WATER QUALITY MONITORING
CHICAGO AREA CONFINED DISPOSAL FACILITY
FINAL REPORT ON OPERATIONS
OCTOBER 1984 TO DECEMBER 1984

CORPS OF ENGINEERS CONTRACT NO.
DACW23-84-D-0012
WORK ORDER 0002

Prepared By:

Daily & Associates, Engineers, Inc.
Peoria, Illinois
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ABSTRACT

This report prepared by Daily & Associates, Engineers, Inc., is in accordance with Contract No. DACW 23-84-D-0012, Work Order No. 2, Section 7.4. The report reviews sampling procedures, equipment, and analytical test results used for monitoring operations of the Chicago Area Confined Disposal Facility, at Calumet Harbor, between the period of October 3 to December 4, 1984. The report draws conclusions concerning compliance of the effluent from the operations with the Water Quality Standards of the State of Illinois. The report identifies deviations between the design memorandum and the construction of the filter units used for treatment prior to discharge. The report concludes that the Facility Operations for the period of study produced an effluent consistent with the Water Quality Standards. The report concluded additional study and/or modification of the filters is warranted to achieve design levels of discharge quality at the design hydraulic loading rates.

During the period of October 3, 1984, through December 3, 1984, the Chicago Area Confined Sites Disposal Facility (CDF) was receiving maintenance dredgings from the Federal Channel at the Calumet River. Approximately 100,000 cubic yards were dredged mechanically, transferred into scows and disposed of in the CDF at the northwest corner using a sluice-box and pipeline. Water quality monitoring of the dredging and disposal operations were conducted in compliance with Illinois Environmental Protection Agency (EPA) Water Pollution Control Permit No. 1982-EA-0325.

Sampling and analysis were conducted by USGS under contract with the Corps from September 6, 1984, until October 16, 1984, and by Daily & Associates, Engineers, Inc., from October 18, 1984 until December 11, 1984.

7.4 FINAL REPORTS

A. Sampling Methods and Procedures

Daily Analytical Laboratories' initial collection of samples at the Chicago Area Confined Disposal Facility (CDF) at Calumet Harbor was October 18, 1984. This "first effort" on October 18, 1984 resulted in certain changes in the methods and equipment used for sampling. All sampling procedures during the 1984 season were in conformance with prescribed methods except as modified per the limitations noted in Section D herein or as further described below.

1. Stations 1, 4, 5, 6, 7, and 8:

a. On October 18, 1984: Thirty feet of Tygon tubing was attached to a weighted rope with the inlet end for sampling located at one meter above the bottom weight. The opposite end of the tubing was attached to a 1 liter sidearm flask with a glass rod through a rubber stopper. A hand vacuum pump was attached to the sidearm of the flask. Water samples were pumped from both 1 meter above the bottom and 1 meter below the water surface into the flask in 1 liter increments until a total sample of 6 liters was collected. One liter portions were composited in

a stainless steel bucket to acquire the total volume. Ph, temperature, and Dissolved Oxygen were measured in the bucket. Sample was stirred and distributed into properly preserved bottles in the boat.

b. For October 23 through December 11, 1984: A custom built (by Daily Analytical) 5 liter PVC JUDAY SAMPLER was used to collect samples for all parameters, except Dissolved Oxygen. One 5 liter grab was taken from 1 meter above the bottom and 1 meter below surface. Each 5 liter aliquot was put into a 15 liter Nalgene carboy while in the boat. Temperatures were measured in the boat. A second 1 liter PVC JUDAY SAMPLER was used to fill a 300 ml BOD bottle for Dissolved Oxygen simultaneously at the same locations as the 5 liter samples. The BOD bottles were preserved in accordance with the Winkler Azide modification for Dissolved Oxygen while in the boat. Upon arrival at the dock, the samples were transferred to appropriately preserved bottles. Ph was measured and BOD bottles were chemically fixed with Sulfuric Acid. Dissolved Oxygen titrations were performed at the Peoria Laboratory the following day.

2. For Turbidity Stations 9, 10, 11, and Dredge:

a. For October 18, 1984: Stainless Steel Juday sampler with 300 ml BOD bottle was used to take samples at 1 meter from bottom, mid depth, and 1 meter below surface. Samples were composited into a 500 ml plastic bottle and turbidity (NTU) was measured in the boat.

b. For October 23, through December 11, 1984: A 1 liter PVC Juday sampler was used to grab samples at 1 meter from bottom, mid depth, and 1 meter below the surface. The three aliquots were composited into a 500 ml plastic bottle in the boat and returned to the dock were measurements were made.

3. For Stations 2 and 3:

a. Station 2 - Manning sampler, Model S-3000, installed in well area of inlet pipe to filter cell - composite mode used - 6 hour intervals. Sample was collected over a one week period. First sample was recovered on October 30, 1984.

b. Station 3 - ISCO Model 1540, wastewater sampler set up in effluent pipe from filter cell - composite mode used on 6 hour time intervals. Sample was collected over a one week period. First sample was recovered on October 23, 1984

4. Sediment - hand grabbed by contractor from scow currently being unloaded.

B. Laboratory Equipment

Lab Pure Water System, Milli-Q" -- Our lab pure water is generated by a Milli-Q system and can achieve up to 18 megohm water. The system is proceeded by a mixed-bed ion exchange resin and a 0.22 micron filter. The Milli-Q is a standard installation except that an extra

"Organ-X" cartridge has been installed to further reduce the chance for "organics" contamination in our water. Cartridges are replaced when the system can no longer generate 8 megohm water.

UV-VIS Spectrophotometer -- Daily Analytical currently has a Bosch and Lomb Spectronic 21. The instrument is in excellent condition. Stray light and wavelength calibration are accomplished quarterly using a Cobalt Nitrate at 512 NM and Copper Sulfate at 850 NM. Stray light is monitored by deviation from the straight line response and wavelength by comparison of the observed max with the published max.

Dissolved Oxygen Meter -- Daily Analytical owns a Yellow Springs Instrument, Model 54, Dissolved Oxygen Meter. The meter is standardized, in duplicate, each time it is used against Winkler titration. The titrant, Sodium Thiosulfate, is, in turn, standardized against Primary Standard Potassium Dichromate Solution.

Specific Ion Electrode Meter -- Daily Analytical performs most Ammonia and Fluoride analyses by Specific Ion Electrode, either by Known Additions or Direct Read. We currently employ an Orion Ammonia Probe interfaced to a Corning, Model 110 Millivolt Meter. For Direct Read analyses, the system is calibrated at three points. For Known Additions analyses, the Relative Millivolt is set to Zero. Commercially available ampules are analyzed quarterly. USEPA ampules are analyzed annually.

pH Meter -- Daily Analytical owns three pH/millivolt meters--an Orion, Model 399A; a Chemtrix, Model 45AR; and a Corning, Model Digital 110. Meters are calibrated each day of use, at two pH levels. Meters are generally calibrated at pH 4 and 7 and 10. However, our instruments can be reliably calibrated at pH 4 and 10 with good linearity. Again Commercial ampules are analyzed quarterly and USEPA ampules are analyzed annually.

Titrations -- Daily Analytical performs numerous analyses titrametrically. Acidity, Alkalinity and Chloride are examples of such. Ammonia and Cyanide are occasionally analyzed titrametrically. The Titrant is initially standardized, in triplicate, against a Primary Standard. It is restandardized prior to each series of analyses. Commercial and USEPA ampules are analyzed quarterly and annually, respectively.

Turbidimeter -- Daily Analytical owns a HF Instrument, Model DRT 15, Turbidimeter. The instrument is zeroed and calibrated against a 0.12 NTU of Formazin. Commercial and USEPA ampules are analyzed quarterly and annually, respectively.

Atomic Absorption Spectrophotometer -- Daily Analytical owns two Atomic Absorption Spectrophotometers, a Perkin-Elmer 305A and a Perkin-Elmer 2380. These instruments are 13 years and 3 years old, respectively. We also have a Perkin-Elmer HGA-400 Graphite Furnace. Electrodless Discharge Lamps are used for certain elements. The Spectrophotometers basically require two calibration steps, the wavelength and response factors. The wavelength is calibrated against the light source. When an element has two or more absorption lines lying close together, care must be employed to use correct wavelength. The wavelength indicator on the instrument can assist in this.

Alternately, any miscalibration is quickly apparent upon aspiration of the first standard. As such, wavelength calibration is self-correcting. Response factors, absorbance units per concentration unit, are calculated from at least three standards, bracketing the concentration of interest. As before, Commercial ampules are analyzed quarterly and USEPA ampules are analyzed annually.

Balances -- Daily Analtyical owns a Mettler, Model H-20, Semi-Micro Balance and a Model AE-160, Electronic Analytical Balance. Both are in excellent condition. The instruments are zeroed before every use and after every fourth weighing. Daily Analytical also has a Mettler, Model PC-180, Top Loader and several Triple Beams. All balances are serviced annually by Mettler.

C. Quality Test Methods and Procedures

1. Blanks were prepared by filling preserved Sample Bottles with Lab Pure Water. Blanks were treated as routine samples and analyzed along side the Field Samples. Results were reported on Table 3 of the Periodic Reports.

2. A duplicate sample was collected in the field for randomly selected monitoring station on each scheduled sampling day. This sample was collected with a complete set of bottles, identical to the original sample. Results of this duplicate analysis were reported with the periodic reports.

3. Once the samples had been returned to the lab, one sampling Station was selected for spiking (not duplicate sample). Spikes were made for all parameters except Dissolved Oxygen and Suspended Solids. As with the field duplicate, the spike sample was handled, in all respects, like a routine sample. The spike analyses were performed blind. That is to say that the amount of spike was not made known to the analyst until after the analysis was completed. Results of this Spike were also reported in the periodic reports.

4. Check Standards were analyzed with each series of analysis. These data are recorded in permanent, bound laboratory notebooks with the analysis data.

5. Optimum Concentration Range as attached. Samples were diluted or concentrated to fall within this range. Metal analyses were digested with Nitric Acid and concentrated 4:1. Dilutions were made in accordance with accepted laboratory procedures, using Volumetric Pipettes and Class A Volumetric Flasks.

