FLUOR DANIEL GTI

PRELIMINARY CHARACTERIZATION REPORT
SURFACE WATER AND STREAMBED SEDIMENT
KOPPERS INDUSTRIES, INC.
SUPERIOR, WISCONSIN FACILITY
WID 006-179-493

Fluor Daniel GTI Project 010030618

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"I Robert T. Smith, hereby certify that I am a scientist as that term is defined in S. NR 712.03(3), Wis. Adm. Code. I have personally examined this report and I am familiar with the information and attachments therein. Furthermore, based on my inquiry of those persons immediately responsible for obtaining the information contained in this report, I believe the information is true, accurate, and complete."

Robert T. Smith

Signature

3/10/97

Date

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1.0 INTRODUCTION

This Preliminary Characterization Report for Surface Water and Streambed Sediment was prepared by Fluor Daniel GTI, Inc., on behalf of Beazer East, Inc. (Beazer). This work has been performed as part of a Phase III RCRA Facility Investigation (RFI) at the Koppers Industries, Inc. wood treating facility, located in Superior, Wisconsin. The Phase III RFI is being performed pursuant to the facility Permit No. WID 006-179-493.

Since the state of Wisconsin had not yet received authorization to administer the hazardous waste requirements of HSWA, the U.S.EPA was compelled to administer the HSWA regulatory requirements promulgated in 1984. In addition to requiring a program to reduce the volume and toxicity of hazardous waste generated, the requirements to assess the release or potential release of hazardous waste constituents from solid waste management units was addressed by U.S.EPA. Subsequently, the U.S.EPA issued the HSWA portion of a permit for the facility on September 30, 1988, which included conditions related to investigating the nature and extent of releases from solid waste management units. Since that time, the state of Wisconsin has been authorized to administer the HSWA program (April 24, 1992). On September 20, 1995, the WDNR incorporated provisions for state authorized corrective action (site-wide) under the state's HSWA authority.

A Phase III RFI Work Plan was submitted by Beazer to the U.S. EPA, Region V, and the Wisconsin Department of Natural Resources (the Agencies) in August 1993 (Chester Environmental, August 1993). The Agencies' comments on the Phase III RFI Work Plan were received by Beazer, by letter dated July 11, 1994. Subsequently, a meeting was held between Beazer and the Agencies on August 2, 1994, in Madison, Wisconsin, to discuss the Agencies' comments on the Phase III RFI Work Plan. Among the issues presented in the Agencies' comments and discussed at the meeting were the Agencies' requirements for the off-site surface water and streambed sediment investigative work to be expanded within the scope of the RFI. It was agreed that this work may be performed in two phases. It should also be noted that the WDNR allowed that the off-site surface water and sediment portion of the RFI may be performed independently of the on-site soil and groundwater portion of the RFI, both under the authority of the State of Wisconsin's Corrective Action Program (October 24, 1996, Conditional Closure & Long-Term Care Plan Approval Modification).

A Surface Water and Streambed Sediment Sampling and Analysis Plan (SAP) (Groundwater Technology, Inc., July 1995) was submitted to the Agencies, and a telephone conference held on October 24, 1995 to address final comments on the SAP from the Wisconsin Department of Natural Resources (WDNR). The agreed revisions to the SAP were documented in an October 31, 1996 correspondence from Groundwater Technology, Inc. to the WDNR. Subsequently, the approved SAP, including agreed revisions, was implemented during the week of June 10, 1996.

This Preliminary Characterization Report provides the results of the June 1996 sampling event. The objective of this Report is to document the preliminary determination of the nature and extent of site-

related constituents within the study area, relative to the historic release of wood treating constituents from the facility. To achieve this objective, the physiography and hydrology of the study area have been assessed qualitatively, in order to develop a conceptual model relative to the potential migration of site-related constituents. Analytical data collected during June 1996 have also been compared to available criteria and guidelines. In doing so, site-related constituents of potential ecological concern are identified. Additionally, potential receptors and exposure pathways are qualitatively evaluated.

This Preliminary Characterization Report is divided into five main sections. Section 1.0 provides introductory information. Section 2.0 summarizes the methods and materials used while implementing the SAP. Section 3.0 provides a description of the physical characteristics and historical information for the study area. Section 4.0 presents the chemical analytical data reported for samples collected pursuant to the SAP. Section 5.0 relates the physical and chemical characteristics of the study area as a data evaluation and provides general recommendations for additional work as part of the off-site RFI activities.

2.0 METHODS AND MATERIALS

The following subsections summarize the methods and materials used to implement the SAP, including agreed revisions. A full description of the methods and materials is provided in the SAP and an October 31, 1996 correspondence containing the agreed revisions. The results of these activities are reported in Sections 3.0 through 5.0.

2.1 Surface Water Sampling

Objectives

Surface water samples were collected and analyzed to characterize surface water quality within the unnamed ditch and Crawford Creek, and determine the nature and extent of site-related constituents, if present.

Locations

A total of seven surface water samples were collected and analyzed: two samples from the unnamed ditch and five samples from Crawford Creek. Sampling locations are illustrated on Figure 2-1 and designated SW-5 through SW-11.

Equipment and Procedures

All surface water samples were collected as grab samples, using a peristaltic pump and dedicated tubing composed of inert material. For Crawford Creek, surface water samples were composited from three locations across a sampling transect. Only single samples were collected at mid-channel from the unnamed ditch. Surface water samples were collected just below the water surface. Background sample location SW-7 was collected first and subsequent sampling was performed from the most downstream location to the upstream locations. Surface water samples were collected prior to sediment sampling at each location. All sampling locations/transects were marked with stakes and surveyed to the state plane coordinate system for location.

Sample Handling and Analysis

All surface water samples were collected and handled in a manner consistent with the SAP. Each surface water sample was analyzed for the parameters listed in Table 2-1. Field measurements of pH, conductivity, dissolved oxygen, and temperature were collected at each of the three composite locations along sampling transects established for Crawford Creek. To help ensure the quality of the surface water data, a field rinsate blank and duplicate sample were collected.

2.2 Streambed Sediment Sampling

Objectives

Sediment samples were collected and analyzed to characterize sediment quality within the unnamed ditch and Crawford Creek, and determine the nature and extent of site-related constituents, if present.

Locations

A total of eleven sediment samples were collected and analyzed: four from the unnamed ditch and seven from Crawford Creek. Sampling locations are illustrated on Figure 2-1 and designated SD-5 through SD-15.

Equipment and Procedures

Unnamed ditch sediment samples were collected from the middle of the ditch's channel, using a dedicated stainless steel hand trowel. Sediment samples were submitted for chemical analysis from the 0- to 6-inch interval. In addition, samples at each ditch sampling location were collected from the 0- to 1-foot interval for field screening by HNU and visual observation. Sediment sampling locations within the unnamed ditch were biased toward likely areas of sediment accumulation.

Crawford Creek sediments were collected along a transect established across the creek at each sampling location. A sediment sounding pole was used to determine the depth of sediment across each transect. At three locations along each transect, a coring device was used to collect cores to depth, based on the bottom substrate and/or equipment limitations. The three cores were screened with an HNU meter and visually inspected. A sample from the 0- to 6-inch interval and 6 inches to the end of the core were collected for analysis from one of the three cores collected along the transect. The core selected for analysis was based on an elevated HNU reading or visual evidence of potentially site-related impacted sediment.

An additional three transects were established between locations SD-15 and SD-14 (ST-14/15), SD-14 and SD-13 (ST-13/14), and SD-11 and SD-10 (ST-10/11), where spacing between the sediment sampling locations was greatest (see Figure 2-1). At these transects, sediment depth/characteristics probing, HNU readings, and visual observation information were collected. All sediment sampling locations were staked in the field and surveyed to the state plane coordinate system.

The sediment samples submitted for chemical analysis were split and screened in the field for total polynuclear aromatic hydrocarbons (PAHs) with immunoassay test kits. The exceptions to this are the background samples from location SD-9 and location SD-8 (6 inches to end of core sample) due to insufficient quantity of sediment for the sample.

Sample Handling and Analysis

All sediment samples were collected and handled in a manner consistent with the SAP. Each sediment sample was analyzed for PAHs, phenolics, pentachlorophenol, tetrachlorophenols, arsenic, barium, cadmium, chromium, lead, total organic carbon, diesel range organics, and grain size (with the exception of locations SD-6A/B; SD-7A/B; and SD-8B), in accordance with the methods listed in Table 2-2. Two sediment samples were analyzed for those additional parameters listed on Table 2-2. To help ensure the quality of the sediment data, a field rinsate blank and duplicate sample were collected.

2.3 Ditch Bank Soil Sampling

Objectives

Ditch bank soil samples were collected and analyzed to determine the nature of the black material observed along the banks of the unnamed ditch.

Locations

Two ditch bank soil samples were collected and analyzed. The sample locations are illustrated on Figure 2-1 and designated DB-1 and DB-2.

Equipment and Procedures

Ditch bank soil samples were collected using a stainless steel hand trowel. The ditch bank soil samples were collected from the 0- to 6-inch interval. In addition, the ditch bank material was probed to help determine the extent of black material along the ditch's bank.

Sample Handling and Analysis

All ditch bank soil samples were collected and handled in a manner consistent with the SAP. Each ditch bank soil sample was analyzed for the parameters listed on Table 2-3.

2.4 On-Site Drainage Mapping

On-site drainageway mapping was performed to delineate on-site drainageways and their discharge points from the site. This was accomplished by performing a reconnaissance of the site and mapping drainageways and discharge points, with the aid of a site topographic map.

2.5 Physical and Historical Characterization

During the collection of surface water and sediment samples from the unnamed ditch and Crawford Creek, observations of physical characteristics were made and noted, in accordance with Section 6.0 of the SAP. These observations included:

- Stream channel width;
- Stream channel cross-section area;
- Sediment depth;
- Sediment color, based on the Munsell color notations;
- Qualitative description of surface water and sediment odor, if any;
- Sediment texture (i.e., clay, silt, sand, gravel, organic material, etc.);
- Presence or absence of visual oil/petroleum staining in the sediment matrix;
- Presence or absence of oil sheens on the water surface after bringing sediment samples up through the water column;
- Sediment description (i.e., structure, lenses, layering, plasticity, moisture content, etc.); and
- Presence of natural or artificial dams and obstructions (i.e., beaver dams).

In addition, efforts were made to collect available information regarding the unnamed ditch and Crawford Creek from the various state agencies (Hazardous and Solid Waste, Water Resources, and Fisheries), Koppers Industries, Inc. (regarding Outfall No. 001), and through a review of available literature.

3.0 PHYSICAL AND HISTORICAL CHARACTERIZATION

Both the existing physical conditions at the site and how they have varied during the years of plant operations likely affect the distribution of site-related constituents of concern in the off-site hydrographic net. In this section, field observations and measurements collected during the investigation are presented, the existing geology and environments of deposition are described, first by form and hydrography, and subsequently by the transport and depositional dynamics which affect sediment-borne constituent migration beyond the KII site.

3.1 Field Observations and Measurements

The following subsections present the results of field observations and measurements collected during the investigation.

3.1.1 Site Drainage

The results of on-site drainageway mapping, as described in Section 2.4, indicated that the majority of the site drains to the north- northwest and discharges from the site via Outfall 001 at the unnamed ditch. The site surface water hydrology is controlled by the site topography and channelization of surface water through man-made ditches to facilitate run-off from the treating plant property. In general, the topographic relief is localized and generally less than 10 feet in elevational change. Figure 3-1 illustrates the site topography and general direction of surface water flow, determined through a site reconnaissance conducted during the RFI activities. As illustrated on Figure 3-1, surface water is generally transmitted to the north, to discharge from the facility at Outfall 001. There are two other minor areas of the site with alternative surface water flow pathways. At the southeast portion of the site, the localized site drainage of approximately 5 acres is toward Outfall 004 and in the southwest portion of the site, the localized site drainage of approximately 3 acres is toward the south-southwest

As indicated in Section 2.5, efforts were made to collect historic information regarding Outfall 001 at the facility. This outfall from the facility represents the beginning of the unnamed ditch. Based on discussions with the facility manager on June 27, 1996 and Koppers Industries, Inc. corporate personnel on July 16, 1996, no information (e.g., flow rates, water quality, etc.) is available regarding this outfall.

3.1.2 Unnamed Ditch

During the collection of surface water and sediment samples within the unnamed ditch, observations and field readings were collected pursuant to the SAP. For surface water, temperature, dissolved oxygen, specific conductance, and pH measurements were collected. Additionally, surface water flow rate observations were made. For sediment, the depth of sediment, sediment texture and color, PID

readings, and observations of odor and visual observations while extracting the sediment cores were noted. Surface water sampling locations within the unnamed ditch include SW-5 and SW-6 (see Figure 2-1), and sediment sampling locations within the unnamed ditch include SD-5 through SD-8 (see Figure 2-1). Refer to Appendix A for supplemental photographic information.

Surface Water

Table 3-1 provides the results of temperature, dissolved oxygen, specific conductance, pH, and flow measurements collected from surface water sampling locations SW-5 and SW-6, within the unnamed ditch. As indicated on Table 3-1, the average temperature of the unnamed ditch is 20.2 degrees Celsius, the average dissolved oxygen content is 8.0 milligrams per liter (mg/l), the average specific conductance is 780.5 micromohs per centimeter (umhos/cm), the average pH is 9.19 (su), and the average flow velocity is 6 feet per minute (ft/min.).

Evaluation of this surface water information is inherently limited due to the intermittent and shallow nature of the unnamed ditch, which will naturally have great variability relative to these measurements over time at any one location and throughout it's length by natural processes (ambient air temperature and pressure, precipitation, flow, depth of water, erosion, etc.). Due to its intermittent nature and wide variability in water quality, the unnamed ditch would likely not support a viable aquatic community.

Sediment

Table 3-2 provides the results of sediment depth, texture, and color assessment; PID readings; and observations of odor or visual observations for sediment sampling locations SD-5 through SD-8, within the unnamed ditch. In general, the unnamed ditch sediment consists of organic material (detritus) or various relatively coarser-grained material (sand or gravel) deposited over a bottom fine-grained clay substrate. Observations of odor and PID readings above background were generally decreasing with distance from the site, for the sediment. Visual or odorous evidence of potentially site-related residuals was noted at all locations, except SD-8. Visual evidence of a sheen while collecting the sediment samples was noted generally at all locations (except SD-7). Table 3-3 provides a summary of grain size analyses for samples collected within the unnamed ditch (see Appendix B for the full grain size data package). As indicated, the material overlying the clay substrate is generally clay or clayey sand. Figures 3-2 through 3-4 depict general stream cross-sections and the depth of sediment measured in the unnamed ditch, at sampling locations SD-5 through SD-8 (with the exception of SD-7, which had a sand/gravel substrate). The depth of sediment was based on refusal of the hand-held sampling equipment, which was typically at an extremely tight clay. As illustrated, ditch sediment is relatively shallow, on the order of one-foot in depth or less, and somewhat uniform across the transect.

Observations

Table 3-4 provides a description of observations made while collecting samples within the unnamed ditch. These observations are keyed to the sediment sampling locations (see Figure 2-1). In general, the vegetative community types along the unnamed ditch reflect upland forest species, with riparian vegetation within and along the banks of the ditch. Aquatic observations were limited due to the intermittent nature of the unnamed ditch. Channel obstructions were limited to anthropogenic sources (culverts under a road and railroad tracks) and would likely have an influence on the transport and deposition of sediment.

3.1.3 Crawford Creek

As indicated in Section 2.5, efforts were made to collect information for Crawford Creek, including historic information regarding flood stage levels, average annual flow rates, and hydrodynamic properties of Crawford Creek. Appendix C is a compilation of notes available from the state Bureau of Solid and Hazardous Waste, Bureau of Water Resources Management, and Bureau of Fisheries regarding Crawford Creek. Pertinent characteristics to note from the state's records for Crawford Creek include:

- Limited fish species and game resources.
- An annual complete winter fish kill.
- A typical minnow creek, with a turbid water supply.
- Length - 6.20 miles
- Shore Length - 12.40 miles
- Direct Drainage Area - 8.45 square miles
- Hydrology - Intermittent to the Nemadji River
- Gradient - 25 feet per mile

Based on discussions with personnel from the Bureau of Solid and Hazardous Waste, little information is available from the state for Crawford Creek, due to its intermittent nature. There are no stream gaging stations located on Crawford Creek.

During the collection of surface water and sediment samples within Crawford Creek, observations and field readings were collected pursuant to the SAP. For surface water, temperature, dissolved oxygen, specific conductance, and pH measurements were collected; surface water flow rate observations were made as well. For sediment, the depth of sediment, sediment texture and color, PID readings, and observations of odor and visual observations while extracting the sediment cores were noted.

Surface water sampling locations within Crawford Creek include SW-7 through SW-11 (see Figure 2-1); sediment sampling locations within Crawford Creek include SD-9 through SD-15 (see Figure 2-1). Refer to Appendix A for supplemental photographic information.

Surface Water

Table 3-5 provides the results for temperature, dissolved oxygen, specific conductance, pH, and flow measurements collected from surface water sampling locations SW-7 through SW-11, within Crawford Creek. As indicated on Table 3-5, the average temperature of Crawford Creek is 22.3 degrees Celsius, the average dissolved oxygen content is 7.8 mg/l, the average specific conductance is 224 umhos/cm, the average pH is 9.08 su, and no flow was observed.

Evaluation of this surface water information is inherently limited, due to the intermittent and shallow nature of Crawford Creek and high sediment load. Crawford Creek will naturally have great variability relative to general water quality over time at any one location and throughout its length, by natural processes (ambient air temperature and pressure, precipitation, flow, depth of water, erosion, etc.).

Sediment

Table 3-6 provides the results of sediment depth, texture and color assessment; PID readings; and observations of odor or visual observations for sediment sampling locations SD-9 through SD-15 and observational transects ST-10/11, ST-13/14, and ST-14/15 within Crawford Creek. In general, Crawford Creek sediment consists of silt or organic matter overlying a clay substrate. Some coarser grained material (sand and gravels) is present at location SD-10. Table 3-7 provides a summary of grain size analyses for samples collected from Crawford Creek (see Appendix B for the full grain size data package). As indicated, the material overlying the clay substrate is generally described as clay. Observations of odor varied throughout Crawford Creek and PID readings were generally at background. Visual or odorous evidence of potentially site-related residuals was noted from location SD-10 to SD-12. Visual evidence of a sheen while collecting sediment samples was noted variously through location SD-13, but not beyond this location toward the Nemadji River. Figures 3-5 through 3-14 depict general stream cross sections and the depth of sediment measured within Crawford Creek, at sampling locations SD-9 through SD-15. The depth of sediment was based on refusal of the hand-held sampling equipment, which was typically at an extremely tight clay. As illustrated, Crawford Creek sediment ranges up to an approximate maximum three feet in thickness.

Observations

Table 3-8 provides a description of observations made while collecting samples within Crawford Creek. These observations are keyed to the sediment sampling locations (see Figure 2-1). In general, the vegetative community types along Crawford Creek reflect typical riparian vegetation of this area, dictated by the local geomorphology and hydrology. The number of observations of aquatic organisms

was limited due to the intermittent nature and high sediment load of Crawford Creek. Channel obstructions include the railroad grade and culvert, beaver dams, and downed trees, which would have an influence on the transport and deposition of sediment.

3.1.4 Ditch Bank Soil

During the collection of ditch bank soil samples, observations were made regarding the distribution of "black" stained soil along the unnamed ditch. The extent of stained soil extends from approximately 40 yards south of Hammond Avenue, to the approximate location of SD-6 (see Figure 2-1). Within this stretch, various thicknesses of weathered, stratified, visibly stained soils are observable along the banks of the ditch, from several feet above and to the bottom of the ditch (see Appendix A for additional photographic information). The extent of stained soil appears to be attributable to historic periods of higher flow within the ditch and/or erosion of the ditch channel to its current elevation. The soil had an odor and was of an "oily" nature. Grain size analyses could not be performed on the soil due to the "oily" nature of the material. Observations of terrestrial macroinvertebrates and extensive rooting in the stained soil were noted.

3.2 Physiography and Morphology

3.2.1 Physiographic Setting

The bedrock within the northwestern portion of Wisconsin immediately adjacent to Lake Superior is composed of geologic formations and structures associated with the Mid -continent Rift System which formed between 1.0 and 1.5 billion years ago. Locally, this area is referred to as the Keweenawan Area and consists of an approximately 65 kilometer wide belt of northeast/southwest trending folded and faulted layers of sandstones, volcanics, quartzites (metamorphosed sandstones and conglomerates), and shales bordered on either side by more durable granitic and/or metavolcanic rock (White, 1966). This material consists of successive layers of sand, clay, and gravel eroded from the surrounding upland areas and intermittent lava flows which upwelled from rifts in the earth's crust. These sediments and lava flows eventually filled the deep trough formed by the splitting or rifting of the crust. The topography of this area was most recently formed by a series of continental sized glaciers migrating back and forth from the north over the last two million years. These glaciers preferentially carved and scoured the relatively softer sand and clay units within the rift zone, accentuating much of the northeast/southwest trending topography in the area, including the Lake Superior basin.

