Report on Maintenance Dredging of Calumet Harbor
(9/17/2001 through 12/13/2001)

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers, Chicago District is responsible for maintaining commercial navigation in the Calumet River and Harbor by periodic dredging to authorized depths. During the period from 1 October 2001 to 2 December 2001, the federal channel within the Calumet Harbor was dredged and the dredged material was disposed of in the Chicago Confined Disposal Facility (CDF). Water and sediment samples were collected between 17 September 2001 and 13 December 2001 and analyzed to assess the impact of this dredging / disposal event.

The purpose of this report is to summarize the monitoring activities for the maintenance dredging of the Calumet Harbor from 1 October 2001 to 2 December 2001 as part of compliance with Illinois EPA Water Pollution Control Permit number 1987-EA-2851 and Section 401 certification requirements.

The report contains the analytical results for the filter cell effluent (treated CDF discharge), total suspended solids monitoring at the dredging and rehandling areas and dredged sediment. Also included is a discussion relating to the potential for impact of the filter cell effluent on the Calumet River and an analysis of filter cell performance. In addition to the above, the water quality data in and around the CDF was analyzed in order to determine if the 2001 dredging and disposal event or the CDF operation was adversely impacting water quality in Calumet Harbor.

Review of the analytical results showed that the treated effluent from the filter cells was below water quality standards and the treated effluent did not adversely impact Calumet River water quality. The filter cells were also effective in removal of the suspended solids below the design level indicated in the Final Environmental Impact Statement. During monitoring around the dredge or rehandling areas, some of the TSS concentrations were above background levels, but the increase was localized and short-term.

The results of these analyses of water quality data indicated that there is no qualitative evidence that indicates that the CDF operation or the 2001 dredging and disposal event has adversely impacted water quality in Calumet Harbor. In addition, the monitoring of the 2001 maintenance dredging operation was in compliance with the Illinois EPA Water Pollution Control Permit and Section 401 certification requirements.

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1.0 Purpose

The U.S. Army Corps of Engineers, Chicago District (Corps) is responsible for maintaining commercial navigation in the Calumet River and Harbor by periodic dredging to authorized depths. Because the sediment in the Calumet Harbor is contaminated, the dredged sediment is placed in the Chicago Area confined disposal facility (CDF). There are two monitoring programs associated with this activity. Routine monitoring of the water quality in and around the CDF is conducted on a tri-annual basis. Additional monitoring occurs during maintenance dredging operations. This additional monitoring involves weekly sampling of the water quality in and around the CDF as well as trubidity around the dredging and unloading areas. In addition, suspended solids levels are monitored in the effluent from the filter cells and the discharge area of the Calumet River.

The purpose of this report is to address the maintenance dredging of the Calumet Harbor during the period between 1 October 2001 and 5 December 2001. The results and analysis of the monitoring done before, during, and after the dredging event is provided in Sections 4 and 5. The sample collection period was from 17 September 2001 through 13 December 2001.

2.0 Background

The Chicago Area CDF is a facility for the disposal and containment of polluted dredged materials from deep-draft federal navigation projects in Chicago, Illinois. The CDF was constructed by the Chicago District in 1982-1984 in Calumet Harbor, south of the Calumet River entrance channel and adjacent to the Chicago Port Authority-owned Iroquois Landing. The CDF is an in-water diked facility and triangular in shape. Dikes form two of the walls and Iroquois Landing forms the third. The facility is about 43 acres in area and has a capacity for approximately 1.3 million cubic yards of dredged materials. This facility was constructed and is operated and maintained by the Chicago District under authority of PL 91-611, Section 123.

The Chicago Area CDF has been previously used for seven dredged material disposal operations since its construction. The eighth dredging event, which is discussed in this report, was the maintenance dredging of the Calumet Harbor. The dredging occurred from around 1 October 2001 to 2 December 2001. 290,995 cubic yards were dredged by Lake Michigan Construction of Holland, Michigan, from the locations shown in Figures 1a, 1b and 1c. Material was dredged mechanically using an enclosed bucket, transported in scows and disposed of in the CDF. A summary of the seven dredging events which have been disposed of in the CDF is outlined in Table 1. All the dredging events except for the fifth were conducted by the Corps; the fifth event was conducted by KCBX Terminals Company.

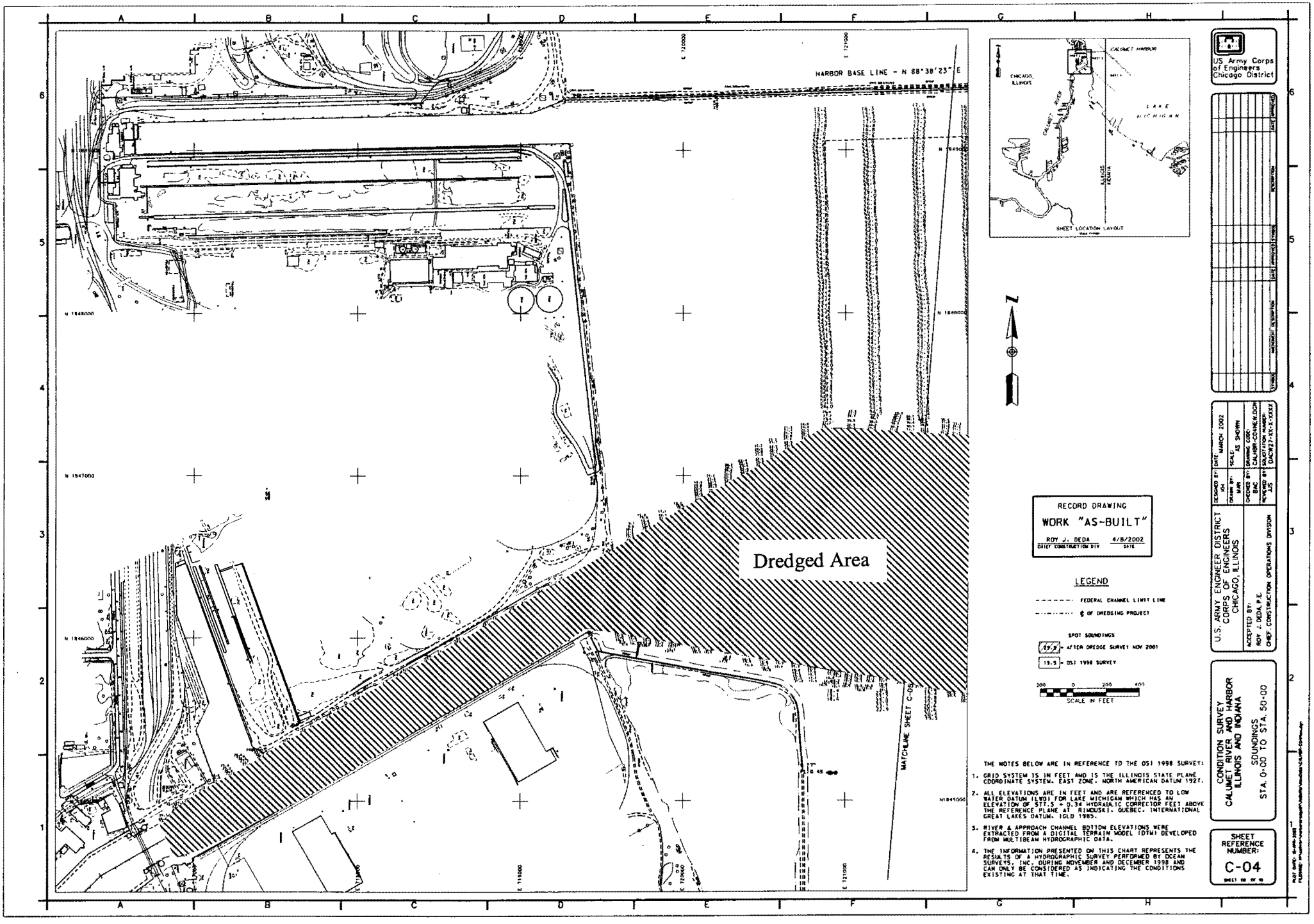


Figure 1a. Maintenance Dredging Locations During 2001 Dredging Event (Sheet #4)

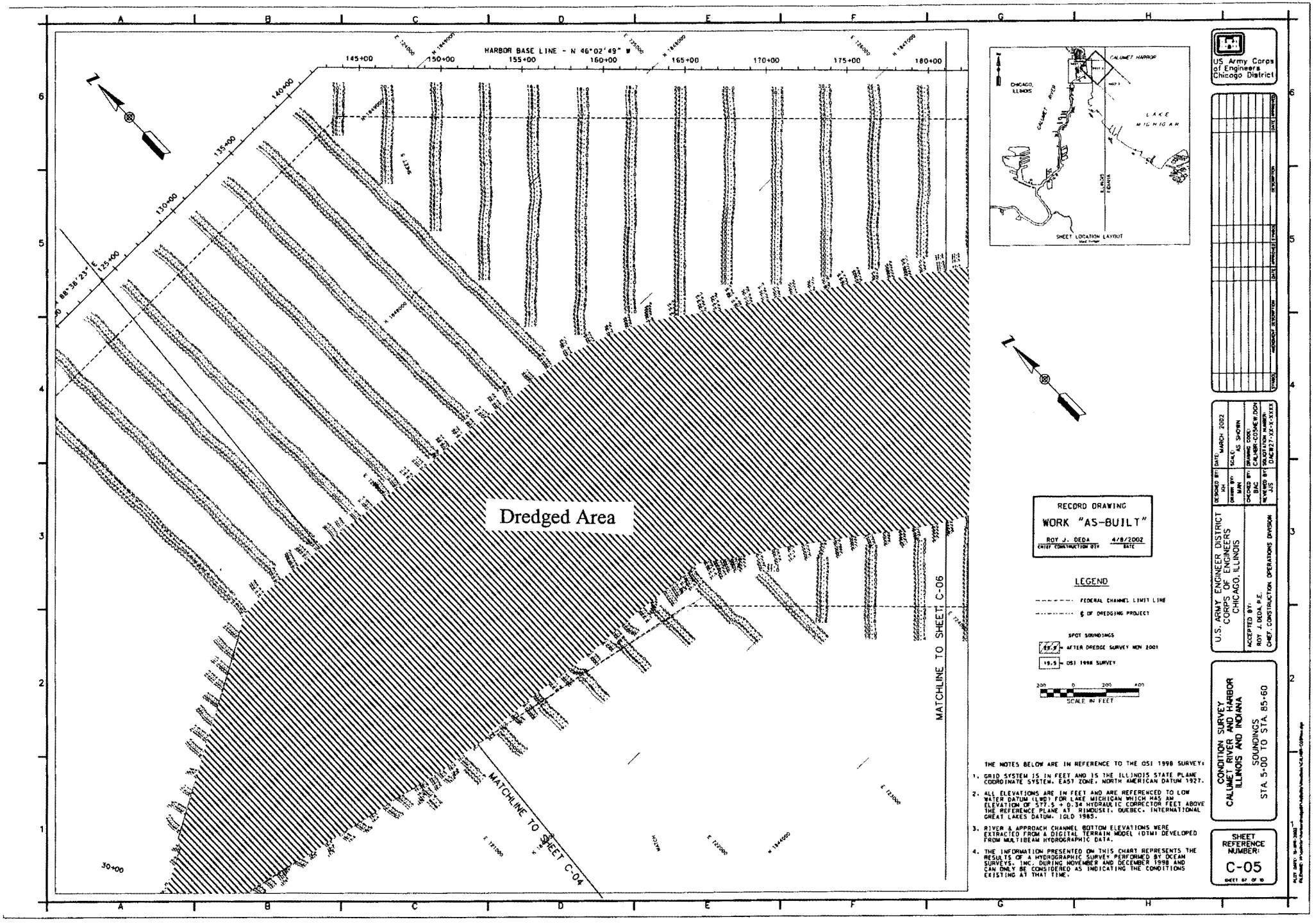


Figure 1b. Maintenance Dredging Locations During 2001 Dredging Event (Sheet #5)

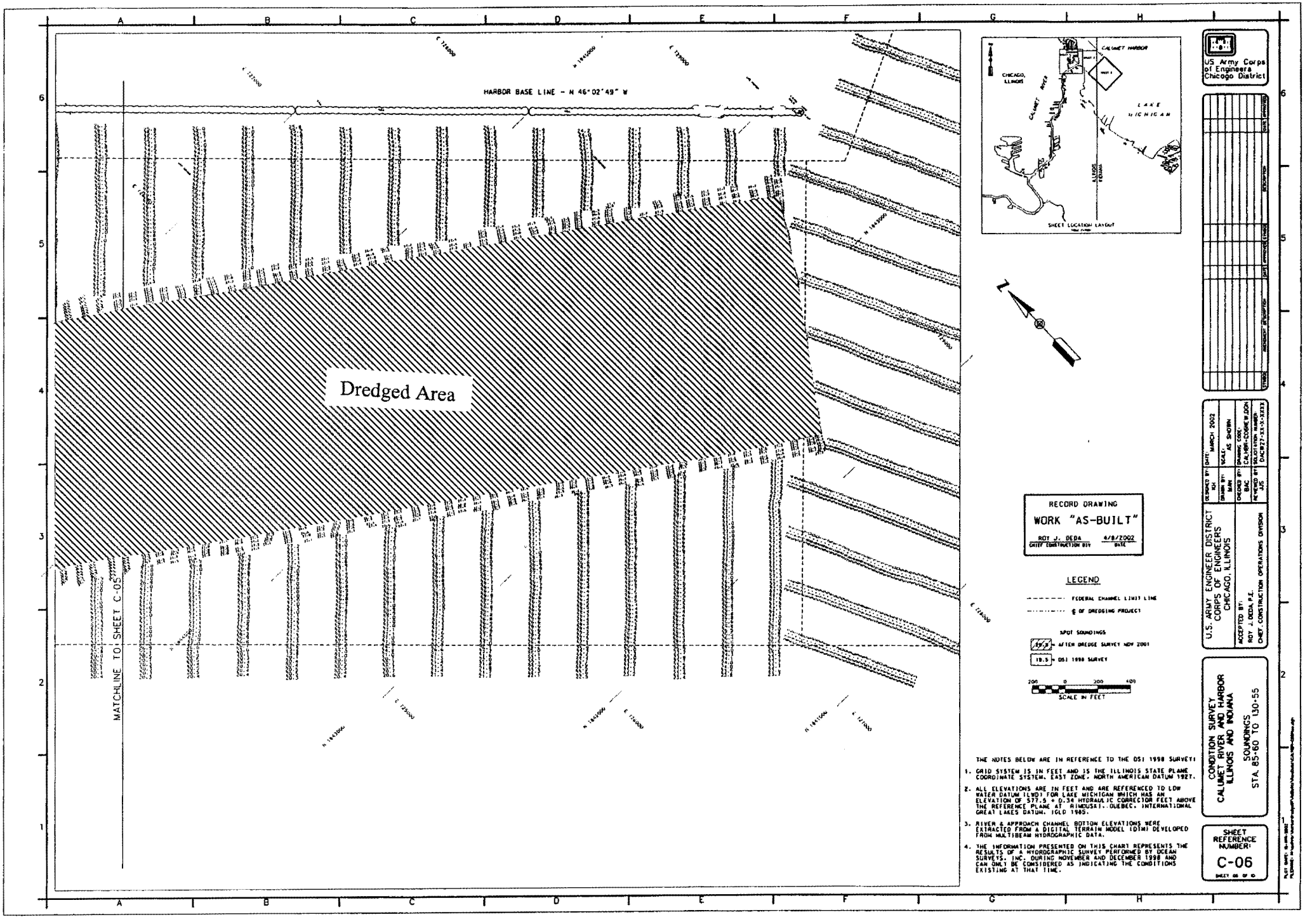


Figure 1c. Maintenance Dredging Locations During 2001 Dredging Event (Sheet #6)

Table 1. Dredging Events

Event No.	Dredging Dates	Amount Dredged (cu yd)	Dredging Location	Rehandling Location
1	10/5 - 12/3/84	100,000	Calumet River	northwest corner of CDF
2	7/29 - 9/24/85	108,000	Calumet River	northeast corner of CDF
3	5/10 - 6/28/86	62,000	Chicago Harbor & Chicago River Mainstem	north dike of CDF
4	4/4 - 6/17/89	70,100	Calumet River	northeast of crossdike in CDF
5	5/13 - 5/17/91	3,100	Calumet River	CDF
6	12/2 - 12/31/94	62,000	Calumet River	northeast corner of CDF
7	8/25/2000 – 4/14/2001	205,000	Calumet River & Coast Guard Station	north dike of CDF
8	**10/5/2001 - 12/2/2001**	**291,000**	Calumet Harbor	**north dike of CDF**

3.0 Introduction

During the period of 1 October 2001 through 2 December 2001, various locations within the Federal Channel of Calumet Harbor were dredged and the dredged material was disposed in the CDF. During a dredging event, the CDF is routinely monitored as part of compliance with Illinois EPA Water Pollution Control Permit number 1987-EA-2851 and Section 401 certification requirements. A report summarizing the monitoring activities conducted for the dredging event is routinely submitted to the Illinois EPA.

Sections 4 and 5 present a summary of the 2001 dredging event. Section 4 discusses the sampling program used to document the water quality before, during, and after dredging. Section 5 contains the analytical results for the filter cell effluent (treated CDF discharge), total suspended solids monitoring at the dredging and rehandling areas, and dredged sediment. Also included in this section is a discussion relating to the potential for impact of the filter cell effluent on the Calumet River and an analysis of filter cell performance. A graphic evaluation of the 2001 dredging event is presented in Appendix B. The report is summarized in Section 6.

3.1 Description of Dredging and Rehandling Operations

Dredged material was loaded into scows using an enclosed clamshell bucket. The scows were transported by tugboat to the rehandling area along the eastern dike wall of the CDF between stations 16+00 and 23+00. Dredged material was removed from the scows by enclosed clamshell bucket and transferred to the CDF by a hopper located on the dike wall and a sluice with a drop section.

The inside of the CDF forms a ponded area of approximately 30 acres, with water depths on average of approximately 10 feet. During the disposal/rehandling operation, water is pumped from the southern end of the CDF to filters located by the Calumet River approximately 3,000 feet west of the CDF. The CDF ponded water is clarified by settling in the CDF pond followed by gravity filtration and discharge to the Calumet River.

The hours of operation for a particular dredging event depend on the completion schedule and the pieces of equipment and crew members that the dredging company has available. In the case of Lake Michigan Contractors, the dredging event was conducted from 1 October 2001 to 2 December 2001. With the exception of down time for equipment maintenance and repair and inclement weather, the dredging event was conducted for a full twenty-four hours per day over a seven-day week. The operation was temporarily halted on several occasions because of the weather conditions.

4.0 Sampling Program

A sampling program was established to document the water quality before, during, and after dredging. In addition, sediment samples were collected that characterized the material to be dredged. Monitoring was conducted at the stations shown in Figure 2 to evaluate the following specific tasks:

a. Compare the water quality of the treated effluent from the CDF to applicable water quality standards (Station 3, Filter cell effluent, CH-00-03).

b. Document the chemical characteristics of dredged material disposed in the CDF (Sediment sample).

c. Document and review the localized effect of the dredging and rehandling operations on the water quality in Calumet River and Harbor, respectively (Total suspended solids monitoring around the dredge and rehandling operations).

d. Compare the river background to a downstream sample of the Calumet River to determine if there is an effect from the discharge of the filter cells (Station 4A, Riv-003, and station 4B, Riv-001).

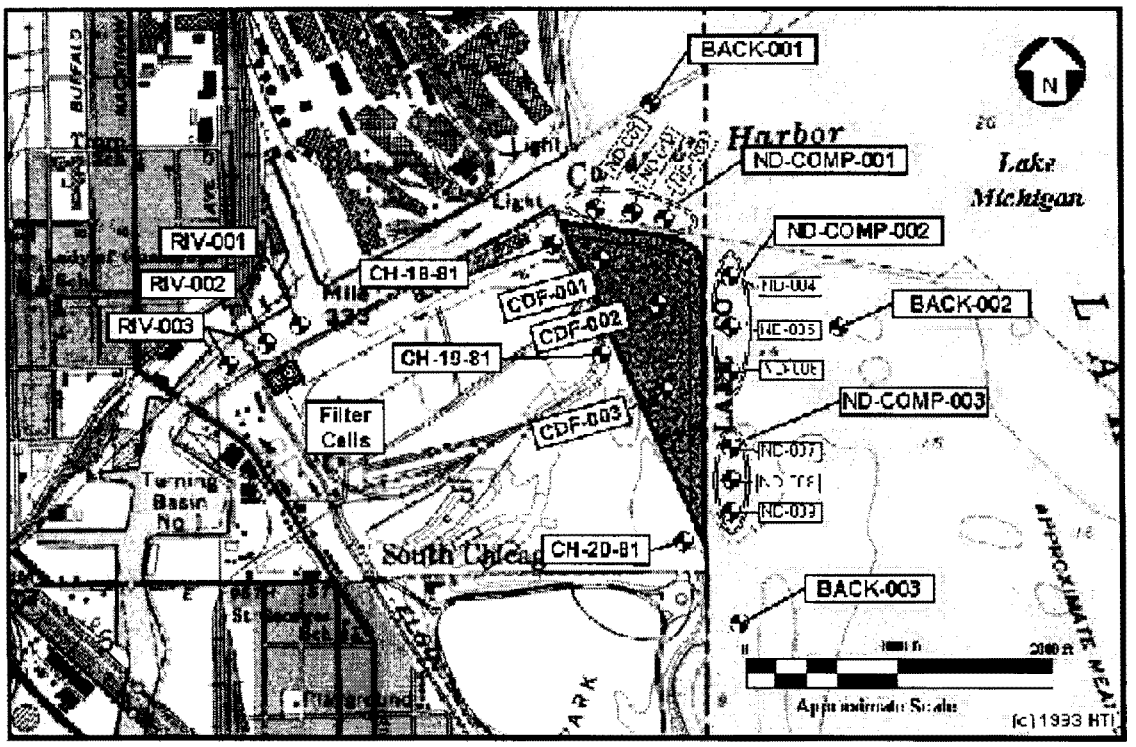


Figure 2: Sampling Locations during dredging events

e. Check the performance of the filter cells in retaining solids (Station 2, CH-00-02, Filter cell influent and Station 3, CH-00-03, Filter cell effluent).

f. Determine the effect of the dredging event on the water quality of Calumet Harbor.

g. Evaluate the short-term impact of the CDF operation on Calumet River / Harbor water quality.

The samples were collected over the period extending from 17 September 2001 to 13 December 2001 by Tri-Matrix Laboratories of Grand Rapids, Michigan. This included the before, during, between and after dredging time periods. Samples were collected at two sampling frequencies. Before and after dredging samples were collected twice a week, during dredging samples were collected once a week except for a single interval of twice-a-week sampling. Table 2 lists the sediment parameters, Table 3 lists the water parameters, and Table 4 outlines the sampling analysis and frequency.

Table 2. Parameters for Chemical Analysis of Sediment Samples

Parameter	Method	Detection Limit, mg/kg dry weight	Parameter	Method	Detection Limit, mg/kg dry weight
Metals:			**Physical:**		
Arsenic	6020	1.9	Total volatile solids	2510G	0.1
Barium	6010B	5.5	Grain size	ASTM D422	N/A
Cadmium	6010B	0.02 – 5.0	**Organics:**		
Chromium	6010B	2.2	Chemical Oxygen Demand	410.4	50
Copper	6010B	2.2	Oil and Grease	9071B	20 - 24
Iron	6010B	3.3	Total PCBs	8081A	0.33
Lead	6010B	5.5	**Nutrients and others:**		
Manganese	6010B	1.1	Ammonia-Nitrogen	350.1	9.6
Mercury	7471A	0.10	Total Kjeldahl Nitrogen	351.2	469
Nickel	6010B	2.2	Total Phosphorus	365.1	8.6
Zinc	6010B	1.1	Total Cyanide	9012A	0.5

NOTES:

1. Units are mg/kg dry weight unless otherwise noted.
2. Method references are SW-846, EPA-600/4-79-020, Standard Methods (SM) 16th edition, The Annual Book of ASTM Standards (ASTM), or HACH Handbook of Water Analysis (HACH).

Table 3. Parameters for Chemical Analysis of Water Samples

Parameter	Method	Detection Limit (mg/L)	Parameter	Method	Detection Limit (mg/L)
Metals:			**Physical:**		
Arsenic * [3]	6020	0.001	Suspended Solids	160.2	5
Cadmium *	6020	0.0002	Dissolved Solids	160.1	5
Chromium *	6020	0.001	Hardness (as $CaCO_3$)	130.2	10.0
Copper *	6020	0.001	**Organics:**		
Lead *	6020	0.001	Oil & Grease	9070A	5.0
Manganese *	6020	0.001	**Nutrients and others:**		
Mercury *	7470A	0.0002	Ammonia-N	350.1	0.01
Nickel *	6020	0.001	Total Kjeldahl Nitrogen	351.2	0.5
Zinc *	6020	0.005	Cyanide	9012A	0.01
			Phosphorus	365.1	0.005
			Measured in Field:		
			pH	150.1	±0.01
			Temperature	170.1	0.2°F
			Dissolved Oxygen	360.1	0.1

NOTES:

1. Method references are SW-846, EPA-600/4-79-020, or Standard Methods (SM) 16th edition.
2. Units are mg/L unless otherwise stated.
3. "*" means dissolved. All metal analyses were from the dissolved or soluble fraction.

Table 4. Sampling Analysis and Frequency Summary

Location	Before / After Dredging	During / Between Dredging	Sample Notes	Parameters
CDF Water Monitoring				
CDF Pond: CDF-001, CDF-002 & CDF-003	√	√	Collected inside the CDF, 1/3 of water column	Table 3
Calumet River/Harbor Water Monitoring				
Calumet River: Riv-001 (Station 4B), Riv-002 & Riv-003 (Station 4A)	√	√	Collected 200 feet upstream, 200 feet downstream and at the location of the filter cell outfall, 1/3 of water column	Table 3
Calumet Harbor, by CDF: ND-COMP-001, NE-COMP-002 & ND-COMP-003	√	√	Collected and composited into three groupings around the CDF, 1/3 of water column	Table 3
Calumet Harbor, background: Back-001, Back 002 & Back 003	√	√	Collected at 1000 feet from CDF dike wall, 1/3 of water column	Table 3
Landing Well Water Quality				
Upland Wells: CH-18-81, CH-19-81 & CH-20-81	√	√	Collected from groundwater wells on CDF landing	Table 3
CDF Effluent Water Quality				
Influent: CH-00-02 (Station 2)	No	√	Collected directly at filter cell influent	TSS, ammonia-nitrogen
Effluent: CH-00-03 (Station 3)	No	√	Collected from discharge sample well using automatic composite sampler	Table 3
Dredged Sediment Quality				
Sediment grab sample: CH-00-SED	No	√	Grab sample	Table 2
Total Suspended Solids Monitoring				
CH-00-09 through CH-00-14, MID and TOP	No	√	Collect at 2 depths per station and analyze 12 samples	TSS

Table 5. Sampling Schedule

SUN	MON	TUES	WED	THUR	FRI	SAT
September 2001						
16	17 Before	18	19	20 Before	21	22
23	24 Before	25	26 Before	27	28	29
30						
October 2001						
	1 Start Dredging	2 During	3	4	5	6
7	8	9 During	10	11	12	13
14	15	16 During	17	18	19	20
21	22	23 During	24	25	26	27
28	29 During	30	31			
November 2001						
				1	2	3
4	5 During	6	7	8	9	10
11	12	13 During	14	15	16	17
18	19	20 During	21	22	23	24
25	26	27 During	28	29	30	
December 2001						
						1
2 End Dredging	3	4 After	5	6	7 After	8
9	10 After	11	12	13 After	14	15

The sampling dates are shown on the calendar in Table 5. The before dredging samples were collected from 17 to 26 September 2001. The during dredging samples were collected from 1 October 2001 through 2 December 2001. The after dredging samples were collected from 4 to 13 December 2001. Samples were collected over a

period of 13 weeks. The laboratory analysis, submitted by Tri-Matrix, is included as Appendix D and contains the analytical results, field sampling and laboratory analysis quality control measures, and field sampling logs.

The water quality samples collected within and around the CDF were as follows: CDF-001, CDF-002 and CDF-003 were collected from the CDF pond at 3 sample locations, taken at one third of the depth at each location; samples CH-18-81, CH-19-81, and CH-20-81 were collected from the three shallow wells installed in the landing adjacent to the CDF; RIV-001, RIV-002 and RIV-003 were samples collected around the effluent discharge of the filter cell, at one third the depth; ND-COMP-001, ND-COMP-002 and ND-COMP-001 were each composite samples collected in Calumet Harbor, at one third of each depth; and Stations BACK-001, BACK-002 and BACK-003 were samples collected in Calumet Harbor at one third each depth, which served as background samples for the harbor. The previous samples were collected before, during, and after dredging. CH-00-02 and CH-00-03 were collected from the filter cell influent and effluent, respectively, and were collected only during dredging. To monitor the dredging and rehandling operations, samples were collected around the dredge and rehandling areas and analyzed for turbidity. Lastly, a weekly sample of the dredged sediment was collected from the scow during dredging.

The Quality Assurance/Quality Control (QA/QC) measures for this project applied to both sample collection and laboratory analytical testing. The field sampling QA consisted of collecting rinsate samples and collecting a weekly field replicate sample. The laboratory QC samples consisted of matrix spikes and matrix spike duplicates, method blanks, surrogate spikes, and laboratory control samples.

5.0 Discussion of Analytical Results

This report was written to document and analyze the 2001 maintenance dredging of the Calumet Harbor. The seven objectives (a through g) of the sampling program listed in Section 4 will be discussed in Sections 5. The discussion includes a comparison of the analytical results to water quality standards, background levels, or previous dredging operations.

The laboratory analysis was performed by Tri Matrix of Grand Rapids, Michigan. The analytical results and the laboratory QC sample results are included in Tri-Matrix's report provided in Appendix D of this report. Summary tables of the laboratory results are included in Appendix A, graphical analysis of these results are included in Appendix B and a quality assurance report is included in Appendix C.

5.1 Treated Effluent from the CDF (Filter Cell Effluent)

When dredged material is placed in the CDF, water is pumped from the CDF pond through one of two redundant filter cells. The treated effluent is then discharged

into the Calumet River at a point approximately 3,000 feet downstream from the harbor mouth. Weekly effluent samples (CH-00-03) were collected during dredging and unloading operations. Collection of a composite sample was accomplished using an automatic-timed sampler. Sampling frequency was set at 10ml every hour such that a 5 gallon jar was filled in the course of a week. This container was mixed prior to sample collection such that a sample was taken to represent the water quality for a weekly period.

The mean values of the effluent samples are presented in Column 2 of Table 6. The general use water quality standards (Column 3) and means of the CDF pond samples (Column 1) have been included for purposes of discussion. The treated effluent is compared to general use water quality standards as a point of reference. The CDF pond samples are shown to compare the water quality of the untreated pond to treated effluent.

Table 6. Filter Cell Effluent

Parameter	**CDF Pond(1) (mg/l)**	**Filter Cell Effluent(1) (mg/l)**	**General Use Water Quality Standards (mg/l)**
Arsenic	<0.003	<0.002	0.36(2)
Cadmium	<0.002	<0.002	0.016(2,3)
Chromium	<0.004	<0.002	2.5(2,3)
Copper	<0.006	<0.002	0.027(2,3)
Mercury	<0.0002	<0.0002	0.0005(2)
Manganese	0.123	0.008	1.0
Nickel	<0.006	<0.002	1.0
Lead	0.013	<0.002	0.1(2,3)
Zinc	0.033	<0.005	1.0
Cyanide	<0.01	<0.01	0.022(2)
Ammonia (as N)	<1.6	<0.2	2.1
TKN	1.8	0.6	
Oil and Grease	<5.0	<5.0	
Phosphorus	0.09	0.03	0.05
TDS	367	368	1,000
TSS	62	<5.2	
pH, S.U.	8.07	7.68	6.5 - 9.0
Hardness	189	195	

NOTES:

(1) Mean concentrations are calculated using the detection limit as the value where no concentrations were detected. Inclusion of the '<' symbol indicates that at least one non-detect was included in calculating the mean.

(2) These are the acute water quality standard from Subpart B (Title 35, Subtitle C, Chap 1, Section 302.208).

(3) Standard is based on hardness concentration of 157 mg/l.

Section 302.208 of Subpart B establishes an acute and chronic water quality standard for the following parameters: arsenic, cadmium, chromium, copper, mercury, lead, and cyanide. Because dredging has a short-term impact on water quality (USACE, 1988), it was decided that the acute standards are more applicable than the chronic ones. In addition, chronic standards are not applied to mercury or lead as stated in Subpart 302.208(d). All the tables in this report will present the acute standards, as presented in column 3, for comparison to the water quality sample results.

As seen from Table 6, in general there is a reduction in contaminant concentration between the samples collected from the CDF pond and the samples collected at the discharge point. Because the mean concentrations are calculated using the detection limit for samples where no concentrations were detected, the concentrations are conservative for parameters where non-detects were observed.

As shown in Table 6, all of the effluent parameters met the water quality standards. Since the effluent concentrations were less than the water quality standards, a mixing zone was not applied.

5.2 Sediment Quality

For the entire dredging event, sediment samples were collected directly from the scow at the station where the dredge was located. The analytical results for the nine sediment samples are summarized in Table 7.

An average for each parameter was calculated for the nine sediment samples and is shown in Table 8. Also included in Table 8 is the minimum, mean, and maximum results of the sediment analysis for the recent dredging event and the past six dredging events contracted by the Corps (1984, 1985, 1986, 1989, 1994 and 2000/2001). In the last column, the table displays the overall maximum, mean, and minimum from all the combined sampling events. The mean value is calculated from the seven means of each sampling event. The number of sediment samples collected for each dredging event varied from 4 to 18 as shown in the last row of the table. The number of samples was dependent on the length of the dredging operation.