6. Sensitivity

	Opt. Conc.	Sensitivity
TDS	0-10mg/l	100 ppm/1mg for 10ml sample
S.S.	0-20,000mg/l	4ppm/1mg for 250ml sample
Hard	0-50,000mg/l	20ppm/1ml for 50ml sample
D.O.	0-20mg/l	1ppm/1ml titrant
G & O	0-1,000mg/l	1ppm/1mg for 1000ml sample
P	0-1.2mg/l	120ug/ 1 ABS Unit
NH3	0-100mg/l	59rel mv/decade

	Opt. Conc.	Sensitivity
TKN	0-500mg/l	59rel mv/decade
CN	0-0.15mg/l	6.25ug/ABS Unit
As	0-0.1mg/l	2.5 NG/ABS Unit
Cd	0-2.0mg/l	4.8ppm/ABS Unit
Cr	0-5.0mg/l	28 ppm/ABS Unit
Cu	0-50mg/l	22 ppm/ABS Unit
Pb	0-20mg/l	0.10ppm/%Absorbance
Mn	0-3.0mg/l	12 ppm/ABS Unit
Hg	0-0.005mg/l	0.02ug/%Absorbance
Ni	0-5.0mg/l	25 ppm/ABS Unit
Zn	0-1.0mg/l	3.6ppm/ABS Unit
PCB	0-0.5mg/l	0.008 NG/CM
Temp	-20-110 C	N/A
pH	1-13S.U.	N/A
% So.	0-100%	1%/0.1gs.for 10ml sample
% V.S.	0-100%	1%/0.1gs.for 10ml sample
COD	0-900mg/l	2000ppm/ABS Unit
Ba	0-25mg/l	0.10ppm/%Absorbance
Fe	C 5.0mg/l	28 ppm/ABS Unit

D. Limitations in Sampling and Testing

Nalgene carboys were taken out in the boat after October 18, 1984 to hold samples until arriving back at the dock. The reason for using a carboy was to be able to get a 5 liter volume adequately transferred to a container with a minimum of spillage. Carboys have a wider mouth and larger volume to accommodate a rapid transfer from sampler to container. For the first sampling conducted October 18, 1984, all the preserved bottles were taken out in the boat. Due to rough water, approximately 50% of the sample was spilled during transfer. Subsequent samplings used the carbons in the boat and transfer was made to properly preserved bottles immediately upon arrival at the dock. Ideally glass should be used for handling of samples for PCB analysis, but because of safety reasons, Nalgene was used. Contact time was kept to a minimum. Nalgene carboys were also used in autosamplers. The only limitation here would be possible PCB exposure and adsorption in the Nalgene container.

pH and Turbidity measurements on October 18, 1984 were done in the sampling boat. Calibration and measurement were difficult (and probably inaccurate) to perform in a bouncing boat. Meter needles were observed to swing on account of roughness. On subsequent trips these measurements were made after transporting the samples back to the dock. Ideally pH should be measured "in situ" and not in a container where the sample is subject to temperature, atmosphere, and pressure effects. The trade-off between either measuring in the rough bouncing boat or deferral until a stable set up could be used was decided in favor of measuring at the dock.

Maintaining a 50 foot distance from the dike while sampling stations 5, 6 and 7 was difficult due to rough water. For future samplings, it is recommended that 3 personnel be used during this phase of sampling. Two would be stationed in the boat, one to sample and one to drive. The third individual would be stationed on the dike. A 50 foot rope could be held taut, thereby assuring a uniform distance.

The samples collected at stations 2 and 3 were both seven day composites. These samples were required to be iced on a daily basis by the dredging contractor. The Work Order requires that pH, temperature and Dissolved Oxygen be measured. Temperatures obviously will be low due to ice, dissolved oxygen will be high due to solubility of D.O. at low temperatures and pH will be inaccurate due to holding time. Also these two stations were subject to freezing the sample. The contractor's pump to the filter cell was observed to have intermittent shutdowns and non-uniform flows to the filter cell. The autosampler at Station 2 was in the well area near the inlet pipe to the cell. If a 2 inch level of water was not present at the sampling time, the sampler would pump air. The sampler at Station 3 was in a much smaller volume area so a low flow coming in would provide enough volume so this station would not pump air.

Samples collected at Station 4 and turbidity stations were subject to occasional stirred up water due to commercial river traffic.

E. Analysis of Data

The results of the monitoring data for Station Nos. 1 through 11 and the turbidity measurements are presented in tabular format with the minimum, maximum and mean average values computed for each monitoring point. A map of the monitoring points is included for reference. Analysis includes results reported by the United States Geological Survey for the operating period October 3, 1984 through October 16, 1984.

A discussion of the effluent compliance with water quality parameters is presented in Part G of this report.

The monitoring data was consistent for each monitoring station. The data did not indicate trends occurring which were adverse to the effects noted and discussed in the Environmental Impact Statement (Corps of Engineer 1982).

The turbidity levels observed near the dredging operations show an increase above ambient levels in the Calumet Harbor. The Monitoring points (Station Nos. 9, 10 & 11) in the harbor show good correlation with each other for ambient turbidity levels. The turbidity levels adjacent to the dredging operations showed the turbidity near the dredge to be as high as 10 times the ambient levels. The turbidity decreased at 300 feet downstream to levels near the measured turbidity at 100 feet upstream of the operations.

The impact of turbidity was addressed in the Environmental Impact Statement. The expected turbidity levels were not reported. It is judged that the levels of turbidity are consistent with the operations and not excessive. It is also judged that the impact of the turbidity is consistent with the effects identified in the Environmental Impact Statement and is not considered significant to the point that mitigation is warranted.

F. Performance Evaluation of CDF Filters

A rigid analysis of the performance characteristics of the CDF Filters for the operating period from October 3, 1984 through December 4, 1984 is not possible due to the following factors:

- It is known that the contractor log for operation of the pump to the south filter is not a reliable log of the actual discharge volume on a daily basis.

- The filter design was based on the use of a hydraulic type dredging operation. The contractor utilized a mechanical dredge which discharges a significantly lower volume of water to the facility for processing.

A discussion of the limitations of this data was held via the telephone with Captain Hurt and Mr. Jan Miller of the Corps of Engineers and Richard Spencer and Otis Michels of Daily & Associates, Engineers on March 8, 1985. It was concluded that filter appraisal comments should be addressed to the facility design and operation features which warrant further investigation or modification given the dredging method will be mechanical instead of hydraulic.

Daily & Associates, Engineers reviewed the basis of design for the filtration system included as Appendix E to the Design Analysis Chicago Area Confined Disposal Facility. Paragraph 5.5 on Page E-11 summarizes the filter cell design as two 34 foot diameter cells with dual media consisting of a 2.0 meter layer of crushed anthracite (D_{10}= 1.5mm and U=2 to 3) over 1.7 meters of coarse sand (D_{10}= 1.5 mm and U=2 to 3). A graded gravel underdrain would also be provided. A section of the filter is shown on Page E-15 of Appendix E.

The filters are designed as a rapid sand filter, 2 gallon per minute per square foot (2gpm/S.F.), with an operating head range of approximately 9 feet above the anthracite.

The filters were installed with a woven geotextile, Mirafi 700X, between the sand and gravel underdrain. The media installed has uniformity coefficients of 1.5. The filters also are operated without tailwater on the filter. The inlet distribution system consists of a concrete weir box constructed as a chord along one side of the circular filter. Large stone was placed below the outlet weir box on the anthracite to prevent disturbance of the anthracite by inlet flows free falling from the inlet distributor to the filter surface, a distance of four feet±.

The change from hydraulic dredging to mechanical dredging has reduced the filtered flowrate to an estimated 1.5 CFS (Corps of Engineers estimate). With this flowrate estimate, the total water filtered through the south filter from October 3 to December 4, 1984 at the facility was calculated to be 28.755 million gallons.

The daily flow for 24 hours operation was approximately 0.975 million gallons. This equates to an average hydraulic loading rate of 0.75 gpm/S.F., which is 37% of the design flowrate for the south filter.

The following observations by the Corps regarding the north filter were reported for consideration in this study. The filter was operated at its peak load design parameters for six days in 1983. The north filter unit was loaded at 5 CFS of effluent from the settling basins with a concentration of approximately 100 mg/l suspended solids. A cationic polymer was added as a floculant aid. The filter started to pond water by

the end of the fourth day and at the mid point of the fifth day had increased the filtering head to a level 6 feet ± above the media for a total headloss of 17 feet ±. At this point all flow was diverted to the south filter unit. The total flow applied in 4.5 days would have been 14.6 million gallons ±.

The filter media was sampled vertically by split spoon methods. The amount of suspended solids were measured in the samples and it was found that the solids capture was approximately uniform at 0.04 g/cm3 except for the bottom one foot of media. Although sample recovery was poor for the bottom one foot, it was determined that the capture rate was 0.34± grams/cm3. The design value for capture rate was 0.3 grams/cm3 for the filters.

Evaluation of the filter design features and operating characteristics leads to the following observations for further study or modifications:

1. Uniformity Coefficient: The initial design analysis called for a uniformity coefficient of the filter media of 2.0 to 3.0. The filter medias used have a uniformity of 1.5. Since the media permeability and the media solid capture rate is dependent on grain size as well as its uniformity coefficient, it is recommended that the use of a uniformity coefficient outside of the initial selected range be verified by literature review or actual laboratory testing.

2. Use of Woven Geotextile Fabrics: The filter utilizes a Mirafi 700X woven geotextile between the gravel underdrain and the sand media. The fabric is suspect of causing excessive solids capture in the lower level of the sand and also the fabric itself blinding. An evaluation of the headloss at this interface is recommended by installation of four piezometer tubes; one into the filter underdrain gravel, the second at one inch above the fabric, the third at 1 foot 1 inch above the fabric and the fourth at three feet one inch above the fabric. The piezometers may be wall supported with a horizontal extension to approximately six feet from the filter wall. The water levels in the piezometers should be recorded three times weekly for the first two weeks of a filter run and weekly thereafter. The four tubes should be sufficient to define the effects of the geotextile.