The project site (including the unnamed ditch and Crawford Creek) is part of the Lake Superior Lowland physiographic province. Bedrock in this area consists of a flat surface of the Superior sandstones with lesser thicknesses of clay and conglomerates. Bedrock occurs at depths of about 100 to 200 feet beneath soft, reddish colored, fine grained sands and clays, which were deposited on the floor of an enlarged Lake Superior approximately 9,100 to 11,500 years ago. Locally, these lake

(lacustrine)* deposits are known as the "red clays." To the south, the Lake Superior Lowland is bounded by the northeast/southwest trending uplands of the Douglas Range which rise up to 350 feet above the Lake Superior lowlands. Bedrock of the Douglas Range is composed of lava flows which are more resistant to scouring of the Ice Age glaciers. In addition, the Douglas Range is bounded on the northwest and southwest by a series of parallel faults, suggesting the entire range may have also been uplifted by tectonic forces. Commonly, terraces of unconsolidated sand, gravel and clay can be found along the northern fault escarpment, marking the position and elevation of the former Lake Superior shoreline during the last Ice Age. It should be noted that the middle and upper portions of the Crawford Creek watershed extend into this northern escarpment area of the Douglas Range.

3.2.2 Hydrologic Setting

3.2.2.1 Drainage Network. Drainage from the KII facility passes through an unnamed ditch, and mingles with flows in Crawford Creek. The drainage area of Crawford Creek (length 6.20 miles) is approximately 8.45 square miles (WDNR, 1971); the drainage area of the unnamed ditch is unknown, but is probably less than 1 square mile. Approximately one mile below their confluence, Crawford Creek empties into the Nemadji River, which flows approximately 3.16 miles to Lake Superior. The drainage area of the Nemadji River above the USGS gage near South Superior, Wisconsin (near the confluence with Crawford Creek) is approximately 420 square miles (USGS, 1996). Other water bodies which may affect the fate and transport of sediment-borne constituents include: the pond just downstream from the facility ("Crawford Creek Pond"), ditches along the railroad, and various wetland and migration-belt depressions within the floodplain of Crawford Creek.

3.2.2.2 Precipitation. Mean annual precipitation in the region averages approximately 30 inches per year. Based on available records, it appears that precipitation is distributed with seasonal peaks in June and in late summer/early fall, with the early winter months of December and January being driest. Average monthly precipitation is shown in figure 3-15.

3.2.2.3 Recent Hydrologic History. Within Douglas County, Wisconsin, the USGS has maintained up to 16 stream gaging sites for a wide variety of periods. Daily and peak flow values are available for these gages. The most relevant gage is one on the Nemadji River, near South Superior, with data available from November 22, 1973, to the present.

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* Some of the red clays are truly lacustrine; others are glacially-compacted ground moraine derived from over-ridden lake clays.

Total annual flow values for the 1974 through 1995 period on the Nemadji River at the USGS gage near South Superior are presented on Figure 3-16. The mean annual flow for this gage during the available period of record is approximately 294,000 acre-feet (409 cfs). This equates to an annual area runoff ratio of almost 1.0 cfs per square mile. Average monthly flows (in cubic feet per second) are highest in April (1346 cfs) and lowest during January (80 cfs) (see Figure 3-17). These figures range from average runoff values of 3.2 to 0.19 cfs per square mile, respectively. Figure 3-18 presents the average monthly flows for the period October 1973 through October 1995. There are typically two major runoff periods each year: a larger and longer snowmelt event during the months of March through May and a second smaller and typically shorter autumn peak event during the fall months of September and October. The relatively larger annual runoff event in the spring is likely associated with snowmelt runoff and possibly rain or snow events. The early fall event is likely associated with rainfall events as this period corresponds to the annual high precipitation events seen in the long-term precipitation records and statistics. Thus, we may surmise that snowmelt processes may have a greater impact on runoff and geomorphic processes than precipitation events, given the greater magnitude and period of annual spring runoff events.

From available information, recent hydrologic events have included: relative droughts during at least 1974 through 1977, 1980, 1987 through 1990, and 1994 through 1995; floods or high flow events during water years 1978, 1983, 1986, and possibly 1993. Additionally, human activity has progressively altered the hydrology by ditch construction; diversions or dams in the watersheds of Crawford and Nemadji, dredging of the Nemadji mouth, modifications of ponds and lakes, fluctuations of lake levels.

3.2.2.4 Channel Geometry. Channel geometry may be best characterized as (a) the dimensions and attributes of the channel at bankfull discharge, and (b) width of the floodplain. Bankfull discharge, which commonly corresponds to the flow with an estimated recurrence of 1.5 to 2 years, is the flow at which self-forming (alluvial) channels typically begin to spill out over their floodplains. Many assessments of the magnitude and frequency of sediment transport are based on the duration of flows at or near bankfull. Most useful non-structural approaches to reconfiguring or restoring stream channels likewise are based in part on bankfull channel geometry and the associated equations which describe the curvature of meanders and stability of banks. Hack (1956) discusses bankfull flow in relation to pool depths and bank erosion for streams in the region, with more abbreviated discussions found in some of the more recent regional geomorphic studies (c.f., Knox and others, 1982).

Much of the unnamed ditch was cut into a pre-existing low drainage area, and the channel has partially naturalized over the years, at least to the extent that it has many properties of alluvial channels. Widths of 3 to 5 feet approximate bankfull width along the unnamed ditch, where bankfull depth is likely to be about 0.8 feet. Depth of sediment in pools is typically somewhat less than one foot (see Section 3.1). Data are presently insufficient to estimate the width of the geomorphically-active floodplain, but it appears to be about 20 to 40 feet wide at some locations.

Crawford Creek has a bankfull width of about 14 to 18 feet, generally increasing in the downstream direction. Bankfull depth appears to be about 2 to 2.5 feet. The width of the geomorphically active floodplain increases in the downstream direction, from about 200 to 400 feet at the mouth of the unnamed ditch, increasing markedly to about 1000 feet at the confluence with the Nemadji River.

3.2.2.5 Properties of the Bed and Banks. During the investigation, the banks and bed materials of the unnamed ditch and Crawford Creek were sampled pursuant to the SAP. General bed and bank conditions at the time of sampling were noted and vegetation, aquatic invertebrates, and other attributes were described (see Section 3.1). Sampling and related probing indicated that bed sediments commonly approach 1 foot in depth within the unnamed ditch, and about 1.5 to 2 feet in Crawford Creek, with occasional observations of up to 3 feet of thickness. Mechanical analyses of the samples was performed by sieving and by hydrometer. The proportions (by dry weight) of each sample composed of gravel, sand, silt and clay (plus colloids) was determined.

The mechanical analyses (Tables 3-3 and 3-7- summary of sediment grain-size analysis) reflect the clayey and silty nature of the local red-clay soils, derived from glacial-lake sediments. Based on the pairs of samples collected at the two locations (SD-05 and SD-08) along the ditch and seven locations SD-09 through SD-15) in Crawford Creek, the results indicate or suggest that:

- The sediments show a bi-modal distribution in their content of clay, containing either moderate (24 to 35 percent by weight) or high (45 to 60 percent) clay content;
- The sample collected from the 0- to 6-inch depth almost universally contains less clay (and generally more sand) than the sample drawn from 6 inches to the end of the core;
- Samples from the lower reaches of Crawford Creek (SD-13 through SD-15) are quite uniform, with clay contents varying only from 24 to 32 percent.

The sandier sediments with a moderate clay content are interpreted to be relatively mobile bed sediments, mostly originating in the upper and middle portions of the Crawford Creek watershed and in transit to the Nemadji River. The bed sediments with high clay content are seen to be of more local origin, and in some cases may simply be intact Douglas Till, which forms the bed of the ditch and the creek. The clayier sediment are more cohesive and less mobile, and (over a given period of years) are substantially less likely to be transported downstream. The two types of sediment do mix, and should be seen as end members, rather than true "populations." Nonetheless, the sandier bed materials are more immediately exposed to the current and probably move through the ditch and Crawford Creek at rates perhaps an order-of-magnitude more rapidly than the clayier sediments.

There are probably two primary reasons why the sediments from the lower reaches of Crawford Creek are relatively uniform. First, storage is much greater, with the floodplain widening by a factor of 10 as Crawford Creek approaches the confluence. Similarly, the railway embankment, beaver dams, and other factors help retain sediment in this reach. Second, much of the sediment load of Crawford Creek is deposited in this reach during times when water levels in the Nemadji River are high, creating a temporary backwater, which likely prevails as much as half of the time that high rates of sediment transport are occurring in Crawford Creek. Hence, the composition of bed material in this reach is a reasonable characterization of the sandier, moderate-clay content sediments preferentially transported by Crawford Creek. As this coarser material is deposited, it dilutes the finer-grained sediments originating in the lower portions of the watershed, including from the unnamed ditch.

3.3 Hydrologic and Geomorphic Processes

3.3.1 Sediment Sources

Review of field summaries and photographs collected during the investigation indicate that the principal sediment sources in the watersheds of the unnamed ditch and Crawford Creek are red to brown, organic-rich clay, with lesser amounts of silt, sand, and gravel. This material is consistent with descriptions of the Late Pleistocene aged "red clay" lacustrine deposits within the Lake Superior Lowlands. These deposits are recognized as being erodible when disturbed, when sediment yields of about 500 tons per square mile annually may be expected (Batten and Hindall, 1980). Also likely to be significant sediment sources are eroding banks of the two streams and their tributaries (Rose and Graczyk, 1996), which appear to be composed in large part of previously-eroded and -deposited red clays, based on photographs and other qualitative descriptions.

Lesser amounts of sediment are contributed by the various pitted tills, moraines, paleo-lake terrace deposits, and small areas of glacially-scoured bedrock in the upper watershed of Crawford Creek. Based on regional syntheses, rates of erosion in these areas are typically in the range of 10 to 40 tons per square mile per year (Hindall and Flint, 1970; Batten and Hindall, 1980), more than an order of magnitude lower than those reported for the red clays. In this upper portion of the Crawford Creek basin, the sandier soils are thought capable of sustaining present-day timber harvests with little or no change in erosion rates based on work performed on similar parent materials in Bayfield County by recognized researchers (Spangenberg and McLennan, 1983).

3.3.2 Sediment Transport

While relatively little systematic sediment-transport work has been conducted in streams along the southern Lake Superior shore, some general guidelines and values may be inferred.

3.3.2.1 Regional Erosion and Transport Rates. Hindall and his co-workers have estimated regional rates of erosion to range from about 500 tons per square mile per year in red clays, to about 20 to 40 tons per square mile per year in the gravel moraines of the middle and upper watershed. Rates in end morainal material and other related glacial deposits at the very head waters of Crawford Creek are thought to be less than 10 tons per year per square mile.

Data from the White River watershed in Bayfield County suggest sediment-transport rates of about 0.2 tons per day (tpd) per square mile during maximum snowmelt, and values of perhaps 0.03 to 0.1 tpd/square mile at other times during the summer. Higher rates may occur during storms (see Rose and Graczyk, 1996, for the nearby North Fish Creek study).

3.3.2.2 Dynamic Sediment Transport Rates. Suspended-sediment concentrations of about 90 milligrams per liter (mg/l) prevail during periods of moderately high flows (corresponding to about half of the two-year peak flows), and 15 mg/l during periods of low to normal flow (Batten and Hindall, 1980). In the White River study, approximately 80 percent of the suspended sediment consisted of silts and clays (finer than 0.0625 mm) both upstream and downstream of a small run-of-the-river hydroelectric reservoir. Similar distributions are reported from portions of the North Fish Creek basin, although sand constituted more than half of the sediment load downstream from eroding banks or incising tributaries. Bedload sediment appears to be a small fraction of total sediment yield, probably less than 10 percent, and perhaps substantially less, based on the limited data from the White River study and photographs of the sediments collected during the field investigation.

Sediment transport commonly increases exponentially with streamflow. For example, Crawford Creek might be expected to transport four times as much sediment at flows of 200 cubic feet per second (cfs) as it moves at 100 cfs. The relation describing sediment transport as a function of streamflow is known as a "sediment-rating curve." Such relations have been developed for streams in Bayfield County (Rose and Graczyk, 1996) and adjoining areas in Minnesota (Tornes, 1986), and are likely to prove applicable to at least selected portions of the Crawford Creek watershed. Using such relations, it will be possible to estimate the rate of sediment in transport in Crawford Creek at most flows, to compare with estimated discharge of sediment or sediment-borne constituents from the facility or from the unnamed ditch. These relations can also be applied to quantify likely distance of travel during a particular storm event, and (when combined with the hydraulic geometry relations) to probable distance of transport during an actual or synthetic sequence of storm events. They also show that sediment rates can be reduced if peak flows can be attenuated within the watershed of the unnamed ditch and Crawford Creek.

3.3.3 Channel Changes Over Time

Channel changes include migration rates, and the extent to which channels aggrade and downcut, as well as any changes in course (meander cutoffs, human channelization, or avulsion). Channel change

is an important process in watersheds along the southern shore of Lake Superior because much of the sediment load is associated with bank retreat, cutting of new channels, and/or changes in the amount of mobile sediment temporarily stored on the bed (Batten and Hindall, 1980). Similarly, channel change can result in streams moving away from formerly-contaminated segments, with the constituents then being largely immobilized in fine-grained alluvium.

4.0 CHEMICAL ANALYTICAL CHARACTERISTICS

The following subsections present a discussion of the analytical results for surface water, sediment, and ditch bank soil samples collected during the site investigation. A full listing of the validated analytical data is included within this section as data tables. Note that throughout this discussion, the use of a J following a concentration value indicates the value to be estimated. The distribution of the primary wood treating constituents (pentachlorophenol and polynuclear aromatic hydrocarbon compounds) of interest are provided on Figures 4-1 through 4-3 for the various media.

A copy of the chain-of-custody records for the sample results discussed in this section are included in Appendix D. Attainment of the data quality objectives was evaluated through a full validation of the analytical data, per the Quality Assurance Project Plan (Groundwater Technology, June 1995). A copy of the validation letters associated with the data set are included in Appendix E.

4.1 Surface Water

Surface water samples were collected from seven locations as part of the investigation. Two locations were within the unnamed ditch and five locations were within Crawford Creek (see Figure 2-1). Samples were analyzed for pentachlorophenol/tetrachlorophenols by Keystone Method 589, polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8310, and acid extractable phenolics (AEPs) by EPA Method 8270.

Pentachlorophenol/Tetrachlorophenols

Pentachlorophenol was detected in one sample of the seven locations sampled (see Table 4-1 and Figure 4-1). The detected pentachlorophenol concentration was found in the sample from location SW-05, at a concentration of 1.1 micrograms per liter (ug/l). Location SW-05 is within the unnamed ditch and the closest location to the plant sampled. There were no detections of the tetrachlorophenols.

Polynuclear Aromatic Hydrocarbons

For the PAHs (see Table 4-2 and Figure 4-1), total detected PAHs were found at relatively low levels in samples from five of the seven locations. Detected total PAH concentrations ranged from 0.044 ug/l in the sample from location SW-10, to 5.022 ug/l in the sample from location SW-06. The farthest downstream sample location, SW-11, had no detections of PAH constituents, as did the background location sample, SW-07. The relatively highest detected levels of total PAHs were within samples from the unnamed ditch, at locations SW-05 and SW-06.

Acid Extractable Phenolics

No AEP compounds were detected in samples from the seven locations (see Table 4-3).

Evaluation of the Surface Water Data

As an initial evaluation of the surface water data, the detected constituent data are compared to background location SW-07. The pentachlorophenol concentration of 1.1 ug/l at location SW-05, within the unnamed ditch; and the total PAH concentrations at locations SW-05 (3.05 ug/l) and SW-06 (5.022 ug/l) within the unnamed ditch, and locations SW-08 (0.133 ug/l), SW-09 (0.263 ug/l), and SW-10 (0.044 ug/l) within Crawford Creek exceed the background concentrations for the respective constituents.

To provide further preliminary assessment of the surface water data, the data are compared to the following available criteria or guidance:

- EPA Ambient Water Quality Criteria;
- Surface Water Quality Criteria for Toxic Substances, Chapter NR 105, Wisconsin Department of Natural Resources;
- EPA Great Lakes Water quality Initiative Criteria Documents for the Protection of Aquatic Life in Ambient Water, 1995;
- Water Quality Benchmarks, Oak Ridge National Laboratory, 1995.

The mean concentration of each analyte was used for screening the constituents that may be identified as constituents of potential ecological concern (COPEC). If a constituent was not detected in samples from any of the six site locations (not including background location SW-07), the concentrations reported as "not detected" were included at one-half the reporting limit.

Due to the paucity of available criteria for PAHs, the detected concentrations were primarily compared to the background concentrations. The analyses, however, demonstrated that the surface water samples had no detectable concentrations above the reporting limits, except for pentachlorophenol and eight PAHs. Among the PAHs, acenaphthene exceeded the background concentration, but was within the water quality benchmark of 1.3 ug/L. Similarly, benzo(a)pyrene exceeded its background concentration, but was within the surface water quality criterion of the Wisconsin Department of Natural Resources (0.03 ug/L). Anthracene was detected only at location SW-06 (0.15 ug/L), but did exceed the water quality benchmark of 0.027 ug/L. Indeno(1,2,3-cd)pyrene, dibenzofuran, fluoranthene, benzo(b)fluoranthene, and benzo(k)fluoranthene were above background concentrations, but do not have any available water quality values. The detected concentration of pentachlorophenol (1.1 ug/L) was below the screening concentration of 63.11 ug/L established in the Great Lakes Water Quality Initiative (EPA, 1995).

Based on the analytical data, the COPECs, which would need to be assessed further due to a lack of criteria for comparison or an exceedance of available criteria for surface water are the PAH compounds

indeno(1,2,3-cd)pyrene, dibenzofuran, fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, and anthracene.

4.2 Sediment

Sediment samples were collected from 11 locations as part of the investigation. Four locations were within the unnamed ditch and seven locations were within Crawford Creek (see Figure 2-1). The sediment samples were collected from two intervals at each location, from the 0-to-0.5 foot interval and from 0.5 foot to the end-of-core. Samples were analyzed for pentachlorophenol/ tetrachlorophenols by Keystone Method 589, PAHs by EPA Method 8310, AEPs by EPA Method 8040, Metals by EPA Method 6010, miscellaneous constituents and TCLP by various methods.

Pentachlorophenol/Tetrachlorophenols

For the 0-to-0.5 foot sediment samples, pentachlorophenol was detected in samples from seven of the 11 locations (see Table 4-4 and Figure 4-2). Detected pentachlorophenol concentrations ranged from 0.020 milligrams per kilogram (mg/kg) in the sample from location SD-07, to 0.530 mg/kg in the sample from location SD-08. Pentachlorophenol was not detected in samples from the last three locations in Crawford Creek prior to the Nemadji River (SD-13, SD-14, and SD-15) and the background location SD-09. There were no detections of the tetrachlorophenols in the 0 to 0.5 foot sediment samples.

For the 0.5 foot to end-of-core sediment samples, pentachlorophenol was detected in samples from five of the 11 locations (see Table 4-4 and Figure 4-3). Detected pentachlorophenol concentrations ranged from 0.024 mg/kg in the sample from location SD-13, to 0.220 mg/kg in the sample from location SD-12. Pentachlorophenol was not detected in samples from the last two locations in Crawford Creek prior to the Nemadji River (SD-14 and SD-15), locations SD-06, SD-07, SD-08, SD-11, and the background location SD-09. The tetrachlorophenols were detected only in the sample from location SD-12, at a concentration of 0.048J mg/kg.

Polynuclear Aromatic Hydrocarbons

For the 0-to-0.5 foot sediment samples, total PAHs were detected in samples from all 11 locations (see Table 4-5 and Figure 4-2). Detected total PAH concentrations ranged from 4.810 mg/kg in the sample from background location SD-09, to 2,013 mg/kg in the sample from location SD-07. The detected PAHs within the top six inches of sediment are widely distributed throughout the sampling locations, without a discernable trend.

For the 0.5 foot to end-of-core sediment samples, total PAHs were detected in samples from all 11 locations (see Table 4-5 and Figure 4-3). Detected total PAH concentrations ranged from 0.391 mg/kg in the sample from location SD-07, to 5,782 mg/kg in the sample from location SD-12. Samples from the last two locations within Crawford Creek prior to the Nemadji River (SD-14 and SD-15) had total

PAH concentrations less than the background location SD-09. The highest levels of detected PAHs were from sampling locations SD-11 and SD-12. Location SD-11 is just prior to Crawford Creek pond and location SD-12 is within Crawford Creek pond. Both of these locations showed visible evidence of potentially site-related residuals within the intervals sampled (see Table 3-6). This area appears to be a depositional area for the sediment borne PAHs, likely attributable to the railroad grade structure.

Acid Extractable Phenolics

The AEP compounds were only detected in one of the 11 samples collected from the 0-to-0.5 foot interval (see Table 4-6). The sample from location SD-10 had detected concentrations of 2,4-dinitrophenol (2J mg/kg), 4-chloro-3methylphenol (0.200J mg/kg), 2,6-dichlorophenol (0.078J mg/kg), 2,4,5-trichlorophenol (0.290J mg/kg), 4-nitrophenol (3.5J mg/kg), and 4,6-dinitro-2-methylphenol (0.940J mg/kg).