Table 7. Sediment Quality of 2001 Maintenance Dredging

Date Collected:	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	29-Oct-01	05-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
Metals:									
Arsenic (mg/kg)	11.1	10.5	9.86	9.86	4.38	6.03	9.28	12.7	5.14
Barium (mg/kg)	43.2	56.5	51.4	76.8	19.1	23.4	19.9	34.9	12.5
Cadmium (mg/kg)	0.863	1.17	0.889	15.5	0.313	0.411	0.939	1.19	0.373
Chromium (mg/kg)	25.9	39.1	35.3	1.65	12.8	15.4	30.0	48.8	11.6
Copper (mg/kg)	51.4	57.6	43.9	67.8	31.0	20.9	32.1	38.7	15.0
Iron (mg/kg)	34200	49900	34800	127000	12700	17600	20300	33100	12800
Lead (mg/kg)	72.9	101	78	161	44.2	44.0	67.6	90.2	32.5
Manganese (mg/kg)	838	900	689	1820	476	518	633	659	488
Mercury (mg/kg)	0.116	0.113	<0.10	0.203	0.123	<0.10	0.114	0.13	<0.10
Nickel (mg/kg)	29.6	32.2	24.3	34.6	17.6	15.7	16.6	25.6	11.5
Zinc (mg/kg)	218	296	205	481	93.9	115	183	316	82.4
Percent Solids (%)	52	50	48	49	41	62	52	59	57
Total Volatile Residue (mg/kg)	39800	32100	36900	34500	35400	29800	48600	38500	23900
Cyanide (mg/kg)	0.80	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50
Chemical Oxygen Demand (mg/kg)	101000	81300	107000	98100	67600	54900	76500	64300	39500
Ammonia - Nitrogen (mg/kg)	244	190	230	198	158	94	139	164	81
Total Kjeldahl Nitrogen (mg/kg)	1240	933	1010	851	1310	819	870	731	627
Oil and Grease (mg/kg)	1310	1070	3050	3350	790	258	1030	1370	417
Phosphorus (mg/kg)	465	285	315	273	347	217	311	230	208
Individual PCBs:									
Aroclor 1016 (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Aroclor 1221 (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Aroclor 1232 (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Aroclor 1242 (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Aroclor 1248 (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Aroclor 1254 (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Aroclor 1260 (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Total PCBs (mg/kg)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

Table 8. Sediment Characteristics for Past and Recent Dredging Events

			Year of Dredging Operation							
Sediment Parameters	**Units**		**1984**	**1985**	**1986**	**1989**	**1994**	**2000 / 2001**	**2001**	**Overall**
Arsenic	mg/kg	Max	12	74	4.3	124	27	57.9	12.7	124
		Mean	5.2	19.1	2.2	54.4	20	17.4	8.8	18.2
		Min	0.4	<0.3	0.66	6.84	11	6.7	4.4	<0.3
Barium	mg/kg	Max	110	52	190	124	75	86	77	190
		Mean	46.3	27.8	66	71	65	57	64	56.7
		Min	23	8.4	28	30	57	32	51	8.4
Cadmium	mg/kg	Max	5	2	5.1	15.6	4.8	6.2	15.5	15.6
		Mean	2.9	1.3	2.7	8.23	3.5	2.5	8.2	4.19
		Min	0.88	0.82	0.82	<0.50	2.7	0.2	0.9	0.2
Chromium	mg/kg	Max	60	27	62	86.9	101	347	35	347
		Mean	34.7	19.2	24	62.3	61	68	18	41.0
		Min	23	12	3	20.9	31	19	2	2
Copper	mg/kg	Max	100	44	82	87.4	131	118	68	131
		Mean	57.6	29.9	42	67.4	86	64	56	58
		Min	34	24	4.4	26.4	47	14	44	4.4
Iron	mg/kg	Max	54,000	30,000	12,000	151,000	120,000	82,800	127,000	151,000
		Mean	40,323	18,909	8,100	54,043	76,475	38,388	38,044	39,183
		Min	22,350	13,000	5,400	16,100	37,400	14,800	12,700	5,400
Mercury	mg/kg	Max	0.66	0.12	0.9	0.169	0.57	0.62	0.20	0.9
		Mean	0.157	0.07	0.57	0.09	0.39	0.19	<0.15	<0.23
		Min	<0.01	0.04	0.11	0.022	0.23	<0.1	<0.1	<0.1
Manganese	mg/kg	Max	2,100	700	160	2,910	2,080	3,980	1820	3980
		Mean	1,069	451.8	140	1,691	1,440	1,257	780	976
		Min	600	390	130	344	881	394	476	130
Nickel	mg/kg	Max	50	32	19	73.7	63	61	35	73.7
		Mean	27	24.3	14	56.8	41	43.4	23	32.8
		Min	15	19	8.6	33.6	23	28.4	12	8.6
Lead	mg/kg	Max	520	130	250	276	639	367	161	639
		Mean	297.3	88	140	179.4	350	179.7	77	187
		Min	50	50	18	35	119	8.8	33	8.8
Zinc	mg/kg	Max	2,300	440	280	849	1,920	1,060	481	2,300
		Mean	1,108	270.5	170	423.5	1,051	511.9	221	537
		Min	280	180	61	80	282	54.3	82	54.3
Total Solids	%	Max	63.2	73	74	66.8	65	86	49	86
		Mean	52	54.6	54	54.1	57	63.7	48.5	54.8
		Min	45.5	43	37	39.9	50.7	40	48	37
Total Volatile Solids	%	Max	17	8.3	19	10.9	8.3	15.4	3.7	19
		Mean	11.1	7.2	9.3	6.34	7.2	5.4	3.6	7.2
		Min	5.1	2.7	2.4	3.8	6.2	2.8	3.5	2.4
Cyanide	mg/kg	Max	5.1	0.56	0.54	2.8	1.4	2.1	1	5.1
		Mean	1.2	0.2	0.23	1.24	1.3	0.79	<0.64	<0.8
		Min	<0.14	0.08	<0.01	<0.15	1.2	<0.5	<0.5	<0.5
Chemical Oxygen Demand	mg/kg	Max	290,000	73,000	52,000	962,000	200,000	134,000	107000	962,000
		Mean	135,309	55,046	39,000	172,500	136,000	81,170	76689	99,388
		Min	65,000	27,000	21,000	11,500	94,000	6,130	39500	6,130
Ammonia - Nitrogen (as N)	mg/kg	Max	240	110	240	141	293	255	244	293
		Mean	137.45	72.9	80	59.97	216	134	166	124
		Min	80	2.4	15	26.8	142	20	81	2.4
TKN	mg/kg	Max	4,900	890	1500	1,220	9,850	2,970	1310	9,850
		Mean	1,624	721.9	910	514.3	7,328	1,224	932	1,893
		Min	670	81	360	156	4,200	541	627	81
Oil & Grease	mg/kg	Max	15,000	4,400	6,500	99,500	1,640	5,780	3350	99,500
		Mean	7,445	1,888	3,360	19,059	1,423	1,394	1405	5139
		Min	1,000	970	650	326	1,080	20	258	20
Phosphorus (total)	mg/kg	Max	1,000	500	540	11.3	3,300	492	465	3,300
		Mean	513.6	307	360	15.8	1,118	252	295	409
		Min	300	300	180	<0.10	227	8.9	208	<0.10
PCBs	mg/kg	Max	19	1.2	12	11	7.3	4.1	<0.33	19
		Mean	4.4	0.7	5.4	5.04	3.8	0.79	<0.33	<2.9
		Min	0.69	0.3	0.41	<0.25	0.8	<0.33	<0.33	<0.25
Total Organic Carbon	mg/kg	Max	No Data	No Data	96,500	198,000	No Data	No Data	No Data	198,000
		Mean	No Data	No Data	57,600	98,014	No Data	No Data	No Data	77,807
		Min	No Data	No Data	9,000	24,000	No Data	No Data	No Data	9,000
Number of samples collected			11	11	7	7	4	18	9	67

The sediment chemistry in the Table 8 characterizes the sediment that was placed in the CDF during the last seven dredging operations. Maintenance dredging of the river and harbor occurred in the shoaled areas so the sediment characteristics shown in Table 8 would have been from various locations along the river and harbor. Some variation in the data is introduced due to using multiple laboratories, analytical methods and sample collection techniques. It should be noted that the 1986 operation involved dredging of Chicago River and Harbor sediments.

5.3 Turbidity Monitoring During Dredging

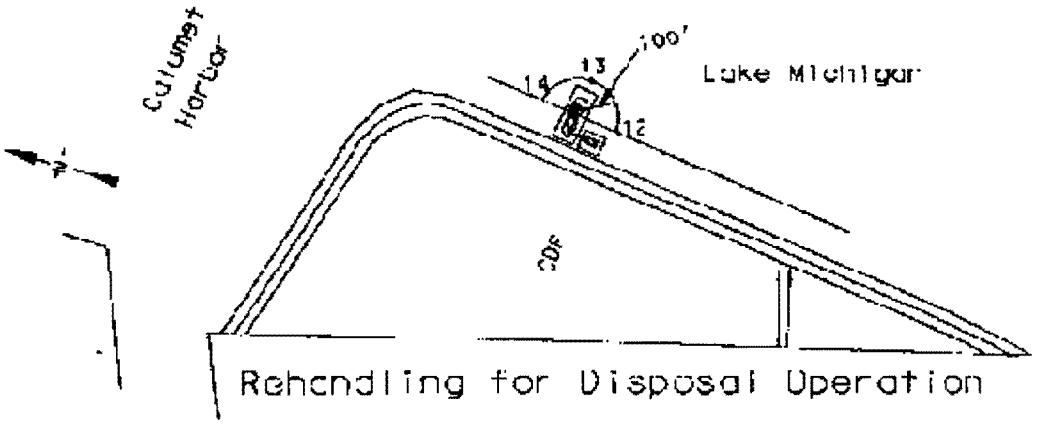
To assess the contractor's operating performance during dredging and rehandling, water samples were collected to measure the Turbidity around the dredging area and rehandling area. Three sampling locations were specified at each of the two areas and samples were collected at two depths (at a few feet below the water surface and at mid-depth). Samples were collected once a week for four weeks and analyzed for total suspended solids using method 160.2 from EPA-600/4-79-020. The sampling locations for both the dredging and rehandling areas are shown in Figure 3.

5.3.1 Dredging Area Turbidity Monitoring

The three sampling stations around the dredging operation were: 100 feet upstream, 100 feet downstream, and 500 feet downstream of the centerline of the dredge. The upstream samples were collected to establish background suspended solids concentrations in the harbor. As the dredge was relocated to different places in Calumet Harbor, the sampling locations remained the same in relation to the dredge and the flow of the river.

Generally, all three samples were collected one after the other within one-half hour of each other and after the harbor and river water quality samples were collected. As reported by the Metropolitan Water Reclamation District, the annual average flow through the O'Brien Lock and Dam for the period of record from 1983 to 1992 is 250 cubic feet per second. The lock is at the downstream end of the Calumet River and is an indication of the current in the river, because the lock controls the flow. Based on a channel cross-section 300 feet wide by 30 feet deep, the average current would be 0.03 ft/sec.

The analytical results are summarized in Table 9. Means were calculated for each depth for the three samples collected around the dredge. Figure 4 depicts the means at each sampling location. The mean suspended solids concentration of both surface and mid-depth samples at the upstream (background) location are similar to both downstream locations.



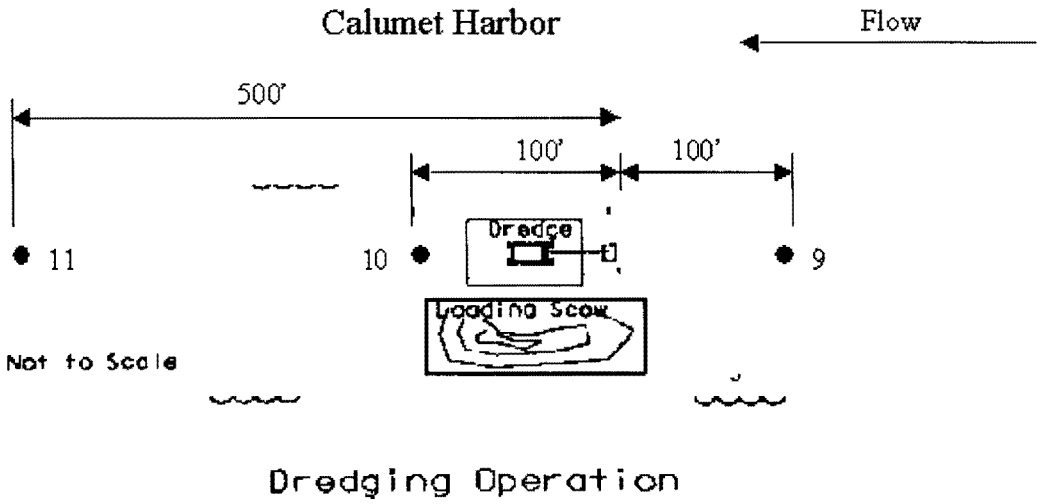
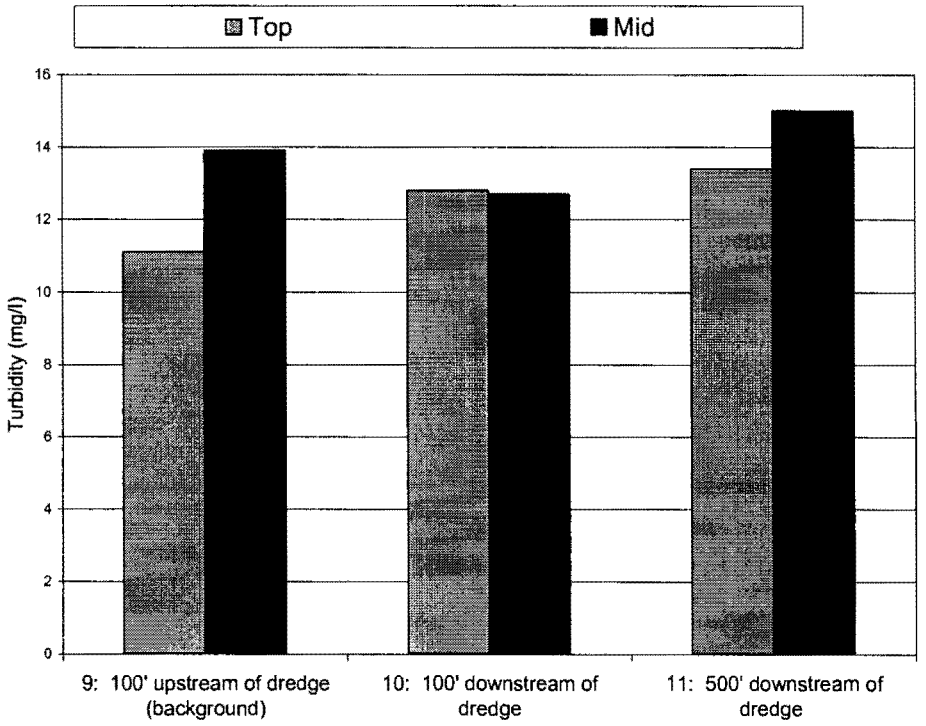


Figure 3. Turbidity Monitoring During Dredging Operations

Table 9. Turbidity (mg/l) Monitoring Results Around the Dredge Area

Sample location:	Sampling date:	2-Oct-01	9-Oct-01	16-Oct-01	23-Oct-01	10/29-30/01	5-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01	Average
9: 100' upstream of dredge (background)	Surface	7	12	21	7	9	7	17	11	9	11.1
	Mid	14	13	23	7	17	8	21	12	10	13.9
10: 100' downstream Of dredge	Surface	9	19	16	19	7	7	18	12	8	12.8
	Mid	6	16	18	13	7	10	19	15	10	12.7
11: 500' downstream Of dredge	Surface	7	27	14	21	7	7	17	13	8	13.4
	Mid	8	26	14	29	7	7	17	18	9	15

Figure 4: Turbidity Around Dredging Area



5.3.2 Rehandling Area Turbidity Monitoring

The rehandling area was located along the CDF dike wall between shallow wells CH-07-84 and CH-09-84. Water samples were collected at three sampling points within approximately 100 ft of the scow. The three samples were collected one after the other within one-half hour and along with the harbor water quality samples. Table 10 is a list of the means of the rehandling area Turbidity samples. The total suspended solids concentrations around the rehandling area averaged between 19.8 to 29.2 mg/L.

Table 10. Turbidity (mg/l) Monitoring Results Around the Rehandling Area

Sample location:	Sampling date:	2-Oct-01	9-Oct-01	16-Oct-01	23-Oct-01	10/29-30/01	5-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01	Average
12: 100' S of rehandling barge	Surface	15	90	21	8	9	19	42	37	15	28.4
	Mid	15	81	22	11	10	20	41	42	21	29.2
13: 100' E of rehandling barge	Surface	6	33	44	8	8	10	26	26	17	19.8
	Mid	12	46	46	8	9	10	26	27	21	22.8
14: 100' N of rehandling barge	Surface	28	19	24	13	40	9	13	30	26	22.4
	Mid	26	27	26	17	54	10	16	31	31	26.4

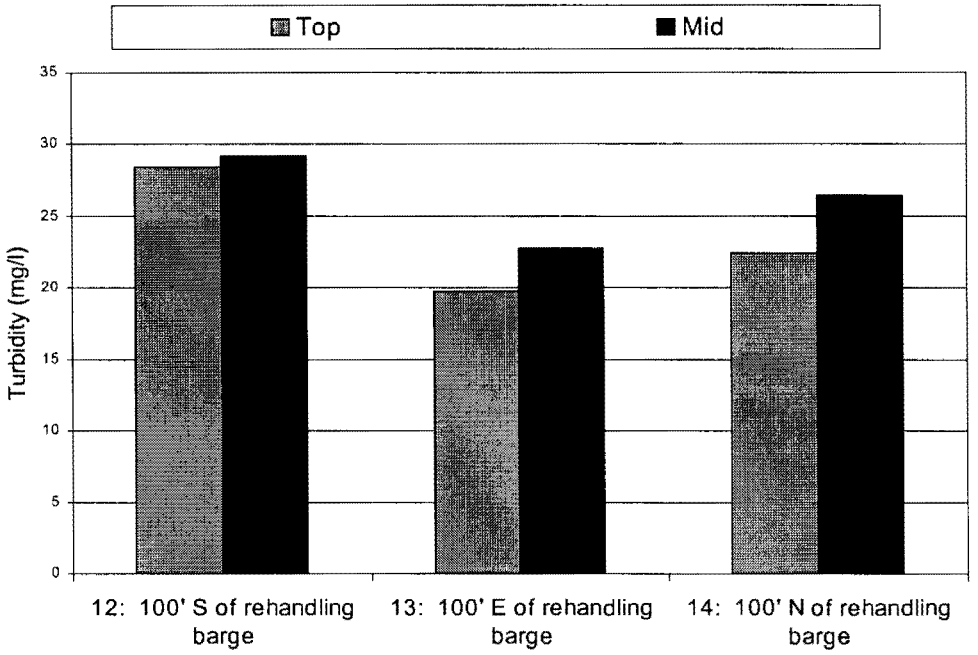
Figure 5 shows the means of the TSS concentrations around the rehandling area on a bar graph.

Some spillage occurred at the rehandling area as the sediment was removed from the barge and placed in the hopper on the dike wall. In order to minimize the spillage, a spill pan was placed on the rehandling barge to catch spills from the bucket.

5.4 Calumet River Sampling

The Calumet River was sampled at three points around the filter cell effluent discharge point to determine if the effluent had an impact on the river. RIV-001 was collected 200 feet upstream of the discharge point, RIV-002 was collected at the discharge point and RIV-003 was collected 200 feet downstream of the discharge point.

Figure 5: TSS Concentrations Around Handling Area



5.4.1 Calumet River Sampling During Dredging

Water is pumped from the CDF and discharged through the filter cells whenever dredged material is placed in the CDF. A total of 11 samples were collected from each river location during dredging. The mean concentrations during dredging were calculated for each of the three river locations and are presented in Table 11. The general use water quality standards and means of the filter cell effluent have been included in Table 11 for discussion.

No Cadmium, Mercury nor Cyanide were detected in either the river or the filter cell effluent. All the other parameters were below water quality standards. A few contaminant concentrations measured in the filter cell effluent were slightly higher than river concentrations, but well below water quality standards.

5.3.2 Rehandling Area Turbidity Monitoring

The rehandling area was located along the CDF dike wall between shallow wells CH-07-84 and CH-09-84. Water samples were collected at three sampling points within approximately 100 ft of the scow. The three samples were collected one after the other within one-half hour and along with the harbor water quality samples. Table 10 is a list of the means of the rehandling area Turbidity samples. The total suspended solids concentrations around the rehandling area averaged between 19.8 to 29.2 mg/L.

Table 10. Turbidity (mg/l) Monitoring Results Around the Rehandling Area

Sample location:	Sampling date:	2-Oct-01	9-Oct-01	16-Oct-01	23-Oct-01	10/29-30/01	5-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01	Average
12: 100' S of rehandling barge	Surface	15	90	21	8	9	19	42	37	15	28.4
	Mid	15	81	22	11	10	20	41	42	21	29.2
13: 100' E of rehandling barge	Surface	6	33	44	8	8	10	26	26	17	19.8
	Mid	12	46	46	8	9	10	26	27	21	22.8
14: 100' N of rehandling barge	Surface	28	19	24	13	40	9	13	30	26	22.4
	Mid	26	27	26	17	54	10	16	31	31	26.4

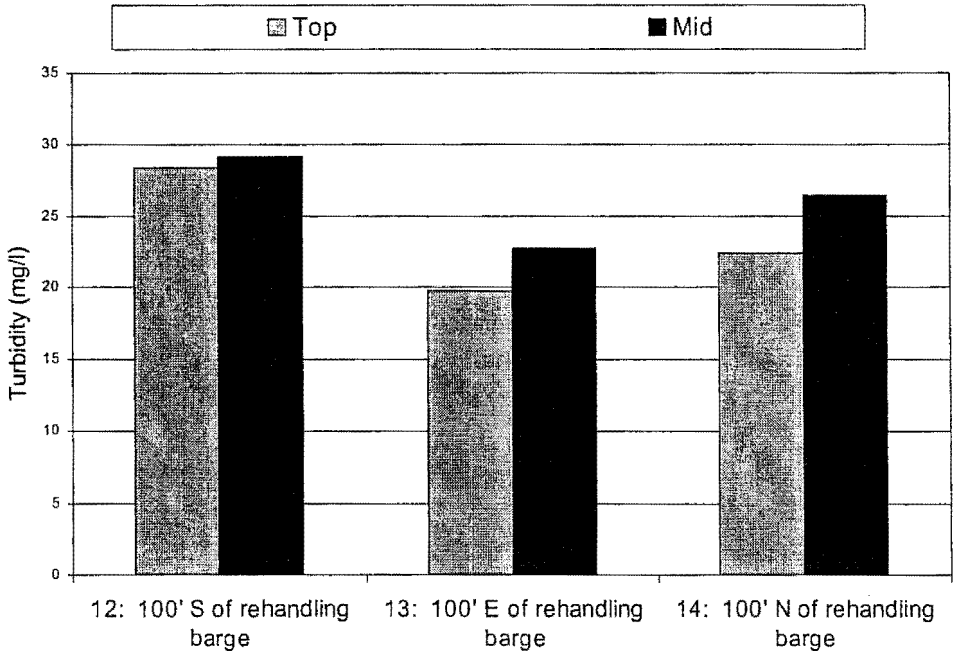
Figure 5 shows the means of the TSS concentrations around the rehandling area on a bar graph.

Some spillage occurred at the rehandling area as the sediment was removed from the barge and placed in the hopper on the dike wall. In order to minimize the spillage, a spill pan was placed on the rehandling barge to catch spills from the bucket.

5.4 Calumet River Sampling

The Calumet River was sampled at three points around the filter cell effluent discharge point to determine if the effluent had an impact on the river. RIV-001 was collected 200 feet upstream of the discharge point, RIV-002 was collected at the discharge point and RIV-003 was collected 200 feet downstream of the discharge point.

Figure 5: TSS Concentrations Around Handling Area



5.4.1 Calumet River Sampling During Dredging

Water is pumped from the CDF and discharged through the filter cells whenever dredged material is placed in the CDF. A total of 11 samples were collected from each river location during dredging. The mean concentrations during dredging were calculated for each of the three river locations and are presented in Table 11. The general use water quality standards and means of the filter cell effluent have been included in Table 11 for discussion.

No Cadmium, Mercury nor Cyanide were detected in either the river or the filter cell effluent. All the other parameters were below water quality standards. A few contaminant concentrations measured in the filter cell effluent were slightly higher than river concentrations, but well below water quality standards.

Table 11. Calumet River Samples Collected During Dredging

Parameter	DREDGING			Filter Cell Effluent (mg/l)	General Use Water Quality Standard (mg/l)
	River-001 (mg/l)	River-002 (mg/l)	River-003 (mg/l)		
Arsenic	<0.002	<0.002	<0.002	<0.002	0.36(2)
Cadmium	<0.002	<0.002	<0.002	<0.002	0.014(2,3)
Chromium	<0.002	<0.002	<0.002	<0.002	2.3(2,3)
Copper	<0.0022	<0.0022	<0.0021	<0.0020	0.024(2,3)
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	0.0005(2)
Manganese	0.019	0.019	0.019	0.009	1.0
Nickel	<0.0021	<0.0021	<0.0021	<0.0020	1.0
Lead	<0.0023	<0.0024	<0.0023	<0.0020	0.1(2,3)
Zinc	<0.008	<0.007	<0.007	<0.005	1.0
Cyanide	<0.010	<0.010	<0.010	<0.013	0.022(2)
Ammonia (as N)	<0.023	<0.018	<0.022	<0.184	2.1
TKN	0.17	<0.16	<0.18	0.63	
Oil and Grease	<5.0	<5.0	<5.0	<5.0	
Phosphorus	<0.009	<0.010	<0.012	0.033	0.05
TDS	199	204	207	368	1,000
Hardness	138	138	143	195	
Dissolved O_2	10.0	9.7	9.6	11.2	5.0 minimum
TSS	11.4	11.6	12.2	<5.2	
Temperature, °F	12.3	12.3	12.0	3.6	
pH, S.U.	7.64	7.60	7.53	7.56	6.5 - 9.0

NOTES:
(1) Mean concentrations are calculated using the detection limit as the value where no concentrations were detected. Inclusion of the '<' symbol indicates that at least one non-detect was included in calculating the mean.
(2) These are the acute water quality standard from Subpart B (Title 35, Subtitle C, Chap 1, Section 302.208).
(3) Standard is based on hardness concentration of 139 mg/l.

5.4.2 Calumet River Sampling Before and After Dredging

Samples were collected at RIV-001, RIV-002 and RIV-003 for the two weeks before dredging and the two weeks after dredging as well as during dredging. These samples were collected to establish the water quality of the river with no discharge from the filter cells. Table 12 displays the means of the river samples collected before during after dredging.

Table 12. Calumet River Samples Collected Before, During, and After Dredging

	Before Dredging			During Dredging			After Dredging		
Parameter	**River-001**	**River-002**	**River-003**	**River-001**	**River-002**	**River-003**	**River-001**	**River-002**	**River-003**
	(mg/l)	**(mg/l)**	**(mg/l)**	**(mg/l)**	**(mg/l)**	**(mg/l)**	**(mg/l)**	**(mg/l)**	**(mg/l)**
Arsenic	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	<0.0020	<0.0020	<0.0023	<0.0022	<0.0022	<0.0021	<0.0010	<0.0021	<0.0021
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0037	<0.0039	<0.0044
Manganese	0.008	0.008	0.009	0.019	0.019	0.019	0.013	0.013	0.013
Nickel	<0.0020	<0.0020	<0.0020	<0.0021	<0.0021	<0.0021	<0.0021	<0.0020	<0.0020
Lead	<0.0020	<0.0020	<0.0020	<0.0023	<0.0024	<0.0023	<0.0020	<0.0020	<0.0020
Zinc	<0.005	<0.005	<0.005	<0.008	<0.007	<0.007	0.005	<0.005	<0.005
Cyanide	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ammonia (as N)	<0.012	0.012	<0.015	<0.023	<0.018	<0.022	0.030	0.045	0.043
TKN	0.22	0.25	0.25	0.17	<0.16	<0.18	<0.19	<0.19	<0.17
Oil and Grease	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Phosphorus	0.006	<0.006	<0.007	<0.009	<0.010	<0.012	0.009	0.009	0.010
TDS	170	175	166	199	204	207	174	204	222
TSS	5.5	6.0	7.3	11.4	11.6	12.2	6.8	6.3	7.3
Hardness	136	136	136	138	138	143	147	142	146
pH, S.U.	7.7	7.7	7.6	7.64	7.60	7.53	7.6	7.7	7.7
Dissolved O_2	10.0	10.1	10.0	10.0	9.7	9.6	10.9	10.9	10.85
Temperature, °F	18.0	18.0	18.0	12.3	12.3	12.0	8.8	8.8	8.9

NOTES:

(1) Mean concentrations are calculated using the detection limit as the value where no concentrations were detected. Inclusion of the '<' symbol indicates that at least one non-detect was included in calculating the mean.

Table 12 provides a comparison of water quality upstream and downstream from the effluent discharge before, during, and after dredging. Arsenic, Cadmium, Chromium, and Cyanide were not detected in the river throughout the sampling period. Concentrations of Copper, Mercury, Nickel, Lead, Zinc, TKN and Phosphorus were measured close to the detection limit. However, Concentrations of Manganese and Total Dissolved Solids were measured higher during and after dredging.

5.5 Filter Cell Performance as Measured by Solids Removal

The ability of the filter cells to reduce the total suspended solids in the effluent is a measure of their performance. According to the Final Environmental Impact Statement issued for the construction of the CDF, the filter cells were designed to reduce the suspended solids in the discharge to at least 15 mg/L (USACE, 1982). The Illinois Environmental Protection water quality standard is also 15mg/l total suspended solids. Table 13 summarizes the suspended solids concentration in the filter cell influent and effluent during the dredging period. The effluent did not exceed the 15 mg/L design concentration in any of the samples.

Table 13. Total Suspended Solids Concentrations and Filter Cell Efficiency

Sampling Date	CH-00-02 Filter Cell Influent (mg/l)	CH-00-03 Filter Cell Effluent (mg/l)	Efficiency (%)
10/02/2001	11	<5	>55
10/09/2001	21	7	67
10/16/2001	20	6	70
10/23/2001	12	4	67
10/29/2001	14	<5	>64
11/05/2001	12	<5	>58
11/13/2001	13	<5	>61
11/20/2001	7	<5	>29
11/27/2001	46	<5	>88

An efficiency can be calculated for three of the sampling dates because both of the samples had a TSS concentrations greater than the detection limit. Because the filter effluent sample was below the detection limit on six other occasions, the calculated efficiencies were between >29% and >88%. The filter cell efficiency is a function of the influent and effluent TSS concentrations.

6.0 Report Summary

During the period of 1 October 2001 through 2 December 2001, various locations within the Federal Channel of the Calumet Harbor were dredged and the dredged material was disposed in the CDF. As part of compliance with Illinois EPA Water Pollution Control Permit number 1987-EA-2851 and Section 401 certification requirements, this report summarizes the monitoring activities conducted for the dredging event. The following conclusions were reached upon review of the analytical data:

1. The treated effluent was below water quality standards and the discharge did not indicate an adverse impact on Calumet River water quality as discussed in Sections 5.1 and 5.4, respectively.
2. TSS concentrations did not differ significantly between upstream and downstream monitoring stations around the dredge.
3. Although TSS concentrations increased around the rehandling area, the increase was localized and short-term. The increased TSS concentrations are likely to be caused by the washing of eroded fines from the dike wall in conjunction with the rehandling operation.
4. The filter cells were effective in removal of the suspended solids.

Appendix A:

Water Quality Summary Data

Oil&Grease HEM, mg/l, Water Quality Samples During Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Back-002	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Back-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
ND-COMP-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
ND-COMP-002	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
ND-COMP-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
RIV-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
RIV-002	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
RIV-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CDF-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CDF-002	<5.0	<5.0	6.1	<5.0	<5.0	<5.0	<5.0	<5.0
CDF-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-18-81	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-19-81	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-20-81	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-00-02								
CH-00-03								
DUP	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Oil&Grease HEM, mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Back-002	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Back-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
ND-COMP-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
ND-COMP-002	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
ND-COMP-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
RIV-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
RIV-002	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
RIV-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CDF-001	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CDF-002	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CDF-003	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-18-81	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-19-81	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-20-81	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
CH-00-02	-	-	-	-	-				-	-	-
CH-00-03	<5.0	<5.0	<5.0	<5.0	<5.0				<5.0	<5.0	<5.0
DUP	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Temperature, Degrees Celsius Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	19.2	19	17	15.3	9.4	9.3	7.8	8.1
Back-002	19.8	19.2	16.9	15.0	9.4	9.3	7.7	8.4
Back-003	20.2	19.6	16.7	15.2	9.7	9.6	8.0	9.0
ND-COMP-001	19.4	19.1	16.8	15.4	9.4	9.3	8.0	8.2
ND-COMP-002	19.6	19.1	16.5	15.2	9.5	9.2	7.8	8.3
ND-COMP-003	19.8	19.2	16.6	15.3	9.4	9.4	7.9	8.4
RIV-001	19.2	19.2	17.4	16.1	9.6	9.3	7.9	8.3
RIV-002	19.2	19.2	17.5	16.2	9.4	9.3	8.2	8.3
RIV-003	19.2	19.4	17.2	16.3	9.7	9.3	8.3	8.4
CDF-001	19.9	18.4	15	13.3	8.7	9.2	5.3	5.7
CDF-002	18.7	18.5	14.3	13.5	9.8	9.3	4.8	5.9
CDF-003	18.3	19.1	15	13.6	8.2	9.2	5.4	5.9
CH-18-81	18.1	18.7	16.9	19.6	15.9	14.5	13.9	14.0
CH-19-81	12.9	14.4	11.5	12.9	14.2	12.5	12.0	12.5
CH-20-81	14	15.1	12.4	13.8	13.9	12.4	11.8	12.5
CH-00-02								
CH-00-03								
Dup	18.1	19.1	12.4	15.0	9.4	9.2	13.9	5.9

Temperature, Degrees Celsius Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	15.8	14.1	13.4	14	9.6	10.7	10.9	11.1	9.4	9.8	10.5
Back-002	16.4	13.6	13.4	14.2	9.5	10.8	10.5	11.2	9.6	9.0	10.9
Back-003	16.3	14.1	13.3	14.5	9.7	11.8	10.7	11.2	9.5	9.5	10.7
ND-COMP-001	15.9	14.0	13.4	14.3	9.7	10.8	10.6	11.1	9.7	9.6	10.5
ND-COMP-002	16.2	13.9	13.1	14.2	9.5	10.9	10.5	11.1	9.4	9.4	10.6
ND-COMP-003	16.3	14.0	13.1	14.3	9.6	11.1	10.5	11.0	9.4	9.4	10.9
RIV-001	15.9	14.5	13.9	14.4	9.9	10.9	10.8	11.0	9.9	9.8	9.9
RIV-002	15.8	14.5	14	13.9	10.0	10.8	11.0	11.0	10.0	9.8	9.8
RIV-003	15.8	14.6	14.2	14	10.0	10.9	11.0	11.3	9.9	9.7	10.5
CDF-001	17.1	12.4	12.4	14.7	8.3	11.0	14.1	10.1	9.0	9.1	8.9
CDF-002	18.1	12.3	12.2	14.7	8.0	9.9	11.8	10.3	9.8	9.3	8.9
CDF-003	17.8	12.2	12.4	14.3	7.9	9.8	11.3	10.3	8.0	9.0	9.0
CH-18-81	20.4	19.9	16.9	18.1	16.0	17.2	16.2	15.6	16.4	14.6	14.0
CH-19-81	15.0	13.7	11.6	14.3	12.0	14.2	13.3	12.7	14.2	12.5	11.9
CH-20-81	15.0	15.3	12.7	14.3	12.8	14.0	12.7	12.7	13.9	12.3	12.3
CH-00-02	18.2	14.2	12.6	14.6	8.2		11.1		8.6	8.8	8.5
CH-00-03	16.1	4.9	3.6	3.5	2.2		2.1		2.2	2.1	1.7
DUP	15.8	13.7	13.1	14.3	10.0	14.0	10.6	11.1	10.0	2.1	10.9

Field Dissolved Oxygen, mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	8.96	10.06	12.29	10.76	9.89	11.01	12.92	12.20
Back-002	8.9	9.84	10.88	10.78	10.00	11.05	12.72	12.16
Back-003	9.19	9.11	11.16	10.71	9.99	10.94	10.79	11.39
ND-COMP-001	8.45	9.98	11.71	10.80	9.92	11.09	12.33	12.30
ND-COMP-002	8.42	9.73	11.37	10.75	10.03	11.09	11.03	11.97
ND-COMP-003	8.31	9.53	11.22	10.57	9.93	11.02	11.09	11.88
RIV-001	8.5	9.86	11.26	10.52	9.56	10.63	11.68	11.57
RIV-002	8.58	9.96	11.63	10.39	9.45	10.74	11.85	11.51
RIV-003	8.45	10.14	11.24	10.42	9.32	10.67	11.82	11.58
CDF-001	13.15	9.3	10.07	11.02	9.51	9.99	11.16	11.49
CDF-002	12.05	9.68	12.72	11.08	9.41	10.04	11.68	11.75
CDF-003	11.11	10.12	10.96	11.19	9.34	10.01	11.10	12.03
CH-18-81	4.94	4.94	3.05	5.11	3.14	4.06	4.44	5.34
CH-19-81	4.17	3.72	2.68	2.81	1.32	2.68	3.81	3.68
CH-20-81	6	4.84	6.41	5.13	1.91	5.36	3.94	3.84
CH-00-02								
CH-00-03								
Dup	4.94	9.73	6.41	10.78	9.45	11.09	4.44	12.03

