LOW FLOW CONVEYANCE CHANNEL

BORAMEP TOTAL LOAD ANALYSIS

2001

MIDDLE RIO GRANDE, NEW MEXICO
MAY 2005

PREPARED FOR:
US BUREAU OF RECLAMATION
ALBUQUERQUE, NEW MEXICO

PREPARED BY:
FORREST JAY
JASON ALBERT
DR. PIERRE Y. JULIEN
COLORADO STATE UNIVERSITY
ENGINEERING RESEARCH CENTER
DEPARTMENT OF CIVIL ENGINEERING
FORT COLLINS, COLORADO 80523

DRAFT

Abstract

The Low Flow Conveyance Channel begins where water from the Middle Rio Grande is diverted at the San Acacia Diversion Dam. It was built to increase the water delivery to Elephant Butte Reservoir and to provide more effective sediment transport. The total load and sand load at three cross sections of the Low Flow Conveyance Channel were calculated using three different methods. The suspended sediment load was also calculated.

BORAMEP, a computer program that utilizes the Modified Einstein Procedure, was used to estimate the total load and sand load. BORAMEP was found to be moderately effective when estimating the sand load and total load of a sand bed channel such as the Low Flow Conveyance Channel.

The BORAMEP results suggest that the total load is between 100 and 1300 tons per day and the sand load is between 10 and 150 tons per day at flow rates near 300 cfs. At flow rates near 600 cfs, the total load range is between 350 and 1150 tons per day and the sand load range is between 50 and 450 tons per day.

BORAMEP total load results appear to be consistent with the total load measurements from the sampling sills at flow rates near 300 cfs but tend to underestimate the total load at flow rates near 600 cfs by at least a factor of two when compared to the total load measurements from the sampling sills. Sand load estimates from BORAMEP appear to be consistent with sand load estimates from the sampling sills at flow rates near 300 and 600 cfs

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1. Introduction

The Low Flow Conveyance Channel (LFCC) on the Middle Rio Grande was designed to increase the volume of water delivered to Elephant Butte Reservoir and to provide more effective sediment transport in the channel. The start of the LFCC is at the San Acacia Diversion Dam where water is diverted from the Rio Grande into the LFCC. When evaluating hydraulic systems such as the LFCC, it is important to quantify the amount of sediment transport. This is usually done by calculating the total load in the LFCC. The total load comes from two parts: the measured and unmeasured load. Because only part of the total load is measured in the field, it is important to get an accurate estimate of the total load from the field measurements. The Bureau of Reclamation Automated Modified Einstein Procedure (BORAMEP) is a computer program that uses the Modified Einstein Procedure to estimate the total sediment load. The purpose of this project was to use BORAMEP for calculating the total load in the LFCC for flow rates near 300 and 600 cfs in order to evaluate the effectiveness of BORAMEP for sand bed channels like the LFCC.

2. Methods

The bed material and suspended sediment data for the LFCC for the flow rates of 300 and 600 cfs were acquired from the United States Bureau of Reclamation. The percentage of the sample within each corresponding bin or size class for the suspended and bed material samples was calculated for later use. This data consisted of three trials (A, B, and C) for each cross section LF-11, LF-25, and LF-39. For a map containing the relative locations of these cross sections and the sampling sills see Appendix I. For each trial at each corresponding cross section, the samples were taken at 7 sections within each cross section. Each sample was labeled appropriately on the BORAMEP input sheet. An example of a label appears like this: LF-25B-25-30. This label means that this sample came from the LF-25 cross section, was the second trial (B) and was collected between stations 25 and 30 ft on the cross section. This sediment data was then organized with the flow rate data recorded at each cross section on the same day the sediment samples were collected. (See Appendix A: BORAMEP Input Sheets).

2.1. Method A

Method A involved summing up the total load results from BORAMEP outputs for each of the seven samples (verticals) within each cross section. Each cross section consisted of BORAMEP total load estimates for the seven verticals within each cross section. The results from each run for every cross section were incomplete because

two types of errors occurred when using BORAMEP. The first error encountered was "FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING…." This meant that the relationship between the Z-value and the fall velocity generated a negative exponent when the power curve was fitted in the Modified Einstein Procedure (MEP). This Z-value is a theoretical exponent of the equation that describes the vertical distribution of suspended sediment of a certain size range. Turbulence caused by bed forms such as dunes could cause higher sediment concentrations higher up in the water column than at the bottom of the water column; this would cause this error message to occur. The other error encountered was "NOT ENOUGH OVERLAPPING BINS FOR MEP". This message occurred often because the sediment size distribution in both the suspended sediment and bed material samples were relatively uniform for many of the parts of each cross section and because the suspended sediment was usually much finer than the bed material samples. In order for BORAMEP to run, there must be at least two overlapping bins between the suspended sediment samples and the bed material samples. Particles smaller than sand (0.0625 mm) are not used when BORAMEP is using the overlapping bins in Z-value calculations, these particles are considered wash load. Due to these two error messages occurring so frequently, the results for every cross section were incomplete. (See Appendix B: BORAMEP error messages for methods A and B).

Different values of the minimum percentage in bins to be considered during calculation of the Z-values in the MEP were used in BORAMEP. When values of 1% and higher were used, the error message indicating that there weren't enough overlapping

bins for the MEP dominated. When 0% was used, there were less errors overall but the error message indicating that a negative Z-value exponent had been calculated occurred more often than when a higher percentage was used. Minimum percentage values between 0% and 1% were tried as an attempt to minimize the total amount of errors. Using 0% for the minimum percentage in bins to be considered during Z-calculations resulted in the least amount of errors in the BORAMEP output; this value was used thereafter every time BORAMEP was run. The missing total load calculations were calculated by multiplying the average suspended sediment concentration by the flow rate and multiplied by a conversion factor.

$$Q_s \text{ (tons/day)} = 0.0027\ Q \text{ (cfs)}\ C \text{ (mg/L)}$$

This gave the suspended sediment load in tons per day. The total sand load was automatically calculated in BORAMEP when no errors were encountered. When error messages were encountered, the total sand load for the samples that had error messages were calculated by multiplying the percent sand (sum of total % in bins with size greater than 0.0625 mm in suspended sediment samples) by the suspended sediment load. The wash load was calculated by subtracting the sand load from the total load.

2.2. Method B

Method B uses all of the BORAMEP output from Method A for the mobile bed sections and uses the suspended sediment load for the rip rap sections of the cross sections. Similar to Method A, the suspended sediment total load was calculated when

errors were encountered in BORAMEP. Below is a detailed table describing how the cross section was divided into the mobile bed and rip rap sections (see Table 2-1. Left and Right Endpoints of Mobile Bed Section).

Table 2-1. Left and Right Endpoints of Mobile Bed Section

	Left/Right endpoints of mobile bed section (ft)		
Cross Section	**From Survey Data**	**300 cfs**	**600 cfs**
LF-11	32 - 50	32 - 48	34 - 50
LF-25	20 - 56	25 - 54	21 - 57
LF-39	24 - 64	29 - 56	20 - 62

2.3. Method C

This method consisted of calculating the suspended sediment load for each part of the cross section by multiplying the suspended sediment concentration by the flow rate and the appropriate conversion factor giving the suspended sediment load in tons/day. The total load for the cross section was the sum of the suspended sediment load for the seven parts of the particular cross section.

2.4. Method D

Since the results were incomplete for Method A, the data for each of the three runs for each cross section was averaged over the width of each cross section. For the nine runs, only two error messages were encountered for the 300 cfs flow and one error message was encountered for the 600 cfs flow. The only type of error message that occurred was associated with the fitted Z-values generating a negative exponent (see Appendix C: BORAMEP error messages for Method D). The benefit of this method

over methods A, B, and C was that the total load was calculated for at least one run on each cross section without supplementing the MEP results with suspended sediment load calculations. The sand load and wash load was calculated in the same manner as they were in Method A

3. Results and Discussion

BORAMEP was run for all methods at the 300 and 600 cfs flow rates. All the suspended sediment load calculations were made when error messages were encountered in BORAMEP.

3.1. Method D

The BORAMEP Method D was completed (see Appendix D: BORAMEP Method D Output). Below are the results from the Method D for the 300 and 600 cfs runs. See Table 3-1. Total Load Results from Method D.

Table 3-1. Total Load Results from Method D

	Method D--300 cfs				Method D--600 cfs			
CR-Sec	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/Day)	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/Day)
LF-11A	280	351	147	204	621	1424	578	846
LF-11B	273	212	80	133	595	926	323	602
LF-11C	262	179	57	122	579	1228	512	715
LF-25A	281	1238	18	1220	587	509	73	435
LF-25B	272	907	84	823	566	474	65	409
LF-25C	287	1254	15	1239	573	528	86	443
LF-39A	287	189	30	159	603	431	54	377
LF-39B	277	154	29	125	571	398	41	357
LF-39C	290	179	38	142	570	377	34	343

The data sets that have the sand load highlighted in light green were the runs that had an error message from the BORAMEP program. All three of these errors dealt with the negative Z-value being generated in the MEP. One result that stands out is the output from the 300 cfs runs for the LF-25 cross section. The total loads for all three

runs are much higher at this cross section than at the other cross sections at 300 cfs. These are also higher than the total load calculations at the same cross section at a higher flow rate, 600 cfs. The sediment samples for LF-11, LF-25, and LF-39 were collected on 6/8/01, 6/11/01, and 6/9/01 respectively. External factors could have increased the wash load on 6/11/01. This high wash load could be due to the channel not reaching equilibrium after flow rates were changed, error in data collection (perhaps recording the wrong suspended sediment concentration), or high wash load in the Rio Grande on that day. Flow records of the Rio Grande and Rio Puerco (a tributary of the Rio Grande that enters just above San Acacia and usually contains high sediment loads) on 6/11/01 were investigated and there is no indication of a significant increase in flow or suspended sediment concentration. An error in data collection is the likely cause of the abnormally high total load. The above table indicates that whenever the suspended sediment load was used instead of the total load from the MEP, the results are lower.

3.2. Method A

The BORAMEP Method A was completed (see Appendix E: BORAMEP Method A Output). Below are the results from Method A (see Table 3-2. Total Load Results From Method A).

Table 3-2. Total Load Results from Method A

	Method A--300 cfs				Method A--600 cfs			
CR-Sec	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/Day)	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/Day)
LF-11A	280	352	152	199	621	1123	465	658
LF-11B	273	220	84	136	595	1036	419	617
LF-11C	262	229	85	144	579	1012	450	562
LF-25A	281	1284	58	1226	587	514	84	431
LF-25B	272	1312	134	1177	566	498	82	416
LF-25C	287	1232	92	1140	573	481	87	394
LF-39A	287	154	15	139	603	411	57	354
LF-39B	277	138	16	123	571	400	45	355
LF-39C	290	163	15	148	570	456	49	408

Since there weren't two sizes of overlapping bins between the suspended sediment and bed material samples and the fitted Z-values generated a negative exponent up to five times for each cross section, the BORAMEP results were incomplete for all cross sections in Method A. The parts of each cross section that were incomplete were completed by calculating the suspended sediment total load. Given that every trial had this problem, the total load results were lower than expected.

3.3. Method B

The BORAMEP Method B was completed (see Appendix F: BORAMEP Method B Output). Shown below are the results from Method B at flow rates of 300 and 600 cfs (see Table 3-3. Total Load Results from Method B at 300 cfs and Table 3-4. Total Load Results from Method B at 600 cfs).

Table 3-3. Total Load Results from Method B at 300 cfs

		Method B--300 cfs						
		Mobile Bed Section						
CR-Sec	Total Q (cfs)	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/day)	Susp Sed Total Load (Ton/day)	Susp Sed Side Slopes (Ton/day)	Total Load (Ton/day)
LF-11A	280	181	240	114	126	209	93	333
LF-11B	273	173	146	56	90	136	69	216
LF-11C	262	184	157	61	96	128	65	222
LF-25A	281	220	1128	34	1094	1002	156	1284
LF-25B	272	217	1081	55	1026	955	231	1312
LF-25C	287	214	949	54	895	894	283	1232
LF-39A	287	201	117	7	110	92	37	154
LF-39B	277	191	98	15	83	83	40	138
LF-39C	290	199	123	14	109	89	40	163

Table 3-4. Total Load Results from Method B at 600 cfs

		Method B--600 cfs						
		Mobile Bed Section						
CR-Sec	Total Q (cfs)	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/day)	Susp Sed Total Load (Ton/day)	Susp Sed Side Slopes (Ton/day)	Total Load (Ton/day)
LF-11A	621	363	722	327	396	633	394	1117
LF-11B	595	349	617	280	337	615	362	979
LF-11C	579	345	667	323	343	592	337	1003
LF-25A	587	474	432	76	356	413	82	514
LF-25B	566	460	416	73	343	392	82	498
LF-25C	573	459	397	76	321	376	84	481
LF-39A	603	522	360	52	308	339	52	411
LF-39B	571	499	357	41	316	317	43	400
LF-39C	570	495	414	46	368	312	42	456

The above results show that the suspended sediment total load in the rip rap side slope areas were always lower than the total load from the mobile bed section. All of the above results had to be modified because of the occurrence of error messages indicating that there weren't enough overlapping bins and the fitted Z-values generated a negative exponent. The suspended sediment load was calculated for these cases; as

a result the total load figures are lower than what they would have been if the MEP was complete from BORAMEP.

3.4. Method C

Method C was completed (see Appendix G: Method C Results). Shown below are the results from Method C, which is the sum of the suspended sediment load from each part of the cross section (see Table 3-5. Suspended Sediment Load from Method C).

Table 3-5. Suspended Sediment Load from Method C

	Method C--300 cfs			Method C--600 cfs		
CR-Sec	Date	Q (cfs)	Susp Sed Total Load (Ton/day)	Date	Q (cfs)	Susp Sed Total Load (Ton/day)
LF-11A	6/8/2001	280	302	5/27/2001	621	1027
LF-11B	6/8/2001	273	206	5/27/2001	595	978
LF-11C	6/8/2001	262	193	5/27/2001	579	929
LF-25A	6/11/2001	281	1158	5/28/2001	587	495
LF-25B	6/11/2001	272	1186	5/28/2001	566	474
LF-25C	6/11/2001	287	1176	5/29/2001	573	460
LF-39A	6/9/2001	287	129	5/29/2001	603	390
LF-39B	6/9/2001	277	123	5/30/2001	571	360
LF-39C	6/9/2001	290	129	5/30/2001	570	354

4. Comparisons of Methods

The four methods described above have similar and different results. The total load results for each method at a flow rate of 300 cfs were first compared to the results from Method A by dividing the results from the other methods by the total load result from Method A. See Table 4-1. Comparison to Method A at 300 cfs.

Table 4-1. Comparison to Method A at 300 cfs

		Method A	Method D		Method B		Method C	
CR-Sec	Q (cfs)	Total Load (Ton/day)	Total Load (Ton/day)	% of Method Al	Total Load (Ton/day)	% of Method A	Susp Sed Total Load (Ton/day)	% of Method A
LF-11A	280	352	351	100%	333	95%	302	86%
LF-11B	273	220	212	96%	216	98%	206	93%
LF-11C	262	229	179	78%	222	97%	193	84%
LF-25A	281	1284	1238	96%	1284	100%	1158	90%
LF-25B	272	1312	907	69%	1312	100%	1186	90%
LF-25C	287	1232	1254	102%	1232	100%	1176	96%
LF-39A	287	154	189	122%	154	100%	129	83%
LF-39B	277	138	154	111%	138	100%	123	89%
LF-39C	290	163	179	110%	163	100%	129	79%

The total load results for each method at a flow rate of 600 cfs were compared to the results from Method A by dividing the results from the other methods by the total load result from Method A (see Table 4-2. Comparison to Method A at 600 cfs).

Table 4-2. Comparison to Method A at 600 cfs

		Method A	Method D		Method B		Method C	
CR-Sec	Q (cfs)	Total Load (Ton/day)	Total Load (Ton/day)	% of Method A	Total Load (Ton/day)	% of Method A	Susp Sed Total Load (Ton/day)	% of Method A
LF-11A	621	1123	1424	127%	1117	99%	1027	91%
LF-11B	595	1036	926	89%	979	95%	978	94%
LF-11C	579	1012	1228	121%	1003	99%	929	92%
LF-25A	587	514	509	99%	514	100%	495	96%
LF-25B	566	498	474	95%	498	100%	474	95%
LF-25C	573	481	528	110%	481	100%	460	96%
LF-39A	603	411	431	105%	411	100%	390	95%
LF-39B	571	400	398	99%	400	100%	360	90%
LF-39C	570	456	377	82%	456	100%	354	78%

By closely observing the percent of the total of Method A for Method B at both flow rates, it is evident that the total loads for method B at cross sections LF-25 and LF-39 are exactly the same as the total loads for Method A. This is due to the error messages. The error messages seemed to occur at the stations that were part of the rip rap side slope areas. The error that seemed to occur most frequently indicated that there weren't enough overlapping bins in the suspended sediment and bed material samples for the MEP to run in BORAMEP. This error message makes sense since the bed material in the rip rap sections of the channel is coarser than the bed material in the mobile bed section and the suspended sediment samples. The Modified Einstein Procedure doesn't apply over the rip rap side slopes. The results were the same calculated total load values for the LF-25 and LF-39 cross sections for both Method A and Method B. The results from the LF-11 cross sections for Method B were within 5% of Method A.

Since Method D was the only one that had complete BORAMEP output for each cross section, the total load for Methods A, B, and C were compared to the total load from Method D at 300 cfs. (see Table 4-3. Comparison to Method D at 300 cfs).

Table 4-3. Comparison to Method D at 300 cfs

		Method D	Method A		Method B		Method C	
CR-Sec	Q (cfs)	Total Load (Ton/day)	Total Load (Ton/day)	% of Method D	Total Load (Ton/day)	% of Method D	Susp Sed Total Load (Ton/day)	% of Method D
LF-11A	280	351	352	100%	333	95%	302	86%
LF-11B	273	212	220	104%	216	102%	206	97%
LF-11C	262	179	229	128%	222	124%	193	108%
LF-25A	281	1238	1284	104%	1284	104%	1158	93%
LF-25B	272	907	1312	145%	1312	145%	1186	131%
LF-25C	287	1254	1232	98%	1232	98%	1176	94%
LF-39A	287	189	154	82%	154	82%	129	68%
LF-39B	277	154	138	90%	138	90%	123	80%
LF-39C	290	179	163	91%	163	91%	129	72%

In a similar manner, the total load for Methods A, B, and C were compared to the total load from Method D at 600 cfs (see Table 4-4. Comparison to Method D at 600 cfs).

Table 4-4. Comparison to Method D at 600 cfs

		Method D	Method A		Method B		Method C	
CR-Sec	Q (cfs)	Total Load (Ton/day)	Total Load (Ton/day)	% of Method D	Total Load (Ton/day)	% of Method D	Susp Sed Total Load (Ton/day)	% of Method D
LF-11A	621	1424	1123	79%	1117	78%	1027	72%
LF-11B	595	926	1036	112%	979	106%	978	106%
LF-11C	579	1228	1012	82%	1003	82%	929	76%
LF-25A	587	509	514	101%	514	101%	495	97%
LF-25B	566	474	498	105%	498	105%	474	100%
LF-25C	573	528	481	91%	481	91%	460	87%
LF-39A	603	431	411	96%	411	96%	390	91%
LF-39B	571	398	400	101%	400	101%	360	90%
LF-39C	570	377	456	121%	456	121%	354	94%

These tables indicate that the total load results from these four methods have more similarities at 600 cfs than at 300 cfs.

The total load results from each of the four methods at 300 cfs were plotted for all three runs at each cross section (see Figure 4-1. Total Sediment Load Method Comparison 300 cfs Run).

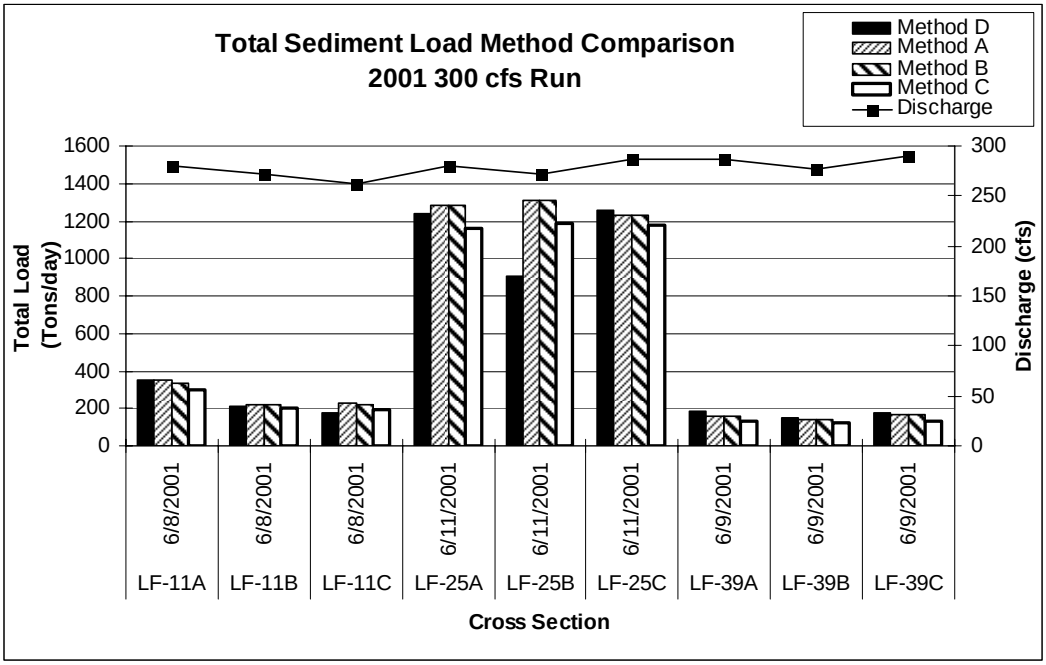

Figure 4-1. Total Sediment Load Method Comparison 300 cfs Run

In order to compare the results for each method at 600 cfs for all three runs at each cross section, the total load results were plotted (see Figure 4-2. Total Sediment Load Method Comparison 2001 600 cfs Run).