For the 0.5 foot to end-of-core sediment samples, AEP compounds were detected in samples from two of the 11 locations. The sample from location SD-06 had detected concentrations of 2,4-dinitrophenol (82.1 mg/kg), 4-chloro-3-methylphenol (7.61 mg/kg), 2,6-dichlorophenol (6.08 mg/kg), 2,4,6-trichlorophenol (5.14 mg/kg), 2,4,5-trichlorophenol (21 mg/kg), 4- nitrophenol (112 mg/kg), and 4,6-dinitro-2-methylphenol (72 mg/kg). The sample from location SD-11 had a detected concentration of 4-nitrophenol only, at a concentration of 42 mg/kg.

The AEPs are limited in their distribution. The relative importance of these compounds within the sediment data set presented should be viewed in light of the AEPs limited distribution and presence, persistence, and potential toxicity.

Other Analyses

Other analyses include various metals (Table 4-7), miscellaneous methods (Table 4-8), and TCLP analyses (Table 4-9). For the metals, lead, arsenic, barium, cadmium, and chromium were collected from all 11 locations as potentially site-related constituents. As indicated in Table 4-8, lead, arsenic, and cadmium were not detected in any sample, and the detected barium and chromium concentrations were found at concentrations similar to the sample from the background location, (SD-09).

The miscellaneous methods include analyses for TOC and diesel range organics. Concentrations of these constituents are provided in Table 4-8. TOC is used to assess potential fate and transport issues associated with sediment borne constituents and available organic carbon. The percent TOC expressed in grams per 100 grams of sediment is 1.8% for the top six inches of the sediment, at background location SD-09. This represents a relatively high organic carbon percentage, which would be available to sorb the organic constituents. The diesel range organics are a general scan for the organic constituents, which can be associated with many sources, potentially including fuel oils used as a carrier for the wood treating constituents at the site. No criteria are available to assess diesel range organics, which would render these results of little significance, in comparison to the site-specific constituent results. Diesel range organics were detected at concentrations ranging from 210 mg/kg in

the sample from location SD-05 (0- to 6-inch interval) to 25,000 mg/kg in the sample from location SD-06 (0.5- to end-of-core interval). Diesel range organics were not detected in samples from the background location (SD-09), or from the last two sample locations prior to the Nemadji River (SD-14 and SD-15).

The miscellaneous methods (Table 4-8) were analyzed in samples from location SD-06 and SD-10 as a representative sample from each of the unnamed ditch and Crawford Creek. These analyses are used to assess the potential for natural recovery within the sediments.

Natural attenuation of constituents in sediment consists primarily of biodegradation and sorption mechanisms. Of these, biodegradation was evaluated by measuring specific parameters which relate to the ability of indigenous microorganisms to biodegrade the constituents. Since the constituents of interest are known to degrade under both aerobic and anaerobic conditions, various parameters were examined.

Nutrients

Nutrient concentrations were measured and compared to the amount of organic carbon present to determine if the appropriate concentrations of nutrients were present in sediment. The primary nutrients for biological activity are nitrogen and phosphorous. Comparing these to the organic carbon concentrations, typical carbon:nitrogen:phosphorous (C:N:P) ratios are 100:5:1. The ratios calculated from the four sediment sampling locations are approximately:

SD-06 (0.5)	C:N:P	106:2:1
SD-06 (1.0)	C:N:P	116:2:1
SD-10 (0.5)	C:N:P	632:15:1
SD-10 (1.0)	C:N:P	232:12:1

These data indicate that at location SD-06, available nitrogen may be slightly limited and that at SD-10, phosphorous may be limiting. Additional data on ammonia nitrogen (a readily available form of nitrogen) were inconclusive, since the detection limits for this parameter were elevated. However, leachable nitrite concentrations were present suggesting that nitrogen may be available for the indigenous microorganisms present in sediment.

Electron Acceptors

Electron acceptors include oxygen, nitrate, sulfate, and possibly iron. Dissolved oxygen is the preferred electron acceptor for aerobic biodegradation. However, in sediments, anaerobic biodegradation is more likely. The primary electron acceptor for anaerobic biodegradation is nitrate. The nitrate concentrations (measured as nitrate-nitrite) ranged from 560 mg/kg to 670 mg/kg, indicating that sufficient nitrate may be available for biodegradation to occur.

After nitrate has been depleted by the microorganisms, sulfate may be used as an electron acceptor to continue anaerobic biodegradation. The sulfate concentration was consistently below the detection limit of 10 mg/kg. These data indicate that the levels of sulfate present in sediment are not sufficient to allow sulfate reduction to occur.

In some cases, ferric iron (Fe^{+3}) is used as an electron acceptor during anaerobic biodegradation of constituents. During this process, ferric iron is reduced to ferrous iron (Fe^{+2}). The data collected show that there are substantial iron concentrations ranging from 24,400 mg/kg to 36,883 mg/kg which indicates that ferric iron may be available, although no distinction between ferric and ferrous iron can be made with this data.

Other Parameters

pH: The leachable pH of the sediment ranged from 6.0 to 6.6 units. Microorganisms generally prefer pH values varying from 6 to 8 standard units. Therefore, these values are within the acceptable range for biodegradation to occur.

Calcium, Iron, Magnesium, Manganese, Potassium: These are general soil (sediment) quality parameters that may be used to evaluate trace nutrients or to determine the general consistency of the sediments. All of these parameters are within typical values expected for sediment of this type and do not pose any constraints for addressing these sediments. In addition, these values fall below any inhibitory levels for biodegradation to occur.

TCLP: TCLP analyses (Table 4-9) were performed to assess the potential leaching of site-related constituents under a landfill type scenario. These results do not reflect the leaching of the constituents under field conditions. The TCLP test is an aggressive, low pH, zero head space evaluation for disposal option assessment only.

Evaluation of the Sediment Data

As an initial evaluation of the sediment data, the detected constituent concentrations are compared to background location SD-09. In addition, the sediment data were compared to the sediment screening criteria established by the National Oceanic and Atmospheric Administration (NOAA) document entitled The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program (Long and Morgan, 1990). Specifically, the effects range low (ER-L) was utilized (see Table 4-10), which represents the lower 10th percentile of the data observed or predicted to be associated with adverse biological effects. The NOAA criteria apply to the PAH compounds only. While other criteria exist for comparison to the PAH compounds, this criteria was selected as representative for screening purposes. For pentachlorophenol, the State of Washington Sediment Management Standards (December 1995) are based on the apparent effects threshold (AET), which is defined as the concentration of a single chemical in sediments above which a particular biological effect has always been observed.

This comparison was performed for the samples collected from the first six inches of the sediment, which is standardly recognized as the biologically active zone for sediment ecological assessment. Based on the data, the primary constituents compared were the PAHs and pentachlorophenol. In general, the detected PAH compounds were found above the background concentrations. In comparison to the listed criteria, all locations, including the background location (SD-09), exceed the ER-L criteria for the various PAH compounds.

For pentachlorophenol, all locations, except the closest to the confluence with the Nemadji River exceeded the background of not detected. As indicated, locations SD-13, SD-14, and SD-15 did not have detected concentrations of pentachlorophenol. In comparison to the available criteria of 360 mg/kg (AET), only locations SD-06 and SD-08 within the unnamed ditch exceeded the criteria.

4.3 Ditch Bank Soil

Ditch bank soil samples were collected at two locations along the unnamed ditch as part of the investigation (see Figure 2-1). Samples were analyzed for pentachlorophenol/tetrachlorophenols by Keystone Method 589, PAHs by EPA Method 8310, AEPs by EPA Method 8040, and TOC by EPA Method 9060.

Pentachlorophenol/Tetrachlorophenols

Pentachlorophenol was detected in both samples DB-01 and DB-02, at concentrations of 87J mg/kg and 100J mg/kg, respectively (see Table 4-11 and Figure 4-3). The tetrachlorophenols were not detected at either location.

Polynuclear Aromatic Hydrocarbons

Total PAHs were detected in both samples DB-01 and DB-02, at concentrations of 133 mg/kg and 90.7 mg/kg, respectively (see Table 4-12 and Figure 4-3).

Acid Extractable Phenolics

No AEP compounds were detected in either sample DB-01 or DB-02 (see Table 4-13).

Total Organic Carbon

Total organic carbon was detected in both samples DB-01 and DB-02, at concentrations of 220 mg/kg and 330 mg/kg, respectively (see Table 4-14). Total organic carbon analyses were performed as a tool to help assess the fate and transport of the site-related constituents.

Evaluation of the Ditch Bank Soil Data

In general, the reporting limits for the PAHs were extremely high due to the high concentrations of PAHs in the samples. Benzo(a)pyrene, benzo(a)anthracene, anthracene, and benzo(b)fluoranthene were the only analytes with quantifiable concentrations. The remaining PAHs and AEPs were reported

as "non-detect" but had high reporting limits. Therefore, the detected PAHs and pentachlorophenol are the only compounds evaluated for the ditch bank soil. There is no complete exposure pathway from constituents detected in the ditch banks to aquatic or benthic receptors, due to the level of water in the ditch and the lack of receptors. A more likely exposure is to the residents who may occasionally go to the area of the unnamed ditch. This scenario is equivalent to a trespasser scenario. In order to address this potential issue, the potential risk due to exposure of a hypothetical resident to detected concentrations of PAHs and pentachlorophenol in the ditch bank samples was evaluated as a screening step in evaluating the data.

Table 4-15 presents the calculated risk due to exposure to the ditch bank soils. The hypothetical receptor may be an adult or child who resides near the ditch and who goes to the area twice a week for 52 weeks a year. The results indicate an acceptable potential risk for the potential carcinogens of 4.0×10^{-5} and hazard index for the non-carcinogenic effects associated with pentachlorophenol of less than one (9.6×10^{-2}). The results of the risk calculations indicate that there is no potential risk or hazard due to exposure to the ditch bank soils. Benzo(a)pryene is the only PAH that was evaluated since it is the most toxic among the PAHs and has a quantifiable concentration. If the risk estimates due to exposure to benzo(a)pyrene demonstrate an acceptable level of risk, then it may be assumed that there is no potential adverse health effects due to exposure to the other PAHs.

4.4 Field Screening Data Evaluation

Sediment and ditch bank soil samples collected from the unnamed ditch and Crawford Creek were analyzed using EPA Method 8310 and the EnSys PAH RIS® Soil Test. In addition to characterizing the PAH concentrations in this area, the comparative analytical testing was performed to confirm that the EnSys test kits provide the accuracy needed to characterize a site.

The EnSys test kit serves as a field-based alternative to sending all soil samples for analysis by laboratory-based methods. It is a semi-quantitative test that gives an absence/presence indication at specific detection levels. The EnSys test exhibits broad recognition of three, four, and five ring PAHs. Consequently, creosote-related PAHs respond very well to the EnSys test kits.

According to EnSys, product validation studies have indicated that the test can correctly identify over 95% of samples that are spiked with PAHs at or near the chosen action level. The recovery of PAH compounds from spiked soils was independent of the soil used. Three different types of soils gave identical results.

For the investigation, 24 samples were collected from 13 sampling locations (both sediment and ditch bank soil). Twenty of those samples were analyzed using both methods. The Method 8310 and EnSys results are presented in Table 4-16. Fourteen of the 20 samples have EnSys test results that are confirmed by Method 8310. Three of the six remaining results (SD-10B, SD-14A and SD-14B) have

Method 8310 results that are approximately equal to the EnSys test result, especially when one considers the analytical variability, the acceptable relative percent difference of an analytical method and split sample results (a relative percent difference of 35 to 50 percent is typical).

Essentially, 17 of the 20 EnSys samples are confirmed as accurate by Method 8310. A binomial probability test may be used to determine if this number of "correct" samples is sufficient to conclude that the EnSys test is accurate. If having an EnSys test result confirmed by Method 8310 is considered a "success," then the probability of obtaining a specific number of successes in a certain number of trials is defined by

$$P(x) = (n,x) \cdot p^x \cdot q^{n-x}$$

where

P(x)	=	the probability of obtaining x successes in n trials
p	=	the probability of a success in each trial
q	=	the probability of a failure in each trial (1-p).
(n,x)	=	the binomial coefficient.
n	=	the number of trials
x	=	the number of successes

The binomial coefficient is defined by the relation:

$$(n,x) = n! / [\, x! \, (n - x)! \,]$$

Binomial coefficients are provided in statistical tables to eliminate the need for manual calculation.

Using the binomial test, the number of "successes" that are required to be confident that the EnSys tests are accurate can be determined. Lotus 1-2-3® provides the means to make that determination. For twenty trials (n = 20), a 95% probability that the EnSys test is correct (p = 0.95) and a level of confidence of 99%, i.e. the test is correct 99% of the time and there are only false positives 1% of the time, 16 of the 20 samples need to be "successes." Seventeen of the samples collected can be regarded as "successes." Therefore, the EnSys tests provide an adequate level of confidence for delineating the site for PAHs.

5.0 DATA EVALUATION

The information presented in Sections 3.0, physical characteristics, and 4.0, chemical characteristics, is evaluated herein to provide a conceptual evaluation of the site.

5.1 General Evaluation

This evaluation focuses on the sediment portion of the study. In general, assessment of the surface water data indicated little impact at the time of sampling. Evaluation of general surface water quality should be viewed in the context of the potential need for remedial activities related to the sediment. Surface water would not be the focus of a remedial activity, but rather be viewed as a potential pathway of transport for dissolved, sediment sorbed or entrained constituents, during periods of increased flow. To focus the evaluation of the data, two general objectives have been established for the study.

- Assess the potential for exposure and, if necessary, develop action levels for site-related constituents in sediments, to determine if remedial activities are required for any areas of the unnamed ditch or Crawford Creek.
- Identify hydrologic/geomorphic site-specific processes which may affect the mobility of sediment borne or entrained constituents, such that an assessment can be made of the need to develop approaches to reduce constituent mobility or to reduce the potential for exposure to constituents.

The goal will be to evaluate the need to restore, relocate, or naturalize the unnamed ditch and Crawford Creek drainageways. Key components to consider are: 1) the potential bioavailability of site-related constituents in sediment; 2) the mass loading of site-related constituents in sediment and sediment storage in the various chambers of the study area (beds, ponds, banks, etc.) and 3) the ratio of site-related constituents in sediment contribution from Crawford Creek versus the Nemadji River sediment load.

To further evaluate the data, a general understanding of the primary wood treating constituents of interest has been considered.

PAHs:
The majority of PAHs entering aquatic environments remain close to sites of deposition. In water, PAHs may either evaporate, disperse into the water column, become incorporated into bottom sediments, concentrate in aquatic biota, or undergo chemical oxidation and biodegradation. Most PAHs in aquatic environments are associated with particulate matter. High organic carbon content, such as that noted for the local sediments, enhances sorption of PAHs to sediment. PAHs dissolved in the water column will degrade rapidly through photo oxidation.

The ultimate fate of PAHs that accumulate in sediments is biotransformation and biodegradation by benthic organisms. In general, toxicity of PAHs increases as molecular

weight increases and with increasing alkyl substitution on the aromatic ring. However, due to the availability of the lower molecular weight PAHs within the sediment pore water, these compounds reportedly may demonstrate a higher potential for toxic effects to benthic and aquatic organisms. The ecological impact of PAHs is inconclusive.

Pentachlorophenol

Degradation and transformation of pentachlorophenol was documented in freshwater streams continuously dosed with pentachlorophenol for 16 weeks. Photooxidation accounted for a 5% to 28% decline in initial pentachlorophenol concentrations and was most rapid at the water surface, under conditions of bright sunlight. Adsorption to sediments and uptake by biota accounted for less than 5% loss in acclimated waters. The half-life of pentachlorophenol in water ranged from 0.15 to 15 days. The short residence time of pentachlorophenol in an aquatic system before degradation suggests that biological effects would be most pronounced in localized areas that receive pentachlorophenol continuously from a point source. A maximum pentachlorophenol concentration of 3.2 ug/l has been shown to be protective of most aquatic species (U.S. Department of Interior, 1989).

The sampling activities suggest elevated levels of PAHs and pentachlorophenol in the sediments and ditch bank of the unnamed ditch, and sediments along Crawford Creek, but considerably lower concentrations prior to Crawford Creek's confluence with the Nemadji River. Concentrations of PAHs and pentachlorophenol that may reach the Nemadji River will undergo significant dilution, due to the high flow rate and sediment load of the river. The Nemadji River runs through an area of northern Minnesota and Wisconsin characterized by heavy red clay soil. These clay deposits, left by the retreating glaciers, are 50 to 200 feet deep. They are highly erosive and prone to slumping, in which large blocks of soil break from the banks and collapse into the river. It is estimated that more than 50% of the sediment dredged from the Duluth/Superior harbor each year comes from the Nemadji River (Soil Conservation Service, Nemadji River Basin Project).

There is still no consensus on the ecological significance of sediment contamination within the scientific community. Sediment is a matrix of materials and can be relatively heterogeneous in terms of its physical, chemical, and biological characteristics. Fine sediments (silts and clays) increase the likelihood of sorption of contaminants. The sediments in the study area have been characterized to be primarily clay. There are 3 potential pathways for contaminants to reach benthic or aquatic organisms: the sediments themselves, the overlying water, and the interstitial (pore) water. Although sediments might contain relatively high concentrations of compounds, this does not necessarily lead to adverse effects on organisms living in the sediments. The sorptive behavior of the contaminants affects bioavailability and toxicity. Organic contaminants bound to sediment organic carbon will generally not be bioavailable. Additionally, the organic constituents are prone to both aerobic and anaerobic biodegradation, potentially resulting in natural recovery.

5.2 Site-specific Evaluation

In conjunction with the objectives and goals of the study, and the behavior of the primary wood treating compounds of interest in the environment, the following summary has been developed.

Unnamed Ditch

For the unnamed ditch, site-related constituents and residuals are found within the ditch and along the ditch bank in certain locations. Due to the intermittent nature of the unnamed ditch, it would not support a viable benthic or aquatic community, and from a risk evaluation, would be considered a soil. Both the ditch and ditch bank soils are limited with regard to access, due to their remoteness, and a conservative screening analysis of the ditch bank soil indicated that human health risk would not be posed by exposure to the ditch bank soils, nor consequently by the ditch bottom soils, which demonstrated generally lower concentrations of constituents than the ditch bank soils. With regard to the general objectives and goals, the ditch should be evaluated further relative to the potential far-field transport of the constituents found within the ditch sediment and ditch bank soil. Identification of site-specific hydrologic or geomorphic processes which may affect the mobility of sediment borne or entrained constituents should be considered, such that an assessment of approaches to reduce constituent mobility can be developed, if necessary to be protective of a viable receptor.

Crawford Creek

The intermittent nature of Crawford Creek is not likely to support a significant benthic or aquatic community. This was documented in a survey conducted in 1985 by personnel from the Wisconsin Department of Natural Resources. The report documents that the Creek is intermittent to the Nemadji River and that there is a complete annual winter fish kill. The Creek was classified as a typical minnow creek, with a turbid water supply.

The high organic carbon content of the sediments (1.8%) in Crawford Creek and the clayey nature of the sediments collectively support the likelihood that the PAHs will remain sorbed to the sediments and sediment-sorbed or entrained pentachlorophenol will not be mobilized, except during periods of sediment disturbance. In addition, existing conditions are such that anaerobic and aerobic (during dry periods) biodegradation will mitigate the concentration of the organic constituents. Few potential benthic or aquatic receptors were observed in the intermittent Creek. The intermittent nature of the Creek and high sediment load would not tend to support the presence of a prevalent benthic or aquatic community. Any potential exposure to benthic or aquatic organisms would be through the interstitial pore water.

The sampling activities indicate the presence of PAHs and pentachlorophenol in the sediments along Crawford Creek, but considerably lower concentrations prior to the confluence with the Nemadji River. Concentrations of PAHs or pentachlorophenol that may reach the Nemadji River will undergo significant dilution, due to the high flow rate and sediment load of the river.

With regard to the general objectives and goals of the study, an assessment of the potential for exposure to ecologic receptors and, if needed, development of action levels for site-related constituents to determine whether remedial activities are required for Crawford Creek sediment should be considered. Also, identification of site-specific geomorphic or hydrologic processes which may affect the mobility and deposition of sediment borne or entrained constituents should be considered, such that an assessment can be made of the need to develop approaches to reduce constituent mobility or to reduce the potential for exposure to constituents within Crawford Creek and the Nemadji River.

Crawford Creek will be further assessed to determine whether ecological receptors are available, such that the detected constituent concentrations within the sediment may pose an unacceptable risk. Additionally, the geomorphology/hydrology of the Crawford Creek drainage system will be evaluated to determine any projected effects on Crawford Creek or the Nemadji River by the mass transport of site-related constituents in sediment. The geomorphology and hydrology of the unnamed ditch will be considered within the scope of the Crawford Creek study.

Should adverse effects be indicated by the constituent concentrations present and geomorphology/hydrology studies, future considerations will include evaluating the feasibility of reducing sediment delivery to Crawford Creek or the Nemadji River by one or more of the following approaches:

- Relocating segments of the unnamed ditch, by constructing a parallel channel with a suitable bankfull geometry and ability to emulate natural processes;
- Retarding sediment delivery through the unnamed ditch and/or Crawford Creek by creating seasonal or temporary impoundments (perhaps emulating beaver ponds) in which adsorbed constituents may be allowed to degrade during repeated wetting/drying cycles; and/or
- Reducing sediment delivery from the unnamed ditch and/or Crawford Creek through the use of conventional detention ponds to suppress the peaks of runoff events, inhibiting transport of sediment through the ditch.