Field Dissolved Oxygen, mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	11.69	9.48	10.66	9.26	10.77	15.22	11.72	10.53	10.51	10.35	10.42
Back-002	11.67	9.62	10.73	9.65	11.07	13.64	11.80	10.44	10.55	10.61	10.46
Back-003	11.51	9.45	10.75	9.4	11.10	13.05	11.64	10.35	10.30	10.62	10.38
ND-COMP-001	11.43	9.63	10.46	9.05	11.14	15.04	11.60	10.51	10.54	10.31	10.56
ND-COMP-002	11.04	9.52	10.8	9.26	10.88	14.22	11.62	10.49	10.58	10.53	10.42
ND-COMP-003	11.26	9.33	10.54	9.13	10.97	14.32	11.54	10.61	10.55	10.61	10.33
RIV-001	11.80	9.21	10.38	8.41	10.70	11.61	11.27	9.83	10.01	10.36	10.37
RIV-002	10.34	9.10	10.93	8.41	10.71	9.6	11.22	10.09	10.03	10.28	10.26
RIV-003	10.09	9.08	10.75	8.54	10.60	9.43	11.21	10.04	9.96	10.36	10.28
CDF-001	15.70	9.94	9.34	8.34	13.51	9.72	10.92	8.77	10.99	10.19	9.65
CDF-002	14.37	10.18	10.66	9.02	13.15	10.78	10.97	9.20	10.73	10.06	10.17
CDF-003	14.33	10.01	10.45	8.86	13.52	13.08	10.64	9.34	10.47	10.20	10.09
CH-18-81	5.88	3.13	4.08	3.49	6.01	5.92	3.47	3.19	3.87	3.53	4.06
CH-19-81	5.01	2.74	4.86	6.53	6.81	5.46	4.92	4.83	3.37	3.99	3.36
CH-20-81	6.88	4.02	4.73	3.7	4.54	6.43	3.65	2.88	2.83	3.97	4.02
CH-00-02	7.10	10.22	10.54	9.98	11.23		11.29		10.16	9.42	10.00
CH-00-03	9.53	11.85	11.74	11.7	11.94		14.30		11.03	11.26	11.56
DUP	10.34	2.74	10.54	8.86	10.60	6.43	11.60	10.53	10.03	11.26	10.33

Hardness as $CaCO_3$, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	136	136	132	136	138	132	134	138
Back-002	140	138	150	134	140	138	138	140
Back-003	136	152	154	136	140	138	138	140
ND-COMP-001	134	134	136	138	138	140	140	136
ND-COMP-002	130	132	154	134	136	138	138	144
ND-COMP-003	138	140	160	140	138	138	142	140
RIV-001	132	138	132	140	144	146	148	148
RIV-002	134	136	138	134	144	140	140	144
RIV-003	138	140	132	134	146	142	152	144
CDF-001	186	186	184	192	222	214	210	226
CDF-002	180	182	228	180	230	224	202	226
CDF-003	180	176	188	178	214	216	216	224
CH-18-81	268	284	312	324	396	344	334	340
CH-19-81	356	346	362	334	326	330	322	338
CH-20-81	686	682	660	662	706	700	702	706
CH-00-02								
CH-00-03								
Dup	284	136	666	146	148	142	324	218

Hardness as $CaCO_3$, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	136	138	136	140	140	140	136	138	134	144	142
Back-002	134	142	140	136	138	136	144	146	136	148	140
Back-003	132	140	144	140	136	140	134	142	138	142	142
ND-COMP-001	140	136	142	136	140	142	138	136	138	142	146
ND-COMP-002	136	140	144	146	136	140	146	142	144	144	142
ND-COMP-003	146	138	152	140	136	150	140	140	142	146	144
RIV-001	138	130	150	134	136	136	138	140	146	142	142
RIV-002	138	134	140	140	138	138	142	140	140	136	140
RIV-003	138	140	142	152	138	144	138	142	146	140	146
CDF-001	186	190	192	198	208	230	204	216	224	224	218
CDF-002	180	180	198	196	196	204	212	216	266	226	230
CDF-003	178	182	196	190	202	202	196	208	218	216	222
CH-18-81	296	282	302	380	350	358	360	352	380	364	400
CH-19-81	374	356	324	338	312	328	320	316	342	326	330
CH-20-81	700	706	778	750	736	724	712	720	722	730	704
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	182	178	212	206	214		210		226	242	236
DUP	138	346	150	192	134	742	138	140	148	228	150

Field pH, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	7.64	7.85	7.77	7.70	7.66	7.71	7.69	7.68
Back-002	7.63	7.85	7.68	7.77	7.63	7.71	7.63	7.63
Back-003	7.6	7.73	7.69	7.69	7.58	7.64	7.63	7.65
ND-COMP-001	7.49	7.78	7.49	7.67	7.61	7.71	7.76	7.63
ND-COMP-002	7.48	7.74	7.61	7.67	7.58	7.68	7.65	7.60
ND-COMP-003	7.52	7.69	7.62	7.60	7.54	7.64	7.71	7.54
RIV-001	7.51	7.98	7.72	7.70	7.62	7.72	7.65	7.58
RIV-002	7.43	7.87	7.69	7.69	7.68	7.69	7.66	7.61
RIV-003	7.46	7.69	7.54	7.66	7.64	7.68	7.68	7.68
CDF-001	8.66	8.04	7.81	7.77	7.93	7.72	7.87	7.82
CDF-002	8.28	8.21	7.69	7.89	8.01	7.89	7.92	7.93
CDF-003	8.44	8.26	7.74	7.92	7.85	7.93	7.90	7.98
CH-18-81	7.41	7.37	7.09	7.16	7.54	7.90	7.93	8.06
CH-19-81	11.01	11.1	11.01	11.29	11.03	11.06	11.26	11.06
CH-20-81	7.04	7.15	7.02	7.10	6.97	7.23	7.15	7.07
CH-00-02								
CH-00-03								
Dup	7.41	7.74	7.02	7.77	7.68	7.68	7.93	7.98

Field pH, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	7.65	7.67	7.78	8	7.66	7.71	7.87	7.65	7.58	7.64	7.67
Back-002	7.84	7.86	7.71	7.64	7.64	7.67	7.90	7.68	7.61	7.45	7.67
Back-003	7.72	7.76	7.75	7.54	7.59	7.65	7.79	7.62	7.62	7.56	7.59
ND-COMP-001	7.60	7.65	7.71	7.71	7.65	7.63	7.14	7.61	7.54	7.63	7.66
ND-COMP-002	7.62	7.59	7.67	7.83	7.65	7.58	7.76	7.61	7.54	7.55	7.66
ND-COMP-003	7.66	7.03	7.62	7.58	7.58	7.57	7.72	7.68	7.48	7.55	7.61
RIV-001	7.64	7.74	7.68	7.78	7.66	7.67	7.77	7.92	7.53	7.61	7.66
RIV-002	7.60	7.66	7.7	7.81	7.71	7.70	7.91	7.74	7.58	7.35	7.58
RIV-003	7.53	7.62	7.7	7.74	7.69	7.74	7.95	8.05	7.62	7.64	7.71
CDF-001	8.91	7.89	7.6	7.78	7.66	7.70	7.46	7.36	8.02	7.85	7.49
CDF-002	8.88	7.92	7.76	7.94	7.69	7.76	7.58	7.50	7.96	7.82	7.68
CDF-003	8.77	7.88	7.73	7.8	7.69	7.73	7.66	7.57	7.90	7.86	7.70
CH-18-81	7.10	7.49	7.12	7.12	7.07	7.35	7.22	7.21	7.25	7.56	7.62
CH-19-81	11.21	11.28	10.99	10.81	11.11	11.01	11.03	10.95	10.49	10.83	10.81
CH-20-81	7.32	7.20	7	6.92	6.94	7.10	6.93	7.00	7.15	6.96	6.90
CH-00-02	8.38	8.14	7.99	7.75	7.66		7.62		7.79	7.35	7.47
CH-00-03	7.71	7.84	7.61	7.56	7.45		7.57		7.46	7.13	7.29
Dup	7.60	11.28	7.62	7.8	7.69	7.10	7.14	7.65	7.58	7.13	7.61

Total Kjeldahl Nitrogen (TKN) as N, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	0.27	0.21	0.26	0.27	0.16	<0.10	0.13	<0.10
Back-002	0.24	0.18	0.38	0.23	0.13	<0.10	0.15	<0.10
Back-003	0.21	0.25	0.51	0.27	0.12	0.18	<0.10	<0.10
ND-COMP-001	0.23	0.22	0.24	0.28	0.15	0.19	<0.10	<0.10
ND-COMP-002	0.19	0.16	0.42	0.29	0.12	0.12	0.18	<0.10
ND-COMP-003	0.28	0.2	0.37	0.30	<0.10	0.11	<0.10	<0.10
RIV-001	0.23	0.22	0.18	0.25	0.21	0.13	0.30	<0.10
RIV-002	0.25	0.23	0.25	0.26	0.16	0.23	0.25	<0.10
RIV-003	0.24	0.26	0.2	0.28	0.23	0.17	0.19	<0.10
CDF-001	1.5	1.3	1.4	1.2	4.4	4.2	4.4	3.8
CDF-002	1.5	1.3	1.4	1.2	4.5	4.2	4.5	4.1
CDF-003	1.3	1.2	1.2	1.1	4.1	4.3	4.4	3.8
CH-18-81	2.4	2.1	1.9	0.62	2.1	2.1	2.1	1.7
CH-19-81	8.2	7.6	8.2	7.9	4.8	5.2	5.6	4.7
CH-20-81	0.11	0.1	0.11	0.11	<0.10	<0.10	<0.10	<0.10
CH-00-02								
CH-00-03								
Dup	2.7	0.2	<0.10	0.22	0.26	<0.10	2.3	3.8

Total Kjeldahl Nitrogen (TKN) as N, mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	0.14	0.22	0.17	0.11	0.14	0.11	0.12	<0.10	0.15	0.14	0.27
Back-002	0.11	0.18	0.2	<0.10	0.15	0.16	0.15	<0.10	0.12	<0.10	0.34
Back-003	0.13	0.14	0.17	0.11	0.12	0.14	0.11	0.14	<0.10	0.11	0.14
ND-COMP-001	0.12	0.20	0.18	<0.10	0.15	0.17	0.14	0.14	<0.10	<0.10	0.16
ND-COMP-002	<0.10	0.27	0.1	0.21	0.15	0.22	0.18	0.16	0.11	<0.10	0.16
ND-COMP-003	0.18	0.26	0.24	0.11	0.16	0.18	0.16	0.14	0.12	0.26	0.33
RIV-001	0.11	0.12	0.25	0.14	0.19	0.20	0.17	0.11	0.17	0.10	0.18
RIV-002	0.11	0.13	0.23	0.19	0.14	0.18	0.17	<0.10	0.20	<0.10	0.20
RIV-003	<0.10	0.23	0.25	0.14	0.20	0.17	0.21	<0.10	0.16	0.16	0.23
CDF-001	1.5	1.6	2.1	2	2.5	2.9	2.9	3.1	3.4	3.4	4.2
CDF-002	1.5	1.3	2	2	2.4	2.5	2.9	2.9	3.4	3.5	4.2
CDF-003	1.4	1.3	1.9	1.9	2.3	2.6	2.9	2.6	3.1	3.6	4.1
CH-18-81	1.2	0.68	0.18	0.86	1.2	1.4	1.9	2.0	2.5	2.8	3.1
CH-19-81	8.1	7.4	5.3	3.7	3.7	3.5	3.2	3.0	2.7	3.2	4.4
CH-20-81	<0.10	<0.10	0.2	<0.10	0.45	0.18	0.13	<0.10	<0.10	<0.10	<0.10
CH-00-02	-	-	-	-	-				-	-	-
CH-00-03	0.15	0.68	0.91	0.77	0.68				0.56	0.59	0.77
Dup	0.12	7.6	0.22	1.8	0.10	0.10	0.16	<0.10	0.17	0.65	0.20

Nitrogen, Ammonia mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Back-002	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01
Back-003	<0.01	0.01	0.02	0.03	0.02	<0.01	<0.01	<0.01
ND-COMP-001	0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01
ND-COMP-002	<0.01	<0.01	0.02	<0.01	0.03	<0.01	<0.01	<0.01
ND-COMP-003	<0.01	<0.01	0.03	<0.01	0.01	<0.01	<0.01	<0.01
RIV-001	0.01	<0.01	<0.01	0.02	0.05	0.01	0.04	0.02
RIV-002	<0.01	<0.01	<0.01	0.02	0.06	0.02	0.05	0.05
RIV-003	0.01	0.02	<0.01	0.02	0.05	0.04	0.04	0.04
CDF-001	<0.01	0.02	0.09	0.11	3.6	3.4	3.5	3.5
CDF-002	0.01	0.04	0.08	0.11	3.8	3.5	3.5	3.7
CDF-003	0.01	<0.01	0.08	0.14	3.4	3.4	3.4	3.5
CH-18-81	2.1	1.8	1.6	0.36	2.2	1.9	1.8	1.9
CH-19-81	7.4	7.5	7.8	7.9	4.7	5.1	5.4	5.1
CH-20-81	0.03	0.04	0.02	0.03	<0.01	<0.01	<0.01	<0.01
CH-00-02								
CH-00-03								
Dup	2.2	<0.01	0.02	0.01	0.05	<0.01	2.0	3.5

Nitrogen, Ammonia mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.01	0.04	0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Back-002	<0.01	0.02	0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01
Back-003	<0.01	0.02	<0.01	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-001	<0.01	0.02	0.02	<0.01	<0.01	0.01	0.04	<0.01	<0.01	0.02	<0.01
ND-COMP-002	<0.01	0.04	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-003	0.02	0.04	<0.01	<0.01	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
RIV-001	0.04	0.04	0.02	<0.01	0.02	0.04	0.05	<0.01	0.04	<0.01	0.02
RIV-002	0.01	0.03	0.02	0.01	0.01	0.05	0.08	<0.01	0.03	<0.01	0.03
RIV-003	0.01	0.04	0.02	<0.01	0.02	0.04	0.07	<0.01	0.04	0.02	0.03
CDF-001	<0.01	0.24	0.6	1	1.7	1.9	2.5	2.8	2.9	3.4	3.6
CDF-002	<0.01	0.23	0.61	1	1.7	1.8	2.2	2.8	2.5	3.7	3.6
CDF-003	0.03	0.23	0.6	0.96	1.6	1.8	2.2	2.3	2.5	2.9	3.1
CH-18-81	0.93	0.52	0.03	0.78	1.1	1.2	1.6	1.8	2.4	2.8	2.7
CH-19-81	8.4	13	4.8	5.1	3.4	3.3	3.0	3.0	4.1	3.3	3.8
CH-20-81	0.04	<0.01	0.06	<0.01	0.27	0.01	0.01	<0.01	<0.01	<0.01	<0.01
CH-00-02	1.1	0.03	0.16	0.45	0.88		1.2		1.4	1.4	1.5
CH-00-03	0.05	<0.01	0.04	0.15	0.24		0.55		0.22	0.18	0.22
Dup	0.01	14	<0.01	0.96	0.02	<0.01	0.01	<0.01	0.02	0.17	<0.01

Phosphorus, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.005	0.005	0.02	0.009	0.005	<0.005	<0.005	<0.005
Back-002	0.005	0.005	0.03	0.01	0.005	0.005	<0.005	<0.005
Back-003	<0.005	0.01	0.03	0.01	0.006	<0.005	<0.005	<0.005
ND-COMP-001	<0.005	0.007	0.01	0.009	0.006	0.01	0.005	<0.005
ND-COMP-002	0.005	0.009	0.04	0.01	0.008	0.005	0.005	<0.005
ND-COMP-003	0.005	0.02	0.03	0.02	0.008	0.006	<0.005	<0.005
RIV-001	0.005	0.006	0.005	0.007	0.01	0.009	0.009	0.009
RIV-002	0.007	<0.005	0.005	0.008	0.009	0.008	0.01	0.007
RIV-003	0.008	0.005	<0.005	0.01	0.01	0.01	0.01	0.009
CDF-001	0.12	0.09	0.09	0.08	0.07	0.07	0.06	0.05
CDF-002	0.11	0.1	0.18	0.07	0.09	0.08	0.04	0.04
CDF-003	0.1	0.09	0.11	0.07	0.08	0.08	0.05	0.05
CH-18-81	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
CH-19-81	0.008	0.008	0.006	0.007	0.006	0.006	<0.005	<0.005
CH-20-81	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.03
CH-00-02								
CH-00-03								
Dup	0.04	0.008	0.02	0.01	0.01	0.01	0.02	0.05

Phosphorus, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	0.005	0.01	0.01	0.01	0.008	0.01	0.007	0.008	0.008	0.02	0.009
Back-002	0.005	0.01	0.02	0.02	0.007	0.01	0.008	0.007	0.007	0.006	0.009
Back-003	<0.005	0.01	0.01	0.01	0.008	0.02	0.01	0.02	0.006	0.009	0.01
ND-COMP-001	<0.005	0.01	0.02	0.009	0.01	0.02	0.009	0.006	0.01	0.02	0.01
ND-COMP-002	0.008	0.02	0.02	0.02	0.008	0.02	0.01	0.01	0.02	0.01	0.01
ND-COMP-003	0.01	0.02	0.03	0.01	0.01	0.03	0.01	0.01	0.009	0.01	0.02
RIV-001	<0.005	0.01	0.02	0.01	0.009	0.02	0.01	<0.005	0.02	<0.005	0.009
RIV-002	<0.005	0.01	0.02	0.01	0.008	0.01	0.01	0.005	0.02	<0.005	0.008
RIV-003	<0.005	0.01	0.02	0.02	0.008	0.01	0.009	0.007	0.01	<0.005	0.01
CDF-001	0.10	0.11	0.1	0.09	0.08	0.15	0.08	0.11	0.07	0.06	0.07
CDF-002	0.09	0.09	0.1	0.1	0.08	0.09	0.08	0.10	0.12	0.07	0.08
CDF-003	0.09	0.08	0.1	0.08	0.06	0.08	0.05	0.06	0.06	0.06	0.07
CH-18-81	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.06	0.04	0.03
CH-19-81	<0.005	0.008	0.007	0.008	0.006	0.008	0.008	0.007	0.005	<0.005	0.005
CH-20-81	0.02	0.04	0.04	0.04	0.08	0.04	0.04	0.03	0.03	0.02	0.02
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	0.02	0.04	0.04	0.03	0.02		0.03		0.01	0.007	0.01
Dup	<0.005	0.01	0.03	0.09	0.01	0.03	0.008	<0.005	0.02	0.007	0.02

Residue, Dissolved @ 180^{0}C, mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	150	150	170	190	160	152	206	180
Back-002	162	158	162	190	156	162	196	182
Back-003	150	176	172	190	164	162	200	190
ND-COMP-001	150	170	154	174	166	156	192	172
ND-COMP-002	146	176	156	188	168	162	210	184
ND-COMP-003	162	154	166	172	176	148	180	178
RIV-001	164	176	152	186	242	174	286	264
RIV-002	170	188	162	178	236	204	268	242
RIV-003	148	178	144	192	278	222	280	270
CDF-001	350	358	346	338	364	330	354	380
CDF-002	348	384	338	354	362	334	362	372
CDF-003	354	358	342	354	358	322	376	390
CH-18-81	514	596	574	570	758	706	670	666
CH-19-81	536	534	548	558	542	544	522	556
CH-20-81	1120	1180	1110	1200	1230	1210	1230	1190
CH-00-02								
CH-00-03								
Dup	532	174	1160	180	248	150	684	398

Residue, Dissolved @ 180°C, mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	180	162	180	184	172	152	152	140	188	158	164
Back-002	172	154	186	164	184	156	166	144	180	148	172
Back-003	182	162	172	178	168	162	162	156	188	160	184
ND-COMP-001	174	160	182	202	172	164	172	144	184	172	178
ND-COMP-002	178	154	174	184	172	154	178	142	196	164	172
ND-COMP-003	178	164	190	182	168	162	174	138	186	166	170
RIV-001	174	178	212	194	164	192	214	146	246	194	212
RIV-002	180	192	228	184	188	196	202	154	246	210	212
RIV-003	188	192	224	182	190	174	194	160	264	214	212
CDF-001	354	348	378	392	360	360	356	340	388	368	384
CDF-002	362	336	384	376	358	338	356	354	390	356	400
CDF-003	352	328	376	362	346	346	350	346	392	376	382
CH-18-81	544	516	496	670	626	634	646	624	696	726	800
CH-19-81	574	544	548	558	542	534	524	524	578	576	544
CH-20-81	1180	1200	1260	1220	1220	1180	1170	1190	1260	1200	1230
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	318	290	372	374	372		358		416	404	408
Dup	174	518	196	350	172	1210	134	160	248	406	186

Residue, Suspended (Total Suspended Solids) mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<5	3	17	22	5	<5	<5	<5
Back-002	<5	4	50	20	<5	<5	5	<5
Back-003	<5	11	44	20	<5	6	<5	<5
ND-COMP-001	<5	3	16	18	<5	12	5	<5
ND-COMP-002	<5	7	64	21	9	5	6	<5
ND-COMP-003	<5	14	62	37	7	<5	5	<5
RIV-001	<5	4	4	9	6	9	7	5
RIV-002	5	4	5	10	6	7	6	6
RIV-003	7	4	5	13	8	8	7	6
CDF-001	36	33	64	36	45	35	30	31
CDF-002	34	38	206	35	90	57	17	19
CDF-003	33	33	91	37	26	49	15	22
CH-18-81	62	28	33	15	15	15	14	13
CH-19-81	10	6	4	<5	<5	<5	<5	<5
CH-20-81	<5	8	7	<5	<5	<5	<5	<5
CH-00-02								
CH-00-03								
Dup	50	7	3	17	6	<5	6	18

Residue, Suspended (Total Suspended Solids) mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
Back-001	7	15	16	12	8	11	9	6	17	31	14
Back-002	6	13	18	5	7	16	8	10	18	13	10
Back-003	<5	15	19	13	9	11	11	18	10	28	13
ND-COMP-001	<5	14	19	9	18	29	6	6	15	28	23
ND-COMP-002	12	30	26	30	9	29	14	15	36	28	15
ND-COMP-003	11	21	46	10	8	42	14	22	14	24	19
RIV-001	6	10	9	20	8	14	16	5	20	5	12
RIV-002	7	13	11	18	8	13	13	6	21	5	12
RIV-003	6	13	11	26	9	16	9	6	20	6	12
CDF-001	25	59	76	64	69	176	55	75	68	47	47
CDF-002	30	45	88	67	40	66	51	91	185	67	68
CDF-003	26	49	88	44	33	64	26	43	41	29	40
CH-18-81	32	15	8	8	11	12	17	11	31	25	29
CH-19-81	<5	9	<5	3	<5	<5	<5	<5	<5	<5	<5
CH-20-81	<5	6	<5	4	<5	<5	<5	<5	<5	<5	<5
CH-00-02	11	21	20	12	14		12		13	7	46
CH-00-03	<5	7	6	4	<5		<5		<5	<5	<5
Dup	6	12	44	42	7	<5	6	5	19	<5	22

Cyanide, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Back-002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Back-003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
RIV-001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
RIV-002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
RIV-003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CDF-001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CDF-002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CDF-003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CH-18-81	<0.01	<0.01	0.02	0.02	0.04	0.02	0.02	0.02
CH-19-81	<0.01	<0.01	<0.01	0.02	0.03	<0.01	<0.01	0.02
CH-20-81	0.03	0.04	0.05	0.05	0.04	0.03	<0.01	0.04
CH-00-02								
CH-00-03								
Dup	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.02	<0.01

Cyanide, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Back-002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Back-003	<0.01	<0.01	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-002	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ND-COMP-003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
RIV-001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
RIV-002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
RIV-003	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CDF-001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CDF-002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CDF-003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CH-18-81	0.02	0.01	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.01	0.03
CH-19-81	<0.01	<0.01	0.02	0.08	0.02	0.07	0.03	0.07	0.09	0.07	0.02
CH-20-81	0.04	0.03	0.04	0.05	<0.01	0.03	0.01	0.04	0.04	0.04	0.03
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	<0.01	<0.01	<0.01	0.04	<0.01		<0.01		<0.01	<0.01	<0.01
Dup	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01

Arsenic, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	0.00424	0.00362	0.00375	0.00309	0.00302	0.0031	0.0026	0.00289
CDF-002	0.00411	0.00381	0.00664	0.00327	0.00383	0.00303	0.00271	0.00267
CDF-003	0.00395	0.00362	0.00429	0.00317	0.00283	0.00332	0.00262	0.00267
CH-18-81	0.0038	0.00368	0.00368	0.00395	0.00406	0.00392	0.00403	0.0039
CH-19-81	<0.002	0.00217	<0.002	0.00223	0.00235	0.00258	0.00204	0.00201
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02								
CH-00-03								
Dup	0.0037	<0.002	<0.002	<0.002	<0.002	<0.002	0.00401	0.00261

Arsenic, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	0.00344	0.00314	0.00323	0.0032	0.00316	0.00509	0.00343	0.00355	0.00331	0.00287	0.003
CDF-002	0.00303	0.00286	0.00342	0.00313	0.00293	0.00343	0.0033	0.00346	0.00456	0.00298	<0.005
CDF-003	0.00295	0.00311	0.00332	0.00279	0.00263	0.00329	0.00283	0.00285	0.00266	0.00263	<0.005
CH-18-81	0.00406	0.0035	0.00396	0.00379	0.00383	0.00403	0.00406	0.00407	0.00494	0.00401	0.00426
CH-19-81	0.00211	<0.002	<0.002	0.00205	0.00228	0.00205	0.00218	<0.002	0.00259	0.00275	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002
Dup	<0.002	<0.002	<0.002	0.00289	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Cadmium, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-18-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02								
CH-00-03								
Dup	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Cadmium, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-18-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002
Dup	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Chromium, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	0.00296	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	<0.002	<0.002	0.00372	<0.002	0.00357	0.00313	<0.002	0.00224
CDF-002	<0.002	0.00204	0.0108	0.00274	0.00544	0.00339	<0.002	<0.002
CDF-003	<0.002	<0.002	0.00474	<0.002	0.00244	0.00372	<0.002	<0.002
CH-18-81	<0.002	<0.002	<0.002	0.00261	<0.002	<0.002	<0.002	<0.002
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02								
CH-00-03								
Dup	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Chromium, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00249	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	<0.002	<0.002	<0.002	0.00253	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	<0.002	0.00464	0.0053	0.0055	0.0044	0.0114	0.00607	0.00538	0.00379	0.00283	0.00375
CDF-002	<0.002	0.00374	0.00596	0.00474	0.00405	0.0049	0.00578	0.00555	0.00929	0.00439	0.00579
CDF-003	<0.002	0.00377	0.00594	0.0033	0.00302	0.00467	0.00396	0.00294	0.00333	0.0022	<0.005
CH-18-81	<0.002	<0.002	0.00753	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	0.00258	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002
Dup	<0.002	<0.002	<0.002	0.00381	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Copper, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	0.00276	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	0.00307	<0.002	0.00388	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	0.00253	<0.002	<0.002	<0.002	0.00203	0.00227	0.00211	0.00244
ND-COMP-002	0.00242	<0.002	0.00596	0.00245	0.00242	<0.002	<0.002	0.00211
ND-COMP-003	0.0023	0.00233	0.00436	0.00272	<0.002	0.00227	0.00206	0.00205
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	0.00225	<0.002	<0.002	<0.002
RIV-003	0.00307	0.00209	<0.002	<0.002	0.00234	<0.002	0.00202	0.0021
CDF-001	0.00621	0.00662	0.00675	0.00553	0.00493	0.0045	0.00354	0.00454
CDF-002	0.00553	0.0055	0.0188	0.00937	0.00765	0.00563	0.0048	0.0039
CDF-003	0.00791	0.00758	0.00873	0.0048	0.00427	0.00714	0.00354	0.0034
CH-18-81	0.00388	0.0025	0.00334	0.00309	0.00259	0.00206	0.00317	0.00266
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02								
CH-00-03								
Dup	0.00309	<0.002	<0.002	<0.002	0.00238	0.00224	0.00227	0.00516

Copper, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00263	0.00261
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00226	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00202	<0.002	<0.002	0.00219	<0.002
ND-COMP-001	<0.002	<0.002	0.00216	<0.002	<0.002	0.00294	<0.002	<0.002	<0.002	0.0031	0.00234
ND-COMP-002	0.00217	0.00242	0.00216	0.00285	<0.002	0.00361	0.00231	0.00207	0.003	0.00348	0.00228
ND-COMP-003	<0.002	0.00248	0.00332	<0.002	0.00207	0.00412	<0.002	0.00286	0.0026	0.00303	0.00311
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	0.00202	0.0023	<0.002	0.00322	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00231	0.0022	<0.002	0.00268	<0.002	0.00287
RIV-003	<0.002	<0.002	<0.002	0.00258	<0.002	0.00208	<0.002	<0.002	0.00263	<0.002	0.00216
CDF-001	0.00364	0.00616	0.00675	0.00603	0.00553	0.0134	0.00621	0.00795	0.00616	0.00446	0.00467
CDF-002	0.00406	0.00512	0.00691	0.00606	0.00655	0.0065	0.00577	0.00729	0.0122	0.00909	0.0064
CDF-003	0.00569	0.00515	0.00899	0.00407	0.00366	0.00595	0.00446	0.00963	0.00429	0.00386	<0.005
CH-18-81	0.00389	0.00291	0.00296	0.00276	0.00273	0.00327	0.00345	0.00361	0.00475	0.00302	0.00299
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00242	<0.002
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	0.00205	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002
Dup	<0.002	<0.002	0.00358	0.00495	<0.002	<0.002	<0.002	<0.002	0.00245	<0.002	0.00302

Lead, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	0.00342	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	0.0331	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	0.00204	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	0.0111	0.00274	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	0.00544	0.00376	<0.002	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	0.0106	0.0133	0.021	0.0129	0.012	0.011	0.00591	0.00821
CDF-002	0.0118	0.0145	0.0584	0.014	0.0189	0.0119	0.0056	0.00559
CDF-003	0.0132	0.0121	0.0291	0.0137	0.00853	0.0128	0.00586	0.00534
CH-18-81	0.00537	0.00432	0.00522	0.00241	0.00264	<0.002	0.00339	0.00244
CH-19-81	0.00203	<0.002	0.00402	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	0.00219	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02								
CH-00-03								
Dup	0.00543	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00538

Lead, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.002	<0.002	0.00251	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00516	0.00204
Back-002	<0.002	<0.002	0.00385	<0.002	<0.002	<0.002	<0.002	0.00254	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	0.00233	0.00289	<0.002	<0.002	<0.002	0.00307	<0.002	0.00224	<0.002
ND-COMP-001	<0.002	<0.002	0.00364	<0.002	0.00276	0.0055	<0.002	<0.002	<0.002	0.00619	0.0033
ND-COMP-002	0.00349	0.00443	0.00387	0.00673	<0.002	0.00592	0.00228	0.00202	0.00395	0.00384	<0.002
ND-COMP-003	0.00267	0.00326	0.00512	0.00238	<0.002	0.00527	0.00219	0.00326	0.00226	0.00323	0.0024
RIV-001	<0.002	<0.002	0.00235	0.00358	<0.002	0.00218	0.00265	<0.002	0.00209	<0.002	<0.002
RIV-002	0.00279	<0.002	0.00297	0.00349	<0.002	0.00337	0.00204	<0.002	0.00242	<0.002	<0.002
RIV-003	<0.002	<0.002	0.00247	0.00374	<0.002	0.00272	<0.002	<0.002	0.00233	<0.002	<0.002
CDF-001	0.00706	0.0158	0.0204	0.0181	0.0132	0.0389	0.0158	0.0198	0.0139	0.00976	0.0119
CDF-002	0.00616	0.0131	0.0229	0.0165	0.0113	0.0194	0.0131	0.0187	0.0273	0.0136	0.0164
CDF-003	0.00491	0.013	0.0215	0.0121	0.00886	0.0168	0.00807	0.0112	0.00898	0.00866	0.0113
CH-18-81	0.00456	0.00233	<0.002	<0.002	<0.002	0.00218	0.0031	0.00344	0.00662	0.00303	0.00302
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002
Dup	<0.002	<0.002	0.00527	0.0121	<0.002	<0.002	<0.002	<0.002	0.00246	<0.002	0.00229

Manganese, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	0.00419	0.00343	0.0169	0.0117	0.00657	0.00439	0.00735	0.00355
Back-002	0.00431	0.00433	0.043	0.0127	0.00507	0.00458	0.00504	0.00361
Back-003	0.00347	0.0108	0.0509	0.0178	0.00758	0.00554	0.00518	0.00242
ND-COMP-001	0.00528	0.00434	0.0169	0.0116	0.00766	0.0171	0.00874	0.00568
ND-COMP-002	0.00484	0.00841	0.0856	0.0202	0.0115	0.00543	0.00768	0.00498
ND-COMP-003	0.00357	0.0155	0.0556	0.0297	0.0102	0.00699	0.00949	0.00462
RIV-001	0.00863	0.00481	0.00595	0.0133	0.0141	0.0171	0.0118	0.0105
RIV-002	0.00994	0.00587	0.00548	0.0119	0.0148	0.012	0.0128	0.0105
RIV-003	0.0116	0.00595	0.00564	0.0135	0.0168	0.0101	0.0128	0.0124
CDF-001	0.111	0.0953	0.15	0.0888	0.0995	0.106	0.0643	0.0755
CDF-002	0.102	0.106	0.31	0.097	0.151	0.114	0.0628	0.055
CDF-003	0.105	0.0959	0.167	0.0933	0.0822	0.116	0.0614	0.0581
CH-18-81	0.0724	0.0689	0.0858	0.04	0.0897	0.0778	0.08	0.0683
CH-19-81	0.0322	0.015	0.00972	0.00706	0.0081	0.0142	0.00512	0.0053
CH-20-81	0.0205	0.0183	0.0132	0.0106	0.0114	0.00883	0.00966	0.0102
CH-00-02								
CH-00-03								
Dup	0.0813	0.00899	0.00996	0.012	0.0146	0.00595	0.0586	0.0547

Manganese, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	0.00532	0.0142	0.0186	0.0134	0.00639	0.0127	0.0108	0.00595	0.0145	0.0539	0.016
Back-002	0.00367	0.00977	0.0252	0.00513	0.00602	0.0161	0.00722	0.0178	0.0096	0.0098	0.00946
Back-003	0.0045	0.0118	0.0217	0.0208	0.0112	0.0105	0.0109	0.0171	0.00944	0.0186	0.0108
ND-COMP-001	0.00391	0.0129	0.0257	0.0124	0.0237	0.0435	0.00956	0.00612	0.0182	0.0687	0.0261
ND-COMP-002	0.0179	0.027	0.0266	0.0452	0.00948	0.0453	0.0149	0.0123	0.0317	0.0261	0.0139
ND-COMP-003	0.0175	0.0204	0.0381	0.0185	0.0104	0.0472	0.0141	0.0204	0.0133	0.0219	0.0195
RIV-001	0.00779	0.0135	0.0186	0.0298	0.0135	0.0235	0.0288	0.00729	0.0303	0.0137	0.0166
RIV-002	0.00673	0.0168	0.0209	0.0288	0.0131	0.0323	0.0239	0.00871	0.0319	0.0116	0.0176
RIV-003	0.00733	0.0167	0.0199	0.0302	0.0126	0.027	0.0197	0.00776	0.03	0.0129	0.0198
CDF-001	0.107	0.12	0.15	0.138	0.114	0.282	0.165	0.175	0.16	0.0999	0.0975
CDF-002	0.0789	0.0995	0.162	0.145	0.102	0.154	0.139	0.171	0.229	0.12	0.132
CDF-003	0.056	0.118	0.148	0.129	0.0857	0.136	0.105	0.124	0.111	0.105	0.107
CH-18-81	0.0701	0.0443	0.0252	0.0465	0.0617	0.0716	0.0875	0.0988	0.131	0.0855	0.0953
CH-19-81	0.00858	0.0151	0.00501	0.00406	0.00268	0.00882	0.00212	0.00313	0.00288	0.00225	0.00538
CH-20-81	0.00748	0.0152	0.0129	0.0109	0.0202	0.0111	0.0103	0.00644	0.00653	0.00628	0.0111
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	0.0167	0.0136	0.0132	0.0121	0.00588		0.00705		0.00337	0.00218	0.00223
Dup	0.00753	0.0113	0.0402	0.131	0.0115	0.00789	0.00875	0.00564	0.0321	0.00229	0.0181