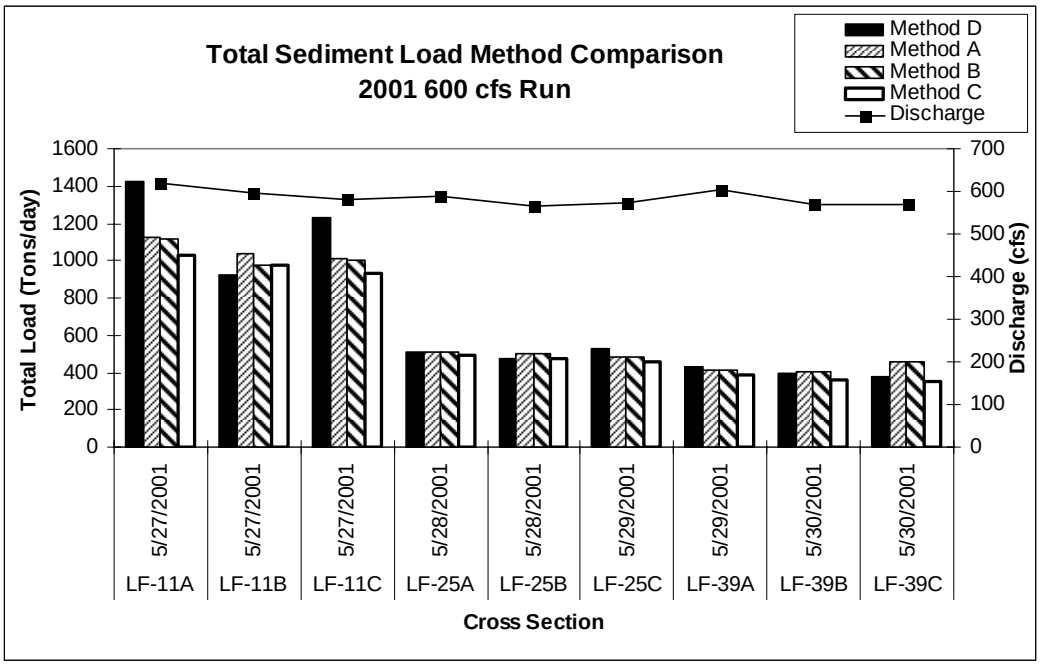

Figure 4-2. Total Sediment Load Method Comparison 600 cfs Run

From the above figures and tables, only four instances occurred where the suspended sediment load (Method C) exceeded or equaled the total load from Method D. This occurred at cross sections LF-11C and LF-25B at flows near 300 cfs and at cross sections LF-11B and LF-25B at flow rates near 600 cfs. Error messages indicating that the fitted Z-values generated a negative exponent occurred at LF-11C (at flows near 300 cfs) and LF-11B (at flows near 300 and 600 cfs) so the suspended sediment load was calculated from the suspended sediment concentrations that were averaged over the width of the cross section. Method D estimate for trial LF-11B at 300 cfs was less than the suspended sediment load (Method C) due to averaging the suspended sediment concentrations over the entire width of the cross section. BORAMEP total results for LF-25B (at flows near 300 cfs and 600 cfs) were the lowest of the three trials at this cross section at both flow rates. This most likely occurred because averaging the

bed material and suspended sediment samples over the width of the entire cross section in Method D resulted in lower suspended sediment concentrations.

To investigate how much of the total load is the sand load or wash load, a graph was constructed to display the contribution of sand and wash load to the total load for Method D at 300 and 600 cfs (see Figure 4-3. Sand Load and Wash Load as Part of Total Load for Method D at 300 and 600 cfs).

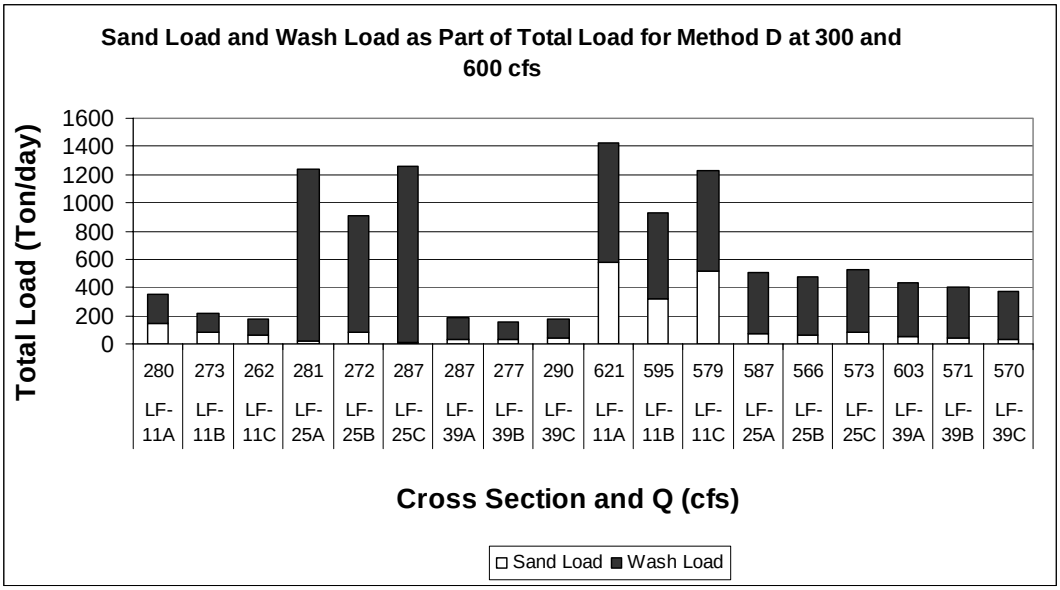

Figure 4-3. Sand Load and Wash Load as Part of Total Load for Method D at 300 and 600 cfs

Above the cross section label on the x-axis is the discharge of the LFCC in cfs. The ratio of sand load to wash load was calculated for all three methods and all three cross sections (see Appendix H: Ratio of Sand Load to Wash Load). The sand load for LF-11 at both flow rates is higher than the sand load at the other two cross sections. It could be possible that the slope of the bed at LF-11 is larger than the bed slope of the other two cross sections.

In order to compare the sand load to the wash load ratio from method A, another graph was created (see Figure 4-4. Sand Load and Wash Load as Part of Total Load for Method A).

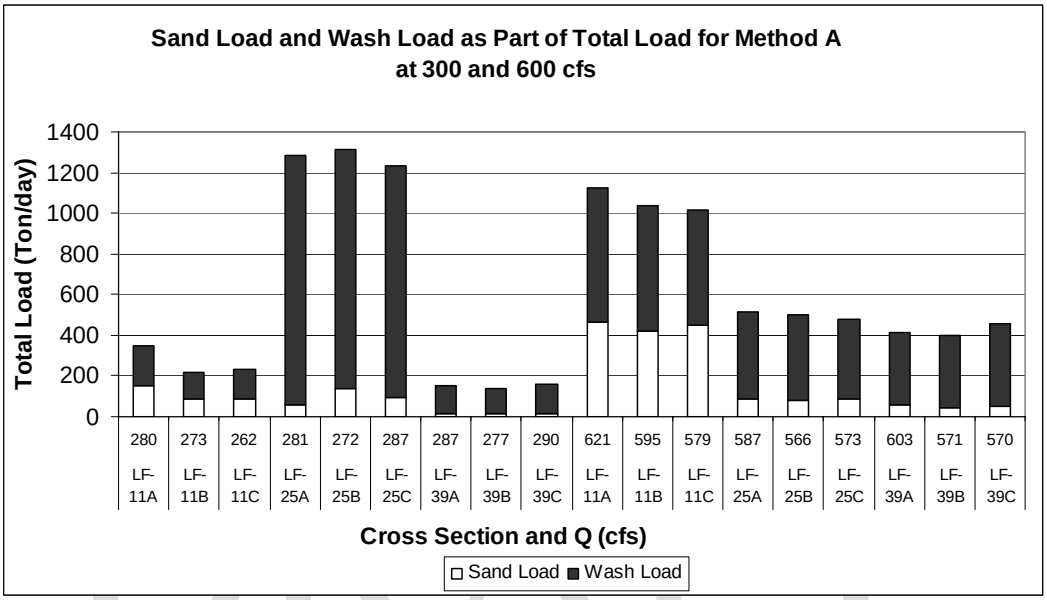

Figure 4-4. Sand Load and Wash Load as Part of Total Load for Method A at 300 and 600 cfs

The same process was completed for Method B, however, the graph only shows the sand and wash load for the mobile bed section (see Figure 4-5. Sand Load and Wash Load as Part of Total Load for Method B at 300 and 600 cfs).

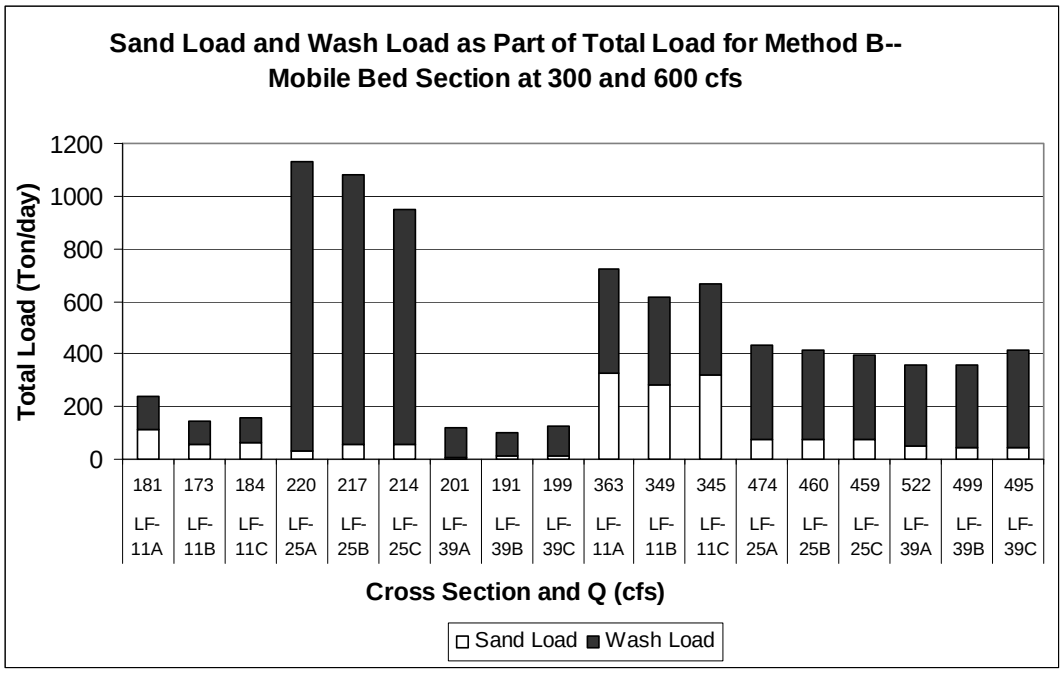

Figure 4-5. Sand Load and Wash Load as Part of Total Load for Method B at 300 and 600 cfs

The above graph indicates that most of the total load from cross sections LF-25 and LF-39 comes from the wash load and the total load for cross section LF-11 is evenly split between sand and wash load. At both flow rates, the LF-11 cross section has the highest sand load of all the cross sections. Upon closer inspection of cross section LF-25 at the 300 cfs flow rate, it is evident that most of the total load is due to the wash load and the sand load is much less than what was indicated at 600 cfs.

To see how the BORAMEP total load estimates from Method D, Method A, and Method B compared to the suspended sediment load (Method C) two tables were constructed by dividing the total load estimates from Method D, Method A, and Method B by the suspended sediment load. (See Table 4-5. Comparison to Suspended Sediment Load at 300 cfs and Table 4-6. Comparison to Suspended Sediment Load at 600 cfs).

Table 4-5. Comparison to Suspended Sediment Load at 300 cfs

		Method C	Method D		Method A		Method B	
CR-Sec	Q (cfs)	SS Load (Ton/day)	Total Load (Ton/day)	% of SS Load	Total Load (Ton/day)	% of SS Load	Total Load (Ton/day)	% of SS Load
LF-11A	280	302	351	116%	352	117%	333	110%
LF-11B	273	206	212	103%	220	107%	216	105%
LF-11C	262	193	179	93%	229	118%	222	115%
LF-25A	281	1158	1238	107%	1284	111%	1284	111%
LF-25B	272	1186	907	76%	1312	111%	1312	111%
LF-25C	287	1176	1254	107%	1232	105%	1232	105%
LF-39A	287	129	189	147%	154	120%	154	120%
LF-39B	277	123	154	125%	138	113%	138	113%
LF-39C	290	129	179	139%	163	126%	163	126%

Table 4-6. Comparison to Suspended Sediment Load at 600 cfs

		Method C	Method D		Method A		Method B	
CR-Sec	Q (cfs)	SS Load (Ton/day)	Total Load (Ton/day)	% of SS Load	Total Load (Ton/day)	% of SS Load	Total Load (Ton/day)	% of SS Load
LF-11A	621	1027	1424	139%	1123	109%	1117	109%
LF-11B	595	978	926	95%	1036	106%	979	100%
LF-11C	579	929	1228	132%	1012	109%	1003	108%
LF-25A	587	495	509	103%	514	104%	514	104%
LF-25B	566	474	474	100%	498	105%	498	105%
LF-25C	573	460	528	115%	481	105%	481	105%
LF-39A	603	390	431	110%	411	105%	411	105%
LF-39B	571	360	398	111%	400	111%	400	111%
LF-39C	570	354	377	106%	456	129%	456	129%

Method D, Method A, and Method B were on the average 13 to 14% greater than the suspended sediment load at 300 cfs and on the average 8 to 12% greater than the suspended sediment load at flows near 600 cfs.

5. Comparison to LFCC Results from Rating Curves

Three types of total load and sand load rating curves for the LFCC near San Marcial were created using the same BORAMEP results used in Jason Albert's M.S. Thesis (2004). Albert had used suspended sediment and bed material samples along with flow data from the USGS gage on the LFCC near San Marcial (#08358300) from 1968 to 1994 to run in BORAMEP. Even though the cross sections used in the BORAMEP analysis are approximately 50 miles upstream from San Marcial, a comparison was still wanted between BORAMEP results and total load rating curves constructed from the San Marcial gage data. Three types of total load rating curves were created using this BORAMEP output. The first type was the total load (Q_T in tons/day) vs. discharge (Q in cfs), the second type was total load (Q_T in tons/day) vs. suspended sediment load (Q_{ss} in tons/day), and the third type was total load (Q_T in tons/day) vs. suspended sediment concentration (C_{ss} in mg/L). Below are these rating curves and the corresponding coefficient of determination in the same order.

$Q_T = 0.0003\ Q^{2.5202}$ $R^2 = 0.8275$

$Q_T = 2.5576\ Q_{ss}^{0.9338}$ $R^2 = 0.9897$

$Q_T = 0.3053\ C_{ss}^{1.3109}$ $R^2 = 0.959$

Below are these three rating curves in the same order.

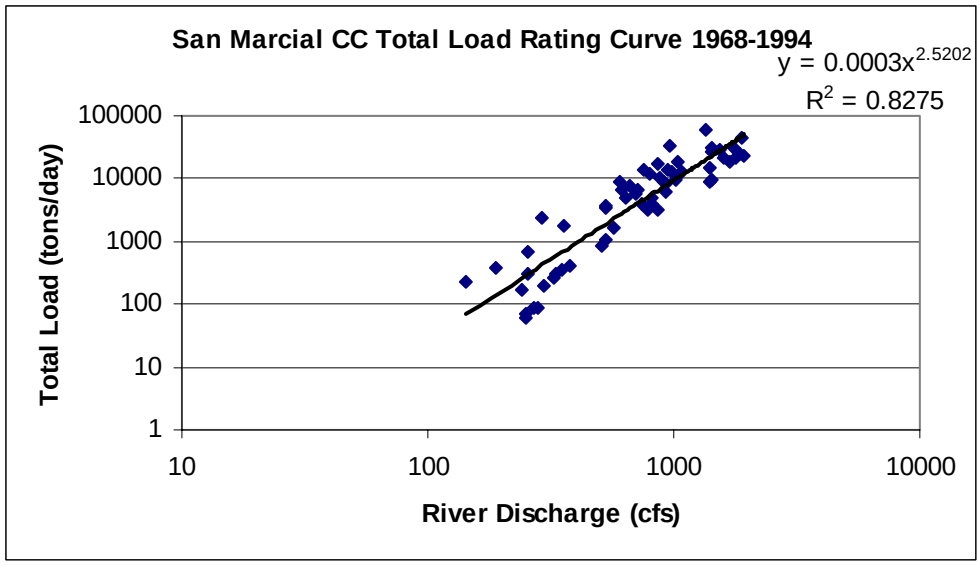

Figure 5-1. LFCC Total Load vs. River Discharge Rating Curve

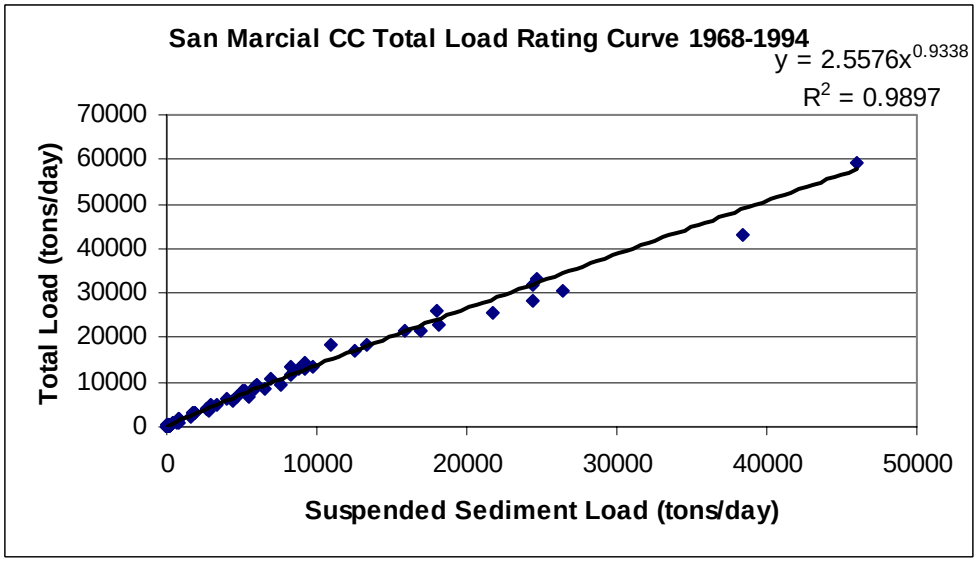

Figure 5-2. LFCC Total Load vs. Suspended Sediment Load Rating Curve

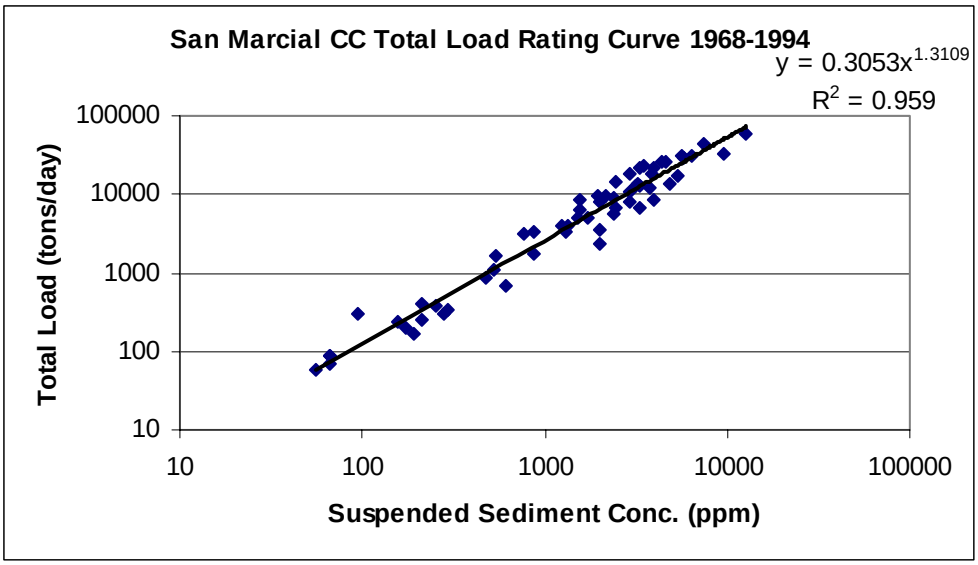

Figure 5-3. LFCC Total Load vs. Suspended Sediment Conc. Rating Curve

The same procedure as above was followed but the BORAMEP sand load was used. Three types of sand load rating curves were created. The first type was the sand load (Q_{TS} in tons/day) vs. discharge (Q in cfs), the second type was total load (Q_{TS} in tons/day) vs. suspended sediment load (Q_{ss} in tons/day), and the third type was total load (Q_{TS} in tons/day) vs. suspended sediment concentration (C_{ss} in mg/L). Below are these sand load rating curves and the corresponding coefficient of determination in the same order.

$Q_{TS} = 0.0002\ Q^{2.49}$ $\quad R^2 = 0.8092$

$Q_{TS} = 1.6919\ Q_{ss}^{0.9242}$ $\quad R^2 = 0.9712$

$Q_{TS} = 0.2050\ C_{ss}^{1.2984}$ $\quad R^2 = 0.9425$

Below are the Sand Load rating curves in the same order.