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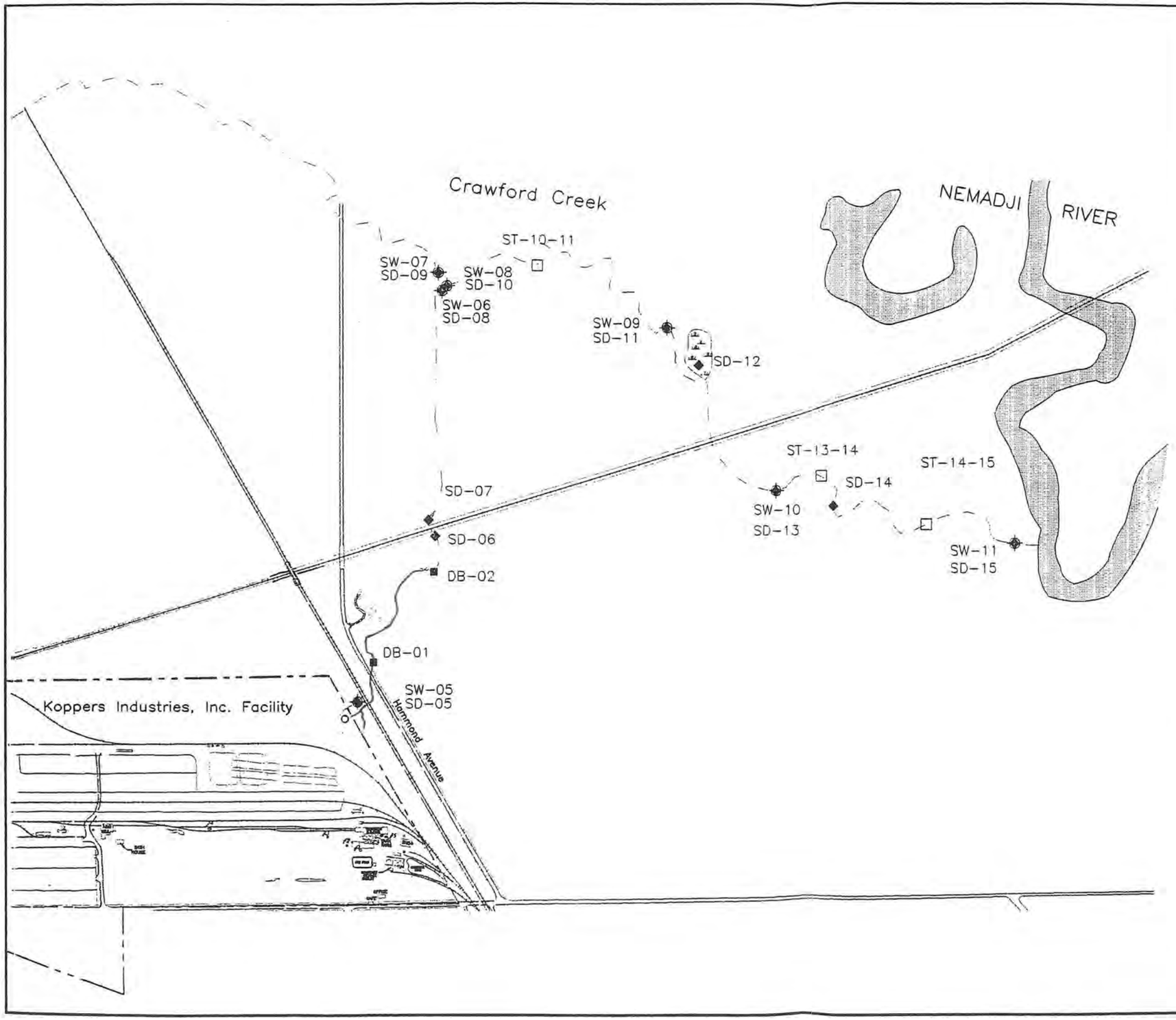

LEGEND

- — — — — Approximate Facility Property Boundary
- DB-01 Ditch Bank Sample Location
- SD-13 Sediment Sample Location
- SW-05 Surface Water Sample Location
- ST-13-14 Stream Description Location
- Intermittent Stream

NOTE: Sample locations are based on surveyed coordinates. The remaining portions of the map are approximated from the U.S.G.S topographic map of the area.

N

600 0 600
SCALE FEET

FLUOR DANIEL GTI
637 BRADDOCK AVENUE
EAST PITTSBURGH, PA 15112
PHONE: (412) 823-5300
FAX: (412) 824-7215

REV. NO.:	DRAWING DATE:	ACAD FILE:
	02-11-97	SUR_LOC

Surface Water, Sediment and Ditch Bank Sample Locations

CLIENT:	PM:
Beazer East, Inc.	R.S.
LOCATION: Koppers Industries, Inc. Superior, Wisconsin	PE:

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
GISKEY	KLM	010030585-03	2-1

N

544,000 N
544,500 N
545,000 N
545,500 N
546,000 N
546,500 N
547,000 N
547,500 N

1,480,000 E
1,480,500 E
1,481,000 E
1,481,500 E
1,482,000 E

DRAINAGE DISCHARGE
MAIN DRAINAGE DISCHARGE
OUTFALL NO. 001 (AREA D)
LEAD TRACK LANDFILL (AREA H)
SPRAY IRRIGATION FIELD
STRAW BALES (AREA G)
CLOSED SURFACE IMPOUNDMENTS
DRIP TRACK AREA (AREA F)
FORMER UNLINED LANDFILL/LANDFARM (AREA A)
CLOSED SURFACE IMPOUNDMENTS (AREA C)
A&B MILL
BATH HOUSE
DRIP TRACK AREA 3 (AREA F)
TREATMENT BUILDING
TANK FARM
SHOP
FIRE POND
CONTAINER STORAGE FACILITY
CONCRETE BERM
TREATMENT AREA (AREA B)
OFFICE
GATE
OUTFALL NO. 002 (AREA E)
COUNTY ROAD A
DRAINAGE DISCHARGE

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- 1' CONTOUR INTERVAL
- 675 — 5' CONTOUR INTERVAL
- "DRAINAGE AREA"
- SURFACE WATER RUN-OFF FLOW DIRECTION

300 0 300
SCALE FEET

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FAX: (412) 824-7215

REV. NO.:	DRAWING DATE:	ACAD FILE:
2	3/07/96	96003377.DWG

TOPOGRAPHIC MAP/ SURFACE WATER RUN-OFF

CLIENT:	PM:
KOPPERS INDUSTRIES, INC.	R.S.
LOCATION: SUPERIOR, WISCONSIN	PE/RG: R.A.

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
R.A.M.		01003-0686-06	3-1

FIGURE 3-2
Unnamed Ditch Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

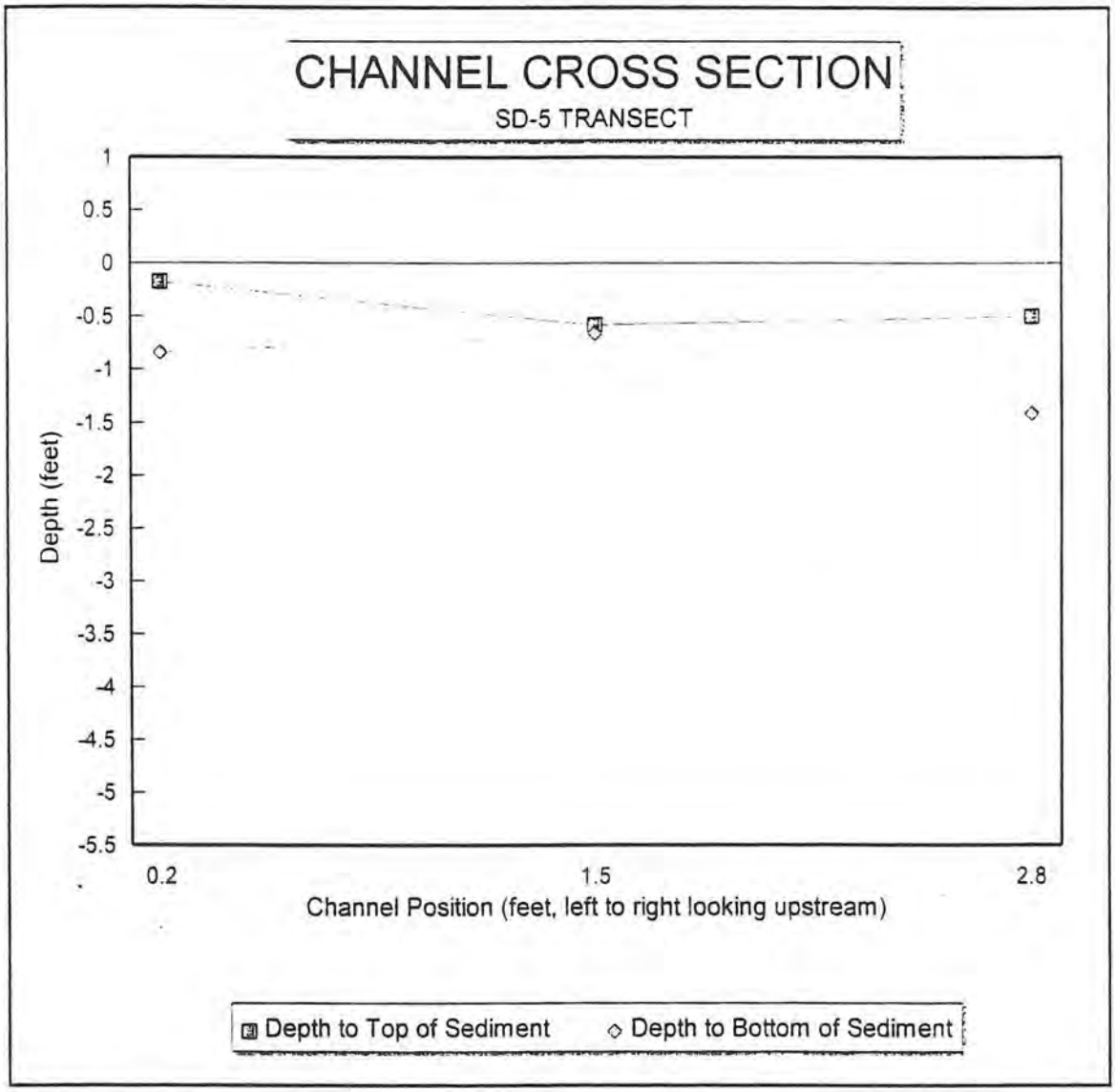

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FIGURE 3-3
Unnamed Ditch Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

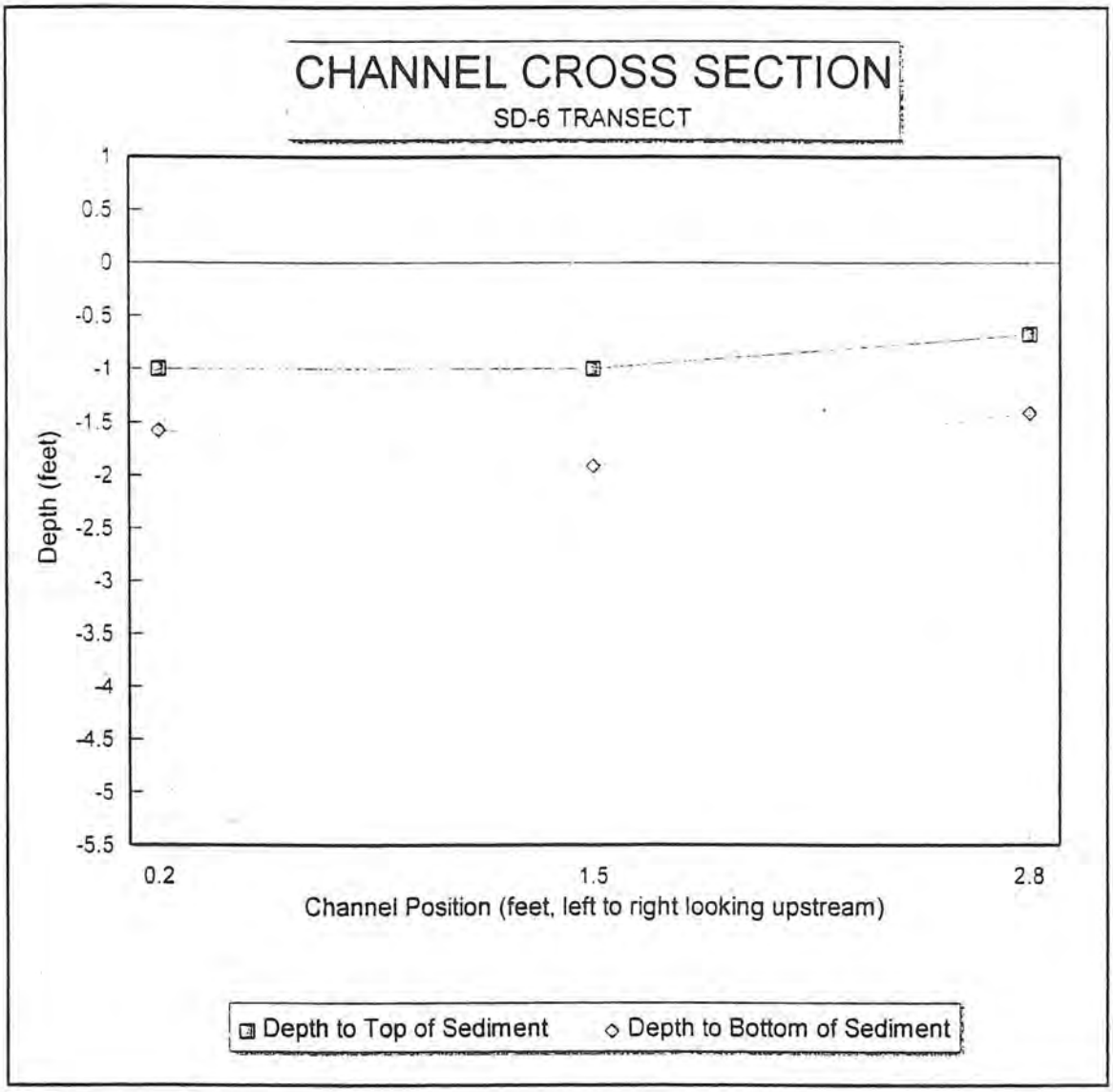

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FIGURE 3-4
Unnamed Ditch Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

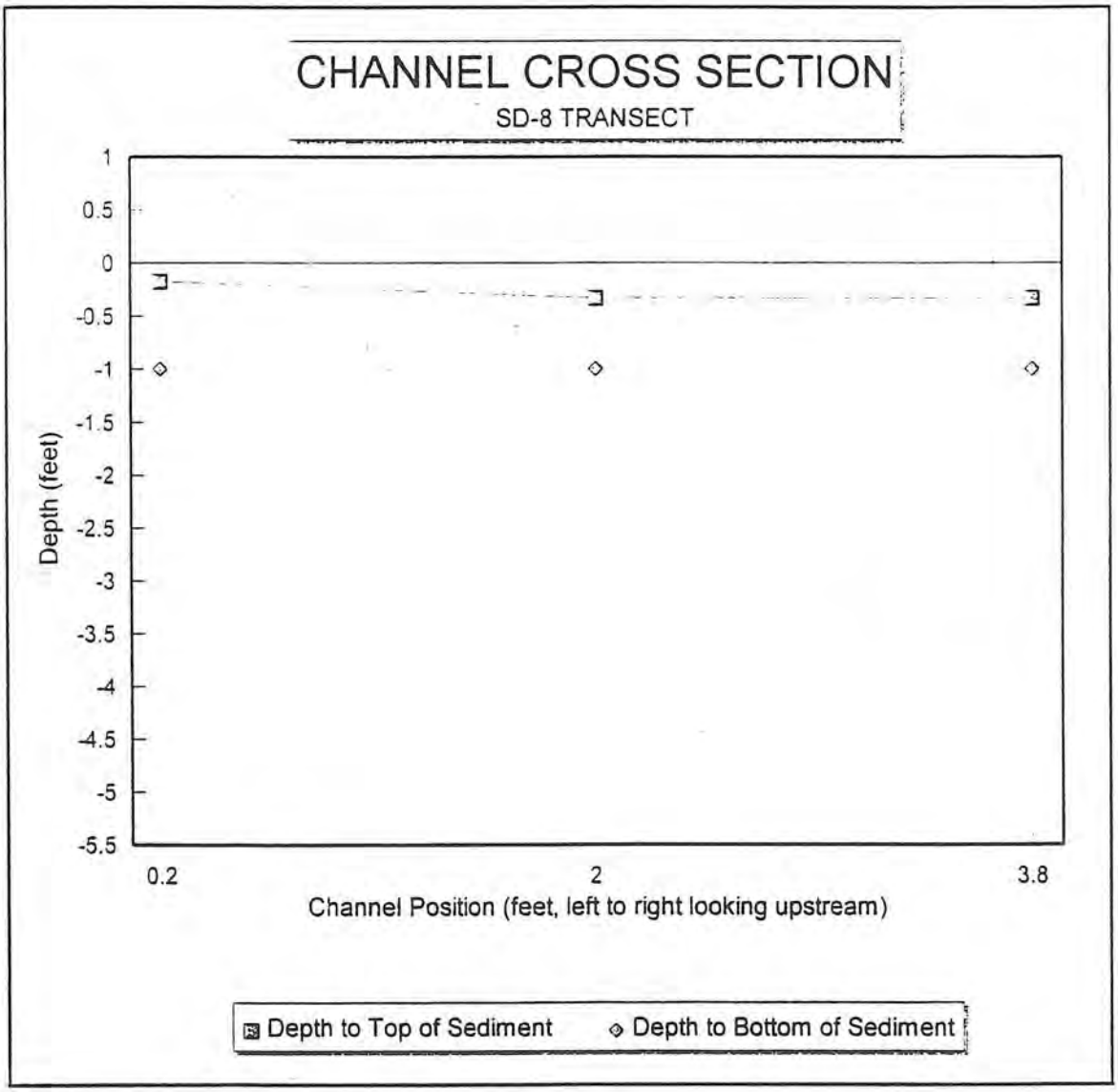

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FIGURE 3-5
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

