No Action Alternative or Alternatives A, B or C would be adopted. Obviously, the No Action Alternative which would result in the cessation of commercial dredging on the LOMR would have the most immediate and pronounced effects upon both the short-term and long run availability of construction sand and gravel.

The analysis and conclusions contained in the EIS with respect to the possibility of replacing the materials currently dredged from the LOMR are at best, troubling. As stated in Chapter 2, "other existing mining operation may be available to provide immediate replacement supplies" while in the long-run "new sources would likely be

developed in proximity to existing processing facilities and urban center." The EIS delineates four potential sources for the sand and gravel now supplied from the LOMR.

1. Additional material dredged from the Kansas and Mississippi rivers.
2. Existing floodplain open pit mines and quarries.
3. Instream mining.
4. Manufactured sand.

The potential sources, estimated production and available capacity are contained in Table 2.3-1.

Estimated Production and Available Capacity of Alternative sand and Gravel Sources (tons/year)

	Alternative Source	Estimated Production	Available Capacity
	Dredging of other Rivers		
1	Mississippi River	1,124,902	1,224,308
2	Kansas River	1,154,529	756,765
	Subtotal	**2,279,431**	**1,981,073**
	Open-pit Mines & Quarries		
	Missouri		
3	Open-pit > 5,000 tons	4,899,964	4,424,881
4	Open-pit < 5,000 tons	18,005	16,995
5	Kansas floodplain open-pit	2,244,253	38,091
6	Illinois open-pit	610,682	531,970
	Subtotal	**7,772,904**	**5,011,937**
	Instream mining (Missouri)		
7	< 5,000 tons	578,732	546,268
8	> 5,000 tons	411,840	388,738
	Subtotal	**990,572**	**935,006**
	Total	**11,042,907**	**7,928,016**

The EIS estimates that the current available capacity from the Mississippi and Kansas river is respectively 1.2 and 0.8 million tons. Open-pit mines in Missouri, Kansas and Illinois have respective excess capacity of 4.5, 0.1 and 0.5 million tons per year. And instream mining in Missouri has a capacity of 0.9 million tons per year. The total of 7.9 million tons would obviously be more than the 6.9 million tons per year which is supplied by dredging on the LOMR.

Because existing alternatives are bound by a finite set of reserves, "it is plausible that these alternative sources would deplete their reserves at a faster rate if required to offset the displaced demand for LOMR sand and gravel. Accordingly, this would likely result

in expedited development of new mining operations that would be needed to restore long-term equilibrium in the sand and gravel market in Missouri."

There are several problems with these blithe statements. First, the estimate of available capacity is based upon the unreasonable assumption that the identified potential supplies are available with a probability of one. While it is fine to assume that these alternative sources of supply are certain, it is extremely naive to do so. For example, despite the fact that permitted dredging on the Kansas River has been reduced in recent years due to concerns of bed degradation, this source is expected to generate 0.8 million tons of sand and gravel per year, over 10 percent of the total projected shortfall. Similarly, the Mississippi River is expected to generate and additional 1.2 million tons per year despite the fact that there have been no new dredging permits approved since 2007.

More importantly, these two alternatives are the only significant sources of Class A sand which is required for both MDOT and most major construction projects. Another issue not addressed in the EIS is that MDOT requires that all sand for a project come from a single plant. Thus, for large projects, the Kansas and Mississippi rivers would probably be the only sources available. Given that a single mile of a new concrete highway (including shoulders) requires nearly 3.8 thousand tons of sand, a single instream or open-pit subject to the less than 5,000 ton production limit would be precluded from even bidding on MODOT contracts.

As stated previously, the analysis of alternative sources should be entirely focused upon sand. The supply of gravel is plentiful in Missouri, particularly south of the Missouri River. Alternative sources of construction sand, however, are very limited and certainly far less than the nearly 6.4 million tons that is dredged from the LOMR.

The estimated capacity for open-pit and instream mines not subject to production caps in Missouri was estimated by subtracting estimated current production from the peak 2006 production levels. For mines with permit caps, capacity was estimated by subtracting estimated production from permit levels. The only problem with this approach is that state-level production data are not available beyond 2007. As a result, all of the production values by source were estimated using national trends. Accordingly, 2009 production in Missouri is estimated at 10.0 million tons. Subtracting the estimated 4.5 million tons extracted from the LOMR and Meramec River leaves a total of 5.5 million tons that came from all mines permitted by the MDNR. Because mine specific data are unavailable, production values by type of mining operation were estimated by prorating the residual based upon their relative size (number of acres).

The use of the latter assumption also deserves some comment. According to mine operators, it is a common practice to permit a much larger number of acres than the size of the actual mining site. There is no penalty for this under current regulations and it saves considerable time and overhead expenses. Thus, an operator may permit ten acres when the actual site may be only a single acre or less.

Implicit in these estimates of excess capacity are several assumptions. First, is that the number of mines has remained at the 2006 value. (This is not true, the total number of permitted mines is smaller that the total for 2006.) Secondly, that the potential supply from open-pit and instream mines without production caps has not been exhausted. And finally, that the permitted values for the mines with capacity limits are actually indicative of their potential output. The probability that all of these assumptions are true, let alone accurate, is certainly far less than one.

One of the presumptions of any EIS is that the assumptions and resulting conclusions be "reasonably certain." Given that the estimates of current production and those for available capacity are not supported by any solid data, the conclusions of this section would not seem to meet this standard. Now if the purpose of the EIS was merely an academic exercise written with the intent to describe the dredging and other sand and gravel mining industry in Missouri, the utilization of such assumptions would be of little concern. However, that is not the case. The EIS provides crucial information for decisions that will have serious short-term and long run consequences for not only the construction mining industry, but more importantly, for the construction and transportation industries in the State. The possibility of making such decision in the absence of any actual hard data is, at a minimum, very disconcerting.

The long-term analysis is just as troubling. The EIS assumes that new sources of sand and gravel can be developed near existing sources and urban centers. In fact, under the No Action Alternative it is assumed that the development of these new sources would be expedited, taking less time than the current average of 5 to 10 years. It is obvious from such statements that the author of this idea has never been to a planning and zoning meeting.

Table 1 presents the number of sand and gravel mines by type for each of the MSA counties in Missouri. These counties which represent the vast majority of the population of the State have a total of 120 sand and gravel facilities, 67 of which have production caps. The major MSA counties in the study area (Boone, Buchanan, Cole, Jackson, Clay, St. Charles, St. Louis County and City) have only a total of 14 mines. Given the reluctance of most urban planning and zoning commissions to authorize anything resembling a mining operation, the possibility of developing a significant new source of sand and gravel in any of these areas is extremely small and the probability of finding a viable source of Class A sand may be near zero.

Table 1 - Metro County Sand and Gravel Mines

Metro County	Open-pit < 5,000	Open-pit > 5,000	Instream < 5,000	Instream > 5,000	Both	Total
Columbia	**0**	**0**	**0**	**0**	**0**	**0**
Boone	0	0	0	0	0	0
Howard	0	0	0	0	0	0
St. Joseph	**0**	**1**	**0**	**0**	**0**	**1**
Buchanan	0	0	0	0	0	0
Andrew	0	1	0	0	0	1
Jefferson City	**0**	**0**	**12**	**0**	**0**	**12**
Cole	0	0	6	0	0	6
Callaway	0	0	2	0	0	2
Moniteau	0	0	0	0	0	0
Osage	0	0	4	0	0	4
Springfield	**0**	**1**	**7**	**0**	**2**	**10**
Greene	0	0	0	0	0	0
Christian	0	0	1	0	0	1
Dallas	0	1	3	0	0	4
Polk	0	0	1	0	2	3
Webster	0	0	2	0	0	2
Joplin	**1**	**0**	**0**	**0**	**0**	**1**
Jasper	0	0	0	0	0	0
Newton	1	0	0	0	0	1
Kansas City	**0**	**3**	**0**	**0**	**0**	**3**
Jackson	0	2	0	0	0	2
Clay	0	1	0	0	0	1
Cass	0	0	0	0	0	0
Platte	0	0	0	0	0	0
Ray	0	0	0	0	0	0
Caldwell	0	0	0	0	0	0
Clinton	0	0	0	0	0	0
St. Louis	**2**	**9**	**12**	**0**	**10**	**33**
St. Louis County	1	4	0	0	0	5
St. Louis City	0	0	0	0	0	0
St. Charles	0	0	0	0	0	0
Franklin	1	0	5	0	2	8
Jefferson	0	1	0	0	8	9
Crawford	0	0	2	0	0	2
Lincoln	0	3	0	0	0	3
Warren	0	0	3	0	0	3
Washington	0	1	2	0	0	3
Total	5	29	62	0	24	120

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Chapter 4.10 Economics and Demographics

This chapter quantifies the short-run economic and demographic effects of the proposed action and the alternatives. The first section of the chapter estimates the changes in the price of sand and gravel under the various alternatives. The mechanism used for this analysis is a transportation cost model that calculates the expected price for construction sand and gravel under each of the alternative scenarios assuming volume demands equal to the 2004-2008 average annual output from the LOMR. The total cost figures include both the FOB price of sand ($4.91) and transportation costs that were assumed to be $0.20 per mile.

Table 2 - Prices and Shipping Costs

	Prices			Total Cost		Shipping Cost	
		FOB					
Segment	Raw	Current	NA	Current	NA	Current	NA
St. Joseph	$4.41	$4.93	$5.14	$7.39	$34.77	$2.46	$29.63
Kansas City	$4.39	$4.90	$5.11	$7.98	$31.27	$3.08	$26.16
Waverly	$4.45	$4.97	$5.19	$9.53	$42.91	$4.56	$37.72
Jefferson City	$4.42	$4.94	$5.15	$9.25	$28.09	$4.31	$22.94
St. Charles	$4.37	$4.89	$5.10	$7.34	$8.60	$2.45	$3.50
Total	**$4.40**	**$4.91**	**$5.13**	**$8.17**	**$25.91**	**$3.26**	**$20.78**

Notes: NA - No Action alternative

Table 2 presents production and cost estimates for sand and gravel currently dredged from the LOMR. The values for raw prices are calculated by dividing the volume data by the production values. The values for the EIS FOB prices were calculated by prorating the average FOB estimate of $4.91 by the raw prices for each river segment. The figures for the EIS shipping costs were calculated by subtracting the EIS FOB price from the total cost figures.

There are several observations that may be made about these figures. First, as noted earlier, the current FOB prices for sand are significantly lower than actual prices charged at existing sand plants on the LOMR. Secondly, and more importantly, the No Action alternative prices and cost figures, assume that the alternative sources for sand and gravel actually have viable quantities of sand available. This assumption is open to considerable skepticism.

Texas county for example, which was not included in the study area but is in the US 63 corridor, has 18 permitted instream mines that produce sand and gravel. The county centroid is also located within 100 miles of 216 other producers of sand and gravel in the south-central portion of Missouri. However, the two concrete manufacturers located in the county (River Rock Redi-Mix located in Cabool and Houston Redi-Mix located in Houston) purchase their sand from either Jefferson City or Arkansas despite the fact that River Rock Redi-Mix has five permitted sites in the county and Houston Redi-Mix has

eight. One can only conclude from such decisions that there is no viable source of sand in Texas County or in the surrounding counties.

Economic Impact of the No Action Alternative

The majority of this portion of the EIS is devoted to multiplier analysis that purports to quantify the impacts on output, earnings and employment under the proposed action and alternatives. The response to this section of the EIS is limited to the No Action alternative because this alternative represents the most significant economic impacts.

In essence, the No Action alternative shuts down all dredging on the LOMR and reallocates sand and gravel production to hypothetical alternative sites, some in Missouri and some in both Illinois and Kansas. The analysis of these actions are limited to three sectors - sand and gravel production, truck transportation and households. The inclusion of the household sector is necessary to indirectly account for changes in the manufacturing and construction sectors that are not explicitly identified in the EIS analysis. The short-term effects of this alternative are summarized in Table 3.

Table 3 - Short-term Economic Effects of No Action Alternative

	Output		Labor Income		Employment	
	Direct	Total	Direct	Total	Direct	Total
Missouri						
Sand & Gravel	$26,965	$42,495	$10,532	$15,449	155	273
Truck Transportation	$109,888	$174,744	$40,823	$63,853	852	1,501
Households	$0	-$91,313	$0	-$28,760	0	-813
Total	$136,853	$125,926	$51,355	$50,542	1,007	961
Primary Market Area						
Sand & Gravel	$9,860	$17,851	$4,586	$7,276	36	91
Truck Transportation	$22,269	$42,463	$8,661	$16,101	159	327
Households	$0	-$88,042	$0	-$27,751	0	-783
Total	$32,129	-$27,728	$13,247	-$4,374	195	-365
Outside Primary Area						
Sand & Gravel	$17,105	$24,644	$5,946	$8,173	119	182
Truck Transportation	$87,619	$132,281	$32,162	$47,752	693	1,174
Households	$0	-$3,271	$0	-$1,009	0	-30
Total	$104,724	$153,654	$38,108	$54,916	812	1,326

Note: Dollar amounts are in thousands.

The estimates of the household effects are based upon the assumption "that any changes in wholesale costs incurred by the manufacturing and construction industries would be passed on to end users in the form of higher production costs." Because of its importance to the analysis, this assumption obviously bears further scrutiny.

What this assumption actually says is that the demand for sand and concrete is perfectly inelastic and that buyers of these products will bear the full cost of any increase in their

prices due to the increased transportation costs that result under the No Action alternative. The problem is that this assumption is unrealistic.

For example, one of the largest users of concrete is state and local government for highway capital outlays. In 2008, Missouri state government spent $1.1 billion on this expenditure category and local governments spent and additional $0.4 billion. While not explicitly analyzed in the EIS, the increase in the price of sand from the current level of about $9.00 per ton to an estimated $28.00 per ton in the Jefferson City segment of the market area could not be absorbed be either the State of Missouri or any other local governmental entity because of their budget constraints. Based upon estimates of highway concrete construction and asphalt resurfacing cost sheets provided by Con-Agg of MO, LLC located in Columbia, the 211 percent increase in sand costs under the No Action alternative would cause construction costs per mile of concrete highway to increase by 10.6 percent with a concomitant change in asphalt resurfacing costs per mile of 6.4 percent. Unless some magical source of additional funding for highway construction and maintenance could be found, the net effect of such cost increases would be to reduce real highway capital expenditures by some factor between 6.4 and 10.6 percent.

Table 4 - Selected Final Demand Multipliers

	Final Demand Multipliers		
Industry	Output	Earnings	Employment
Sand & Gravel Mining	1.9863	0.5763	19.3
Concrete manufacturing	2.2943	0.6110	23.4
Trucking	2.0448	0.5197	22.7
Construction			
Highways & streets	2.4908	0.6893	25.7
Office buildings	2.4179	0.6892	24.8
New residential	2.4193	0.7262	33.0

Source: BEA - RIMS II multipliers

Table 4 contains the Missouri BEA final demand multipliers for selected industries. Assuming that the average increase in highway costs was 8.35 percent, real highway capital outlays would have to decline by approximately $125.3 million. Using the RIMS-II multipliers, this would cause a decline in output of nearly $312 million and a reduction in earning and employment of nearly $86.4 million and 2,831 jobs respectively. Losses of this magnitude would certainly negate all of the gains registered in the mining and trucking industries. And, while not quantifiable, the impact on other construction categories, such as office buildings and new residential, would be devastating given current market conditions.

Appendices

1. EIS Market Areas - Population Densities and Market Shares

2. Other Potential Counties Excluded form the EIS Market Areas - Population Density

3. Cost Estimation Worksheets for New Highways, Bridges and Asphalt Resurfacing

Appendix 1

EIS Market Areas - Population Density and Market Shares

Segment	State	County	Population	Land Area	Density	Share	Tons
St. Joseph	Kansas	Atchison	16,374	432.3	37.9	0.0032	22,321
	Kansas	Doniphan	7,770	392.2	19.8	0.0015	10,592
	Kansas	Leavenworth	74,355	463.3	160.5	0.0147	101,359
	Missouri	Andrew	16,923	435.2	38.9	0.0033	23,069
	Missouri	Buchanan	89,408	409.7	218.2	0.0177	121,879
	Missouri	Clinton	21,094	418.8	50.4	0.0042	28,755
	Missouri	DeKalb	12,275	424.2	28.9	0.0024	16,733
	Missouri	Holt	4,905	461.9	10.6	0.0010	6,686
	Missouri	Platte	85,896	420.3	204.4	0.0170	117,092
Kansas City	Kansas	Johnson	535,000	476.8	1,122.1	0.1058	729,301
	Kansas	Wyandotte	153,968	151.4	1,017.0	0.0305	209,886
	Missouri	Clay	215,707	396.3	544.3	0.0427	294,047
	Missouri	Jackson	668,417	604.8	1,105.2	0.1322	911,173
Waverly	Missouri	Carroll	9,756	694.7	14.0	0.0019	13,299
	Missouri	Lafayette	32,913	629.3	52.3	0.0065	44,866
	Missouri	Ray	23,445	569.5	41.2	0.0046	31,960
Jefferson City	Missouri	Boone	154,365	685.4	225.2	0.0305	210,427
	Missouri	Callaway	43,464	838.8	51.8	0.0086	59,249
	Missouri	Chariton	7,740	755.9	10.2	0.0015	10,551
	Missouri	Cole	74,313	391.4	189.9	0.0147	101,302
	Missouri	Cooper	17,535	565.0	31.0	0.0035	23,903
	Missouri	Howard	9,918	465.7	21.3	0.0020	13,520
	Missouri	Miller	24,949	592.3	42.1	0.0049	34,010
	Missouri	Moniteau	15,121	416.5	36.3	0.0030	20,613
	Missouri	Osage	13,465	606.1	22.2	0.0027	18,355
	Missouri	Randolph	25,723	482.3	53.3	0.0051	35,065
	Missouri	Saline	22,505	755.6	29.8	0.0045	30,678
St. Charles	Illinois	Calhoun	5,024	253.8	19.8	0.0010	6,849
	Illinois	Jersey	22,597	369.2	61.2	0.0045	30,804
	Illinois	Macoupin	48,150	863.6	55.8	0.0095	65,637
	Illinois	Madison	267,839	725.0	369.4	0.0530	365,113
	Illinois	St. Clair	262,131	663.8	394.9	0.0519	357,332
	Missouri	Franklin	100,898	922.8	109.3	0.0200	137,542
	Missouri	Gasconade	15,261	520.7	29.3	0.0030	20,803
	Missouri	Jefferson	217,679	656.8	331.4	0.0431	296,736
	Missouri	Montgomery	11,804	537.5	22.0	0.0023	16,091
	Missouri	St. Charles	349,407	560.4	623.5	0.0691	476,305
	Missouri	St. Louis	991,830	507.8	1,953.2	0.1962	1,352,043
	Missouri	St. Louis City	354,361	61.9	5,724.7	0.0701	483,058
	Missouri	Warren	31,214	431.3	72.4	0.0062	42,550
Total			5,055,499	21,010	240.6	1.0000	6,891,554

Appendix 2

Other Potential Counties Excluded form the EIS Market Areas - Population Density

Segment	State	County	Population	Land Area	Density
St. Joseph	Missouri	Atchison	6,031	544.7	11.1
	Missouri	Nodaway	22,054	876.6	25.2
Kansas City	Missouri	Bates	17,075	848.5	20.1
	Missouri	Cass	98,429	699.0	140.8
Waverly	Missouri	Johnson	52,016	830.4	62.6
	Missouri	Pettis	41,006	684.8	59.9
Jefferson City	Missouri	Adair	24,943	567.0	44.0
	Missouri	Audrain	26,049	693.1	37.6
	Missouri	Camden	40,664	655.1	62.1
	Missouri	Laclede	35,524	765.9	46.4
	Missouri	Macon	15,621	803.8	19.4
	Missouri	Maries	9,046	527.7	17.1
	Missouri	Morgan	20,861	597.4	34.9
	Missouri	Phelps	42,205	672.9	62.7
	Missouri	Pulaski	44,546	547.0	81.4
St. Charles	Missouri	Washington	24,548	759.6	32.3
Total			520,618	11,074	47.0