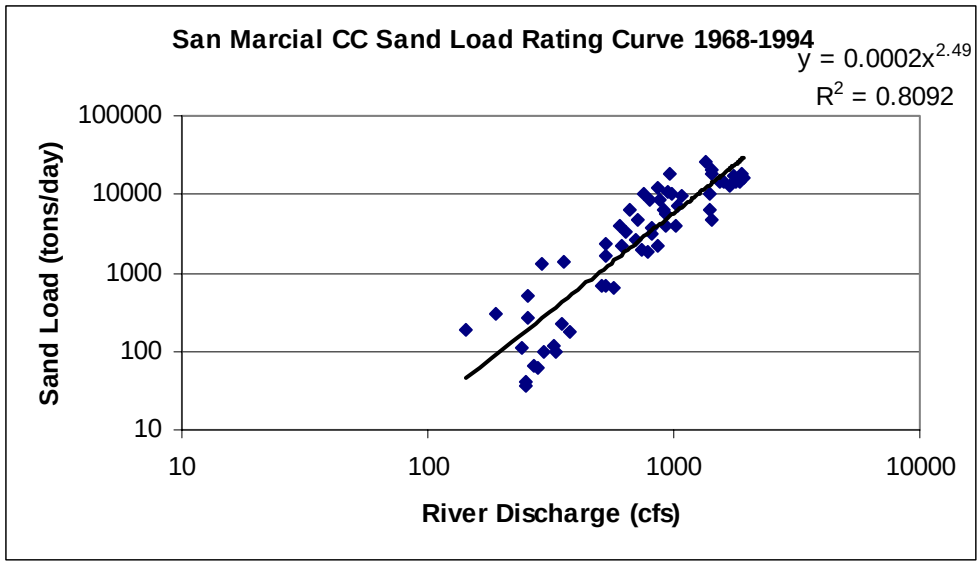

Figure 5-4. LFCC Sand Load vs. River Discharge Rating Curve

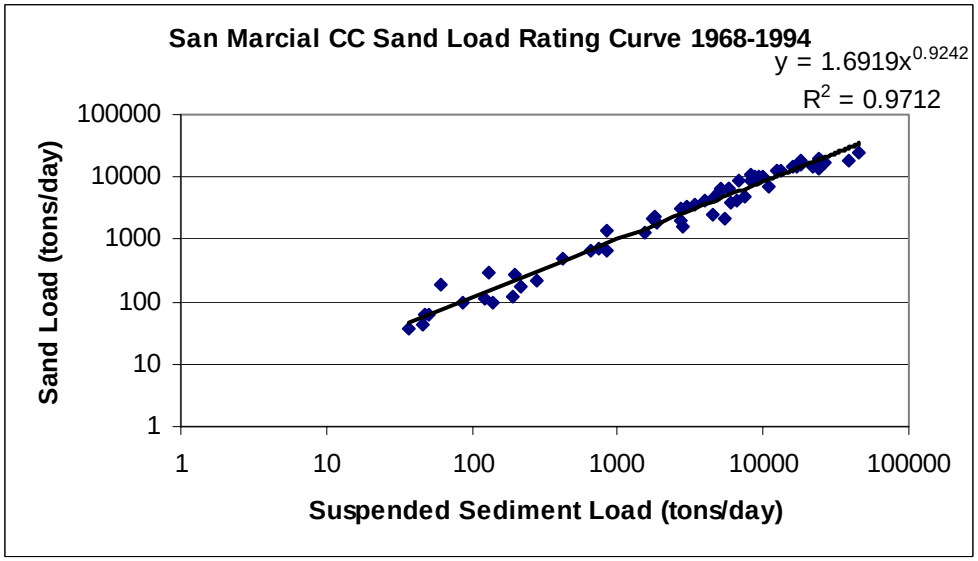

Figure 5-5. LFCC Sand Load vs. Suspended Sediment Load Rating Curve

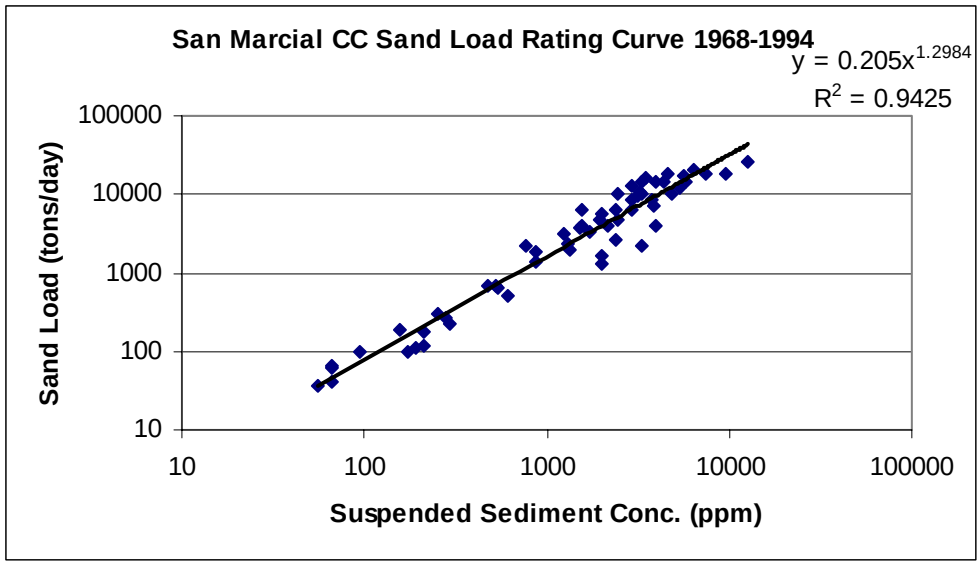

Figure 5-6. LFCC Sand Load vs. Suspended Sediment Conc. Rating Curve

The river flow rate, suspended sediment concentration, and suspended sediment load for each run were inserted into the appropriate sand load and total load rating curve equations and compared to the BORAMEP Method A results (see Table 5-1. Comparison of BORAMEP Method A to Rating Curves).

Table 5-1. Comparison of BORAMEP Method A to Rating Curves

				Method A Results		Discharge Rating Curve Results		SS Load Rating Curve Results		SS Conc. Rating Curve Results	
Cross Section	Q (cfs)	Qss (tons/day)	Css (mg/L)	Total Load (tons/day)	Sand Load (tons/day)	Total Load (tons/day)	Sand Load (tons/day)	Total Load (tons/day)	Sand Load (tons/day)	Total Load (tons/day)	Sand Load (tons/day)
LF-11A	280	302	399	352	152	442	248	529	331	785	489
LF-11B	273	206	279	220	84	413	232	370	232	492	308
LF-11C	262	193	273	229	85	373	210	349	219	478	299
LF-25A	281	1158	1530	1284	58	444	250	1856	1148	4564	2796
LF-25B	272	1186	1614	1312	134	411	232	1898	1173	4898	2999
LF-25C	287	1176	1518	1232	92	471	264	1884	1165	4521	2770
LF-39A	287	129	167	154	15	468	263	239	151	250	157
LF-39B	277	123	164	138	16	431	242	229	144	245	154
LF-39C	290	129	165	163	15	482	271	240	151	247	156
LF-11A	621	1027	613	1123	465	3283	1802	1660	1027	1378	854
LF-11B	595	978	609	1036	419	2950	1622	1585	982	1365	846
LF-11C	579	929	595	1012	450	2755	1516	1512	936	1323	820
LF-25A	587	495	313	514	84	2849	1567	840	523	570	356
LF-25B	566	474	310	498	82	2599	1431	806	502	564	352
LF-25C	573	460	298	481	87	2681	1475	784	489	534	334
LF-39A	603	390	240	411	57	3048	1675	672	420	403	252
LF-39B	571	360	234	400	45	2657	1462	623	390	389	244
LF-39C	570	354	230	456	49	2645	1456	614	384	381	239

For better comparison purposes, the total load from Method A and the rating curves were also plotted with the flow rate (see Figure 5-7. Total Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 300 cfs and Figure 5-8. Total Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 600 cfs).

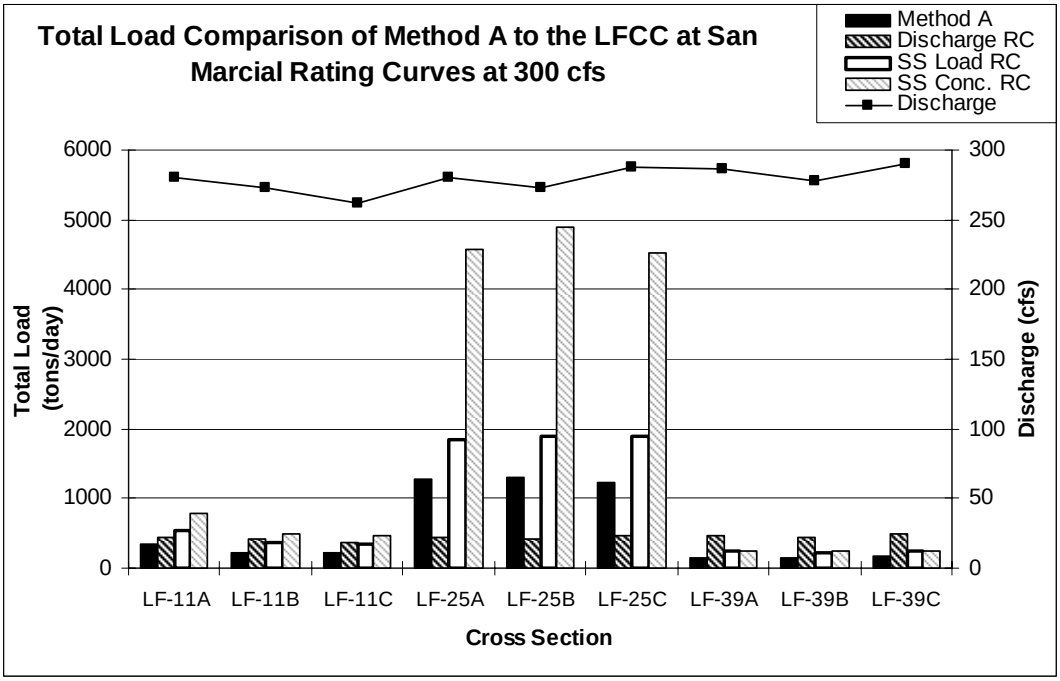

Figure 5-7. Total Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 300 cfs

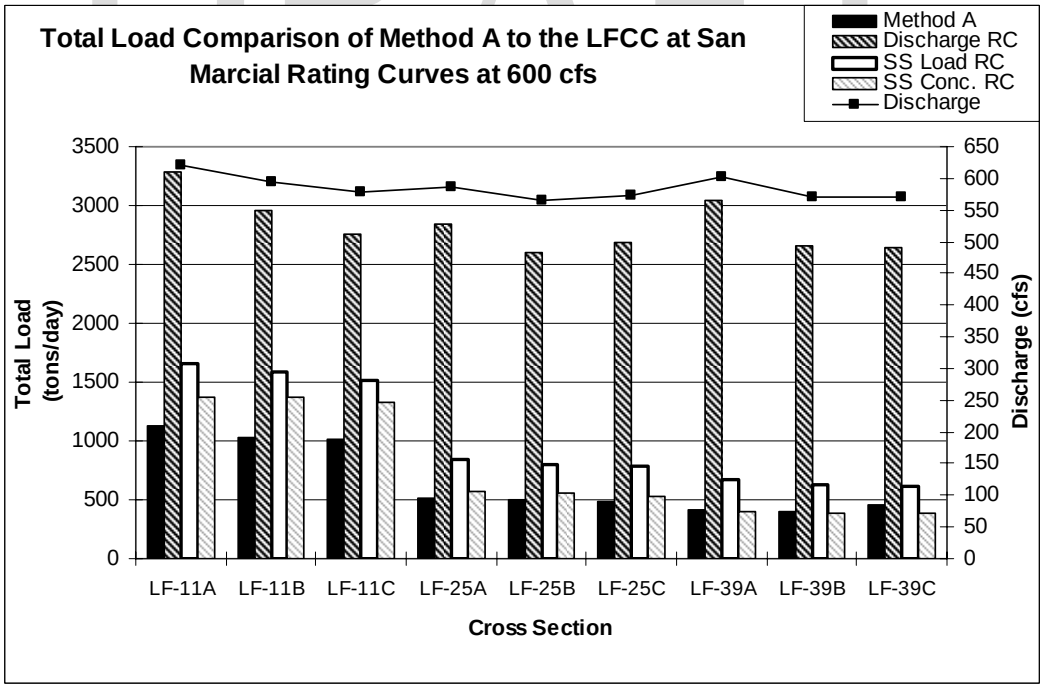

Figure 5-8. Total Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 600 cfs

Looking closely at Figure 5-7, the total load estimates from Method A, the discharge rating curves, the suspended sediment load rating curves, and the suspended sediment

concentration rating curves yield similar results for the LF-11 and LF-39 cross sections at flow rates near 300 cfs, but at LF-25 the results appear to vary greatly due to the abnormally high suspended sediment concentration recorded at this cross section for a particularly low flow rate. On Figure 5-8, it is apparent that the results from BORAMEP Method A are similar in magnitude to the results from the suspended sediment load and concentration rating curves. This suggests that there is a higher correlation between total load and suspended sediment rather than discharge itself; this argument seems very intuitive. When comparing the BORAMEP results to total load estimates from total load versus river discharge rating curves, the BORAMEP results are much lower than the results from the discharge rating curves. This supports the argument that BORAMEP may be more sensitive to suspended sediment concentrations rather than river discharge.

In a similar manner, the BORAMEP Method A sand load estimates were also compared to the estimates from the sand load rating curves (see Figure 5-9. Sand Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 300 cfs and Figure 5-10. Sand Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 600 cfs).

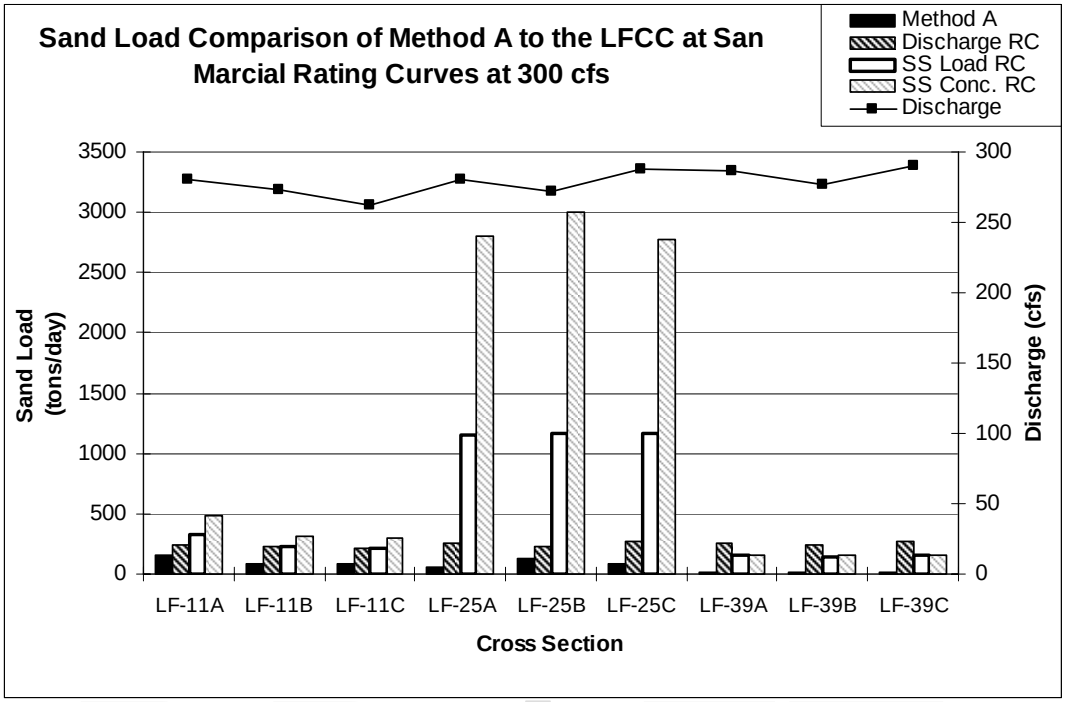

Figure 5-9. Sand Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 300 cfs

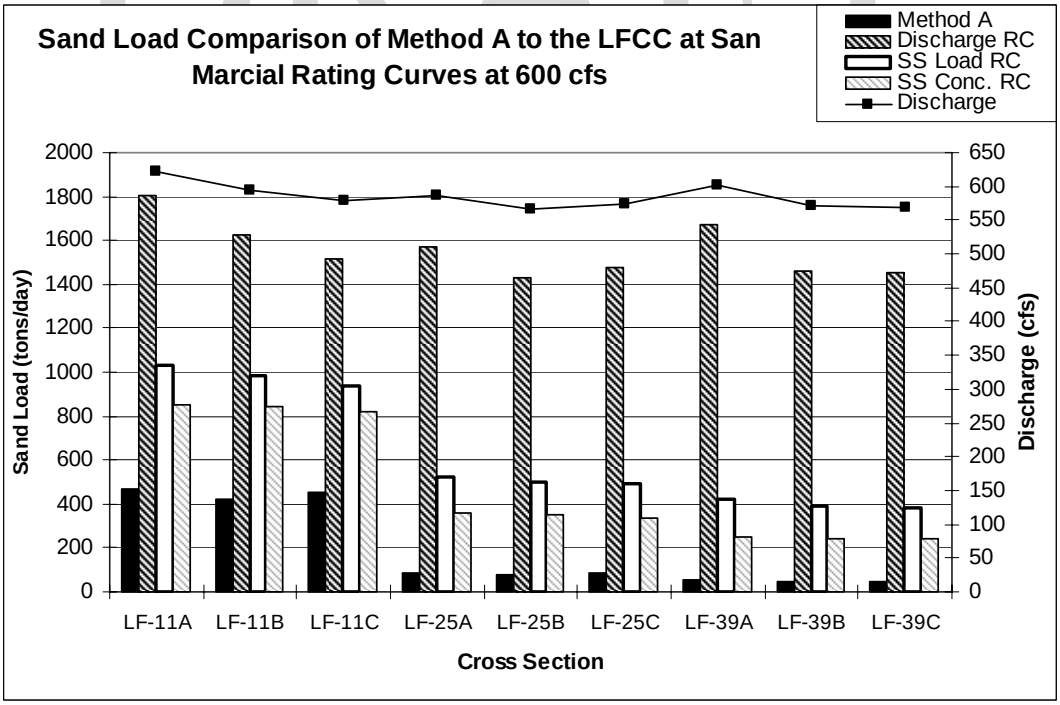

Figure 5-10. Sand Load Comparison of Method A to the Rating Curve Results at Flow Rates Near 600 cfs

When comparing the sand load estimates from Method A to the sand load results from the three rating curves, it appears that the sand load from Method A is always lower than the sand load from the rating curves. This underestimation could just be due to supplementing the BORAMEP Method A results with the suspended sediment load when error messages occurred.

To further understand the variability of the BORAMEP total load results, the BORAMEP total load and sand load estimates (from Method A) were plotted on the total load vs. river discharge and sand load vs. river discharge rating curves. (see Figure 5.11. BORAMEP Total Load Inside Variability and Figure 5.12. BORAMEP Sand Load Variability.

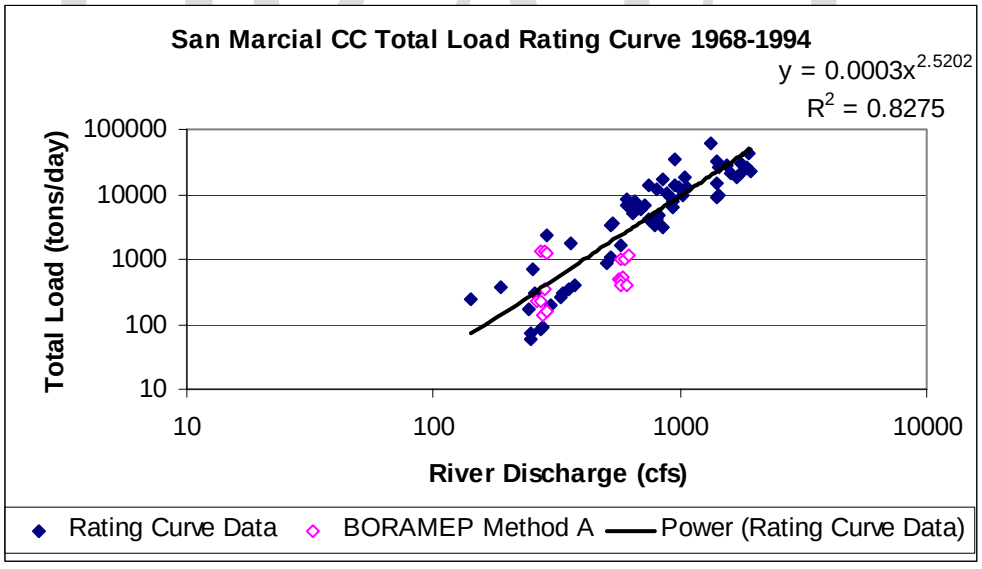

Figure 5-11. BORAMEP Total Load Variability

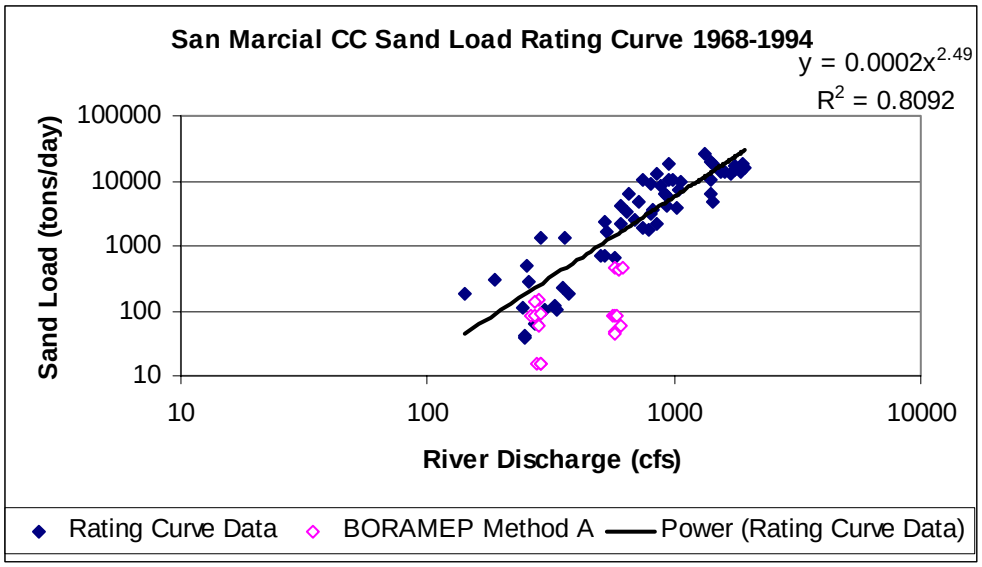

Figure 5-12. BORAMEP Sand Load Variability

The BORAMEP total load estimates appear to be within the measured variability of the total load at San Marcial, but the sand load estimates from BORAMEP Method A appear to be on the low side of the variability of the sand load measurements at San Marcial. The sand load estimates from Method A may be underestimating the sand load because of the occurrence of error messages (not enough overlapping bins and fitted Z-values generated negative exponent) and the supplementing the total load with the suspended sediment load

6. Comparison to Total Load Sampling Sills

Two total load sampling sills are located at the Foot Bridge (LF-FB) and Vehicle Bridge (LF-FB) (The relative locations of these sampling sills can be found on the maps contained in Appendix I). The presence of the sampling sill allows the entire water column to be sampled with depth integrated or point samplers with a tolerance of 0.05 to 0.1 feet. Suspended sediment samples were taken on the same days as samples were taken at LF-11, LF-25 (except on 6/11/01), and LF-39. The suspended sediment concentrations (mg/L) at the sampling sills were multiplied by the approximate flow rate (300 and 600 cfs) and the appropriate conversion factor (0.0027) to give an estimate of the total load (in tons per day) at the total load sampling sills. The total load results from the sampling sills (LF-FB and LF-VB) along with the BORAMEP Method A total load estimates were plotted against the date on which the field samples were taken (see Figure 6-1. Sampling Sill and BORAMEP Total Load Results vs. Date at 300 cfs and Figure 6-2. Sampling Sill and BORAMEP Total Load Results vs. Date at 600 cfs).