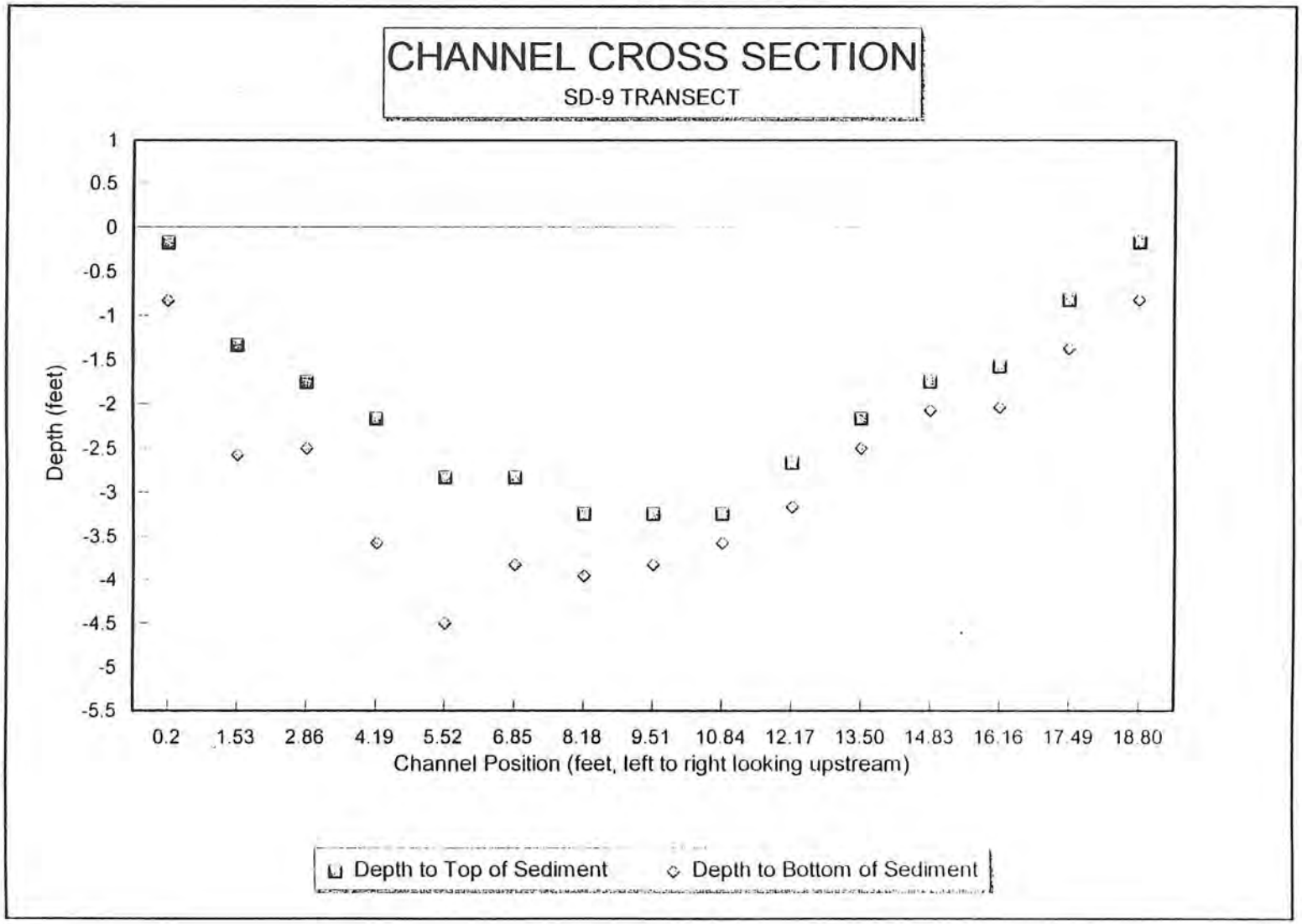

FIGURE 3-6
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

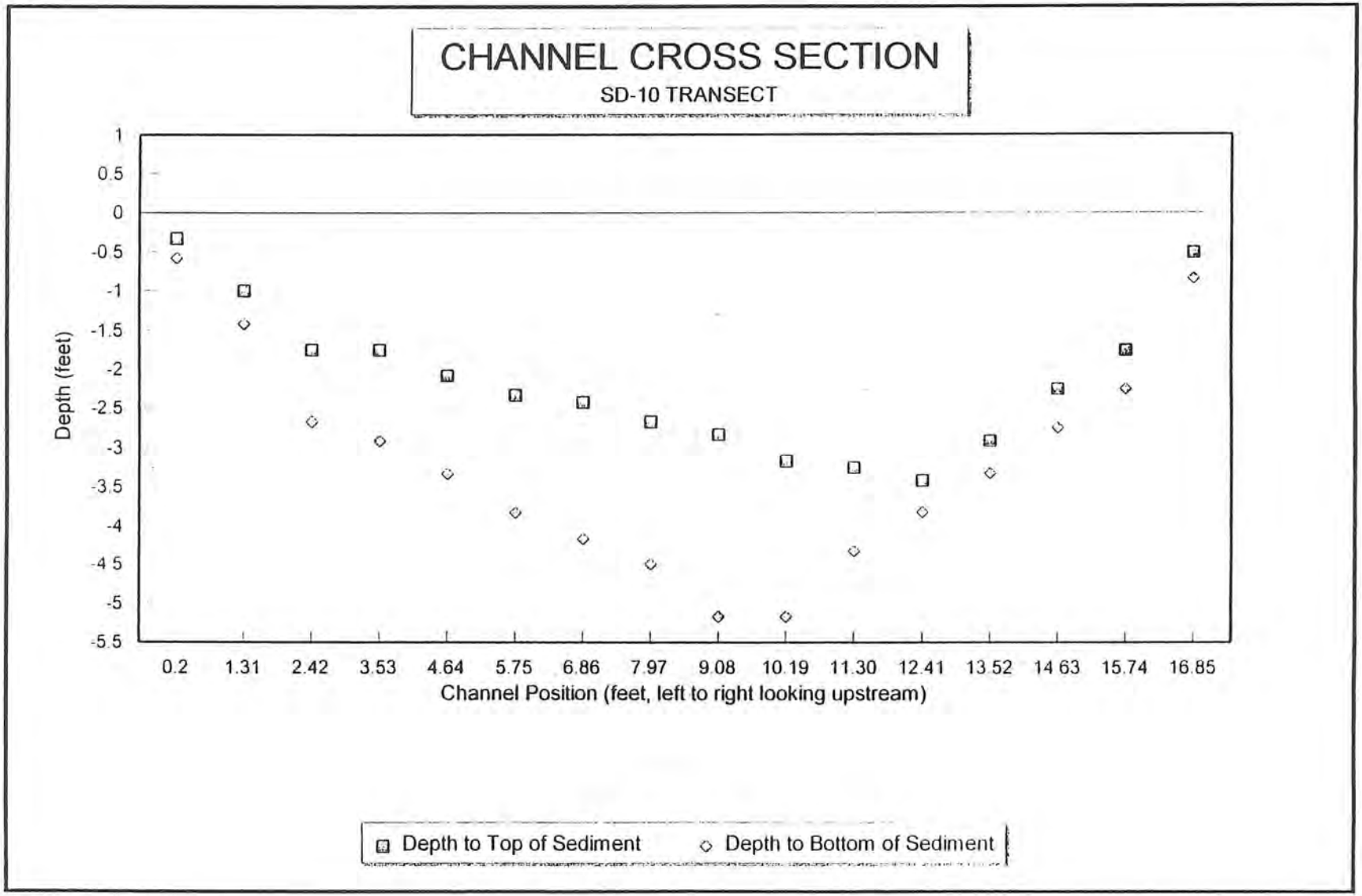

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FIGURE 3-7
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

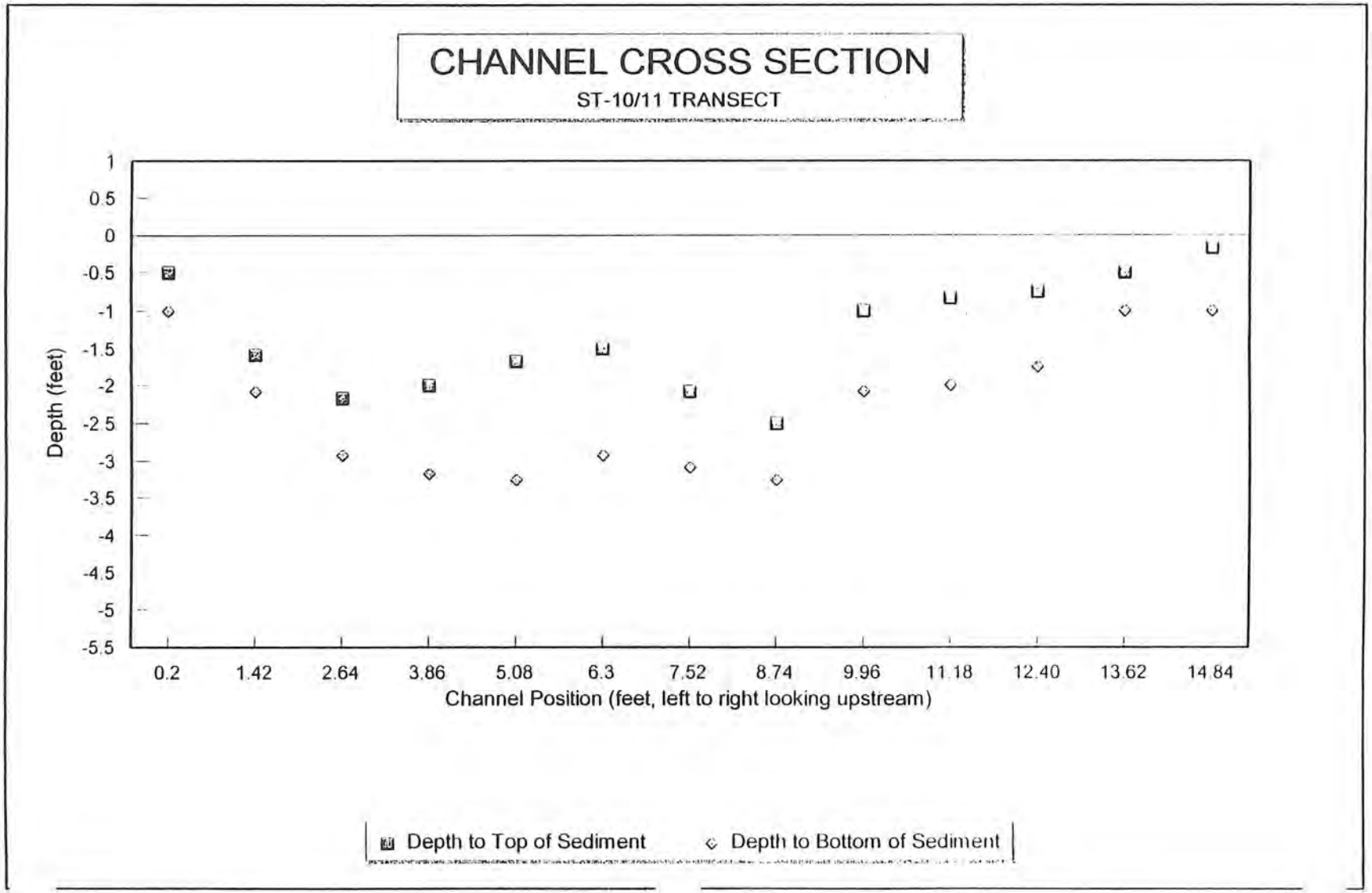

FIGURE 3-8
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

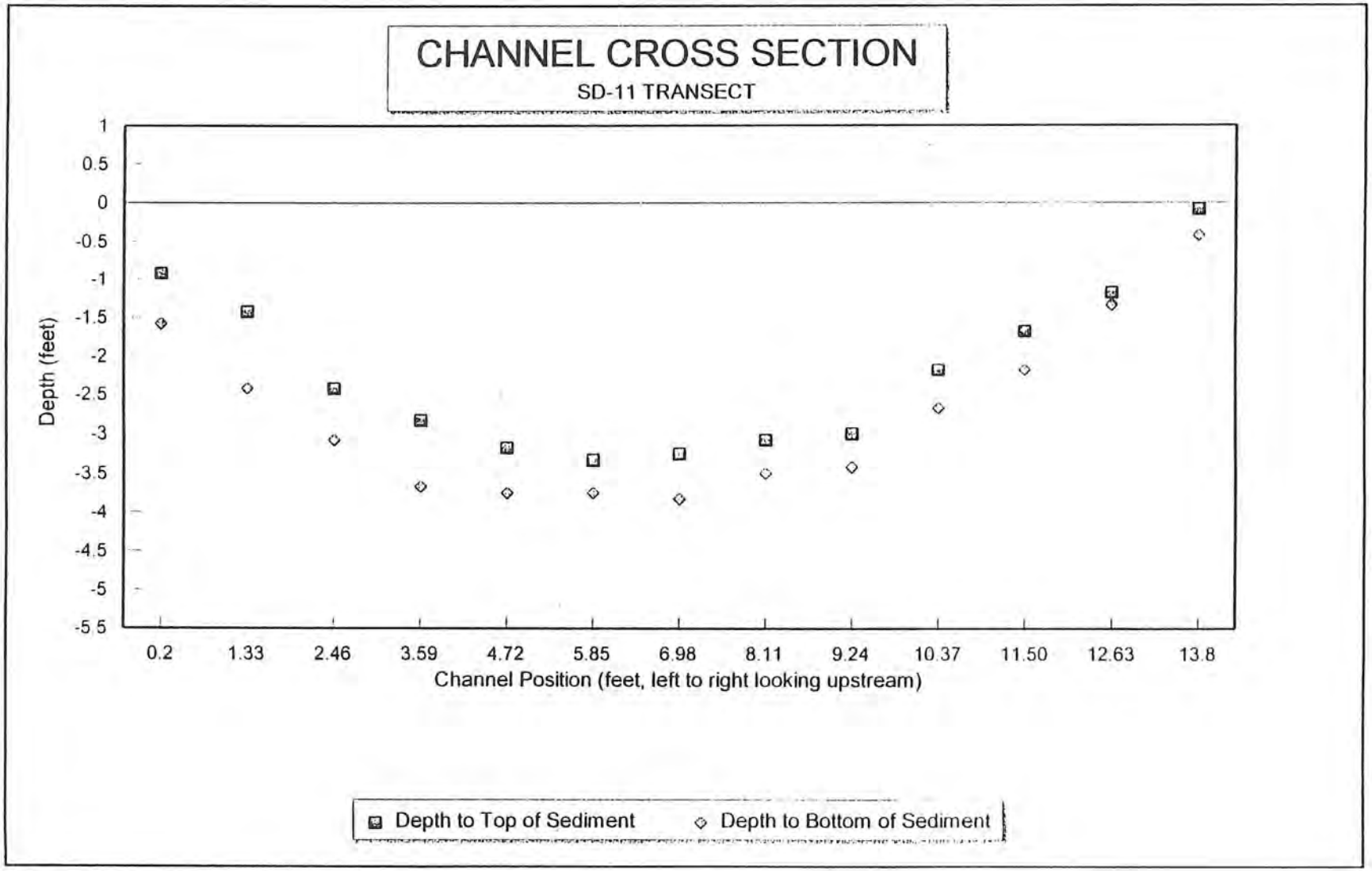

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FIGURE 3-9
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

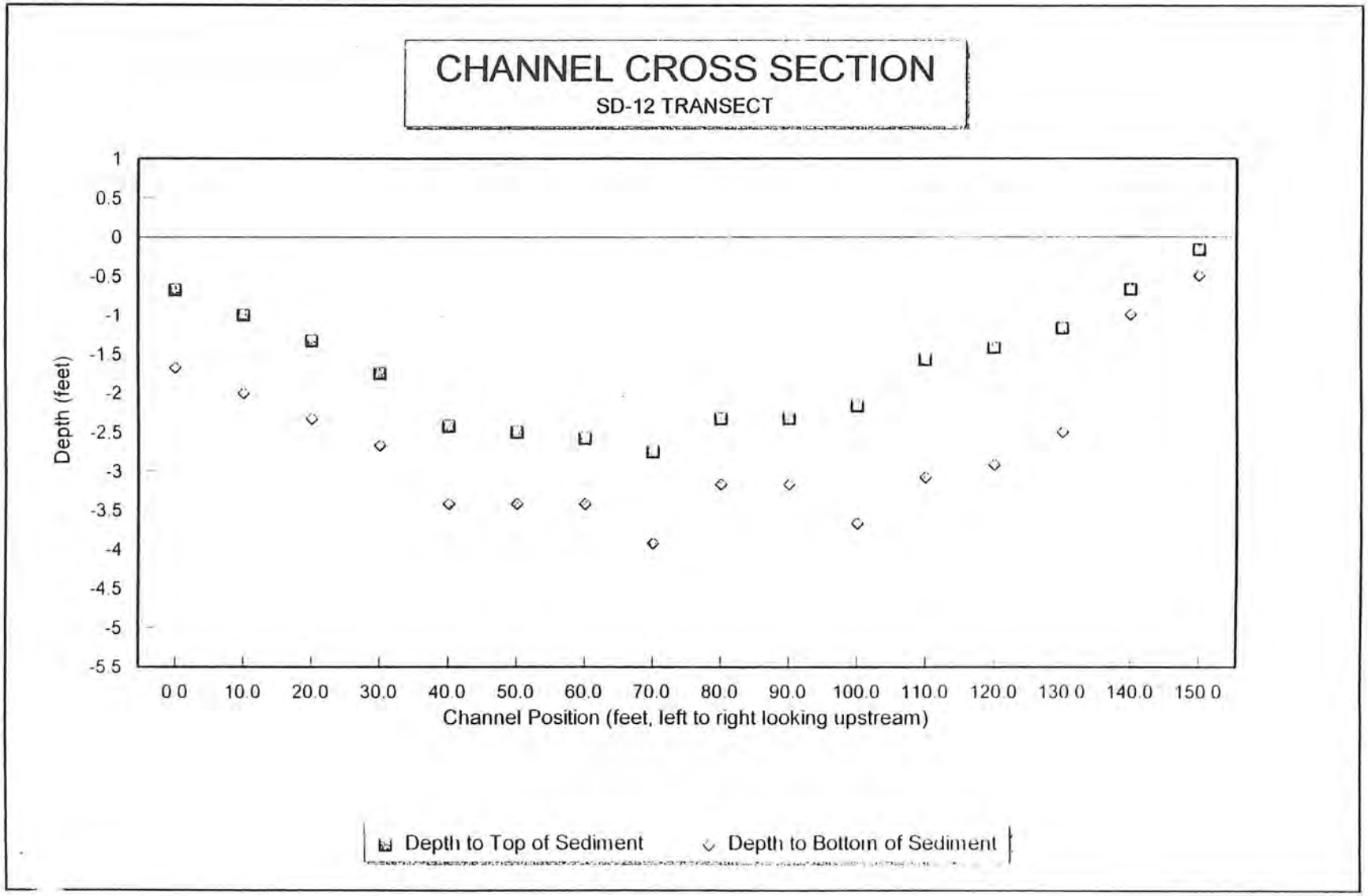

FIGURE 3-10
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

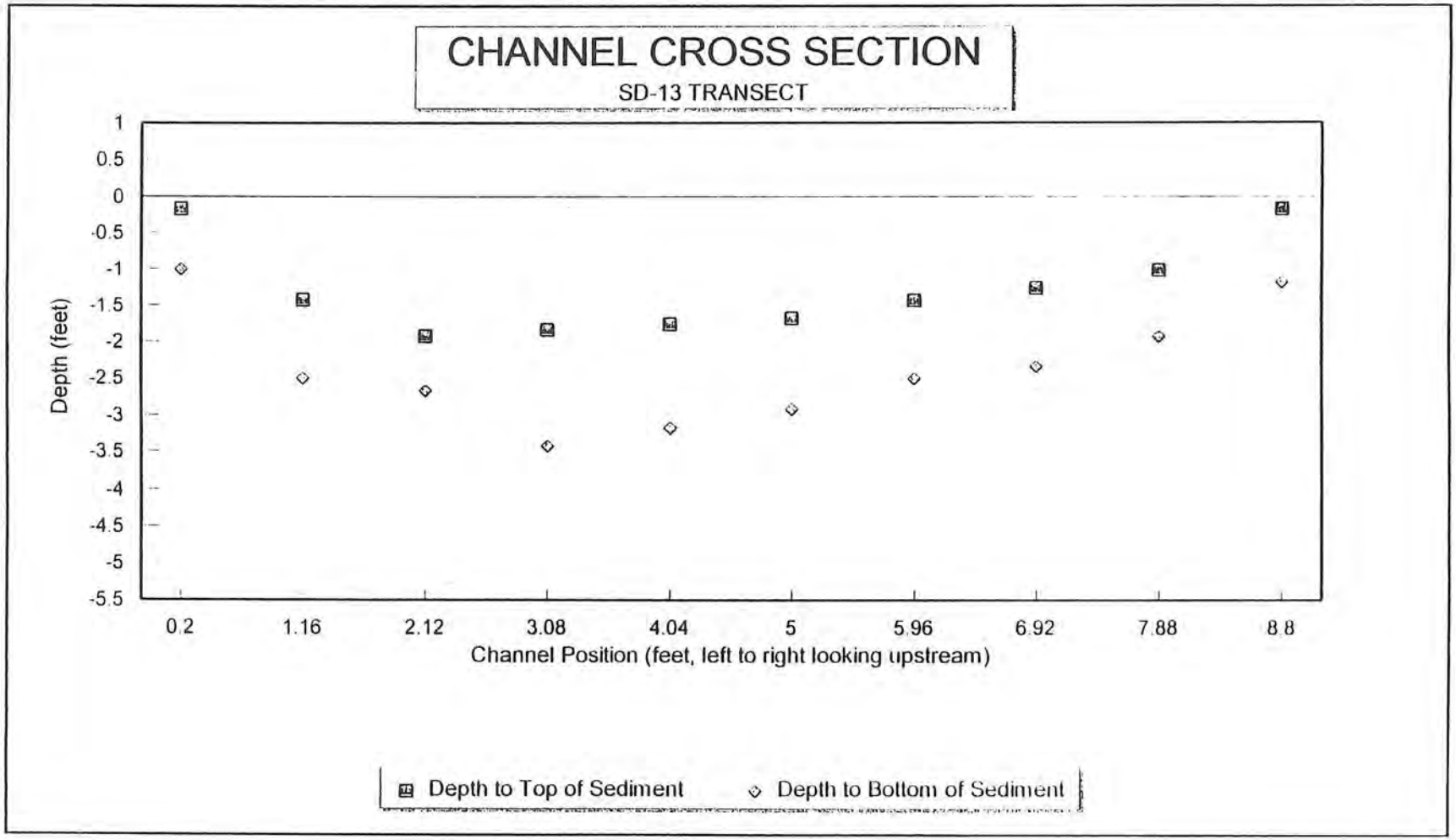

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FIGURE 3-11
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