3. Influent Distribution Across Filter Surface: The filter is operated without tailwater and hence in a dry media condition. The inlet distribution system is suited to a filter with tailwater and a submerged media. This situation is suspect of causing excessive surface loading rates in the top portion of the filter. A valved discharge line is recommended to insert an artificial tailwater on the unit. As headloss occurs the valve can be manually adjusted reducing the headloss through the valve to gain the required operating head. Operation of the filter in a submerged mode will aid velocity distribution and uniform solids loading across the filter surface.

G. Compliance Evaluation With Water Quality Standards

The facility effluent monitoring occurred at Station No. 3. Table One has been prepared which lists the maximum, minimum and mean average values for the effluent quality for the fall 1984 facility operation. The intermittent discharge occurred over the period from October

8, 1984 through December 3, 1984. The facility discharge appears to be in compliance with applicable water quality standards. The temperature, pH and dissolved oxygen measurements commented upon in Section D do not have any impact upon this evaluation.

Two samples of the effluent, November 27, 1984 and December 4, 1984, indicated the effluent exceeded the water quality numerical standard of 15 mg/l for total suspended solids. This in itself is not a violation. In accordance with Title 35: Environmental Protection, Subtitle C: Water Pollution, Chapter I: Pollution Control Board, Section 304.104 Averaging, paragraph a) subpart 2) "No daily composite shall exceed two times the prescribed numerical standard." The composite samples analyzed for November 27, 1984 and December 4, 1984 indicated total suspended solids levels of 20 mg/l and 18 mg/l, respectively.

Further, in accordance with Section 304.104 Averaging, paragraph 6) subpart 1) "The monthly average shall be the numerical average of all daily composites taken during a calendar month. A monthly average must be based on at least three daily composites."

The tabulated data for all sample results for Station No. 3 indicates the results of all composite samples collected and analyzed. During November 1984, three samples were analyzed with an average of 10.7 mg/l for total suspended solids. In December 1984, only one sample was collected and analyzed with a value of 18 mg/l for total suspended solids. Therefore, since the facility discharge was not monitored with at least three daily composites, a valid monthly average may not be computed. Since the facility ceased operations for the season on December 4, 1984, no additional samples were collected and analyzed.

One potential cause for the deterioration of the discharge suspended solids to levels exceeding 15.0 mg/l for the last two samples is that the standby filter unit was undergoing a changeout of media during the period of November 27 to December 4, 1984. The filter underdrains are connected by piping ahead of the sample point for Station No. 3. Further, rain was known to have occurred during the period in question. A further study, if warranted, of contractor logs, rainfall data, and possibly field inspection notes could conclude that this was a cause of the higher than normal suspended solids levels in the discharge.

The effluent quality was compared to the ambient water quality of the receiving stream. The ambient water quality of the receiving stream is indicated by the analysis results from monitoring Station No. 4. The mean average of each parameter analyzed at Station No. 3 (effluent) showed concentrations higher than the mean average at Station No. 4 (ambient). The increases in the mean average concentrations in the effluent were less than one order of magnitude over ambient levels. Eight of the twenty-two parameters analyzed showed mean average concentrations below detectable levels for the parameter. Since the effluent quality and the ambient quality were in compliance with water quality criteria, the increases are not considered significant. A mixing zone determination was not necessary since the effluent achieves compliance with water quality limits.

TABLE ONE

SUMMARY EFFLUENT QUALITY

File: STATION 3: Minimum, Maximum and Mean Average
For Discharge Period October 8 to December 3, 1984

For: Chicago District, Corps of Engineers
Prepared By: Daily & Associates, Engineers, Inc. - Peoria, Illinois
Daily Analytical Laboratories - Peoria, Illinois

STATION #3 WATER QUALITY DATA Contract Number: DACW 23
Confined Disposal Facility Calumet Harbor

		MAXIMUM	MINIMUM	MEAN AVERAGE	IL STD*
SOLIDS, DISSOLVED	mg/l	260	165	197	1500.0
SOLIDS, TOTAL SUSPENDED	mg/l	20	4	9.66	15.0
HARDNESS, AS CaCO3	mg/l	160	150	155	
DISSOLVED OXYGEN	mg/l	12.1	10.1	11.2	6.0/5.
OIL and GREASE	mg/l	3	<1	1.57	15.0
PHOSPHORUS, TOTAL	mg/l	<0.1	<0.01	<0.1	
AMMONIA NITROGEN as N	mg/l	1.2	0.6	0.855	2.5 & 4
TOTAL KJELDAHL NITROGEN	mg/l	2.5	<2.5	<2.5	---
CYANIDE	mg/l	<0.01	<0.01	<0.01	.1
ARSENIC	mg/l	<0.001	<0.001	<0.001	1.0
CADMIUM	mg/l	<0.01	<0.01	<0.01	.15
CHROMIUM	mg/l	<0.01	<0.01	<0.01	.3
COPPER	mg/l	0.01	<0.01	0.01	1.0
LEAD	mg/l	0.02	<0.01	0.018	.1
MANGANESE	mg/l	0.04	0.01	0.028	1.0
MERCURY	mg/l	<0.0001	<0.0001	<0.0001	.0005
NICKEL	mg/l	0.18	<0.01	0.038	1.0
ZINC	mg/l	0.03	<0.01	0.017	1.0
TOTAL PCB's	mg/l	<0.001	<0.001	<0.001	---
TEMPERATURE (field)	OC	11	3.5	6.399	
pH (field)	S.U.	7.9	7.6	7.76	

* = Illinois Standards for Water Quality for Secondary Contact Waters

For purposes of Statistical evaluation, "less than," ,<, values were treated as being equal to the Detection Limit.

Table 2 has been prepared which lists the maximum, minimum, and mean average values for the sediment quality.

TABLE TWO

SUMMARY SEDIMENT QUALITY

File: SEDIMENT: Minimum, Maximum and Mean Average
For Dredging Period October 3, 1984 to December 3, 1984

For: Chicago District, Corps of Engineers
Prepared By: Daily & Associates, Engineers, Inc. - Peoria, Illinois
Daily Analytical Laboratories - Peoria, Illinois

SEDIMENT QUALITY Contract Number: DACW 23
Confined Disposal Facility Calumet Harbor

		MAXIMUM	MINIMUM	MEAN AVERAGE
TOTAL SOLIDS	%	63.2	45.5	52
TOTAL VOLATILE SOLIDS	%	17	5.1	11.1
CHEMICAL OXYGEN DEMAND	mg/kg	290000	65000	135309.08
TOTAL KJELDAHL NITROGEN	mg/kg	4900	670	1623.999
OIL and GREASE	mg/kg	15000	1000	7445
AMMONIA NITROGEN, as N	mg/kg	240	80	137.45
TOTAL PHOSPHORUS	mg/kg	1000	300	513.62
ARSENIC	mg/kg	12	.4	5.2181819
BARIUM	mg/kg	110	23	46.272723
CADMIUM	mg/kg	5	.88	2.889091
CHROMIUM	mg/kg	60	23	34.727264
CYANIDE	mg/kg	5.1	< .14	1.177
IRON	mg/kg	54000	22350	40322.727
LEAD	mg/kg	520	50	297.27
MANGANESE	mg/kg	2100	600	1069.09
MERCURY	mg/kg	.66	< .01	.1569
NICKEL	mg/kg	50	15	27
ZINC	mg/kg	2300	280	1108.1817
COPPER	mg/kg	100	34	57.636355
TOTAL PCB's	mg/kg	19	.69	4.425

For purposes of Statistical evaluation, "less than," $<$, values were treated as being equal to the Detection Limit.

The water quality was monitored at 50 feet from the dike perimeter at monitoring stations Nos. 5, 6, and 7. The mean average concentrations for all parameters at these stations were consistent with ambient water quality monitored at station No. 8, located in the lake. No discernable trends were noted in the dike perimeter monitoring indicative of significant seepage through the dike.

H. Conclusions

The Chicago Confined Sites Disposal Facility operations for the period of October 3 to December 4, 1984 were monitored with the following conclusions developed from evaluation of the monitoring data:

1. Sampling Techniques: It was concluded that sampling techniques utilized were adequate to provide reliable analytical testing results except that the sampling methods for Station No. 3 effluent do not produce a daily 24 hour composite sample. This would appear inconsistent with the sampling requirements for analysis in conformance with the Water Quality Standards. Two modifications would provide improvements to the data available. It is recommended that a propeller or dopler type flowmeter be installed on the filter influent line with recording totalizer and sampler control capability. It is recommended that at least one 24 hour composite sample of the influent and effluent be collected. This change would provide data consistent with monitoring requirements for judging compliance with Water Quality Standards. As may be required under the NPDES permit or if the Corps desires additional monitoring of operations, a second sampler could provide the 7 day composite at the influent and/or effluent station(s).

2. Water Quality Compliance: It was concluded that the facility discharge was in compliance with the water quality regulations of the State of Illinois which governed the discharge.