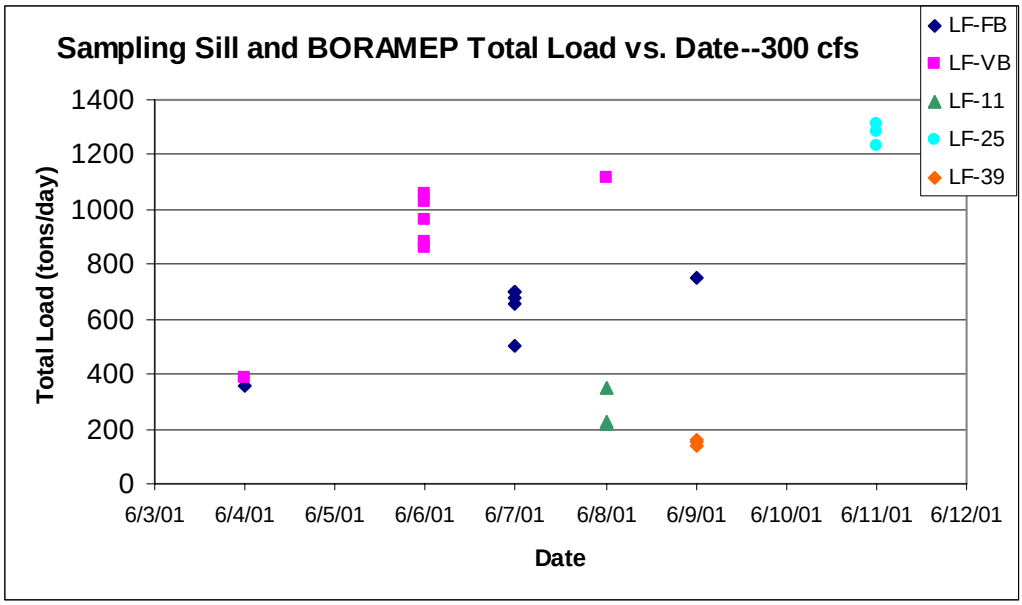

Figure 6-1. Sampling Sill and BORAMEP Total Load vs. Date at 300 cfs

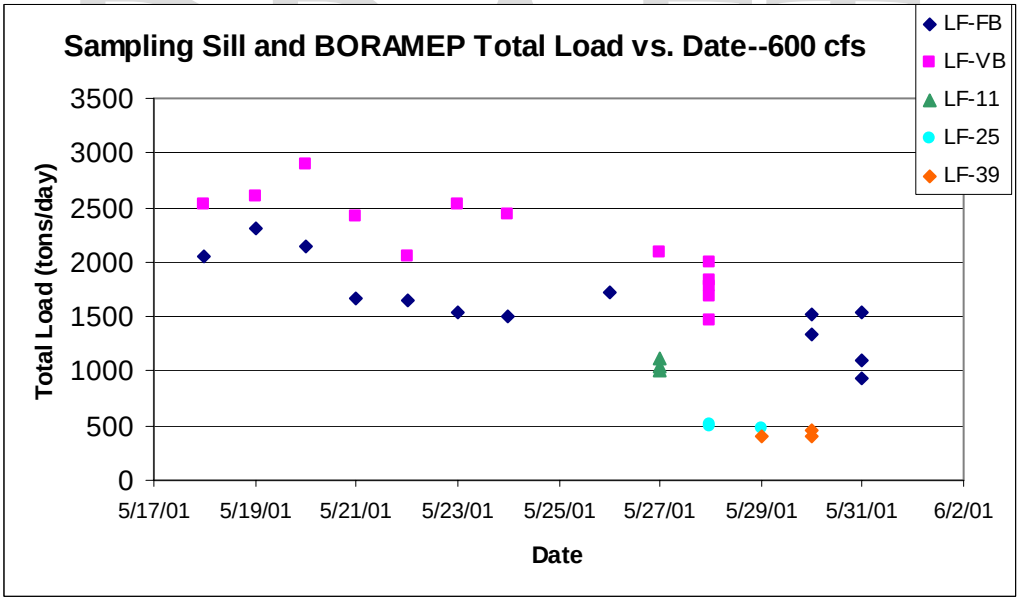

Figure 6-2. Sampling Sill and BORAMEP Total Load vs. Date at 600 cfs

From the above figures, it is evident that the total load at LF-VB is consistently higher than the total load at LF-FB for most of the sampling dates. No trend in the change in total load can be seen when comparing the total loads from the different sampling dates at 300 cfs but a slight decline in total load over time can be seen at 300 cfs.

The total load estimates from the sampling sills were also compared to the total load estimates from BORAMEP Method A by plotting the total load and the flow rate (see Figure 6-3. Sampling Sill and BORAMEP Total Load vs. Flow Rate).

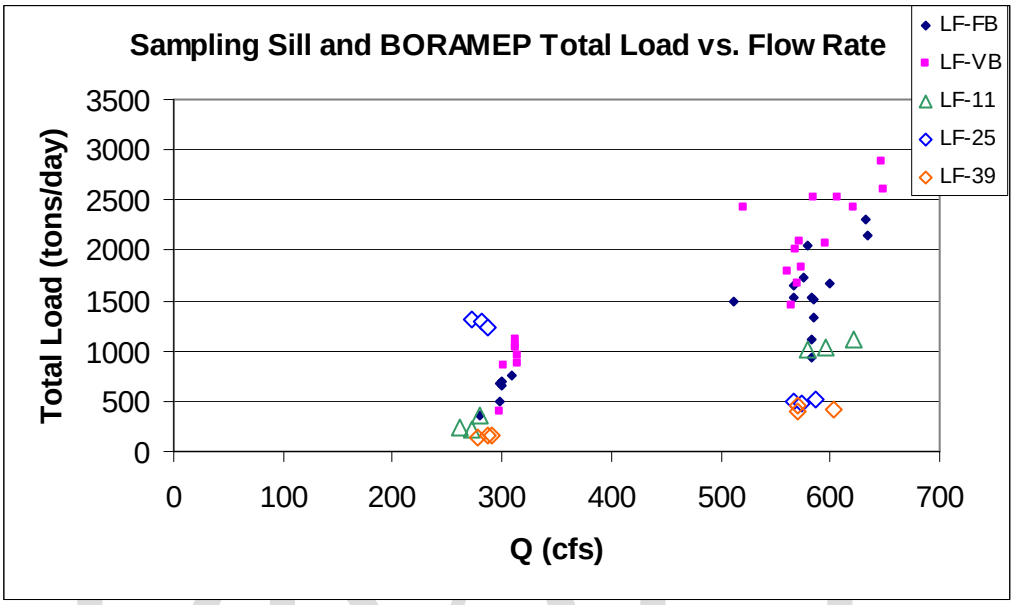

Figure 6-3. Sampling Sill and BORAMEP Total Load vs. Flow Rate

From Figure 6-3, The BORAMEP Method A (LF-11, LF-25, and LF-39) results seem to be within the same range as the total load estimates from the sampling sills at 300 cfs; but the BORAMEP Method A results seem to underestimate the total load at 600 cfs when compared to the total load sampling sill estimates. If there was an error in the suspended sediment data collection at LF-25 at 300 cfs, it is possible that BORAMEP is underestimating the total load at all flow rates. This could also be due to supplementing the suspended sediment load in for the total load when error messages occurred. Because of the variability of total load on any given day, it may be inaccurate to compare the total load estimates from BORAMEP to total load estimates from the sampling sills from other sampling days.

Similarly, the sand load (particles larger than 0.0625 mm) estimates from BORAMEP Method A were compared to the sand load estimates from the sampling sills by plotting the sand load and the discharge (see Figure 6-4. Sampling Sill and BORAMEP Sand Load vs. Flow Rate).

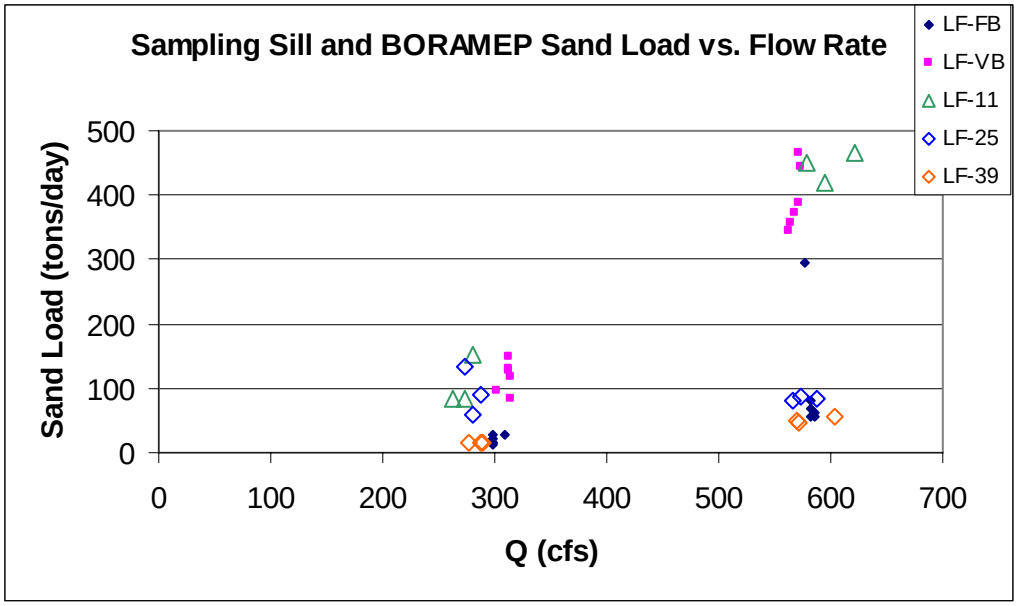

Figure 6-4. Sampling Sill and BORAMEP Sand Load vs. Flow Rate

Less data points for the sampling sills were used for Figure 6-4 than Figure 6-3 because many of the samples from the sampling sills did not contain size fraction data. From the above figure, it appears that the BORAMEP Method A sand load estimates are consistent with the sand load estimates from the sampling sills at flow rates near 300 and 600 cfs. This is most likely due to the occurrence of error messages (not enough overlapping bins and fitted Z-values generated a negative exponent) and supplementing the total load with the suspended sediment load when these error messages occurred.

7. Conclusions

The main conclusions for the application of BORAMEP on the LFCC are as follows:

1. The BORAMEP results suggest that the total load range of the LFCC is between 100 and 1300 tons per day at flow rates near 300 cfs and between 350 and 1150 tons per day at flow rates near 600 cfs (see Figure 7-1. Total Load vs. Discharge).

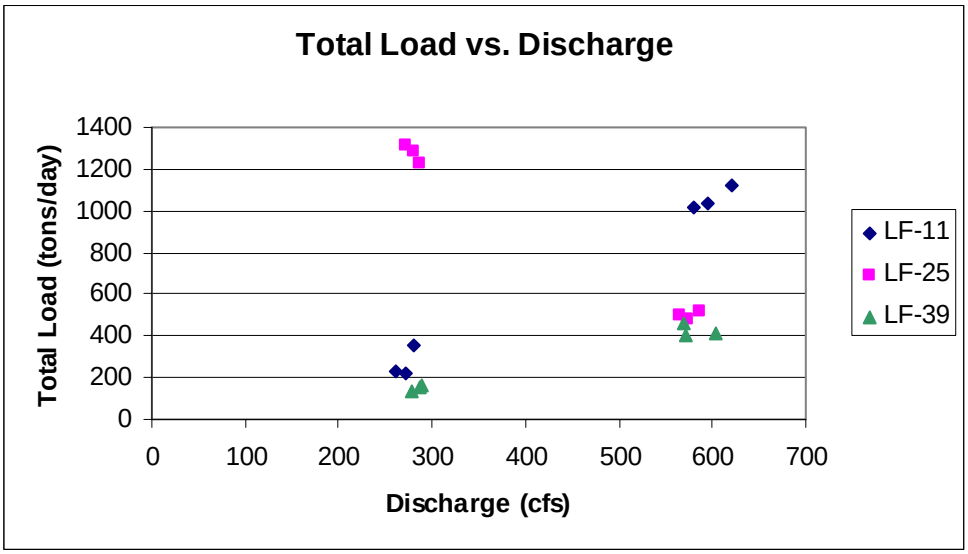

Figure 7-1. Total Load vs. Discharge

2. The field measurements for all three cross sections were taken on different days for the given discharge. If measurements were taken at all three cross sections at each discharge on the same day, the data range would be expected to have a smaller range than what is shown on Figure 7-1.
3. Sand load results from BORAMEP are between 10 and 150 tons per day at 300 cfs and between 50 and 450 tons per day at 600 cfs (see Figure 7-2. Sand Load vs. Discharge).

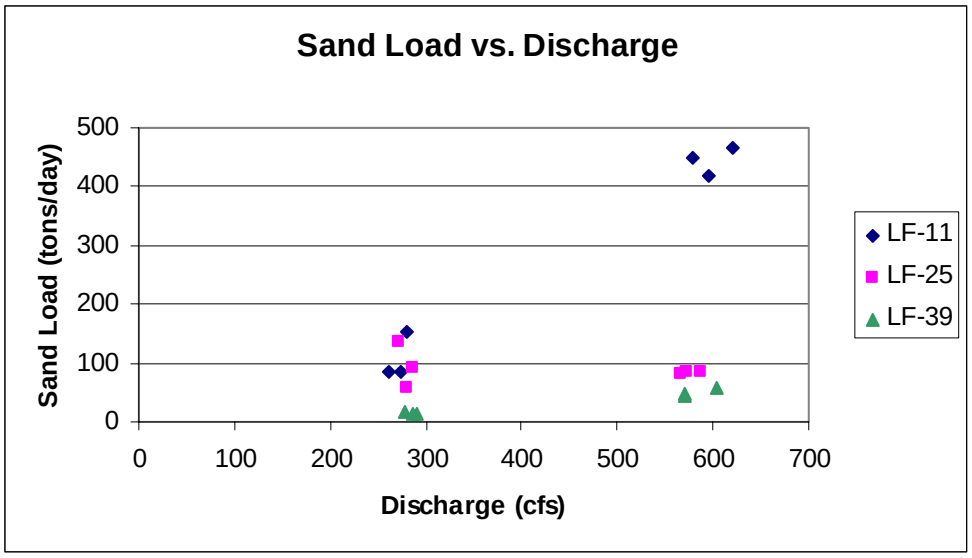

Figure 7-2. Sand Load vs. Discharge

4. The sand load range at 300 cfs is an order of magnitude smaller than the total load range at 300 cfs. This difference is due to the large amount of wash load at cross section LF-25 on 6/11/01. The sand load at LF-11 at 600 cfs is as much as 350 tons per day higher than the sand load at the other two cross sections at 600 cfs. Since over half of the total load is wash load, the total load in the LFCC will vary greatly at a given discharge. At times, the diverted water from the Rio Grande will contain a large amount of fine sediment. This could be from irrigation returns, heavy thunderstorms, or high flow in the Rio Grande.
5. The BORAMEP total load figures from Method A, Method B, and Method D were almost always greater than the suspended sediment load calculated in method C. They were 13-14% greater than the suspended sediment load at flows near 300 cfs and 8-12% greater than the suspended sediment load at flows near 600 cfs. This was an expected result since the total load should be greater than the suspended sediment load or measured load.

6. For the most part, BORAMEP total load estimates appear to be consistent with the results from the three total load rating curves (versus river discharge, suspended sediment load, and suspended sediment concentration); but BORAMEP sand load estimates appear to be less than the sand load estimates from the rating curves (especially at the higher flow rate). This was most likely caused by substituting the suspended sediment load in for the BORAMEP total load when error messages occurred in BORAMEP.
7. BORAMEP total load results appear to be consistent with the total load estimates from the sampling sills at flow rates near 300 cfs but tend to underestimate the total load at flow rates near 600 cfs by at least a factor of two when compared to the total load estimates from the sampling sills.
8. Sand load estimates from BORAMEP appear to be consistent with sand load estimates from the sampling sills at flow rates near 300 and 600 cfs.
9. BORAMEP does a satisfactory job of estimating the total load and sand load in the LFCC. Due to a lack of overlapping suspended sediment and bed material size fractions for BORAMEP to complete the MEP calculations, the effectiveness of BORAMEP in estimating the total load in the LFCC was greatly impaired. If there was a better overlap between the bed material and suspended sediment data, the application of BORAMEP would have been more successful.

Appendix A: BORAMEP Input Sheets

Table A-1. BORAMEP Method A Input Sheet 300 cfs

***	bin1		bin2		bin3		bin4		bin5		bin6		bin7		bin8		bin9
16	0.001	0.002	0.002	0.004	0.004	0.016	0.016	0.0625	0.0625	0.125	0.125	0.25	0.25	0.5	0.5	1	1
Input Variables	Title	Date	Time	S_energy	g (ft/s2)	gamma_w (lb/ft3)	gamma_s (lb/ft3)	Q (cfs)	Vavg (ft/s)	h (ft)	W (ft)	T (F)	dn (ft)	Cs (ppm)	d65 (mm)	d35 (mm)	ds (ft)
###	LF-11A-20-32	6/8/2001	1130	0.0008	32.17	62.4	165	38.098	1.3228	3.3	12	72	0.3	354.462	0.9	0.34	3
###	LF-11A-32-36.5	6/8/2001	1130	0.0008	32.17	62.4	165	51.518	2.2063	5.7	4.5	72	0.3	443.125	0.21	0.15	5.4
###	LF-11A-36.5-39.5	6/8/2001	1130	0.0008	32.17	62.4	165	35.758	2.4832	5.9	3	72	0.3	421.455	0.18	0.14	5.6
###	LF-11A-39.5-42.5	6/8/2001	1130	0.0008	32.17	62.4	165	35.265	2.5011	5.7	3	72	0.3	451.692	0.16	0.12	5.4
###	LF-11A-42.5-45.5	6/8/2001	1130	0.0008	32.17	62.4	165	32.203	2.2758	6	3	72	0.3	411.719	0.18	0.14	5.7
###	LF-11A-45.5-48	6/8/2001	1130	0.0008	32.17	62.4	165	26.368	2.1791	5.7	2.5	72	0.3	391.408	0.21	0.15	5.4
###	LF-11A-48-63	6/8/2001	1130	0.0008	32.17	62.4	165	53.535	1.4768	3.1	15	72	0.3	392.48	0.2	0.15	2.8
###	LF-11B-20-32	6/8/2001	1600	0.0008	32.17	62.4	165	33.168	1.1359	4.5	12	72	0.3	274.762	0.18	0.14	4.2
###	LF-11B-32-36.5	6/8/2001	1600	0.0008	32.17	62.4	165	46.11	1.9961	5.3	4.5	72	0.3	296.667	0.19	0.15	5
###	LF-11B-36.5-39.5	6/8/2001	1600	0.0008	32.17	62.4	165	32.465	2.115	5.1	3	72	0.3	322	0.21	0.16	4.8
###	LF-11B-39.5-42.5	6/8/2001	1600	0.0008	32.17	62.4	165	32.55	2.1919	5.2	3	72	0.3	290.847	0.17	0.14	4.9
###	LF-11B-42.5-45.5	6/8/2001	1600	0.0008	32.17	62.4	165	34.598	2.1556	5.4	3	72	0.3	256	0.18	0.15	5.1
###	LF-11B-45.5-48	6/8/2001	1600	0.0008	32.17	62.4	165	26.808	1.9931	5.4	2.5	72	0.3	298.621	0.22	0.17	5.1
###	LF-11B-48-63	6/8/2001	1600	0.0008	32.17	62.4	165	56.41	1.452	4.4	15	72	0.3	295.077	0.21	0.16	4.1
###	LF-11C-20-32	6/8/2001	1750	0.0008	32.17	62.4	165	35.127	1.2325	4.5	12	72	0.3	245.208	0.12	0.001	4.2
###	LF-11C-32-36.5	6/8/2001	1750	0.0008	32.17	62.4	165	49.113	2.1447	5.2	4.5	72	0.3	237.624	0.19	0.15	4.9
###	LF-11C-36.5-39.5	6/8/2001	1750	0.0008	32.17	62.4	165	35.6	2.2894	5.2	3	72	0.3	203.425	0.19	0.15	4.9
###	LF-11C-39.5-42.5	6/8/2001	1750	0.0008	32.17	62.4	165	35.258	2.1967	5.4	3	72	0.3	291.667	0.18	0.14	5.1
###	LF-11C-42.5-45.5	6/8/2001	1750	0.0008	32.17	62.4	165	35.53	2.0361	5.9	3	72	0.3	299.398	0.21	0.16	5.6
###	LF-11C-45.5-48	6/8/2001	1750	0.0008	32.17	62.4	165	28.845	2.0242	5.7	2.5	72	0.3	267.891	0.22	0.16	5.4
###	LF-11C-48-63	6/8/2001	1750	0.0008	32.17	62.4	165	60.688	1.5702	3.4	15	72	0.3	255.385	0.22	0.16	3.1
###	LF-39A-11-29	6/9/2001	1450	0.0008	32.17	62.4	165	51.608	0.9366	4.9	18	72	0.3	132.041	0.31	0.22	4.6
###	LF-39A-29-34.5	6/9/2001	1450	0.0008	32.17	62.4	165	43.11	1.7383	4.7	5.5	72	0.3	149.623	0.32	0.24	4.4
###	LF-39A-34.5-39.5	6/9/2001	1450	0.0008	32.17	62.4	165	40.553	1.8391	4.8	5	72	0.3	169.091	0.33	0.25	4.5
###	LF-39A-39.5-44.5	6/9/2001	1450	0.0008	32.17	62.4	165	42.91	1.9071	4.5	5	72	0.3	169.167	0.08	0.033	4.2
###	LF-39A-44.5-49.5	6/9/2001	1450	0.0008	32.17	62.4	165	36.203	1.7574	4.4	5	72	0.3	184.737	0.24	0.17	4.1
###	LF-39A-49.5-56	6/9/2001	1450	0.0008	32.17	62.4	165	38.005	1.4875	3.9	6.5	72	0.3	178.125	0.3	0.2	3.6
###	LF-39A-56-73	6/9/2001	1450	0.0008	32.17	62.4	165	37.589	0.7026	4.3	17	72	0.3	184.583	0.32	0.24	4
###	LF-39B-11-29	6/9/2001	1030	0.0008	32.17	62.4	165	54.871	1.0059	4.6	18	73	0.3	151.803	0.31	0.21	4.3
###	LF-39B-29-34.5	6/9/2001	1030	0.0008	32.17	62.4	165	41.595	1.6772	4.5	5.5	73	0.3	171.067	0.31	0.22	4.2
###	LF-39B-34.5-39.5	6/9/2001	1030	0.0008	32.17	62.4	165	39.498	1.7633	4.5	5	73	0.3	162.063	0.32	0.23	4.2
###	LF-39B-39.5-44.5	6/9/2001	1030	0.0008	32.17	62.4	165	39.055	1.8466	4.2	5	73	0.3	151.897	0.1	0.064	3.9
###	LF-39B-44.5-49.5	6/9/2001	1030	0.0008	32.17	62.4	165	34.958	1.8066	3.9	5	73	0.3	157.636	0.22	0.16	3.6
###	LF-39B-49.5-56	6/9/2001	1030	0.0008	32.17	62.4	165	36.385	1.4671	3.8	6.5	73	0.3	158.627	0.27	0.18	3.5
###	LF-39B-56-73	6/9/2001	1030	0.0008	32.17	62.4	165	31.026	0.6539	3.7	17	73	0.3	210.2	0.33	0.26	3.4