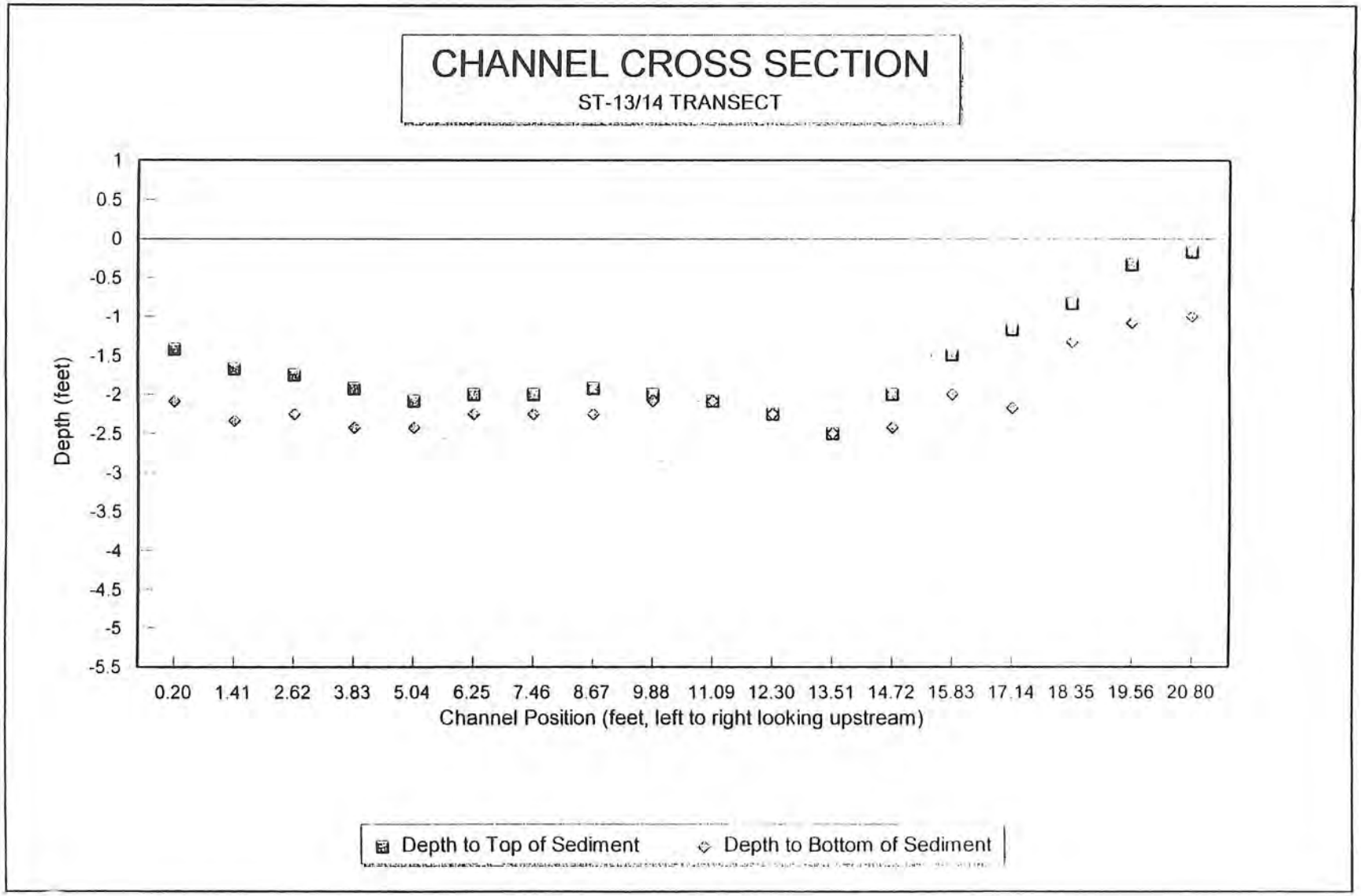

FIGURE 3-12
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

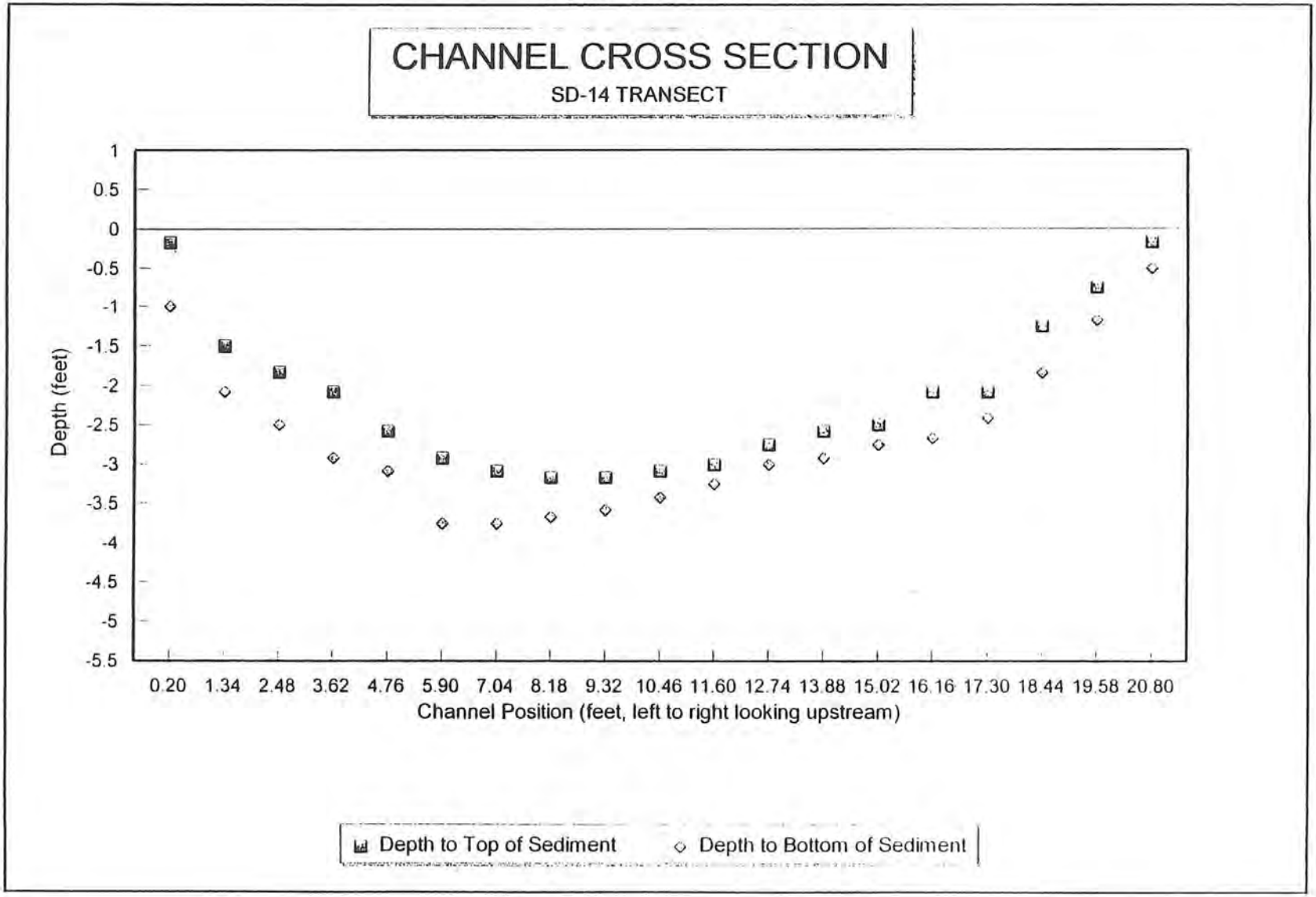

FIGURE 3-13
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

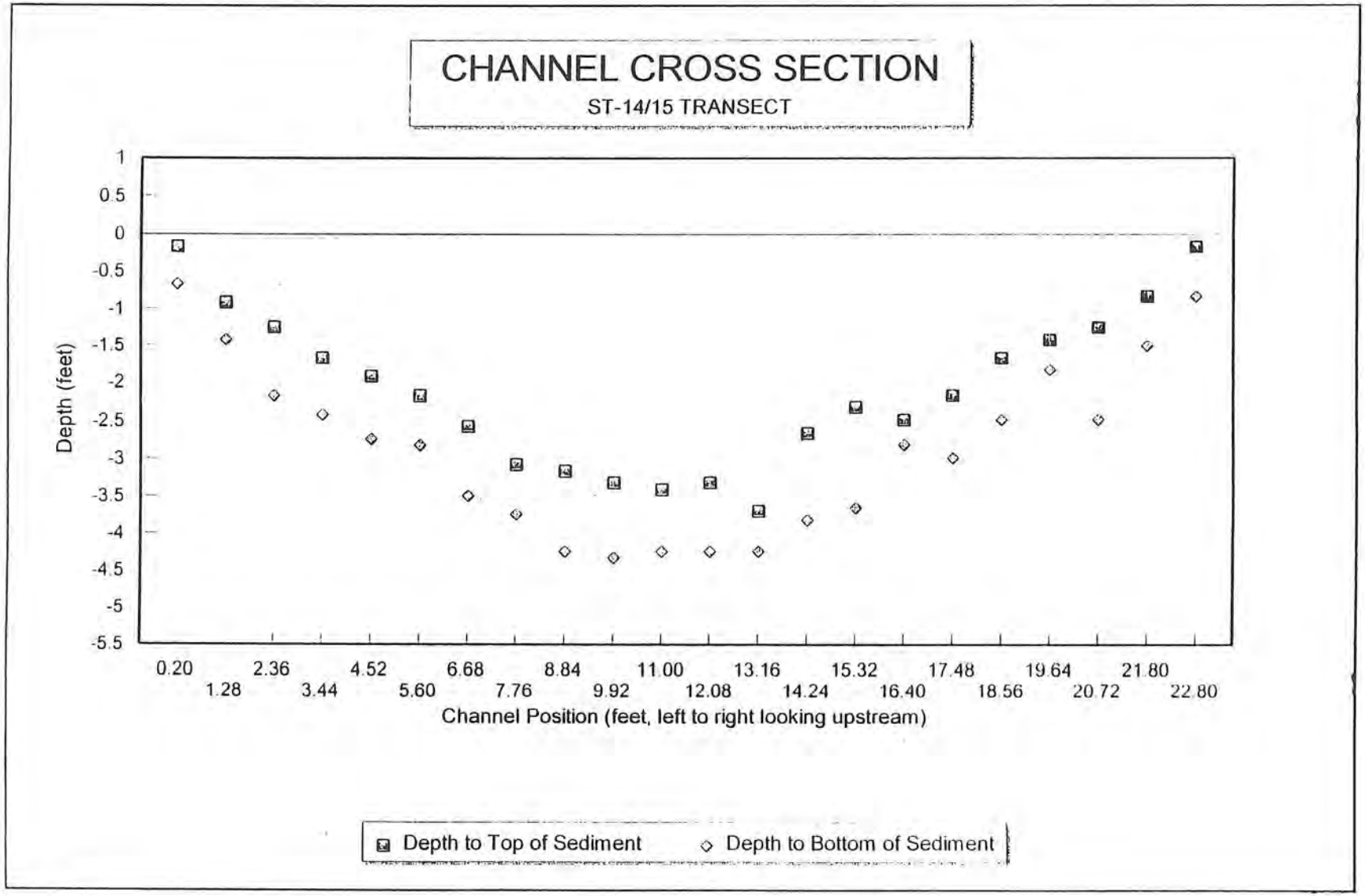

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FIGURE 3-14
Crawford Creek Cross-Section
Koppers Industries, Inc.
Superior, Wisconsin

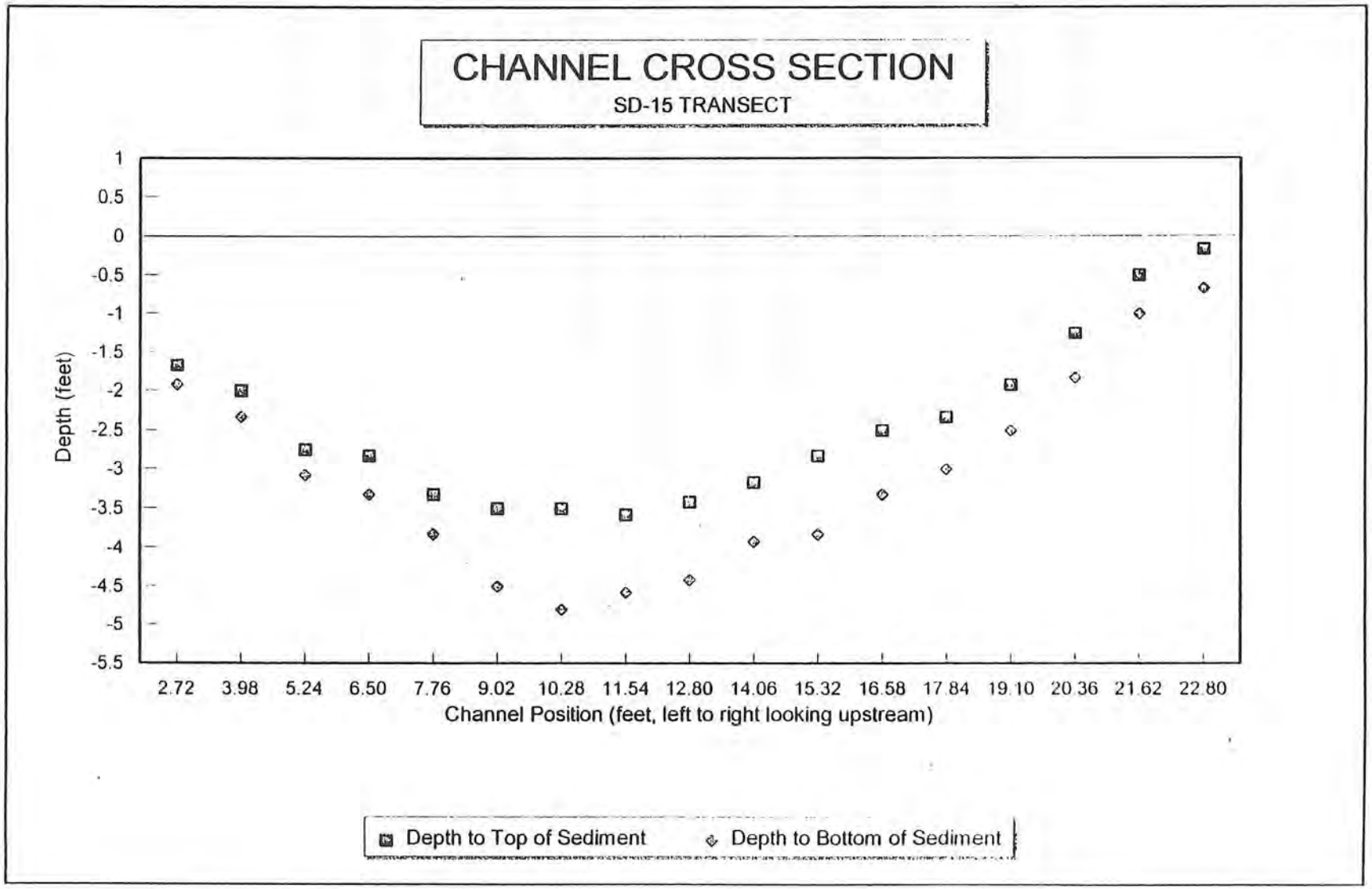

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FIGURE 3-15

Average Monthly Precipitation: Duluth, MN (1931-1960)

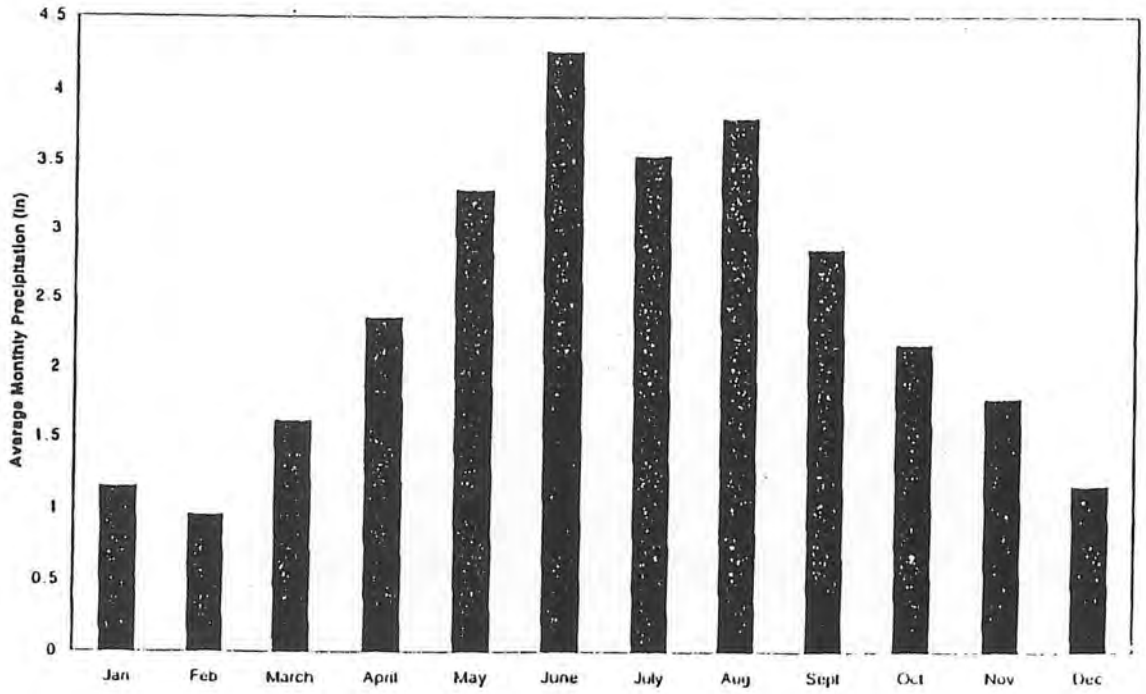


FIGURE 3-16

Total Annual Flow on the Nemadji R. near South Superior, WI
Water Years 1974 through 1995

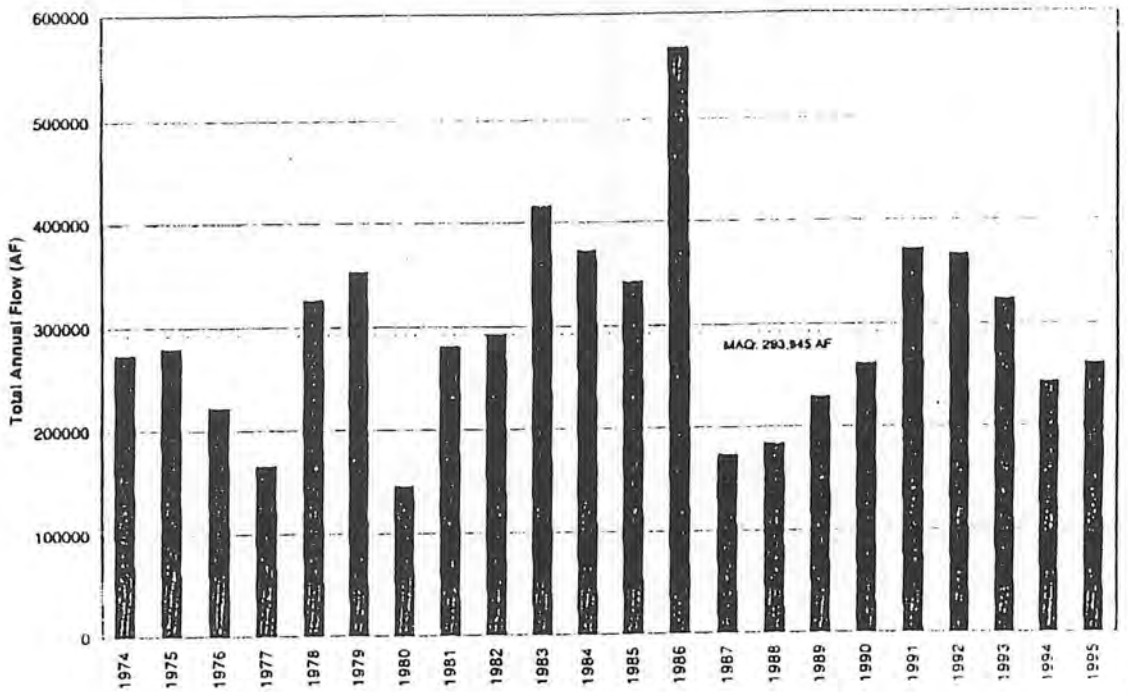


FIGURE 3-17

Long-term Average Monthly Flow on the Nemadji R. near South Superior, WI Water Years 1974 through 1995