3. Filter Performance:

a. It was concluded that the filter performance met the design requirements of producing an effluent consistent with the water quality regulations of the State of Illinois.

b. It was observed that the monitoring data was not adequate to fully evaluate the performance of the filter unit. The hydraulic loading and the solids loading were estimated to be 43% and 20% of the design influent values. Therefore, it has been concluded, results of the filter performance during this observation should not be extrapolated to judge performance in compliance with the filter design criteria.

c. It was observed that the filter construction deviates from the design memorandum for the units as follows:

- the filter medias utilized have uniformity coefficients of 1.5 versus the design value range of 2.0 to 3.0;
- a geotextive fabric was utilized at the sand media and gravel underdrain interface to provide segregation of these materials in lieu of a graded gravel underdrain;

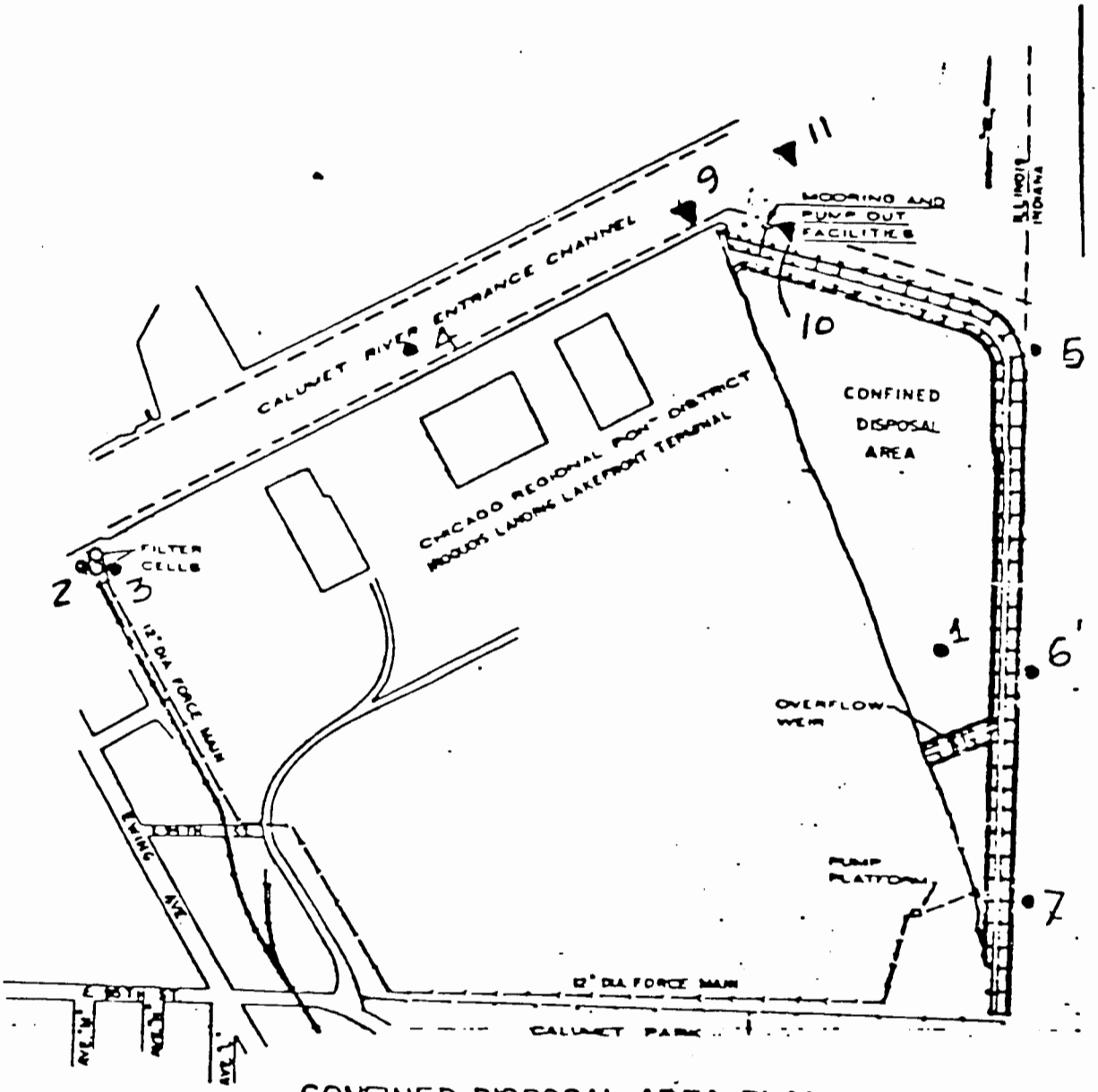
- the filter is operated in a dry media condition without tailwater control which increases the available operating headloss on the unit. The clean bed loss was calculated to be 5.8 feet through the dual media for a flow rate of 3.5 CFS. An additional operating head provided for in the design calculations of 2.2 to 4.2 feet would be increased to approximately 16 feet when a dry bed operation mode is utilized. This causes non-uniform hydraulic and solids loading of the filter which is contradictory to the calculations for filter headloss.

d. It has been concluded that additional study should be conducted on use of the geotextile in this filter application due to its permeability characteristics and its potential for blinding with grease or solids creating additional headloss which is not considered in the design calculations.

e. It has been concluded that the filter influent distribution should be modified to enhance uniform flow and solids distribution across the filter surface.

f. The data collected for water quality compliance is not adequate to fully evaluate the filter performance. See Paragraph 1 above for sampling modifications recommended.

g. It has been concluded that the dike is an effective containment barrier for the dredged sediments.



CONFINED DISPOSAL AREA PLAN

400' 0 400' 800'

APPROX SCALE

PLATE 2

Monitoring Stations:

- ● WQ Station
- ▲ Turbidity Station

File: SEDIMENT

prepared by: District, Corps of Engineers
Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

SEDIMENT QUALITY Contract Number: USGS-1 USGS-2 USGS-3
Confined Disposal Facility, Calumet Harbor

D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	4292-82	4292-83	4297-90	4305-32	4311-10
COLLECTED DURING WEEK OF:		84/09/06	84/09/13	84/09/25	84/10/10	84/10/12	84/10/16	84/10/18	84/10/19	84/10/23	84/10/31	84/11/06
TOTAL SOLIDS	%				51.8	63.2	53.6	56	52	48.9	45.5	47.4
TOTAL VOLATILE SOLIDS	%				11.3	13.7	12.5	5.1	6.4	9.5	15.9	17
CHEMICAL OXYGEN DEMAND	mg/kg				290000	240000	290000	76000	92000	98000	84400	78000
TOTAL KJELDAHL NITROGEN	mg/kg				***	4900	4900	820	800	1000	780	800
OIL and GREASE	mg/kg				4000	3000	1000	11000	9000	5500	7500	15000
AMMONIA NITROGEN, as N	mg/kg				150	200	240	200	160	85	94	100
TOTAL PHOSPHORUS	mg/kg				1000	990	670	330	400	300	400	410
ARSENIC	mg/kg				5	3	3	.4	12	3.7	8.2	.6
BARIUM	mg/kg				110	70	60	54	39	26	37	33
CADMIUM	mg/kg				4	5	5	4.2	3.1	1.5	2.3	2.7
CHROMIUM	mg/kg				60	50	40	36	27	24	34	24
CYANIDE	mg/kg				<0	<0	<0	5.1	2.5	.66	1.1	1.2
IRON	mg/kg				54000	41000	31000	47800	38000	22350	31500	45000
LEAD	mg/kg				50	420	370	520	420	180	290	420
MANGANESE	mg/kg				2100	1700	1300	1000	800	600	700	790
MERCURY	mg/kg				.04	.33	<.01	.09	.08	.076	.1	.11
NICKEL	mg/kg				50	40	30	27	21	21	23	24
ZINC	mg/kg				2300	2200	980	1540	1130	490	1000	1000
COPPER	mg/kg				100	73	66	55	48	44	50	73
TOTAL PCB's	mg/kg				***	.69	.81	5.2	4.4	1.8	2	19

D/A SAMPLE #		4318-90	4325-99	4332-52	***	***	MAXIMUM	MINIMUM	MEAN AVERAGE
COLLECTED DURING WEEK OF:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11	63.2	45.5	52
TOTAL SOLIDS	%	47.6	53.5	52.8	***	***	17	5.1	11.1
TOTAL VOLATILE SOLIDS	%	15.8	8	7.2	***	***	290000	65000	135309.08
CHEMICAL OXYGEN DEMAND	mg/kg	100000	75000	65000	***	***	4900	670	1623.999
TOTAL KJELDAHL NITROGEN	mg/kg	830	740	670	***	***	15000	1000	7445
OIL and GREASE	mg/kg	14000	5900	6000	***	***	240	80	137.45
AMMONIA NITROGEN, as N	mg/kg	80	110	93	***	***	1000	300	513.62
TOTAL PHOSPHORUS	mg/kg	400	400	300	***	***	12	.4	5.2181819
ARSENIC	mg/kg	10	4.9	6.6	***	***	110	23	46.272723
BARIUM	mg/kg	24	23	33	***	***	5	.88	2.889091
CADMIUM	mg/kg	1.7	.88	1.4	***	***	60	23	34.727264
CHROMIUM	mg/kg	39	25	23	***	***	5.1	<.14	1.177
CYANIDE	mg/kg	1.65	<.14	.6	***	***	54000	22350	40322.727
IRON	mg/kg	38900	43000	51000	***	***	520	50	297.27
LEAD	mg/kg	320	150	130	***	***	2100	600	1069.09
MANGANESE	mg/kg	840	940	990	***	***	.66	<.01	.1569
MERCURY	mg/kg	.13	.66	.1	***	***	50	15	27
NICKEL	mg/kg	28	18	15	***	***	2300	280	1108.1817
ZINC	mg/kg	980	280	290	***	***	100	34	57.636355
COPPER	mg/kg	55	36	34	***	***	19	.69	4.425
TOTAL PCB's	mg/kg	7.8	.85	1.7	***	***			

Dredging began:
84/10/3
Dredging ceased:
84/12/3

For purposes of Statistical evaluation, "less than", <, values were treated as being equal to the Detection Limit

File: STATION 1

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories Peoria, Illinois

STATION #1 WATER QUALITY DATA Contract Number: DACW 23-84-D-0012
Confined Disposal facility Calumet Harbor