Table A-1. BORAMEP Method A Input Sheet 300 cfs

***	bin1		bin2		bin3		bin4		bin5		bin6		bin7		bin8		bin9
16	0.001	0.002	0.002	0.004	0.004	0.016	0.016	0.0625	0.0625	0.125	0.125	0.25	0.25	0.5	0.5	1	1
Input Variables	Title	Date	Time	S_energy	g (ft/s2)	gamma_w (lb/ft3)	gamma_s (lb/ft3)	Q (cfs)	Vavg (ft/s)	h (ft)	W (ft)	T (F)	dn (ft)	Cs (ppm)	d65 (mm)	d35 (mm)	ds (ft)
###	LF-39C-11-29	6/9/2001	1712	0.0008	32.17	62.4	165	55.65	1.0202	4.5	18	72	0.3	163.725	0.31	0.21	4.2
###	LF-39C-29-34.5	6/9/2001	1712	0.0008	32.17	62.4	165	44.203	1.7611	4.5	5.5	72	0.3	163.03	0.34	0.27	4.2
###	LF-39C-34.5-39.5	6/9/2001	1712	0.0008	32.17	62.4	165	42.485	1.8882	4.5	5	72	0.3	168.226	0.32	0.22	4.2
###	LF-39C-39.5-44.5	6/9/2001	1712	0.0008	32.17	62.4	165	40.08	1.9131	4.1	5	72	0.3	170.164	0.14	0.088	3.8
###	LF-39C-44.5-49.5	6/9/2001	1712	0.0008	32.17	62.4	165	34.793	1.7981	3.9	5	72	0.3	166.207	0.29	0.2	3.6
###	LF-39C-49.5-56	6/9/2001	1712	0.0008	32.17	62.4	165	37.021	1.4808	3.9	6.5	72	0.3	163.8	0.28	0.19	3.6
###	LF-39C-56-73	6/9/2001	1712	0.0008	32.17	62.4	165	32.441	0.6495	3.8	17	72	0.3	178.909	0.34	0.27	3.5
###	LF-25A-8-25	6/11/2001	1445	0.0008	32.17	62.4	165	34.183	0.6018	5.2	17	73	0.3	60.3604	0.06	0.028	4.9
###	LF-25A-25-30.5	6/11/2001	1445	0.0008	32.17	62.4	165	8.0585	0.3289	4.6	5.5	73	0.3	1805.09	0.081	0.049	4.3
###	LF-25A-30.5-36	6/11/2001	1445	0.0008	32.17	62.4	165	41.106	1.2648	6	5.5	73	0.3	1690.45	0.32	0.21	5.7
###	LF-25A-36-42	6/11/2001	1445	0.0008	32.17	62.4	165	56.59	1.5504	6.1	6	73	0.3	1734.22	0.11	0.072	5.8
###	LF-25A-42-48	6/11/2001	1445	0.0008	32.17	62.4	165	60.045	1.6633	6	6	73	0.3	1643.04	0.35	0.28	5.7
###	LF-25A-48-54	6/11/2001	1445	0.0008	32.17	62.4	165	54.32	1.4923	6	6	73	0.3	1670	0.3	0.19	5.7
###	LF-25A-54-68	6/11/2001	1445	0.0008	32.17	62.4	165	33.032	0.7028	5.4	14	73	0.3	1687.05	0.34	0.26	5.1
###	LF-25B-8-25	6/11/2001	1840	0.0008	32.17	62.4	165	26.159	0.4791	4.9	17	73	0.3	1548.03	0.09	0.05	4.6
###	LF-25B-36-42	6/11/2001	1840	0.0008	32.17	62.4	165	57.92	1.6044	6	6	73	0.3	1674.51	0.17	0.11	5.7
###	LF-25B-42-48	6/11/2001	1840	0.0008	32.17	62.4	165	62.15	1.7264	6	6	73	0.3	1599.48	0.33	0.26	5.7
###	LF-25B-48-54	6/11/2001	1840	0.0008	32.17	62.4	165	55.425	1.5311	6.1	6	73	0.3	1591.88	0.26	0.15	5.8
###	LF-25B-54-68	6/11/2001	1840	0.0008	32.17	62.4	165	28.853	0.5961	5.3	14	73	0.3	1560.69	0.32	0.22	5
###	LF-25C-8-25	6/11/2001	2000	0.0008	32.17	62.4	165	34.744	0.6149	4.9	17	73	0.3	1589.55	0.1	0.035	4.6
###	LF-25C-25-30.5	6/11/2001	2000	0.0008	32.17	62.4	165	10.898	0.4476	4.4	5.5	73	0.3	1623.64	0.078	0.045	4.1
###	LF-25C-30.5-36	6/11/2001	2000	0.0008	32.17	62.4	165	34.056	1.0829	5.8	5.5	73	0.3	1538.77	0.26	0.14	5.5
###	LF-25C-36-42	6/11/2001	2000	0.0008	32.17	62.4	165	56.975	1.5826	6	6	73	0.3	1578	0.14	0.068	5.7
###	LF-25C-42-48	6/11/2001	2000	0.0008	32.17	62.4	165	58.14	1.6105	6	6	73	0.3	1517.14	0.36	0.28	5.7
###	LF-25C-48-54	6/11/2001	2000	0.0008	32.17	62.4	165	54.41	1.4907	6.1	6	73	0.3	1528.97	0.12	0.03	5.8
###	LF-25C-54-68	6/11/2001	2000	0.0008	32.17	62.4	165	31.478	0.6424	5.2	14	73	0.3	1575.77	0.32	0.23	4.9

Table A-2. BORAMEP Method A Input Sheet 600 cfs

***	bin1		bin2		bin3		bin4		bin5		bin6		bin7		bin8		bin9
16	0.001	0.002	0.002	0.004	0.004	0.016	0.016	0.063	0.063	0.125	0.125	0.25	0.25	0.5	0.5	1	1
Input Variables	Title	Date	Time	S_energy	g (ft/s2)	gamma_w (lb/ft3)	gamma_s (lb/ft3)	Q (cfs)	Vavg (ft/s)	h (ft)	W (ft)	T (F)	dn (ft)	Cs (ppm)	d65 (mm)	d35 (mm)	ds (ft)
###	LF-11A-15-34	5/27/2001	1130	0.0008	32.17	62.4	165	142.8	2.084	5.4	17	70	0.3	579.231	0.3	0.19	5.1
###	LF-11A-34-38	5/27/2001	1130	0.0008	32.17	62.4	165	93.71	3.082	7.6	2	70	0.3	643.307	0.3	0.19	7.3
###	LF-11A-38-42	5/27/2001	1130	0.0008	32.17	62.4	165	91.07	2.976	7.9	2	70	0.3	715.04	0.3	0.19	7.6
###	LF-11A-42-46	5/27/2001	1130	0.0008	32.17	62.4	165	91.16	3.08	8.4	2	70	0.3	690.073	0.19	0.15	8.1
###	LF-11A-46-50	5/27/2001	1130	0.0008	32.17	62.4	165	86.61	2.906	8.4	2	70	0.3	535.769	0.14	0.028	8.1
###	LF-11A-50-54	5/27/2001	1130	0.0008	32.17	62.4	165	56.64	2.473	7.7	2	70	0.3	555.868	0.17	0.13	7.4
###	LF-11A-54-66	5/27/2001	1130	0.0008	32.17	62.4	165	59.5	1.787	4.2	2	70	0.3	538.571	0.17	0.13	3.9
###	LF-11B-15-34	5/27/2001	1620	0.0008	32.17	62.4	165	138.7	2.033	7.2	17	70	0.3	565.556	0.19	0.16	6.9
###	LF-11B-34-38	5/27/2001	1620	0.0008	32.17	62.4	165	88.05	2.945	7.5	2	70	0.3	699.107	0.19	0.16	7.2
###	LF-11B-38-42	5/27/2001	1620	0.0008	32.17	62.4	165	89.06	2.979	7.4	2	70	0.3	731.404	0.19	0.16	7.1
###	LF-11B-42-46	5/27/2001	1620	0.0008	32.17	62.4	165	88.93	2.964	7.5	2	70	0.3	593.273	0.175	0.135	7.2
###	LF-11B-46-50	5/27/2001	1620	0.0008	32.17	62.4	165	83.11	2.846	7.3	2	70	0.3	586.542	0.175	0.135	7
###	LF-11B-50-54	5/27/2001	1620	0.0008	32.17	62.4	165	49.96	2.357	4.8	2	70	0.3	537.5	0.16	0.11	4.5
###	LF-11B-54-66	5/27/2001	1620	0.0008	32.17	62.4	165	57.47	1.715	4	2	70	0.3	505.769	0.16	0.11	3.7
###	LF-11C-15-34	5/27/2001	2200	0.0008	32.17	62.4	165	130.8	1.983	7.2	17	70	0.3	593.469	0.19	0.15	6.9
###	LF-11C-34-38	5/27/2001	2200	0.0008	32.17	62.4	165	91.67	3.161	7.5	2	70	0.3	566.545	0.19	0.15	7.2
###	LF-11C-38-42	5/27/2001	2200	0.0008	32.17	62.4	165	90.58	3.167	7.4	2	70	0.3	644.262	0.28	0.11	7.1
###	LF-11C-42-46	5/27/2001	2200	0.0008	32.17	62.4	165	87.43	3.057	7.5	2	70	0.3	752.929	0.2	0.16	7.2
###	LF-11C-46-50	5/27/2001	2200	0.0008	32.17	62.4	165	75.13	2.655	7.3	2	70	0.3	579.145	0.185	0.14	7
###	LF-11C-50-54	5/27/2001	2200	0.0008	32.17	62.4	165	46.51	2.215	4.8	2	70	0.3	499.608	0.17	0.12	4.5
###	LF-11C-54-66	5/27/2001	2200	0.0008	32.17	62.4	165	57.11	1.715	4	2	70	0.3	420.202	0.17	0.12	3.7
###	LF-25A-5-21	5/28/2001	1138	0.0008	32.17	62.4	165	72.11	1.165	6	13	70	0.3	266.265	0.37	0.32	5.7
###	LF-25A-21-27.5	5/28/2001	1138	0.0008	32.17	62.4	165	31.87	0.703	7.2	3	70	0.3	314.333	0.37	0.32	6.9
###	LF-25A-27.5-34.5	5/28/2001	1138	0.0008	32.17	62.4	165	67.34	1.347	7.5	3.5	70	0.3	320.787	0.37	0.32	7.2
###	LF-25A-34.5-41.5	5/28/2001	1138	0.0008	32.17	62.4	165	120.8	2.259	7.9	3.5	70	0.3	337.949	0.38	0.31	7.6
###	LF-25A-41.5-48.5	5/28/2001	1138	0.0008	32.17	62.4	165	126.3	2.383	7.7	3.5	70	0.3	325.954	0.34	0.27	7.4
###	LF-25A-48.5-57	5/28/2001	1138	0.0008	32.17	62.4	165	127.6	1.981	7.7	3.5	70	0.3	310.199	0.35	0.28	7.4
###	LF-25A-57-71	5/28/2001	1138	0.0008	32.17	62.4	165	40.97	0.811	4.8	5	70	0.3	274.423	0.35	0.28	4.5
###	LF-25B-5-21	5/28/2001	1710	0.0008	32.17	62.4	165	65.56	1.159	6.1	13	70	0.3	274.894	0.38	0.28	5.8
###	LF-25B-21-27.5	5/28/2001	1710	0.0008	32.17	62.4	165	33.07	0.739	7	3	70	0.3	305.95	0.38	0.28	6.7
###	LF-25B-27.5-34.5	5/28/2001	1710	0.0008	32.17	62.4	165	61.11	1.263	6.7	3.5	70	0.3	316.522	0.38	0.28	6.4
###	LF-25B-34.5-41.5	5/28/2001	1710	0.0008	32.17	62.4	165	117	2.198	7.6	3.5	70	0.3	332.571	0.35	0.29	7.3
###	LF-25B-41.5-48.5	5/28/2001	1710	0.0008	32.17	62.4	165	118.9	2.248	7.6	3.5	70	0.3	307.013	0.36	0.3	7.3
###	LF-25B-48.5-57	5/28/2001	1710	0.0008	32.17	62.4	165	129.5	2.012	7.6	3.5	70	0.3	311.571	0.33	0.26	7.3
###	LF-25B-57-71	5/28/2001	1710	0.0008	32.17	62.4	165	40.91	0.854	4.2	5	70	0.3	302.301	0.33	0.26	3.9

Table A-2. BORAMEP Method A Input Sheet 600 cfs

***	bin1		bin2		bin3		bin4		bin5		bin6		bin7		bin8		bin9
16	0.001	0.002	0.002	0.004	0.004	0.016	0.016	0.063	0.063	0.125	0.125	0.25	0.25	0.5	0.5	1	1
Input Variables	Title	Date	Time	S_energy	g (ft/s2)	gamma_w (lb/ft3)	gamma_s (lb/ft3)	Q (cfs)	Vavg (ft/s)	h (ft)	W (ft)	T (F)	dn (ft)	Cs (ppm)	d65 (mm)	d35 (mm)	ds (ft)
###	LF-25C-5-21	5/29/2001	1045	0.0008	32.17	62.4	165	68.48	1.135	6.1	13	70	0.3	271.942	0.34	0.24	5.8
###	LF-25C-21-27.5	5/29/2001	1045	0.0008	32.17	62.4	165	30.24	0.694	7.1	3	70	0.3	294.609	0.34	0.24	6.8
###	LF-25C-27.5-34.5	5/29/2001	1045	0.0008	32.17	62.4	165	65.86	1.325	7.5	3.5	70	0.3	303.871	0.34	0.24	7.2
###	LF-25C-34.5-41.5	5/29/2001	1045	0.0008	32.17	62.4	165	113.9	2.153	7.7	3.5	70	0.3	307.6	0.38	0.29	7.4
###	LF-25C-41.5-48.5	5/29/2001	1045	0.0008	32.17	62.4	165	122	2.333	7.7	3.5	70	0.3	306.23	0.37	0.29	7.4
###	LF-25C-48.5-57	5/29/2001	1045	0.0008	32.17	62.4	165	127.1	1.982	7.7	3.5	70	0.3	299.149	0.32	0.23	7.4
###	LF-25C-57-71	5/29/2001	1045	0.0008	32.17	62.4	165	45.51	0.867	4.7	5	70	0.3	277.622	0.32	0.23	4.4
###	LF-39A-5-20	5/29/2001	1545	0.0008	32.17	62.4	165	40.16	0.95	4.8	13	70	0.3	229.15	0.22	0.17	4.5
###	LF-39A-20-28	5/29/2001	1545	0.0008	32.17	62.4	165	80.65	1.603	6.4	4	70	0.3	219.744	0.22	0.17	6.1
###	LF-39A-28-37	5/29/2001	1545	0.0008	32.17	62.4	165	140	2.333	7.1	5	70	0.3	242.188	0.35	0.28	6.8
###	LF-39A-37-46	5/29/2001	1545	0.0008	32.17	62.4	165	141	2.452	6.9	5	70	0.3	243.951	0.3	0.2	6.6
###	LF-39A-46-55	5/29/2001	1545	0.0008	32.17	62.4	165	104	1.989	5.9	5	70	0.3	244.595	0.3	0.2	5.6
###	LF-39A-55-62	5/29/2001	1545	0.0008	32.17	62.4	165	56.2	1.364	6.4	5	70	0.3	250.385	0.3	0.2	6.1
###	LF-39A-62-77	5/29/2001	1545	0.0008	32.17	62.4	165	40.76	0.786	5.4	4	70	0.3	243.788	0.3	0.2	5.1
###	LF-39B-5-20	5/30/2001	945	0.0008	32.17	62.4	165	37.51	0.959	5.1	13	70	0.3	213.684	0.3	0.2	4.8
###	LF-39B-20-28	5/30/2001	945	0.0008	32.17	62.4	165	80.53	1.595	6.5	4	70	0.3	230.143	0.3	0.2	6.2
###	LF-39B-28-37	5/30/2001	945	0.0008	32.17	62.4	165	136.8	2.262	6.9	5	70	0.3	246.986	0.31	0.21	6.6
###	LF-39B-37-46	5/30/2001	945	0.0008	32.17	62.4	165	130.4	2.292	6.8	5	70	0.3	243.289	0.35	0.27	6.5
###	LF-39B-46-55	5/30/2001	945	0.0008	32.17	62.4	165	103.6	2.035	5.8	4	70	0.3	219	0.3	0.2	5.5
###	LF-39B-55-62	5/30/2001	945	0.0008	32.17	62.4	165	47.72	1.178	6	3	70	0.3	224.211	0.19	0.12	5.7
###	LF-39B-62-77	5/30/2001	945	0.0008	32.17	62.4	165	34.66	0.691	5	5	70	0.3	230.806	0.19	0.12	4.7
###	LF-39C-5-20	5/30/2001	1230	0.0008	32.17	62.4	165	38.75	0.975	4.8	13	70	0.3	210.635	0.24	0.18	4.5
###	LF-39C-20-28	5/30/2001	1230	0.0008	32.17	62.4	165	78.93	1.572	6	4	70	0.3	223.537	0.24	0.18	5.7
###	LF-39C-28-37	5/30/2001	1230	0.0008	32.17	62.4	165	129.6	2.171	6.7	5	70	0.3	262.121	0.31	0.22	6.4
###	LF-39C-37-46	5/30/2001	1230	0.0008	32.17	62.4	165	133.6	2.352	6.3	5	70	0.3	228.986	0.33	0.25	6
###	LF-39C-46-55	5/30/2001	1230	0.0008	32.17	62.4	165	101	1.956	5.6	4	70	0.3	213.333	0.25	0.19	5.3
###	LF-39C-55-62	5/30/2001	1230	0.0008	32.17	62.4	165	51.61	1.262	5.9	3	70	0.3	229.273	0.21	0.08	5.6
###	LF-39C-62-77	5/30/2001	1230	0.0008	32.17	62.4	165	36.82	0.729	5.4	5	70	0.3	202.813	0.21	0.08	5.1

Table A-3. BORAMEP Method D Input Sheet 300 cfs

***	bin1		bin2		bin3		bin4		bin5		bin6		bin7		bin8		bin9
16	0.001	0.002	0.002	0.004	0.004	0.016	0.016	0.063	0.0625	0.125	0.125	0.25	0.25	0.5	0.5	1	1
Input Variables	Title	Date	Time	S_energy	g (ft/s2)	gamma_w (lb/ft3)	gamma_s (lb/ft3)	Q (cfs)	Vavg (ft/s)	h (ft)	W (ft)	T (F)	dn (ft)	Cs (ppm)	d65 (mm)	d35 (mm)	ds (ft)
###	LF-11A	6/8/2001	1750	0.0008	32.17	62.4	165	280.2	1.82	3.566	43	72	0.3	394.603	0.21	0.17	3.566
###	LF-11B	6/8/2001	1130	0.0008	32.17	62.4	165	272.7	1.9	3.329	43	72	0.3	288.637	0.2	0.14	3.329
###	LF-11C	6/8/2001	1600	0.0008	32.17	62.4	165	262.1	1.73	3.508	43	72	0.3	253.39	0.19	0.13	3.508
###	LF-39A	6/9/2001	1712	0.0008	32.17	62.4	165	286.7	1.31	3.506	62	72	0.3	168.917	0.2	0.07	3.506
###	LF-39B	6/9/2001	1450	0.0008	32.17	62.4	165	277.4	1.29	3.46	62	73	0.3	163.07	0.2	0.097	3.46
###	LF-39C	6/9/2001	1030	0.0008	32.17	62.4	165	290	1.29	3.615	62	72	0.3	171.545	0.19	0.07	3.615
###	LF-25A	6/11/2001	2000	0.0008	32.17	62.4	165	280.7	1.04	4.498	60	73	0.3	1570.35	0.29	0.14	4.498
###	LF-25B	6/11/2001	1840	0.0008	32.17	62.4	165	272.4	1.02	4.44	60	73	0.3	1235.9	0.29	0.15	4.44
###	LF-25C	6/11/2001	1445	0.0008	32.17	62.4	165	287.3	1.06	4.497	60	73	0.3	1588.37	0.3	0.19	4.497