Mercury, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.2	<0.0002	<0.0002	<0.0002	0.00657	<0.0002	<0.0002	<0.0002
Back-002	<0.2	<0.0002	<0.0002	<0.0002	0.00507	<0.0002	<0.0002	<0.0002
Back-003	<0.2	<0.0002	<0.0002	<0.0002	0.00758	<0.0002	0.000549	<0.0002
ND-COMP-001	<0.2	<0.0002	<0.0002	<0.0002	0.00766	<0.0002	<0.0002	<0.0002
ND-COMP-002	<0.2	<0.0002	<0.0002	<0.0002	0.0115	<0.0002	<0.0002	<0.0002
ND-COMP-003	<0.2	<0.0002	<0.0002	<0.0002	0.0102	<0.0002	<0.0002	<0.0002
RIV-001	<0.2	<0.0002	<0.0002	<0.0002	0.0141	<0.0002	<0.0002	<0.0002
RIV-002	<0.2	<0.0002	<0.0002	<0.0002	0.0148	<0.0002	<0.0002	<0.0002
RIV-003	<0.2	<0.0002	<0.0002	<0.0002	0.0168	<0.0002	<0.0002	<0.0002
CDF-001	<0.2	<0.0002	<0.0002	<0.0002	0.0995	<0.0002	<0.0002	<0.0002
CDF-002	<0.2	<0.0002	<0.0002	<0.0002	0.151	<0.0002	<0.0002	<0.0002
CDF-003	0.329	0.0002	<0.0002	<0.0002	0.0822	<0.0002	<0.0002	<0.0002
CH-18-81	<0.2	<0.0002	<0.0002	<0.0002	0.0897	<0.0002	<0.0002	0.000462
CH-19-81	<0.2	<0.0002	<0.0002	<0.0002	0.0081	<0.0002	<0.0002	<0.0002
CH-20-81	<0.2	<0.0002	<0.0002	<0.0002	0.0114	<0.0002	<0.0002	<0.0002
CH-00-02								
CH-00-03								
Dup	<0.2	<0.0002	<0.0002	<0.0002	0.0146	<0.0002	<0.0002	0.000202

Mercury, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.000232	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Back-002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Back-003	<0.0002	0.000349	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
ND-COMP-001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00281	<0.0002
ND-COMP-002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
ND-COMP-003	0.000239	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
RIV-001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
RIV-002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
RIV-003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
CDF-001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
CDF-002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
CDF-003	0.000228	<0.0002	<0.0002	<0.0002	0.000256	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
CH-18-81	<0.0002	0.000479	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
CH-19-81	<0.0002	0.000271	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
CH-20-81	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002		<0.0002	<0.0002	<0.0002
Dup	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Nickel, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	<0.002	<0.002	<0.002	0.00255	<0.002	<0.002
ND-COMP-002	<0.002	<0.002	0.00204	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-003	<0.002	<0.002	<0.002	<0.002	0.00253	<0.002	<0.002	<0.002
RIV-001	<0.002	<0.002	<0.002	<0.002	<0.002	0.0024	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	0.00272	0.0027	0.00323	0.00262	0.00672	0.00686	0.00421	0.00476
CDF-002	0.00272	0.00252	0.00814	0.00292	0.0081	0.00694	0.00431	0.00393
CDF-003	0.00291	0.00263	0.00387	0.00289	0.00634	0.00731	0.00389	0.00376
CH-18-81	<0.002	<0.002	0.00235	<0.002	<0.002	<0.002	0.00264	0.00258
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0026
CH-00-02								
CH-00-03								
Dup	0.00212	<0.002	<0.002	<0.002	<0.002	<0.002	0.00201	0.00427

Nickel, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
	During Dredging										
Back-001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00307	<0.002
Back-002	<0.002	<0.002	0.00292	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Back-003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
ND-COMP-001	<0.002	<0.002	0.00293	<0.002	<0.002	0.0023	<0.002	<0.002	<0.002	0.00345	<0.002
ND-COMP-002	<0.002	0.00235	0.00296	0.00316	<0.002	0.00255	<0.002	<0.002	0.00253	0.00248	<0.002
ND-COMP-003	<0.002	0.00227	0.00296	<0.002	<0.002	0.00345	<0.002	<0.002	<0.002	0.00229	<0.002
RIV-001	<0.002	<0.002	<0.002	0.00303	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-002	<0.002	<0.002	<0.002	0.00308	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
RIV-003	<0.002	<0.002	<0.002	0.00314	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CDF-001	0.00433	0.00554	0.00731	0.00752	0.00562	0.0118	0.00667	0.00724	0.00617	0.00548	0.00586
CDF-002	0.00405	0.00472	0.00747	0.00692	0.00566	0.00693	0.00641	0.00745	0.0103	0.00702	0.00716
CDF-003	0.00378	0.00495	0.00721	0.00631	0.00538	0.00709	0.00486	0.00523	<0.002	0.00529	0.00582
CH-18-81	0.00365	<0.002	<0.002	0.00804	0.00298	0.00345	0.00386	0.00398	0.00839	0.00423	0.0038
CH-19-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
CH-20-81	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0024	0.00235
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	<0.002	<0.002	<0.002	<0.002	<0.002		0.00232		<0.002	0.00218	0.00231
Dup	<0.002	<0.002	0.00302	0.00607	<0.002	<0.002	<0.002	<0.002	<0.002	0.00237	<0.002

Zinc, Total mg/l, Water Quality Samples Predredging and Postdredging 2001
Calumet Harbor, Chicago Area CDF, IL

Sample ID	17-Sep-01	20-Sep-01	24-Sep-01	26-Sep-01	04-Dec-01	07-Dec-01	10-Dec-01	13-Dec-01
	Predredging				Postdredging			
Back-001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Back-002	<0.005	<0.005	0.00929	<0.005	0.00588	<0.005	0.0118	<0.005
Back-003	<0.005	0.00358	0.0149	0.00564	0.00566	0.00564	<0.005	<0.005
ND-COMP-001	0.00585	<0.005	0.00838	0.00715	0.0149	0.00945	0.0229	0.00736
ND-COMP-002	0.00568	<0.005	0.0312	0.00932	0.00942	0.00755	0.00842	0.00686
ND-COMP-003	<0.005	0.00613	0.0167	0.0133	0.0177	0.0358	0.00893	0.00633
RIV-001	<0.005	<0.005	<0.005	<0.005	0.00548	0.00636	0.00517	0.00565
RIV-002	<0.005	<0.005	<0.005	<0.005	0.00657	0.00691	0.00693	<0.005
RIV-003	<0.005	<0.005	<0.005	<0.005	0.00638	0.00553	<0.005	<0.005
CDF-001	0.0271	0.033	0.0486	0.029	0.0328	0.0294	0.0143	0.0244
CDF-002	0.0312	0.0349	0.155	0.0343	0.0451	0.0304	0.0156	0.0142
CDF-003	0.0411	0.0343	0.0697	0.0318	0.0218	0.0379	0.0153	0.0134
CH-18-81	0.0166	0.0134	0.0134	0.00625	0.012	0.00733	0.0132	0.0315
CH-19-81	<0.005	<0.005	<0.005	<0.005	0.00766	0.00832	0.00561	0.00659
CH-20-81	0.00859	0.0105	0.00598	0.00721	0.0147	0.00983	0.00675	0.0151
CH-00-02								
CH-00-03								
Dup	0.0113	0.00572	0.00891	<0.005	0.00692	0.00945	0.007	0.0166

Zinc, Total mg/l, Water Quality Samples During Dredging 2001
Calumet Harbor, Chicago Area CDF, IL

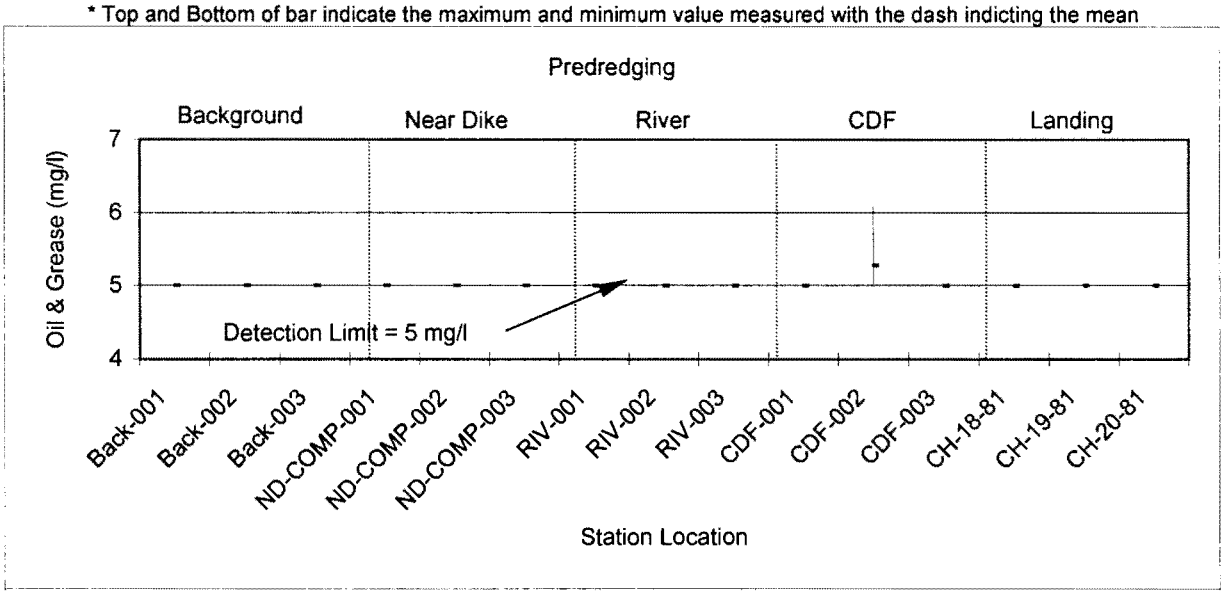
Sample ID	02-Oct-01	09-Oct-01	16-Oct-01	23-Oct-01	10/29-30/2001	01-Nov-01	05-Nov-01	08-Nov-01	13-Nov-01	20-Nov-01	27-Nov-01
Back-001	<0.005	0.00534	0.00765	<0.005	<0.005	0.00719	0.00553	0.00599	0.00876	0.0146	0.00731
Back-002	<0.005	<0.005	0.0104	<0.005	<0.005	0.00749	0.00642	0.0097	0.00709	0.00586	<0.005
Back-003	<0.005	0.00543	0.00699	0.00681	<0.005	0.00678	0.00818	0.0103	0.00564	0.00837	0.00607
ND-COMP-001	<0.005	0.008	0.0109	<0.005	0.0313	0.0333	0.021	0.00925	0.0202	0.0828	0.0113
ND-COMP-002	0.0115	0.0139	0.0115	0.0171	0.00997	0.0272	0.0106	0.0169	0.0151	0.0155	0.00824
ND-COMP-003	0.0124	0.0112	0.0152	0.00766	0.00944	0.0425	0.0294	0.0129	0.0243	0.021	0.017
RIV-001	<0.005	<0.005	0.00639	0.00782	0.00515	0.00786	0.012	0.00526	0.0185	0.00609	0.00645
RIV-002	<0.005	<0.005	0.00643	0.00806	0.00706	0.0105	0.00878	<0.005	0.0102	0.00507	0.00912
RIV-003	<0.005	<0.005	0.00639	0.0109	0.00612	0.00984	0.0083	<0.005	0.00972	0.00512	0.0092
CDF-001	0.0152	0.0397	0.0638	0.0374	0.0308	0.0934	0.0408	0.0467	0.0365	0.024	0.0289
CDF-002	0.0169	0.0308	0.061	0.0352	0.0275	0.048	0.0349	0.0459	0.0721	0.0367	0.0364
CDF-003	0.0185	0.0322	0.0503	0.0244	0.0216	0.0405	0.0213	0.0302	0.0245	0.022	0.0267
CH-18-81	0.0187	0.0137	0.00728	0.006	0.0105	0.0101	0.0144	0.0134	0.0225	0.0142	0.0211
CH-19-81	<0.005	<0.005	<0.005	<0.005	<0.005	0.00582	0.0113	0.00892	0.00728	0.00605	0.00985
CH-20-81	0.00932	0.00585	0.0078	<0.005	0.0103	0.00784	0.00595	0.0108	0.00905	0.0117	0.00672
CH-00-02	-	-	-	-	-		-		-	-	-
CH-00-03	0.00607	0.0115	<0.005	<0.005	0.00504		0.0067		<0.005	<0.005	<0.005
Dup	<0.005	0.00588	0.018	0.0318	<0.005	0.00841	0.0156	0.0058	0.00994	<0.005	0.0196

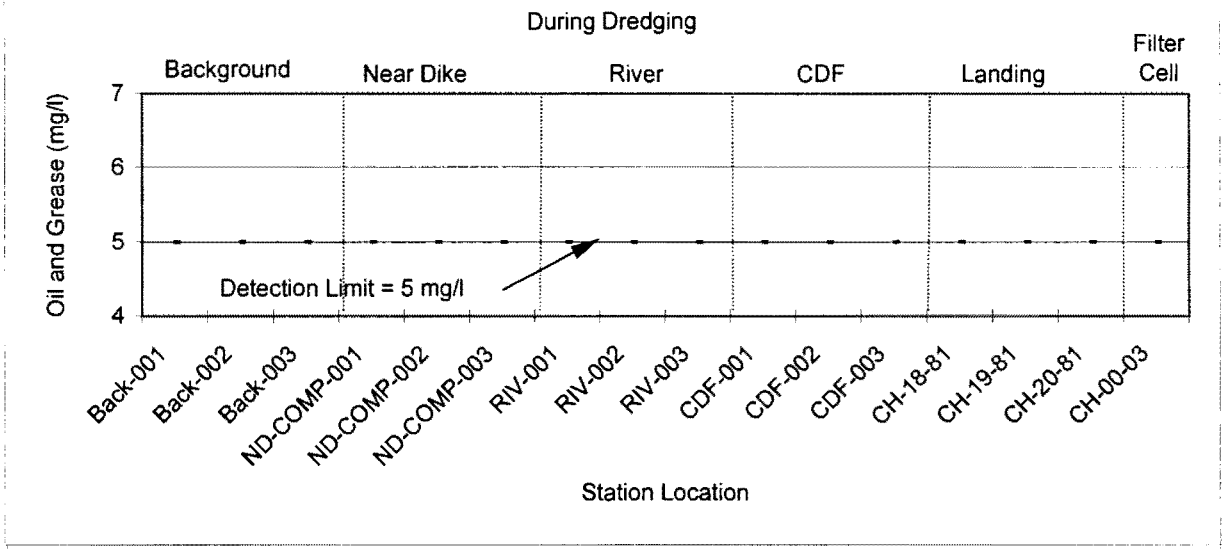
Appendix B:

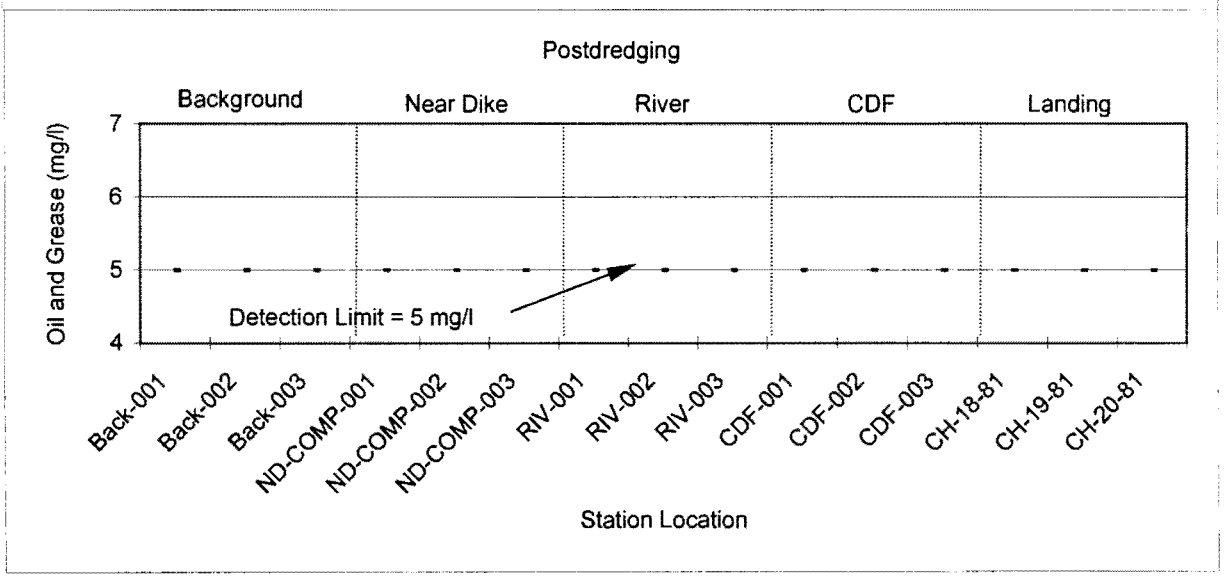
Graphic Analysis

Oil & Grease Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

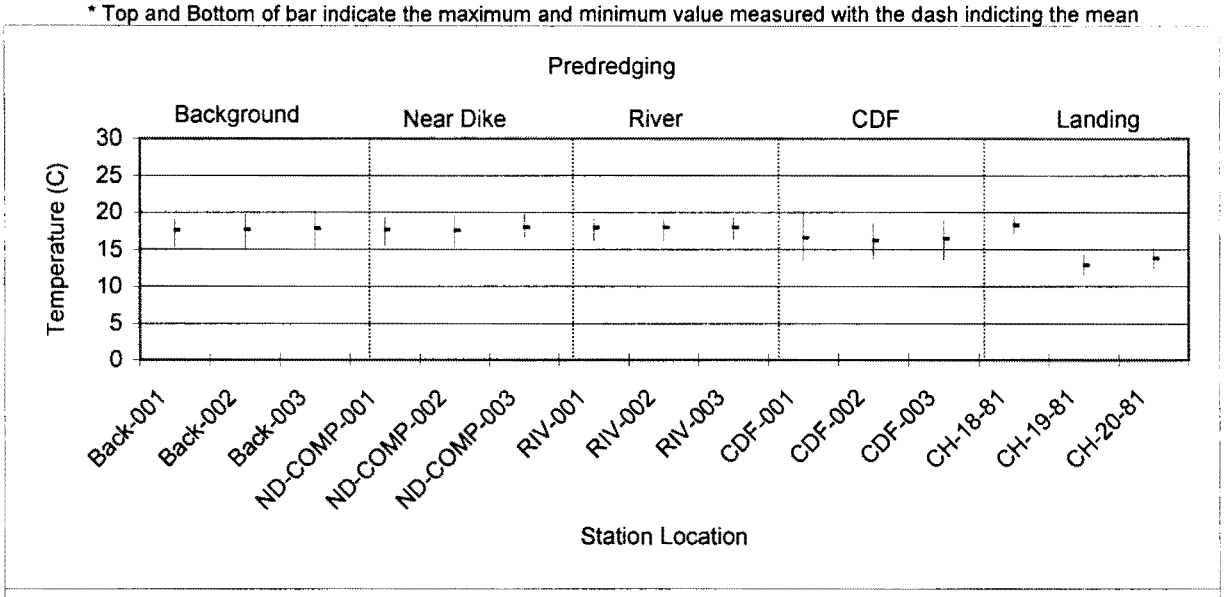


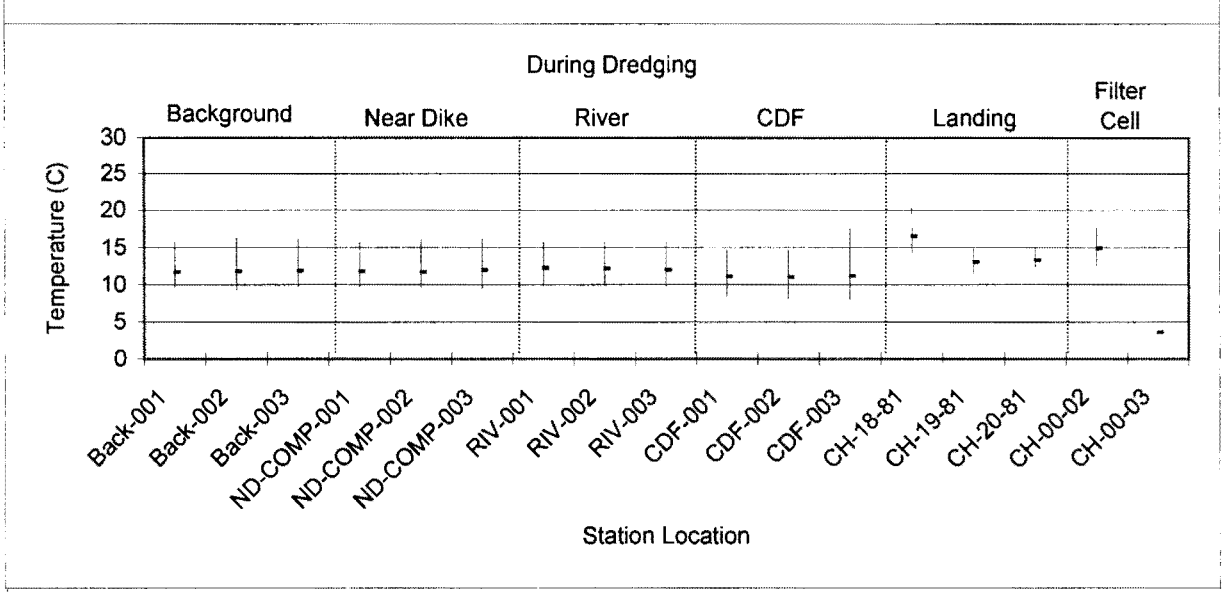


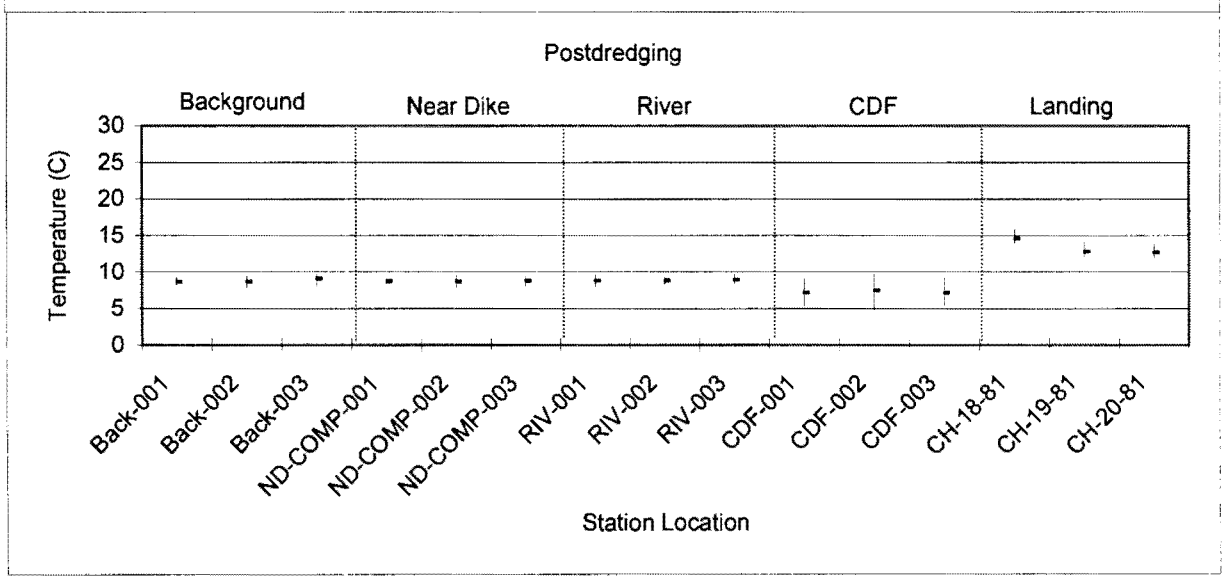


Temperature Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

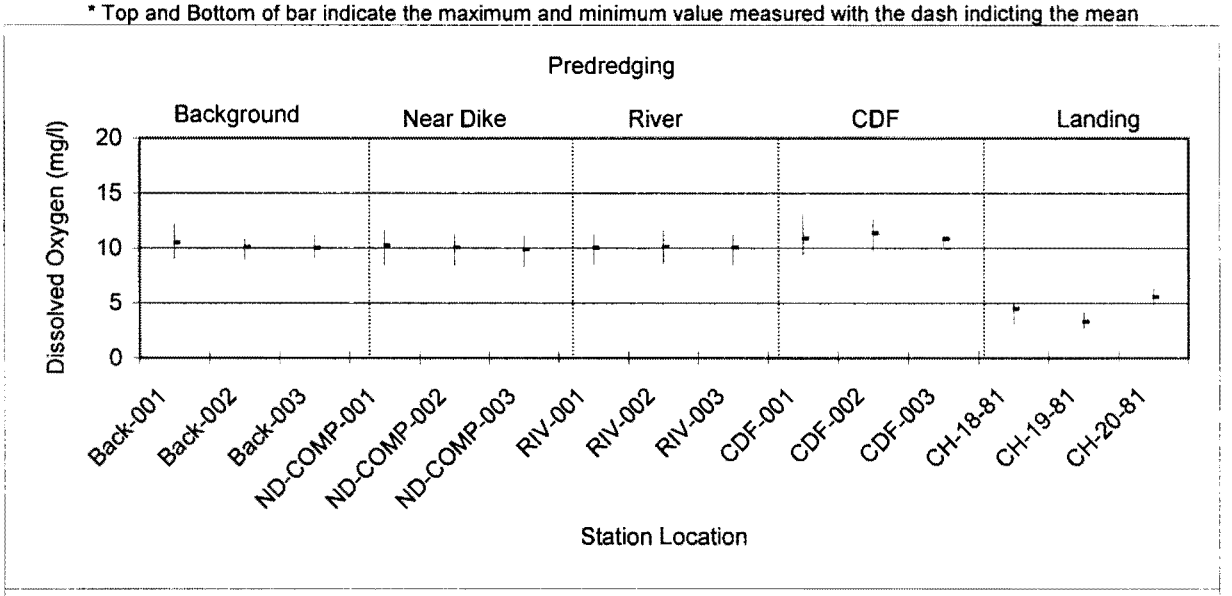


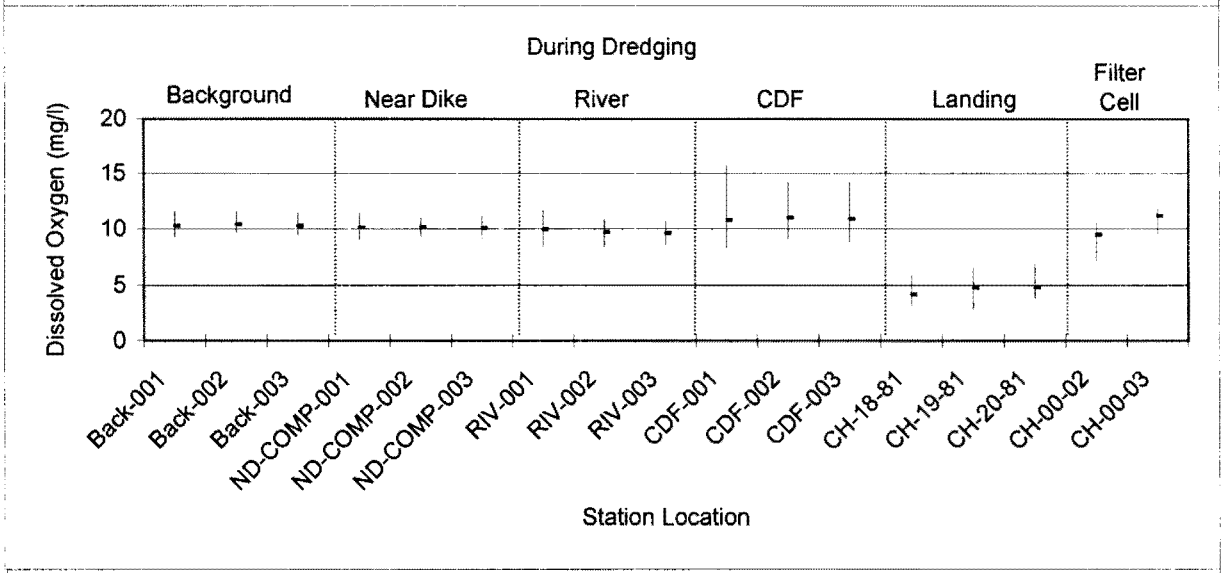


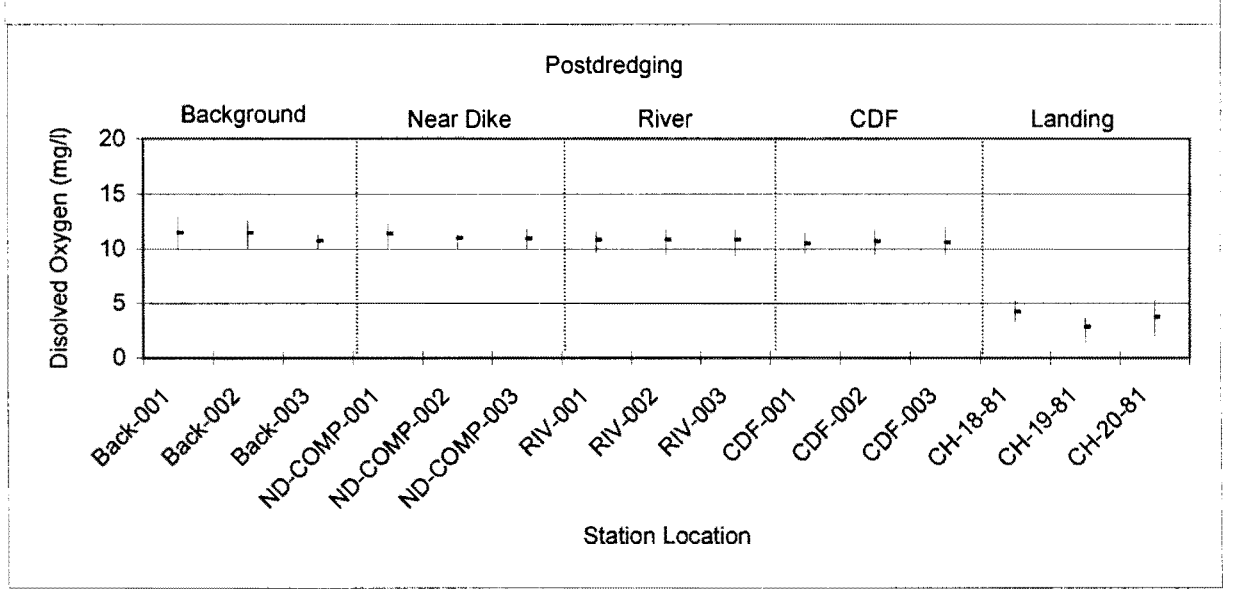


Dissolved Oxygen Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

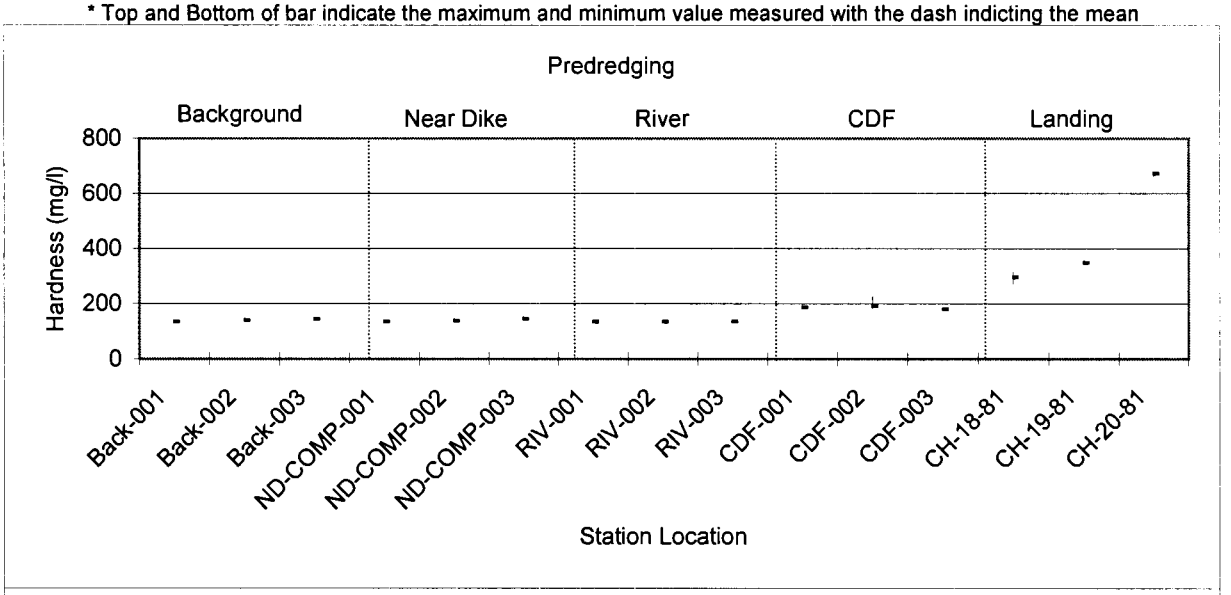


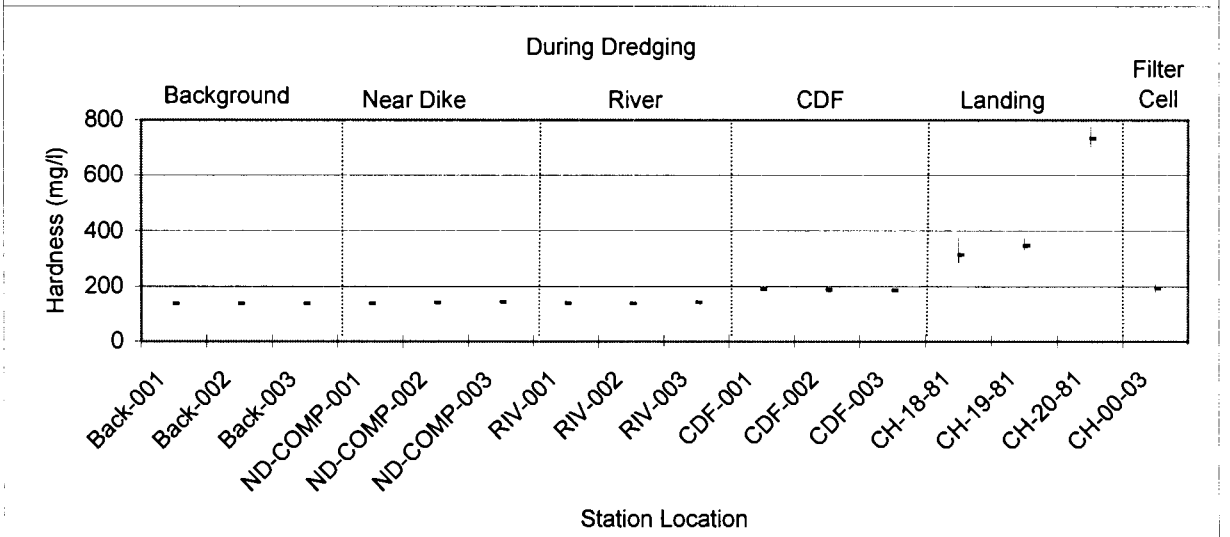


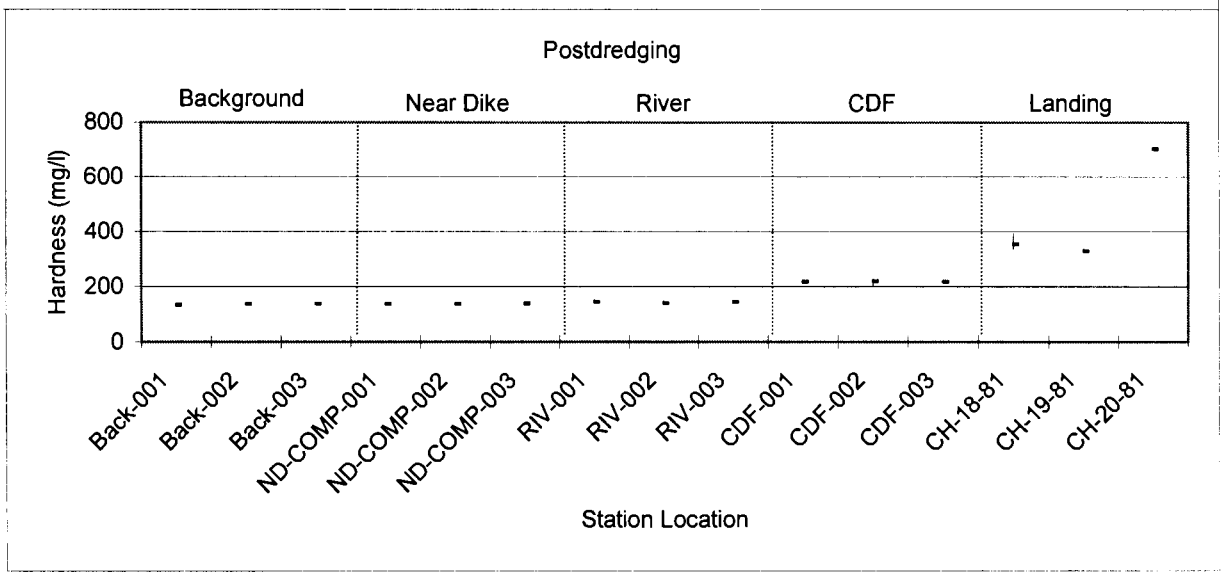


Hardness Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

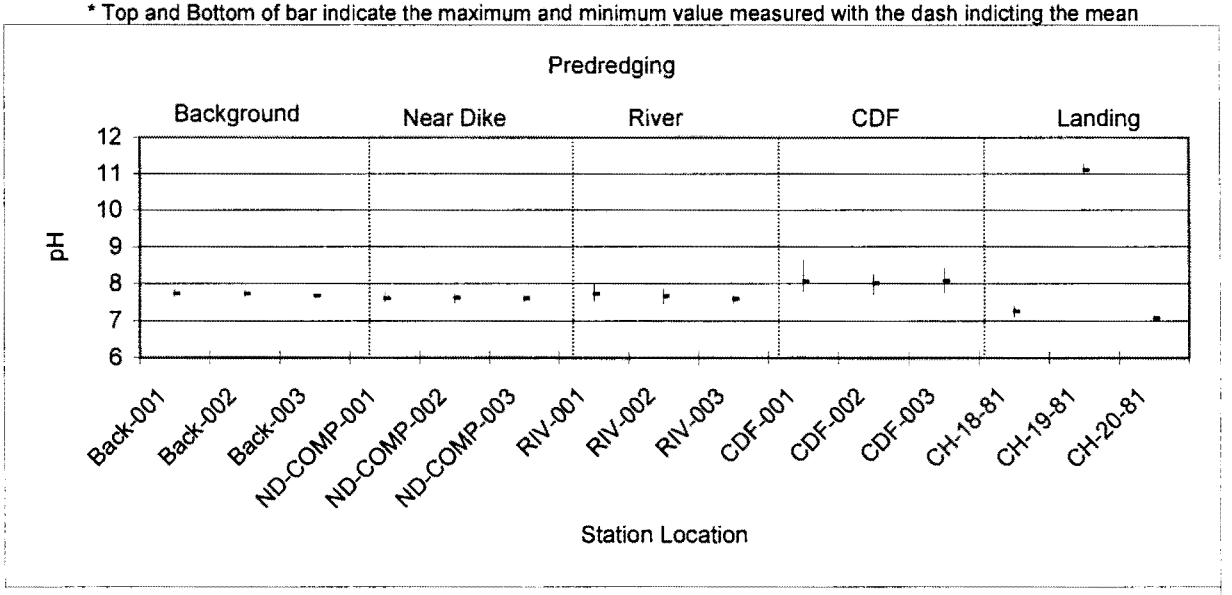


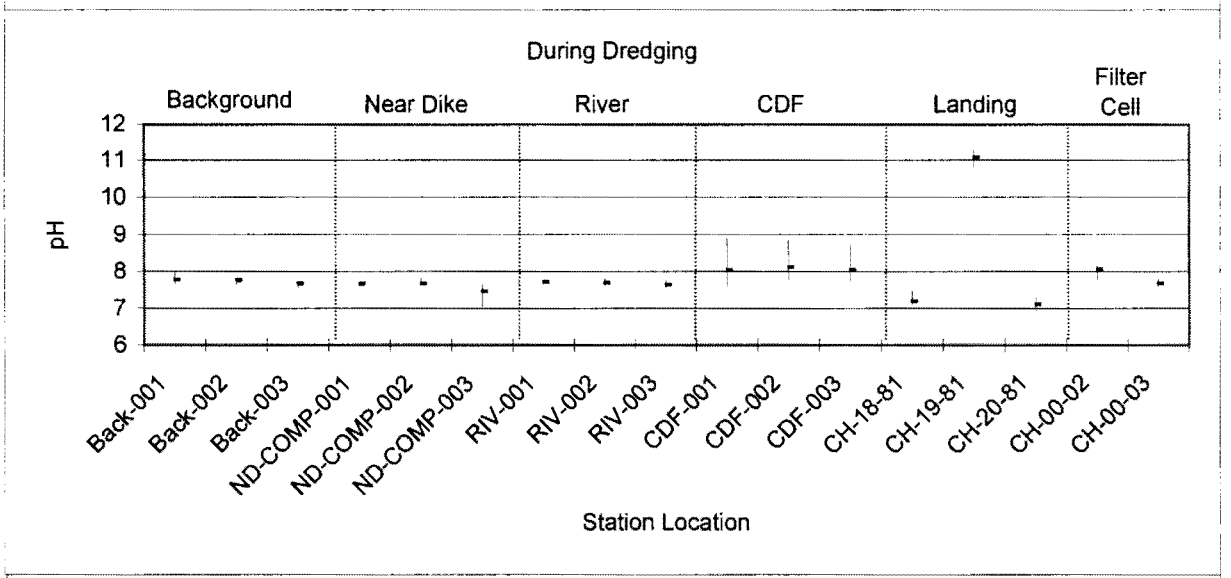


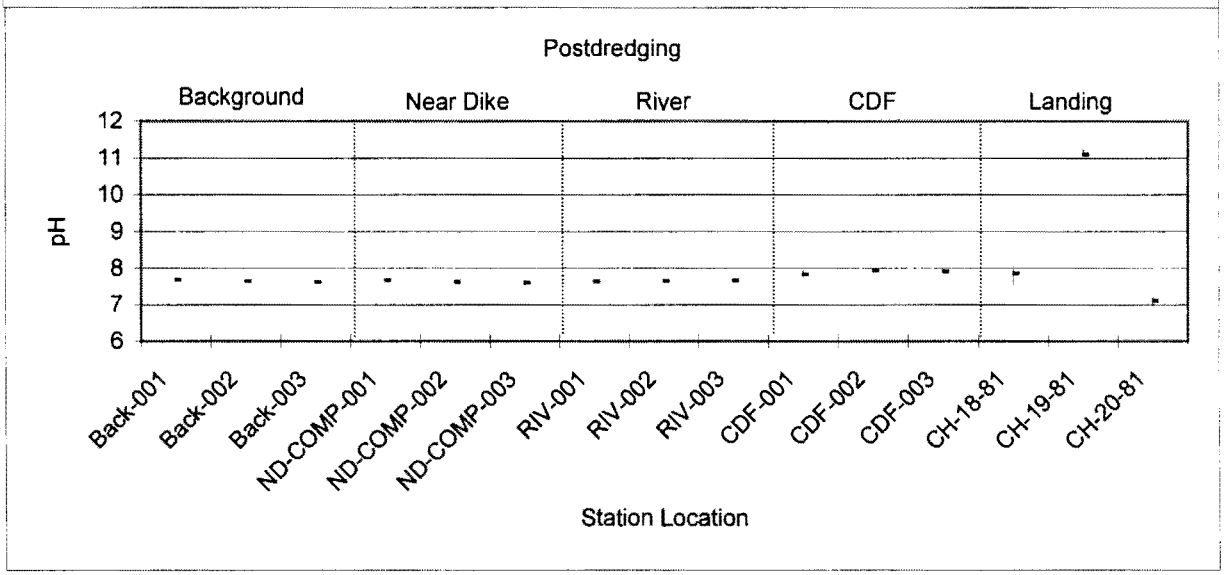


pH Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

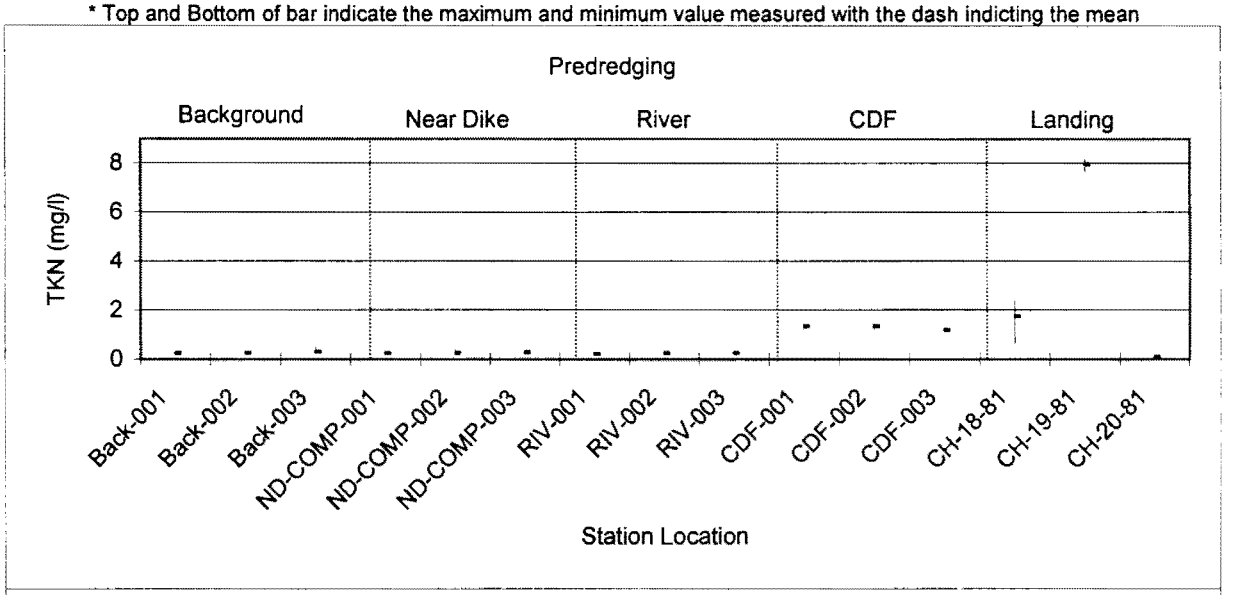


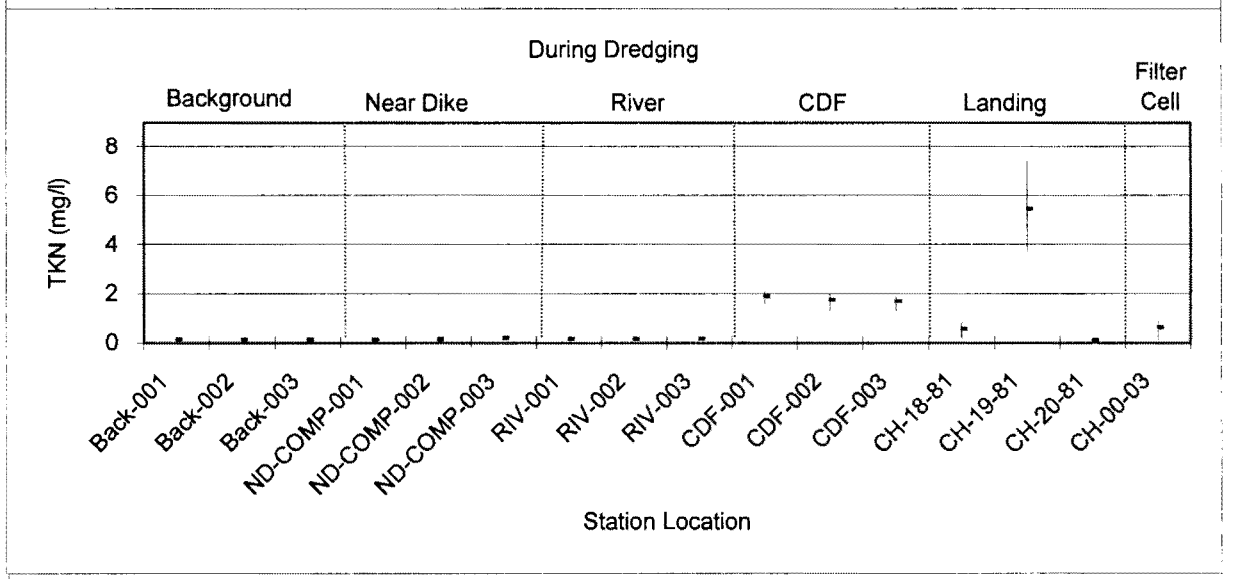


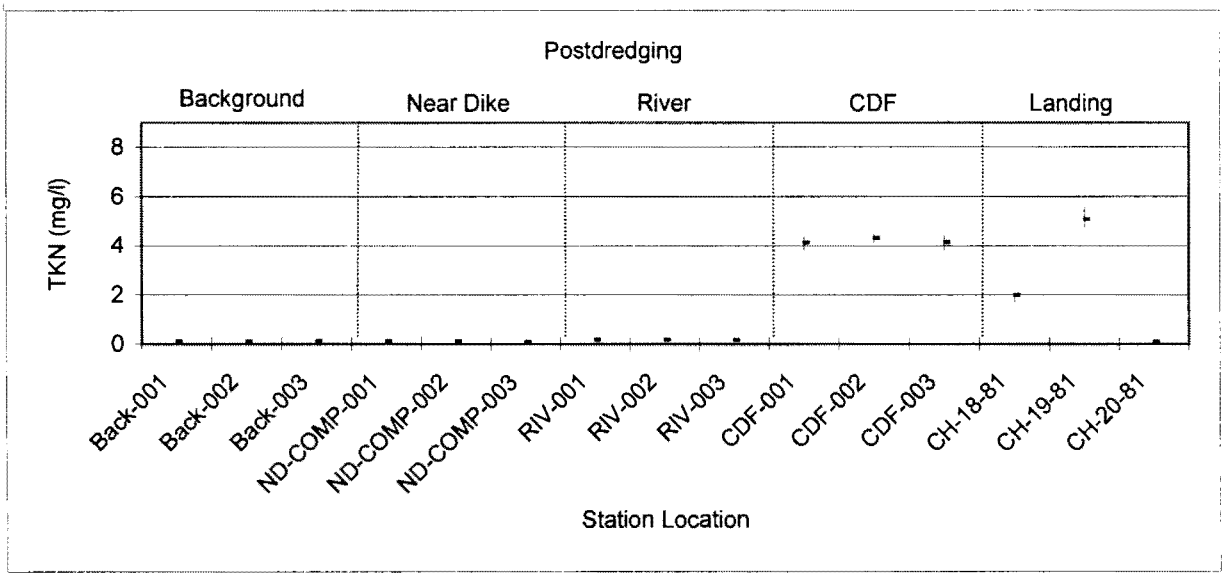


Total Kjeldahl Nitrogen Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

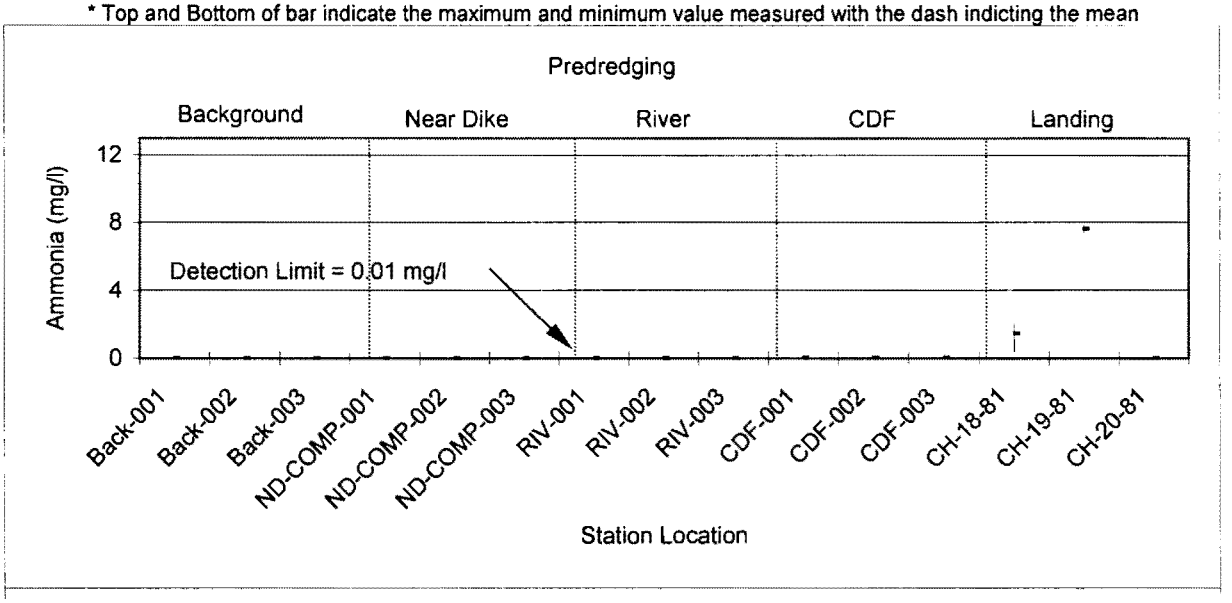


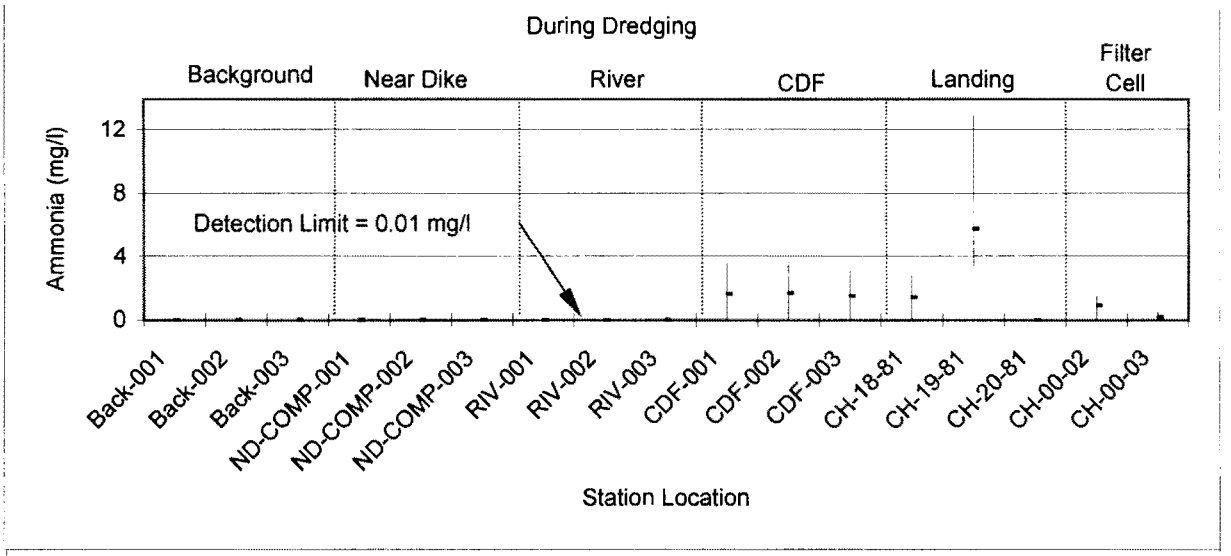


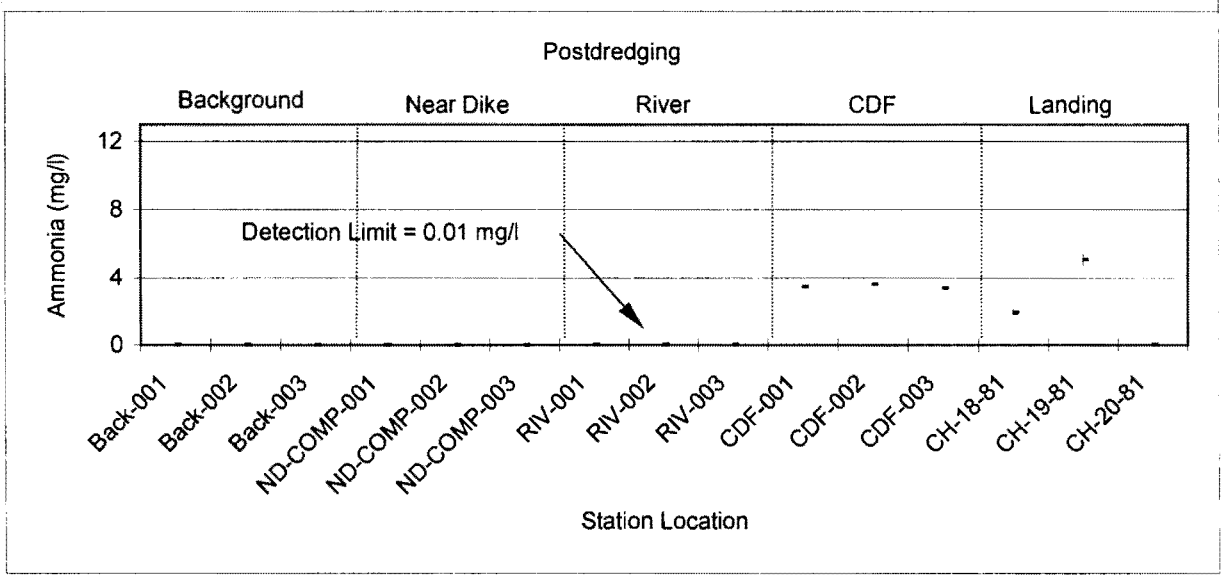


Ammonia as Nitrogen Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