Appendix 3 - Cost Estimation Worksheets for New Highways, Bridges and Asphalt

Standard New Concrete Highway - 1 Mile

Assumptions:					
1. Location	Mid-Missouri				
2. Length		1	mile	5,280	lf
3. Roadway Width		26	ft.		
4. Roadway Area	15,253		SY		
5. Roadway Pavt. Thickness		10	in.		
6. Shoulder Width - Each Side		8	ft.		
7. Shouldr Area	9,387		SY		
8. Shoulder Thickness		5.75	in.		
Quantities:					
Concrete - Roadway	4,237		CY	Neat Qty	
Concrete - Shoulders (Each Side)	1,499		CY	Neat Qty	
Asphalt Mix Design:					
Sand	1,200		LB/CY	Neat Qty	
Sand Quantities Required:					
1 Mile of Highway - 10" thk	2,796		Tons	Includes 10% Allowance for Plant Site Waste	
1 Mile of Shldrs - 5.75" thk	990		Tons		
Total Sand Requirements	3,786		Tons		
Sand Pricing:					
Current Price - Missouri River Sand	$ 9.00		per Ton		
Possible Pricing - Non-Local Sand	$ 28.00		per Ton		
Sand Costs Per Mile of Roadway:					
Total Sand Costs - Missouri River Sand	$ 34,074				
Total Sand Costs - Non-Local Sand	$ 106,007				

Cost Increases Due to Use of Non-Local Sand

Total Price Increase Per Mile of Roadway	$ 71,933	per Mile
% Sand Price Increase Per Mile of Roadway	211%	

Current Average Costs for Highway Construction

10" Concrete Pavement	$ 32.00	per SY
5.75" Concrete Shoulder	$ 20.00	per SY
Total Cost - Concrete Pavement	$ 488,107	
Total cost - Concrete Shoulders	$ 187,733	
Total Costs - Concrete Pavt. & Shldrs	$ 675,840	per Mile
Possible Sand Price Increase	$ 71,933	per Mile
% Total Price Increase Per Mile of Roadway	10.6%	

Standard MoDOT Bridge

Assumptions:

1. Location	Mid-Missouri		
2. Bridge Length	180	ft.	
3. Bridge Width	38	ft.	
4. Bridge Area	760	SY	
5. Span lengths	3 at 60 ft		

Quantities:

Total Concrete in Bridge	550	CY	Neat Qty

Concrete Mix Design:

Sand	1,200	LB/CY	Neat Qty

Sand Quantities Required:

Standard 3 Span MoDOT Bridge - 180 LF	363	Tons	Includes 10% Allowance for Overrun

Sand Pricing:

Current Price - Missouri River Sand	$ 9.00	per Ton
Possible Pricing - Non-Local Sand	$ 28.00	per Ton

Sand Costs Std MoDOT Bridge:

Total Sand Costs - Missouri River Sand	$ 3,267
Total Sand Costs - Non-Local Sand	$ 10,164

Cost Increases Due to Use of Non-Local Sand

Total Price Increase Per Std Bridge	**$ 6,897**	**Per Bridge**
% Sand Price Increase Per Bridge	**211%**	

Current Average Costs for Bridge Construction

Std MoDOT Bridge - 3 Span - 180' x 38'	**$ 500,000.00**
Possible Sand Price Increase	**$**

	6,897	
% Total Price Increase Per Bridge		**1.4%**

Standard 1.5" Asphalt Resurfacing - 1 Mile

Assumptions:					
1. Location	Mid-Missouri				
2. Length		1	mile	5,280	lf
3. Roadway Width		24	ft.		
4. Roadway Area	14,080		SY		
5. Resurfacing Thickness		1.5	in.		
Quantities:					
Asphalt (110 lb/sy per inch of thickness)	1,162		Tons	Neat Qty	
Concrete Mix Design:					
Sand - 15% of Mix	174		Tons	Neat Qty	
Sand Quantities Required:					
1 Mile of Resurfacing - 1.5" thk	192		Tons	Includes 10% Allowan for Plant Site Waste	
Sand Pricing:					
Current Price - Missouri River Sand	$ 9.00		per Ton		
Possible Pricing - Non-Local Sand	$ 28.00		per Ton		
Sand Costs Per Mile of Roadway:					
Total Sand Costs - Missouri River Sand	$ 1,725				
Total Sand Costs - Non-Local Sand	$ 5,367				
Cost Increases Due to Use of Non-Local Sand					
Total Price Increase Per Mile of Resurfacing	**$ 3,642**		**Per Mile**		
% Sand Price Increase Per Mile of Resurfacing		**211%**			
Current Average Costs for Highway Construction					
1.5" Asphalt Resurfacing	**$ 50.00**		**per Ton**		
Total Cost - 1.5" Asphalt Resurfacing	**$**		**per**		

	58,080	Mile
	$	per
Possible Sand Price Increase	3,642	Mile
% Total Price Increase Per Mile of Resurfacing	6.3%	

Vita of Edward Howard Robb

VITA

EDWARD HOWARD ROBB

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PRESENT

President, Edward H. Robb & Associates, Columbia, Missouri

Senior Fellow, Economic & Policy Analysis Research Center, College of Arts & Science, University of Missouri-Columbia

Fellow, Show-Me Institute

PREVIOUS POSITIONS

Missouri State Representative, 24th House District

Director, State & Regional Fiscal Studies Unit, College of Arts & Science, University of Missouri- Columbia

Director, Economic & Policy Analysis Research Center, College of Arts & Science, University of Missouri-Columbia

Contract Instructor, SAS Institute, Inc.
Assistant Professor of Economics, University of Missouri-Columbia
Economic Analyst, Office of Management & Budget, State of Michigan

EDUCATION

Ph.D., Economics, Michigan State University, June 1971.
M.S., Economics, Michigan State University, June 1971.
B.S., Economics, Bradley University, June 1964.

Areas of Specialization
Public Finance
Economic Theory
Econometrics
Symbolic Logic

Dissertation
"A Quarterly Econometric Model of Michigan"

PROFESSIONAL EXPERIENCE

1972-2003: Director, State and Regional Fiscal Studies Unit (SRFSU)

The SRFSU is a separately funded and budgeted unit within the Research Center. The Unit is directly responsible to the Missouri State Legislature. The primary function is to provide on-line analytical support to legislature staff and elected State officials. The Unit maintains several large data bases and econometric models.

Budget: $200,000
Staffing: 3.5 FTE

1972-2003: Director, Economic & Policy Analysis Research Center, UMC

The Research Center is a diversified service bureau providing computer assisted research system support to the academic, governmental, and private sectors. Support services range from simple data-base extractions from our extensive economic, demographic, and financial data files to complete customized system development encompassing data-base design and maintenance and applications software.

Budget: $200,000
Staffing: 10-15 FTE dependent on current projects

Regular Publications:

Missouri Economic Indicators - quarterly
Missouri Statistical Abstract - annual

1984-91: Contract Instructor, SAS Institute, Inc. Cary N.C.

1972-77: Assistant Professor of Economics, University of Missouri-Columbia.

1972: Instructor, Michigan State University, spring.

1968: Instructor, Lansing Community College, summer.

1967-72: Economic Analyst, Executive Office, State of Michigan.

1966: Instructor, Michigan State University, summer.

1965: Instructor, Michigan State University, summer.

1964-67: Graduate Assistant, Michigan State University.

PUBLICATIONS (Articles)

"An Econometric Model of the State of Missouri," Proceedings of the 1974 American Statistical Associates, Business and Economic Statistics Section American Statistical Association, August 1974, pp. 206-208, (with J.P. Doll).

"An Econometric Model for Forecasting State Tax Revenues," Proceedings of the 67th Annual Conference on Taxation, National Tax Association, October 1974, pp. 427-437, (with G.E. Auten).

"A General Model for State Tax Revenue Analysis," National Tax Review, December 1976, (with G.E. Auten).

"Estimating Selling Prices of Houses," Proceedings of the American Institute for Decision Sciences, AIDS, fall 1977, (with F. Morgan).

"The Income Elasticity of the Federal Income Tax," Journal of Economics, Vol. VI, 1980, pp. 97-100 (with G.E. Auten).

"A Federal-State Tax Interaction Model," Public Finance Quarterly, (with G.E. Auten).

"The Effects of Age on Interregional Migration," Annals of Regional Science, November 1981, (with J.N. Morgan).

"An Evaluation of the Changing Age Structure as a Cause of Shifts in Migration Patterns, with James N. Morgan, spring 1986, Midsouth Journal of Economics.

PUBLICATIONS (Other)

"A Study of Insurance Rates in Missouri," internal paper for the Missouri Insurance Coalition, 1993

"Taxation of the Insurance in Missouri," internal paper for the Missouri Insurance Coalition, 2003

"Tax and School Finance Reform," 2003

PAPERS PRESENTED

"Revenue Forecasting," presented at the Midwest National Association of Budget Officers Meetings, July 1971.

"Econometric Model and Revenue Forecasts," presented at the National Association of Tax Administrators Meetings, spring 1972.

"On the Estimation of State Product Accounts," presented at the National Association of Tax Administrators Meeting, fall 1973.

"An Econometric Model of the State of Missouri," presented at the Missouri Economics Association Meetings, fall 1973.

"An Econometric Model for Forecasting State Tax Revenues," presented at National Tax Association Meetings, fall 1974, (with G.E. Auten).

"Estimating Agricultural Investment Functions--Problems, Procedures and Findings," presented at American Agricultural Economics Association Meeting, fall 1974, (with J.P. Doll and C. K. King).

"Missouri Tax Revenue Model," presented at Associated University Bureaus of Economic Research Meetings, fall 1974, (with G.E. Auten).

"An Econometric Model of the State of Missouri," presented at the American Statistical Association Meetings, fall 1974.

"The Interaction Between State and Federal Tax Revenues," presented at the American Economics Association Meetings (joint session with the Association for the Study of the Grants Economy), fall 1976, (with G.E. Auten).

"Implicit Prices of Product Attributes," presented at the Southwest American Institute for Decision Sciences, winter 1977, (with F. Morgan).

"Estimating Selling Prices of Houses," presented at the National American Institute for Decision Sciences, fall 1977, (with F. Morgan).

"The Income Elasticity of the Federal Income Tax," presented at the Missouri Valley Economic Association Meetings, March 1980, (with G.E. Auten).

"An Evaluation of the Changing Age Structure as a Cause of Shifts in Migration Patterns," presented at the Mid South Economic Association Meetings, February 1981, (with J.N. organ).

MONOGRAPHS

A Study of the Federal, State and Local Tax Incidence in Missouri, September 1981.

Tax and School Finance Reform in Missouri, April 2003.

GRANTS & CONTRACTS

1977-1978

A study of the Federal, State and Local Tax Incidence in Missouri, $54,000
Missouri Small Area Socio-Economic Estimates and Projections, Missouri Office of Administration, $19,635
State Planning I, Missouri Office of Administration, $2,960
State Planning II, Missouri Office of Administration, $3,907
State Planning III, Missouri Office of Administration, $3,754
Economic Development Information, Missouri Office of Administration, $4,000
Missouri Occupational Training Information Service, Missouri Department of Education, $82,598
District Projections, Missouri Office of Administration, $1,218
Missouri Economic Indicators, Missouri Office of Administration, $5,000

1978-1979

Public School Enrollment Projections, Missouri Department of Education, $2,500
State Population Projections, Missouri Office of Administration, $10,000
Missouri Occupational Training Information Service, Missouri Department of Education, $91,920

Missouri Department of Revenue, $20,000
Missouri Economic Indicators, Missouri Office of Administration, $6,533
Project Conserve, Missouri Department of Conservation, $15,000

1979-1980

Missouri Department of Revenue, $35,000
State Census Data Center, Missouri Department of Education, $92,000
Rural Social & Economic Conditions, Missouri Office of Administration, $6,101
Missouri Economic Indicators, Missouri Office of Administration, $4,900
State Planning, Missouri Office of Administration, $22,500
Public School Enrollment Projections, $1,250

1980-1981

State Census Data Center, Missouri Department of Education, $70,000
Missouri Department of Revenue, $35,000
Missouri Economic Indicators, Missouri Office of Administration, $4,900
Public School Enrollment Projections, $750

1981-1982

Missouri Department of Revenue, $35,000
State Census Data Center, Missouri Department of Education, $70,000

1982-1983

Missouri Department of Revenue, $35,000
State Census Data Center, Missouri Department of Education, $70,000
Higher Education Enrollment Projections, Missouri Coordinating Board of Higher Education, $8,000.
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $5,000.
Community Development Block Grant Computer Software Programs, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $20,000.

1983-1984

Missouri Department of Revenue, $35,000
State Census Data Center, Missouri Department of Education, $70,000
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $5,000

1984-1985

Missouri Department of Revenue, $35,000
State Census Data Center, Missouri Department of Education, $70,000
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $5,000

1985-1986

Missouri Department of Revenue, $35,000
State Census Data Center, Missouri Department of Education, $7,500
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $1,000

1986-1987

Missouri Department of Revenue, $27,600
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $1,000

1987-1988

Missouri Department of Revenue, $27,600
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $1,000
Missouri State Legislature, $40,000

1988-1989

Missouri Department of Revenue, $21,000
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $1,000
Missouri State Legislature, $40,000
Office of Administration, $3,500

1989-1990

Missouri Department of Revenue, $21,000
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $1,000
Missouri State Legislature, $90,000
Office of Administration, $3,500

1990-1991

Missouri Department of Revenue, $15,000
Enterprise Zone Program, Missouri Department of Community Affairs, Regulations and Licensing, Division of Community and Economic Development, $1,000
Missouri State Legislature, $120,000
Office of Administration, $3,500

1991-1992

Missouri Department of Revenue, $15,000
Missouri State Legislature, $164,000
Misc. and Private Contracts, $25,000

1992-1993

Missouri Department of Revenue, $8,300
Missouri State Legislature, $168,000
Office of Administration, $15,000
Misc. and Private Contracts, $45,700

1993-1994

Missouri Department of Revenue, $9,400
Missouri State Legislature, $200,400
Office of Administration, $15,000
Misc. and Private Contracts, $25,000

1994-1995

Missouri Department of Revenue, $8,200
Missouri State Legislature, $224,200
Office of Administration, $58,200
Misc. and Private Contracts, $32,000

1995-1996

Missouri Department of Revenue, $9,000
Missouri State Legislature, $218,300
Office of Administration, $15,000
Misc. and Private Contracts, $45,100

1996-97

Missouri Department of Revenue, $11,000
Missouri State Legislature, $215,000
Office of Administration, $15,000
Missouri Department of Health, $7,367
Misc. and Private Contracts, $47,000

1997-98

Missouri Department of Revenue, $7,800
Missouri State Legislature, $186,000
Office of Administration, $15,000
Missouri Department of Health, $39,870
Misc. and Private Contracts, $47,000

1998-99

Missouri Department of Revenue, $8,600
Missouri State Legislature, $191,000
Office of Administration, $15,000
Missouri Department of Health, $86,543
Misc. and Private Contracts, $50,000

1999-00

Missouri Department of Revenue, $9,400
Missouri State Legislature, $215,000
Office of Administration, $15,000
Missouri Department of Health, $30,600
Misc. and Private Contracts, $50,000

2000-01

Missouri Department of Revenue, $12,200
Missouri State Legislature, $245,000
Office of Administration, $15,000
Missouri Department of Health, $22,00
Misc. and Private Contracts, $50,000

2001-02

Missouri Department of Revenue, $5,400
Missouri State Legislature, $250,000
Office of Administration, $15,000
Missouri Department of Health, $25,000
Misc. and Private Contracts, $20,000

APPENDIX C – LEGAL REVIEW

Memorandum: Title to the bed of the Missouri River and the sand constituting a part thereof

by Andy Crossett
Lathrop & Gage LLP

LATHROP & GAGE LLP

MEMORANDUM

To: David A. Shorr
Don F. Dagenais

From: Andy Crossett

Date: August 25, 2010

Subject: **Title to the bed of the Missouri River and the sand constituting a part thereof**

1. Question Presented. Our client, the Missouri River Dredgers Group, has asked us to investigate the question of—under Missouri and Kansas law—who owns the bed of a river and the sand constituting a part thereof?

2. Analysis. This memorandum addresses certain issues concerning the ownership of river beds located within the states of Missouri and Kansas and title to the sand contained therein.

a. **Missouri**. As a general rule, title to river beds will turn on the question of whether the particular river is navigable or non-navigable. For example, "[i]n Missouri, title to the beds of navigable streams is in the State. . . . Therefore, on a navigable stream, the property line between a riparian owner and the State is the low water mark."[1] On the other hand, title to the bed of a non-navigable river is held by the riparian owners to the center-line or "thread" of the river.[2] Under Missouri law, "a river is navigable if, in its ordinary condition, it 'has [the] capacity and suitability for the usual purpose of navigation, ascending or descending, by vessels such as are employed in the ordinary purposes of commerce, whether foreign or inland, and whether steam or sail vessels.'"[3] The Missouri River constitutes a navigable waterway.[4] Consequently, title to the bed of the Missouri River lies with the State of Missouri, at least to the extent the river is contained within the borders of the state.

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[1] Skinner v. Osage County, 822 S.W.2d 437, 444 (Mo. Ct. App. 1991) (*citing* Conran v. Girvin, 341 S.W.2d 75, 80 (Mo. banc 1960)). *See also* 43 U.S.C. §§ 1301(a)(1), 1311(a) (confirming ownership of lands below navigable waters to be vested with the states).

[2] *Id.*

[3] *Id.* (*quoting* Elder v. Delcour, 269 S.W.2d 17, 22 (Mo. banc 1954)).

[4] Benson v. Morrow, 61 Mo. 345 (1875). *See also* Peterson v. City of St. Joseph, 156 S.W.2d 691, 694 (Mo. 1942).

b. **Kansas**. In Kansas, like in Missouri, the question of ownership of the bed of a river centers on whether the river is "navigable." The title to the bed of a navigable river is vested in the State of Kansas, and private ownership in lands bordering a navigable river extends only to the river's margin.[5] "Navigability in fact is the test of navigability in law" and whether a river is navigable in fact is to be determined by inquiring whether it is used, or is susceptible of being used, in its natural and ordinary condition as a highway of commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.[6] Kansas courts have adjudged as navigable the Kansas River, Arkansas River, and Missouri River.[7]

c. **Title to Sand**. The Submerged Lands Act[8] (the "**Act**") dictates that the title to and ownership of the natural resources beneath navigable waters within the boundaries of each state (in the United States), including "the right and power to manager, administer, lease, develop, and use" the natural resources, belong to the respective state.[9] The Act defines "natural resources" to include "oil, gas, and all other minerals."[10] Therefore, it is indisputable that the title to the sand contained in and beneath the Missouri River belongs to the state in which the natural resource is located.

3. **Conclusion**. The law in Missouri and Kansas is clear: the state owns the beds of navigable waterways, including the minerals contained therein and that make up the bed of the waterways.

[5] Kaw Valley Drainage Dist. v. Attwood, 629 P.2d 163, 165-66 (Kan. 1981) (*citing* Fowler v. Wood, 85 P. 763 (1906)). *See also See also* 43 U.S.C. §§ 1301(a)(1), 1311(a) (confirming ownership of lands below navigable waters to be vested with the states).

[6] State *ex rel.* Meek v. Hays, 785 P.2d 1356, 1359 (Kan. 1990).

[7] *Id.* at 1360.

[8] 43 U.S.C. §§ 1301-1315.

[9] *Id.* at §§ 1301(a)(1), 1301(e), and 1311(a)(1).

[10] *Id.* at § 1301(e).