Table A-4. BORAMEP Method D Input Sheet 600 cfs

***	bin1		bin2		bin3		bin4		bin5		bin6		bin7		bin8		bin9
16	0.001	0.002	0.002	0.004	0.004	0.016	0.016	0.063	0.0625	0.125	0.125	0.25	0.25	0.5	0.5	1	1
Input Variables	Title	Date	Time	S_energy	g (ft/s2)	gamma_w (lb/ft3)	gamma_s (lb/ft3)	Q (cfs)	Vavg (ft/s)	h (ft)	W (ft)	T (F)	dn (ft)	Cs (ppm)	d65 (mm)	d35 (mm)	ds (ft)
###	LF-11A	5/27/2001	1130	0.0008	32.17	62.4	165	621	2.53	4.804	51	70	0.3	588.794	0.082	0.001	4.804
###	LF-11B	5/27/2001	1620	0.0008	32.17	62.4	165	595.2	2.46	4.743	51	70	0.3	576.59	0.016	0.0005	4.743
###	LF-11C	5/27/2001	2200	0.0008	32.17	62.4	165	579.3	2.47	4.696	50	70	0.3	558.594	0.1	0.0005	4.696
###	LF-25A	5/28/2001	1138	0.0008	32.17	62.4	165	587	1.55	5.742	66	70	0.3	302.429	0.39	0.28	5.742
###	LF-25B	5/28/2001	1710	0.0008	32.17	62.4	165	566	1.54	5.576	66	70	0.3	298.104	0.39	0.29	5.576
###	LF-25C	5/29/2001	1045	0.0008	32.17	62.4	165	573	1.53	5.682	66	70	0.3	289.688	0.37	0.26	5.682
###	LF-39A	5/29/2001	1530	0.0008	32.17	62.4	165	603	1.7	4.931	72	70	0.3	238.629	0.31	0.2	4.931
###	LF-39B	5/30/2001	920	0.0008	32.17	62.4	165	571	1.64	4.847	72	70	0.3	228.868	0.3	0.19	4.847
###	LF-39C	5/30/2001	1500	0.0008	32.17	62.4	165	570	1.63	4.847	72	70	0.3	221.393	0.302	0.2	4.847

Appendix B: BORAMEP Error Messages for Methods A and B

BORAMEP Method A Error Messages 300 cfs

LF-11A-32-36.5,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11B-20-32,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11B-36.5-39.5,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11B-39.5-42.5,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11B-45.5-48,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11C-20-32,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39A-11-29,6/9/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39A-29-34.5,6/9/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39A-34.5-39.5,6/9/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39A-49.5-56,6/9/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39A-56-73,6/9/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39B-11-29,6/9/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39B-44.5-49.5,6/9/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39B-49.5-56,6/9/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39B-56-73,6/9/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39C-11-29,6/9/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39C-56-73,6/9/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25A-8-25,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25A-25-30.5,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25A-36-42,6/11/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-25A-54-68,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25B-8-25,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25B-25-30.5,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25B-48-54,6/11/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-25B-54-68,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25C-8-25,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25C-25-30.5,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25C-36-42,6/11/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-25C-48-54,6/11/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-25C-54-68,6/11/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP

BORAMEP Method A Error Messages 600 cfs

LF-11A-34-38,5/27/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-11A-50-54,5/27/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11A-54-66,5/27/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11B-34-38,5/27/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-11B-38-42,5/27/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11B-42-46,5/27/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-11C-15-34,5/27/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-11C-46-50,5/27/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-11C-50-54,5/27/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-25A-5-21,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25A-21-27.5,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25A-27.5-34.5,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25A-57-71,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25B-5-21,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25B-21-27.5,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25B-27.5-34.5,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25B-57-71,5/28/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25C-5-21,5/29/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25C-21-27.5,5/29/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25C-27.5-34.5,5/29/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-25C-57-71,5/29/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39A-5-20,5/29/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39A-20-28,5/29/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39A-62-77,5/29/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39B-5-20,5/30/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39B-20-28,5/30/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39B-28-37,5/30/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39B-62-77,5/30/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39C-5-20,5/30/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP
LF-39C-20-28,5/30/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39C-28-37,5/30/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-39C-62-77,5/30/2001,-9999,NOT ENOUGH OVERLAPPING BINS FOR MEP

Appendix C: BORAMEP Error Messages for Method D

BORAMEP Method D Error Messages 300 cfs

LF-11B,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...
LF-11C,6/8/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...

BORAMEP Method D Error Message 600 cfs

LF-11B,5/27/2001,-9999,FITTED Z-VALUES GENERATED NEGATIVE EXPONENT, NOT CONTINUING...

Appendix D: BORAMEP Method A Output

Table D-1. BORAMEP Method A Output 300 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Total Sand	CS total	CS tot sand	%sand
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(>0.625mm) (tons/day)	tons/day	tons/day	
LF-11A-20-32	6/8/2001	38.098	354.5	36.46154	0.9	0.34	72	41.747112	14.60800762			31.944444
LF-11A-32-36.5		51.5175	443.1					61.566424	27.42267503			44.541608
LF-11A-36.5-39.5	6/8/2001	35.7575	421.5	40.68943	0.18	0.14	72	45.584928	18.90709448			37.100949
LF-11A-39.5-42.5	6/8/2001	35.265	451.7	43.00811	0.16	0.12	72	57.620693	34.0044684			47.207084
LF-11A-42.5-45.5	6/8/2001	32.2025	411.7	35.79761	0.18	0.14	72	43.027961	20.61476988			41.70778
LF-11A-45.5-48	6/8/2001	26.3675	391.4	27.86525	0.21	0.15	72	32.309856	13.18283836			36.020151
LF-11A-48-63	6/8/2001	53.535	392.5	56.73083	0.2	0.15	72	69.878542	23.71270173	351.7355158	152.45256	38.850387
LF-11B-20-32		33.168	274.8					24.577556	8.760457634			35.644136
LF-11B-32-36.5	6/8/2001	46.11	296.7	36.93411	0.19	0.15	72	42.293346	18.14305242			36.543606
LF-11B-36.5-39.5		32.465	322					28.192538	12.45774967			44.18811
LF-11B-39.5-42.5		32.55	290.8					25.531666	8.808127289			34.498834
LF-11B-42.5-45.5	6/8/2001	34.5975	256	23.91379	0.18	0.15	72	28.457298	9.185573729			26.953125
LF-11B-45.5-48		26.8075	298.6					21.589327	7.229682232			33.487298
LF-11B-48-63	6/8/2001	56.41	295.1	44.94228	0.21	0.16	72	49.722174	19.31214733	220.3639054	83.89679	41.397289
LF-11C-20-32		35.127	245.2					23.229464	6.295835914			27.102804
LF-11C-32-36.5	6/8/2001	49.1125	237.6	31.5098	0.19	0.15	72	41.436731	9.7160831			21.5
LF-11C-36.5-39.5	6/8/2001	35.6	203.4	19.55318	0.19	0.15	72	24.936872	9.086511452			31.717172
LF-11C-39.5-42.5	6/8/2001	35.2575	291.7	27.76528	0.18	0.14	72	33.315034	16.36719633			45.350649
LF-11C-42.5-45.5	6/8/2001	35.53	299.4	28.7216	0.21	0.16	72	33.079433	16.36142065			47.965846
LF-11C-45.5-48	6/8/2001	28.845	267.9	20.86376	0.22	0.16	72	24.480083	9.85964463			38.953784
LF-11C-48-63	6/8/2001	60.688	255.4	41.84671	0.22	0.16	72	48.279187	16.83294894	228.7568032	84.519641	31.325301
LF-25A-8-25		34.183	60.36					5.5644839	0.885845202			15.919629
LF-25A-25-30.5		8.0585	1805					39.229883	3.215564151			8.1967213
LF-25A-30.5-36	6/11/2001	41.1055	1690	187.6149	0.32	0.21	73	191.80267	2.716088038			12.007168
LF-25A-36-42		56.59	1734					264.67078	20.86075098			7.8817734
LF-25A-42-48	6/11/2001	60.045	1643	266.3721	0.35	0.28	73	377.33874	3.977045972			7.8822412
LF-25A-48-54	6/11/2001	54.32	1670	244.9289	0.3	0.19	73	255.37179	3.396734774			27.251462
LF-25A-54-68		33.032	1687					150.28828	22.7298297	1284.266615	57.781859	15.124153
LF-25B-8-25		26.159	1548					109.21012	16.51124951			15.11879
LF-25B-25-30.5		9.1135	1584					38.940908	3.490416534			8.9633671
LF-25B-30.5-36	6/11/2001	32.8295	1678	148.6981	0.26	0.15	73	157.87686	1.983980302			27.91381

Table D-1. BORAMEP Method A Output 300 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Total Sand	CS total	CS tot sand	%sand
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(>0.625mm) (tons/day)	tons/day	tons/day	
LF-25B-36-42	6/11/2001	57.92	1675	261.8671	0.17	0.11	73	366.76531	4.703663668			16.231555
LF-25B-42-48	6/11/2001	62.15	1599	268.4014	0.33	0.26	73	279.56133	4.141526031			12.110727
LF-25B-48-54		55.425	1592					237.94689	40.88333431			17.181706
LF-25B-54-68		28.853	1561					121.4428	62.74351832	1311.744212	134.45769	51.665081
LF-25C-8-25		34.744	1590					148.94186	10.52403581			7.0658683
LF-25C-25-30.5		10.898	1624					47.719784	4.967115042			10.408922
LF-25C-30.5-36	6/11/2001	34.056	1539	141.4915	0.26	0.14	73	145.14704	1.701623876			12.176414
LF-25C-36-42		56.975	1578					242.46789	23.82632411			9.8265896
LF-25C-42-48	6/11/2001	58.14	1517	238.1581	0.36	0.28	73	289.45322	4.164613657			9.1286307
LF-25C-48-54		54.41	1529					224.35758	19.44980262			8.6691087
LF-25C-54-68		31.478	1576					133.77121	26.91737675	1231.858583	91.550892	20.121951
LF-39A-11-29		51.6076	132					18.377429	7.51554566			40.895522
LF-39A-29-34.5		43.11	149.6					17.395553	0.180010424			1.0348072
LF-39A-34.5-39.5		40.5525	169.1					18.49272	0.253597393			1.3713364
LF-39A-39.5-44.5	6/9/2001	42.91	169.2	19.59914	0.08	0.033	72	38.645414	4.051568274			1.6951508
LF-39A-44.5-49.5	6/9/2001	36.2025	184.7	18.05743	0.24	0.17	72	24.588991	2.352252595			1.0809232
LF-39A-49.5-56		38.005	178.1					18.256962	0.183380726			1.0044427
LF-39A-56-73		37.589	184.6					18.711825	0.458447111	154.4688931	14.994802	2.4500395
LF-39B-11-29		54.871	151.8					22.463991	0.218692299			0.9735238
LF-39B-29-34.5	6/9/2001	41.595	171.1	19.2119	0.31	0.22	73	20.412793	2.000701238			1.1439842
LF-39B-34.5-39.5	6/9/2001	39.4975	162.1	17.28298	0.32	0.23	73	25.779383	8.210871218			1.3105206
LF-39B-39.5-44.5	6/9/2001	39.055	151.9	16.01726	0.1	0.064	73	21.798154	4.635945611			1.2155163
LF-39B-44.5-49.5		34.9575	157.6					14.861398	0.1966174			1.3230074
LF-39B-49.5-56		36.385	158.6					15.565519	0.187058318			1.201748
LF-39B-56-73		31.026	210.2					17.5882	0.367822994	138.4694396	15.817709	2.0913055
LF-39C-11-29		55.6503	163.7					24.572351	0.189403745			0.7708003
LF-39C-29-34.5	6/9/2001	44.2025	163	19.45714	0.34	0.27	72	33.404032	3.905032958			1.1870101
LF-39C-34.5-39.5	6/9/2001	42.485	168.2	19.2971	0.32	0.22	72	20.933164	2.676202643			1.1305973
LF-39C-39.5-44.5	6/9/2001	40.08	170.2	18.41446	0.14	0.088	72	23.909522	3.452330585			1.417214
LF-39C-44.5-49.5	6/9/2001	34.7925	166.2	15.61343	0.29	0.2	72	24.527804	2.125925609			1.3418079
LF-39C-49.5-56	6/9/2001	37.0205	163.8	16.37269	0.28	0.19	72	20.153375	1.744937062			1.1253246

Table D-1. BORAMEP Method A Output 300 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Total Sand	CS total	CS tot sand	%sand
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(>0.625mm) (tons/day)	tons/day	tons/day	
LF-39C-56-73		32.4405	178.9					15.652469	0.890169684	163.1527161	14.984002	5.6870881

Table D-2. BORAMEP Method A Output 600 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Total Sand	CS total	total sand	%sand
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(>0.625mm) (tons/day)	tons/day		
LF-11A-15-34	5/27/2001	142.752	579.2	223.2531	0.3	0.19	70	229.161791	85.82107726			36.653
LF-11A-34-38		93.705	643.3					162.571344	68.41129486			42.081
LF-11A-38-42	5/27/2001	91.065	715	175.8108	0.3	0.19	70	200.960722	104.3270706			46.162
LF-11A-42-46	5/27/2001	91.155	690.1	169.8397	0.19	0.15	70	201.284343	85.04555834			41.95
LF-11A-46-50	5/27/2001	86.61	535.8	125.288	0.14	0.028	70	157.635426	68.93035578			38.191
LF-11A-50-54		56.64	555.9					84.9097636	30.1716228			35.534
LF-11A-54-66		59.497	538.6					86.4174153	22.34933154	1122.9408	465.0563	25.862
LF-11B-15-34	5/27/2001	138.661	565.6	211.7353	0.19	0.16	70	230.089893	75.32023954			31.5
LF-11B-34-38		88.05	699.1					166.010667	73.40088487			44.215
LF-11B-38-42		89.06	731.4					175.672032	79.3452713			45.167
LF-11B-42-46		88.925	593.3					142.279114	79.4024722			55.808
LF-11B-46-50	5/27/2001	83.11	586.5	131.6183	0.175	0.135	70	133.07597	47.89497002			35.755
LF-11B-50-54	5/27/2001	49.96	537.5	72.50445	0.16	0.11	70	96.6579726	35.89127945			32.713
LF-11B-54-66	5/27/2001	57.468	505.8	78.47697	0.16	0.11	70	91.8573622	27.46801898	1035.64301	418.7231	27.452
LF-11C-15-34		130.848	593.5					209.424895	85.70000842			40.922
LF-11C-34-38	5/27/2001	91.67	566.5	140.2251	0.19	0.15	70	166.002596	66.53267119			38.318
LF-11C-38-42	5/27/2001	90.575	644.3	157.5559	0.28	0.11	70	184.104612	97.8828641			46.056
LF-11C-42-46	5/27/2001	87.425	752.9	177.7271	0.2	0.16	70	199.195732	109.2547984			51.274
LF-11C-46-50		75.13	579.1					117.344792	49.80572922			42.444
LF-11C-50-54		46.51	499.6					62.6669389	21.05294337			33.595
LF-11C-54-66	5/27/2001	57.111	420.2	64.79503	0.17	0.12	70	73.1886198	19.52053283	1011.92819	449.7495	24.327
LF-25A-5-21		72.107	266.3					51.7791006	4.451596886			8.5973
LF-25A-21-27.5		31.8695	314.3					27.0164687	3.409289263			12.619
LF-25A-27.5-34.5		67.335	320.8					58.253371	8.607886446			14.777
LF-25A-34.5-41.5	5/28/2001	120.76	337.9	110.1889	0.38	0.31	70	116.158936	21.95664308			16.743
LF-25A-41.5-48.5	5/28/2001	126.325	326	111.1756	0.34	0.27	70	118.142471	22.70860282			16.909
LF-25A-48.5-57	5/28/2001	127.5875	310.2	106.8592	0.35	0.28	70	112.520489	19.07149949			15.371
LF-25A-57-71		40.966	274.4					30.3184563	3.463145319	514.189294	83.66866	11.423
LF-25B-5-21		65.56	274.9					48.6033825	4.815195793			9.9071
LF-25B-21-27.5		33.0745	306					27.2902319	3.40575017			12.48
LF-25B-27.5-34.5		61.1085	316.5					52.1636607	8.741712363			16.758
LF-25B-34.5-41.5	5/28/2001	116.9525	332.6	105.0167	0.35	0.29	70	114.253726	24.62333154			19.33
LF-25B-41.5-48.5	5/28/2001	118.92	307	98.57696	0.36	0.3	70	103.216002	19.95883796			17.09
LF-25B-48.5-57	5/28/2001	129.4675	311.6	108.9136	0.33	0.26	70	118.751897	16.44068618			11.967

Table D-2. BORAMEP Method A Output 600 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Total Sand	CS total	total sand	%sand
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(>0.625mm) (tons/day)	tons/day		
LF-25B-57-71		40.906	302.3					33.3495	3.983195549	497.628399	81.96871	11.944
LF-25C-5-21		68.475	271.9					50.219448	5.898792304			11.746
LF-25C-21-27.5		30.24325	294.6					24.0290674	3.404354291			14.168
LF-25C-27.5-34.5		65.85725	303.9					53.9704072	10.3701101			19.214
LF-25C-34.5-41.5	5/29/2001	113.9175	307.6	94.61076	0.38	0.29	70	103.481868	20.0564992			17.208
LF-25C-41.5-48.5	5/29/2001	122.0025	306.2	100.8741	0.37	0.29	70	108.793112	22.87174075			18.094
LF-25C-48.5-57	5/29/2001	127.1375	299.1	102.6892	0.32	0.23	70	106.303329	19.30834141			16.264
LF-25C-57-71		45.507	277.6					34.0718386	4.788938521	480.869071	86.69878	14.055
LF-39A-5-20		40.164	229.2					24.8210605	1.939809066			7.8152
LF-39A-20-28		80.65	219.7					47.7951117	4.182769401			8.7515
LF-39A-28-37	5/29/2001	139.99	242.2	91.54034	0.35	0.28	70	98.2494981	17.48114939			12.903
LF-39A-37-46	5/29/2001	141.01	244	92.87859	0.3	0.2	70	98.9199213	15.82820076			13.36
LF-39A-46-55	5/29/2001	104.02	244.6	68.69537	0.3	0.2	70	75.5420848	8.990090469			9.3923
LF-39A-55-62	5/29/2001	56.195	250.4	37.98998	0.3	0.2	70	39.3634825	5.143748331			17.051
LF-39A-62-77		40.758	243.8					26.7971044	3.580719354	411.488263	57.14649	13.362
LF-39B-5-20		37.511	213.7					21.6169276	2.076502902			9.6059
LF-39B-20-28		80.53	230.1					49.9825137	5.243354944			10.49
LF-39B-28-37		136.825	247					91.1383618	10.76676154			11.814
LF-39B-37-46	5/30/2001	130.4	243.3	85.65736	0.35	0.27	70	119.354223	18.19891179			13.034
LF-39B-46-55	5/30/2001	103.56	219	61.23503	0.3	0.2	70	66.2960592	5.204830743			6.1644
LF-39B-55-62	5/30/2001	47.715	224.2	28.88515	0.19	0.12	70	30.242489	2.057565804			6.1033
LF-39B-62-77		34.66	230.8					21.5744333	1.613182644	400.205008	45.16111	7.4773
LF-39C-5-20		38.749	210.6					22.0117092	1.343593403			6.104
LF-39C-20-28		78.93	223.5					47.5831961	3.45257233			7.2559
LF-39C-28-37		129.595	262.1					91.612199	12.92102691			14.104
LF-39C-37-46	5/30/2001	133.575	229	82.58419	0.33	0.25	70	176.742872	20.88145184			9.8734
LF-39C-46-55	5/30/2001	100.955	213.3	58.15008	0.25	0.19	70	63.622726	6.044044096			7.6705
LF-39C-55-62	5/30/2001	51.61	229.3	31.94847	0.21	0.08	70	34.7680439	3.184095785			7.6923
LF-39C-62-77		36.822	202.8					20.140256	0.837884302	456.481002	48.66467	4.1602

Appendix E: BORAMEP Method D Output

Table E-1. BORAMEP Method D Output 300 cfs

Location	Date	Discharge (cfs)	Conc (ppm)	Suspended Sample (tons/day)	d65 (mm)	d35 (mm)	Temp (F)	Total Load (tons/day)	Total Sand Load (>0.0625) (tons/day)	%>sand
LF-11A	6/8/2001	280.16	394.6028	298.4901	0.21	0.17	72	351.090381	146.9372433	38.0145162
LF-11B	6/8/2001	272.743	288.637					212.309048	79.67877835	37.5296198
LF-11C	6/8/2001	262.108	253.39008					179.11534	56.83157397	31.7290378
LF-25A	6/11/2001	280.7	1570.35	1190.153	0.29	0.14	73	1238.45095	18.04885138	11.9115363
LF-25B	6/11/2001	272.4	1235.898	908.9779	0.29	0.15	73	906.548452	83.63524376	14.5925213
LF-25C	6/11/2001	287.3	1588.369	1232.113	0.3	0.19	73	1254.26305	15.03489891	25.688785
LF-39A	6/9/2001	286.6713	168.9171	130.744	0.2	0.07	72	188.959772	29.5331819	2.14626263
LF-39B	6/9/2001	277.4	163.0703	122.1364	0.2	0.097	73	153.527925	28.81315002	12.7573554
LF-39C	6/9/2001	289.9766	171.5449	134.3088	0.19	0.07	72	179.353368	37.71999131	1.36282647