D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	4292-84	4297-91	4305-23	4311-100
SAMPLE COLLECTED ON:		84/09/06	84/09/1[illegible]	84/09/25	84/10/1[illegible]	84/10/12	84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	19[illegible]	164	208	204	174	220	220	250	180
SOLIDS, TOTAL SUSPENDED	mg/l	312	16	[illegible]	37	10	16	56	35	48	10
HARDNESS, as CaCO3	mg/l	***	***	[illegible]	***	***	***	150	150	150	160
DISSOLVED OXYGEN	mg/l	8.4	9.2	7.5	7.8	7	7	7.6	7.4	8.2	9
OIL and GREASE	mg/l	<1	<	1	<1	<1	<1	<1	2	<1	2.3
PHOSPHORUS, TOTAL	mg/l	.03	<0.01	.02	<.01	.04	.02	.13	<0.1	.1	.1
AMMONIA NITROGEN as N	mg/l	.23	<0.01	.08	.3	.47	.55	1.5	1.3	2.1	2.1
TOTAL KJELDAHL NITROGEN	mg/l	1.6	.6	.3	.8	1.1	.9	4.3	<2.5	<2.5	<2.5
CYANIDE	mg/l	***	<0.01	<0.01	<.01	<0.01	<0.01	<0.01	.003	.002	<0.001	.001
ARSENIC	mg/l	***	***	***	***	***	***	***	<0.01	<0.01	<0.01	<0.01
CADMIUM	mg/l	.003	.001	.001	.001	.001	.001	.001	<0.01	<0.01	<0.01	<.01
CHROMIUM	mg/l	.04	.01	<.01	.01	<.01	.04	<0.01	<0.01	<0.01	<0.01	.01
COPPER	mg/l	.033	.046	.008	.004	.004	.003	.01	<0.01	<0.01	.01
LEAD	mg/l	.065	.014	.012	.01	.011	.007	.02	<0.02	.03	<0.02
MANGANESE	mg/l	2.1	.03	.04	.06	.08	.05	.07	.08	.08	.06
MERCURY	mg/l	***	***	***	***	***	***	<0.0001	<0.0001	<0.0001	<0.0001
NICKEL	mg/l	.037	.024	.017	.004	.004	.004	<0.01	<0.01	<0.01	<.01
ZINC	mg/l	.28	.02	.02	.02	.03	.03	.06	.03	.04	.04
TOTAL PCB's	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.001	<.001	<0.001	<0.001
TEMPERATURE (field)	oC	21	19	19.5	16	16	16.5	16	14	14	10
pH (field)	S.U.	8.4	8.4	8.1	8.1	8	8	8.1	7.6	7.8	7.9
Turbidity	NTU	85	16	16	23	50	8.4				

D/A Sample #		4318-81	4325-100	4332-53	4339-65	4346-109	MAXIMUM	MINIMUM	MEAN AVERAGE
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11			
SOLIDS, DISSOLVED	mg/l	190	210	220	180	250	250	165	205
SOLIDS, TOTAL SUSPENDED	mg/l	15	12	60	18	12	312	10	44.86666
HARDNESS, as CaCO3	mg/l	160	150	150	150	160	160	150	150
DISSOLVED OXYGEN	mg/l	10.2	10.8	10.5	11.3	12.3	12.3	7	8.9466667
OIL and GREASE	mg/l	<1	<1	<1	<1	<1	2.3	<1	1.15
PHOSPHORUS, TOTAL	mg/l	<0.1	.1	<0.1	<0.1	<0.1	.13	.02	.07
AMMONIA NITROGEN as N	mg/l	2	2.2	2.3	2.9	3	3	<.01	1.403
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	<2.5	3.7	4.7	2.7	4.7	.3	2.21
CYANIDE	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<.01	<.01	<.01
ARSENIC	mg/l	.001	.001	.002	<0.001	<0.001	.003	<.001	.0014
CADMIUM	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	.003	.001	.0065
CHROMIUM	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	.04	<.01	.014
COPPER	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	.046	.003	.0125
LEAD	mg/l	<0.02	<0.01	<0.01	<0.02	<0.02	.065	.007	.0193
MANGANESE	mg/l	.05	.1	.13	.1	.08	2.1	.03	.2073
MERCURY	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	<0.01	<0.01	<.01	<0.01	<0.01	.037	.004	.012
ZINC	mg/l	<0.02	.01	.04	.02	.025	.28	.01	.0457
TOTAL PCB's	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<.001	<.001	<.001
TEMPERATURE (field)	oC	8	5	7	2	2	21	2	12.4
pH (field)	S.U.	7.7	8	7.9	7.6	7.9	8.4	7.6	7.9666667

Dredging began:
84/10/3
Dredging ceased:
84/12/3

For purposes of Statistical evaluation, "less than", <, values were treated as being equal to the Detection Limit

File: STATION 2

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

STATION #2 WATER QUALITY DATA Contract Number: DACW 23-84-D-0012
Confined Disposal facility Calumet Harbor

D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	***	***	4305-24	4311-101
SAMPLE COLLECTED ON:		84/09/06	84/09/13	84/09/15	84/10/10	84/10/12	84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	***	***	***	***	***	***	***	250	240
SOLIDS, TOTAL SUSPENDED	mg/l	***	***	***	***	***	***	***	***	20	18
HARDNESS, as CaCO3	mg/l	***	***	***	***	***	***	***	***	160	160
DISSOLVED OXYGEN	mg/l	***	***	***	***	***	***	***	***	9.5	9.6
OIL and GREASE	mg/l	***	***	***	***	***	***	***	***	<1	2.3
PHOSPHORUS, TOTAL	mg/l	***	***	***	***	***	***	***	***	<0.1	.1
AMMONIA NITROGEN as N	mg/l	***	***	***	***	***	***	***	***	1.6	1.1
TOTAL KJELDAHL NITROGEN	mg/l	***	***	***	***	***	***	***	***	<2.5	<2.5
CYANIDE	mg/l	***	***	***	***	***	***	***	***	<0.01	<0.01
ARSENIC	mg/l	***	***	***	***	***	***	***	***	<0.001	.006
CADMIUM	mg/l	***	***	***	***	***	***	***	***	<0.01	<0.01
CHROMIUM	mg/l	***	***	***	***	***	***	***	***	<0.01	<0.01
COPPER	mg/l	***	***	***	***	***	***	***	***	<0.01	.01
LEAD	mg/l	***	***	***	***	***	***	***	***	.01	<0.02
MANGANESE	mg/l	***	***	***	***	***	***	***	***	.07	.06
MERCURY	mg/l	***	***	***	***	***	***	***	***	<0.0001	<.0001
NICKEL	mg/l	***	***	***	***	***	***	***	***	.01	<.01
ZINC	mg/l	***	***	***	***	***	***	***	***	.03	.02
TOTAL PCB's	mg/l	***	***	***	***	***	***	***	***	<0.001	<0.001
TEMPERATURE (field)	oC	***	***	***	***	***	***	***	***	13.5	9
pH (field)	S.U.	***	***	***	***	***	***	***	***	7.9	7.8
TURBIDITY	NTU	***	***	***	***	***	***	***	***	***	***

D/A Sample #		4318-82	4325-102	4332-55	***	***	MAXIMUM	MINIMUM	MEAN AVERAGE
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11			
SOLIDS, DISSOLVED	mg/l	190	210	220	***	***	250	190	222
SOLIDS, TOTAL SUSPENDED	mg/l	18	22	16	***	***	22	16	19
HARDNESS, as CaCO3	mg/l	170	150	150	***	***	170	150	160
DISSOLVED OXYGEN	mg/l	10.5	11.8	10.8	***	***	11.8	9.5	10.4
OIL and GREASE	mg/l	<1	<1	<1	***	***	2.3	<1	1.26
PHOSPHORUS, TOTAL	mg/l	<0.1	.1	<0.1	***	***	.1	<.1	.1
AMMONIA NITROGEN as N	mg/l	1.5	1.2	1.5	***	***	1.6	1.1	1.38
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	<2.5	<2.5	***	***	<2.5	<2.5	<2.5
CYANIDE	mg/l	<0.01	<0.01	<0.01	***	***	<.01	<.01	<0.01
ARSENIC	mg/l	.001	.001	<0.001	***	***	.006	<.001	.002
CADMIUM	mg/l	<0.01	<0.01	<0.01	***	***	<.01	<.01	<.01
CHROMIUM	mg/l	<0.01	<0.01	<0.01	***	***	<.01	<.01	<.01
COPPER	mg/l	<0.01	<0.01	<0.01	***	***	.01	<.01	<.01
LEAD	mg/l	<0.02	<.01	<0.01	***	***	<.02	<.01	.014
MANGANESE	mg/l	.04	.05	.065	***	***	.07	.04	.057
MERCURY	mg/l	<0.0001	<0.0001	<0.0001	***	***	<.0001	<.0001	<0.0001
NICKEL	mg/l	<0.01	<0.01	<0.01	***	***	.01	<.01	.01
ZINC	mg/l	<.02	.02	.04	***	***	.04	<.02	.026
TOTAL PCB's	mg/l	<0.001	<0.001	<0.001	***	***	<.001	<.001	<0.001
TEMPERATURE (field)	oC	8	5	9	***	***	13.5	5	8.89
pH (field)	S.U.	7.7	7.9	7.7	***	***	7.9	7.7	7.8

Dredging began:
84/10/3
Dredging ceased:
84/12/3

For purposes of Statistical evaluation, "less than",<, values were treated as being equal to the Detection Limit

File: STATION 3

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

STATION #3 WATER QUALITY DATA Contract Number: DACW 27-84-D-0012
Confined Disposal facility Calumet Harbor

D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	***	4297-92	4305-25	4311-102
SAMPLE COLLECTED ON:		84/09/06	84/09/13	84/09/25	84/10/10	84/10/12	84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	***	**	***	***	***	***	210	260	165
SOLIDS, TOTAL SUSPENDED	mg/l	***	***	**	***	***	***	***	4	4	6
HARDNESS, as CaCO3	mg/l	***	***	***	***	***	***	***	160	150	160
DISSOLVED OXYGEN	mg/l	***	***	***	***	***	***	***	12.1	10.1	10.9
OIL and GREASE	mg/l	***	***	***	***	***	***	***	3	2	1.4
PHOSPHORUS, TOTAL	mg/l	***	***	***	***	***	***	***	<0.1	<0.1	<0.1
AMMONIA NITROGEN as N	mg/l	***	***	***	***	***	***	***	.6	1.2	.7
TOTAL KJELDAHL NITROGEN	mg/l	***	***	***	***	***	***	***	<2.5	<2.5	<2.5
CYANIDE	mg/l	***	***	***	***	***	***	***	<0.01	<0.01	<0.01
ARSENIC	mg/l	***	***	***	***	***	***	***	<0.001	<0.001	<.001
CADMIUM	mg/l	***	***	***	***	***	***	***	<0.01	<0.01	<0.01
CHROMIUM	mg/l	***	***	***	***	***	***	***	<0.01	<0.01	<0.01
COPPER	mg/l	***	***	***	***	***	***	***	.01	.01	.01
LEAD	mg/l	***	***	***	***	***	***	***	<0.02	.02	<0.02
MANGANESE	mg/l	***	***	***	***	***	***	***	.02	.04	.04
MERCURY	mg/l	***	***	***	***	***	***	***	<0.0001	<0.0001	<.0001
NICKEL	mg/l	***	***	***	***	***	***	***	<0.01	.18	<.01
ZINC	mg/l	***	***	***	***	***	***	***	.03	.01	.02
TOTAL PCB's	mg/l	***	***	***	***	***	***	***	<0.001	<0.001	<0.001
TEMPERATURE (field)	oC	***	***	***	***	***	***	***	3.5	11	5
pH (field)	S.U.	***	***	***	***	***	***	***	7.8	7.9	7.6
TURBIDITY	NTU	***	***	***	***	***	***	***	***	***	***