Holliday
SAND AND GRAVEL COMPANY
9660 LEGLER ROAD
PH: (913) 492-5920 LENEXA, KS 66219-1291 FAX (913) 438-0200

September 6, 2010

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, Missouri 64106-2896

Re: Missouri River Commercial Dredging EIS

Dear Mr. Wheeler:

Holliday Sand & Gravel Company is disappointed in the Draft EIS (DEIS). The few facts available and supplied were ignored, discounted or misinterpreted. In their place, correlations were elevated to be causes, and hypotheticals were formulated to be in agreement with the correlations.
Here are a few of the facts that were ignored:

1. The Missouri River has been steadily degrading from the 1930s, long before any significant dredging, at about 2 inches a year.
2. More than twice the amount of sand dredged is being scoured from the river bed by the BSNP dike structures.
3. The Corps own Dredge Hole Study demonstrated that dredge holes do not erode upstream (headcut).

Something other than dredging is causing increased degradation problems in Kansas City (KC) if the River is transporting an average of 8 million tons per year (not including high water), and only 3 million tons per year are being dredged. The problem is not what is taken out, but why it is not refilling. We do not believe that question has been adequately addressed in the DEIS. Even worse, the DEIS has made unequivocal statements that dredging is the cause of degradation and therefore the cause of the indirect effects of degradation. These statements are not based in fact but based on limited correlations. For that reason, the bulk of our comments address the issue of degradation and attempt to not only correct the misinformation leading to these assumptions, but to correct the entire point of view taken with regard to dredging and degradation by putting correct emphasis

on what is the most likely cause of degradation, the BSNP, which created a self scouring shipping channel in sand.
With the information published in the DEIS, the causal relationship between dredging and degradation should at best been concluded as inconclusive. Many times the DEIS states that regardless of the level of dredging, the BSNP in its current design will likely not allow any resedimentation or healing of the degraded reaches. Though stated repeatedly, it had no bearing on the conclusions. Frankly, we needed someone to stand up and say: the BSNP is causing the degradation and it can fix it!
We look forward to the Degradation Study to determine the root causes of degradation and design the corrections needed to stabilize the River. Holliday Sand is proud to be one of the many stakeholders in the Study.
Fortunately we have evidence that the rate of degradation has slowed for now in the KC reach. For that reason, we believe it is warranted to continue with the sand quantities of the 2007 permits, expecting completion of the Degradation Study by the end of the next permit cycle.

Dredging is not the cause of Degradation

Since certain reaches of the River degrade with dredging while other don't it is because other forces than dredging are literally causing this degradation. That force is the BSNP. It is the author and the controller of the river bed.

Major commercial dredging has been going on in KC since before the 1950's yet on Page 3.4-75, Paragraph 2, of the DEIS it states:

> *"The rate of decline in average river bed elevation appears to have been relatively steady from 1955 until the 1993 flood event."*

Relatively steady means the river bottom at the KC gage on the Hannibal Bridge in downtown KC dropped 6 feet over 38 years (0.16 ft/year). Obviously the concern is how fast it drops, not that it is steadily dropping. But, whether there is dredging or not, the river bottom will continue to drop. This is the steady scour from the BSNP constricted channel.

From Page A-62 Paragraph 2:

> *"The reason for the decrease in bed material load between Kansas City and Hermann may be attributable to several factors. First, based on the hydraulic modeling results, the Hermann reach has lower flow velocities and boundary shear stresses at a given flow than the Kansas City reach, which results in lower sediment transport rates."*

Bottom line: velocities and the resulting shear stresses in KC are too high and they are scouring too much sediment from the riverbed in KC.

Degradation is Reversing -Dike Modifications

In 2004 and again in 2007 the Corps began to lower the sill dikes near KC. In addition, the drought ended and the bed is showing signs of some recovery near the KC gage. The sill dikes were specified to be 2 feet below 1973 CRP or underwater at normal navigation, but they have been 5 feet or more too high for possibly 20 years or more. The

Corps even lowered them somewhat below their relative height, CRP minus 2 feet, for the first time. Now look at Figure 3.4-24 on page 3.4-75 and see how the degradation has reversed since then.
Here is our explanation.
Sill dike elevations corrected below CRP Elevation: low flows (navigation support releases) are supposed to stay within the narrow dike channel, keeping velocity up and removing sediment. Greater flows, normally occurring several times each year, are supposed to overtop the dikes and spread out, removing excess sediments behind the dikes and even depositing sediment in the channel. As soon as the river drops back within the dikes, it begins to scour and maintain the channel again.

> **[For the first time that we can recall, the sill dikes above KC are now underwater at normal navigation stage.]**

However, when the sill dikes too high: normal raises are dammed up at each dike creating higher than intended stresses on the bed, creating excessive eddys and scouring, and actually depositing fines behind the dikes where it is not wanted. The only flows that top the dikes and drop out sediments in the channel are high water events. High water events don't happen every year. During the drought from 1999 to 2007, no raises probably ever topped the dikes and the river scoured all year for all those years. This is the period of the greatest degradation rates at the KC gage. The regular fill/scour cycles each year became only scouring.
This higher stress concern were again described in the DEIS:
From Page 3.4-87 Paragraph 2:

> *"Consequently, stages for high-discharge events such as the 1993 flood have increased at all gage sites since the 1950s (USACE 2007c). Higher stages increase the shear stress on the river bed, and these higher stresses can result in river bed degradation and increased sediment transport capacity during storm events"*

The 1993 flood is being described, but the same principal would apply to anything that increases stage or depth and shear stress on the river bed.

In 2004 the Corps notched the dikes, but this did not adequately reduce excessive water depth and energy acting on the channel bottom.
We are grateful to the Corps for taking further action in 2007. We believe it should be studied even further to determine if more modifications are required to keep the bed recovery going in all reaches, not just at the downtown gage.

We disagree that finer sand in KC results in more degradation.

The DEIS has concluded that dredging is the cause of the greater degradation in KC because the sand is finer in the River near KC and dredging makes it even finer and increasing scouring of sediments. The DEIS points out geologic reasons and displays numerous sand gradation tests.
RM 270 to 350 is the location of the wide river valley rock cut (see Figure 3.4-2). We would expect to find finer deposits in the flood plain in this reach. However, there is not necessarily any correlation between the gradation of the deposits in the flood plain and those in upper 30 feet of the modern day river channel. Even before the BSNP, the modern river flows were changing the deposits in the top 30 feet of the flood plain. Then

the BSNP further classified sands the modern 600 foot navigation channel deposits, coarsening them even further. The theory that the modern river bed was for all time classified by the original rock cut and therefore finer upstream, has not been substantiated by dredging experience. We have done extensive core-drilling in the flood plain. It has proven highly variable deposits that were obviously classified by countless flooding since glacial times.
If you look at Brian Kelly's (USGS) river cross sections in his *Simulation of Ground Water Flow* report, you will see that everywhere there was an actual drill hole there is a highly variable deposit. In between the drill hole locations the strata/deposits look very consistent and homogenous, going from coarse on the bottom to fine on the top. This is only a trend. In reality you will find that it is very often not the case where the substrate has been actually drilled and investigated. Looking again on Brian's cross sections, the more drill information, the more variable the strata seem to become. This is not a coincidence. It's a mixed bag!
Also note the variability in the rock cut channel from one side to the other. The location of the modern river in the rock cut moves from side to side adding even more variability in the river bottom deposits. This is another reason why we move the dredge around for miles. We firmly contend that there is more variability in the river sand deposits from one bend to the other than there is generally from one reach to another.

The wide rock cut = fine sand deposits in the River theory makes no sense anyway as the rock cut is actually narrow through the KC reach and widens in St. Joe and Waverly (where there is little degradation with respect to dredging). It's not the sand grain size that causes degradation, it's the velocity head forces acting on the river bottom.

What about the sand gradations in the DEIS? Let's look more carefully at the data used in the DEIS to substantiate the "sand is finer upstream (and in KC)" theory.
See Page A-7
Table A-1 Standard Deviations of the "Percent Finer Than" Values for the Particle Size Classes Used To Estimate the Average Gradation in Bed Material Cumulative Frequency Curves in Figures A-2 through A-5 (%)

The variance in the % finer in the 0.5 and the 1.0 mm sizes from Nebraska City to St. Joe to KC to Hermann is exceeded by the statistical variances as shown in Table A-1 on page A-7 with a standard deviation of plus or minus 4 to 16%. The actual differences in the means (averages) are only 5 to 20% total. The pattern of change from the mean values is rendered "meaningless" by the variance in the data.
What this does prove is there is a lot of variance in the gradation of the bed material at any location, just as much as from reach to reach.

From Page 3.4-96:

> *"Up to two-thirds of the material dredged in some areas of the Kansas City segment is too fine to meet specifications for making concrete and is discharged back into the river. Consequently, the actual volume of material extracted from the river bed may be up to three times greater than the retained dredging volumes indicate."*

The amount of sand that must be wasted in the Kansas City reach has been overstated in the DEIS by a factor of 5:1 (12% vs. the stated 60-70%). See explanation below.

Page A-12
Figure A-6 Representative Bed Material Particle Size Gradations at Missouri River Gaging Sites (2001–2009)
Study of the plotted bed material gradations reveals the following:

1. Nebraska City gradation is as coarse as Hermann is. As Nebraska City is over 60 miles upstream of Rulo, how can you say that the bed material gets finer as you proceed upstream? This disproves that generalization from within the DEIS itself.
2. The KC gradation plotted in Fig. A-6 is only 12% from satisfying the Missouri Concrete specification (requiring wasting 12% of the minus 0.25 mm). This does not agree with the DEIS statements that in KC, only 30 to 40 percent of the sand dredged is saved and therefore 60 to 70 % is returned to the bottom.
3. The sand gradation in St. Joseph is up to 10% finer than the Kansas City gradation (yet there is no degradation issue in St. Joseph).

While dredging, when finer sand is encountered, every attempt is made to save the sand and use it for products other than concrete sand. If it is not excessively fine, it can be used for commercial asphalt sand. Since we dry our sand enough to place individual piles on the barge, the finer piles are conveyed to stockpiles other than concrete sand. (This is another advantage to having on-board processing.) If the sand is excessively fine for more than a barge load or two we move the dredge to find coarser sand.

Alternate Sources

Page 2-39 Paragraph 3

> *"Similarly, additional production capacity exists in the Kansas River. Up to approximately 2.2 million tons can be extracted annually from the Kansas River based on existing permits. When compared to existing and historical production figures (approximately 1.4 million tons per year), the available capacity in the Kansas River is estimated at approximately 757,000 tons annually."*

There are at least three good reasons why all permitted sand is not being dredged on the Kansas River and would not be available as an alternate source for MO River dredging:

1. The permit is suspended because the degradation limit has been reached and it would not be prudent to attempt to relocate in a degrading reach (such as Topeka and DeSoto).
2. There is insufficient demand in the local market because of the current economy. Once the economy recovers the sand will be needed within its local market and would not be available as a MO river alternative source.
3. The permit is all or partially depleted and the operator is waiting for the river to refill the deposit so the entire permitted tonnage can be dredged someday.

Another reason, is that Kansas River sand west of De Soto is located too far from the MO River market to be a practical alternative for even the KC market.

Page 2-40 Paragraph 2

> *"Based on these **assumptions**, an estimated 4.4 million tons of available capacity are present in open-pit mines throughout Missouri."*

You cannot assume that all open pit sand and gravel mines produce concrete sand. Some produce foundry sand, some produce gravel only. MO River sand is trucked hundreds of miles into these rural areas where these pits are. That is because they don't have decent sand there. This is another wrong **assumption** based on other assumptions.

Page 2-41 Paragraph 3

> *"The available capacity of instream mining operations in Missouri was estimated using assumptions similar to those outlined for MDNR-permitted open-pit mines."*

The same assumptions prove wrong for instream mines too. Almost all these Missouri mines are creek gravel. They could replace quarried stone, but not river sand.

Page 2-43 Paragraph 1

> *"With an available capacity of approximately 7.9 million tons, the alternate sources would be able to produce the required amount of replacement sand and gravel supplies under all of the alternatives, including the No Action Alternative (where dredging of the LOMR would cease entirely)."*

We disagree with the available capacity. Much of the 7.9 M tons available is not even concrete sand. Gravel is not what we are making and is not even the issue. Almost all of the alternate sources are in remote locations. There would be a shortage of trucking and the increased costs would be close to $8.00 a ton. Under these conditions, no one would likely bid any MoDOT work for fear of shortages. We have not seen any proven impacts in this DEIS that justify sand shortages and additional construction costs in excess of $60 million a year. There are not satisfactory alternate sources in existence. Therefore, any significant reduction of MO River dredging below market demand must include a phase-in period of five years to provide adequate time to develop sustainable alternatives.

Page 2-55 Chapter 2

> *"Alternate sources to the LOMR in order to meet regional needs for sand and gravel."*

The only realistic and already existing alternate source to supplement LOMR dredging is flood plain pits next to the Missouri and other rivers. Our following comments relate only to the Kansas City area and were originally submitted under DR2 PD10 Data Collection. A summary follows:

- Holliday Sand has extensive experience in flood plain mining in the KC area since 1990.
- Costs are significantly higher than river dredging – estimated in our detailed analysis at $4.22/ton higher cost.
- Flood plain mining sites within 20 miles of the market area are rare as they conflict with federal levees, water wells, and other more desired land uses.

- Land not excluded by the above barriers is usually not for sale.
- There are two existing sand pits on the East edge of the KC market already supplying a portion of the market. They would deplete in 10 years if they had to replace all the Missouri River dredged sand in KC. They have struggled to annually produce more than 400K tons of inferior quality sand. Their limit would not exceed 1 million tons (up to 3 million tons would be needed).
- Any additional pit sites in the area could potentially impact drinking water well quality and federal levee protection. All the pits are in the recharge area of the Liberty and Independence municipal drinking water wells. The groundwater in the area already contains TCE solvent from the Lee Chemical Superfund Site nearby.
- The aquifer becomes permanently exposed to evaporation from the remaining lake. This is an ongoing loss of valuable water.
- 56 to 84 acres per year would be needed to replace Missouri River Dredging in the Kansas City area alone.
- Permanent loss of prime farmland – trading pit sand for food is not wise. We estimate an <u>annual increase</u> in loss of crops would be 21,000 bushels of corn (in 20 years that would add up to 4.4 Million bushels lost – that could have fed 15,000 people for those 20 years!)
- The DEIS somehow purports that new pits will be closer to the market. Just the opposite is the case in Kansas City.
- Average truck haul distances would increase 12 miles each way from pit sites versus the two existing KC area Missouri River sites. The impacts of this would be:
    - 20% increase in truck traffic on MO Highway 210
    - 120,000 loads hauled an additional 12 miles each way = 2.88 Million added truck miles on our roads each year.
    - 1.2 Million more gallons of diesel fuel burned every year.
- Stripping pit overburden material is a full time earthmoving operation – over 1.5 Million cubic yards per year would be moved annually to replace all river dredging – burning an additional 260,000 gallons of fuel every year.

Existing Sand Pits in KC

We have contacted several of our customers that have tried sand from a local sand pit that is an alternate source for Missouri River sand in KC.

The concrete sand customers remark that there is excessive lignite in the pit sand - resulting in pop-outs and unsightly stains on floors, driveways and pool decks. Others comment that there are excessive fines in the sand that make it difficult to pump and to finish – because it is too sticky. Extra fines also require more cement to obtain the same compressive strength, a significant increase in cost.

A second sand pit has started up. They are only able to market their sand by hauling it to the other competing sand pit and mixing it with their product, evidently due to excessive lignite.

The asphalt sand customers remark that pit sand is much finer and sucks up more asphaltic cement oil, increasing their costs up to $5.00 per ton of asphalt. Another asphalt

contractor reportedly had a problem with the paver's belt stopping because the mix was too sticky.
These problems are indicative of most pit sand from the Missouri River bottoms. We used to operate a pit in the same locale and we had the same problems, especially with excessive fines and silt in the sand.
No one prefers to buy pit sand. It is not the same quality as river sand and would result in a marked decrease in the quality and increase in the costs of construction in KC.
Pit sand production at this time is limited by the slowed construction market. However, even at today's limited demand we hear that the sand pits have had difficulties keeping a stockpile of concrete sand on hand. One customer commented that even if changes in quality were made they would not want to return because of concerns of inadequate capacity and stockpiles.

Impacts

The impacts of the alternate supplies have not been adequately evaluated. Any negative impact of Alternative C is met or exceeded by the negative impacts of the Alternate Sources, such as flood plain or mining in stream beds. Both of these alternate sources necessitate trucking sand further to end users. This is contrary to our local, regional and national goals and would be an irresponsible solution.
River dredging is sustainable at the correct level (below bed material load levels).
Flood plain mining is not sustainable. It forever uses up priceless agricultural land and developing wetlands.
The River delivers sand directly into the cities near major highways. Flood plain pits are out of town so the sand must be hauled tens of miles on county roads that were not designed for heavy truck traffic.
The River has already removed all soil and overburden and classified the sand. The flood plain pit requires a full time earthmoving operation to strip the overburden and even then there is 15 feet or more unusable fine sand that is not found in the River. The cost of land, stripping, wasted fines and reclamation add another $4 per ton cost.
The added emissions from pit mining were not adequately investigated. The added sand trucking and dirt stripping, hauling and piling result in a tremendous increase in fuel consumption and the subsequent emissions. Pit mining should be a last resort.

Contrary to the DEIS's reduction in the cost of sand ($-68M net), we estimate the annual increased cost of replacing river dredging with pit mining at $28 Million ($4/ton) a year increasing as the pit mines are depleted and move farther out of town. This is significant money and it will not solve degradation, and may not even reduce it where existing MO River channel scour is too great to allow any sand to settle out and recover the bed.

Degradation Comments

If not dredging, then what is causing the degradation?

We recommend studying the following issues to determine the cause of degradation rather than studying the effects of degradation. We strongly believe that degradation in dredge areas is an effect from inadequate sediment deposition resulting from overly aggressive BSNP scour. Naturally we have focused on the KC reach.

See Page 3.4-88

> *"In particular, the Kansas City segment is more constrained than other segments of the LOMR. This is due to the extensive infrastructure in the Kansas City metropolitan area and the location of the Kansas River confluence. As stated in the 2009 USACE Reconnaissance Study Report:*
> *This set of river conditions has resulted in the installation of a very constrictive dike system to maintain a navigation channel. The construction of that dike system has resulted in a reach of river that is very efficient at "cleaning" and maintaining the low-flow channel (USACE 2009a)."*

This statement from the DEIS says it all, but somehow gets ignored in the other sections of the report when discussing the impacts of dredging. Entrix wouldn't come out and say it, but they lay it between the lines: <u>Reducing dredging in KC to reduce degradation will not be of benefit unless the very constrictive dike system in KC is modified.</u>

Is the Channel Wide Enough?

Page 3.4-28 Paragraph 5

> *"For example, the drainage area increases significantly (by 15 percent) between the St. Joseph and Kansas City gages where the Kansas and Platte Rivers join the Missouri River, resulting in a 19.9-percent increase in mean annual flow."*

Note that only 50 feet is added to the channel width from Rulo to the Kansas River confluence. This is only an increase of 10% (from 550' to 600' sill dike width) where the mean annual flow increased 19.9% (See Page 3.4.31 **Figure 3.4-7 Cumulative Drainage Area and Mean Annual Flows for the Lower Missouri River)**. Dike heights (relative to the CRP) remain the same until below the Grand River. Would this not result in above normal energy from below the Platte River, to the Grand? It is also likely that the Platte River flows have increased with development in its corridor? What happens when the Kansas River does flood?