Table E-2. BORAMEP Method D Output 600 cfs

Location	Date	Discharge (cfs)	Conc (ppm)	Suspended Sample (tons/day)	d65 (mm)	d35 (mm)	Temp (F)	Total Load (tons/day)	Total Sand Load (>0.0625) (tons/day)	%>sand
LF-11A	5/27/2001	621	588.7935	987.2301	0.082	0.001	70	1424.19396	578.4373034	35.7339788
LF-11B	5/27/2001	595.2	576.58996					925.535101	323.4931017	34.9520079
LF-11C	5/27/2001	579.3	558.5942	873.7027	0.1	0.0005	70	1227.52209	512.1096752	37.5722404
LF-25A	5/28/2001	587	302.4286	479.3191	0.39	0.28	70	508.888561	73.42319855	13.3455981
LF-25B	5/28/2001	566	298.1038	455.5623	0.39	0.29	70	473.719985	65.00746053	12.8659141
LF-25C	5/29/2001	573	289.6881	448.1765	0.37	0.26	70	528.462422	85.55739266	15.1009544
LF-39A	5/29/2001	603	238.6293	388.5123	0.31	0.2	70	430.608782	53.8123042	11.4990487
LF-39B	5/30/2001	571	228.8677	352.8454	0.3	0.19	70	398.0067	41.47435172	9.2118714
LF-39C	5/30/2001	570	221.3929	340.7238	0.302	0.2	70	376.512425	33.70996487	7.59999432

Appendix F: BORAMEP Method B Output

Table F-1. BORAMEP Method B Output 300 cfs

*** Location	Date	Discharge (cfs)	Conc (PPM)	Suspended Sample (tons/day)	d65 (mm)	d35 (mm)	Temp F	Total Load (tons/day)	Total Sand Load (>0.625mm) (tons/day)	mb SS TL	mobile bed tons/day	mb sand	mb SS total	side slopes	Q mb	%sand
LF-11A-20-32	6/8/2001	38.098	354.5					36.419518	11.63401259	36.41952						31.944
LF-11A-32-36.5		51.5175	443.1					61.566424	27.42267503	61.56642						44.542
LF-11A-36.5-39.5	6/8/2001	35.7575	421.5	40.68943	0.18	0.14	72	45.584928	18.90709448	40.64254						37.101
LF-11A-39.5-42.5	6/8/2001	35.265	451.7	43.00811	0.16	0.12	72	57.620693	34.0044684	42.95854						47.207
LF-11A-42.5-45.5	6/8/2001	32.2025	411.7	35.79761	0.18	0.14	72	43.027961	20.61476988	35.75635						41.708
LF-11A-45.5-48	6/8/2001	26.3675	391.4	27.86525	0.21	0.15	72	32.309856	13.18283836	27.83313	240.10986	114.132	208.75698	93.084953	181.1	36.02
LF-11A-48-63	6/8/2001	53.535	392.5					56.665436	22.01474121	56.66544						38.85
LF-11B-20-32		33.168	274.8					24.577556	8.760457634	24.57756						35.644
LF-11B-32-36.5	6/8/2001	46.11	296.7	36.93411	0.19	0.15	72	42.293346	18.14305242	36.89154						36.544
LF-11B-36.5-39.5		32.465	322					28.192538	12.45774967	28.19254						44.188
LF-11B-39.5-42.5		32.55	290.8					25.531666	8.808127289	25.53167						34.499
LF-11B-42.5-45.5	6/8/2001	34.5975	256	23.91379	0.18	0.15	72	28.457298	9.185573729	23.88623						26.953
LF-11B-45.5-48		26.8075	298.6					21.589327	7.229682232	21.58933	146.06418	55.8242	136.0913	69.468035	172.5	33.487
LF-11B-48-63	6/8/2001	56.41	295.1					44.890479	18.58344128	44.89048						41.397
LF-11C-20-32		35.127	245.2					23.229464	6.295835914	23.22946						27.103
LF-11C-32-36.5	6/8/2001	49.1125	237.6	31.5098	0.19	0.15	72	41.436731	9.7160831	31.47349						21.5
LF-11C-36.5-39.5	6/8/2001	35.6	203.4	19.55318	0.19	0.15	72	24.936872	9.086511452	19.53064						31.717
LF-11C-39.5-42.5	6/8/2001	35.2575	291.7	27.76528	0.18	0.14	72	33.315034	16.36719633	27.73328						45.351
LF-11C-42.5-45.5	6/8/2001	35.53	299.4	28.7216	0.21	0.16	72	33.079433	16.36142065	28.68849						47.966
LF-11C-45.5-48	6/8/2001	28.845	267.9	20.86376	0.22	0.16	72	24.480083	9.85964463	20.83971	157.24815	61.3909	128.26562	65.02794	184.3	38.954
LF-11C-48-63	6/8/2001	60.688	255.4					41.798476	13.09349861	41.79848						31.325
LF-25A-8-25		34.183	60.36					5.5644839	0.885845202	5.564484						15.92
LF-25A-25-30.5		8.0585	1805					39.229883	3.215564151	39.22988						8.1967
LF-25A-30.5-36	6/11/2001	41.1055	1690	187.6149	0.32	0.21	73	191.80267	2.716088038	187.3986						12.007
LF-25A-36-42		56.59	1734					264.67078	20.86075098	264.6708						7.8818
LF-25A-42-48	6/11/2001	60.045	1643	266.3721	0.35	0.28	73	377.33874	3.977045972	266.0651						7.8822
LF-25A-48-54	6/11/2001	54.32	1670	244.9289	0.3	0.19	73	255.37179	3.396734774	244.6466	1128.4139	34.1662	1002.011	155.85276	220.1	27.251
LF-25A-54-68		33.032	1687					150.28828	22.7298297	150.2883						15.124
LF-25B-8-25		26.159	1548					109.21012	16.51124951	109.2101						15.119
LF-25B-25-30.5		9.1135	1584					38.940908	3.490416534	38.94091						8.9634
LF-25B-30.5-36	6/11/2001	32.8295	1678	148.6981	0.26	0.15	73	157.87686	1.983980302	148.5267						27.914
LF-25B-36-42	6/11/2001	57.92	1675	261.8671	0.17	0.11	73	366.76531	4.703663668	261.5652						16.232
LF-25B-42-48	6/11/2001	62.15	1599	268.4014	0.33	0.26	73	279.56133	4.141526031	268.092						12.111
LF-25B-48-54		55.425	1592					237.94689	40.88333431	237.9469	1081.0913	55.2029	955.07172	230.65292	217.4	17.182
LF-25B-54-68		28.853	1561					121.4428	62.74351832	121.4428						51.665

Table F-1. BORAMEP Method B Output 300 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Total Sand Load	mb SS TL	mobile bed	mb sand	mb SS total	side slopes	Q mb	%sand
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(>0.625mm) (tons/day)		tons/day					
LF-25C-8-25		34.744	1590					148.94186	10.52403581	148.9419						7.0659
LF-25C-25-30.5		10.898	1624					47.719784	4.967115042	47.71978						10.409
LF-25C-30.5-36	6/11/2001	34.056	1539	141.4915	0.26	0.14	73	145.14704	1.701623876	141.3284						12.176
LF-25C-36-42		56.975	1578					242.46789	23.82632411	242.4679						9.8266
LF-25C-42-48	6/11/2001	58.14	1517	238.1581	0.36	0.28	73	289.45322	4.164613657	237.8836						9.1286
LF-25C-48-54		54.41	1529					224.35758	19.44980262	224.3576	949.14551	54.1095	893.7572	282.71307	214.5	8.6691
LF-25C-54-68		31.478	1576					133.77121	26.91737675	133.7712						20.122
LF-39A-11-29		51.6076	132					18.377429	7.51554566	18.37743						40.896
LF-39A-29-34.5		43.11	149.6					17.395553	0.180010424	17.39555						1.0348
LF-39A-34.5-39.5		40.5525	169.1					18.49272	0.253597393	18.49272						1.3713
LF-39A-39.5-44.5	6/9/2001	42.91	169.2	19.59914	0.08	0.033	72	38.645414	4.051568274	19.57656						1.6952
LF-39A-44.5-49.5	6/9/2001	36.2025	184.7	18.05743	0.24	0.17	72	24.588991	2.352252595	18.03661						1.0809
LF-39A-49.5-56		38.005	178.1					18.256962	0.183380726	18.25696	117.37964	7.02081	91.758398	37.089254	200.8	1.0044
LF-39A-56-73		37.589	184.6					18.711825	0.458447111	18.71183						2.45
LF-39B-11-29		54.871	151.8					22.463991	0.218692299	22.46399						0.9735
LF-39B-29-34.5	6/9/2001	41.595	171.1	19.2119	0.31	0.22	73	20.412793	2.000701238	19.18976						1.144
LF-39B-34.5-39.5	6/9/2001	39.4975	162.1	17.28298	0.32	0.23	73	25.779383	8.210871218	17.26306						1.3105
LF-39B-39.5-44.5	6/9/2001	39.055	151.9	16.01726	0.1	0.064	73	21.798154	4.635945611	15.9988						1.2155
LF-39B-44.5-49.5		34.9575	157.6					14.861398	0.1966174	14.8614						1.323
LF-39B-49.5-56		36.385	158.6					15.565519	0.187058318	15.56552	98.417248	15.2312	82.878529	40.052191	191.5	1.2017
LF-39B-56-73		31.026	210.2					17.5882	0.367822994	17.5882						2.0913
LF-39C-11-29		55.6503	163.7					24.572351	0.189403745	24.57235						0.7708
LF-39C-29-34.5	6/9/2001	44.2025	163	19.45714	0.34	0.27	72	33.404032	3.905032958	19.43471						1.187
LF-39C-34.5-39.5	6/9/2001	42.485	168.2	19.2971	0.32	0.22	72	20.933164	2.676202643	19.27485						1.1306
LF-39C-39.5-44.5	6/9/2001	40.08	170.2	18.41446	0.14	0.088	72	23.909522	3.452330585	18.39323						1.4172
LF-39C-44.5-49.5	6/9/2001	34.7925	166.2	15.61343	0.29	0.2	72	24.527804	2.125925609	15.59544						1.3418
LF-39C-49.5-56	6/9/2001	37.0205	163.8	16.37269	0.28	0.19	72	20.153375	1.744937062	16.35381	122.9279	13.9044	89.052049	40.224819	198.6	1.1253
LF-39C-56-73		32.4405	178.9					15.652469	0.890169684	15.65247						5.6871

Table F-2. BORAMEP Method B Output 600 cfs

*** Location	Date	Discharge (cfs)	Conc (PPM)	Suspended Sample (tons/day)	d65 (mm)	d35 (mm)	Temp F	Total Load (tons/day)	Total Sand Load (>0.625mm) (tons/day)	MB SS TL	mobile bed tons/day	mb sand total	mb SS TL	side slopes	Q mb	%sand
LF-11A-15-34	5/27/2001	142.752	579.23					222.99583	81.73552351	222.99583						36.653
LF-11A-34-38		93.705	643.31					162.57134	68.41129486	162.571344						42.081
LF-11A-38-42	5/27/2001	91.065	715.04	175.8108	0.3	0.19	70	200.96072	104.3270706	175.608173						46.162
LF-11A-42-46	5/27/2001	91.155	690.07	169.8397	0.19	0.15	70	201.28434	85.04555834	169.643969						41.95
LF-11A-46-50	5/27/2001	86.61	535.77	125.288	0.14	0.03	70	157.63543	68.93035578	125.143609	722.45	326.71	632.97	394.323	363	38.191
LF-11A-50-54		56.64	555.87					84.909764	30.1716228	84.9097636						35.534
LF-11A-54-66		59.497	538.57					86.417415	22.34933154	86.4174153						25.862
LF-11B-15-34	5/27/2001	138.661	565.56					211.49127	66.61905867	211.491274						31.5
LF-11B-34-38		88.05	699.11					166.01067	73.40088487	166.010667						44.215
LF-11B-38-42		89.06	731.4					175.67203	79.3452713	175.672032						45.167
LF-11B-42-46		88.925	593.27					142.27911	79.4024722	142.279114						55.808
LF-11B-46-50	5/27/2001	83.11	586.54	131.6183	0.18	0.14	70	133.07597	47.89497002	131.46658	617.03	280.04	615.43	362.298	349	35.755
LF-11B-50-54	5/27/2001	49.96	537.5					72.420879	23.69117132	72.4208791						32.713
LF-11B-54-66	5/27/2001	57.468	505.77					78.386515	21.51903564	78.3865149						27.452
LF-11C-15-34		130.848	593.47					209.42489	85.70000842	209.424895						40.922
LF-11C-34-38	5/27/2001	91.67	566.55	140.2251	0.19	0.15	70	166.0026	66.53267119	140.063482						38.318
LF-11C-38-42	5/27/2001	90.575	644.26	157.5559	0.28	0.11	70	184.10461	97.8828641	157.374352						46.056
LF-11C-42-46	5/27/2001	87.425	752.93	177.7271	0.2	0.16	70	199.19573	109.2547984	177.522225						51.274
LF-11C-46-50		75.13	579.15					117.34479	49.80572922	117.344792	666.64	323.47	592.3	336.812	345	42.444
LF-11C-50-54		46.51	499.61					62.666939	21.05294337	62.6669389						33.595
LF-11C-54-66	5/27/2001	57.111	420.2					64.720338	15.74446674	64.7203376						24.327
LF-25A-5-21		72.107	266.27					51.779101	4.451596886	51.7791006						8.5973
LF-25A-21-27.5		31.8695	314.33					27.016469	3.409289263	27.0164687						12.619
LF-25A-27.5-34.5		67.335	320.79					58.253371	8.607886446	58.253371						14.777
LF-25A-34.5-41.5	5/28/2001	120.76	337.95	110.1889	0.38	0.31	70	116.15894	21.95664308	110.061842						16.743
LF-25A-41.5-48.5	5/28/2001	126.325	325.95	111.1756	0.34	0.27	70	118.14247	22.70860282	111.047499						16.909
LF-25A-48.5-57	5/28/2001	127.5875	310.2	106.8592	0.35	0.28	70	112.52049	19.07149949	106.736018	432.09	75.75	413.12	82.097	474	15.371
LF-25A-57-71		40.966	274.42					30.318456	3.463145319	30.3184563						11.423
LF-25B-5-21		65.56	274.89					48.603383	4.815195793	48.6033825						9.9071
LF-25B-21-27.5		33.0745	305.95					27.290232	3.40575017	27.2902319						12.48
LF-25B-27.5-34.5		61.1085	316.52					52.163661	8.741712363	52.1636607						16.758
LF-25B-34.5-41.5	5/28/2001	116.9525	332.57	105.0167	0.35	0.29	70	114.25373	24.62333154	104.895608						19.33
LF-25B-41.5-48.5	5/28/2001	118.92	307.01	98.57696	0.36	0.3	70	103.216	19.95883796	98.4633393						17.09
LF-25B-48.5-57	5/28/2001	129.4675	311.57	108.9136	0.33	0.26	70	118.7519	16.44068618	108.788062	415.67	73.17	391.6	81.952	460	11.967
LF-25B-57-71		40.906	302.3					33.3495	3.983195549	33.3495						11.944

Table F-2. BORAMEP Method B Output 600 cfs

*** Location	Date	Discharge (cfs)	Conc (PPM)	Suspended Sample (tons/day)	d65 (mm)	d35 (mm)	Temp F	Total Load (tons/day)	Total Sand Load (>0.625mm) (tons/day)	MB SS TL	mobile bed tons/day	mb sand total	mb SS TL	side slopes	Q mb	%sand
LF-25C-5-21		68.475	271.94					50.219448	5.898792304	50.219448						11.746
LF-25C-21-27.5		30.24325	294.61					24.029067	3.404354291	24.0290674						14.168
LF-25C-27.5-34.5		65.85725	303.87					53.970407	10.3701101	53.9704072						19.214
LF-25C-34.5-41.5	5/29/2001	113.9175	307.6	94.61076	0.38	0.29	70	103.48187	20.0564992	94.5017108						17.208
LF-25C-41.5-48.5	5/29/2001	122.0025	306.23	100.8741	0.37	0.29	70	108.79311	22.87174075	100.757794						18.094
LF-25C-48.5-57	5/29/2001	127.1375	299.15	102.6892	0.32	0.23	70	106.30333	19.30834141	102.570854	396.57	76.01	375.83	84.2912	459	16.264
LF-25C-57-71		45.507	277.62					34.071839	4.788938521	34.0718386						14.055
LF-39A-5-20		40.164	229.15					24.821061	1.939809066	24.8210605						7.8152
LF-39A-20-28		80.65	219.74					47.795112	4.182769401	47.7951117						8.7515
LF-39A-28-37	5/29/2001	139.99	242.19	91.54034	0.35	0.28	70	98.249498	17.48114939	91.4348237						12.903
LF-39A-37-46	5/29/2001	141.01	243.95	92.87859	0.3	0.2	70	98.919921	15.82820076	92.7715254						13.36
LF-39A-46-55	5/29/2001	104.02	244.59	68.69537	0.3	0.2	70	75.542085	8.990090469	68.6161914						9.3923
LF-39A-55-62	5/29/2001	56.195	250.38	37.98998	0.3	0.2	70	39.363483	5.143748331	37.9461906	359.87	51.62	338.56	51.618	522	17.051
LF-39A-62-77		40.758	243.79					26.797104	3.580719354	26.7971044						13.362
LF-39B-5-20		37.511	213.68					21.616928	2.076502902	21.6169276						9.6059
LF-39B-20-28		80.53	230.14					49.982514	5.243354944	49.9825137						10.49
LF-39B-28-37		136.825	246.99					91.138362	10.76676154	91.1383618						11.814
LF-39B-37-46	5/30/2001	130.4	243.29	85.65736	0.35	0.27	70	119.35422	18.19891179	85.5586358						13.034
LF-39B-46-55	5/30/2001	103.56	219	61.23503	0.3	0.2	70	66.296059	5.204830743	61.1644466						6.1644
LF-39B-55-62	5/30/2001	47.715	224.21	28.88515	0.19	0.12	70	30.242489	2.057565804	28.8518569	357.01	41.47	316.7	43.191	499	6.1033
LF-39B-62-77		34.66	230.81					21.574433	1.613182644	21.5744333						7.4773
LF-39C-5-20		38.749	210.63					22.011709	1.343593403	22.0117092						6.104
LF-39C-20-28		78.93	223.54					47.583196	3.45257233	47.5831961						7.2559
LF-39C-28-37		129.595	262.12					91.612199	12.92102691	91.612199						14.104
LF-39C-37-46	5/30/2001	133.575	228.99	82.58419	0.33	0.25	70	176.74287	20.88145184	82.489004						9.8734
LF-39C-46-55	5/30/2001	100.955	213.33	58.15008	0.25	0.19	70	63.622726	6.044044096	58.0830454						7.6705
LF-39C-55-62	5/30/2001	51.61	229.27	31.94847	0.21	0.08	70	34.768044	3.184095785	31.9116381	414.32	46.48	311.68	42.151	495	7.6923
LF-39C-62-77		36.822	202.81					20.140256	0.837884302	20.140256						4.1602

Appendix G: Method C Results

Table G-1. Method C Results 300 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Cross Section total
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(tons/day)
LF-11A-20-32	6/8/2001	38.098	354.461539					36.419518	
LF-11A-32-36.5		51.5175	443.125					61.566424	
LF-11A-36.5-39.5	6/8/2001	35.7575	421.4546	40.68943	0.18	0.14	72	40.64254	
LF-11A-39.5-42.5	6/8/2001	35.265	451.6923	43.00811	0.16	0.12	72	42.958536	
LF-11A-42.5-45.5	6/8/2001	32.2025	411.7188	35.79761	0.18	0.14	72	35.75635	
LF-11A-45.5-48	6/8/2001	26.3675	391.4084	27.86525	0.21	0.15	72	27.833126	
LF-11A-48-63	6/8/2001	53.535	392.48					56.665436	301.841929
LF-11B-20-32		33.168	274.761905					24.577556	
LF-11B-32-36.5	6/8/2001	46.11	296.6667	36.93411	0.19	0.15	72	36.891543	
LF-11B-36.5-39.5		32.465	322					28.192538	
LF-11B-39.5-42.5		32.55	290.847458					25.531666	
LF-11B-42.5-45.5	6/8/2001	34.5975	256	23.91379	0.18	0.15	72	23.886228	
LF-11B-45.5-48		26.8075	298.62069					21.589327	
LF-11B-48-63	6/8/2001	56.41	295.076923					44.890479	205.5593374
LF-11C-20-32		35.127	245.208333					23.229464	
LF-11C-32-36.5	6/8/2001	49.1125	237.6238	31.5098	0.19	0.15	72	31.473488	
LF-11C-36.5-39.5	6/8/2001	35.6	203.4247	19.55318	0.19	0.15	72	19.530645	
LF-11C-39.5-42.5	6/8/2001	35.2575	291.6667	27.76528	0.18	0.14	72	27.733281	
LF-11C-42.5-45.5	6/8/2001	35.53	299.3985	28.7216	0.21	0.16	72	28.688492	
LF-11C-45.5-48	6/8/2001	28.845	267.8911	20.86376	0.22	0.16	72	20.839712	
LF-11C-48-63	6/8/2001	60.688	255.384615					41.798476	193.2935582
LF-25A-8-25		34.183	60.3603604					5.5644839	
LF-25A-25-30.5		8.0585	1805.09434					39.229883	
LF-25A-30.5-36	6/11/2001	41.1055	1690.455	187.6149	0.32	0.21	73	187.39864	
LF-25A-36-42		56.59	1734.21687					264.67078	
LF-25A-42-48	6/11/2001	60.045	1643.04	266.3721	0.35	0.28	73	266.06508	
LF-25A-48-54	6/11/2001	54.32	1670	244.9289	0.3	0.19	73	244.64657	
LF-25A-54-68		33.032	1687.04762					150.28828	1157.863714
LF-25B-8-25		26.159	1548.02817					109.21012	
LF-25B-25-30.5		9.1135	1584.375					38.940908	
LF-25B-30.5-36	6/11/2001	32.8295	1677.557	148.6981	0.26	0.15	73	148.52667	
LF-25B-36-42	6/11/2001	57.92	1674.513	261.8671	0.17	0.11	73	261.5652	