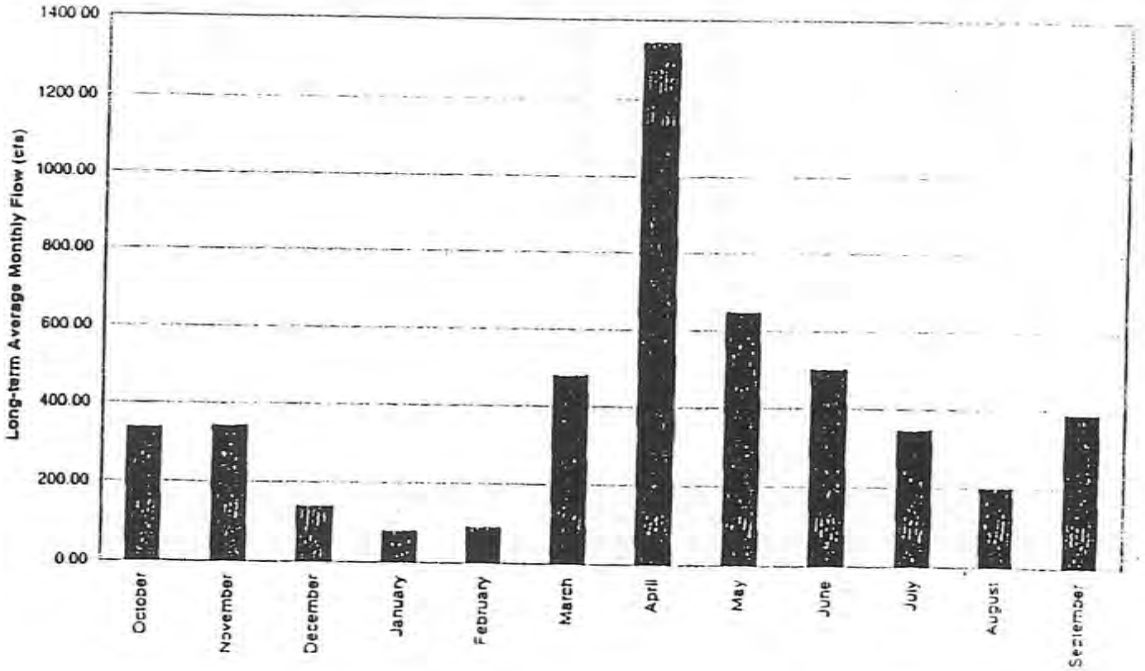
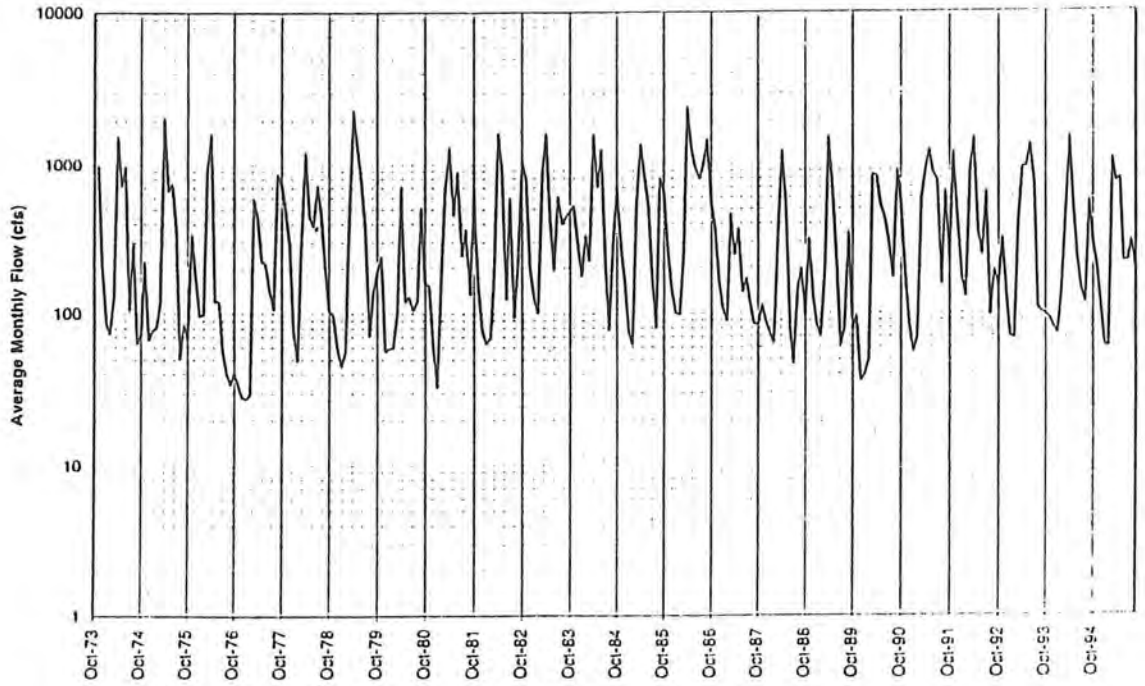
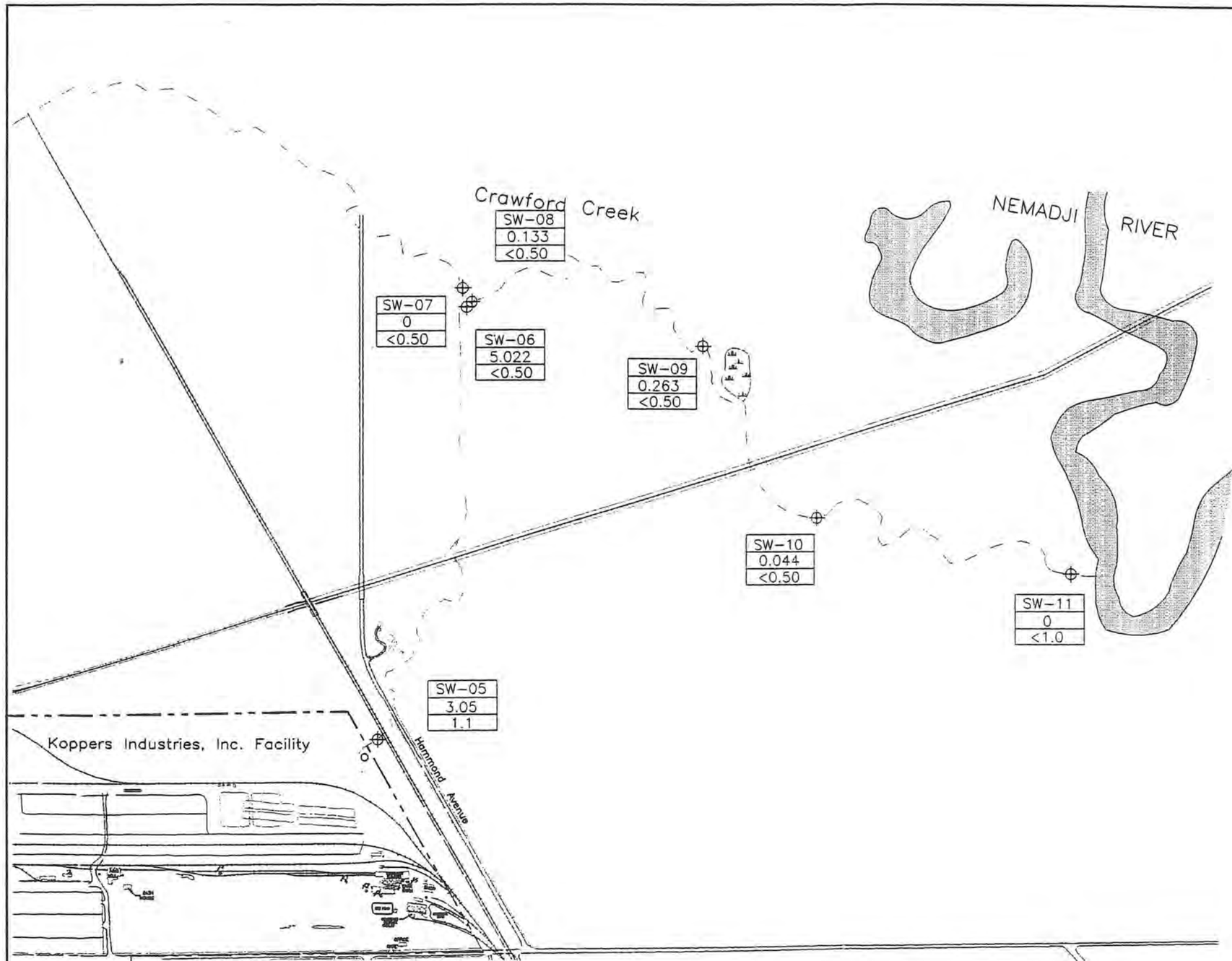


FIGURE 3-18

Average Monthly Flow on the Nemadji R. near South Superior, WI
Water Years 1974 through 1995





LEGEND

- Approximate Facility Property Boundary
- SW-05 — Surface Water Sample Location
- Intermittent Stream
- SW-05 / 0 / ND — Surface Water Sample Location / Total PAH Concentration (ug/L) / Pentachlorophenol Concentration (ug/L)

NOTE: Sample locations are based on surveyed coordinates. The remaining portions of the map are approximated from the U.S.G.S topographic map of the area.

N

600 0 600
SCALE FEET

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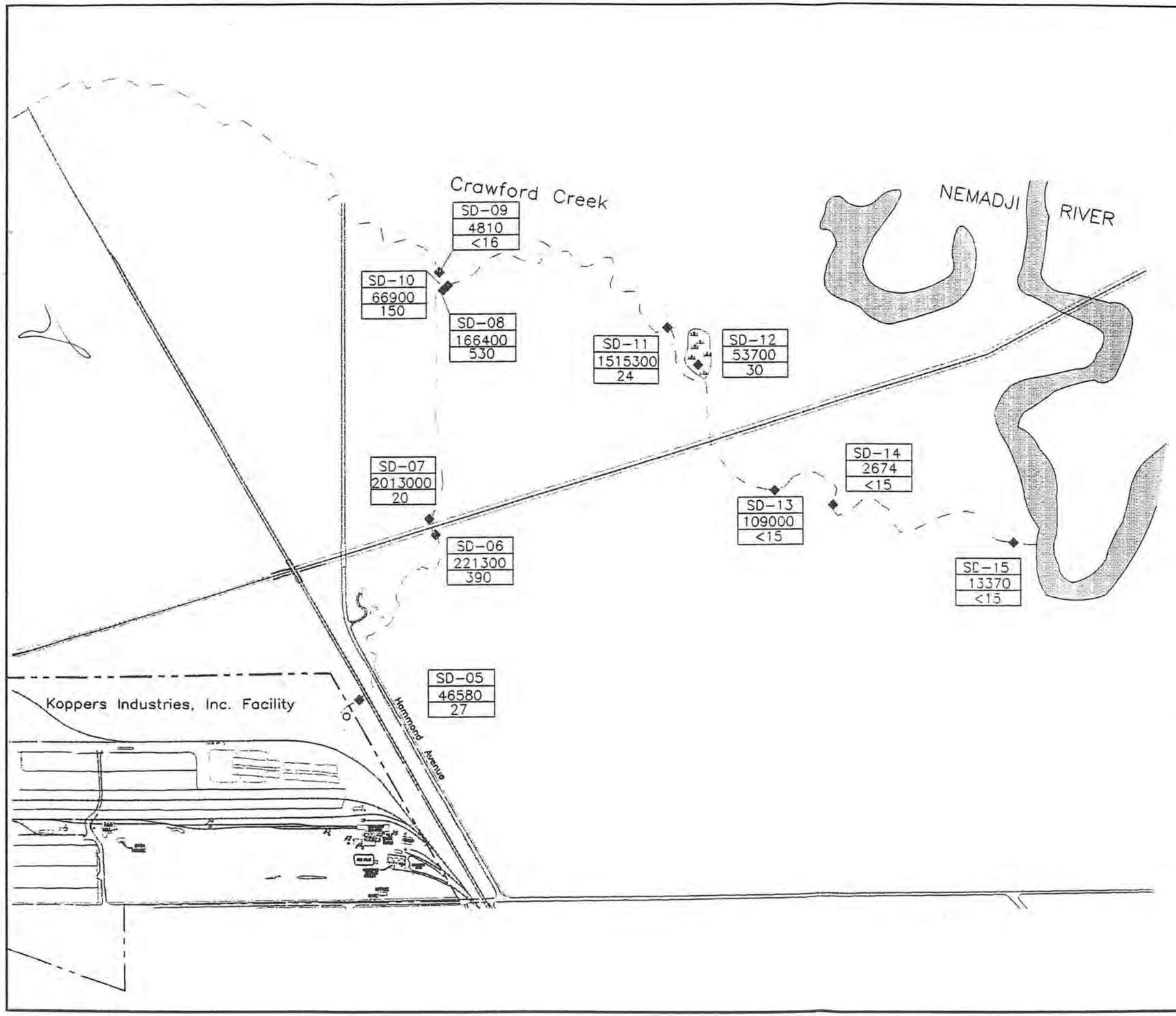
REV. NO.:	DRAWING DATE:	ACAD FILE:
	02-17-97	96q2sw

Total PAH Constituents and Pentachlorophenol Concentrations in the Surface Water Samples - June 1996

CLIENT:	PM:
Beazer East, Inc.	R.S.
LOCATION: Koppers Industries, Inc. Superior, Wisconsin	PE:

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
GISKEY	KLM	010030585-03	4-1



LEGEND

- Approximate Facility Property Boundary
- ◆ SD-15 Sediment Sample Location
- Intermittent Stream
- SD-14 / 2674 / <15 — Sediment Sample Location / Total PAH Concentration (ug/kg) / Pentachlorophenol Concentration (ug/kg)

NOTE: Sample locations are based on surveyed coordinates. The remaining portions of the map are approximated from the U.S.G.S topographic map of the area.

600 0 600
SCALE FEET

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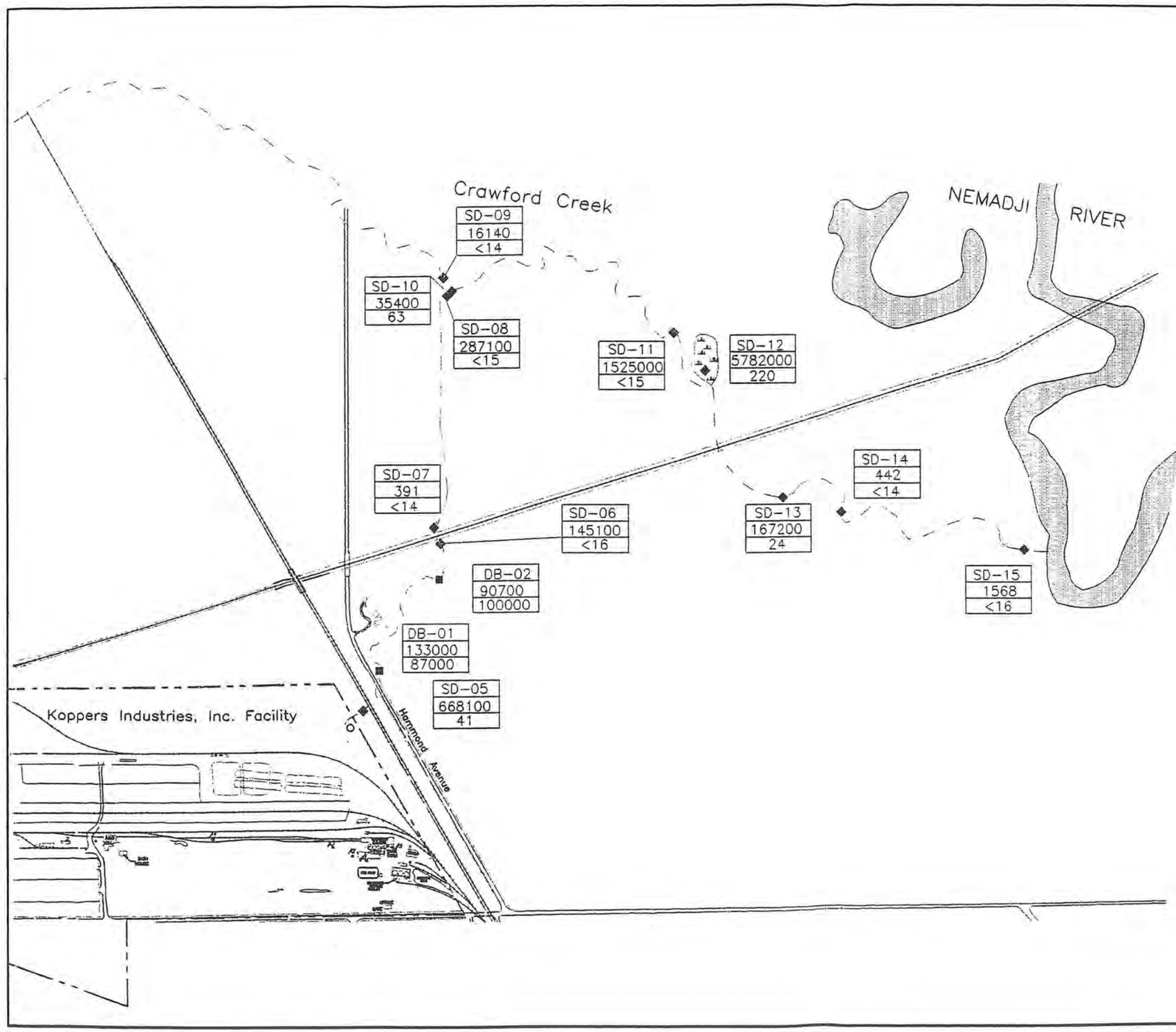
REV. NO.:	DRAWING DATE:	ACAD FILE:
	02-17-97	96q2sed

Total PAH Constituents and Pentachlorophenol Concentrations in the 0 - 0.5 Ft. Sediment Samples - June 1996

CLIENT:	PM:
Beazer East, Inc.	R.S.
LOCATION: Koppers Industries, Inc. Superior, Wisconsin	PE:

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
GISKEY	KLM	010030585-03	4-2



LEGEND

- Approximate Facility Property Boundary
- ◆ SD-14 Sediment Sample Location
- ■ DB-02 Ditch Bank Soil Sample Location
- Intermittent Stream
- SD-14 / 0 / ND — Sample Location / Total PAH Concentration (ug/kg) / Pentachlorophenol Concentration (ug/kg)

NOTE: Sample locations are based on surveyed coordinates. The remaining portions of the map are approximated from the U.S.G.S topographic map of the area.

N

600 0 600
SCALE FEET

FLUOR DANIEL GTI
637 BRADDOCK AVENUE
EAST PITTSBURGH, PA 15112
PHONE: (412) 823-5300
FAX: (412) 824-7215

REV. NO.:	DRAWING DATE:	ACAD FILE:
	02-17-97	96q2sed2

Total PAH Constituents and Pentachlorophenol Concentrations in the 0.5 Ft. to End-Of-Core Sediment Samples and Ditch Bank Soil - June 1996

CLIENT:	PM:
Beazer East, Inc.	R.S.
LOCATION: Koppers Industries, Inc. Superior, Wisconsin	PE:

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
GISKEY	KLM	010030585-03	4-3

TABLE 2-1
Surface Water Analytical Parameters
Phase III RFI

Koppers Industries, Inc.
Superior, Wisconsin

Parameter	EPA Method
Wood Treating Constituents	
Polynuclear Aromatic Hydrocarbons	8310
Phenolics	8270
Pentachlorophenol	Keystone 589
Tetrachlorophenols	Keystone 589
Other	
pH	Field
Dissolved Oxygen	Field
Conductivity	Field
Temperature	Field

TABLE 2-2
Sediment Analytical Parameters
Phase III RFI

Koppers Industries, Inc.
Superior, Wisconsin

Parameter		Method
Wood Treating Constituents		
Polynuclear Aromatic Hydrocarbons		EPA 8310
Phenolics		EPA 8040
Pentachlorophenol		Keystone 589
Tetrachlorophenols		Keystone 589
Diesel Range Organics		EPA 8015
Metals		
Calcium	Arsenic	EPA 6010
Iron	Barium	EPA 6010
Magnesium	Cadmium	EPA 6010
Manganese	Chromium	EPA 6010
Potassium	Lead	EPA 6010
Other		
Total Organic Carbon		EPA 9060
Ammonia		EPA 350.2
Nitrate		EPA 353.2
Nitrite		EPA 354.1
Ortho-Phosphate		EPA 365.2
Sulfate		EPA 9038
pH		EPA 9045
Cation Exchange Capacity		EPA 9081
Grain Size		ASTM-D-422
TCLP		
Extraction		EPA 1311
Volatile Organic Constituents		EPA 8240
Semi-volatile Organic Constituents		EPA 8270
Polynuclear Aromatic Hydrocarbons		EPA 8310
Phenolics		EPA 8040
Pentachlorophenol		Keystone 589
2,3,5,6-Tetrachlorophenol		Keystone 589
Metals		EPA 6010
Mercury		EPA 7470
Pesticides		EPA 8080

Note:

1) Not every sediment sample will be analyzed for all of the above analytical parameters. Two samples were analyzed for a subset of the above.

TABLE 2-3
Ditch Bank Soil Analytical Parameters
Phase III RFI

Koppers Industries, Inc.
Superior, Wisconsin

Parameter	EPA Method
Wood Treating Constituents	
Polynuclear Aromatic Hydrocarbons	8310
Phenolics	8040
Pentachlorophenol	Keystone 589
Tetratachlorophenol	Keystone 589
Other	
Total Organic Carbon	9060

TABLE 3-1
Summary of Field Measurements and Observations
Unnamed Ditch Surface Water

Koppers Industries, Inc.
Superior, Wisconsin

Sample Location[1]	Temperature (Deg. °C)	Dissolved Oxygen (mg/L)	Specific Conductivity (umhos/cm)	pH ~~(SU)~~	Flow (ft/min)	Comments
SW-5	24.4	7.8	884	9.18	4 to 8	SW-5 data collected at 1400 hours on 6/13/96
SW-6	16.0	8.2	677	9.20	8	SW-6 data collected at 1000 hours on 6/13/96

Notes:

1 = Unnamed drainage ditch field measurement data (SW-5 and SW-6) collected at one central channel location.

TABLE 3-2
Summary of Physical Characteristics
Unnamed Ditch Sediment

Koppers Industries, Inc.
Superior, Wisconsin

Sample Location	Depth (Inches)	Texture	Color	Odor (Y,N)[1]	PID Reading (PPM)[2]	Observation of Potentially Site-Related Residuals	Visual Sheen (Y,N)[3]
SD-5	0 - 6	silty sand, some gravel	reddish brown	--	--	N	Y
	6-13	clayey sand, some gravel	reddish brown	--	--	N	Y
	13-15	wood chips	dark brown	Y	25	"oily" and odor	Y
SD-6	0 - 6	silty coarse sand, some gravel, trace organic matter	reddish brown	Y	1.5	"oily" and odor	Y
	6 - 12	silty clay, trace organic matter, wood fragments	reddish brown	Y	1.5	N	Y
SD-7	0 - 3	silty sand, gravel, cobbles	reddish brown	N	Ambient	N	N
	3 - 6	clay	reddish brown	Y (slight)	Ambient	staining and odor	N
SD-8	0 - 2	organic matter (leaf litter)	dark brown	N	Ambient	N	Y
	2 - 4	silty sand, organic matter	reddish brown	N	0.6	N	Y
	4 - 8	clay	reddish brown	N	Ambient	N	Y

TABLE 3-2 (Continued)
Summary of Physical Characteristics
Unnamed Ditch Sediment

Koppers Industries, Inc.
Superior, Wisconsin

NOTES:

1 = "Y" represents that an odor was discernable, "N"represents no discernable odors were detected.