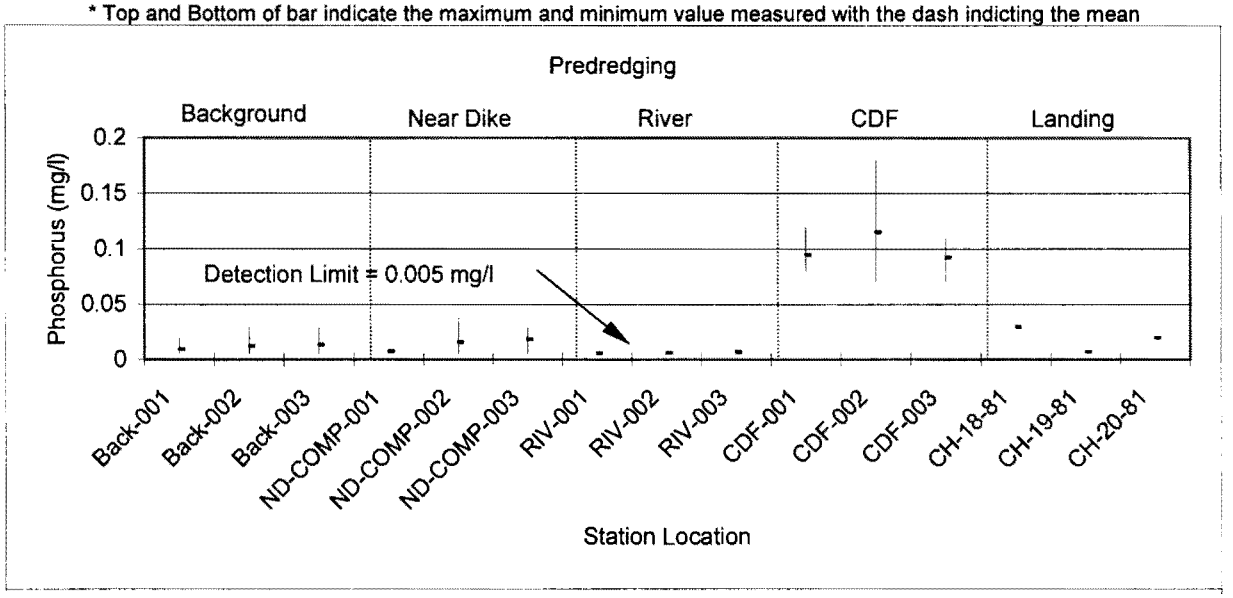


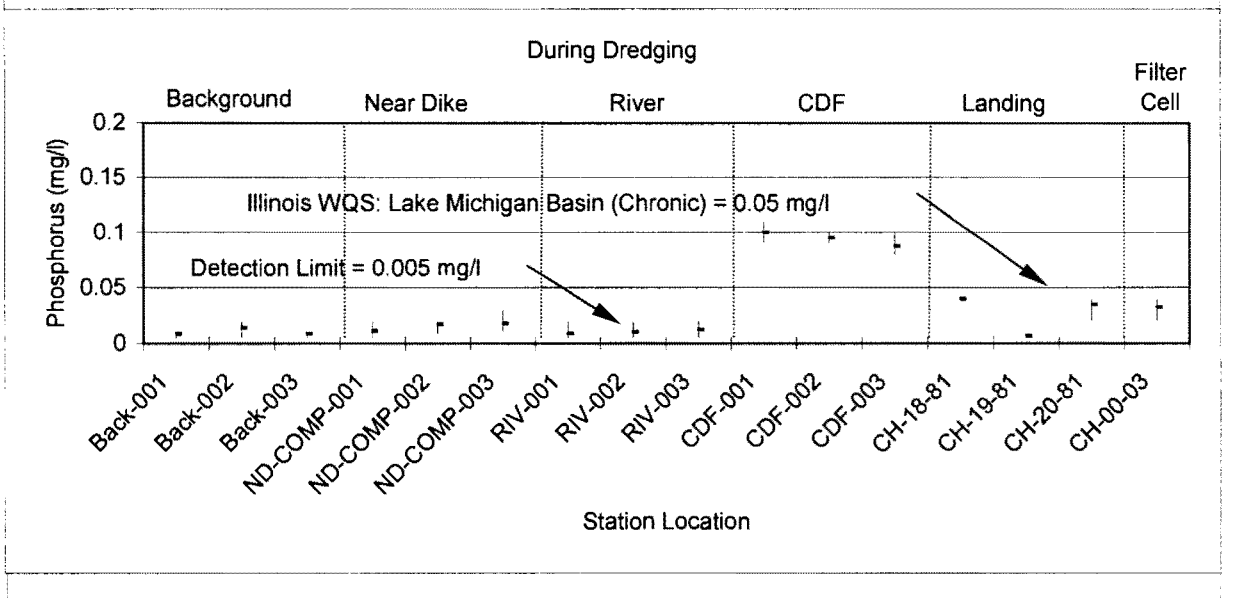


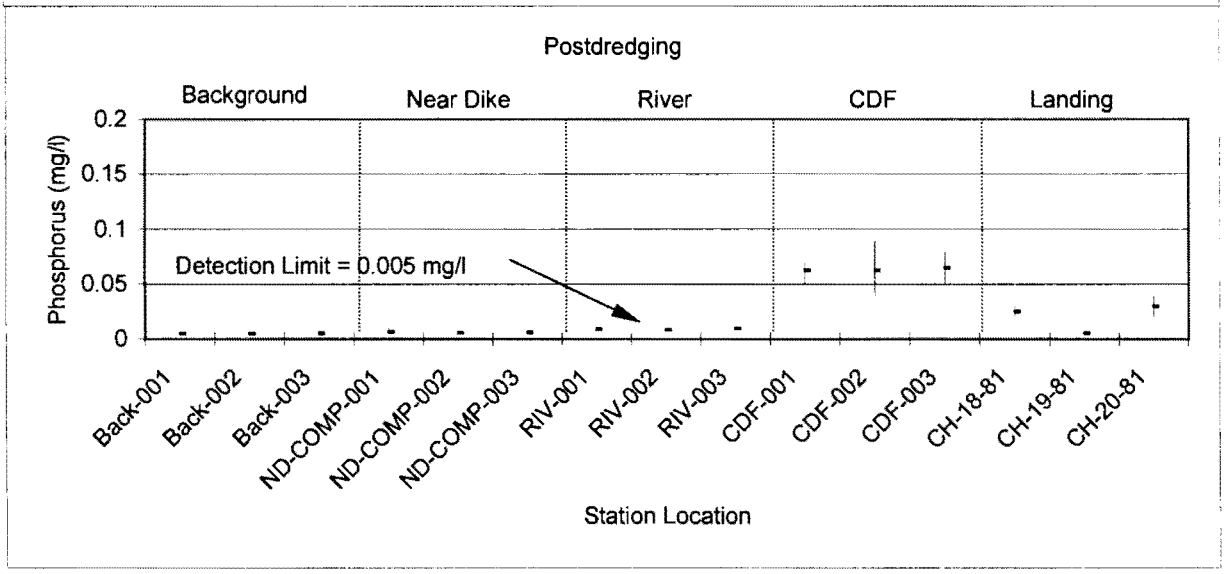


Phosphorus Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

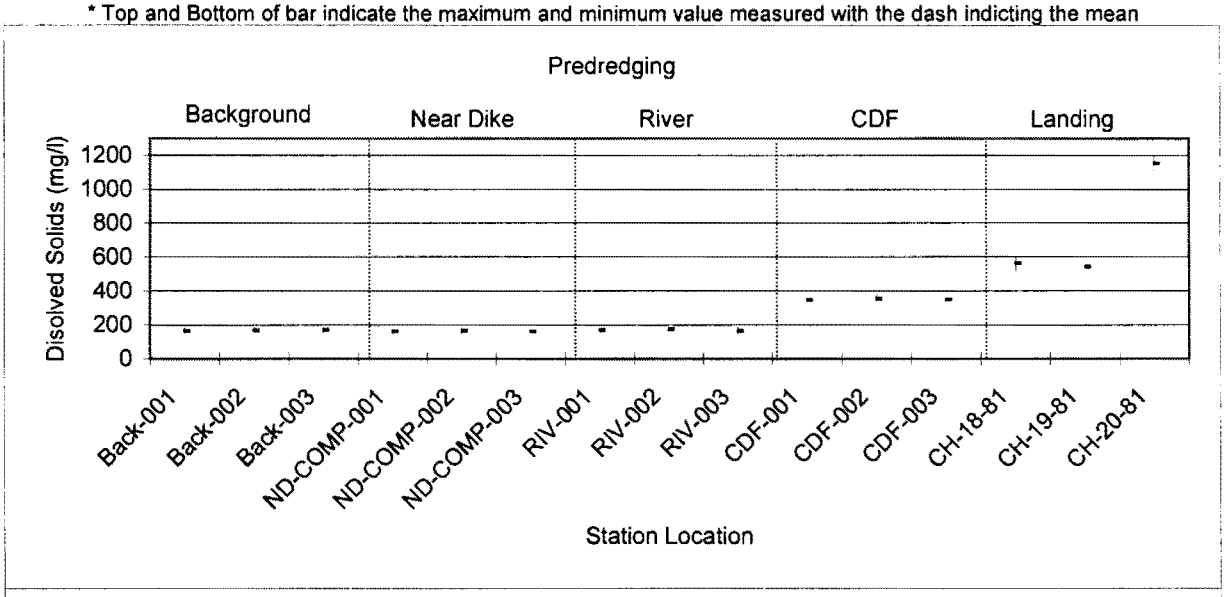


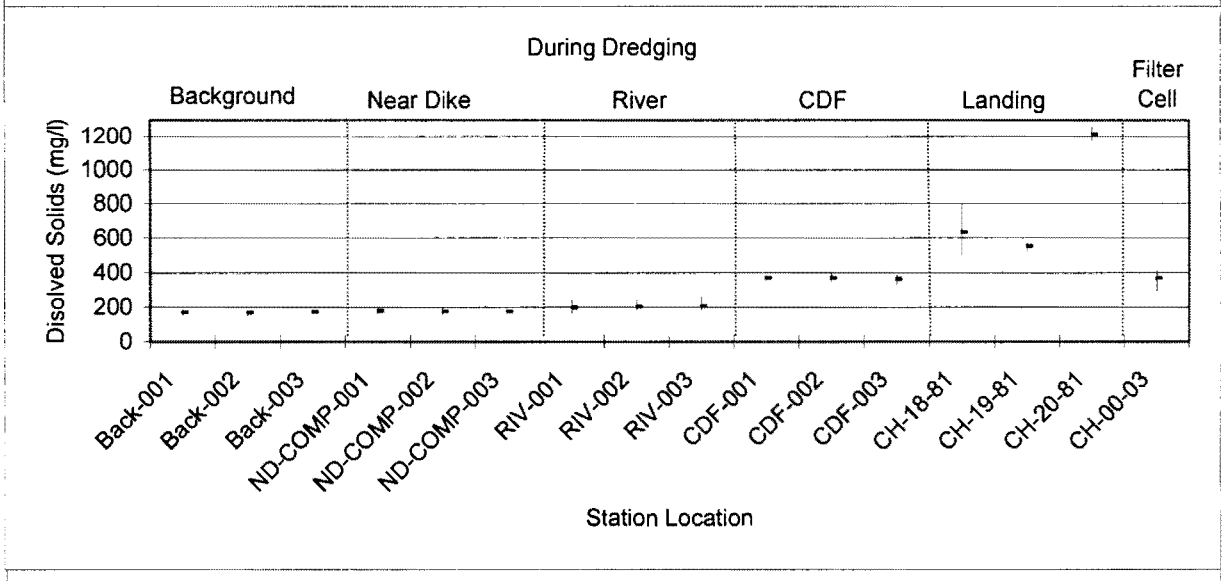


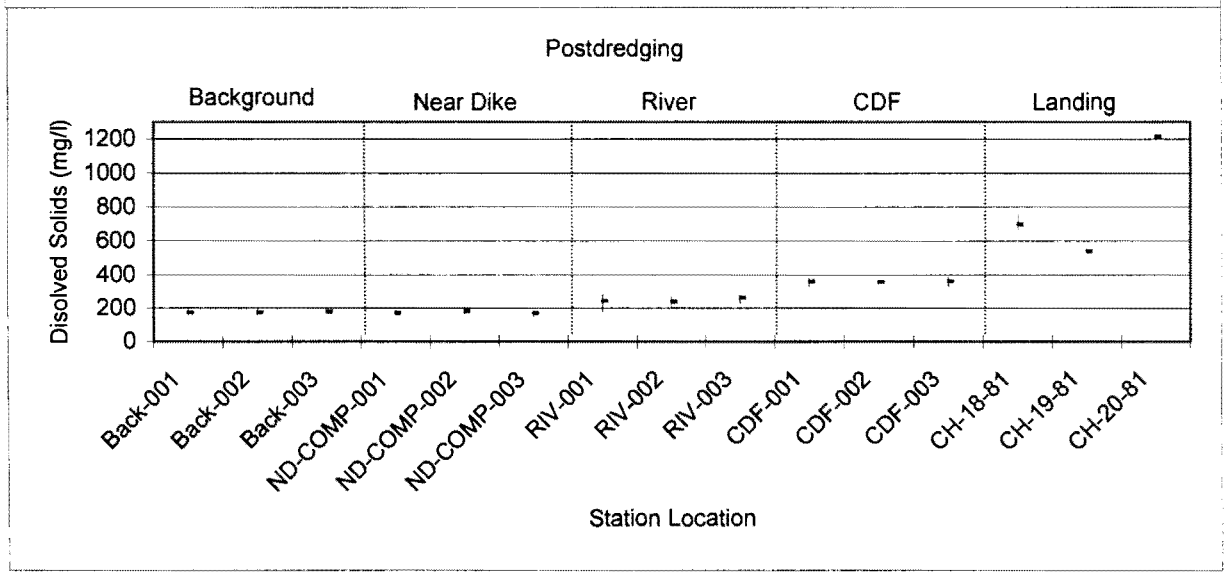


Disolved Solids Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

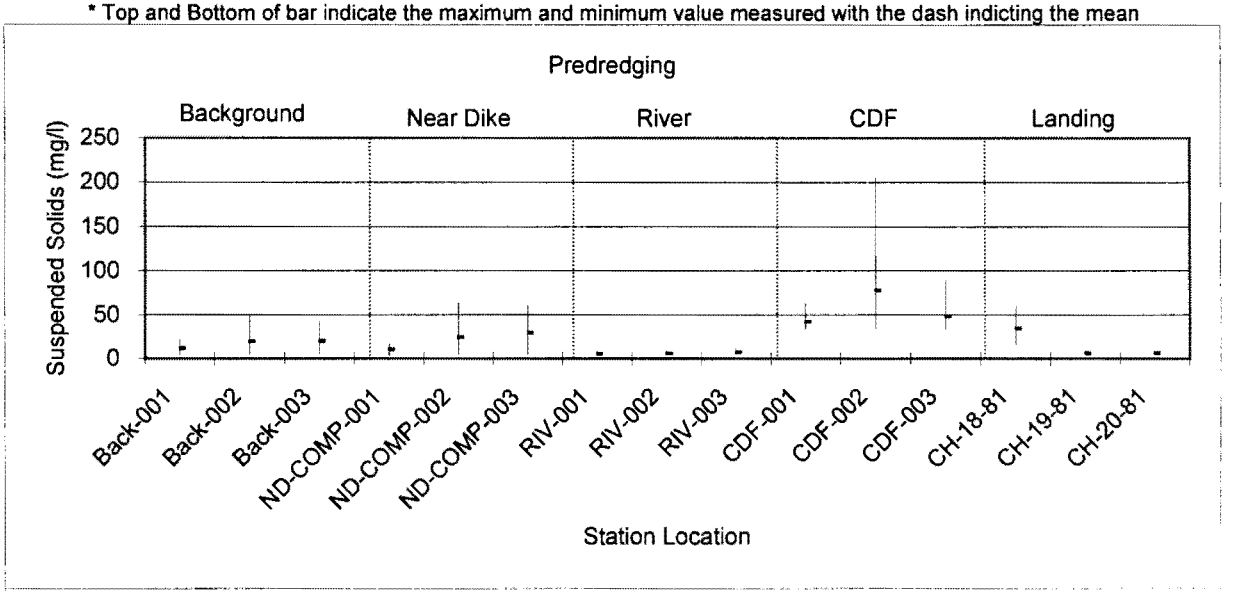


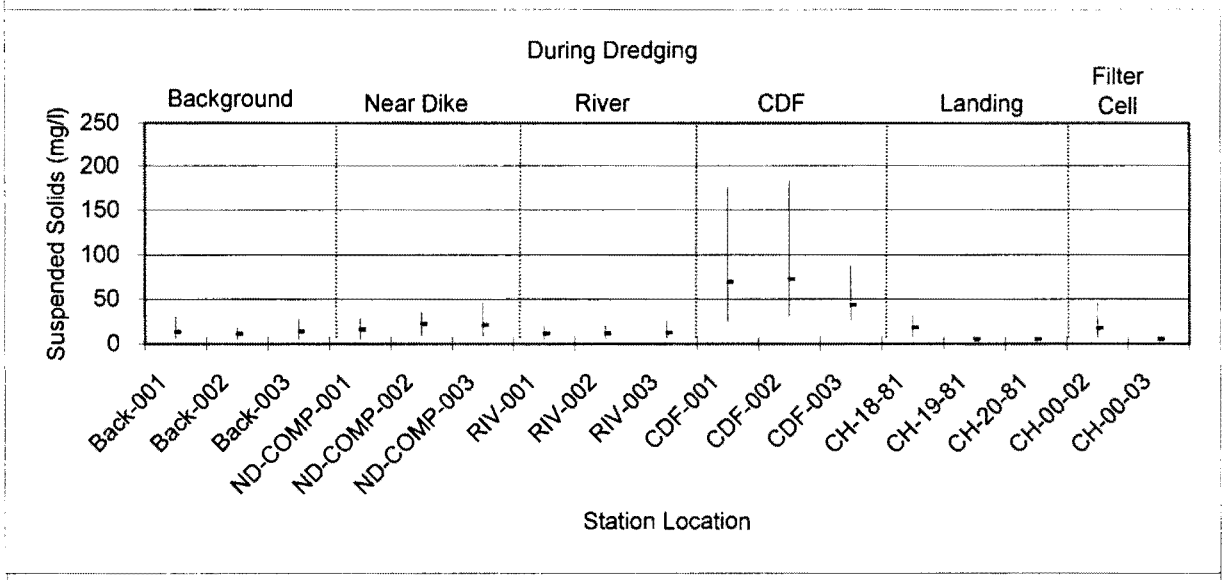


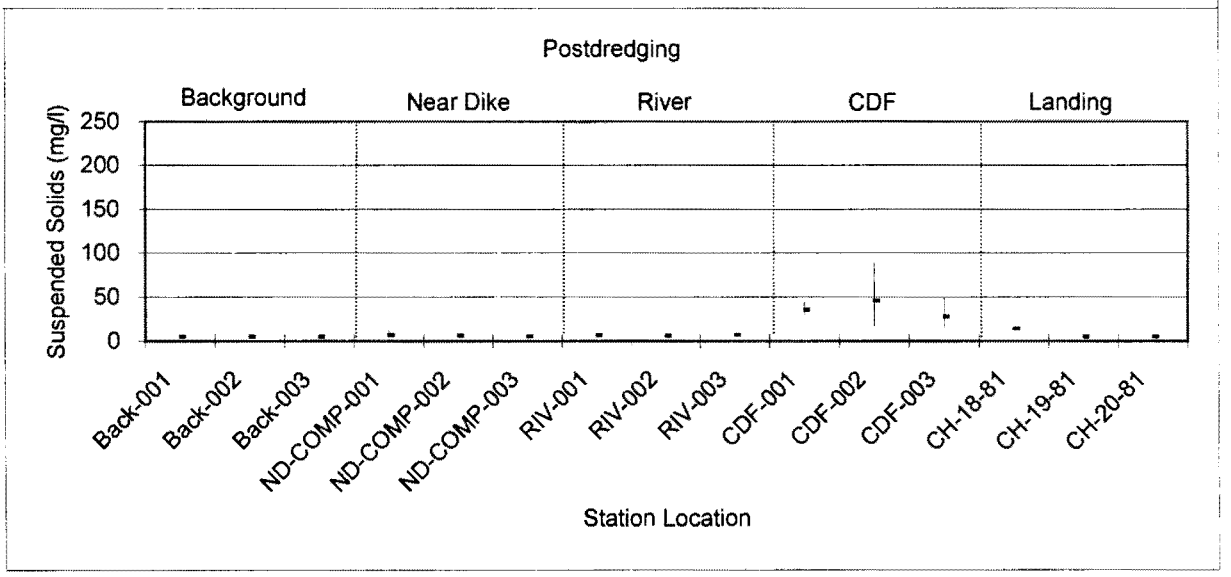


Suspended Solids Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

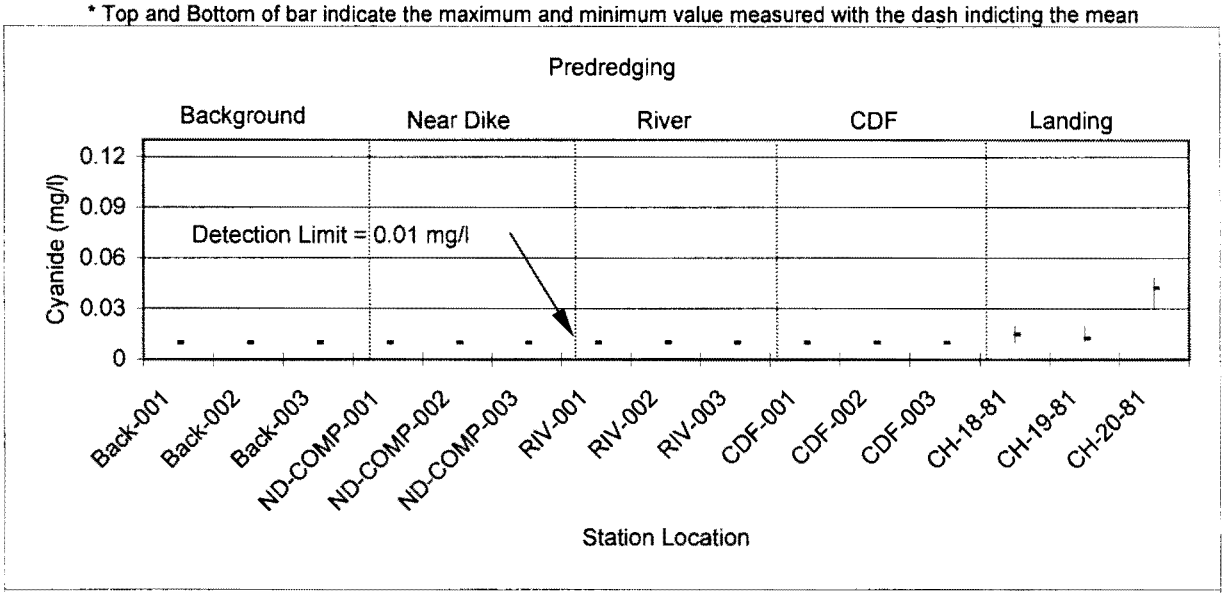


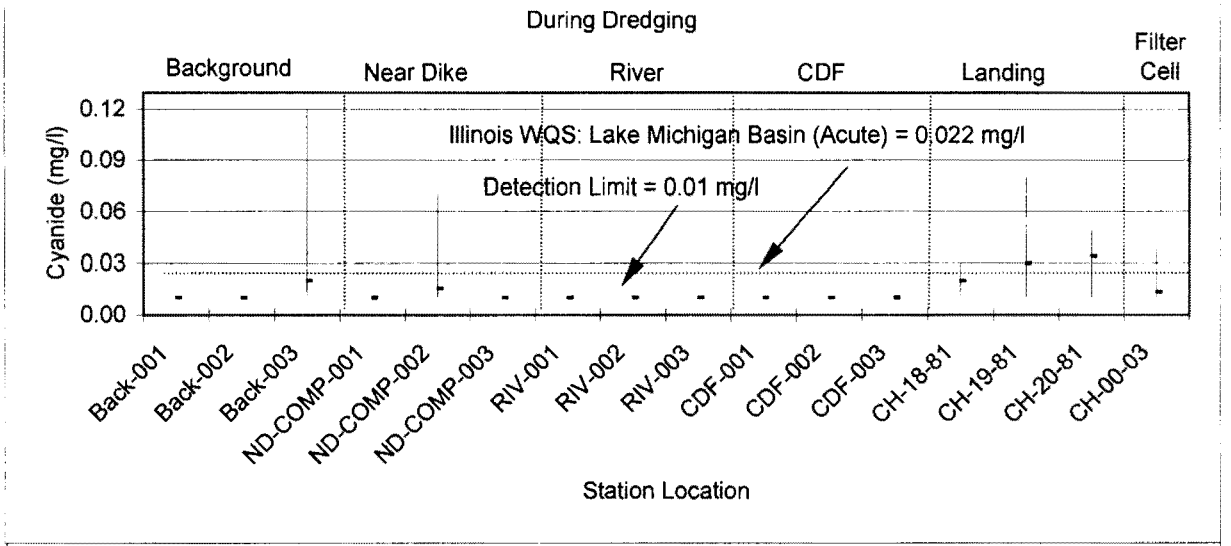


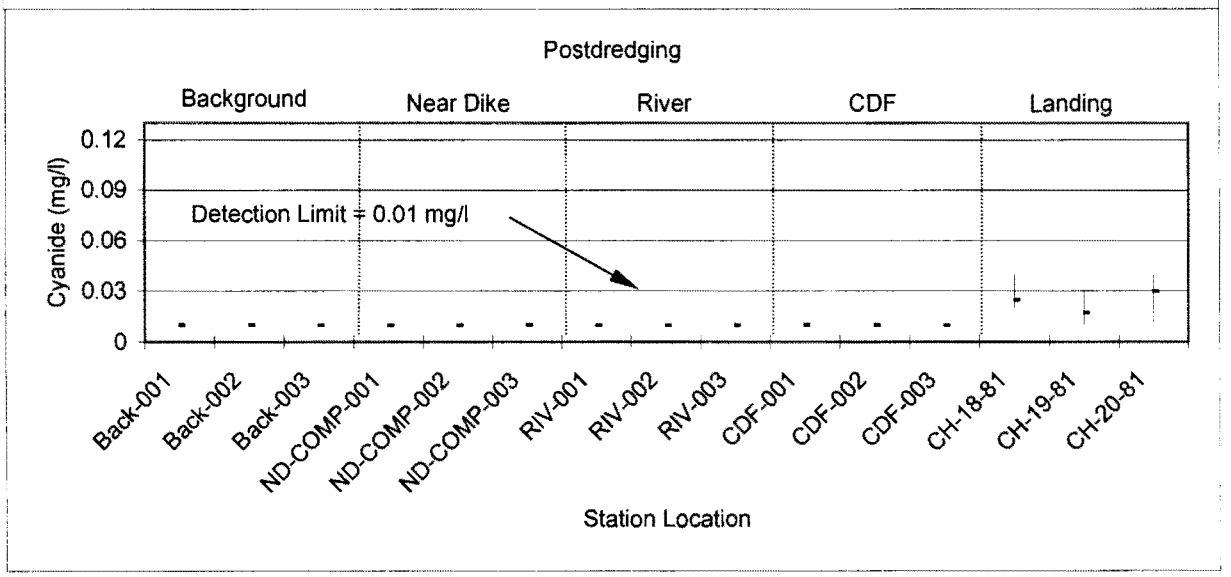


Cyanide Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

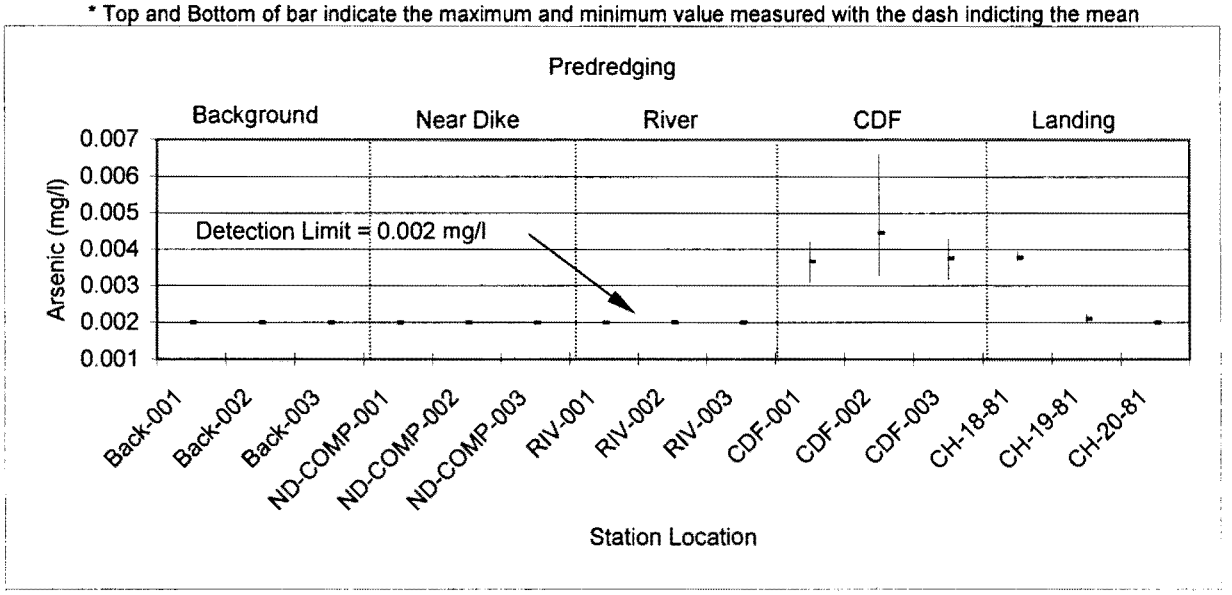


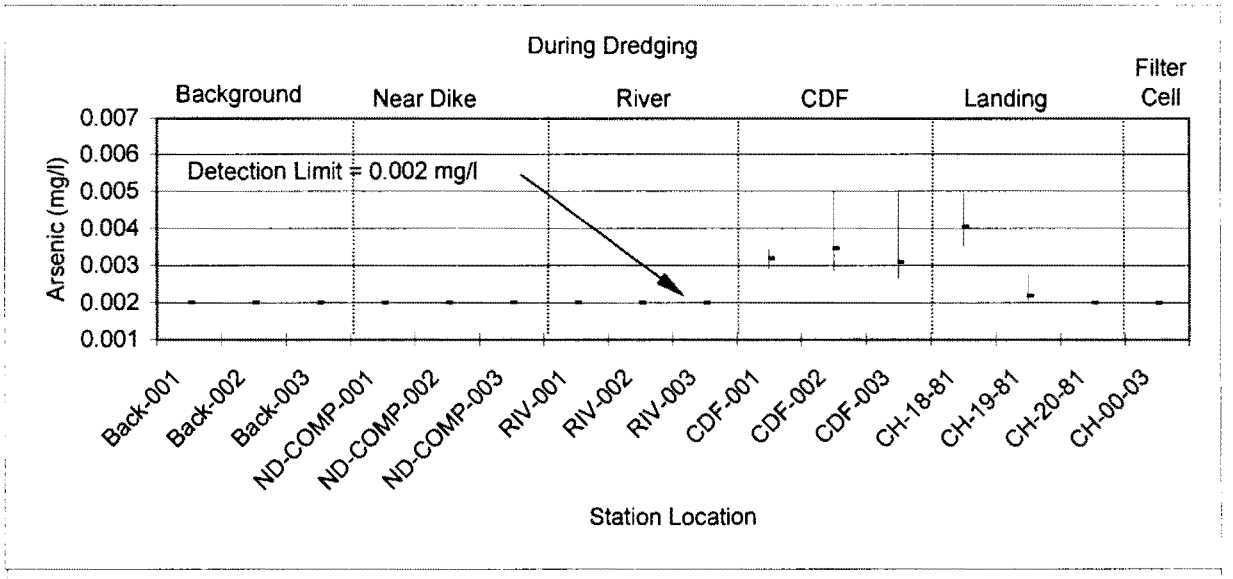


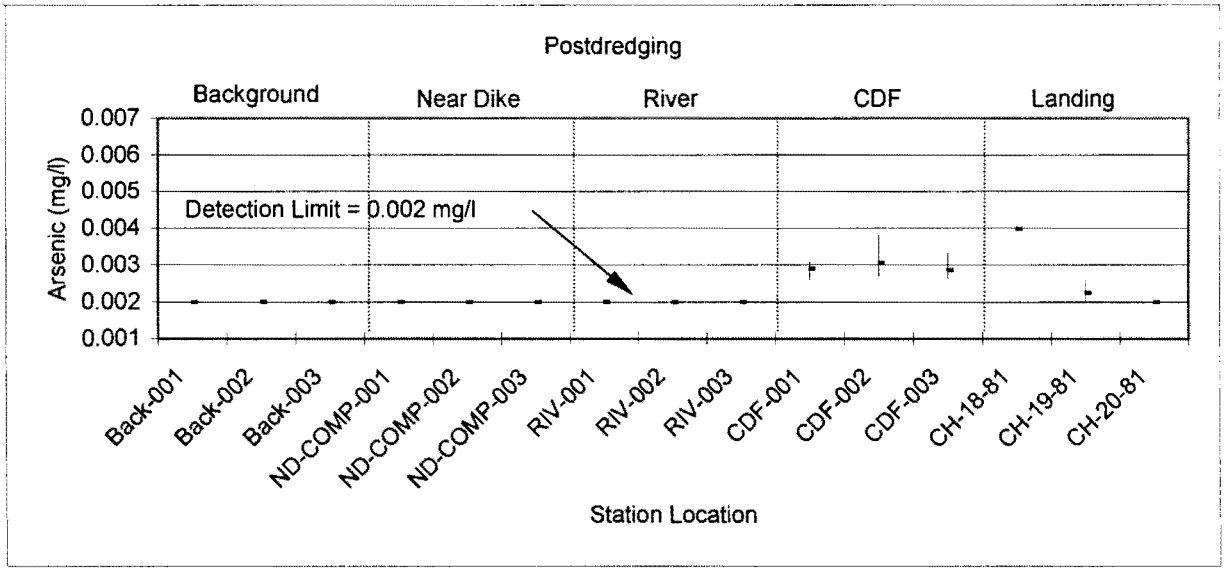


Arsenic Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

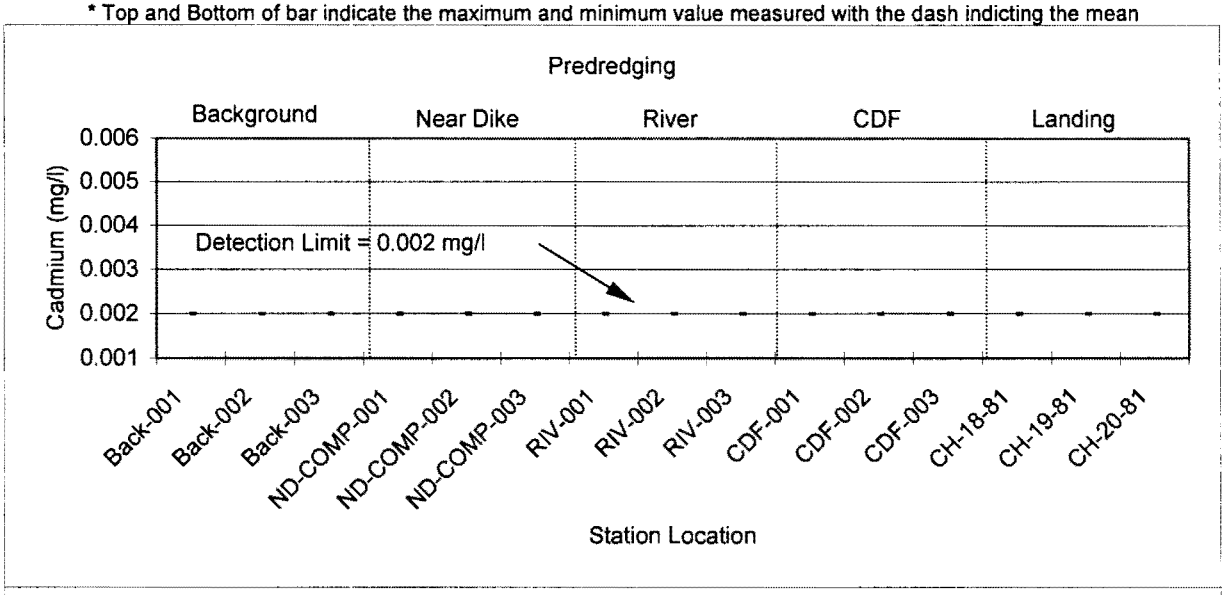


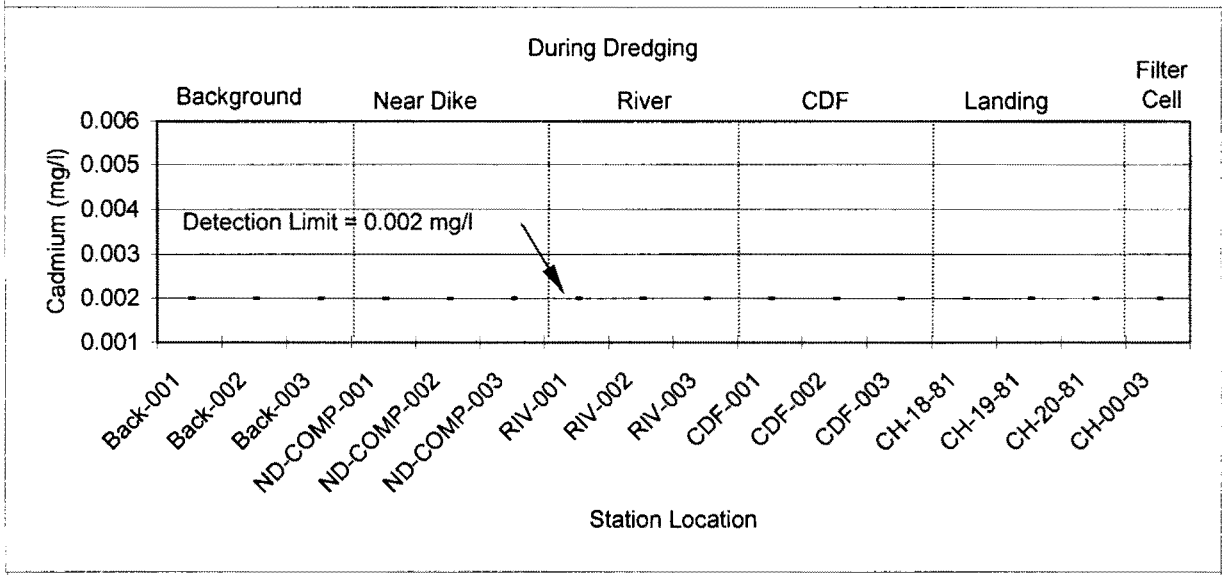


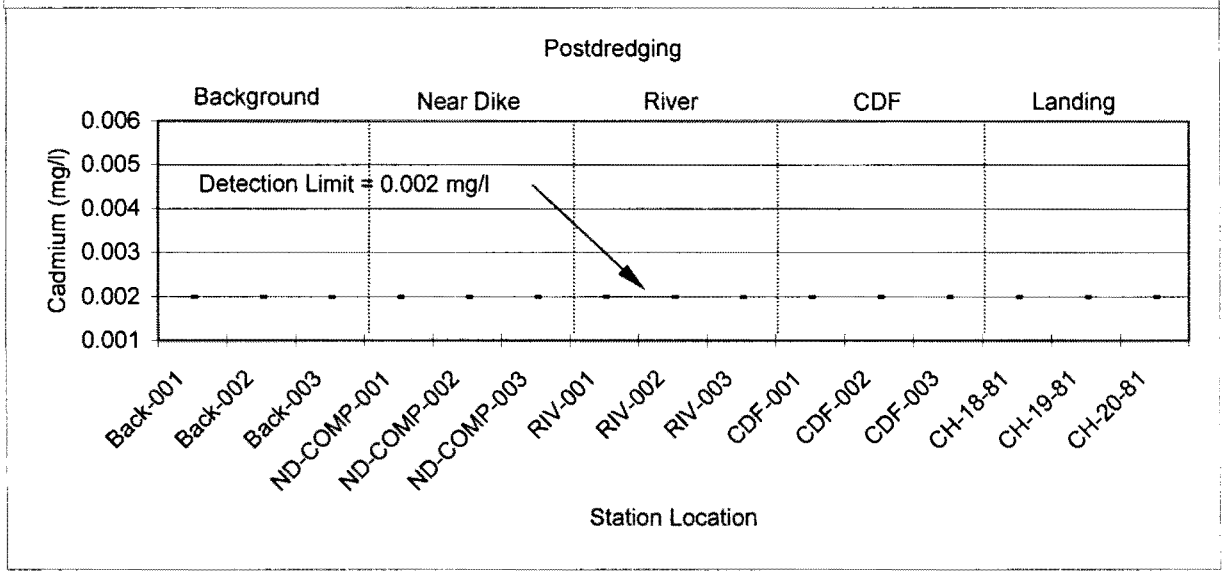


Cadmium Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

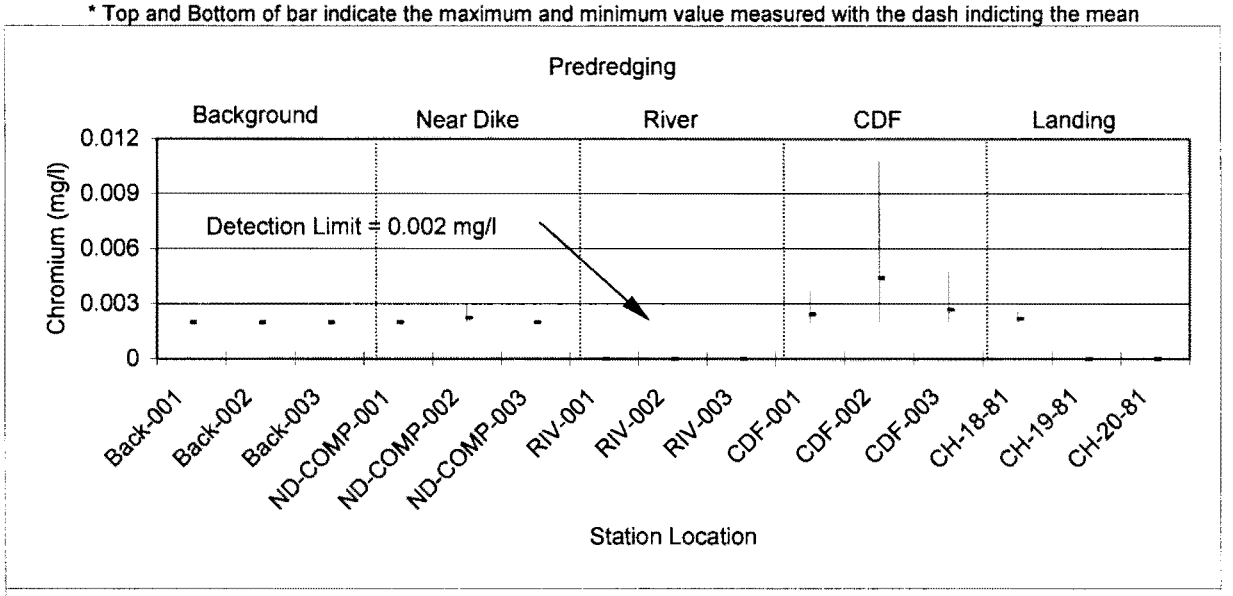


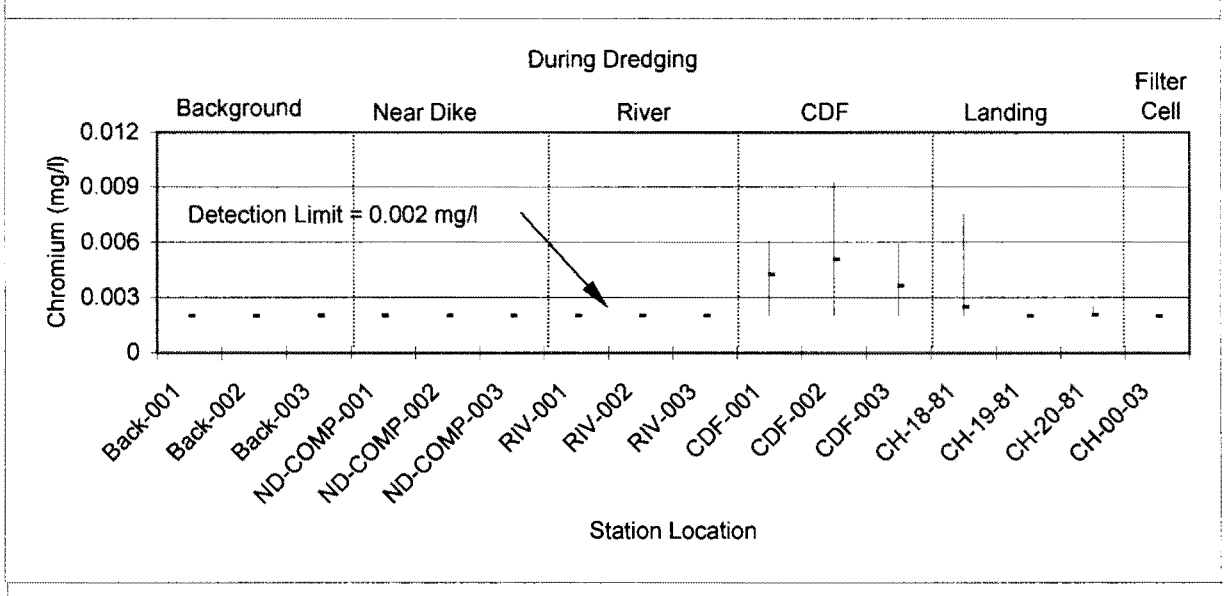


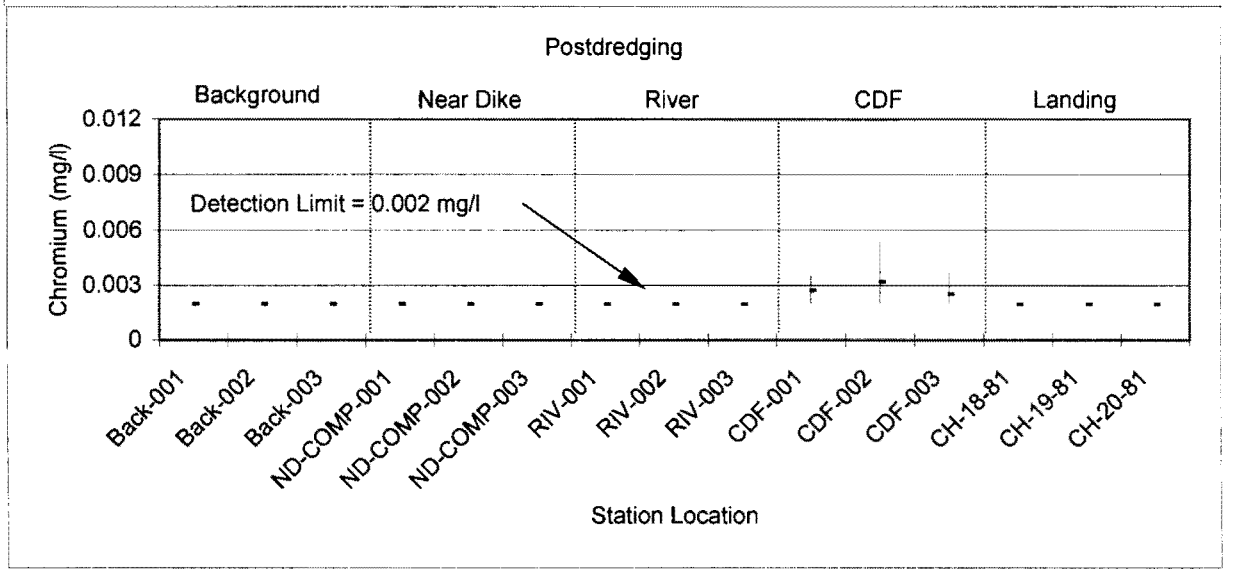