See **Table 3.4-9 Significant Tributaries to the Lower Missouri River**
Notice the potential for runoff from the Kansas River which dwarfs all other tributaries. Granted, there are numerous reservoirs, but then consider what happened in 1993 – essentially the Kansas reservoirs overflowed created the flooding on the Kansas River rather than reducing it. We witnessed the Missouri River flowing upstream at the Kansas River confluence upstream of downtown Kansas City. That is the magnitude of the

energy – the River was essentially dammed-up upstream of downtown by the floodwaters of the Kansas River. Even though the bed recovered half of what was lost in the flood, that still represents a huge amount of material that had to relocate from somewhere upstream (headcut). We believe this accounts for much of the degradation at RM 380. We are convinced that this event coupled with the ensuing drought (see above: Degradation is Reversing) and to an unknown extent, the Corps' dredged fill for the L385 Levee, resulted in a huge net loss of sediment upstream of Kansas City which has migrated to mile 380. Mix in the extra velocity below the Platte River and the reach will not fully recover until the velocities are reduced.

See Page 3.4.31 **Figure 3.4-7 Cumulative Drainage Area and Mean Annual Flows for the Lower Missouri River**

Note the greatest increase in drainage area and the 19.9% increase in flows (between St. Joe and KC). Does it seem logical that there is no adjustment to the dike Structure Height Criteria in this reach until below the Grand River?

The sill dike heights are designed to be low enough to allow medium to high flows to spread out bank to bank, reducing water depth and scouring energy. But what happens if the sill dikes are too high, not allowing medium to high flows to spread out. We believe greater depth of flow, greater energy on the bottom and greater scour.

We strongly recommend that before dredging is reduced below what is currently needed, areas of degradation should be modeled to analyze the velocities at various flows to see if modifications to the BSNP structures are needed to restore the bed. (If the velocities are too great, the reach will never recover regardless of the amount of sediment reporting there.)

(Note: In 2004 and 2007 the Corps did some major notching and then lowering of the dikes upstream of KC and that will help tremendously. Unfortunately this has failed to be factored into the DEIS. It should be.)

Page 3.4-35

Figure 3.4-11 Flow Duration Curves on the Missouri River Measured at Kansas City, Missouri

Notice how the low flows have increased:
20kcfs from 72% to 98% of the time
40kcfs increased 35%
60kcfs increased 24%

This is the same thing we told the Corps in 1985 concerning degradation on the Kansas River after the reservoirs were constructed. Low and high flows have been replaced with medium flows. On the Kansas River this brings the riverbanks down, on the Missouri River it brings the channel bottom down. No one listened on the Kansas River because what could be done, take out the dams? The Missouri River is different in that the dikes can be adjusted.

Page 3.4-37

Figure 3.4-13 Mean Daily Discharge and Annual Flow Peaks Measured on the Missouri River at Kansas City, Missouri (1929–2008)

Look at the graph of flows over the years. Sit back and look at the white area under all the curves. Notice how the white area greatly increases as you move to the right. This increase in area below the lines is the increased occurrence of low to medium flows. These are the flows that cause degradation day in and day out.

3.4-46 Paragraph 3

"However, the sandy river bottom likely contributes sediment in degrading reaches, as do tributaries that undergo headcutting as a result of degradation in the main river channel."

Why wouldn't a tributary which is often discharging relatively cleaner water in turn erode the Missouri River bed at the outfall?

Page 3.4-87

Pre-Flood Average Bed Elevation Post-Flood Average Bed Elevation

Figure 3.4-28 River Bed Elevations Based on Hydraulic Depth before and after the 1993 Flood at the Kansas City Gage

"Consequently, stages for high-discharge events such as the 1993 flood have increased at all gage sites since the 1950s (USACE 2007c). ***Higher stages increase the shear stress on the river bed, and these higher stresses can result in river bed degradation and increased sediment transport capacity during storm events."****[bolding added]*

This indicates that the dikes had been too high prior to that time (1993) in order for accretion to have occurred behind the dikes. Normal raises should have topped the dikes and removed the sediments.

Entrix points out that the plotted bed elevations in Fig. 3.4-28 show the river healed after the 1993 flood from an initial cut of 9 feet (707 down to 698) to a permanent drop of 2 feet (back to 705). We don't know how far upstream the cut of 9 feet went, but this could definitely account for degradation increasing upstream as 7 feet of sediments refilled downtown. These sediments came from somewhere.

From Page 3.4-88:

"Dikes and Structures

As described in Section 3.4.5.2, the BSNP has caused major changes to the geomorphic character of the LOMR. The extensive system of dikes and revetments is designed to maintain a self-scouring navigation channel that is 300 feet wide and 9 feet deep, even at lower flows. By design, the structures reduce sediment deposition at lower flows and reduce the likelihood of recovery from scouring events such as floods and dredging."

Confusing grammar may be distorting this statement so as to describe dredging as a scouring event, like flooding. If that was not the intent, it should be reworded as follows:

*"By design, the structures reduce sediment deposition at lower flows and reduce the likelihood of recovery from **dredging and** scouring events such as floods."*

Page 3.4-89

"Dredging levels generally increased to a peak in 2002, at 8.7 million tons per year. Figure 3.2-3 shows dredging levels by river mile for dredging that has occurred in the last 10 years."

We believe this includes 1.7 million L385 tons and that should be noted here.

Page 3.4-90

"The impacts of dredging on river systems have been documented in publications at the local level and worldwide (Jacobson et al. 2009; Kondolf 1997; Simons, Li, and Associates 1985; Rinaldi et al. 2005). There is strong evidence that dredging has contributed to degradation at several locations on the LOMR."

This statement is ridiculous. Every reason listed was a correlation. Would the vice President of Entrix like to be convicted of a crime based on correlations? Would he agree that they make strong evidence? No, they only make for strong coincidence.

Page 3.4-90 **Evidence of Degradation Caused by Commercial Dredging**

Correlation does not prove causation. Commercial sand dredging is too valuable an industry to be regulated based on correlations.

There is really no need to even attempt to use correlations to prove that dredging causes degradation. Common sense tells us that dredging tons should not exceed bed load tons. If they did, then that would be some proof of degradation. However, if dredging is less than bed load ton movement through a degrading reach, you have to look elsewhere, at dikes and the velocities. *All this points to the need for completion of the Degradation Study before finalizing dredge permit limits.*

Bottom line: first data and then analysis is needed rather than an assemblage of correlations.

Page 3.4-91

Figure 3.4-30 Cumulative Dredging (1998–2007) and Changes in the CRP-Adjusted Low-Flow Water Profile between 1990 and 2005.

Page 3.4-90

Note that the intensive and concentrated L385 dredging is included on the tons dredged curve, **making the curves and the entire correlation inadmissible** - as contract dredging was a separate authorized activity and is not the purpose of the commercial dredge permit.

For example: if one were drafting a DEIS on commercial air traffic noise impacts in order to evaluate the re-licensing of a commercial airport, would you include the noise from the air traffic from the nearby military base? Well that has been done here when you include L385 dredged tons. Just like the noise from airplanes, it's impossible to separate impacts from commercial dredging and government contract dredging in the same reach.

Conclusion: Throw out Figure 3.4-30 – it can't be used in the correlation as it includes impacts from other dredging projects.

Page 3.4-93

Figure 3.4-32 Correlation between Dredging and Changes in Stage at 40,000 cfs for Gages on the Lower Missouri River (2000–2005)

The cumulative tons don't make sense – they seem too high: 6 years dredging in KC = 23 million tons?

Page 3.4-93 Paragraph 2

"The bed material load is composed of sediment that is on average smaller in size than the material removed from the river bed by dredging"

This generalization is incorrect. The bed load size is dependent on the location in the river and the velocities acting on it. We dredge where we find coarser than average bed material. Those areas exist and we repeatedly dredge them as do other dredgers in their respective reaches. Obviously for them to fill originally or repeatedly, the bed material load must be refilling them to our satisfaction. You are assuming that we dredge everywhere with no regard to the varying sand size found in different areas. The following is true if you wish to make an accurate statement:

<u>The bed load material is composed of sediment that is on average somewhat smaller in size (0.25 mm smaller) than the average material found in the river bed. (However that average material is too fine to make concrete sand from efficiently.)</u>

Page 3.4-94

Table 3.4-20 Comparison of Dredging Amounts to Bed Material Loads for Four Segments on the Lower Missouri River (2000–2009)

First of all, L385 dredging took place during this period. This in itself should make the whole Table void as far as relating tons dredged to bed load, to degree of degradation. The reasons for excluding Jeff City don't make sense. The Grand River is a major contributor of degradation as shown on the Bed Elevation change charts, but is no where near Jeff City or KC. However, the Platte and KS River are between St. Joe and KC and immediately upstream of KC, yet St. Joe is compared to KC? Also, skipping Jeff City leaves us with 200 miles with no comparison, where the other three locations are only 70 to 80 miles apart. This whole %-of-bed-load analysis is a failed attempt to oversimplify what causes degradation.

Page 3.4-95

"The dredge depression does not refill with the same material that was extracted"

(This is just not true as we have dredged in some spots off and on for 40 years!)

Page 3.4-96

"The underlying glacial sediments may provide some erosion resistance to all but the most extreme flood events, and the larger size fraction resists transport and degradation more effectively than finer size fractions. With the removal of the

glacial deposits, the river bed is both physically lowered and more prone to scour if the material that refills in the dredge depressions is a finer size fraction."

The deeper glacial sediments do not come into play until a depth of more than 20 feet is degraded. The problem is the excessive velocities eroding the surface sands. Dredging in KC continues in the same spots for decades. Obviously the dredge holes fill in with the moving bed form material that is common to that portion of the river. If we dredge on an outside bend or below a dike the higher velocity will fill in material similar to what we found there. That is why you usually can't find coarse sand in a crossing. There is less current there so you will never dredge it. But if you did, it would fill in with fine material unless the river is up. It's not rocket science, but Entrix has oversimplified the River, assuming it is homogenous. The sand is picked up and settles out where it will, according to the velocity. If too much sand is moving through and not settling out, resulting in degradation, then the velocities are too great in that reach.
The difference in the d50 of the naturally occurring flood plain deposits in the river and concrete sand is not enough to affect the armoring capability of the river bottom. The difference is only 0.25 mm. Again, the DEIS has considered 500 miles of River, all with the same average velocities and average size sands. In reality it is highly variable and defies generalizations.

Page 3.4-96:

"The combination of less aggressive dredging techniques with a more resistant geological layer in the St. Charles segment may reduce rates of bed degradation from commercial dredging in that segment."

Again, what is dredged or not dredged 15 to 30 feet below the surface of the river bottom has no bearing on the erosion of the surface of the river bottom. Gravel, clay and cobbles are not encountered anywhere near the surface of the river bottom, but are deep below the river bottom.
In KC, we also stop dredging when we hit hardpan. Our continuous chain type cutter is more of a traveling screen than a chain saw (at a top speed of only 30 fpm). It bounces on hardpan and we have no incentive to dredge hardpan and damage our expensive chain.

Page 3.4-98

"The BSNP structures and more moderate but slightly higher than average river flows from construction of upstream dams are likely contributing to increased sediment transport capacity, which results in scour in the Kansas City segment. Dredging is likely the key factor in causing bed degradation in the Kansas City segment based on the results of the bed material load estimates, the HBED analysis, and the change in CRP adjusted low-flow water surface elevations compared with dredging locations."

We believe the statement above, from the Conclusion of Section 3.4, draws an inaccurate conclusion. We believe the following conclusion is more accurate and should replace it:

Even though estimated bed material load volumes are nearly twice the historic maximum dredge volumes in the Kansas City segment, the HBED analysis and the change in CRP adjusted low-flow water surface elevations show a strong correlation between major dredging and degradation upstream of downtown Kansas City. Although dredging is likely not the cause of degradation, it has likely added to the degradation in reaches of the river that have experienced above normal stresses and have not been able to refill or recover from dredging and other multiple factors (major tributary confluence, flow-restricting infrastructure, and nearby river bend cutoffs) influencing bed degradation rates. The BSNP structures near Kansas City and the resultant higher than average river flows are likely contributing to increased sediment transport capacity, which results in scour in the Kansas City segment. Figure 3.4-24 plainly shows that there has been persistent, ongoing degradation in KC since 1940, well before any significant dredging.

Note the following:
Could it be that what is destabilizing the bottom are velocities of 2.73 fps in Kansas City versus 1.8 fps at Waverly and 1.66 fps at Hermann, all measured at 20,000 cfs?
This low-flow (20kcfs) velocity is likely preventing the refilling of the channel in KC. Levels of dredging will not change that fact. Fix the velocity and allow dredging up to the conservative quantity of the bed load in this report.

3.4-98 paragraph 3:

"The Jefferson City portion of the segment is not affected by the additional factors that affect the Kansas City segment, such as a major tributary confluence, flow-restricting infrastructure, or nearby river bend cutoffs."

Why does this important statement about the KC segment not also appear in the paragraph about KC? (Note that it was included in our recommended rewrite of the KC conclusion paragraph above.)

Page 3.5-22

Table 3.5-12 Wharf and Dock Facilities – Kansas City Segment

"Holliday Sand and Gravel Co. Sand and gravel unloading dock 386.2
Holliday Sand and Gravel Co. Sand and gravel unloading dock 378.3"

Holliday Sand does not have unloading docks at either of the locations noted above. Instead, Holliday's unloading dock at RM 371.8 needs to be added.

Except for KCP&L Hawthorn Intake, there was no specific data about degradation and water surface elevation decline at the intakes. There needs to be specific data with elevations and dates before impacts to intakes can be attributed to river bed degradation. It is our understanding that unusually low reservoir releases during the last extended drought triggered low water problems for some of the intakes and that awareness of this can be addressed with greater releases. If releases can be made for navigation, then they can be made for adequate drinking water, also an authorized and even more beneficial purpose. These are very important facts needed to determine if there we impacts from dredging. For example, in the past, BPU, Trigen and KCP&L have requested Holliday Sand to dredge sand buildup in front of their intakes. As is, the opening statement in Section 3.05 ("Changes in commercial dredging activity could contribute to the ongoing

river bed degradation in the LOMR, creating maintenance and operational impacts for infrastructure that relies on predictable minimum water levels and stable stream channels.") implies something that is not quantified or investigated. We certainly believe that water companies have a problem as they have stated, but when dredging is not allowed near the intakes, details would be helpful if impacts are to be assessed.

Page 3.5-19 paragraph 1:

> *"The existing condition of the river bed at RM 370.1, near the Charles B. Wheeler Downtown Airport, is estimated to have dropped 24 feet, resulting in loss of rock fill toe protection at one storm sewer outlet."*

From when to when? This has traditionally been the site of a very deep hole since the 1980's, prior to any dredging in the area. Check out old hydrographs.

Page 3.5-19

Fairfax-Jersey Levee Unit

> *"Analysis of the existing river bed condition at RM 367.8 indicates that a drop of 20 feet in the river bed already has occurred and is threatening a slide in the riverside bank (USACE 2009a)."*

We have not dredged below 368.2, some 2000 feet above the Unit. The RM 367.8 location noted with the threatened riverbank slide is only 1500 feet upstream of what we could call "ground zero" or the mouth of the Kansas River which enters on the sharpest bend in the River, a 1600 foot radius above a 160 degree curve just below the Levee Unit. It should be stated that this is not a dredging zone and it is in an unstable location – the headcut of the Kansas River. Instead, by omission it implies that dredging has caused this scouring. Good news, the dikes can be lowered and shortened in this reach as there are no property issues across the River if they were shortened and some bank was lost. What are we waiting for?

Page 3.5-20

Bank Stabilization and Navigation Project Facilities

> *"The Kansas City reach has required installation of additional dikes to manage the sediment load from the Kansas River."*

It is our experience and observation that no sediment is coming out of the KS River except in flood events. Have the dikes been modified since completion of KS River dams, as they have eliminated most events that moved sand through the KS River? If not, they should be to reduce velocities that are no longer needed. We are not aware of any maintenance dredging needing to be done at the mouth of the Kansas River, which in itself is a no-dredge zone.

Page 3.5-20

Bridge, Pipeline, and Cable Crossings

It was not explained what the impacts would be on bridge piers that extend to bedrock. Obviously the bridge pier itself creates significant scour. Do any bridges across the Missouri River not have piers extending to bedrock?

What is the expected life of pipelines placed 6 feet deep in sand? Since the River has been uniformly degrading 0.16' feet a year for over 40 years it would be 38 years before they are uncovered (at the KC gage degradation rate). What maintenance has been done (we recall that some has been done).

It should be noted here that no dredging occurs within 500 feet upstream or downstream of a pipeline or bridge pier, and that this requirement has never been questioned, or changed. What is the point of this list of infrastructure if there is no dialogue on the potential for impacts from dredging (cost of maintenance or replacement).

Page 3.5-21

Wharf and Dock Facilities

It appears that this list is very old and many of these facilities are no longer in existence. Without any up to date data on the condition and status of these docks and whether there has been degradation impacts, what benefit is this to decision making concerning commercial dredging?

Page 4.2-3 Paragraph 4

> *"Aggradation (raising of the river bed elevation) could occur in areas degraded by past dredging when proposed dredging would be less than past dredging. However, because it was designed to maintain a self-scouring navigation channel that reduces deposition, the BSNP may prevent a degraded reach from recovering even if commercial dredging is reduced."*

That is correct – we have to focus on the real problem and fix it.

[If we over-fix it we may need to actually do some maintenance dredging – bring it on, as that is preferred to degradation!]

Page 4.2-4 paragraph 3

> *"Reduced low-flow water surface elevations also allow vegetation to become established along the river banks and on sand bars, especially if periods of low flows become prolonged. The increased amount of vegetation traps sediment, building up land in the channel and reducing the amount of area in the channel to convey high flows."*

This is all under the control of the dike structures. When the dikes near KC were finally lowered in 2004 and then in 2007 the accumulation of material behind the dikes was scoured out as it should have been during normal navigation flows.

Failure to regularly adjust the dike elevations for the peculiar conditions in the KC area has exacerbated the degradation, creating a vicious cycle of even more rapid degradation from an increasingly narrow and deeper channel with greater depth and shear stresses on the river bed. Normal navigation flows should have been overtopping the dikes, but have not for many years.

The Corps is now beginning to modify the height criteria for the dikes in KC – something we believe is overdue since 1993.

Once the dike height criteria is adjusted correctly in KC, recovery of the bed will begin – the sediments are there. We are seeing the beginning of this now with the latest dike adjustments. All the information in this DEIS is a cry for this to be done!

Page 4.2-5 Paragraph 3

> *"Tributary degradation is most likely to occur in areas of concentrated dredging, where river bed degradation and reductions in low-flow water surface elevations are expected to occur as a result of dredging. Table 4.2-1 lists the tributaries by river segment in the areas where existing dredging has been concentrated.1 These tributaries are at greatest risk of degradation under alternatives where lowflow water surface elevations are expected to decline as a result of dredging in those areas."*

This comment is correlation based and should never be worded the way it is. The Osage, the Grand and the Platte Rivers all have degradation but no dredging near them. If you are going to use a correlation then it needs to apply "across the board". A correct statement would be: tributary degradation occurs when the outfall elevation of the tributary lowers. The study has identified other causes of degradation (cutoffs, headcuts, and confluences) that we have direct evidence of. Any clear water discharge is going to erode directly below it as sediments are picked up. This is an established fact. The contribution from commercial dredging is inconclusive at best. Dredging has been restricted from the areas at least 1000 feet upstream and down from tributaries. The Little Blue no-dredge zone extends 4490 feet, Line Creek 3700 feet, Kansas River 4000 feet. Tributaries themselves flood and erode and contribute to their own instability. Undermining of the structures on the tributaries could be attributed to improper design and construction which can in itself cause erosion below the structure. (This was the case on Line Creek where the footings were built atop the mud from the 1993 flood fill. (Engineers told us later that they knew there would be problems with it from the beginning.) The only dredging that occurred within 3700 feet of Line Creek was the L385 dredging which was a huge concentrated dredging project immediately upstream of the Creek. But somehow commercial dredging has become the cause.