D/A Sample #		4318-83	***	4332-56	4339-67	***			MEAN	Dredging began:
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11	MAXIMUM	MINIMUM	AVERAGE	84/10/3
SOLIDS, DISSOLVED	mg/l	190	***	180	180	***	260	165	197	Dredging ceased:
SOLIDS, TOTAL SUSPENDED	mg/l	6	***	20	18	***	20	4	9.66	84/12/3
HARDNESS, as CaCO3	mg/l	160	***	150	150	***	160	150	155	
DISSOLVED OXYGEN	mg/l	12.1	***	11	***	***	12.1	10.1	11.2	For purposes of Statistical
OIL and GREASE	mg/l	<1	***	<1	1	***	3	<1	1.57	evaluation, "less than",<,
PHOSPHORUS, TOTAL	mg/l	<0.1	***	<0.1	<0.1	***	<.1	<.1	<.1	values were treated as being
AMMONIA NITROGEN as N	mg/l	.6	***	.83	1.2	***	1.2	.6	.855	equal to the Detection Limit
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	***	<2.5	2.5	***	2.5	<2.5	<2.5	
CYANIDE	mg/l	<0.01	***	<0.01	<0.01	***	<.01	<.01	<.01	
ARSENIC	mg/l	<0.001	***	<0.001	<0.001	***	<.001	<.001	<.001	
CADMIUM	mg/l	<0.01	***	<0.01	<0.01	***	<.01	<.01	<.01	
CHROMIUM	mg/l	<0.01	***	<0.01	<0.01	***	<.01	<.01	<.01	
COPPER	mg/l	<0.01	***	<0.01	<0.01	***	.01	<.01	.01	
LEAD	mg/l	<0.02	***	<0.01	<0.02	***	.02	<.01	.018	
MANGANESE	mg/l	.01	***	.03	.03	***	.04	.01	.028	
MERCURY	mg/l	<0.0001	***	<0.0001	<0.0001	***	<.0001	<.0001	<.0001	
NICKEL	mg/l	<0.01	***	<0.01	.01	***	.18	<.01	.038	
ZINC	mg/l	.022	***	.01	<0.01	***	.03	<.01	.017	
TOTAL PCB's	mg/l	<0.001	***	<0.001	<0.001	***	<.001	<.001	<.001	
TEMPERATURE (field)	oC	4.5	***	8	***	***	11	3.5	6.399	

File: STATION 4

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

Station #4 WATER QUALITY DATA Contract Number: DACW 23-84-D-0012
Confined Disposal facility Calumet Harbor

D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	4292-86	4297-93	4305-26	4311-103
SAMPLE COLLECTED ON:		84/09/06	84/09/13	84/09/25	84/10/10	84/10/12	84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	160	161	176	175	164	170	180	220	170
SOLIDS, TOTAL SUSPENDED	mg/l	5	10	6	4	3	2	5	7	10	12
HARDNESS, as CaCO3	mg/l	***	***	***	***	***	***	140	150	140	190
DISSOLVED OXYGEN	mg/l	8.7	9.2	8.7	9	9.7	9.3	9.6	9.5	9.7	10
OIL and GREASE	mg/l	<1	1	<1	1	<1	<1	<1	<1	1	<1
PHOSPHORUS, TOTAL	mg/l	<0.01	<0.01	<0.01	.07	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1
AMMONIA NITROGEN as N	mg/l	.04	<0.01	.02	.01	.02	.02	<0.5	<0.5	.6	<0.5
TOTAL KJELDAHL NITROGEN	mg/l	.3	.5	.4	.3	.3	.5	<2.5	<2.5	<2.5	<2.5
CYANIDE	mg/l	***	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ARSENIC	mg/l	***	***	***	***	***	***	.002	<0.001	<0.001	.001
CADMIUM	mg/l	.001	.001	.001	.001	.001	.001	<0.01	<0.01	<0.01	<0.01
CHROMIUM	mg/l	.01	<.01	.03	<.01	<.01	.03	<0.01	<0.01	<0.01	<0.01
COPPER	mg/l	.002	.002	.002	.002	.002	.003	<0.01	<0.01	<0.01	<0.01
LEAD	mg/l	.002	.01	.003	.003	.004	.003	<0.02	<0.02	.02	<0.02
MANGANESE	mg/l	.01	.02	.02	.01	.01	.03	<0.01	.01	.02	.02
MERCURY	mg/l	***	***	***	***	***	***	<0.0001	<0.0001	<0.0001	<.0001
NICKEL	mg/l	.002	.003	.002	.003	<.001	.002	<0.01	<0.01	<0.01	.01
ZINC	mg/l	.02	.02	.02	.02	.02	.02	.02	.02	.02	.03
TOTAL PCB's	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.001	<.001	<.001	<0.001
TEMPERATURE (field)	oC	21	18	18	16	17	16.5	15	14	14	10
pH (field)	S.U.	8.5	8.4	8.3	8.3	8.4	8.2	8.2	7.9	8.1	8
TURBIDITY	NTU	4.8	2.2	2.1	2.4	5.4	1.1	***	***	***	***

D/A Sample #		4318-84	4325-103	4232-57	4339-68	4346-110	MAXIMUM	MINIMUM	MEAN AVERAGE
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11			
SOLIDS, DISSOLVED	mg/l	180	210	180	170	200	220	160	179
SOLIDS, TOTAL SUSPENDED	mg/l	14	10	18	16	10	18	2	8.8
HARDNESS, as CaCO3	mg/l	150	140	140	140	150	150	140	143
DISSOLVED OXYGEN	mg/l	10.1	11.1	11.3	10.9	11.7	11.7	8.7	9.9
OIL and GREASE	mg/l	<1	<1	<1	<1	<1	1	<1	1
PHOSPHORUS, TOTAL	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	.07	<.01	.068
AMMONIA NITROGEN as N	mg/l	2	<0.5	<0.5	.6	<0.5	.2	<.01	.391
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	.3	1.65
CYANIDE	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<.01	<.01	<.01
ARSENIC	mg/l	<0.001	<0.001	<0.001	<0.001	<0.00	.2	<.001	.0015
CADMIUM	mg/l	<0.01	<0.01	<0.01	<0.01	<0.0	.1	.001	.0064
CHROMIUM	mg/l	<0.01	<0.01	<0.01	<0.01	<0.0	.03	<.01	.013
COPPER	mg/l	<0.01	<0.01	<0.01	<0.01	<0.0	.01	.002	.007
LEAD	mg/l	<0.02	<0.01	<0.01	<0.02	<0.0	.02	.002	.012
MANGANESE	mg/l	<0.01	.03	.04	.05	.0	.05	<.01	.021
MERCURY	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.000	<.0001	<.0001	<.0001
NICKEL	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	.01	<.001	.0068
ZINC	mg/l	<0.01	<0.01	.01	<0.01	.02	.03	<.01	.018
TOTAL PCB's	mg/l	<0.001	<0.001	<0.001	<0.001	<0.00	<.001	<.0001	<.001
TEMPERATURE (field)	oC	8	6	8	3.5		21	3	12.53333

Dredging began:
84/10/3
Dredging ceased:
84/12/3

For purposes of Statistical evaluation, "less than",<, values were treated as being equal to the Detection Limit

File: STATION 5

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

STATION #5 WATER QUALITY DAT AContract Number: DACW 23-84-D-0012
Confined Disposal Facility Calumet Harbor

D/A Sample #		USGS		USGS	USGS	USGS	USGS	4297-87	4297-94	4305-27	4311-104
SAMPLE COLLECTED ON:		84/09/06	84/09/13	84/09/25	84/10/10	84/10/12	84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	164	162	178	174	170	170	180	240	140
SOLIDS, TOTAL SUSPENDED	mg/l	6	9	4	6	1	4	4	6	8	8
HARDNESS, as CaCO3	mg/l	***	***	***	***	***	***	140	140	140	110
DISSOLVED OXYGEN	mg/l	8.7	9.2	9.4	9.2	9.6	9.2	9.5	9.6	9.9	10.2
OIL and GREASE	mg/l	<1	<1	<1	<1	<1	<1	1	<1	2	<1
PHOSPHORUS, TOTAL	mg/l	<.01	<0.01	<0.01	<0.01	.01	<0.01	.1	<.1	<0.1	<.1
AMMONIA NITROGEN as N	mg/l	.03	<.01	.03	.02	.01	.05	<0.5	<.5	<.05	<.5
TOTAL KJELDAHL NITROGEN	mg/l	.3	.4	.3	.4	.1	.3	<2.5	<2.5	<2.5	<2.5
CYANIDE	mg/l	***	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<.01	<.01	<.01
ARSENIC	mg/l	***	***	***	***	***	***	<0.001	<.001	<.001	<.001
CADMIUM	mg/l	.001	.001	.001	<.001	.001	<.001	<0.01	<.01	<.01	<.01
CHROMIUM	mg/l	.01	.02	.01	.04	<.01	.04	<0.01	<.01	<.01	<.01
COPPER	mg/l	.002	.002	.002	.004	.002	.001	<0.01	<.01	<.01	.02
LEAD	mg/l	.004	.003	.013	.004	.003	<.001	<0.02	<.02	<.02	<.02
MANGANESE	mg/l	.02	.01	.01	.02	.01	.05	<0.01	<.01	.01	.01
MERCURY	mg/l	***	***	***	***	***	***	<0.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	.054	.002	.03	.051	.002	.003	<0.01	<.01	<.01	<.01
ZINC	mg/l	.04	.02	.03	.03	.01	.01	.02	.02	.01	.02
TOTAL PCB's	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.001	<.001	<.001	<.001
TEMPERATURE (field)	oC	21	18	18.5	16	17	16.5	15	13.5	13	10
pH (field)	S.U.	8.6	8.4	8.3	8.2	8.3	8.2	8.1	8	8.2	7.9
TURBIDITY	NTU	6.2	1.6	1.4	2.5	1.3	1.1	***	***	***	***