Chromium Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

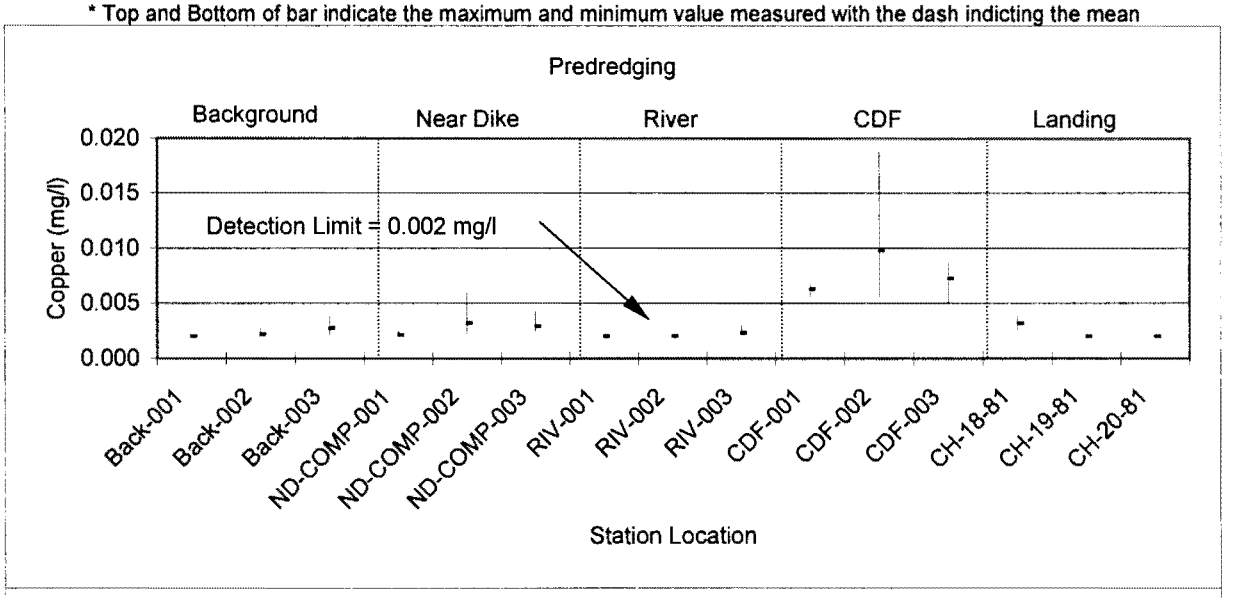


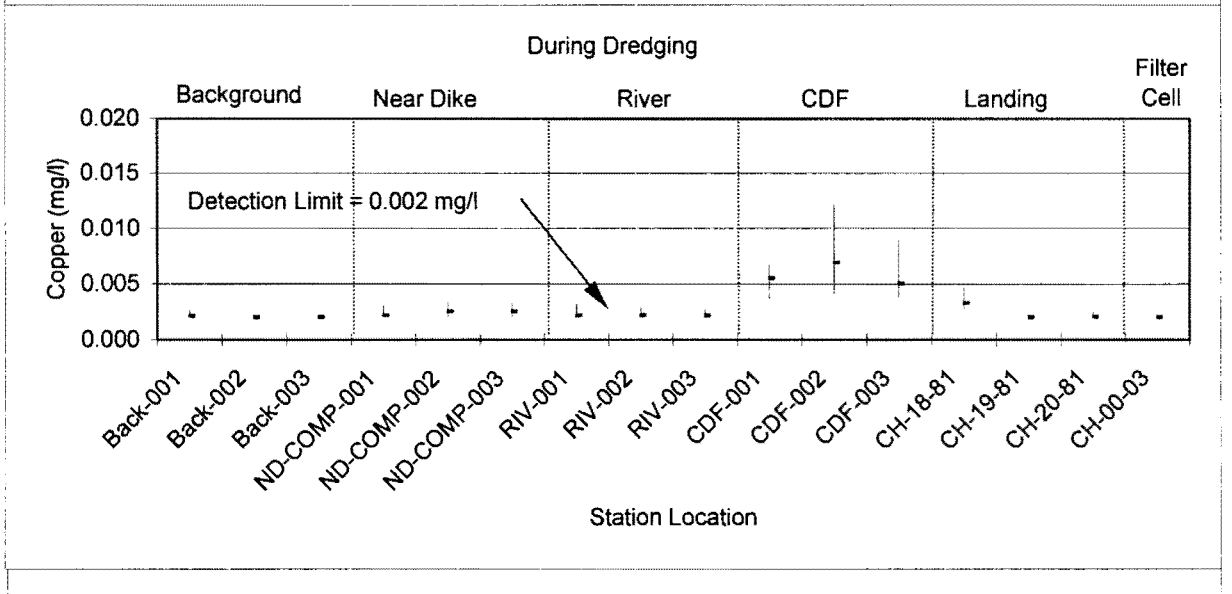


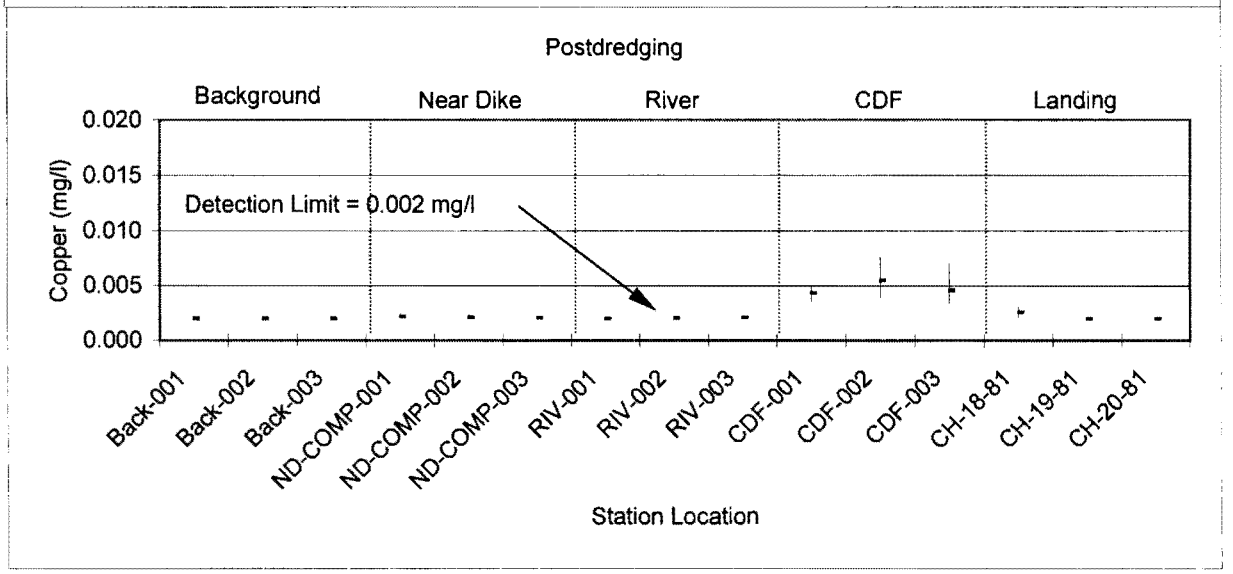


Copper Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

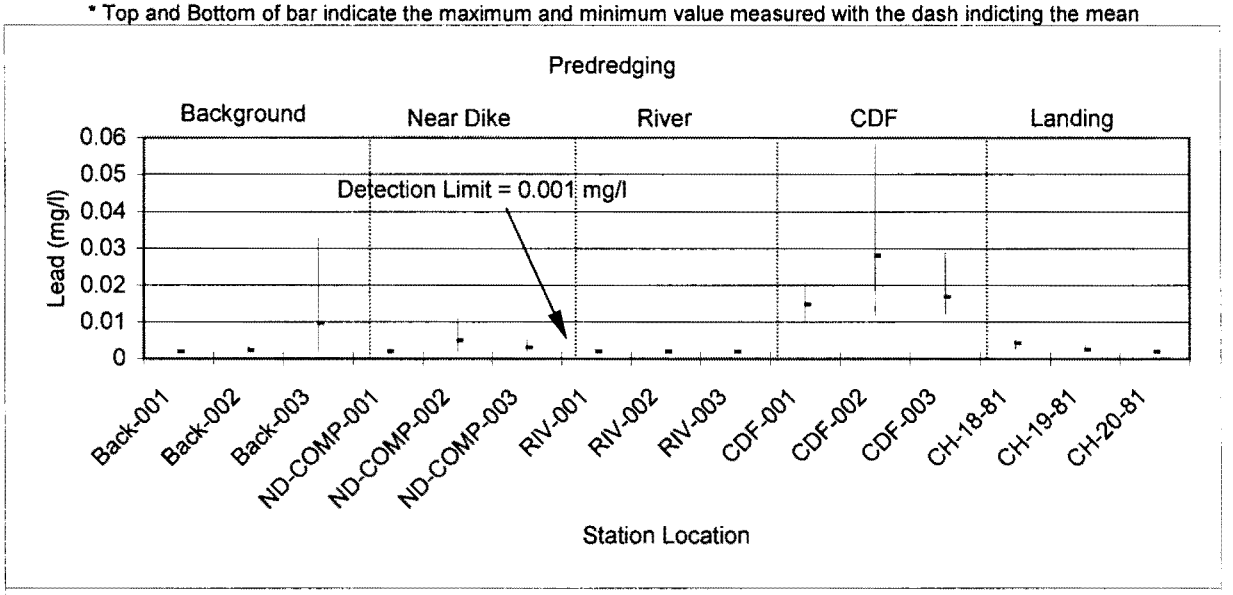


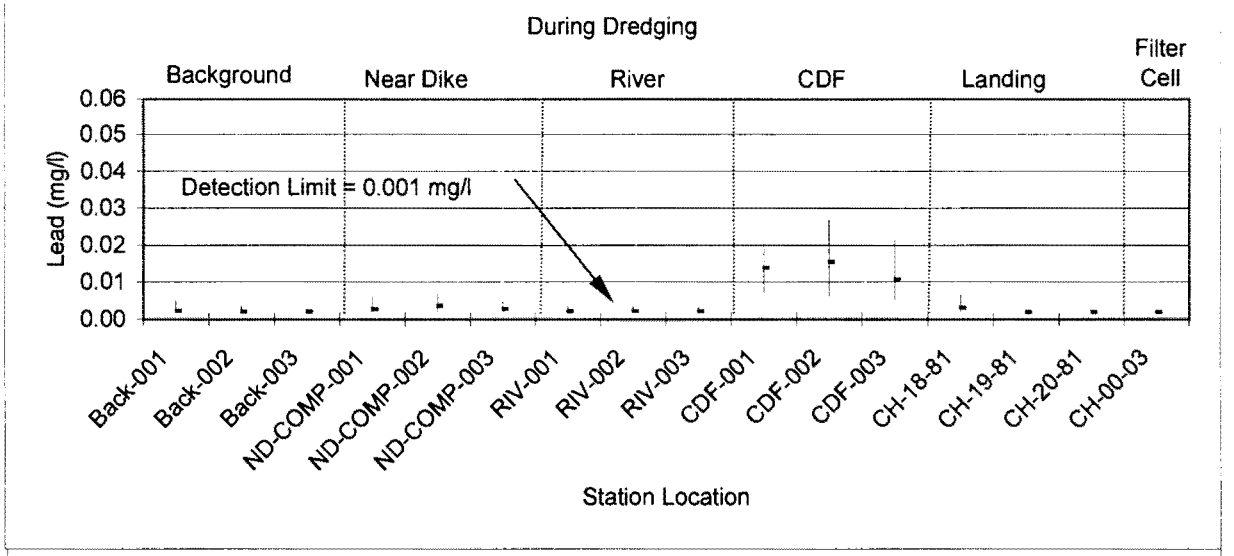


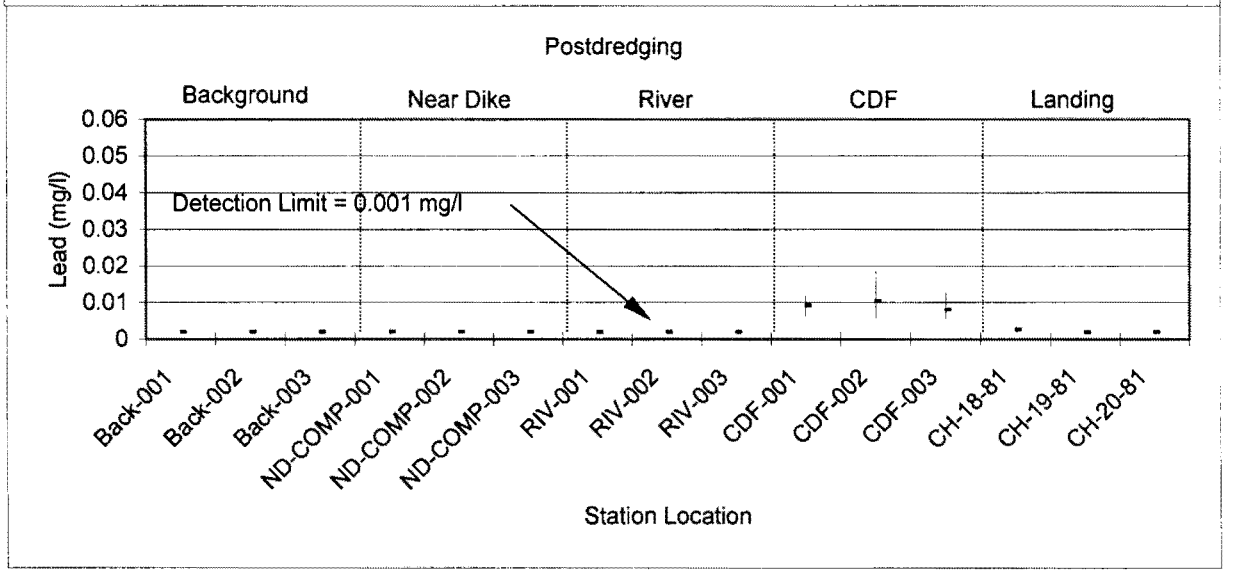


Lead Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

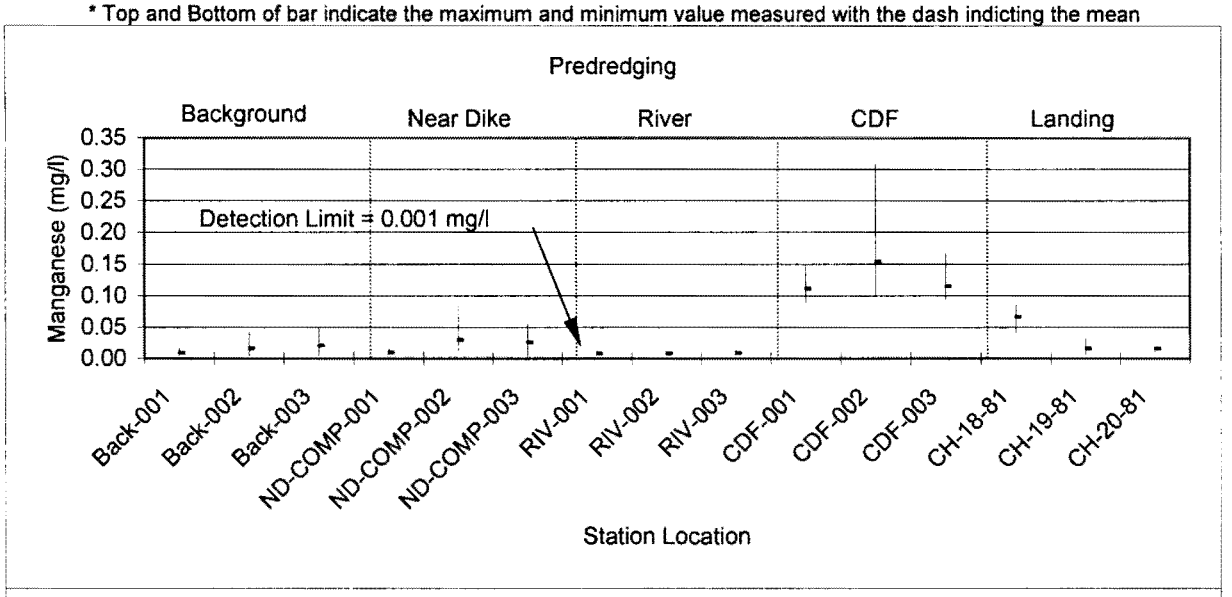


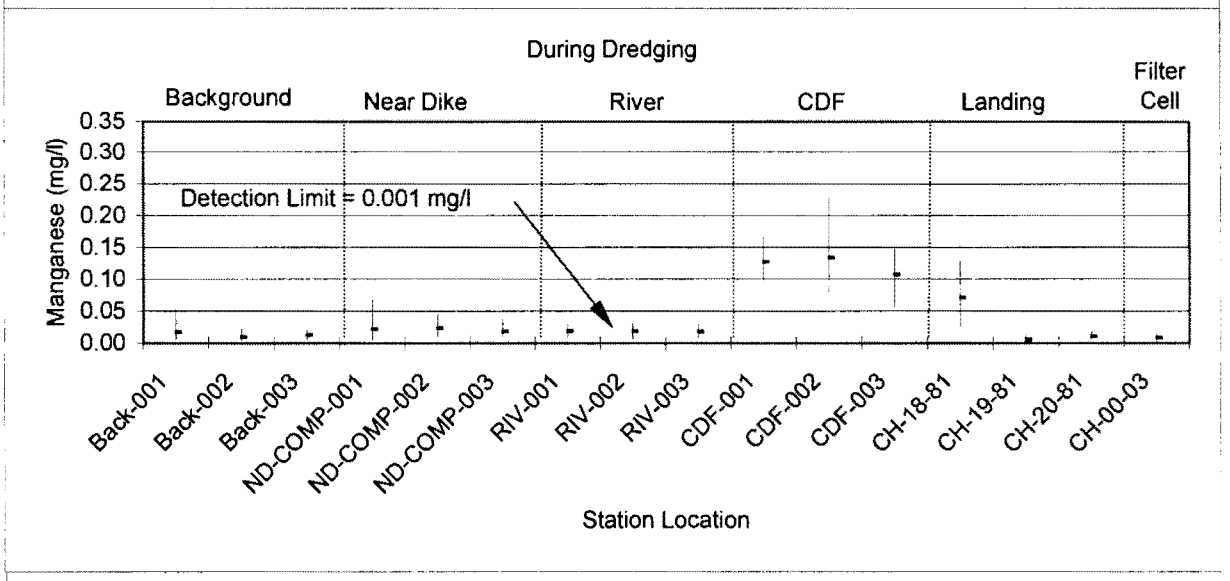


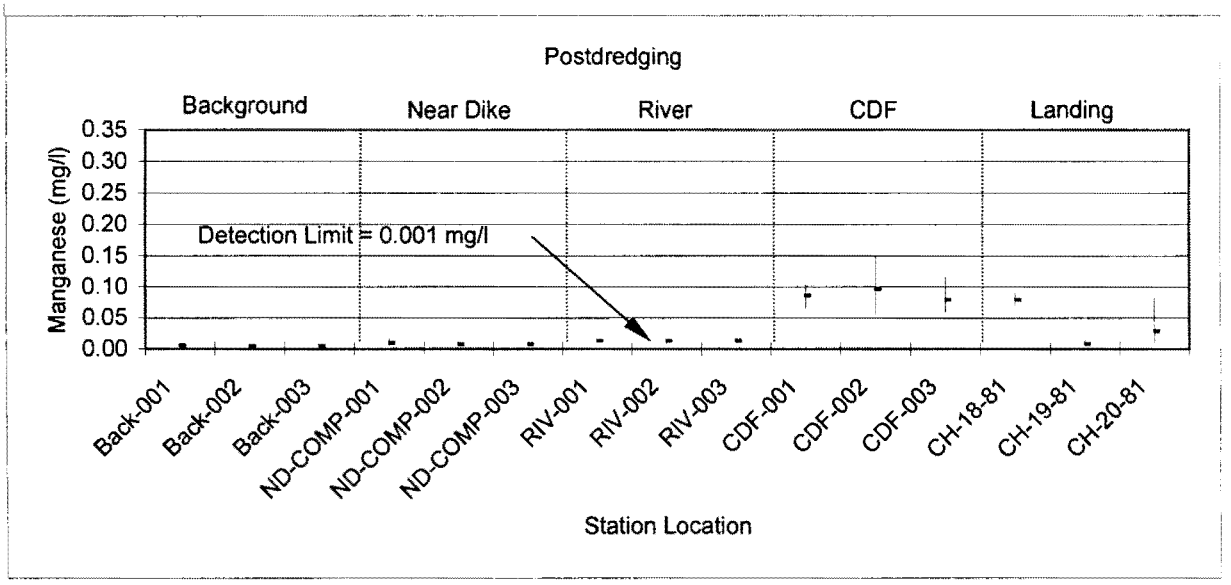


Manganese Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

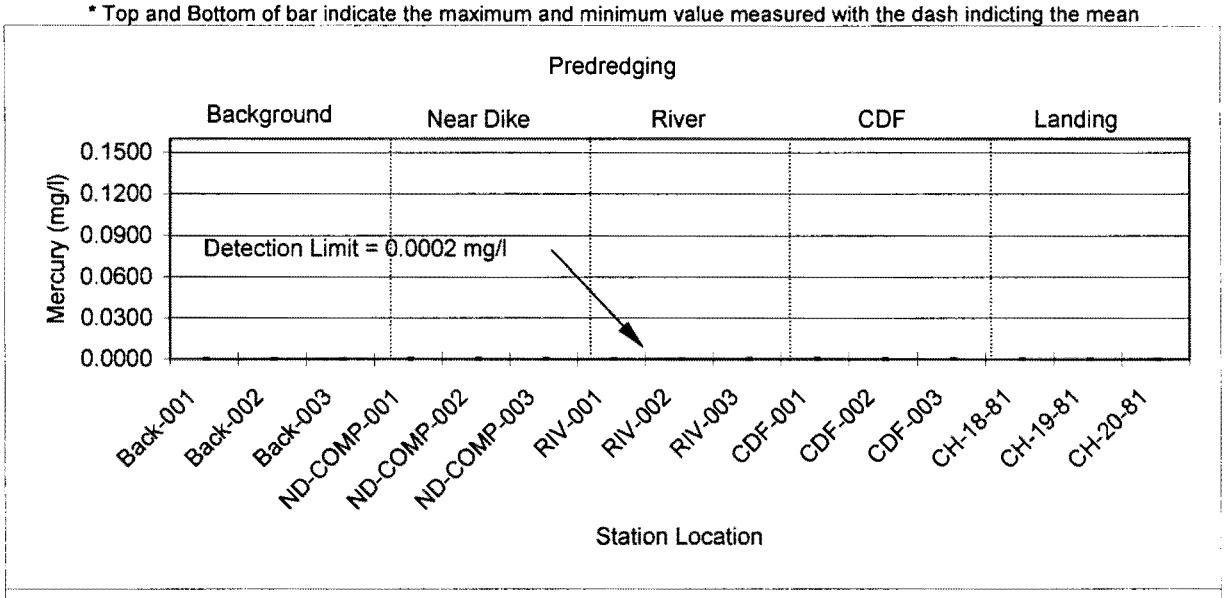


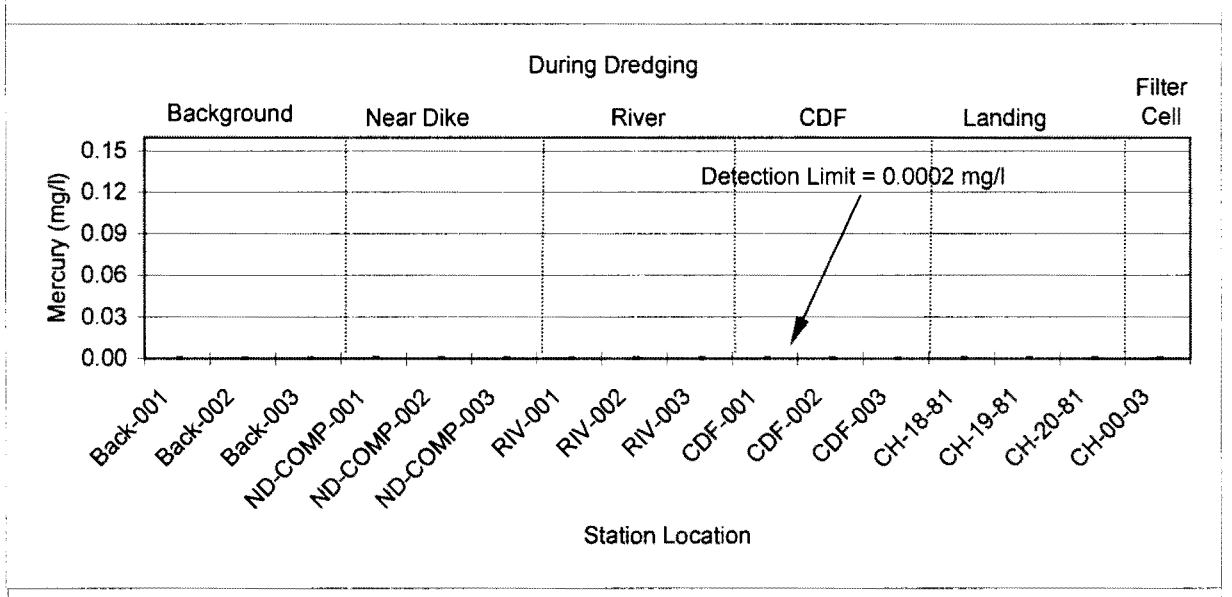


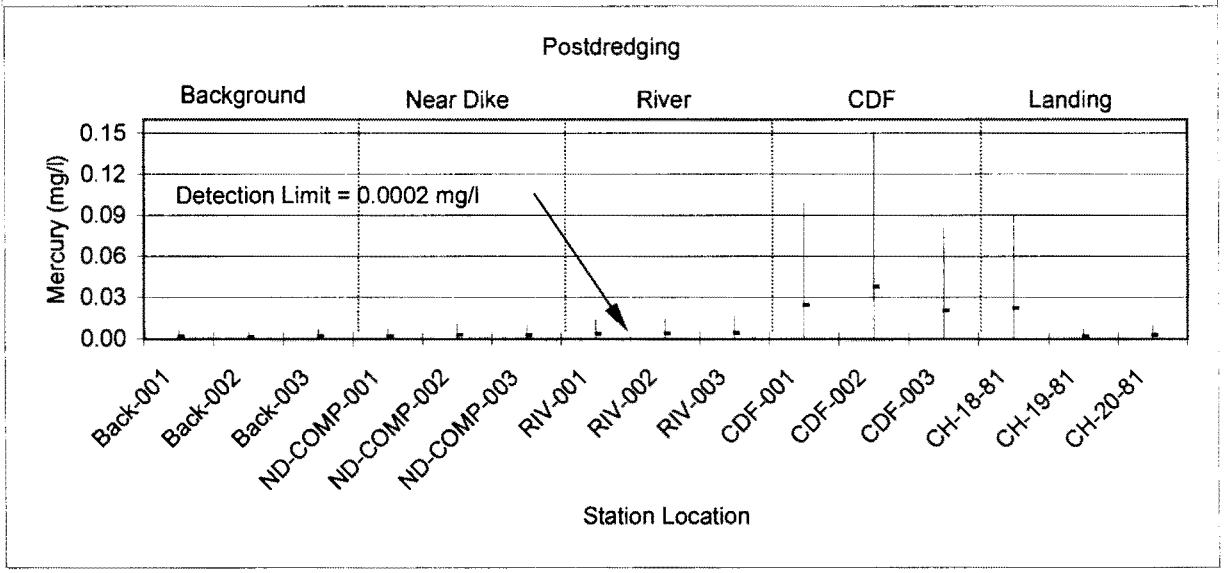


Mercury Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

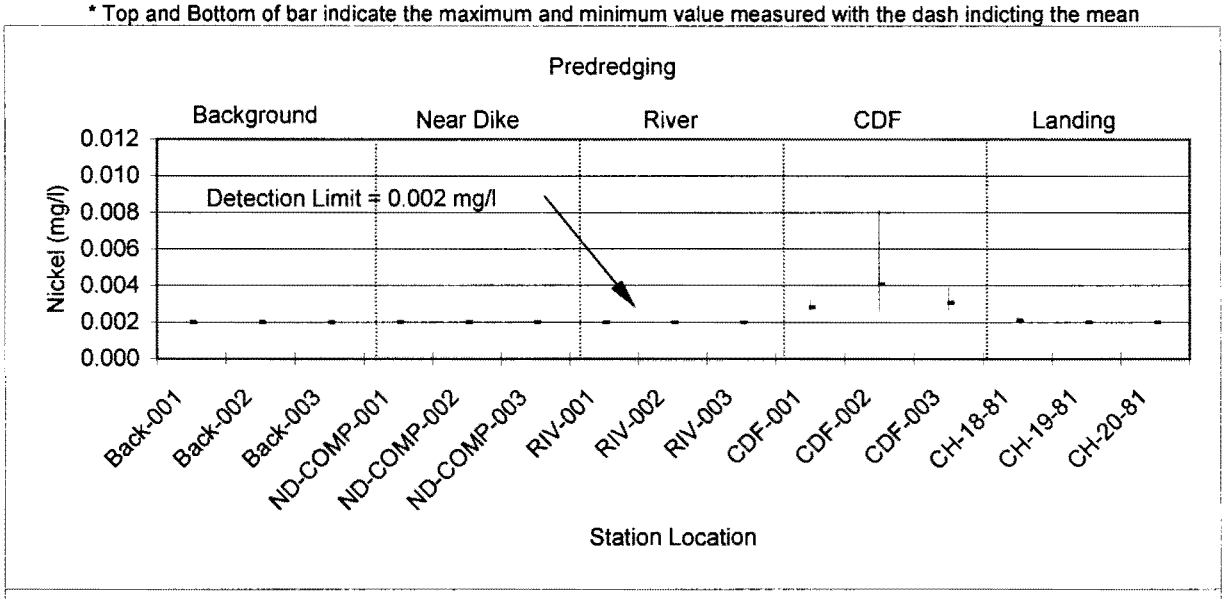


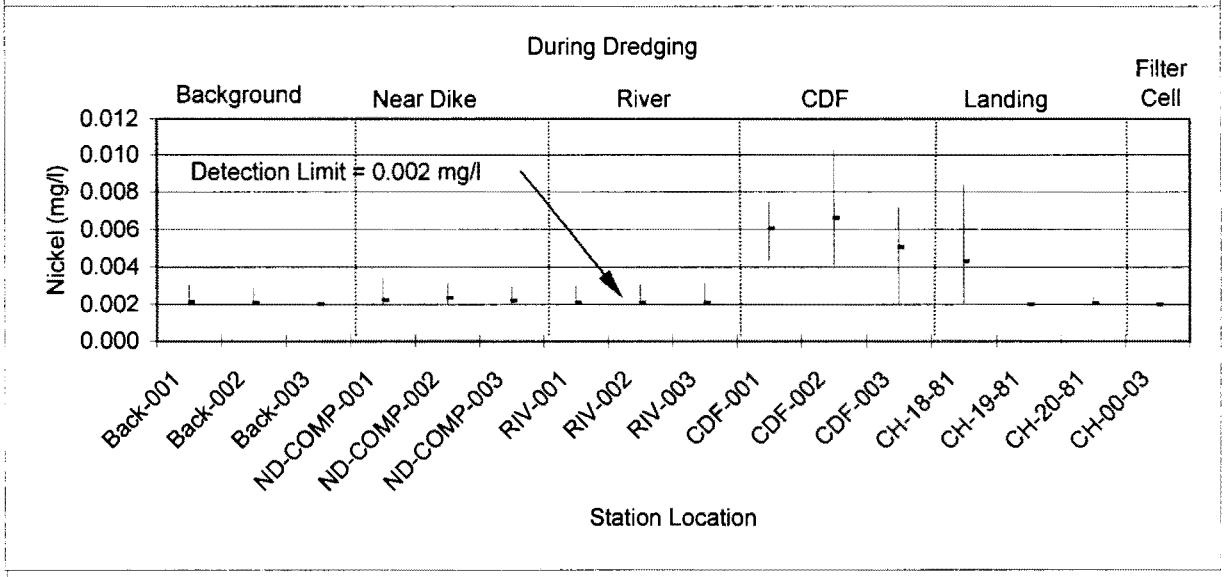


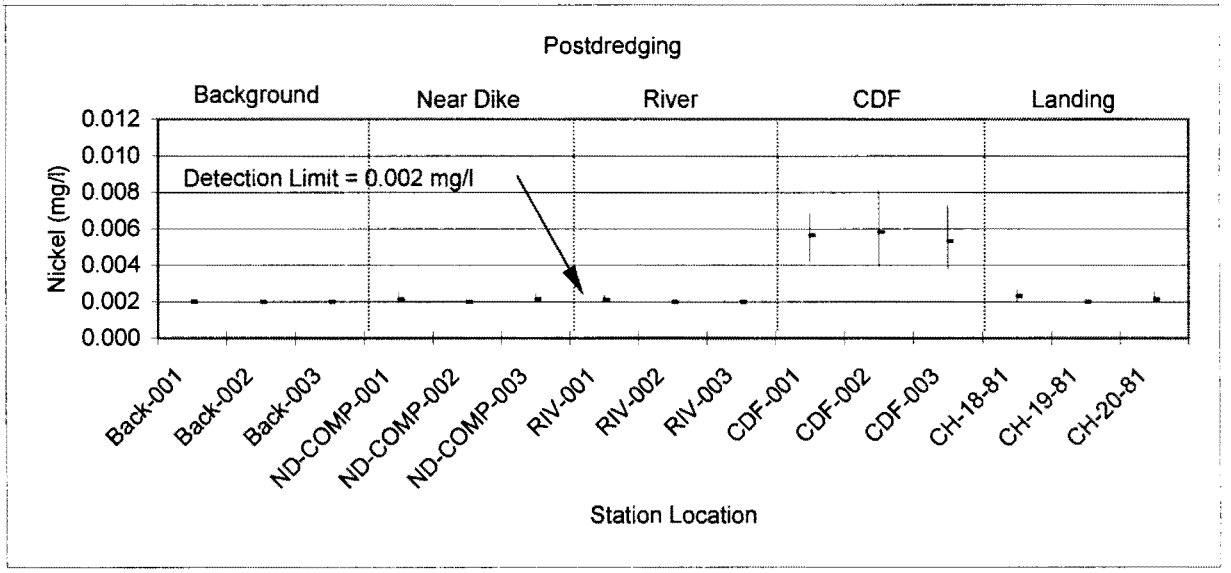


Nickel Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean

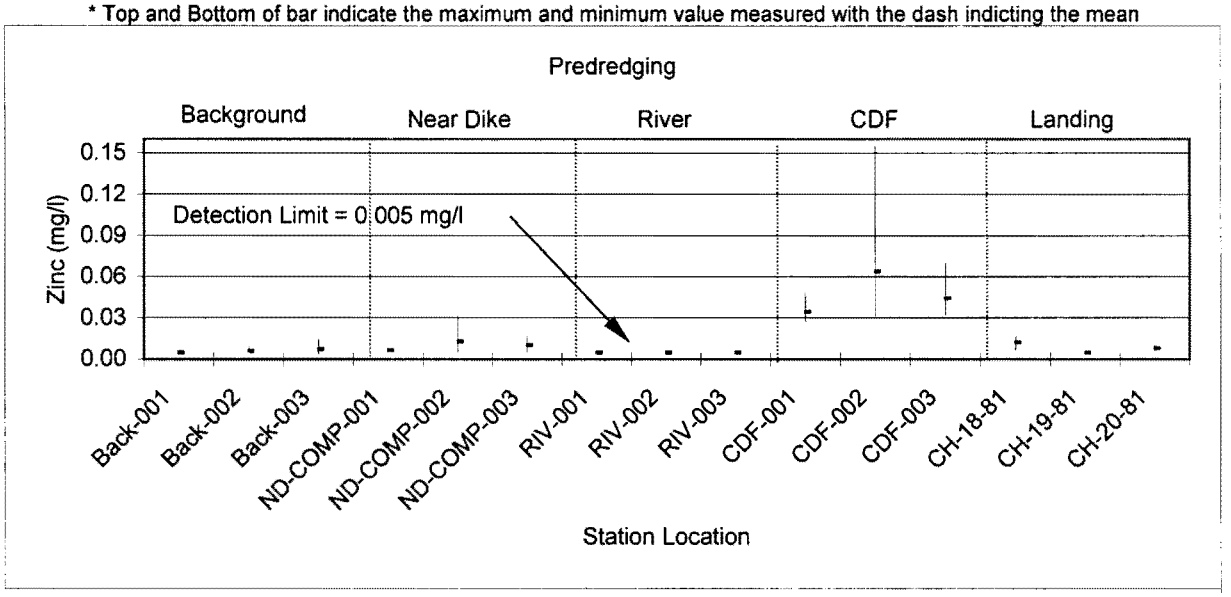


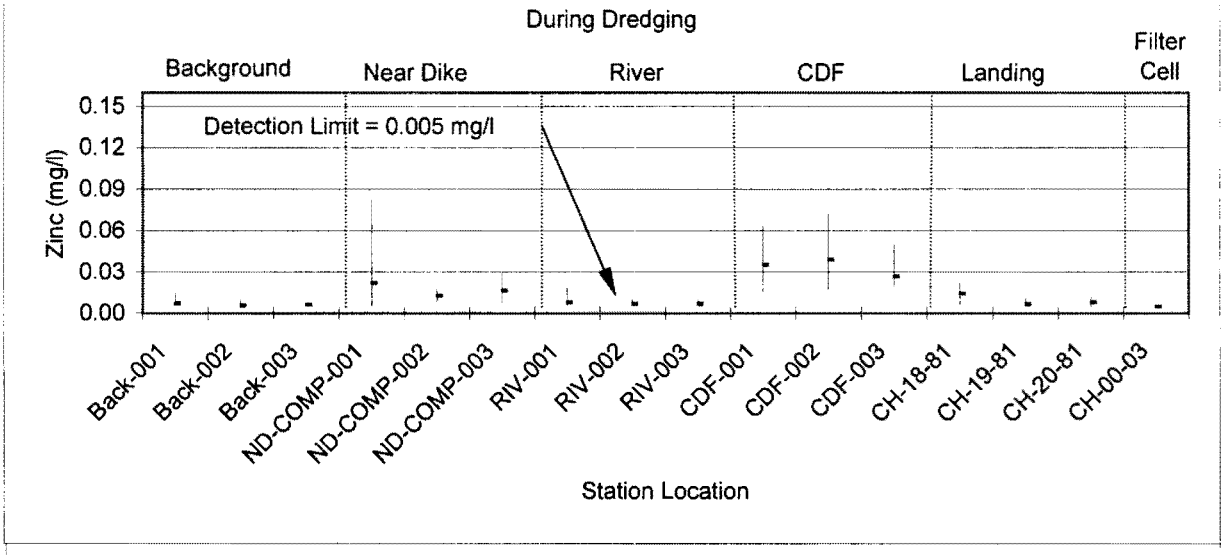


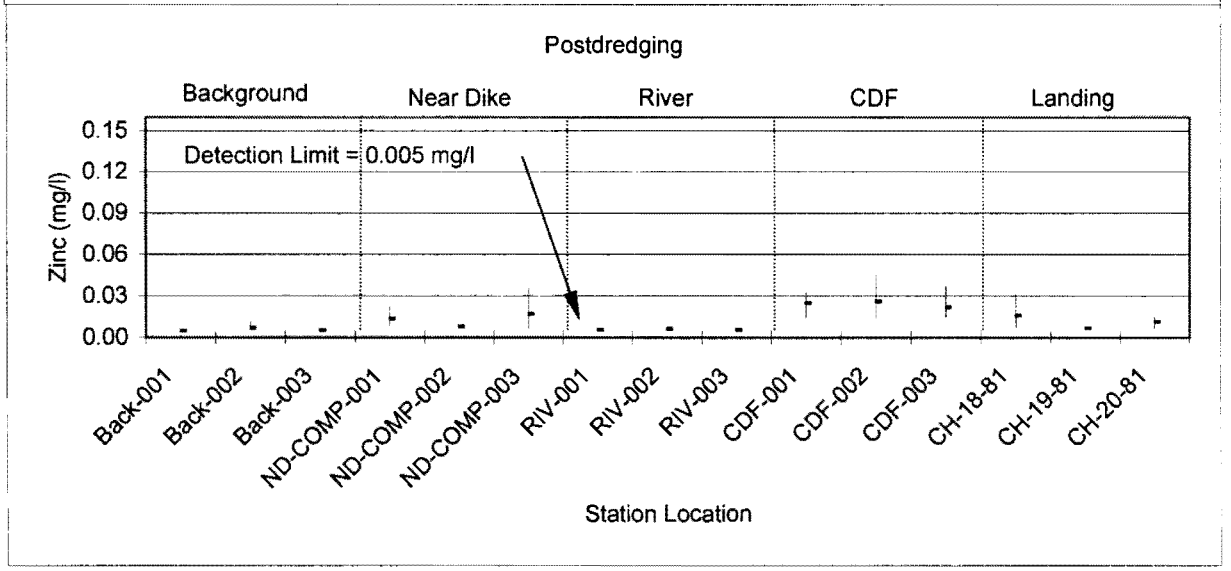


Zinc Location Comparison Calumet Harbor

* Top and Bottom of bar indicate the maximum and minimum value measured with the dash indicting the mean