4.2.3 Assessment Methods

Page 4.2-7 Paragraph 1

> *"Emphasis was placed on recent trends because changes associated with the BSNP have mostly stabilized since it was completed in the 1980s (USACE 2009)."*

The Potamology Report was compiled in 1980 after completion of the BSNP. Has a similar follow up report been done that confirms the cutoff headcuts are through? The real reason that recent trends are being analyzed is because there is no reliable data until recently except at the gage stations and then there is no data for Jefferson City, the site of the second most intensive dredging. Great lengths were gone to manufacturing comparable data from the 1998 "serpentine cross sections" so some data from cross sections could be included. The report repeatedly creates rationale to try to substantiate the absence of data. The DEIS is flawed because of its shortage of data which forced it to draw conclusions based on existing reports that were short on data and long on correlation.

An existing viable and necessary industry must not be curtailed on the basis of correlations without causation, insufficient data and transport theories with limited application (useless in high flows) and the potential for large margins of error. The DEIS has attempted to explain various phenomena from a dredging view point and should only be used to form theories that could be researched further in the Degradation Study if deemed warranted.

> *"Changes in CRP-adjusted low-water surface elevations between 1990 and 2005 were reviewed, as were changes in channel bed cross sections between 1998, 2007, 2008, and 2009 (see Appendix A and Section 3.4.6.1 for details on these analyses)."*

One must ask, with the required annual CRP elevation review, if the CRP was continuously being adjusted downward after 1990 and the flood of 1993, why were the dikes not adjusted downward along with it in order to maintain design flow elevations between the dikes? (Adjustments were finally made in 2004 and 2007 and we are seeing improvements).

Page 4.2-8

4.2.3.1 Changes in Sediment Loads and River Bed Composition

> *"Dredging generally removes the bed material load-sized sediment and returns the finer sediment and the coarser gravel and cobbles to the river."*

The D50 for most of the River fluctuates between 0.3 and 0.5 mm. A look at the variability in Figure 3.4-17 shows that there is a trend, but the greatest variance is within each reach of the river, not between reaches. There are areas in Hermann finer than Kansas City. The only accurate conclusion: there are areas in Hermann that are coarser than the coarsest in KC.

Flow Conditions

Page 4.2-11 Paragraph 2

> *"Although they can measurably affect river bed elevations, extreme flood or drought scenarios were not considered in the analysis because they cannot be accurately predicted."*

This is contradictory with the selected data years of 2000-2009 which mostly overlap the drought years of 1999 to 2007 which were the most extreme of recent times.

Page 4.2-12

> *" Short-term impacts in all segments under the Proposed Action would include a local decrease in sediment availability as the dredged area captures sediment transported by the river, and erosion occurs downriver as the river replaces the captured sediment. The amount of fine sediment in the water column would increase below the active dredge location as the dredging operation discharges unusable material back into the river."*

Again we say, the zero to 30% (averaging closer to 20%) sand we waste is not "fine" sand (defined as -0.25mm). It is medium sand – similar to the "average" bed material of 0.35mm. Our wasted sand is 0.25 to 0.6 mm. This size sand does not stay suspended in the water column.

> *"Long-term impacts in all segments under the Proposed Action would include an increase in the concentration of coarse gravel and cobbles on or near the surface of the river bed as material is dredged from the river bed and the material that is too coarse to retain is deposited back onto the surface of the river bed."*

Moving cobbles from deep in the bed (25-50 feet down) to the surface is what is needed to armor the bottom from scour. It is only bad if the area needs to be lowered.

4.2-13 Paragraph 1

> *"For example, up to two-thirds of the material dredged in some areas of the Kansas City segment is too fine to meet specifications for making concrete and is discharged back into the river. As a result, the actual volume of material extracted from the river bed may be three times greater than the dredging records indicate, increasing local impacts on sediment availability and coarse sediment."*

Again, this is an incorrect assumption. Why, because we don't dredge just anywhere in the river. We find areas that are naturally coarser because they are on the outside of bends and downstream of dikes. This is why we travel up and down the River – finding those sweet spots. We cannot afford to waste that much production. However, this is exactly the situation in a land based pit in the floodplain. It is way too fine and the overburden is still there so the added costs are tremendous – over double the costs of river dredging.

Page 4.2-22

Kansas City Segment

> *"Under the No Action Alternative, the Kansas City segment likely would experience slight to moderate aggradation in the short term and moderate to substantial aggradation in the long term. Other factors likely to influence the amount of aggradation in this segment include the BSNP structures in the segment that effectively scour the navigation channel and reduce deposition of new sediment; flow modification from upstream dams that increase moderate flows and eliminate the lowest pre-dam flows from the annual hydrograph; and the Kansas River, which contributes flows but likely has reduced sediment delivery due to dredging and dams. These factors reduce deposition of sediment in this segment and may limit aggradation or recovery of the river bed in this segment."*

Finally the bottom line: "These factors reduce deposition of sediment in this segment…" There it is in a nutshell. **Even with the No Action (no dredging) Alternative, there will be no change in the degradation in KC.** The excessive velocities and scour shear stresses in the upstream KC reach will not allow "deposition of new sediment". It doesn't matter if there is a headcut, a cutoff, levee dredging, or flood scour, there is no redeposition of sediments if the velocity is excessive **(2.73 fps in Kansas City versus 1.8 fps at Waverly and 1.66 fps at Hermann all measured at 20,000 cfs - source USGS)**.

When we have a high flow and the river spreads out above the dike elevation material is deposited. Unfortunately, as soon as the river levels drop within the dike width the sediments placed in high water are lost downstream where the velocity is normal (evidenced downstream of KC). Once the Corps is adequately motivated and authorized to fix this problem in KC and likely all other degrading reaches, the degradation will be over and will recover quickly. This will not occur as long as it is assumed that dredging is the problem!

4.4-2 Paragraph 1

> *"This estimate assumes an average truck capacity of 20 tons and 216 delivery days per year."*

Entrix has failed to consider the commercial zone around KC on the Missouri side. This is a huge factor in the delivery of sand in KC. The commercial zone allows loads in excess of 30 tons depending on the axle configuration and tare weight of the truck. These loads greatly reduce the cost and increase the efficiency of delivering sand within the commercial zone. Most of the alternate sources cited in the DEIS are outside the commercial zone and are restricted to approximately 20 tons. The existing sand pits within the commercial zones have a limited supply depending on their sales. New pits will be outside the commercial zone. More truckloads, more miles to market, you can see the trend.

Page 4.4-6

4.4.3.3 Changes in Truck Traffic

The changes in truck traffic are flawed. Entrix oversimplifies and applies a correlation: permit tons = trucked tons. Masters Dredging Company could have requested a 10 million ton permit but there will not be over 300,000 tons sold from that location because there is limited demand anywhere near that area.

Page 4.2-2 Para 3

> *"Erosion of the river bed occurs both upriver as a headcut and downriver from the dredging depression, as the river entrains sediment to replenish its transport capacity (Kondolf 1997; Simons, Li, and Associates 1985; Rinaldi, Wyzga, and Surian 2005)."*

We do not agree that a dredge hole headcuts in the MO River (see below)

Absence of Headcutting – 2007 Dredge Hole Survey*

We have included with our comments profile cross-sections of the Corps' multi-beam Dredge Hole Survey that demonstrates that there is NO HEADCUT and only a slight downstream sediment pickup related to the dredge hole. You can see that most of the tailings, sand and oversize gravel go right back in the dredge hole, but occupy a small portion of the total sand made back in. The absence of a headcut flies in the face of conventional transport theory. But there it is – look for yourself – no trace of a headcut. Sediment carrying rivers are evidently nothing like clear streams and defy traditional transport theories. The moving bed creates entirely different phenomena on the river bottom.

April 2007 KC Dredge Hole Survey - Description

In 2007 the KCD Corps embarked on two dredge hole surveys – one in KC and one in Washington, MO, using multi-beam survey equipment. We will focus on the more complete survey done from April 18 to 30, 2007, at River Mile 368.3, just upstream of the Kansas River, in Kansas City.

Holliday Sand dredged from March 28 to April 17, 2007 in this location. The operation was around the clock except for six weekend days shut down. Immediately on April 18, the Corps began surveying the dredge hole. Attached are overlapping profiles of the dredge hole plus 500 feet upstream and 1000 feet downstream.

This is amazing data that has been overlooked in the DEIS process. It clearly demonstrates the absence of the assumed "dredge hole headcut" that was the assumption that other studies have been based on. Simons, Li and Associates did not have this kind of data available for the Kansas River DEIS. This data is amazing and future surveys can contribute additional valuable information such as: actual net tons removed from the dredge hole, real time ADCP velocities, and a pre-dredging baseline. With this information from various locations we can completely evaluate different dredges and different reaches at different flows. The possibilities are very exciting!

Here are some observations:

Surveys were repeated on the 19th, 20th, 23rd and 24th with a fairly uniform river stage and flow (from 53.6Kcfs on the 19th to 46.9Kcfs on the 24th).

One additional survey was conducted on 4/30/07 after a raise in the river to 79.2Kcfs to record the post refilling condition. It was noted at the time that the hole had filled in over 11 days.

***Please see attached Adobe files:**

Bed Elevation Comp in color.pdf
Bed Elevation Comp b&w.pdf
4-18-07 DH Survey.pdf
4-19-07 DH Survey.pdf
4-20-07 DH Survey.pdf
4-23-07 DH Survey.pdf
4-24-07 DH Survey.pdf
4-30-07 DH Survey.pdf

Volume of hole on 4/18/10 = 53,000 CY or approx. 71.550 tons @ 100 lbs/cubic foot
Total net sand product barged from 368.3 Dredge Hole = 162,100 tons or approx. 120,074 CY
Volume of dredge hole upon completion of dredging = 53, 000 CY, or approx. 71, 550 tons
Breakdown of products dredged:
Concrete Sand = 156,100 tons
Asphalt Sand = 6,000 tons

The final sections were under higher flow conditions than all the prior sections, propagating huge sand wave forms (some as large as 9 feet high and 75 feet long) that dwarf the normal flow wave forms. The only degradation appears to be downstream of the dredge hole and it is a minor depression that would not cause a headcut in itself. It could possibly be even less pronounced under static, more normal flows.

The absence of a headcut shows that we do not have a firm handle on the velocities and forces acting on the riverbed. Our prior mental pictures of a dredge hole triggering an "avalanche of degradation" as material sloughs into the dredge hole is simply not the case. Even more proof is that the hole held stable when the flows went over double the normal navigation flows.

More studies like this should be done to monitor dredge holes under varying conditions and locations.

Conclusions from the April 2007 KC Dredge Hole Survey:

- The dredge hole fills in quickly
- Most dredge tailings are returned to the dredge hole
- The dredge hole itself does not erode or grow once dredging is completed
- There is no evidence of a headcut upstream
- There is evidence of some minor erosion occurring immediately downstream (within 1000 feet) of the dredge hole, but at a fraction of the amount dredged

[Two humps, at Sta 2+50 and 4+00 are of unknown origin. We had not operated in that vicinity prior to this dredge hole. The humps were probably sand as they disappeared when the flows increased to 79.2Kcfs.]

Page 2-56

2.5.4 Increasing Sediment Supply in the Lower Missouri River

> "Several commenters suggested various means for increasing the sediment supply in the LOMR. Specific suggestions included reconstructing channel chutes to reintroduce trapped sediments, and piping sand and gravel from upstream mainstem Missouri River dams via sediment slurry pipelines to move sediment accumulated in the reservoir back into the LOMR channel. This alternative does not meet the Project purpose and need because it does not supply the sand and gravel to support the regional construction and manufacturing needs."

This is not true with regard to the channel chute construction projects. According to Michael Chapman, USCOE KCD, much of the material that is discharged into the River from chute dredging meets concrete sand specification. His opinion is that it would mitigate commercial dredging projects downstream of the projects (three of the five planned chutes are above KC). Chapman noted that we are talking about hundreds of millions of tons of sand. This is huge (200 million tons is 1260 mile-feet of River, 600 feet wide), and should be a noted as mitigation of degradation in the DEIS.

Page 2-60 Table 2.6-1 Summary of Impacts of the Proposed Action and Alternatives This rote exercise in tabulation is flawed and should be completely redone because of the following errors:

1. DEIS assumes that dredging is the major cause of degradation based on use of correlation.
2. DEIS assumes that degradation will cease/reverse with reduced dredging.
3. DEIS has incorrectly distributed proposed dredging tonnage in the KC and Waverly segments by shifting the boundary river mile from RM 350 in the data request, to RM 357 in the DEIS analyses.
4. DEIS incorrectly evaluated the impacts and suitability of in-stream and flood plain alternatives.
5. Incorrectly assumes that new river sand plants would be built under Alternatives A and B. (Masters' Waldron location would comprise only 15% of the total market.)
6. Incorrectly determines that regional sand prices will decrease with pit mining.
7. Incorrectly assumes that alternate sources only result in minimal increased traffic even though they are obviously more distant from the market.
8. DEIS makes no attempt to predict future market demand and assumes that all the permitted tons would we dredged every year.
9. No status quo Alternative is provided for analysis. Alternative C is the closest, but it includes the unnecessary development of additional sand dredging sites (new facilities) that have negative impacts that are not justifiable.
10. Failure to provide any perspective of scale with regard to commercial dredging impacts in comparison to the BSNP and high water events (re: degradation, loss of sturgeon habitat, loss of sediments, loss of wetlands, etc.).
11. Fails to identify the likely loss of emergent agricultural wetlands from new pit mines.

12. Fails to identify significant instream mining (a major alternate source) impacts to turbidity as opposed to hydraulic river dredging.
13. Incorrectly assumes that Missouri's economy is better off with more sand trucking rather than union scale river dredging crews
14. Incorrectly concludes that barging sand – currently 80% of barge movement – is a negative impact to barge traffic.
15. Fails to consider the impact to air quality of pit mine stripping operation and additional trucking from remote sites, all of which are not temporary. Fails to recognize that existing alternate sources would have to increase existing operations, and therefore emissions, proportionately.

Mitigation

Mitigation involving extreme measures that result in significant increased production costs or major capital purchases would be a hardship under the current economy and really should be deferred until the BSNP in the degrading reaches has been scrutinized for further need of adjustments.
To change something with no probable guarantee of improvement only perpetuates the problem. We're afraid this has been the situation with commercial dredging for the last several years. We have been the focus since we needed to renew our permits, so engineering leading to the solutions has not been completed. If we have to, we will proceed to do the needed engineering.

Monitoring
Right now, the <u>best mitigation is monitoring</u>. (We have no reliable data prior to 2008 and have no data to determine velocities or actual bed slopes).
We propose to:

1. Survey and monitor the riverbed in and beyond our dredging reach. All benchmark elevations should be checked prior so more accurate water surface and riverbed elevations and therefore slopes can be determined.
2. Use ADCP to measure actual channel bottom velocities at the cross section locations throughout the dredge reach. With this data modeling can be done on the bottom of the river.
3. Facilitate complete multi-beam dredge hole surveys in various reaches and flows to gather precise data that can be used to model the exact impacts from dredging. The rate of dredge hole fill is real data that will more accurately determine the bed load rather than using theories and samplers that only approximate it. (See the attached data and our evaluation from the Corps' April 2007 Dredge Hole Survey in Kansas City.)
4. Monitor the percentage of waste along with tons removed to approximate total tons dredged.

With this information we can begin to fully understand what happening in the river bed. **Again, we strongly urge the Corps to maintain the status quo by reverting back to the 2009 permit levels until all this data can be collected and evaluated. The DEIS is inconclusive as it is with regard to degradation.**

Control Reaches
Mitigation already exists in the No–Dredge zones which are numerous and lengthy (from 1000 feet to a mile) providing control areas that are never disturbed. If these areas have not been successful in preventing any dredging impacts from migrating it could be due to excessive velocities.

Natural Controls
As we have told the Corps and KCMO Water, there is already an existing bed level control near RM 370 (by airport) that will stop the degradation at approximately a -3 foot Stage. It is not a rock outcropping but it is just as hard.

The following are our comments on the DEIS' mitigation ideas:

Page 6-4
6.2.1 Restrict Concentrated Dredging
Except for the L-385 dredged fill, Holliday Sand already moves many miles up and downstream searching for the best material and we already have maximum tonnages per reach.
Displacing dredging more than 10 miles from its port requires fleeting with larger towboats with resident crews and many more barges than we currently have. We would also need additional barge handling equipment at the dock. Acquiring these assets could require years and many millions of dollars.

Page 6-5
6.2.2 Prohibit the Use of Cutter-Head Dredges
Holliday does not use a "cutter-head" per say, but rather a cutter chain. A cutterhead is a rapidly rotating basket with blades on which teeth may be attached to loosen more aggressive deposits (cemented/conglomerate) or to improve cutter edge life. A "Swintek" chain cutter is more of a traveling screen that passes at very low speed across the suction pipe entrance. It does not cut, but rather loosens the deposit. It is an efficiency tool (screens out larger rocks that would wedge in the pump vanes, and increases the percent of solids) rather than an excavation tool. Not using our cutter chain would have no effect on the coarseness, depth of the sand we dredge, or whether hardpan is attacked (we don't and are prohibited from it by the Corps Dredge Permit conditions) only on our efficiency (production and downtime rates).

The following was emailed to Cody Wheeler in June, 2010 when we realized this was becoming an issue:

> Cody,
> Attached is info on the "Swintek" cutter chain we use on the KS and MO Rivers. We would use it in Tulsa on the Arkansas River, but the deposits are too shallow for it to be efficient (only 3 to 8 feet deep). A rotary cutterhead is best there.
> The Swintek chain will not dig to the side, only down, and then you must lift and move over or upstream. A Swintek chain ladder's ability to cut is limited by the weight of the ladder which is not especially great. When you get to something hard, it bounces. If it gets caught on something tough it stalls to prevent breaking the chain links. It can be reversed to free it when stuck. The maximum horsepower on a Swintek chain drive is usually 15, and the speed of the Swintek chain is only 35 fpm max. It is basically used as a traveling screen.
>
> A rotary cutterhead (as used by Capital) is the preferred tool when the dredge "swings" (although you don't have to) thereby digging sideways rather than down. It is primarily used for contract dredging to a controlled depth, or when the deposit is shallow and the dredge needs to excavate as it swings, chasing the material more quickly than a chain or plain suction pipe would provide. The swinging cutterhead dredge has more cutting force because it cuts to the side, pulled sideways by the swing cable that passes through the ladder (or dredge arm) itself. However, the cutting force is to the side, not downward. The rotary cutterhead dredge is better than a plain suction dredge because when moving sideways you can leave the suction in the material. However, a Swintek chain dredge becomes more efficient if there is a lot of clay or oversize debris (sticks, boulders) that would clog the pump or get stuck in a cutterhead or the screen on a plain suction pipe.
>
> The different designs are more of an efficiency decision on the MO River rather than being needed to attack the substrate. Cutters are 20 to 50% more efficient than a plain suction because the operator can leave the suction down in the material a greater % of the time - thereby increasing efficiency. There are tough digging environments where Swintek chains or rotary cutterheads with removable teeth are a necessity, but not in the KS, MO or AR Rivers, as they are 95% or greater sand deposits by volume that are loose or free flowing with very intermittent shallow clay lenses.
>
> I hope this helps describe our equipment and the criteria used for selection.
>
> Mike Odell

Page 6-5:
6.2.3 Limit the Dredging Season
> ***"****Prohibiting dredging operations from May 15 to July 15, the period of highest larval pallid sturgeon drift, would reduce the entrainment-related mortality to larval pallid sturgeon."*

Dredging sucks up 1/2000th of the river flow while in operation, and that is about 12 hours a day, 5 days a week. That equates to 1/5600th (or .018 of a percent) of the river flow. Assuming all larvae picked up would be destroyed, that is an insignificant fraction of the water flow and therefore of the larvae. Municipal and power plant intakes dwarf any impact from sand dredges in regard to entrainment of pallid larvae.