Table G-1. Method C Results 300 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Cross Section total
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(tons/day)
LF-25B-42-48	6/11/2001	62.15	1599.484	268.4014	0.33	0.26	73	268.09204	
LF-25B-48-54		55.425	1591.88406					237.94689	
LF-25B-54-68		28.853	1560.69444					121.4428	1185.724634
LF-25C-8-25		34.744	1589.54955					148.94186	
LF-25C-25-30.5		10.898	1623.63636					47.719784	
LF-25C-30.5-36	6/11/2001	34.056	1538.767	141.4915	0.26	0.14	73	141.32838	
LF-25C-36-42		56.975	1578					242.46789	
LF-25C-42-48	6/11/2001	58.14	1517.143	238.1581	0.36	0.28	73	237.88357	
LF-25C-48-54		54.41	1528.97059					224.35758	
LF-25C-54-68		31.478	1575.76923					133.77121	1176.470271
LF-39A-11-29		51.6076	132.040816					18.377429	
LF-39A-29-34.5		43.11	149.622642					17.395553	
LF-39A-34.5-39.5		40.5525	169.090909					18.49272	
LF-39A-39.5-44.5	6/9/2001	42.91	169.1667	19.59914	0.08	0.033	72	19.576556	
LF-39A-44.5-49.5	6/9/2001	36.2025	184.7368	18.05743	0.24	0.17	72	18.036608	
LF-39A-49.5-56		38.005	178.125					18.256962	
LF-39A-56-73		37.589	184.583333					18.711825	128.8476527
LF-39B-11-29		54.871	151.803279					22.463991	
LF-39B-29-34.5	6/9/2001	41.595	171.0667	19.2119	0.31	0.22	73	19.189758	
LF-39B-34.5-39.5	6/9/2001	39.4975	162.0635	17.28298	0.32	0.23	73	17.263057	
LF-39B-39.5-44.5	6/9/2001	39.055	151.8965	16.01726	0.1	0.064	73	15.998796	
LF-39B-44.5-49.5		34.9575	157.636364					14.861398	
LF-39B-49.5-56		36.385	158.627451					15.565519	
LF-39B-56-73		31.026	210.2					17.5882	122.9307204
LF-39C-11-29		55.6503	163.72549					24.572351	
LF-39C-29-34.5	6/9/2001	44.2025	163.0303	19.45714	0.34	0.27	72	19.43471	
LF-39C-34.5-39.5	6/9/2001	42.485	168.2258	19.2971	0.32	0.22	72	19.274855	
LF-39C-39.5-44.5	6/9/2001	40.08	170.1639	18.41446	0.14	0.088	72	18.393232	
LF-39C-44.5-49.5	6/9/2001	34.7925	166.2069	15.61343	0.29	0.2	72	15.595438	
LF-39C-49.5-56	6/9/2001	37.0205	163.8	16.37269	0.28	0.19	72	16.353815	
LF-39C-56-73		32.4405	178.909091					15.652469	129.2768681

Table G-2. Method C Results 600 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Cross Section total
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(tons/day)
LF-11A-15-34	5/27/2001	142.752	579.2308					222.99583	
LF-11A-34-38		93.705	643.307087					162.57134	
LF-11A-38-42	5/27/2001	91.065	715.04	175.8108	0.3	0.19	70	175.60817	
LF-11A-42-46	5/27/2001	91.155	690.073	169.8397	0.19	0.15	70	169.64397	
LF-11A-46-50	5/27/2001	86.61	535.7692	125.288	0.14	0.028	70	125.14361	
LF-11A-50-54		56.64	555.867769					84.909764	
LF-11A-54-66		59.497	538.571429					86.417415	1027.290104
LF-11B-15-34	5/27/2001	138.661	565.5555					211.49127	
LF-11B-34-38		88.05	699.107143					166.01067	
LF-11B-38-42		89.06	731.403509					175.67203	
LF-11B-42-46		88.925	593.272727					142.27911	
LF-11B-46-50	5/27/2001	83.11	586.5421	131.6183	0.175	0.135	70	131.46658	
LF-11B-50-54	5/27/2001	49.96	537.5					72.420879	
LF-11B-54-66	5/27/2001	57.468	505.7692					78.386515	977.7270607
LF-11C-15-34		130.848	593.469388					209.42489	
LF-11C-34-38	5/27/2001	91.67	566.5455	140.2251	0.19	0.15	70	140.06348	
LF-11C-38-42	5/27/2001	90.575	644.2623	157.5559	0.28	0.11	70	157.37435	
LF-11C-42-46	5/27/2001	87.425	752.9293	177.7271	0.2	0.16	70	177.52223	
LF-11C-46-50		75.13	579.145299					117.34479	
LF-11C-50-54		46.51	499.607843					62.666939	
LF-11C-54-66	5/27/2001	57.111	420.202					64.720338	929.1170227
LF-25A-5-21		72.107	266.26506					51.779101	
LF-25A-21-27.5		31.8695	314.333333					27.016469	
LF-25A-27.5-34.5		67.335	320.787402					58.253371	
LF-25A-34.5-41.5	5/28/2001	120.76	337.9487	110.1889	0.38	0.31	70	110.06184	
LF-25A-41.5-48.5	5/28/2001	126.325	325.9542	111.1756	0.34	0.27	70	111.0475	
LF-25A-48.5-57	5/28/2001	127.5875	310.1987	106.8592	0.35	0.28	70	106.73602	
LF-25A-57-71		40.966	274.423077					30.318456	495.212756
LF-25B-5-21		65.56	274.893617					48.603383	
LF-25B-21-27.5		33.0745	305.950413					27.290232	
LF-25B-27.5-34.5		61.1085	316.521739					52.163661	
LF-25B-34.5-41.5	5/28/2001	116.9525	332.5714	105.0167	0.35	0.29	70	104.89561	

Table G-2. Method C Results 600 cfs

***		Discharge	Conc	Suspended	d65	d35	Temp	Total Load	Cross Section total
Location	Date	(cfs)	(PPM)	Sample (tons/day)	(mm)	(mm)	F	(tons/day)	(tons/day)
LF-25B-41.5-48.5	5/28/2001	118.92	307.013	98.57696	0.36	0.3	70	98.463339	
LF-25B-48.5-57	5/28/2001	129.4675	311.5714	108.9136	0.33	0.26	70	108.78806	
LF-25B-57-71		40.906	302.300885					33.3495	473.5537843
LF-25C-5-21		68.475	271.942446					50.219448	
LF-25C-21-27.5		30.24325	294.608696					24.029067	
LF-25C-27.5-34.5		65.85725	303.870968					53.970407	
LF-25C-34.5-41.5	5/29/2001	113.9175	307.6	94.61076	0.38	0.29	70	94.501711	
LF-25C-41.5-48.5	5/29/2001	122.0025	306.2295	100.8741	0.37	0.29	70	100.75779	
LF-25C-48.5-57	5/29/2001	127.1375	299.1489	102.6892	0.32	0.23	70	102.57085	
LF-25C-57-71		45.507	277.622378					34.071839	460.1211199
LF-39A-5-20		40.164	229.150327					24.821061	
LF-39A-20-28		80.65	219.74359					47.795112	
LF-39A-28-37	5/29/2001	139.99	242.1875	91.54034	0.35	0.28	70	91.434824	
LF-39A-37-46	5/29/2001	141.01	243.9506	92.87859	0.3	0.2	70	92.771525	
LF-39A-46-55	5/29/2001	104.02	244.5946	68.69537	0.3	0.2	70	68.616191	
LF-39A-55-62	5/29/2001	56.195	250.3846	37.98998	0.3	0.2	70	37.946191	
LF-39A-62-77		40.758	243.787879					26.797104	390.1820077
LF-39B-5-20		37.511	213.684211					21.616928	
LF-39B-20-28		80.53	230.142857					49.982514	
LF-39B-28-37		136.825	246.986301					91.138362	
LF-39B-37-46	5/30/2001	130.4	243.2895	85.65736	0.35	0.27	70	85.558636	
LF-39B-46-55	5/30/2001	103.56	219	61.23503	0.3	0.2	70	61.164447	
LF-39B-55-62	5/30/2001	47.715	224.2105	28.88515	0.19	0.12	70	28.851857	
LF-39B-62-77		34.66	230.806452					21.574433	359.8871758
LF-39C-5-20		38.749	210.634921					22.011709	
LF-39C-20-28		78.93	223.536585					47.583196	
LF-39C-28-37		129.595	262.121212					91.612199	
LF-39C-37-46	5/30/2001	133.575	228.9855	82.58419	0.33	0.25	70	82.489004	
LF-39C-46-55	5/30/2001	100.955	213.3333	58.15008	0.25	0.19	70	58.083045	
LF-39C-55-62	5/30/2001	51.61	229.2727	31.94847	0.21	0.08	70	31.911638	
LF-39C-62-77		36.822	202.8125					20.140256	353.8310478

Appendix H: Ratio of Sand Load to Wash Load

Table H-1. Ratio of Sand Load to Wash Load 300 cfs

CR-Sec	Date	Method	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/Day)	Ratio sand/ wash
LF-11A	6/8/2001	Method D	280.2	351	147	204	0.72
LF-11B	6/8/2001	Method D	272.7	212	80	133	0.60
LF-11C	6/8/2001	Method D	262.1	179	57	122	0.46
LF-25A	6/11/2001	Method D	280.7	1238	18	1220	0.01
LF-25B	6/11/2001	Method D	272.4	907	84	823	0.10
LF-25C	6/11/2001	Method D	287.3	1254	15	1239	0.01
LF-39A	6/9/2001	Method D	286.7	189	30	159	0.19
LF-39B	6/9/2001	Method D	277.4	154	29	125	0.23
LF-39C	6/9/2001	Method D	290.0	179	38	142	0.27
LF-11A	6/8/2001	Method B--Mobile Bed	181.1	240	114	126	0.91
LF-11B	6/8/2001	Method B--Mobile Bed	172.5	146	56	90	0.62
LF-11C	6/8/2001	Method B--Mobile Bed	184.3	157	61	96	0.64
LF-25A	6/11/2001	Method B--Mobile Bed	220.1	1128	34	1094	0.03
LF-25B	6/11/2001	Method B--Mobile Bed	217.4	1081	55	1026	0.05
LF-25C	6/11/2001	Method B--Mobile Bed	214.5	949	54	895	0.06
LF-39A	6/9/2001	Method B--Mobile Bed	200.8	117	7	110	0.06
LF-39B	6/9/2001	Method B--Mobile Bed	191.5	98	15	83	0.18
LF-39C	6/9/2001	Method B--Mobile Bed	198.6	123	14	109	0.13
LF-11A	6/8/2001	Method A	280.2	352	152	199	0.77
LF-11B	6/8/2001	Method A	272.7	220	84	136	0.61
LF-11C	6/8/2001	Method A	262.1	229	85	144	0.59
LF-25A	6/11/2001	Method A	280.7	1284	58	1226	0.05
LF-25B	6/11/2001	Method A	272.4	1312	134	1177	0.11
LF-25C	6/11/2001	Method A	287.3	1232	92	1140	0.08
LF-39A	6/9/2001	Method A	286.7	154	15	139	0.11
LF-39B	6/9/2001	Method A	277.4	138	16	123	0.13
LF-39C	6/9/2001	Method A	290.0	163	15	148	0.10

Table H-2. Ratio of Sand Load to Wash Load 600 cfs

CR-Sec	Date	Method	Q (cfs)	Total Load (Ton/day)	Sand Load (Ton/day)	Wash Load (Ton/Day)	Ratio sand/ wash
LF-11A	5/27/2001	Method D	621	1424	578	846	0.68
LF-11B	5/27/2001	Method D	595.2	926	323	602	0.54
LF-11C	5/27/2001	Method D	579.3	1228	512	715	0.72
LF-25A	5/28/2001	Method D	587	509	73	435	0.17
LF-25B	5/28/2001	Method D	566	474	65	409	0.16
LF-25C	5/29/2001	Method D	573	528	86	443	0.19
LF-39A	5/29/2001	Method D	603	431	54	377	0.14
LF-39B	5/30/2001	Method D	571	398	41	357	0.12
LF-39C	5/30/2001	Method D	570	377	34	343	0.10
LF-11A	5/27/2001	Method B--Mobile Bed	362.5	722	327	396	0.83
LF-11B	5/27/2001	Method B--Mobile Bed	349.1	617	280	337	0.83
LF-11C	5/27/2001	Method B--Mobile Bed	344.8	667	323	343	0.94
LF-25A	5/28/2001	Method B--Mobile Bed	473.9	432	76	356	0.21
LF-25B	5/28/2001	Method B--Mobile Bed	459.5	416	73	343	0.21
LF-25C	5/29/2001	Method B--Mobile Bed	459.2	397	76	321	0.24
LF-39A	5/29/2001	Method B--Mobile Bed	521.9	360	52	308	0.17
LF-39B	5/30/2001	Method B--Mobile Bed	499.0	357	41	316	0.13
LF-39C	5/30/2001	Method B--Mobile Bed	494.7	414	46	368	0.13
LF-11A	5/27/2001	Method A	621	1123	465	658	0.71
LF-11B	5/27/2001	Method A	595.2	1036	419	617	0.68
LF-11C	5/27/2001	Method A	579.3	1012	450	562	0.80
LF-25A	5/28/2001	Method A	587	514	84	431	0.19
LF-25B	5/28/2001	Method A	566	498	82	416	0.20
LF-25C	5/29/2001	Method A	573	481	87	394	0.22
LF-39A	5/29/2001	Method A	603	411	57	354	0.16
LF-39B	5/30/2001	Method A	571	400	45	355	0.13
LF-39C	5/30/2001	Method A	570	456	49	408	0.12

Appendix I: LFCC Maps

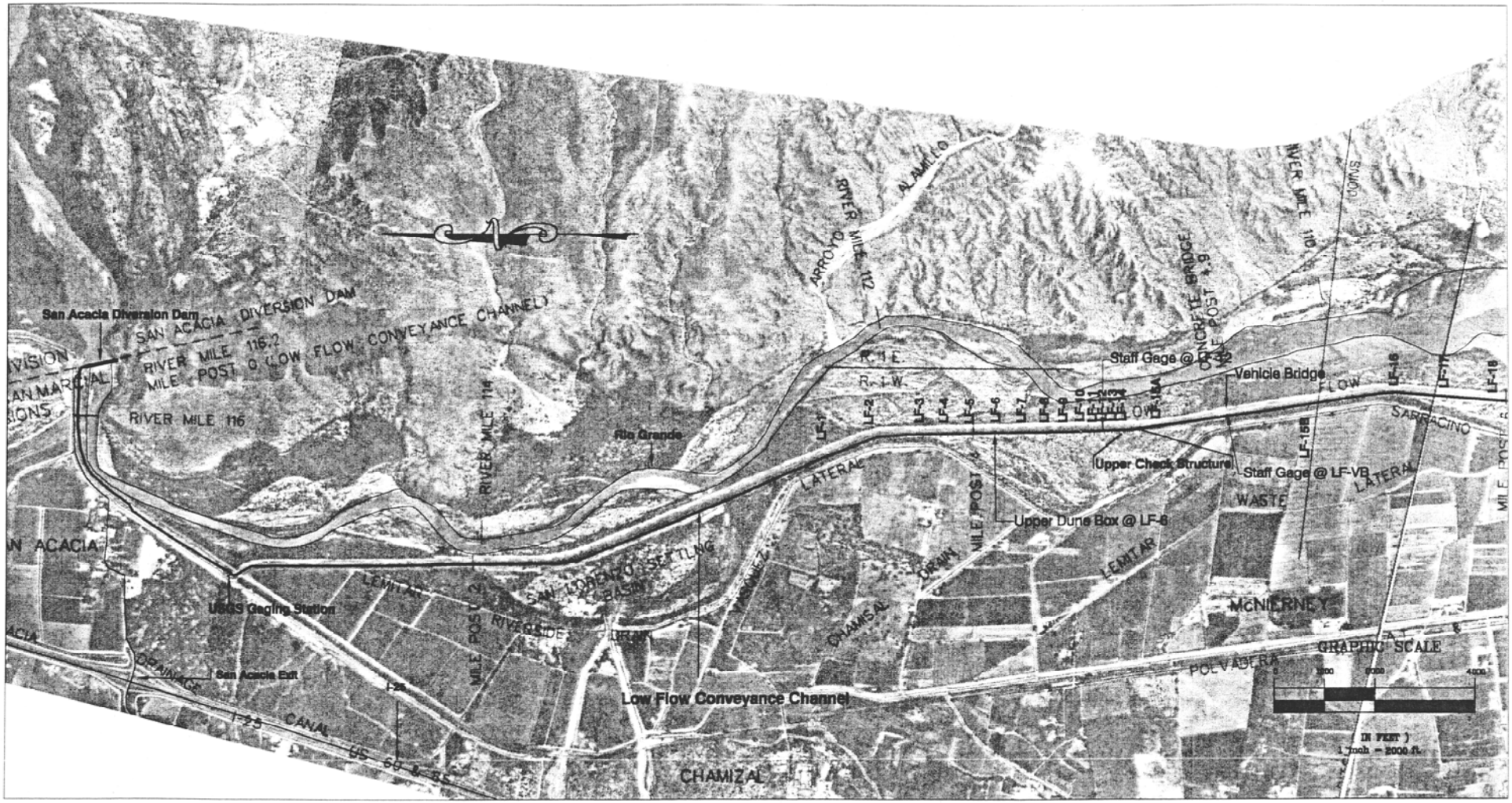

Figure: 1.5

Drawing File: LFCC-Gen3.dwg

Drawn by: D.Cline

Checked by: A. Smith

USBR Delivery Order: 28

USBR Task List: 2

Tt-ISG Project No.: 10600.28b

Project Description: LFCC Data Collection

Survey Date: 1997 - 1999

Photography Date: Feb.24, 1992

Scale: 1" = 2000'

TETRA TECH, INC.
INFRASTRUCTURE SOUTHWEST GROUP
6121 Indian School Rd. NE, Suite 205
Albuquerque, NM 87110
Phone: (505)881-3188 Fax: (505)881-3283
Formerly FLO Engineering

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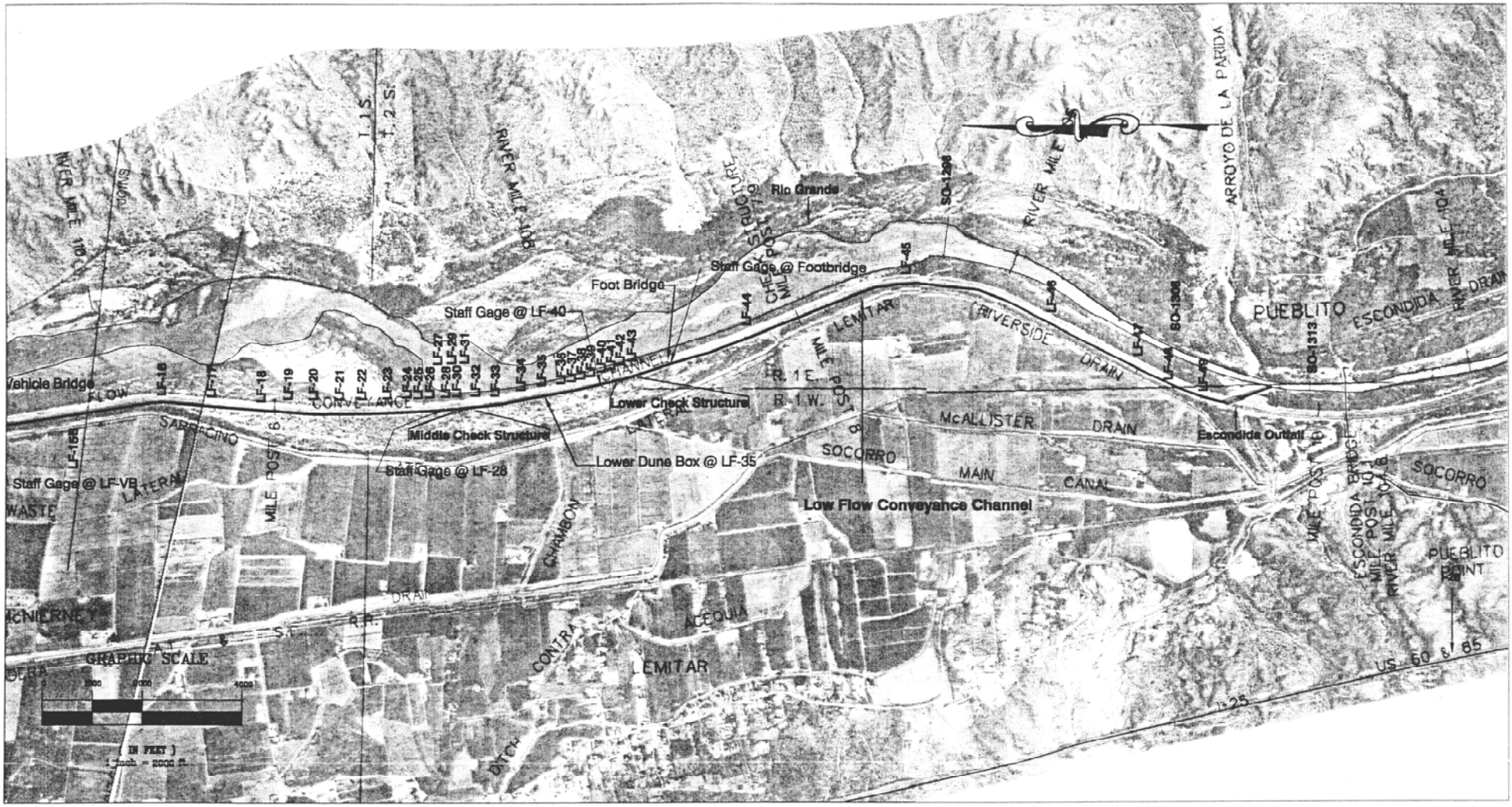

Figure: 1.6

Drawing File: LFCC-Gen3.dwg

Drawn by: D.Cline

Checked by: A. Smith

USBR Delivery Order: 28

USBR Task List: 2

Tt-ISG Project No.: 10600.28b

Project Description: LFCC Data Collection

Survey Date: 1997 - 1999

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TETRA TECH, INC.
INFRASTRUCTURE SOUTHWEST GROUP
8121 Indian School Rd. NE, Suite 205
Albuquerque, NM 87110
Phone: (505)881-3188 Fax: (505)881-3283
Formerly FLO Engineering

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