D/A Sample #		4318-85	4325-104	4232-58	4339-69	4346-111	MAXIMUM	MINIMUM	MEAN AVERAGE
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/04	84/12/11			
SOLIDS, DISSOLVED	mg/l	150	170	190	170	240	240	140	178
SOLIDS, TOTAL SUSPENDED	mg/l	22	17	14	7	12	22	1	8.5
HARDNESS, as CaCO3	mg/l	190	140	140	140	150	190	110	143
DISSOLVED OXYGEN	mg/l	10.6	11.6	11.3	11.8	12.6	12.6	8.7	10.16
OIL and GREASE	mg/l	<1	<1	<1	<1	<1	2	<1	1.1
PHOSPHORUS, TOTAL	mg/l	<.1	<.1	<.1	<.1	<.1	.1	<.01	.05
AMMONIA NITROGEN as N	mg/l	<.5	<.5	<.5	<.5	<.5	<.5	<.01	.28
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	.1	1.82
CYANIDE	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
ARSENIC	mg/l	<.001	<.001	<.001	<.001	[illegible]	<.001	<.001	<.001
CADMIUM	mg/l	<.01	<.01	<.01	[illegible]	[illegible]	<.01	<.001	.001
CHROMIUM	mg/l	<.01	<.01	<.01	[illegible]	[illegible]	.04	<.01	.0147
COPPER	mg/l	<.01	<.01	<.01	<.01	<.01	.02	.001	.008
LEAD	mg/l	<.02	<.01	<.01	<.02	<.02	<.02	.003	.01
MANGANESE	mg/l	.015	.03	.04	.03	.02	.05	.015	.02
MERCURY	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	<.01	<.01	<.01	<.01	<.01	.054	.002	.015
ZINC	mg/l	<.01	<.01	.01	<.01	.01	.04	<.01	.017
TOTAL PCB's	mg/l	<.001	<.001	<.001	<.001	<.001	<.001	<.0001	<.001
TEMPERATURE (field)									

Dredging began:
84/10/3
Dredging ceased:
84/12/3

For purposes of Statistical evaluation, "less than",<, values were treated as being equal to the Detection Limit

File: STATION 6

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

STATION #6 WATER QUALITY DATA Contract Number: DACW 23-84-D-0012
Confined Disposal facility Calumet Harbor

D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	4292-88	4297-95	4305-28	4311-105
SAMPLE COLLECTED ON:		84/09/06	84/09/13	84/09/25	84/10/10	84/10/12	84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	184	156	158	169	164	170	160	250	150
SOLIDS, TOTAL SUSPENDED	mg/l	5	6	4	2	1	1	3	4	3	9
HARDNESS, as CaCO3	mg/l	***	***	***	***	***	***	140	140	140	150
DISSOLVED OXYGEN	mg/l	8.9	9	9.3	9.1	9.7	9.1	10	9.5	9.8	10.3
OIL and GREASE	mg/l	<1	2	<1	<1	<1	<1	<1	<1	1	<1
PHOSPHORUS, TOTAL	mg/l	<0.01	<.01	<.01	<.01	.02	<.01	.17	<.1	<.1	<.1
AMMONIA NITROGEN as N	mg/l	.02	<.01	.04	.01	.19	.02	<.5	<.5	<.5	<.5
TOTAL KJELDAHL NITROGEN	mg/l	.4	.4	.8	.5	.4	.4	<2.5	4	<2.5	<2.5
CYANIDE	mg/l	***	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
ARSENIC	mg/l	***	***	***	***	***	***	<.001	<.001	<.001	<.001
CADMIUM	mg/l	.001	.001	.001	.001	.001	.001	<.01	<.01	<.01	<.01
CHROMIUM	mg/l	<.01	<.01	.02	.01	<.01	.04	<.01	<.01	<.01	<.01
COPPER	mg/l	.002	.002	.002	.002	.002	.002	<.01	<.01	<.01	.01
LEAD	mg/l	.001	.002	.008	.002	.003	.002	<.02	<.02	<.02	<.02
MANGANESE	mg/l	.01	<.01	.01	.01	.02	.03	<.01	<.01	<.01	<.01
MERCURY	mg/l	***	***	***	***	***	***	<.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	.007	.005	.013	.002	<.001	.001	<.01	<.01	<.01	<.01
ZINC	mg/l	.02	.02	.02	.01	.01	.01	.02	<.01	<.01	.01
TOTAL PCB's	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.001	<.001	<.001	<.001
TEMPERATURE (field)	oC	21	18.5	18	16.5	17	17	15	13.5	13.5	10
pH (field)	S.U.	8.6	8.4	8.3	8.3	8.4	8.3	8.3	8	8.2	7.7
TURBIDITY	NTU	5.8	1.7	1.3	2	1.3	1.3	***	***		

D/A Sample #		4318-86	4325-105	4332-59	4339-70	4346-112			MEAN
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11	MAXIMUM	MINIMUM	AVERAGE
SOLIDS, DISSOLVED	mg/l	160	200	200	160	220	250	150	179
SOLIDS, TOTAL SUSPENDED	mg/l	21	24	11	5	5.2	24	1	6.9
HARDNESS, as CaCO3	mg/l	150	140	140	140	150	150	140	143
DISSOLVED OXYGEN	mg/l	10.3	11.6	11.3	11.9	12.6	12.6	8.9	10.2
OIL and GREASE	mg/l	<1	<1	<1	<1	<1	2	<1	1.1
PHOSPHORUS, TOTAL	mg/l	<.1	<.1	<.1	<.1	<.1	.17	<.01	.069
AMMONIA NITROGEN as N	mg/l	<.5	<.5	<.5	<.5	<.5	.19	<.01	.306
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	<2.5	<2.5	<2.5	<2.5	4	.4	1.79
CYANIDE	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
ARSENIC	mg/l	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
CADMIUM	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	<.001	.001
CHROMIUM	mg/l	<.01	<.01	<.01	<.01	<.01	.04	<.01	.013
COPPER	mg/l	<.01	<.01	<.01	<.01	<.01	.01	.002	.007
LEAD	mg/l	<.02	<.01	<.01	<.02	<.02	<.02	.001	.012
MANGANESE	mg/l	<.01	.03	.02	.02	.02	.03	<.01	.015
MERCURY	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	<.01	<.01	<.01	<.01	<.01	.013	<.001	.01
ZINC	mg/l	<.01	<.01	.01	<.01	.01	.02	<.01	.013
TOTAL PCB's	mg/l	<.001	<.001	<.001	<.001	<.001	<.001	<.0001	<.001
TEMPERATURE (field)	oC	8	5.5	9	4	3	21	3	12.6
pH (field)	S.U.	7.5	7.7	8	8	8	8.6	7.5	8.1

Dredging began:
84/10/3
Dredging ceased:
84/12/3

For purposes of Statistical evaluation, "less than",<, values were treated as being equal to the Detection Limit

File: STATION 7

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

STATION #7 WATER QUALITY DATA Contract Number: DACW 23-84-D-0012
Confined Disposal facility Calumet Harbor

D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	4292-89	4297-97	4305-29	4311-106
SAMPLE COLLECTED ON:		84/09/06	84/09/13	84/09/25	84/10/10	84/10/12	84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	168	160	178	177	156	160	160	220	150
SOLIDS, TOTAL SUSPENDED	mg/l	3	6	2	1	1	1	4	4	3	8
HARDNESS, as CaCO3	mg/l	***	***	***	***	***	***	140	140	150	150
DISSOLVED OXYGEN	mg/l	8.9	8.8	9.3	9.1	9	9.2	9.5	9.5	9.6	10.4
OIL and GREASE	mg/l	<1	<1	<1	<1	<1	<1	2	<1	2	<1
PHOSPHORUS, TOTAL	mg/l	<.01	<.01	<.01	<.01	***	<.01	<.1	<.1	<.1	<.1
AMMONIA NITROGEN as N	mg/l	.02	<.01	.03	<.01	***	<.01	<.5	<.5	<.5	<.5
TOTAL KJELDAHL NITROGEN	mg/l	.3	.5	.7	.4	***	.7	3.3	<2.5	<2.5	<2.5
CYANIDE	mg/l	***	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
ARSENIC	mg/l	***	***	***	***	***	***	<.001	<.001	<.001	<.001
CADMIUM	mg/l	.001	.001	.001	.001	.001	.001	<.01	<.01	<.01	<.01
CHROMIUM	mg/l	.01	<.01	.01	<.01	<.01	.06	<.01	<.01	<.01	<.01
COPPER	mg/l	.002	.002	.002	.002	.002	.002	<.01	<.01	<.01	.01
LEAD	mg/l	.005	.009	.006	.003	.002	.001	<.02	<.02	<.02	<.02
MANGANESE	mg/l	.01	<.01	<.01	.01	.03	.04	<.01	<.01	<.01	.02
MERCURY	mg/l	***	***	***	***	***	***	<.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	.009	.003	.001	.001	.002	.002	<.01	<.01	<.01	<.01
ZINC	mg/l	.02	.02	.02	.02	.01	.01	.06	<.01	<.01	.01
TOTAL PCB's	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.001	<.001	<.001	<.001
TEMPERATURE (field)	oC	21	18.5	18	16.5	17.5	17	15	13.5	14.5	10
pH (field)	S.U.	8.3	8.4	8.3	8.3	8.4	8.3	8.1	8.1	8.2	7.7
TURBIDITY	NTU	4.7	1.2	1.1	1.5	1.2	1	***	***	***	***