Page 6-8
> *"Dredging levels and locations could be adjusted based on changes in channel geometry over time."*

This is done in the KS River and is inherently unfair and unhelpful. It exacts a penalty on dredging for degradation that may or may not have any connection with dredging. It was done on the Kansas River because, except for the reservoirs, there was nothing else to control in reaches that were already degrading, with or without any dredging. We accepted that and packed up and headed for the big Missouri River – ten times larger with traveling dunes of sand. Until more sand is being removed than is entering a reach, the problem is one of velocity (or shear stress) induced erosion, not of excessive dredging. Unless the velocity forces are reduced, the reach is doomed to continue to degrade. Less dredging only results in the accumulation of more sediment downstream of the degrading, high velocity reach. This will become a problem in itself and has been in the

past with various water intakes that we provided dredging services to remove sand accumulated in front of the intake (primarily KCP&L's Hawthorne Station and Trigen).

Page 6-9:
6.4.1

> *"Funding for the design and implementation of erosion countermeasures, rehabilitative construction, or other measures could be required before dredging could continue in that area to maintain the stability and continued operation of water intake facilities."*

Without proof of cause and effect this would be inherently unfair. No structure on the river can expect to operate forever without repairs or modifications – everything has a service life. Degradation and a lowered water surface existed well before most of the intakes were constructed. Their failure to research and project into the future carries some of the liability. Also, the intakes have become obsolete, as collector wells are replacing them because of their improved pumping efficiency, low maintenance and the reduced treatment required for wells.

Funding the repairs of any infrastructure on the river is not appropriate unless there was an obvious direct impact (which there won't be because of the no-dredge zones).

Commercial Dredging is now the majority portion of Missouri River navigation - an authorized purpose. Authorized purposes all have a relative share of the River's use. In addition, commercial sand dredging is licensed by the states to remove and market the sand those bordering states own in the navigable Missouri River for the greater good of the communities. We are not selling Coca-cola. We do not create demand that is not there and necessary for our way of life.

Page 6-9

6.4.2 Develop a Programmatic Agreement for Cultural Resources

> *"Although no direct effects to historic properties would be associated with dredging activities, indirect effects may result from headcutting, erosion, scour, and fluctuations in high and low water surface elevations."*

This statement should not be made in the DEIS. It implies that dredging has been proven to cause these indirect effects. (The attached Dredge Hole Survey already disproves the presence of headcutting). The DEIS has not studied anything - it has reported on what data already exists (which is limited) and with limited time and budget tried to arrive at conclusions based on correlations. Ergo the DEIS has not proven any indirect effects.

The whole idea that dredging endangers historical shipwrecks is ironic considering it was the BSNP that caused the out of channel shipwrecks to be completely and probably permanently buried.
[In fact this follows a pattern: the BSNP has actually caused impacts, but somehow dredging a portion of what is scoured by the dikes is the major cause of every problem on the River. If you think we are whining, well consider this: the Dredgers paid over $2.5 Million for this report!]

Page B-2

B.2 THE MASTER'S DREDGING COMPANY, INC.

The Master's plan to dredge all material up onto the bank is not sustainable.
First, permission must be obtained to operate a slurry pipeline over the Waldron Levee. Does Master's have permission for that pipeline? Second, the water carrying the sand must be returned or pumped back to the River, requiring a major wastewater permit. Third, an excess of fine sand will be brought to the bank that can never be marketed and current 404 permits do not allow reintroduction of solids in any significant quantity back into the River. These are major permitting and operational issues that must be addressed before an allocation of permitted tons is appropriate.
Also, without the ability to navigate and move to other areas in the river, their deposit in front of their property will not likely meet their needs for concrete sand on a continual basis, but only on a seasonal or intermittent basis. Just look at Figure B-1 at the various dredge locations we use throughout the year. That is for a reason. If we could pump sand right in front of our dock all year we would. The river is full of sand, but one must go find the coarsest sand possible to be productive.
Masters did not acquire land in Waldron solely for the purpose of River dredging. They optioned and purchased hundreds of acres for farming and possibly flood plain pit mining. The investment they made in many hundreds of acres was not likely made for just to dredge in the river.
Their site is also problematic in regard to the intersection with 45 Hwy and the concerns for creating a sand pit behind the federal levee. They are facing local opposition.

Page B-13
We believe Figure B-2 may have the sites reversed in regard to the description of which site is behind and outside the levee. The site outside the levee is not feasible as the local Levee District will not allow truck hauling across the levee.

Page B-16
Fig. B-4
The proposed Rau terminal site looks very problematic in regard to keeping open water to a dock and the amount of trees on the site.

Page 3.6-12

Table 3.6-4 Estimated Annual Haul Truck Trips under Existing Conditions by River Segment

This table incorrectly assumes 20 tons per truck load. The Kansas City, Missouri Commercial Zone allows greater loads, up to 30 tons or more depending on the number of truck axles. This is why moving sand production out of the commercial trucking zone would have such a significant impact to the number of truck miles on Kansas City roads and highways.

Page 3.7-5

> *"Further, due to industrial, agricultural, and residential land uses in the LOMR watershed, contaminants such as nutrients, pathogens, metals, and pesticides can be found in the water, sediment, and fish."*

Prior to receiving permission to dredge upstream of drinking water intakes from its Riverside location, Holliday Sand drilled the river bottom in several locations above the Kansas City Missouri and BPU water intakes where we proposed to dredge. Split spoon samples of sand were collected by a third party's mobile drill rig mounted on a barge and moored to a rented spud barge. Samples were collected continuously down to a 20 foot depth below the river bottom and then analyzed for all compounds monitored in drinking water standards. Styrene was the only compound that was discovered in any recordable amount. The results were forwarded to Kansas City, MO, BPU and KDHE.
After we began dredging, we also sampled water in front and behind the dredge every time we moved to a new location and tested for sediments and compounds. There was no measurable difference. After doing this for months without any results we were allowed to cease the sampling and testing.
We have also seen aerial pictures of our dredge operating in winter in clear water with no visible plume.
We believe all of this is evidence that dredging does not negatively impact water quality from suspended solids or by dispersing pollutants from the river bed.

Page 3.7-6

3.7.3.1 Nutrients

Though is was not stated, commercial dredging in the MO River is not the same as the Corps' dredging of side channels as we do not dredge and discharge any overburden or soil as is the case with the habitat restoration dredging. Therefore it should be added that commercial dredging makes no contribution to the nutrient level in the Missouri River and has no impact on hypoxia in the Gulf of Mexico.

Page 3.7-10-11

> *"Approximately 60–70 percent of all dredged sediment from the Kansas City and St. Joseph segments does not meet the required materials specifications and is discharged into the LOMR via the slurry water."*

As we have stated, this statement is not correct. Our waste averages about 20%.

Page 4-3, Paragraph 1

> *"Adverse and beneficial impacts to a particular environmental resource (e.g., aquatic resources) were identified based on the direct impacts of dredging and indirect effects that are generally manifested through changes in the river channel geometry and water elevations, as compared to the baseline. Indirect impacts were based largely on the projected changes in the river channel based on the results of the geomorphic analysis."*

The premise that dredging can significantly impact bed and water level should only be listed as a "Key Assumption", as there is no real geomorphic analysis determining its level of indirect effects through channel morphology compared to other stated causes of degradation, i.e. the BSNP (which was designed for that purpose –bed material scour - and has been highly successful – especially in Kansas City above the Kansas River - considering the almost complete absence of channel maintenance dredging required).

The absence of anything more than correlations showing that where there is dredging there is degradation (and therefore the opposite is true – where there is degradation, there is dredging – ridiculous, yes, but that is all a correlation proves, coincidental occurrence) and the misunderstanding that dredging in the Kansas City reach involves much more wasted fine sand than anywhere else in the river, which causes increased degradation.

Page 4-3, Paragraph 3

> *"Under Alternative C, dredging would approximate recent levels. The response of the river would generally follow its current trajectory, and ongoing impacts to resources would generally continue."*

Recent levels of dredging are temporary and are more of a product of the depressed economy and collapse of the home building market. The "current trajectory" of the river under the current reduced levels of dredging and post recent dike modifications has yet to be determined. It is unknown which factor has contributed to the "current trajectory" of the river bed and surface.

Page 4-3, Paragraph 4

> *"For example, changes in economic activity caused by changes in the amount of river dredging can be offset by other changes in response, such as increases in the trucking industry."*

Saying that dredging in out-of-town pits improves the macro economy through increased trucking employment is like saying that we should drive to Chicago to do our grocery shopping because the auto and truck industry will flourish from the added mileage. We'll pay more, pollute more, but look much it will help the auto and gasoline industries!

Page 4-3

> *"It is important to note that commercial dredging of sand and gravel authorized to continue through December 31, 2010, was previously permitted with a specific set of conditions that were imposed to reduce the environmental consequences associated with dredging activities. These conditions are presented in Section 2.4. The environmental consequences discussion assumes that these permit conditions would apply to the Proposed Action and action alternatives."*

The current conditions for dredging in the KC reach are much more restrictive than those of other reaches. This has not been the case in the past. These conditions should not be automatically assumed to be necessary as they were instituted as a stop-gap measure until the DEIS was completed.

Page 4.2-2, Para 4

> *"Because most of the commercially dredged material must meet detailed specifications, dredging operations return the material that is too fine or too*

coarse to the river. This results in an increase in fine sediment transported downriver as this fine material is discharged into the river from the dredging operation (Kondolf et al. 2002)."

Bottom line: we do not waste more than 20% on the average and the size of the sand we waste is 0.25 to 0.40 mm. It was stated that the d50 of the bed material in KC is 0.35mm. In essence we are wasting the typical medium sand that there is an excess of in the river. This is necessary for a well graded concrete sand, that minimizes voids and cement.

Page 4.2-2 Para 4

"Consequently, rows of coarse material can form on the river bottom as the dredge moves up and down the river. Bed sediment also can become coarser below dredging operations as finer material is picked up by the river to replenish what was deposited in the dredging depression (Kondolf 1997; Rinaldi, Wyzga, and Surian 2005)."

The attached Dredge Hole Survey shows that the oversize rock (1.5" to 6")is dropped back in the dredge hole and there was no evidence of any humps when completed.

Final Considerations

Existing Missouri River Dredgers pay federal Waterway Fuel Taxes (up to $500K per year) that subsidizes inland navigation projects.

Holliday Sand pays sand royalties to the State of Kansas on over a million tons at $0.15 per ton.

Recommended Alternative

There is no true "status quo" Alternative in the DEIS. Alternative A and B put the existing Dredgers out of business at the 10% to 25% of bed load estimates. Alternative C is the right level of tonnage, but includes new permits which are not needed and are inappropriate as existing permit holders have been capped or reduced.

We request that the Corps continue to freeze permits and tonnages at the 2009 permit levels. Dredging's role in degradation is not fully known and is obviously not the root cause. Until the root cause is determined and all mitigation options for degradation weighed we should not make any major changes. For this reason, none of the Alternatives are truly appropriate.

Alternative C – the "best" alternative

If we had to select a Dredging Alternative, we would have to select Alternative C. However, we would prefer the same dredging limits we had in 2009 under the 2007 permit extension. Alternative C implies that new permits would be issued that would reduce our needed volumes even further. We of course oppose new permits for that reason.

- Alternative C is the best alternative proffered:
- It keeps dredging from increasing and even reduces it below prior peak years.
- It will not increase the cost of sand and therefore construction.

- There will not be a sand shortage.
- It will not require closing operations and the loss of good paying jobs.
- It will not increase carbon footprint as would happen with more remote pits.
- It allows time for determining how to reverse degradation: Dredging is a contributor to degradation, but is not the cause. Modifications to the BSNP need to be analyzed and implemented to bring about recovery.
- It does not exceed the bed load volume.
- The slow economy has in itself reduced dredging to almost half of Alternative C levels. This will likely continue for several years allowing time to complete the Degradation Study without increased degradation.

Conclusion

Dike Modifications

Significant modifications have been recently done on the sill dike portion of the BSNP adjacent to areas of major degradation. No previous modifications have been done since 1990 or since the very major event of the 1993 flood. Our understanding is that in 2004 and further in 2007 a program to notch and lower the dikes was implemented to increase slack water habitat and as a by product attempt to slow degradation. We believe the recent increases in bed elevation at the KC gage are a direct result of the dike modifications.

Authorized Purpose

The BSNP's primary purpose was flood control and then navigation to facilitate barge transportation of commodities on the MO River. Delivering sand is now 80% of the barge traffic on the River. Every barge of sand towed is saving 50 truck loads of hauling from a rural pit into the city. In total, the amount of Missouri River sand barged equals 350,000 truck loads of sand. The net annual reduction in trucking is approximately 7 million miles (saved hauling sand from remote alternate sources back to market). That is why President Obama and the State of Missouri are promoting initiatives to increase river transportation. It's good for our air, roads and reduces our dependency on foreign oil.

Just think, the sand in the Missouri River is continuously moving downstream past us, whether we remove it or not. It belongs to the respective states. It is clean and delivered right to our doorstep by the River. As long as we don't remove more than is coming down we should not see degradation from dredging. (Granted, this assumes river channel velocities are not excessive for settling out some of the sand moving through. Fortunately, that is completely under the control of the Corps operated river structures or BSNP).

We firmly believe that river dredging is the best alternative for the air, land, ground water, roads, truck traffic, construction, and employment. All that remains is the degradation problem in KC. If we can just get the River adjusted in certain areas the river bed will rebuild and we will stop and likely reverse degradation. The good news there is

that we are already seeing signs that recent dike adjustments by the Corps are reversing that in some areas.

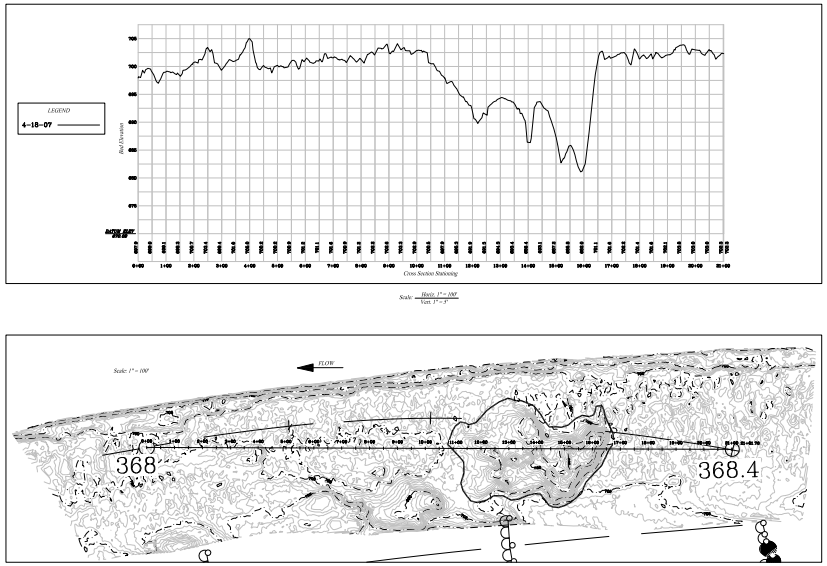
We wish to personally thank all the Kansas City District Regulatory personnel that have worked so very hard to bring about the EIS and the upcoming Decision Document. We look forward to a continuation of our joint cooperative efforts to effect the best resolution possible for all parties and most importantly the greater Kansas City and Missouri communities. Thank you for considering our comments.

Sincerely yours,
Holliday Sand & Gravel Company

Michael R. Odell
Vice President – Production

Encl.

USACE 2007
Dredge Hole
Multi-Beam Survey (4-18-2007)



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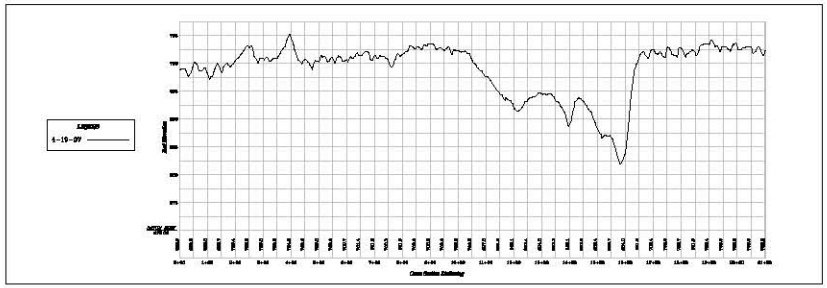

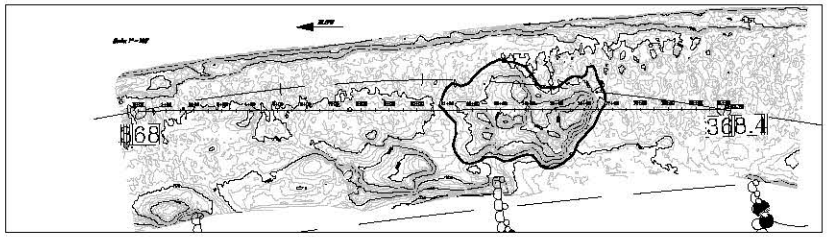

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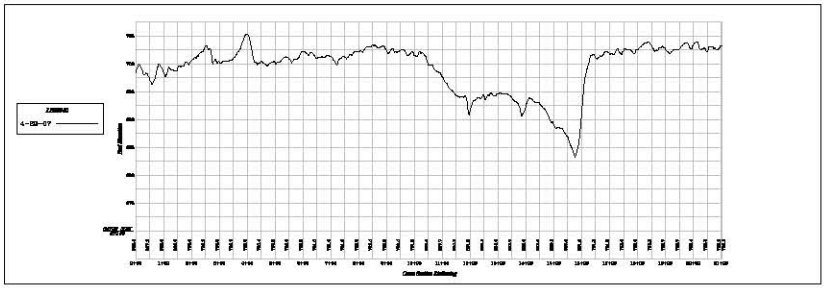

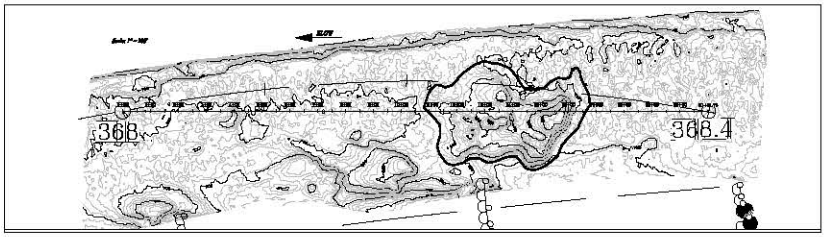

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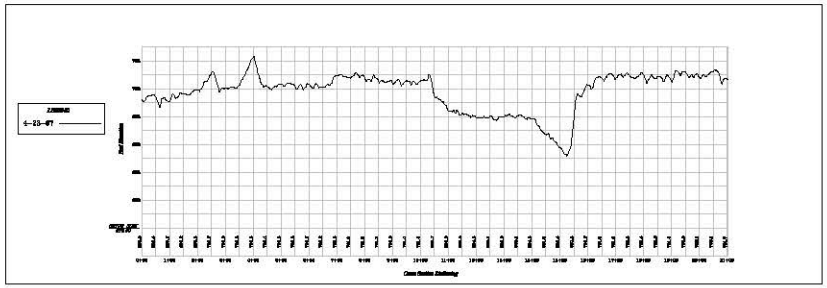

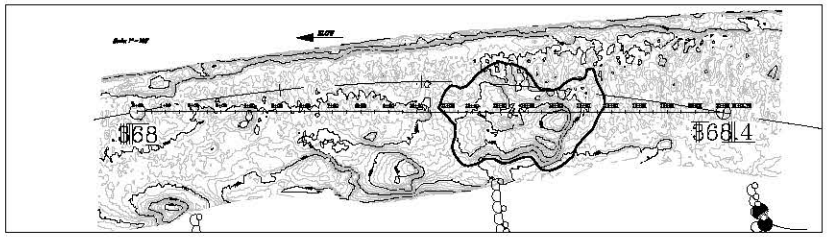

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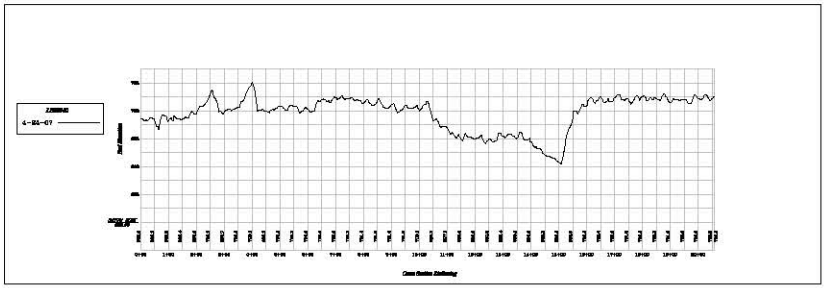