Appendix C:

Data Quality Analysis

CELRC-ED-HE (1110-2-1403a) 5 March, 2002

MEMORANDUM FOR RECORD

SUBJECT: DATA QUALITY ASSESSMENT TriMatrix Laboratories 17 Sep - 13 Dec 2001 Dredging Monitoring Calumet Harbor, Illinois

1. The purpose of this data collection and analyses effort was to determine the suitability of the material for disposal in the Chicago Area CDF. The data quality objectives are to make sure that the water and sediment samples collected are representative of the material collected and that the data is reasonably precise and accurate. Making sure that the data is representative is primarily the responsibility of the sampling personnel who should be well-trained in water and sediment sample collection. Making sure that the data is precise and accurate is the responsibility of the laboratory personnel. Making sure that the data is acceptable is the responsibility of the laboratory supervisory personnel and the quality control personnel and reviewers. The final USACE Specifications for the sampling were reviewed to provide guidance for this effort.

2. Pre-dredge sampling of Calumet Harbor began 17 September 2001. Actual dredging began 2 October 2001 and ended 6 December 2001. Post-dredge sampling ended 13 December 2001. Lake Michigan Contractors, prime contractor, retained TriMatrix Laboratories Inc. to perform water and sediment sampling in Calumet Harbor before, during, and after dredging for various constituents. There were 4 pre-dredging, 11 dredging, and 4 post-dredging sampling events making a total of 19 events. The data is all present and complete. A 20% sample of the Quality Control data is reviewed in this memorandum. The data reviewed is from one pre-dredging, three during dredging, and one post-dredging sampling event. The data events are numbers 1, 5, 9, 14, and 18. The corresponding dates are 17 September, 2 October, October 29-30, 20 November, and 10 December 2001. These events are assumed to be representative of the 19 sampling events. They consist of about 20% to 26% of the collected raw and quality control data.

3. Notes were made on a Data Quality Assessment Worksheet for each of the five events. The 17 September 2000 event (#1) monitored only pre-dredging water quality. The data was all present according to the data collection manager. All analyte specific holding times were met and, all required detection limits were met also. Field and method blanks were run at the required frequency. No quantifiable concentrations were detected in the blanks in the 17 September data. Matrix spikes and matrix spike duplicates were run at

an acceptable frequency. Percent recoveries in the matrix spike and relative percent differences in the matrix spike duplicate were out in manganese sample CDF-001 #1. Accurate manganese concentrations were unavailable due to high analyte concentrations resulting in sample dilution. Field and laboratory duplicates were run at the required frequency and relative percent differences (RPDs) were within the acceptance criteria. Laboratory control samples were run at an acceptable frequency, and percent recoveries were acceptable. PCB samples were not run for this water quality sampling event. Therefore no surrogates were required. Data qualification statements were sufficient and appropriate recommendations were made. The associated laboratory parameters were logically and reasonably related. Therefore the 17 September data is recommended and acceptable for its intended use.

4. The 2 October 2001 event (# 5) monitored water quality and dredged sediment. A sample of dredged sediment was retrieved from one of the barges. The data was all present and all the detection limits were met for water and sediment samples. Holding times were also met. Field and laboratory blanks were run at an acceptable frequency for water and sediment. Quantifiable concentrations were found in one method preparation blank for mercury in water and one blank for arsenic in sediment. Matrix spikes and matrix spike duplicates were run at an acceptable frequency and percent recoveries and RPDs were within acceptable limits. Field and laboratory duplicates were run at an acceptable frequency. RPDs were acceptable for water. But the HEM Oil and Grease sediment sample CH-00-SED #5 relative percent difference was 24%. Acceptable RPD limits are 0 to 20%. Laboratory control samples were run at the required frequency and percent recoveries were acceptable. Surrogate spikes on PCB sediment samples were run at an acceptable frequency. The analytes used as surrogates were Tetrachloro-M-xylene and Decachlorobiphenyl. Percent recoveries were well within the limits established by the acceptance criteria. One water blank contained mercury and one sediment blank contained arsenic. Data qualification statements are sufficient and recommended actions are appropriate for this event. Related laboratory parameters appear logical and reasonable. Therefore the 2 October data is recommended and acceptable for its intended use.

5. The 29-30 October 2001 sampling event (#9) monitored water quality and dredged sediment. Dredged sediment from Calumet Harbor was sampled for analyses from one of the barges. A map of turbidity sample locations tied to harbor or river stationing around the dredge operation and tied to CDF location stationing around the disposal operation would be helpful for each future dredging event and each future disposal event. All the requested data is present, all holding times and detection limits have been met for water and sediment. Field blanks for water and sediment and method blanks for water and sediment contain no quantifiable concentrations. Matrix spikes and matrix spike duplicates were run at an acceptable frequency. Percent recoveries are within acceptable limits for water and soil matrix spikes. Relative percent differences are outside matrix spike duplicate limits for Cyanide at 21% in water sample CH-18-81 #09, at 166% in sediment sample CH-00-SED #09, and for Oil and Grease at 21% in sediment sample CH-00-SED #09. Field and laboratory duplicates were run at an acceptable frequency, and the RPDs are within the limits established by the laboratory's acceptance criteria of

0% to 20%. Laboratory control samples were run at an acceptable frequency, and the percent recoveries were within acceptable limits for turbidity, water, and sediment. Surrogate spikes were run at an acceptable frequency with the same analytes mentioned previously in this memorandum. Percent recoveries for the surrogates were within the laboratory's acceptance limits. Data qualification statements were present for the following parameters from sample CH-00-SED #09:

Sediment

Copper estimated due to serial dilution
Iron dilution
Manganese high concentration
Zinc one matrix spike out of limit, precision within limit
Cyanide below % recovery at 7% estimated
Cyanide above % recovery at 166% estimated
Chemical Oxygen Demand 146% estimated
Oil and Grease HEM relative percent difference 21%
Ammonia as Nitrogen high concentration due to high percent solids content
Chemical Oxygen Demand high due to high percent solids content

All related laboratory parameters appear logical and reasonable. Based on review of items outlined in this paragraph. The data from event # 9 is recommended and acceptable for its intended use with the exception of the sediment parameters in sample CH-00-SED #09 listed above.

6. The 20 November 2001 sampling event (#14) monitored water and dredged sediment quality. All the requested data was present, holding times were met, and all detection limits were met. Water and sediment field and method blanks were run at the required frequency. Quantifiable concentrations of zinc less than 0.020 mg/l were detected in an instrument water blank which should have been less than 0.005 mg/l. Arsenic was detected in an instrument sediment blank at a concentration of 0.235 mg/kg. Matrix spike and matrix spike duplicates were run at an acceptable frequency. Matrix spike percent recovery was out low at 44% for cyanide water sample CDF-001 #14. The matrix spike duplicate relative percent difference was out high at 58% for cyanide water sample CDF-001 #14. Matrix spike duplicate relative percent differences were out high for sediment sample CH-00-SED #14 at 26% for Barium, and 34% for Phosphorous. Field and laboratory duplicates were run at an acceptable frequency and RPDs are within the 0 to 20% acceptance criteria for water and sediment. Laboratory control samples were run at an acceptable frequency and percent recoveries were within acceptable limits. Surrogate recoveries were run at an acceptable frequency, and percent recoveries were within acceptable laboratory control limits. The widest surrogate control limits being 5% to 131%. Data qualification statements are present for the items in the following list:

Water

Cyanide estimated, for sample CH-00-SED #14 Matrix Spike, Matrix Spike Duplicate are both out of limits.

Phosphorus estimated because of 127% and 332% percent recoveries for Matrix Spikes. The RPD for the Matrix Spike Duplicate was out at 34%

Sediment

Barium estimated in sample CH-00-SED #14 because Matrix Spike was out of percent recovery and Matrix Spike Duplicate was out of relative percent difference limits.

Zinc the matrix spike was out but the matrix spike duplicate RPD (precision measure) was within the limits.

The Iron and Manganese samples required high analyte dilutions.

Phosphorus and Ammonia as Nitrogen reporting limits were elevated due to % solids content of the subject sample.

The COD concentration was elevated due to % solids content of the subject sample.

Two corrective actions were used for this subject sample. They were estimating the parameter concentration or not reporting the parameter result. Related laboratory parameters appear logical and reasonable. Based on the review items outlined in this paragraph the 20 Nov 2001 event # 14 data is acceptable for its intended use except as noted in the case narratives located in the statement of data qualifications of the raw data event report.

7. The 10 December 2001 sampling event (# 18) monitored post dredging water quality. All requested data was present, holding times were met, and detection limits were met. Field and method blanks were run at an acceptable frequency and no quantifiable concentrations were found in the blanks. Matrix spike and matrix spike duplicates were run at an acceptable frequency. Percent recoveries and RPDs are within acceptance limits. Field and laboratory duplicates were run at an acceptable frequency and RPDs were within acceptance limits. Laboratory control samples were run at an acceptable frequency and percent recoveries were within acceptance limits. PCBs were not monitored for this event; therefore surrogate recoveries were not required. Because of serial dilution, Manganese from water sample RIV-001 # 18 must be qualified as estimated. Related laboratory parameters appear logical and reasonable. The data from event 10 Dec 2001 is recommended for its intended use based on the review items outlined in this paragraph.

8. This was a level "other" review due to the large amount of data collected. A level "other" review is definable by the reviewer according to Chicago District Engineering Division guidance. In this case it is defined as a review of 20% total of the analytical data and 20% total of the laboratory QC data. Five of the 19 events were reviewed for a total of 26% of the analytical and QC data. The sampling data from the five reviewed events appears to have very few poor quality analytical samples. Inaccurate or in-precise data was generally confined to a few parameters from 1 water sample and 1 sediment sample per event. Raw data with inaccuracies was flagged on the data sheet of each sample to the data qualification sections of the raw data event reports. If the other non-reviewed events have similar poor quality sample parameter rates, the data is acceptable

for its intended purpose except as noted in each event data quality summary section. This means some of the data is flagged as estimated and some will be unreported. Asterisks on the sample raw data sheets indicate which data is flagged or unreported. The data is acceptable for its intended purpose based on the scope found in the final specifications for the dredging project. The data quality objectives appear to be met and the data is recommended with the exceptions noted.

Michael Neeley
Environmental Engineering

DATA QUALITY ASSESSMENT WORKSHEET

Sept 17, 2001
Sampling Event #1

Project Name: Calumet Harbor, IL. Dredging 2001 Sample Medium: Water

Reviewer: Michael Neeley Review Date: 20 Feb 2002

Brief Description of Project: 17 September 2001 Predredging Water Quality Sampling Event

Objectives for Data Quality (See DQA Step 1):

Documents Reviewed (check all that apply):

Draft Specifications
☒ Scope of Work ☐ Quality Assurance Project Plan ☐ Data Quality Objectives ☐ Other:

Level of Review Required:

☐ Level 1: (100% of analytical data, 100% of lab QC data)

☐ Level 2: (20% of analytical data, 100% of lab QC data)

☐ Level 3: (Only summary data of the laboratory analysis are evaluated)

☐ Level 4: (No additional assessment of the data is performed. The internalreviews performed by the laboratory are judged adequate for the project.)

☒ Other: (20 % of analytical data, 20 % of lab QC data)

Data Presence (See DQA Step 2):

Are all the requested data present? ☒ Yes ☐ No (describe missing data)

Holding Times (See DQA Step 3):

Were all analyte specific holding times met? ☒ Yes ☐ No (list exceeded holding times)

Detection Limits (See DQA Step 4):

Were all required detection limits met? ☒ Yes ☐ No (list exceeded detection limits and any explanation included in the lab report)

Field and Method Blanks (See DQA Step 5):

Were field and method blanks run at the required frequency? ☒ Yes ☐ No (describe deficiencies)

Were any quantifiable concentrations detected in the blanks? ☒ No ☐ Yes (which analytes were detected?)

Sept 17, 2001
Sampling event #1

Matrix Spikes / Matrix Spike Duplicates (See DQA Step 6):

Were the Matrix Spikes / Matrix Spike Duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Are the % recoveries within the limits established by the acceptance criteria? ☐ Yes ☒ No (document any deficiencies)

Are the relative % differences within the limits established by the acceptance criteria? ☐ Yes ☒ No (document any deficiencies)

Sample #01 Station CDF-001 ID 288157 Mn Matrix QC Spike and MSD unavailable due to high analyte concentrations resulting in sample dilution.

Field and Laboratory Duplicates (See DQA Step 7):

Were the field and laboratory duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the relative % differences within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

per statement of theedata collection manager.

Laboratory Control Samples (See DQA Step 8):

Were the laboratory control samples run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries (or other measures such as response factor, where appropriate) within the limits established by the acceptance criteria?

☒ Yes ☐ No (document any deficiencies)

Surrogate Recoveries (See DQA Step 9):

Were the surrogate spikes run at the required frequency and with the correct analytes? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries within the limits established by the acceptance criteria? ☐ Yes ☐ No (document any deficiencies) N/A

No semi-volatile or volatile analysis was run therefore no surrogates were required.

Corrective Action Forms (See DQA Step 10):

Are corrective action forms present for all deficiencies identified in the above steps? ☒ Yes ☐ No (document any deficiencies)

Are corrective actions documented sufficient and appropriate? ☒ Yes ☐ No (document any deficiencies)

Related Laboratory Parameters (See DQA Step 11):

Are all related laboratory parameters logical and reasonable? (A more detailed discussion of this evaluation is found in the DQA Standard Operating Procedure) ☒ Yes ☐ No (document any deficiencies)

Reviewer's Recommendation (See DQA Step 12):

Based on the review items outlined here, acceptance of this data package is (circle one) Sept 17, 2001 **RECOMMENDED** **NOT RECOMMENDED**

Is the data acceptable for its intended use? ☒ Yes ☐ No

Reviewer's Signature: [signature]

If acceptance of the data package is not recommended, identify the deficiencies which must be corrected before the data package is accepted:

DATA QUALITY ASSESSMENT WORKSHEET

Oct 2, 2001
Sampling Event #5

Project Name: Calumet Harbor, IL. Dredging 2001

Sample Medium: Water and Sediment

Reviewer: Michael Neeley

Review Date: 20 Feb 2002

Brief Description of Project: 2 October 2001 Dredging Water and Sediment Quality Sampling Event

Objectives for Data Quality (See DQA Step 1):

Documents Reviewed (check all that apply):

☒ Scope of Work (Draft Specifications) ☐ Quality Assurance Project Plan ☐ Data Quality Objectives ☐ Other:

Level of Review Required:

☐ Level 1: (100% of analytical data, 100% of lab QC data)

☐ Level 2: (20% of analytical data, 100% of lab QC data)

☐ Level 3: (Only summary data of the laboratory analysis are evaluated)

☐ Level 4: (No additional assessment of the data is performed. The internalreviews performed by the laboratory are judged adequate for the project.)

☒ Other: (20 % of analytical data, 20 % of lab QC data)

Data Presence (See DQA Step 2):

Are all the requested data present? ☒ Yes ☐ No (describe missing data) Need dredge and disposal turbidity sample location maps. Data present as per statement of project data collection manager.

Holding Times (See DQA Step 3):

Were all analyte specific holding times met? ☒ Yes ☐ No (list exceeded holding times)

Detection Limits (See DQA Step 4):

Were all required detection limits met? ☒ Yes ☐ No (list exceeded detection limits and any explanation included in the lab report)
Yes for water and for sediment.

Field and Method Blanks (See DQA Step 5):

Were field and method blanks run at the required frequency? ☒ Yes ☐ No (describe deficiencies) Yes for Lab and Field sediment blanks. Yes for water although wide control limits for lab fortified blank.

Were any quantifiable concentrations detected in the blanks? ☐ No ☒ Yes (which analytes were detected?) Arsenic (soil) Mercury (water) Hg total %recovery = 12% in method preparation blank; ~~Quantifiable found in total Arsenic blank (soil)~~

Matrix Spikes / Matrix Spike Duplicates (See DQA Step 6):

Were the Matrix Spikes / Matrix Spike Duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Are the % recoveries within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Are the relative % differences within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Field and Laboratory Duplicates (See DQA Step 7):

Were the field and laboratory duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the relative % differences within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Water Yes, Sediment No 35810-5 CH-00-SED 24% RPD HEM Oil & Grease

Laboratory Control Samples (See DQA Step 8):

Were the laboratory control samples run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries (or other measures such as response factor, where appropriate) within the limits established by the acceptance criteria?

☒ Yes ☐ No (document any deficiencies)

Surrogate Recoveries (See DQA Step 9):

Were the surrogate spikes run at the required frequency and with the correct analytes? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Wide limits PCB surrogates Surr 1 TETRACHLORO-M-XYLENE 33-131% (Sediment PCBs); Surr. 2 Decachlorobiphenyl 5%-131%

Corrective Action Forms (See DQA Step 10):

Are corrective action forms present for all deficiencies identified in the above steps? ☐ Yes ☒ No (document any deficiencies)

Are corrective actions documented sufficient and appropriate? ☐ Yes ☒ No (document any deficiencies) One water blank for Mercury, One soil blank for Arsenic, No deficiencies documented.

Related Laboratory Parameters (See DQA Step 11):

Are all related laboratory parameters logical and reasonable? (A more detailed discussion of this evaluation is found in the DQA Standard Operating Procedure) ☒ Yes ☐ No (document any deficiencies)

Reviewer's Recommendation (See DQA Step 12):

Based on the review items outlined here, acceptance of this data package is (circle one) 2 Oct 2001 RECOMMENDED NOT RECOMMENDED

Is the data acceptable for its intended use? ☒ Yes ☐ No

Reviewer's Signature: Michael Neley

If acceptance of the data package is not recommended, identify the deficiencies which must be corrected before the data package is accepted:

DATA QUALITY ASSESSMENT WORKSHEET

Oct 29-30, 2001
Sampling Event #9

Project Name: Calumet Harbor, IL. Dredging 2001

Sample Medium: Water and Sediment

Reviewer: Michael Neeley

Review Date: 21 Feb 2002

Brief Description of Project: 29-30 October Dredging Water Quality Sediment Quality Sampling Event Disposal to Chicago Area CDF.

Objectives for Data Quality (See DQA Step 1):

Documents Reviewed (check all that apply):

Draft Specifications

☒ Scope of Work ☐ Quality Assurance Project Plan ☐ Data Quality Objectives ☐ Other:

Level of Review Required:

☐ Level 1: (100% of analytical data, 100% of lab QC data)

☐ Level 2: (20% of analytical data, 100% of lab QC data)

☐ Level 3: (Only summary data of the laboratory analysis are evaluated)

☐ Level 4: (No additional assessment of the data is performed. The internalreviews performed by the laboratory are judged adequate for the project.)

☒ Other: (20% % of analytical data, 20% % of lab QC data)

Data Presence (See DQA Step 2):

Are all the requested data present? ☒ Yes ☐ No (describe missing data) Need map of turbidity sample locations relative to channel and CDF for this event.

Holding Times (See DQA Step 3):

Were all analyte specific holding times met? ☒ Yes ☐ No (list exceeded holding times)

Detection Limits (See DQA Step 4):

Were all required detection limits met? ☒ Yes ☐ No (list exceeded detection limits and any explanation included in the lab report)

Yes water, Yes sediment

Field and Method Blanks (See DQA Step 5):

Were field and method blanks run at the required frequency? ☒ Yes ☐ No (describe deficiencies) Field and Method blanks Yes water and yes sediment.

Were any quantifiable concentrations detected in the blanks? ☐ No ☒ Yes (which analytes were detected?) No in water blanks

Soil method preparation blank HEM oil and grease high detection limit may indicate matrix interference.

Jan-95

DATA QUALITY ASSESSMENT WORKSHEET (Page 2)

Matrix Spikes / Matrix Spike Duplicates (See DQA Step 6):

Were the Matrix Spikes / Matrix Spike Duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Are the % recoveries within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Are the relative % differences within the limits established by the acceptance criteria? ☐ Yes ☒ No (document any deficiencies)

Water MSD ELH20 CH-18-81 #09 21% RPD Control limit 0-20%Cyanide; Soil MSD CH-00-SED CN 166% RPD Controllimit 0-20%, Oil and Grease 21% RPD CH-00-SED#9 RPD Control limit 0-20%

Field and Laboratory Duplicates (See DQA Step 7):

Were the field and laboratory duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the relative % differences within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Yes Turbidity

Laboratory Control Samples (See DQA Step 8):

Were the laboratory control samples run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries (or other measures such as response factor, where appropriate) within the limits established by the acceptance criteria?

☒ Yes ☐ No (document any deficiencies) Yes Turbidity, Yes Water, Yes Sediment Lab fortified blank.

Surrogate Recoveries (See DQA Step 9):

Were the surrogate spikes run at the required frequency and with the correct analytes? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

PCBs Same wide control limit band as Oct 2,2001 Surrogate 1 33-131% Surr. 2 5-131%

Corrective Action Forms (See DQA Step 10):

Are corrective action forms present for all deficiencies identified in the above steps? ☒ Yes ☐ No (document any deficiencies)

Are corrective actions documented sufficient and appropriate? ☒ Yes ☐ No (document any deficiencies) All CH-00-SED#09 Soil Cu, Fe estimated due to serial dilution; Mn high concentration, Zn one MS %REC. out of limit, precision in limit, CN estimated / & 166% COD est. 146%; Oil & Grease HEM RPD 21% NH3 and COD out due to %solids content. RPD Control Limit 0-20%

Related Laboratory Parameters (See DQA Step 11):

Are all related laboratory parameters logical and reasonable? (A more detailed discussion of this evaluation is found in the DQA Standard Operating Procedure) ☒ Yes ☐ No (document any deficiencies)

Reviewer's Recommendation (See DQA Step 12):

Based on the review items outlined here, acceptance of this data package is (circle one) 29-30 Oct 2001 **RECOMMENDED** **NOT RECOMMENDED**

Is the data acceptable for its intended use? ☒ Yes ☐ No except noted sediment parameters CH-00-SED#09

Reviewer's Signature: Michael Mulay

If acceptance of the data package is not recommended, identify the deficiencies which must be corrected before the data package is accepted:

DATA QUALITY ASSESSMENT WORKSHEET

Nov 20, 2001
Sampling Event #14

Project Name: Calumet Harbor, IL Dredging 2001

Sample Medium: Water and Sediment

Reviewer: Michael Neeley

Review Date: 21 Feb 2002

Brief Description of Project: 20 November 2001 Dredging Water Quality and Sediment Quality Sampling Event

Objectives for Data Quality (See DQA Step 1):

Documents Reviewed (check all that apply):

- [x] Scope of Work (Draft Specifications)
- [ ] Quality Assurance Project Plan
- [ ] Data Quality Objectives
- [ ] Other:

Level of Review Required:

- [ ] Level 1: (100% of analytical data, 100% of lab QC data)
- [ ] Level 2: (20% of analytical data, 100% of lab QC data)
- [ ] Level 3: (Only summary data of the laboratory analysis are evaluated)
- [ ] Level 4: (No additional assessment of the data is performed. The internalreviews performed by the laboratory are judged adequate for the project.)
- [x] Other: (20 % of analytical data, 20 % of lab QC data)

Data Presence (See DQA Step 2):

Are all the requested data present? [x] Yes [ ] No (describe missing data) Need map of dredging sample locations for dredgeoperation and disposal operation for Nov 20, 2001

Holding Times (See DQA Step 3):

Were all analyte specific holding times met? [x] Yes [ ] No (list exceeded holding times) Yes Turbidity (Suspended Solids) Yes Water, Yes Sediment

Detection Limits (See DQA Step 4):

Were all required detection limits met? [x] Yes [ ] No (list exceeded detection limits and any explanation included in the lab report)
Yes Water, Yes Sediment, CRDL=Contract Required Detection Limit

Standard Nitrogen Ammonia % Recovery 50%

Field and Method Blanks (See DQA Step 5):

Were field and method blanks run at the required frequency? [x] Yes [ ] No (describe deficiencies) Yes Turbidity, Yes Water, Yes sediment

Were any quantifiable concentrations detected in the blanks? [ ] No [x] Yes (which analytes were detected?) Water Mn DL Less Than 0.010 instead of less than 0.005 Instrument ID 101 (35810-21) out. Water Instrument ID114' ~~Mn less than0.002 in compliance with CRDL Yes concentrations described above in the water~~ instrument blanks. Zn less than 0.020mg/l/sediment As 0.235 mg/kg.

DATA QUALITY ASSESSMENT WORKSHEET (Page 2)

Matrix Spikes / Matrix Spike Duplicates (See DQA Step 6):

Yes Water Yes soil
Were the Matrix Spikes / Matrix Spike Duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Are the % recoveries within the limits established by the acceptance criteria? ☐ Yes ☒ No (document any deficiencies)

Are the relative % differences within the limits established by the acceptance criteria? ☐ Yes ☒ No (document any deficiencies)

Water R=44% SPK CDF-001#14, CN Water MSD CDF-001#14 CN 58% RPD out high/ Soil RPDs Ba 26% P total 34%, CH-00-SED#14

Field and Laboratory Duplicates (See DQA Step 7):

Yes field and laboratory
Were the field and laboratory duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the relative % differences within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Laboratory Control Samples (See DQA Step 8):

Were the laboratory control samples run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries (or other measures such as response factor, where appropriate) within the limits established by the acceptance criteria?

☒ Yes ☐ No (document any deficiencies) Yes Turbidity

Surrogate Recoveries (See DQA Step 9):

Were the surrogate spikes run at the required frequency and with the correct analytes? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Surrogate 1 Control limit band 33-131%, Surrogate 2 Control limit band 5-131%

Corrective Action Forms (See DQA Step 10): FOR CH-00-SED #14

SoilCOD, NH3, P, reporting limits elevated due to %solids content; Mn high analyte, Fe analyte high dilution

Are corrective action forms present for all deficiencies identified in the above steps? ☒ Yes ☐ No (document any deficiencies)

Are corrective actions documented sufficient and appropriate? ☒ Yes ☐ No (document any deficiencies) Ba estimated, MS & MSD % Recovery and RPD limits out Zinc precision in; Water CN, P estimated 127% 332% Rec. MS and MSD was 34% Relative Percent Difference (RPD)

Related Laboratory Parameters (See DQA Step 11):

Are all related laboratory parameters logical and reasonable? (A more detailed discussion of this evaluation is found in the DQA Standard Operating Procedure) ☒ Yes ☐ No (document any deficiencies)

Reviewer's Recommendation (See DQA Step 12):

Based on the review items outlined here, acceptance of this data package is (circle one) Nov 20, 2001 **RECOMMENDED** **NOT RECOMMENDED**

Is the data acceptable for its intended use? ☒ Yes ☐ No

Reviewer's Signature: Michael Neeley

If acceptance of the data package is not recommended, identify the deficiencies which must be corrected before the data package is accepted:

Some data marked with a star on the data sheets should be dealt with as noted in the statement of data qualifications

DATA QUALITY ASSESSMENT WORKSHEET

Sampling Event # 18

Project Name: Calumet Harbor, IL Dredging 2001 Sample Medium: Water Dec 10,2001

Reviewer: Michael Neeley Review Date: 22 Feb 2002

Brief Description of Project: 10 December 2001 Post Dredging Water Quality Sampling Event

Objectives for Data Quality (See DQA Step 1):

Documents Reviewed (check all that apply):

Draft Specifications

☒ Scope of Work ☐ Quality Assurance Project Plan ☐ Data Quality Objectives ☐ Other:

Level of Review Required:

☐ Level 1: (100% of analytical data, 100% of lab QC data)

☐ Level 2: (20% of analytical data, 100% of lab QC data)

☐ Level 3: (Only summary data of the laboratory analysis are evaluated)

☐ Level 4: (No additional assessment of the data is performed. The internalreviews performed by the laboratory are judged adequate for the project.)

☒ Other: (20 % of analytical data, 20 % of lab QC data)

Data Presence (See DQA Step 2):

Are all the requested data present? ☒ Yes ☐ No (describe missing data)

As per statement of project data collection manager.

Holding Times (See DQA Step 3):

Were all analyte specific holding times met? ☒ Yes ☐ No (list exceeded holding times)

Detection Limits (See DQA Step 4):

Were all required detection limits met? ☒ Yes ☐ No (list exceeded detection limits and any explanation included in the lab report)

CRDL Standard % Recovery P=120%, CN=120%, Hg=120%

Field and Method Blanks (See DQA Step 5):

Were field and method blanks run at the required frequency? ☒ Yes ☐ No (describe deficiencies)

Yes, Field and Method

Were any quantifiable concentrations detected in the blanks? ☒ No ☐ Yes (which analytes were detected?)

Matrix Spikes / Matrix Spike Duplicates (See DQA Step 6):

Were the Matrix Spikes / Matrix Spike Duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Are the % recoveries within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Are the relative % differences within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Field and Laboratory Duplicates (See DQA Step 7):

Were the field and laboratory duplicates run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the relative % differences within the limits established by the acceptance criteria? ☒ Yes ☐ No (document any deficiencies)

Laboratory Control Samples (See DQA Step 8):

Were the laboratory control samples run at the required frequency? ☒ Yes ☐ No (document any deficiencies)

Were the % recoveries (or other measures such as response factor, where appropriate) within the limits established by the acceptance criteria?

☒ Yes ☐ No (document any deficiencies)

Surrogate Recoveries (See DQA Step 9):

Were the surrogate spikes run at the required frequency and with the correct analytes? ☐ Yes ☐ No (document any deficiencies)

Were the % recoveries within the limits established by the acceptance criteria? ☐ Yes ☐ No (document any deficiencies)

PCBs were not required for this event (Water)

Corrective Action Forms (See DQA Step 10):

Are corrective action forms present for all deficiencies identified in the above steps? ☒ Yes ☐ No (document any deficiencies)

Are corrective actions documented sufficient and appropriate? ☒ Yes ☐ No (document any deficiencies) Mn for water

sample RIV-001 #18 to be qualified as estimated. Serial dilution 14.2 ug/l %Diff 20%

Related Laboratory Parameters (See DQA Step 11):

Are all related laboratory parameters logical and reasonable? (A more detailed discussion of this evaluation is found in the DQA Standard Operating Procedure) ☒ Yes ☐ No (document any deficiencies)

Reviewer's Recommendation (See DQA Step 12):

Based on the review items outlined here, acceptance of this data package is (circle one) 10 Dec 2001 **RECOMMENDED** / **NOT RECOMMENDED**

Is the data acceptable for its intended use? ☒ Yes ☐ No

Reviewer's Signature: Michael E Neley

If acceptance of the data package is not recommended, identify the deficiencies which must be corrected before the data package is accepted:

Appendix D:

Tri-Matrix Analytical Data