D/A Sample #		4318-87	4325-106	4332-60	4339-71	4346-113			MEAN
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11	MAXIMUM	MINIMUM	AVERAGE
SOLIDS, DISSOLVED	mg/l	160	220	190	140	190	220	140	173
SOLIDS, TOTAL SUSPENDED	mg/l	16	24	12	5	6.4	24	1	6.4
HARDNESS, as CaCO3	mg/l	150	140	140	140	150	150	140	144
DISSOLVED OXYGEN	mg/l	10.5	11.6	11.3	11.7	12.6	12.6	8.8	10
OIL and GREASE	mg/l	<1	<1	<1	<1	<1	2	<1	1.13
PHOSPHORUS, TOTAL	mg/l	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.1
AMMONIA NITROGEN as N	mg/l	<.5	<.5	<.5	<.5	<.5	<.5	<.01	.327
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	<2.5	<2.5	<2.5	<2.5	3.3	.3	1.85
CYANIDE	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
ARSENIC	mg/l	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
CADMIUM	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	.001	.01
CHROMIUM	mg/l	<.01	<.01	<.01	<.01	<.01	.06	<.01	.01
COPPER	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	.002	.007
LEAD	mg/l	<.02	<.001	<.01	<.02	<.02	<.02	<.001	.012
MANGANESE	mg/l	<.01	.03	.03	.02	.02	.04	<.01	.018
MERCURY	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	.001	.007
ZINC	mg/l	<.01	.02	.02	<.01	.01	.06	<.01	.017
TOTAL PCB's	mg/l	<.001	<.001	<.001	<.001	<.001	<.001	<.0001	<.001
TEMPERATURE (field)	oC	8	5.5	9	4	3	21	3	12.7
pH (field)	S.U.	7.7	7.5	8.1	7.9	8.0	8.4	7.5	7.6

Dredging began: 84/10/3
Dredging ceased: 84/12/3

For purposes of Statistical evaluation, "less than",<, values were treated as being equal to the Detection Limit

File: STATION 8

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

STATION #8 WATER QUALITY DATA Contract Number: DACW 23-84-D-0012

		Confined Disposal facility			Calumet Harbor						
D/A Sample #		USGS	USGS	USGS	USGS	USGS	USGS	4292-90	4297-97	4305-30	4311-107
SAMPLE COLLECTED ON:		84/09/06	84/09/13	84/09/23	84/10/1	84/10/1	84/10/13	84/10/18	84/10/23	84/10/31	84/11/06
SOLIDS, DISSOLVED	mg/l	***	168	164	164	177	167	160	170	200	150
SOLIDS, TOTAL SUSPENDED	mg/l	4	4	13	2	***	5	3	5	3	6
HARDNESS, as CaCO3	mg/l	***	***	***	***	***	***	140	140	140	150
DISSOLVED OXYGEN	mg/l	8.9	9.2	9	9.4	9.7	9.4	9.5	9.6	9.9	10.2
OIL and GREASE	mg/l	<1	<1	1	<1	<1	<1	2	<1	1	<1
PHOSPHORUS, TOTAL	mg/l	<.01	<.01	<.01	<.01	<.01	***	<.1	<.1	<.1	<.1
AMMONIA NITROGEN as N	mg/l	.03	<.01	<.01	<.01	.02	***	<.5	<.5	<.5	<.5
TOTAL KJELDAHL NITROGEN	mg/l	.4	.3	.8	.3	.3	***	3	<2.5	<2.5	<2.5
CYANIDE	mg/l	***	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
ARSENIC	mg/l	***	***	***	***	***	***	<.001	<.001	<.001	<.001
CADMIUM	mg/l	.001	.001	.001	<.001	.001	<.001	<.01	<.01	<.01	<.01
CHROMIUM	mg/l	<.01	.01	.01	<.01	<.01	.02	<.01	<.01	<.01	<.01
COPPER	mg/l	.002	.001	.003	.001	.002	.002	<.01	<.01	<.01	.01
LEAD	mg/l	.001	.008	.001	.001	.002	<.001	<.02	<.02	<.02	<.02
MANGANESE	mg/l	<.01	.01	.02	.01	.02	.04	<.01	<.01	<.01	.02
MERCURY	mg/l	***	***	***	***	***	***	<.0001	<.0001	<.0001	<.0001
NICKEL	mg/l	.004	.003	.007	.001	.001	.007	<.01	<.01	<.01	<.01
ZINC	mg/l	.03	.02	.02	.01	.01	.01	.02	.01	<.02	.01
TOTAL PCB's	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.001	<.001	<.001	<.001
TEMPERATURE (field)	oC	21	19	17	15.5	16	16.5	15	13.5	14	9
pH (field)	S.U.	8.5	8.4	8.3	8.3	8.2	8.2	8.1	8.2	8.1	7.4
TURBIDITY	NTU	4.9	1.2	1.7	1.7	1	.7	***	***	***	***

									MEAN	
D/A Sample #		4318-88	4325-107	4332-61	4339-72	4346-114				Dredging began:
SAMPLE COLLECTED ON:		84/11/13	84/11/20	84/11/27	84/12/4	84/12/11	MAXIMUM	MINIMUM	AVERAGE	84/10/3
SOLIDS, DISSOLVED	mg/l	150	180	190	170	200	200	150	171	Dredging ceased:
SOLIDS, TOTAL SUSPENDED	mg/l	16	17	7	5	6.8	17	2	6.9	84/12/3
HARDNESS, as CaCO3	mg/l	170	140	140	140	160	170	140	147	
DISSOLVED OXYGEN	mg/l	10.8	11.7	11.6	12.1	12.7	12.7	8.9	10.2	For purposes of Statistical
OIL and GREASE	mg/l	1	<1	<1	1	<1	2	<1	1.1	evaluation, "less than",<,
PHOSPHORUS, TOTAL	mg/l	<.1	<.1	<.1	<.1	<.1	<.1	<.01	<.1	values were treated as being
AMMONIA NITROGEN as N	mg/l	<.5	<.5	<.5	<.5	<.5	<.5	<.01	.327	equal to the Detection Limit
TOTAL KJELDAHL NITROGEN	mg/l	<2.5	<2.5	<2.5	<2.5	<2.5	3	.3	1.79	
CYANIDE	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
ARSENIC	mg/l	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
CADMIUM	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	<.001	.001	
CHROMIUM	mg/l	<.01	<.01	<.01	<.01	<.01	.02	<.01	.077	
COPPER	mg/l	<.01	<.01	<.01	<.01	<.01	.01	.001	.007	
LEAD	mg/l	<.02	<.01	<.01	<.02	<.02	<.02	<.001	.012	
MANGANESE	mg/l	<.01	.02	.03	.02	.01	.04	<.01	.016	
MERCURY	mg/l	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
NICKEL	mg/l	<.01	<.01	<.01	<.01	<.01	<.01	.001	.008	
ZINC	mg/l	<.01	<.01	.03	.03	<.01	.03	<.01	.017	
TOTAL PCB's	mg/l	<.001	<.001	<.001	<.001	<.001	<.001	<.0001	<.001	
TEMPERATURE (field)	oC	8	5	8	4	3	21	3	11.2	
pH (field)	S.U.	7.8	7.5	8.2	7.9	8	8.5	7.4	8.1	

File: TURBIDITIES

for : Chicago District, Corps of Engineers
prepared by: Daily & Associates Engineers, Inc. Peoria, Illinois
Daily Analytical Laboratories, Peoria, Illinois

TURBIDITY STATIONS Contract Number: DACW 23-84-D-[illegible]2
Confined Disposal Facility Calumet Harbor

********** TURBIDITY ********* MEASUREMENTS **********

D/A Sample # / SAMPLE COLLECTED ON:	USGS 84/09/06	USGS 84/09/13	USGS 84/09/25	USGS 84/10/10	USGS 84/10/12	USGS 84/10/16	84/10/18	84/10/23	84/10/31	84/11/06
STATION #9	6.3	1.1	1.5	1.1	1.6	.9	6.2	5.9	6.6	22
STATION #10	5.5	1.6	1.6	1.2	1.6	.9	6.2	5.8	6.5	9.1
STATION #11	4.8	1.4	2.6	1.6	2.3	.8	6.5	6.2	3.9	12
100' UPSTREAM (#12)	***	***	***	3.9	7.6	4.3	65	60	56	74
100' DOWNSTREAM (#13)	***	***	***	7.4	8.4	9.6	25	44	91	74
300' DOWNSTREAM (#14)	***	***	***	5.8	9.4	7.7	33	41	54	73

********** SUSPENDED SOLIDS MEASUREMENTS **********

STATION #9	3	5	4	2	1	1
STATION #10	3	5	4	2	1	1
STATION #11	4	7	12	3	1K	1
100' UPSTREAM (#12)	***	***	***	6	5	6
100' DOWNSTREAM (#13)	***	***	***	11	5	37
300' DOWNSTREAM (#14)	***	***	***	8	6	32

********** TURBIDITY ********* MEASUREMENTS **********

D/A Sample # / SAMPLE COLLECTED ON:	84/11/13	84/11/20	84/11/27	84/12/04	84/12/11	MAXIMUM	MINIMUM	MEAN AVERAGE
STATION #9	20	19	12	***	***	22	.9	8.0153847
STATION #10	24	18	13	***	***	24	.9	7.3076923
STATION #11	26	19	14	***	***	26	.8	7.7769231
100' UPSTREAM	48	52	67	***	***	74	3.9	43.77999
100' DOWNSTREAM	75	54	54	***	***	91	7.4	44.239995
300' DOWNSTREAM	48	57	79	***	***	79	5.8	40.789995

Dredging began:
84/10/3
Dredging ceased:
84/12/3

For purposes of Statistical evaluation, "less than",<, values were treated as being equal to the Detection Limit