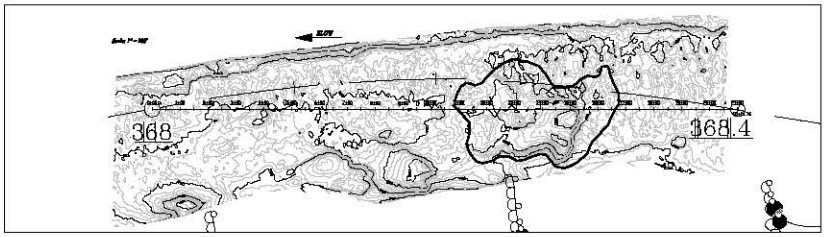

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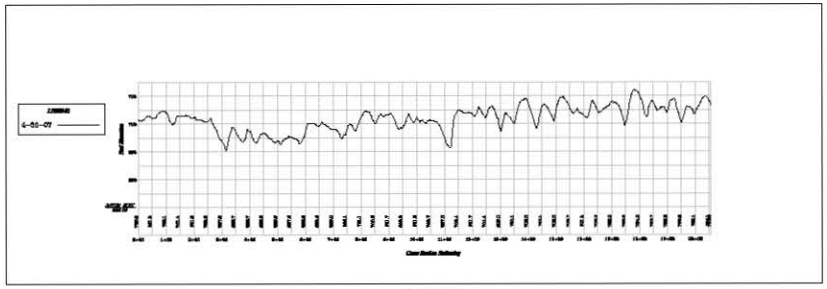

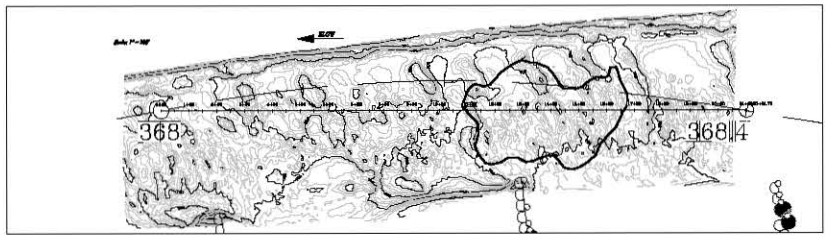

USACE 2007
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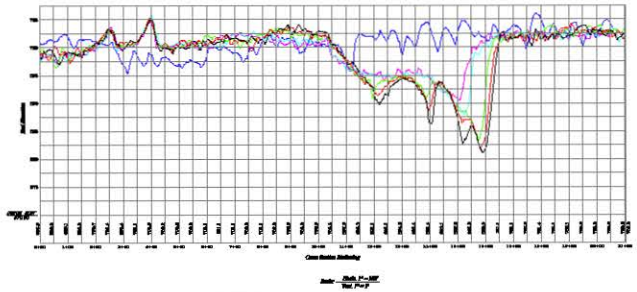
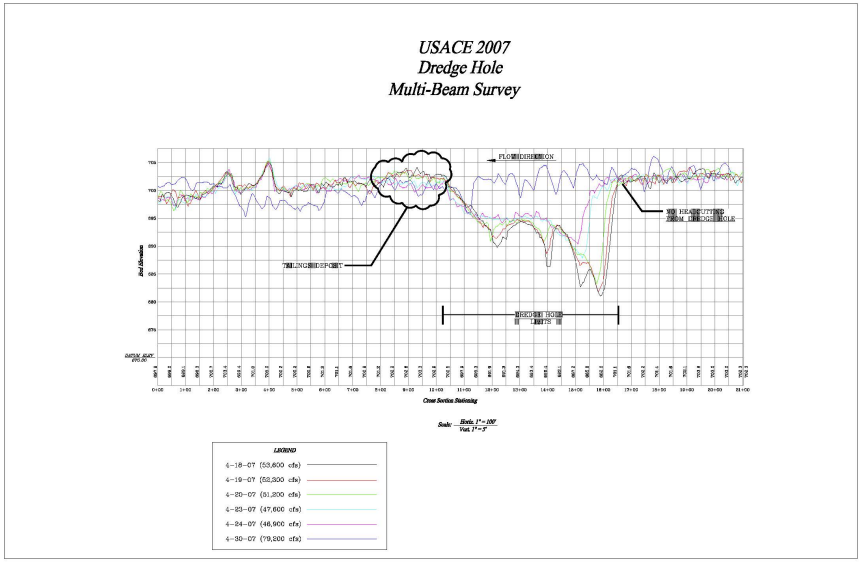
Multi-Beam Survey





MISSOURI CONCRETE ASSOCIATION, INC.

101 E. High Street, P.O. Box 392, Jefferson City, Missouri 65102
(573) 635-6271 • FAX: (573) 636-9749 • www.moconcrete.com
RANDY J. SCHERR, Executive Director

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September 2, 2010

RECEIVED
REGULATORY BRANCH
2010 SEP -9 PM 2:04

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street – Room 402
Kansas City, MO 64106-2896

Dear Mr. Wheeler:

I am writing this letter to address the consideration by the U.S. Army Corps of Engineers of a denial or a reduction in quantity of permits which would constitute a ban on dredging operations on the Missouri River.

The Missouri Concrete Association represents over 130 companies engaged in highway construction, public works, commercial and private development. The reduction or ban on dredging operations in the Missouri River will have a devastating economic impact on the members of the Missouri Concrete Association and the customers they serve.

We would like to go on record as opposing a ban or reduction in supply of dredged sand from the Missouri River based on the following:

- The study understates the impact of sand on Missouri's economy and the impact of dredged material as a resource.
- The presumption that 7 million tons of sand will be available from the Mississippi River, Kansas River and out-state sand and gravel operations is not correct and is inaccurate. Out-state sand and gravel operations do not provide the same type of material, cannot provide the same grade of material, and cannot provide the same volume of material. The Mississippi and Kansas River are not available as sources.

MISSOURI CONCRETE ASSOCIATION, INC.

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RANDY J. SCHERR, Executive Director

- Retention of sediment behind Missouri River main stem dams and the design of the Bank Stabilization and Navigation Project are the principal causes of the lack of material in the Missouri River and the largest contributors to bed degradation. To blame the dredgers as the cause of bed degradation is inaccurate.
- There are factual errors and conclusions about Missouri construction, shipping and transportation that significantly bias the outcomes of the analysis to the detriment of Missouri's construction industry.

For the reasons stated, any further reduction in the total amount of material currently authorized for Missouri River dredgers is harmful to the construction industry in the State of Missouri and is a direct contradiction to Missouri's efforts to stimulate the economy.

Sincerely,

Randy J. Scherr,
MCA Executive Director

RJS:bsr

cc: The Honorable Jeremiah (Jay) Nixon, Governor, State of Missouri
Missouri Department of Natural Resources, Water Pollution Control Program
KDHE Bureau of Watershed Management

Capital Sand Company, Inc
P.O. Box 104990
Jefferson City, Missouri 65110-4990
Phone: (573) 634-3020 Fax: (573) 636-5734
Providing Aggregates for the Construction Industry

September 7, 2010

Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comments on the Draft Environmental Impact Statement

Dear Mr. Wheeler:

Capital Sand Company, Inc. is on record approving the comment letter submitted by Mr. David Shorr, Lathrop & Gage. We appreciate the demanding effort placed on the U.S. Army Corp of Engineers (USACE), Kansas City District (KCD) Regulatory Program in trying to determine the factors related to this Environmental Impact Statement (EIS).

Although we disagree with the biased approach throughout this study, it is time to form a cooperative dialogue in order to reach a common goal. The necessary items to focus on for a common sense approach are:

- Permitted tonnage not be reduced from the current levels in order to meet the demands of the future
- Eliminate the term segments from the study
- Understand dredging with cutterhead and how we use them to create a mixing zone not just for obtaining maximum depth
- Understand the Mine and Relax method of dredging that Capital Sand Company (CSC) has been using for years and we know that it works
- CSC mines specific seams that are deposited by flows and BSNP dynamics of the river.
- CSC does not make a product onboard our dredges by mechanical controls (i.e. Classifiers). We make specification products by screening the raw material from preferred locations.
- We must continue to work through adaptive management practices that are approved through a cooperative effort by the USACE and the dredging community. This will help supply answers to the EIS which are not just another set of regulations added to the R.O.D.

Thank you in advance for the effort of the USACE-KCD. The outcome of the EIS will be a better understanding of the dredging community and our importance to the State of Missouri.

Sincerely,

F. Ray Bohlken, President
Capital Sand Company, Inc.

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2010 SEP -7 PM 4:06

September 3, 2010

Dear Mr. Wheeler,

My name is Mike Novak and I am writing to you because **I support sand dredging on the Missouri River in the City of Hermann, MO.** I am a construction worker – unemployment is over 20% in my work environment. Speaking of environment let me tell you a story about a bear. Smokey the bear said no fires to protect the forest, so we would have no destruction and save the forest for future generations. That was not the best for the forest. The Missouri Conservation Department at the Lake of the Ozarks (State park #1) has controlled burns all the time. The result is we have prettier grasses, and stronger, better trees. The new grasses and flowers are amazing. Thanks to some "one" **Smokey the bear** in the Conservation Department, I have had the privilege of seeing this beautiful change. I have been going to the Lake of the Ozarks (State Park #1) for over 50 years. I know there are fish, birds and lots of other animals along the Missouri River. I believe taking the sand out of the river gives these animals deeper holes to feed and survive. I have had a Fishing & Hunting license for 40 years. My family enjoys the outdoors and would never do anything to harm the great State of Missouri. We need the jobs for people to afford boating on this great river.

We believe animals and people can live together, and it should not cost people their jobs.

Yours truly,

Mike Novak
Christie Novak

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2010 SEP -7 PM 4:02

JEAN HELD
1002 STONE HILL HIGHWAY
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Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

September 3, 2010

Re: Commercial sand dredging on the Missouri River at Hermann, Missouri

Dear Mr. Wheeler:

I am writing to express my support for commercial sand dredging on the Missouri River at Hermann, Missouri. I believe the current dredging operations are of great importance to our local economy by supporting several families in our community by providing good jobs. I further believe that by maintaining a local dredging operation to supply central Missouri with needed materials, less product is trucked from further away to meet those needs, thus reducing the amounts of fuels consumed and pollutants emitted.

I support our local commercial sand dredging operations and encourage you to continue to allow commercial sand dredging on the Missouri River at levels no less than current production. Thank you for the opportunity to express my comments.

Yours very truly,

Jean Held

Jean Held

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 4:00

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

The time has come for this country to realise that producers should be rewarded and not continiously under assault by non-productive beauracrats.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Dale A. Gloe

Unofficial Comments – Robb Jacobson, USGS

9/1/2010

3.2-10 "The CWCP attempts to mirror the pre-dam annual flow cycle…." Fails to put naturalization of the CWCP into perspective. It would be more accurate to state : "The CWCP attempts to restore some elements of natural variability of the pre-dam annual flow cycle by instituting pulsed flows in the spring. In approximately one out of every three years, the March pulse is designed to achieve as much as the 11th percentile of the pre-dam pulse magnitude and the May pulse is designed to achieve the 6-10th percentile of the pre-dam pulse magnitude (Jacobson and Galat, 2008)".

3.2-12 "In the short term, the amount …." It would be more accurate to state: "The amount of sediment released from any particular restoration site would be small relative to current suspended sediment load over the duration of construction. The total sediment added to river from all sites over the projected 15-year time period of construction would be greater, as much as 62% of the current suspended-sediment load, but would be a transient pulse, diminishing after construction as the sites equilibrate to the prevailing sediment load of the river (Jacobson and others, 2009a)."

3.4-39 "Spring pulse releases…. as Hermann, Missouri (USACE, 2009b)." Should be cross checked with Corps presentations that indicate that the flow pulses will attenuate to immeasurably small levels downstream of the Kansas River (Roy McAllister, I believe). Moreover, pulse-related stage changes downstream of the Kansas River been minimized operationally by decreasing flows from Kansas reservoirs. These observations/facts would help up the pulses in perspective.

3.4-53 Supply limitation: Data presented in appendix A and reported by Jacobson and others (2009) show that total suspended sediment and suspended sand increase with increasing discharge. This indicates that sediment supply does not limit transport. Leveling off of the transport curves or would support supply limitations; this isn't evident in the data. I agree that most of the suspended load is wash load and that the percent sand does not show a systematic increase with discharge; I do not agree with the interpretation that the lack of increase indicates supply limitation – or at least this argument has not been supported sufficiently. The lack of relation may simply mean that the particle size distribution of the available sediment does not change with discharge.

3.4-64 "…lie within a reasonable range of each other." First, I think the preparers of this report did a state-of-the-art job of estimating bed-material loads. Using a variety of available models is entirely appropriate to provide some measure of variance. This statement asserts that the variation in results in reasonable, which is a fairly subjective concept. It would be useful to present variance in terms of percent difference ("the L-385 report estimates bed material load only 33% higher than this report") and to cite, if possible, other studies or standards for what level of agreement would be expected, hence reasonable.

3.4-65 The annual bedload flux cited from Gaeuman and Jacobson (2007) is in metric tons, so should convert to 6.9 million (short) tons.

3.4-95 For dune dimensions, you can cite a peer-reviewed report with many systematic observations (Elliott and others, 2009). Table 8 provides summary data for Miami, Missouri (near Waverly). The text states: " In the Miami reach, characteristic dunes varied in height for all of the surveys from 0.52–1.45 m (fig. 22, table 8). Dune length varied from 5.04–38.7 m. " p. 43.

3.8-9 Citations of reports on Missouri River habitats could include (Jacobson and others, 2001; Jacobson and others, 2004a; Jacobson and others, 2004b; Elliott and Jacobson, 2006; Jacobson and Galat, 2006; Jacobson and others, 2007; Reuter and others, 2008; DeLonay and others, 2009; Elliott and others, 2009; Jacobson and others, 2009b; Reuter and others, 2009)

3.9-10 Another good reference for wetland connections to flow variation is (Kelly, 2006).

4.5-7 I think the Jacobs et al. (2008) citation is meant to be Jacobson et al (2009). In references the name is correct but the date needs to be changed (p. 4.5-28).

4.6-4 Johnson, Jacobson, DeLonay citation for habitat use by sturgeon is dated. Better to restate in the first paragraph as: "…by general river ecology theory, rheophilic native species like the pallid sturgeon have been shown to select the deeper, faster margins of shallow-water habitat but are seldom found in that habitat type (DeLonay and others, 2009; Reuter and others, 2009)."

In third paragraph it would be useful to add a more-available (somewhat higher-quality) publication (Jacobson and Galat, 2006) to back up the Johnson, Jacobson, DeLonay (2006) citation.

4.6-8 Third paragraph: DeLonay et al (2009) document spring migrations of reproductive pallid sturgeon of 10's to 100's of km; migrations have been documented through dredge reaches at Jeff City, Rocheport, Waverly, and Kansas City. The effect of dredging specifically on migrating reproductive sturgeon has not been documented.

4.6-11 First paragraph: better (more direct) citation than Jacobson, Johnson, Dietsch for the reduction in sediment load is Jacobson, Blevins, Bitner (2009). Best citation for reduction in turbidity is (Blevins, 2006).

4.8-4 First paragraph: Dredging as a potential barrier to <u>migration</u> of reproductive pallid sturgeon might be considered for inclusion.

Second paragraph, some context for Laustrup et al (2007): "…and map coarse substrate deposits and bedrock exposures that were exposed subaerially or identifiable in shallow water. This survey provided a minimum inventory of areas that could likely serve as…."

5-23 3rd and 4th paragraph: the extent to which sediment released from the floodplain in creating SWH can compensate for dredging depends as well on the particle size of the floodplain sand compared to the bed-material load of the river. This analysis has not been made, to my knowledge. Presumably, floodplain sedimentation and sedimentation in accreted lands would have smaller sand particles, on average, than bed-material load. A significant portion of the accreted land sedimentation may have been from what would be considered wash load on a cross-section averaged basis, but was deposited from traction or suspension in slow velocities on the floodplain or in accreted areas. Although there is a lot of sand in accreted land and the floodplain, it follows that most of it would be transported as wash load with present-day channel velocities.

Last paragraph: relevance of historical trends supports the need to assess effects of climate change on future trends.

6-2 About adaptive management. Although the 1-dimensional analysis of bed-material load is excellent, in my opinion, it is limited in application to prediction of habitat effects because it provides cross sectional averages. Habitat dynamics result from 3-dimensional erosion and sedimentation processes that cannot be captured in 1-d and only partly in 2-d models. Particles that are carried in suspension as washload in the thalweg may be deposited to create habitat on inside bends, for example, where velocities are lower. Similarly, a threshold of bed-material load associated with cross-sectional-average channel stability (lack of degradation) does not necessarily indicate stability (or dynamic equilibrium) of channel marginal habitats. For example, sidecast gravel and cobbles may accumulate in the main channel and impede incision in the thalweg, but sediment deficits in the reach may result in increased erosion of lateral (SWH) deposits.

I would not expect these 2-d and 3-d processes to be covered in the EIS, but I think they should be acknowledged in planning for adaptive management. In particular, well-designed habitat monitoring in dredged and undredged reaches could provide a basis for evaluating effects of dredging on all habitats at the reach scale. A comprehensive monitoring design could also address changes in bed composition and recovery times (p. 6-6).

6-3 Seasonal restrictions and exclusion zones. Research on environmental requirements for pallid sturgeon population recovery is progressing rapidly and providing new perspectives on possible constraints on reproduction, growth, and survival (DeLonay and others, 2009). Telemetry studies have demonstrated that reproductive sturgeon migrates 10's to 100's of km to spawning sites March - May. Currently, documented spawning sites are distributed widely through 100's of km of the river; large aggregations of reproductive fish at specific sites or repeat use of specific sites have not been documented. All documented spawning sites downstream of Rulo have been on outside, revetted bends. These data indicate that reproductive pallid sturgeon migrate through dredging operations and any outside bend has the potential for spawning. This may have implications for planning mitigation measures.

6-4 Bathymetric is miss-spelled.

Appendix A.

A-3 In the general discussion/definition of washload and bed-material load it would be useful to clarify that all of the analysis is on a cross-sectional average basis, essentially a 1-dimensional hydraulic view of the river. The 1-dimensional view is reasonable for the scale of the broad questions about bed

stability and relates directly to streambed elevation and water-surface elevation data. The 1-dimensional view does not, however, describe what happens within a reach where lateral variation in sediment transport, erosion, and deposition determine reach-scale channel morphology and habitat. Hence, the D_{10} and Rouse number criteria for the transport modes may be valid on a cross section averaged basis, but does not describe lateral variation that results in habitat. Particles that are transported in suspension in the thalweg may be transported in traction (bedload) on the inside bend. And, of course, turbulent bursts and sweeps produce at great deal of variability at finer temporal and spatial scales. Generally: a caveat here about limitations of the 1-d approach would delineate uncertainties and demonstrate rationale for adaptive management.

A-6 Last paragraph: important to note that "The maximum particle size measured for the USGS data…."

A-13 See comments from page 3.4-53 about whether the case has been adequately argued that sand percentages indicate supply limitations.

A-43 Inherent limitations of 1-d models. Large scour holes associated with every wing dikes (see, for example, maps in (Reuter and others, 2008)) attest to complex 3-dimensional sediment transport processes associated with flows through, over, and around navigation structures. Unstable sandbars between navigation structures attest to sediment transport, erosion, and deposition processes within the dike complexes. These observations indicate that the assumption about bed-material transport being limited to the navigation channel are not completely valid, especially as they relate to maintenance of marginal habitats. It is not clear, however, whether the assumption is unwarranted relative to understanding total fluxes.

A-67+ Section A.4.3. The rationale for a weighted average of modeled bed-material load (and the proportional weight given to SEMEP) is not well explained. I would agree that SEMEP is different and potentially a more valid representation – but I would not know how to weight it relative to the others.

Also: Under predictions of bed-material loads in SEMEP relative others at Hermann is notable (table A-16). Speculation on what is happening in the Hermann reach (pp. A-81-82) could include bed armoring (apparently not taken into account sufficiently in SEMEP (?), probably due to coarse sediment introduced from Osage and Gasconade rivers), and increased dominance of wash load (due to influxes of fine sediments and agricultural land uses in Chariton/Grand rivers).

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September 1, 2010

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2010 SEP -3 PM 1:06

Mr. Cody Wheeler, Regulatory Project Manager
U.S. Army Corps of Engineers
Kansas City District Regulatory Office
601 East 12th St. Room 402
Kansas City, MO 64106-2896

Dear Mr. Wheeler,

I am one of those employees that will be unemployed if dredging is stopped. You probably don't care, for I am only one. I do love my job and anything connected with the river. I have worked at two companies on the River for almost 30 years and it gets into your blood and becomes a way of life and the MO River is no exception. But, what makes me so furious is the current Federal Government Administration that is trying to create more jobs is the very same government that threatens to take my job and others away too. Hypocritical isn't it?! It will be a huge snowball effect. Can you (U.S. Army Corps of Engineers) handle another disaster like New Orleans after Hurricane Katrina?

I have seen the data. I have witness the U.S. Army Corps of Engineers Dredging down river from the mouth of the Missouri River because of all the sediment. Where did it all come from? Please look at more than the last recent years. There was a drought involved and if you do a scope of say the last 50 years you will see a different picture. Dredging has been done in Hermann as far back as I can remember with no complaints.

Keep this in mine, if dredging is stopped: Business **will** go under, more unemployment, people will loose their homes & farms, (including me), prices will skyrocket for material, more truck traffic on already congested highways, and the list goes on. The question is will you be able to live with yourself having made a bad decision or will you be able to sleep good at night? Have you ever felt insecure about your future like we are feeling right now at the hands of someone else and not in your control? Let me tell you it doesn't feel good at all. This is where anger comes in. People do not like to bullied, lied to and raked over the coals.

I am in full support of Commercial Dredging at the current levels. Dredging already adds to the local economies and keeps people employed with a possibility of a company growing and expanding meaning more employment. This was at one time, "An American Dream." Don't be a dream killer. I hope you will make an educated, logical & rational decision in this matter.

Sincerely,

Lisa E. Redfern

Lisa E. Redfern
32423 Hwy. 94
Hermann, MO 65041

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

2010 SEP -3 PM 1:10
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RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

How is your record? I simply did a very small amount of research and it looks to me like the Corp of Engineers has made their fair share of mistakes. Would you like to know about our record here at Hermann Sand and Gravel? We have NEVER had a complaint filed against us for the way in which we conduct our business. Nobody has ever complained about our dredging and nobody has ever cited us for making bad decisions or causing other people harm. Can you say the same for YOUR organization? Just in case you wonder if people are complaining about the way you conduct business, I have included a few comments from the public and the fact that the Corp of Engineers has been held liable in a recent lawsuit.

NEW ORLEANS -- A federal judge has held the Army Corps of Engineers liable for some of the damage stemming from Hurricane Katrina.
The lawsuit involves WDSU anchor Norman Robinson, along with four other plaintiffs seeking damages from the federal government.
In a first-of-its-kind ruling, a U.S. District Court judge has awarded nearly $720,000 in total compensation to four of the plaintiffs. Judge Stanwood Duval Jr. ruled against the claim by Norman and Monica Robinson.
Duval ruled that the Army Corps of Engineers' failure to properly maintain a navigation channel led to massive flooding in Hurricane Katrina. He ruled in favor of residents who alleged the Army Corps' shoddy oversight of the Mississippi River-Gulf Outlet led to the flooding of New Orleans' Lower Ninth Ward and neighboring St. Bernard Parish. –WDSU-TV November 18, 2009

Ottumwa, Ia. — Martha Dietz and many of her neighbors blame the U.S. Army Corps of Engineers for allowing the Des Moines River to virtually cut off the only access they had to their Wapello County homes since early June.
While Saylorville and Red Rock reservoirs continue to fall — both should be at normal levels by mid-September — the misery continues in Eddyville and Ottumwa.

"It's the corps' fault," said Dietz, who lives in the isolated area and owns 28 acres of land and homes in the area around 120th Avenue. "They knew they had all that snow up there" last winter.
Corps officials say they balance the interest of landowners above and below the dam, and have managed to avert major property damage.

Ron Fournier, spokesman for the corps' office in Rock Island, Ill., said farmers upstream are so irate that the district commander met with them a couple of weeks ago to calm things. The corps bought easements to get the right to flood farmland, but those payments in some cases went to previous owners. Excerpts taken from Desmoinesregister.com- September 2, 2010

Lower Valley citizen group sues Army Corps of Engineers over Snoqualmie River flooding

The waters have long since receded, but the thick black lines on Erick Haakenson's barn wall still bear witness to the damage that the January 2009 flood did to the Lower Valley.

Haakenson's Jubilee Farm barn was built several generations ago, on a spot that the original builders considered floodproof. That certainty vanished after what Haakenson called "the flood to end all floods," in 1990. He painted the first stripe on his barn to mark the height of the event.

Even after the United States Army Corps of Engineers completed the Snoqualmie Falls Flood Reduction Project, also known as the "205 project," in 2005, Haakenson had little respite. Floods in 2006 and 2009 topped the 1990 mark on his barn, leading him to question what the project really did to Lower Valley farmers in the river's path.

When Haakenson learned of a second flood control measure planned at Snoqualmie Falls, this time as part of Puget Sound Energy's planned makeover now in the works, he drew a different kind of line. Haakenson is among Lower Valley residents who filed suit last week against the Corps of Engineers in an effort to stop channel widening efforts at the Falls.

"You've got to ask what the relationship is between blasting away the side of Snoqualmie Falls so that water can escape more quickly, and higher flooding that we experience 15 miles below," Haakenson said. "How can we make a judgement to do something like this when there's every reason to suspect that there might be serious impacts?" – Snoqualmie Valley Record- July 6, 2010

Would you like to know why I am so angry? Every day I watch my husband beat his head against the wall, fighting with mother nature to make his business a success. He could give up or he could make decisions that are unethical but he doesn't. He has been able to sustain the business that was passed down from his father, by making smart business decisions and being respectful of the laws put in place. He is one of the most ethical human beings I have ever met and gives 110% so that he doesn't have to lay people off while still offering a quality product.

He has enough issues with the weather and the navigable seasons of the river and then the Corp of Engineers comes along and adds to the head aches with this Environmental Impact Statement. We barely have enough money to sustain our business and the

government decides that we need to shell out more money so that the study WE paid for- can tell us we are disrupting nature and should cease dredging. Really? Would you like to tell our employees and their families that you are shutting down our business and putting them out of work because a fish is more important then their well being?

I support nature and our environment. I try to be contientcious of my decisions and respect the world around me. I teach my children that we need to sustain our world and protect natural habitat. I am also very realistic that we need to worry about our fellow human beings BEFORE we protect what will not ultimately make a difference in our future.

For over 30 years, Hermann Sand and Gravel has been a part of the Engemann Family. In a time when people could shut down a business and go work for a large corporation, Gerald Engemann made the decision to support his family and grow a local business so he could employee local community members. He paid his employees well and that money stayed in the community supporting the local economy. Through floods, through financial hardship Hermann Sand and Gravel has withstood all of the elements and continued to thrive. In 1994, Gerald's son Steve stepped in to manage the sand plant. A decision was made to grow the business event more and even though it was a far stretch of a dream, they invested money and went on to build new equipment. This family has given everything to make this business successful. It takes every single member of the family to participate whether it is moving equipment when the waters rise, helping to market and manage the public relations of the business, or just helping with the equipment when there is a break down. This business has affected hundreds of lives over the course of its existence.

Now after investing an unbelievable amount of time and money in a business that is to be passed down to the next generation, the Corp is nearly making it impossible for that dream to continue. It seems that they don't care that 11 employees and their families will be affected by the ceasing of dredging. In this economy, how can you justify taking a completely solid business and setting it up for dissolution?

They don't worry that it would be near impossible to continue doing business if they cut the amount of tonnage our permit includes or cease our permits altogether. They make it sound so easy that we should just go from dredging on the river to a pit dredging operation. This is not possible. Every ounce of extra cash flow has gone into ridiculous paperwork and following regulations and guidelines already and now we are expected to change the entire direction of our business. Are you going to pay for that? Or are you going to allow us to continue to dredge at the same amounts we are now so that we can continue to stimulate the local economy? The answer seems pretty easy to me. Again, we aren't the ones who keep getting sued or who are making the local people angry- you are.

I would like for you to be the one to explain to my children that their Dad was doing nothing wrong but the federal government decided to shut him down, take away his business and put other family businesses at risk because they are more interested in the future of a fish or a bird than humans. I am glad that you can live with yourself when you take away the legacy of a family business that we plan to pass down to our children. I am not willing to let that happen.

Sincerely,

Kate Engemann

From: Geralyn Gloe
To: Wheeler, Cody S NWK
Subject: FW: Hermann Sand and Gravel
Date: Tuesday, September 07, 2010 1:31:12 PM

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

Keeping the navigation channel open by dredging is an important part of the transportaion infrastructure that our country needs to move goods in the most efficient manner. Other countries don't ignore such an important resource, so why should we.

We don't feel that dredging will adversely affect endangered species. Perhaps you need to look to the introduction of game fish not native to our local waterways which fish and wildlife is proposing for the Lake of the Ozarks. Cutting the trail dikes has decreased to slow water habitat that allows spawning in a safer environment for egress than the ox bow lakes which often dry up, stranding fish to slowly die when water recedes.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Geralyn Gloe
33048 Case Rd.
Hermann, MO 65041
573-486-3534
g.gloe@hotmail.com

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12 th Street, Room 402
Kansas City, Mo. 6401-2896

RE: Commercial Sand Dredging

Dear Mr. Wheeler,

I am expressing our support for commercial sand dredging on the Missouri River surrounding Hermann, MO and all Missouri Rivers.

We in the State realize the importance of commercial sand dredging to our economy. In a time when it is imperative that we keep our funds in our State in order to stimulate the growth in our communities, we need every single job for people to survive in our towns and State. Dredging supports families in our communities. Dredging Missouri River Sand provides us and everyone in Missouri with high quality, low cost product which helps build roads, homes and infrastructure.

It has also affected our recreation on our waterways when the rivers are allowed to fill up with sand bars in the middle of the rivers, it effects our boating and recreation which hurts our economy.

Not only dose this affect our jobs, and recration, but our surrounding land can also be effected, as the sand builds up in our riverways causing the water to run in other directions effecting our fields and surrounding land. As you can see all the rivers in Missouri that can not be dredged is already affected , the rivers are not deep enough as they once was causing flooding.

Also when the rivers are allowed to fill up it stops the water from running freely leaving pools causing stag water which causes mosquitos which could effect our health .

I hope you will take a serious look at this before a decision is made. There comes a time when we must look ahead for the human race and our childrens future. I am a serious animal lover too but not at the expense of the human race.

The beautiful rivers we once had is slowing getting smaller they are filling up with sand and erosion, they are not as wide and deep as they use to be, if they keep skrinking we won't have to worry about any river species, cause there won't be any rivers deep enough for them to live in.

We Support our state commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River and all rivers in Missouri. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Eugene + Wanda Casaretto

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2010 SEP -7 PM 3:58

September 2, 2010

Mr. Cody Wheeler, Regulatory Projects Manager
US Army Corps of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the City of Hermann, MO and everyone in the local community, we are expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River sand provides us and everyone in central Missouri with high quality, low cost products which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours truly,

Marie Colabello and family

Sept 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing my support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

I am a dump truck owner/operator and I realize the importance of commercial sand dredging to our local economy and across Mid-Missouri. My trade has already been hurt by MODOT cutbacks the last few years. I have been struggling to get by for the last 2 years and I am not alone. Sand is needed for what work we are still getting in the asphalt paving industry and the laying of concrete highways.

In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

I Support our local commercial sand dredging operations as well as the other mid Missouri operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. I appreciate the opportunity to comment on this very important matter.

Yours Truly,

Diana L Pope

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:36

September 1, 2010

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:38

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Dear Mr. Wheeler;

I am writing in support of providing a permit to Hermann Sand and Gravel.

The community of Hermann realizes the importance of commercial sand dredging to the local economy. In a time when it is imperative that funds are keep locally in order to stimulate the growth of this community, we need every single job for people to survive in small communities, as well as across the state. Dredging supports at least eleven local families in Hermann and allows them to work here instead of commuting to another city, thereby adding monies to local revenue. River dredging provides everyone in Central Missouri with high quality, low cost product that helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs. Missouri, as the rest of the country has suffered economic hardship and we should do all we can to provide for our small communities to survive and thrive.

I whole-heartedly support local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

I also support and encourage growth of this company, which not only provides a quality product, but whose owners, and employees, spend countless hours to support the community in which they live.

Sincerely,

Laura J Feldman

Laura J. Feldman

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:39

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896
RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler
On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.
We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.
We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,
Cathi Utley
470 Frene dr
Hermann, MO 65041

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:41

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler:

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Debra Brethorst

Debra Brethorst
204 Highway 100 W
Hermann, MO 65041

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:42

September 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Jeremy Overkamp

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:42

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler:

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Glenn Brethorst

Glenn Brethorst
204 Highway 100 W
Hermann, MO 65041

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly, Christine Crowe

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly, Martin Crane

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:57

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,
Dan Kemna

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 4:05

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Wendy Tiber

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 4:02

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Darrell Reinhart

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 4:01

Friday, September 3, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler:

On behalf of the City of Hermann, MO and everyone in our local community, we are expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our communities and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes, and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with quality jobs.

We support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours truly,

Marty & Dana Bruckerhoff

Marty & Dana Bruckerhoff

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 4:00

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO. We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs. We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Lisa Winkelman

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:59

1 September 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community and in the marine industry, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the state realize the importance of commercial sand dredging to our local economies. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in Hermann and allows them to work there instead of commuting to another city. Dredging Missouri River sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

William and Marie Colabello
470 Caballero Court
Manchester, MO 63021

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:57

September 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Christi Overkamp

Christi Overkamp

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:56

September 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Very truly yours,

Roger & Brenda Kempker
1515 Highland Avenue
Fulton, MO 65251

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 3:56

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,
Gary & Kathy Rohlfing

Gary + Kathy Rohlfing
3 Sunrise Lane
Big Spring, MO. 63363

RECEIVED
REGULATORY BRANCH

2010 SEP -7 PM 3:54

September 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler:

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours truly,

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO. We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs. We Support our local commercial sand dredging operations and *encourage you to continue commercial sand dredging on the Missouri River at levels* NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Mrs. Lindsay Flint

Lindsay M. Flint

Thank you for your time!

I know my return address says KC, Mo but this is my family in Hermann and I care about their job & what they do for their community. Thanks for reading!

RECEIVED
REGULATORY BRANCH
2010 SEP -3 PM 1:11

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, Missouri 64106-2896

RE: Comment by the Residents of Hermann, Missouri on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, Missouri and everyone in their local community, I am expressing my support for commercial sand dredging on the Missouri River in areas surrounding Hermann, Missouri.

I am not a resident of the Herman but I have a number of friends in this city that are either owners of small businesses, community leaders, teachers, farmers, or folks that previously worked for me that are very dependent on limited employment opportunities in the city of Herman. My friends in Hermann are primary employed in the businesses of farming, tourism, and sand and gravel related operations and are very dependent on responsible use of the Missouri River for employment, tourism, and sporting.

The Engemann family has owned a commercial sand dredging business employing a minimum of eleven employees since 1978. Their small business has impacted the lives of many families that it has and continues to employ, as well as other members of the Herman community who realize the importance of continuing to have a viable commercial sand dredging business in their local economy. Every local job in this community is necessary to provide the local revenues to fund operations of their city and to stimulate future growth in their community. It is important to note that this family owned business supports Central Missouri with high quality and competitively priced products to helps build roads, homes and infrastructure in Herman and in counties surrounding Hermann.

On a personal note Mr. Gerald Engemann, the founder of this business, was recognized throughout the state not only as an employer but as a community leader involved the Herman Chamber of Commerce, the Levee and Drainage District, the Veteran of Foreign Wars, local government, and other activities at both a local level and at a state level and he still found time to be a farmer. Unfortunately, he recently lost his life in an accident working with equipment from another of his locally owned businesses. However, he left the business and his incredible work ethic to his family members that share his work ethic and are very committed to continuing the business employing folks in Hermann and the surrounding areas.

I support local commercial sand dredging operations and encourage you to continue supporting commercial sand dredging on the Missouri River at levels NO LESS than current production.

Thanks for the opportunity to comment on this very important matter.

Yours Truly,
Jim Clay
Jim Clay

Barbara Flint
203 Rosalie Ave.
Berger, MO 63014

RECEIVED
REGULATORY BRANCH
2010 SEP -3 AM 11:30

September 1, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,
Barbara Flint
Barbara Flint

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

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We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

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We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

J. Scott Rood

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

On behalf of the City of Hermann, MO and everyone in our local community, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, MO.

We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

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We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

Our family love the outdoors, nature, animals, etc. We respect your efforts to save wildlife. But we do feel that the wildlife in our area have plenty of areas to maintain their habitat.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Mr & Mrs Brian Larkin

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

RE: Comment by the Residents of Hermann, MO on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler

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We in the community realize the importance of commercial sand dredging to our local economy. In a time when it is imperative that we keep our funds locally in order to stimulate the growth in our community, we need every single job for people to survive in our town. Dredging supports at least eleven local families in our community and allows them to work here instead of commuting to another city. Dredging Missouri River Sand provides us and everyone in Central Missouri with high quality, low cost product which helps build roads, homes and infrastructure within our town and in counties surrounding Hermann. This business also provides the local residents with high paying quality jobs.

We Support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours Truly,

Michael Rood

SFP Landscaping, Inc.
9800 Gravois Road Saint Louis, Missouri 63123
314-544-4436 FAX 842-8610 www.sfplandscapinginc.com

Professional landscape solutions

RECEIVED
REGULATORY BRANCH
2010 SEP -7 PM 4:01

September 3, 2010

Mr. Cody Wheeler, Regulatory Project Manager
US Army Corp of Engineers
Kansas City District Regulatory Office
601 East 12th Street, Room 402
Kansas City, MO 64106-2896

Re: Comments by St. Louis firm on the EIS for Commercial Sand Dredging

Dear Mr. Wheeler,

On behalf of the City of Hermann, its surrounding communities and those of us in the St. Louis metropolitan area, I am expressing our support for commercial sand dredging on the Missouri River and in reaches surrounding Hermann, Missouri.

We fully realize the importance of commercial sand dredging to Hermann's economy. This is a time when it is imperative that funds be kept "at home" as stimulus for the area's growth. Hermann needs every single existing job to insure the survival of its citizens! Dredging supports at least eleven Hermann area families, allowing them to locally rather than commuting. Dredging Missouri river sand provides the local area, indeed, much of Central Missouri with high quality, low cost product that helps build roads, homes and infrastructure within Hermann and in surrounding counties. The dredging and construction industries provide local residents with high paying quality jobs.

We support our local commercial sand dredging operations and encourage you to continue commercial sand dredging on the Missouri River at levels NO LESS than current production. We appreciate the opportunity to comment on this very important matter.

Yours truly,

Jen Mikiska

Jen Mikiska
Construction Field Operations Manager
SFP Landscaping, Inc.