2 = Photoionization detector readings were obtained using an Hnu Systems P101 meter. The reported readings represent the actual meter response, with no deductions for background. Ambient (background) meter readings were between 0.1 and 0.2 ppm during the project. Where possible, readings are reported for distinct depth intervals of the sediment cores; however, it was often not possible to distinguish individual readings by strata.

3 = "Y" represents that a visible sheen was observed on surface water during the extraction of the sediment core, "N" represents that no visible sheen was observed. This observation is reported similarly for all depth increments of the core.

TABLE 3-3
Summary of Sediment Grain Size Analysis
Unnamed Ditch

Koppers Industries, Inc.
Superior, Wisconsin

Location	Soil Description	USCS Classification	Percent Each Component	
SD-5A	Brown Lean Clay with Sand	cl	gr = 2	sl = 19
			sa = 26	cl = 53
SD-5B	Brown Lean Clay with Sand	cl	gr = 5	sl = 23
			sa = 12	cl = 60
SD-8A	Brown Clayey Sand	sc	gr = 14	sl = 15
			sa = 41	cl = 30

NOTES: 1 gr = gravel sl = silt
sa = sand cl = clay

2. Grain size analyses were not performed on samples from locations SD-6A,B; SD-7A,B; and SD-8B.

TABLE 3-4
Summary of Vegetative, Aquatic and Channel Obstruction Observations
Unnamed Ditch

Koppers Industries, Inc.
Superior, Wisconsin

Sediment Sample Transect Location	Vegetative Observations	Observations[1]	Channel Obstructions
SD-5	Lowland herbaceous species, dominated by common reed (Phragmites australis), and including grasses and occasional emergents observed within channel and immediate channel bank. Shrub and tree species, including rose (Rosa spp.) and aspen (Populus spp.), dominated along banks.	No significant observations.	Weir approximately 50 yards above SD-5 location and culvert under railroad grade approximately 15 yards below location.
SD-6	Herbaceous species, primarily lowland reeds and grasses, dominated channel banks and "floodplain" area surrounding bank. Aspen and spruce (Picea spp.) forest dominated higher elevations.	Water snake that had captured a frog observed in water.	Culvert under railroad grade approximately 25 yards below SD-6 location.
SD-7	Herbaceous species, primarily lowland reeds and grasses, dominated immediate banks of channel. Aspen and spruce forest dominated surrounding banks.	Small fish (unclassified "minnows") observed.	Culvert under railroad grade approximately 30 yards above SD-7 location.
SD-8	Lowland meadow, primarily reeds and grasses and some sedges and rushes, dominated the channel banks and surrounding area. Emergent herbaceous species observed within channel. Clumps of black willows (Salix nigra) scattered along banks.	Unclassified surface water insects, leeches, and frog observed in water.	None in vicinity of SD-8 location.

Notes:

1 = Generally, the frequency and abundance of benthic, aquatic or miscellaneous invertebrates observed during sediment sampling was limited.

TABLE 3-5
Summary of Field Measurements and Observations
Crawford Creek Surface Water

Koppers Industries, Inc.
Superior, Wisconsin

Sample Location[1]	Temperature (Deg. C)	Dissolved Oxygen (mg/L)	Specific Conductivity (umhos/cm)	pH SU)	Flow (ft/min)	Comments
SW-7 (left)	20.6	7.8	198	9.33	0	SW-7 data collected at 1500 hours on 6/10/96 except DO data collected at 1630 hours on 6/13/96
SW-7 (center)	20.3	7.7	199	8.70	"	"
SW-7 (right)	20.3	7.5	200	9.72	"	"
SW-8 (left)	28.1	9.0	225	9.38	0	SW-8 data collected at 1530 hours on 6/12/96
SW-8 (center)	27.9	7.9	226	9.14	"	"
SW-8 (right)	27.7	9.6	225	8.95	"	"
SW-9 (left)	29.8	8.2	232	7.50	4	SW-9 data collected at 1315 hours on 6/12/96
SW-9 (center)	29.6	7.7	233	7.25	"	"
SW-9 (right)	29.7	8.0	233	8.25	"	"
SW-10 (left)	22.3	6.6	260	9.10	0	SW-10 data collected at 1840 hours on 6/11/96
SW-10 (center)	22.4	6.7	259	8.60	"	"
SW-10 (right)	22.4	6.7	257	9.46	"	"
SW-11 (left)	18.3	7.6	214	10.57	0	SW-11 data collected at 1115 hours on 6/11/96
SW-11 (center)	18.3	8.1	212	9.40	"	"
SW-11 (right)	18.3	8.0	213	9.26	"	"

Notes:
1 = Crawford Creek field measurement data (SW-7 through SW-11) collected at three channel locations - left, center and right, looking downstream.

TABLE 3-6
Summary of Physical Characteristics
Crawford Creek Sediment

Koppers Industries, Inc.
Superior, Wisconsin

Sample Location (selected core location)[1]	Depth (Inches)	Texture	Color	Odor (Y/N)[2]	PID Reading (PPM)[3]	Observation of Potentially Site-related Residuals	Visual Sheen (Y/N)[4]
SD-9 (right)	0 - 2	silty clay, organic matter	reddish brown	N	Ambient	N	N
	2 - 11	clay	reddish brown	N	Ambient	N	N
SD-10 (center)	0 - 8	sand and gravel	reddish brown	Y	0.5	sheen	Y
	8 - 13	silty sand, some gravel	reddish brown	Y	(meter down due to rain)	sheen	Y
	13 -17	sandy clay	reddish brown	Y	(meter down due to rain)	accumulation of residuals	Y
ST-10/11 (observational transect - no samples collected)	0 - 1	fine silt	reddish brown	–	(meter down due to rain)	N	Y
	1 - 3	coarse sand to clayey sand, trace organic matter, trace gravel	brown	Y	(meter down due to rain)	N	Y
	3 - 18	silty clay, organic matter	brown	–	(meter down due to rain)	accumulation of residuals	Y
SD-11 (right)	0 - 2	fine silt, organic matter	reddish brown	N	Ambient	N	Y
	2 - 4	clay	reddish brown	N	Ambient	N	Y
	4 - 8	organic matter, clay	blackish brown	Y	5	staining and odor	Y
	8 - 10	clay, some organic matter	reddish brown to dark reddish gray	Y	–	N	Y

TABLE 3-6 (Continued)
Summary of Physical Characteristics
Crawford Creek Sediment

Koppers Industries, Inc.
Superior, Wisconsin

Sample Location (selected core location)[1]	Depth (Inches)	Texture	Color	Odor (Y/N)[2]	Pid Reading (PPM)[3]	Observation of potentially site-related residuals	Visual Sheen (Y/N)[4]
SD-12 (center)	0 - 3	silt, organic matter	reddish brown	N	–	N	Y
	3 - 5	clay	reddish brown	N	–	N	Y
	5 - 12	organic matter	blackish brown	Y	19	staining and odor	Y
	12 - 14	clay	reddish brown	–	–	N	Y
SD-13 (left)	0 - 3	silt, organic matter	reddish brown	Y	3	N	Y
	3 - 12	clay	reddish brown	Y	3	N	Y
ST-13/14 (observational transect - no samples collected)	0 - 2	fine silt	brown	N	Ambient	N	N
	2 - 12	clay, trace organic matter	reddish brown to dark reddish brown	N	Ambient	N	N
SD-14 (left)	0 - 3	silty clay, organic matter	reddish brown	N	Ambient	N	N
	3 - 19	clay	reddish brown	N	Ambient	N	N
ST-14/15 (observational transect - no samples collected)	0 - 3	silty clay, organic matter	reddish brown	N	Ambient	N	N
	2 - 12	clay, organic matter	reddish brown to dark brown	Y	Ambient	N	N
SD-15 (left)	0 - 2	silty clay, organic matter, trace sand	reddish brown	N	Ambient	N	N
	2 - 12	clay, trace organic matter	reddish brown to dark reddish brown	N	Ambient	N	N

TABLE 3-6 (Continued)
Summary of Physical Characteristics
Crawford Creek Sediment

Koppers Industries, Inc.
Superior, Wisconsin

Notes:

1 = Data represents observations at the core location within the channel as selected for sampling. Within Crawford Creek (samples SD-9 through SD-15), three core locations were advanced across a transect at each sediment sample location- one near each bank and one in the center of the channel. The selected core location was designated "right, "center" or "left" looking downstream.

2 = "Y" represents that an odor was discernable. "N"represents no discernable odors were detected.

3 = Photoionization detector readings were obtained using an Hnu Systems P101 meter. The reported readings represent the actual meter response, with no deductions for background. Ambient (background) meter readings were between 0.1 and 0.2 ppm during the project. Where possible, readings are reported for distinct depth intervals of the sediment cores; however, it was often not possible to distinguish individual readings by strata.

4 = "Y" represents that a visible sheen was observed on surface water during the extraction of the sediment core, "N" represents that no visible sheen was observed. This observation is reported similarly for all depth increments of the core.

TABLE 3-7
Summary of Sediment Grain Size Analysis
Crawford Creek

Koppers Industries, Inc.
Superior, Wisconsin

Location	Soil Description	USCS Classification	Percent Each Component	
SD-9A	Brown Sandy Lean Clay	cl	gr = 2 sa = 40	sl = 25 cl = 33
SD-9B	Brown Lean Clay	cl	gr = 0 sa = 10	sl = 38 cl = 52
SD-10A	Brown Sandy Lean Clay	cl	gr = 7 sa = 36	sl = 23 cl = 34
SD-10B	Brown Sandy Lean Clay	cl	gr = 7 sa = 25	sl = 27 cl = 41
SD-11A	Brown Lean Clay with Sand	cl	gr = 2 sa = 17	sl = 35 cl = 46
SD-11B	Brown Lean Clay	cl	gr = 1 sa = 7	sl = 41 cl = 51
SD-12A	Brown Lean Clay	cl	gr = 1 sa = 12	sl = 33 cl = 54
SD-12B	Brown Sandy Lean Clay	cl	gr = 3 sa = 30	sl = 23 cl = 46
SD-13A	Brown Lean Clay with Gravel	cl	gr = 19 sa = 11	sl = 46 cl = 24
SD-13B	Brown Lean Clay	cl	gr = 1 sa = 4	sl = 61 cl = 34
SD-14A	Brown Lean Clay	cl	gr = 0 sa = 10	sl = 58 cl = 32
SD-14B	Brown Lean Clay	cl	gr = 0 sa = 7	sl = 60 cl = 33
SD-15A	Brown Lean Clay	cl	gr = 1 sa = 17	sl = 53 cl = 29
SD-15B	Brown Lean Clay	cl	gr = 1 sa = 14	sl = 58 cl = 27

NOTES: 1 gr = gravel sl = silt
sa = sand cl = clay

TABLE 3-8
Summary of Vegetative, Aquatic and Channel Obstruction Observations
Crawford Creek

Koppers Industries, Inc.
Superior, Wisconsin

Sediment Sample Transect Location	Vegetative Observations	Aquatic Observations	Channel Obstructions
SD-9	Lowland meadow, primarily reeds and grasses and some sedges and rushes, dominated surrounding banks. Scattered ash trees (Fraxinus spp.) along banks.	Leeches observed in water.	No obstructions in immediate vicinity of SD-9 location. Scattered downed trees and log debris upstream between roadway and sample location.
SD-10	Lowland meadow, primarily reeds and grasses and some sedges and rushes, dominated the channel banks and surrounding area. Emergent herbaceous species observed within channel. Clumps of black willow shrubs and ash trees scattered along banks.	No significant observations.	None in vicinity of SD-10 location.
SD-11	Banks dominated by emergent vegetation and willows. Emergent and submergent vegetation within channel.	Dragonfly nymphs (naiads) observed in sediment.	None in vicinity of SD-11 location.
SD-12	Crawford Creek "Pond" area. Open water and emergent habitat surrounded by deciduous shrub and forest species. Submergent vegetation observed in cores.	Beaver, tadpoles and frogs observed within "Pond".	Culvert under railroad grade approximately 150 yards below point where "Pond" joins main channel. Beaver dam, which maintains "Pond" approximately 150 yards below railroad grade.

TABLE 3-8 (Continued)
Summary of Vegetative, Aquatic and Channel Obstruction Observations
Crawford Creek

Koppers Industries, Inc.
Superior, Wisconsin

Sediment Sample Transect Location	Vegetative Observations	Aquatic Observations[1]	Channel Obstructions
SD-13	Lowland meadow dominated by reeds, grasses and willow.	Numerous unclassified small fish (minnows) observed. Frogs observed on surrounding stream banks.	Small beaver dam in main channel approximately 30 yards upstream of SD-13. Large beaver dam approximately 40 yards upstream of SD-13. Culvert under railroad grade approximately 200 yards above SD-13 location.
SD-14	Open forested meadow surrounding banks. Reeds and grasses, ferns and ash trees dominate. Scattered emergents within channel.	Frogs observed on stream banks.	Scattered down trees and logs upstream between SD-14 and SD-13 locations.
SD-15	Scattered clumps of emergent vegetation within channel. Grasses, unclassified ferns and clubmosses (Lycopodium spp.) dominate the steep banks. Ash dominates tree species surrounding banks.	Frogs observed on stream banks.	None in vicinity of SD-15 location.

Notes:

1 = Generally, the frequency and abundance of benthic, aquatic or miscellaneous invertebrates observed during sediment sampling was limited.

TABLE 4-1

Summary of Analytical Results for the
Surface Water Samples
- Method 589 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-05 06/13/96	SW-06 06/13/96	SW-07 06/10/96	SW-08 06/12/96	SW-09 06/12/96	SW-10 06/11/96
Pentachlorophenol		1.1	<0.50 U	<0.50 U	<0.50 U	<0.50 U	<0.50 U
2,3,4,6 & 2,3,5,6-Tetrachlorophenol		<0.50 U	<0.50 U	<0.50 U	<0.50 U	<0.50 U	<0.50 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-590

TABLE 4-1

Summary of Analytical Results for the
Surface Water Samples
- Method 589 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-11 06/11/96
Pentachlorophenol		<0.50 U
2,3,4,6 & 2,3,5,6-Tetrachlorophenol		<0.50 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-59

TABLE 4-2

Summay of Analytical Results for the
Surface Water Samples
- Method 8310 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-05 06/13/96	SW-06 06/13/96	SW-07 06/10/96	SW-08 06/12/96	SW-09 06/12/96	SW-10 06/11/96
Benzo(a)pyrene		<0.020 U	0.10	<0.020 U	0.040 J	<0.020 UJ	<0.020 U
Dibenzo(a,h)anthracene		<0.030 U	<0.030 U	<0.030 U	<0.030 UJ	<0.030 UJ	<0.030 U
Benzo(a)anthracene		<0.020 U	<0.020 U	<0.020 U	<0.020 UJ	<0.020 UJ	<0.020 U
Acenaphthene		3.0	<2.0 U	<2.0 U	<2.0 UJ	<2.0 UJ	<2.0 U
Phenanthrene		<0.60 U	<0.60 U	<0.60 U	<0.60 UJ	<0.60 UJ	<0.60 U
Fluorene		<0.20 U	<0.20 U	<0.20 U	<0.20 UJ	<0.20 UJ	<0.20 U
Naphthalene		<2.0 U	<2.0 U	<2.0 U	<2.0 UJ	<2.0 UJ	<2.0 U
2-Methylnaphthalene		<2.0 U	--	<2.0 U	<2.0 UJ	<2.0 UJ	<2.0 U
Anthracene		<0.10 U	0.16	<0.10 U	<0.10 UJ	<0.10 UJ	<0.10 U
Pyrene		<0.20 U	<0.20 U	<0.20 U	<0.20 UJ	<0.20 UJ	<0.20 U
Dibenzofuran		<2.0 U	--	<2.0 U	<2.0 UJ	<2.0 UJ	<2.0 U
Benzo(ghi)perylene		<0.050 U	<0.050 U	<0.050 U	<0.050 UJ	<0.050 UJ	<0.050 U
Indeno(1,2,3-cd)pyrene		<0.050 U	0.056	<0.050 U	<0.050 UJ	<0.050 UJ	<0.050 U
Benzo(b)fluoranthene		0.050	0.26	<0.020 U	0.051 J	0.033 J	0.044
Fluoranthene		<0.20 U	<0.20 U	<0.20 U	<0.20 UJ	0.23	<0.20 U
Benzo(k)fluoranthene		<0.020 U	0.056	<0.020 U	0.042 J	<0.020 UJ	<0.020 U
Acenaphthylene		<2.0 U	<2.0 U	<2.0 U	<2.0 UJ	<2.0 UJ	<2.0 U
Chrysene		<0.15 U	<0.15 U	<0.15 U	<0.15 UJ	<0.15 UJ	<0.15 U
Methylnaphthalene		<2.0 U	<2.0 U	<2.0 U	<2.0 UJ	<2.0 UJ	<2.0 U
2-Methylnaphthalene/Dibenzofuran		--	4.4	--	--	--	--
Total PAH's		3.05	5.022	0	0.133	0.263	0.044

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RI/N-8310

TABLE 4-2

Summay of Analytical Results for the
Surface Water Samples
- Method 8310 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-11 / 06/11/96
Benzo(a)pyrene		<0.020 U
Dibenzo(a,h)anthracene		<0.030 U
Benzo(a)anthracene		<0.020 U
Acenaphthene		<2.0 U
Phenanthrene		<0.50 U
Fluorene		<0.20 U
Naphthalene		<2.0 U
2-Methylnaphthalene		<2.0 U
Anthracene		<0.10 U
Pyrene		<0.20 U
Dibenzofuran		<2.0 U
Benzo(ghi)perylene		<0.050 U
Indeno(1,2,3-cd)pyrene		<0.050 U
Benzo(b)fluoranthene		<0.020 U
Fluoranthene		<0.20 U
Benzo(k)fluoranthene		<0.020 U
Acenaphthylene		<2.0 U
Chrysene		<0.15 U
Methylnaphthalene		<2.0 U
2-Methylnaphthalene/Dibenzofuran		--
Total PAH's		0

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RI 310

TABLE 4-3

Summary of Analytical Results for the
Surface Water Samples
- Method 8270 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-05 06/13/96	SW-06 06/13/96	SW-07 06/10/96	SW-08 06/12/96	SW-09 06/12/96	SW-10 06/11/96
2,4-Dinitrophenol		<50 UJ	<50 UJ	<50 U	<50 UJ	<50 UJ	<50 U
2,3,4,6-Tetrachlorophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
4-Chloro-3-methylphenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Benzoic acid		<50 UJ	<50 UJ	<50 U	<50 UJ	<50 UJ	<50 U
Hexachloroethane		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Hexachlorocyclopentadiene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Isophorone		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Diethyl phthalate		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Di-n-butyl phthalate		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Butyl benzyl phthalate		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
N-Nitrosodiphenylamine		<10 UJ	<10 UJ	<10 U	<10 UJ	<10 UJ	<10 U
2,6-Dichlorophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Hexachlorobutadiene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2,4,6-Trichlorophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2-Nitroaniline		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2-Nitrophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2-Chloronaphthalene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
3,3'-Dichlorobenzidine		<20 UJ	<20 UJ	<20 U	<20 UJ	<20 U	<20 U
2-Methylphenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
1,2-Dichlorobenzene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2-Chlorophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2,4,5-Trichlorophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Nitrobenzene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
3-Nitroaniline		<10 UJ	<10 UJ	<10 U	<10 UJ	<10 UJ	<10 U
4-Nitroaniline		<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ
4-Nitrophenol		<10 UJ	<10 UJ	<10 U	<10 UJ	<10 UJ	<10 U
Benzyl alcohol		<10 U	<10 U	<10 U	<10 U	<10 U.	<10 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-8270

TABLE 4-3

Summary of Analytical Results for the
Surface Water Samples
- Method 8270 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-05 06/13/96	SW-06 06/13/96	SW-07 06/10/96	SW-08 06/12/96	SW-09 06/12/96	SW-10 06/11/96
4-Bromophenyl phenyl ether		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2,4-Dimethylphenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
4-Methylphenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
1,4-Dichlorobenzene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
4-Chloroaniline		<10 UJ	<10 UJ	<10 U	<10 UJ	<10 UJ	<10 U
Phenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
bis(2-Chloroethyl) ether		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Bis(2-chloroethoxy) methane		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
bis(2-Ethylhexyl) phthalate		<10 U	<10 U	<10 UJ	<10 U	<10 U	<10 UJ
Di-n-octyl phthalate		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Hexachlorobenzene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
1,2,4-Trichlorobenzene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2,4-Dichlorophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2,4-Dinitrotoluene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
O,O,O-Triethylphosphorothioate		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Dimethyl phthalate		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Dibenzofuran		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
4,6-Dinitro-2-methylphenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
1,3-Dichlorobenzene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
2,6-Dinitrotoluene		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
N-Nitroso-di-n-propylamine		<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ	<10 UJ
2,3,5,6-Tetrachlorophenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
4-Chlorophenyl phenyl ether		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Bis(2-chloroisopropyl) ether		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
3 & 4 - Methylphenol		<10 U	<10 U	<10 U	<10 U	<10 U	<10 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLI /0

TABLE 4-3

Summary of Analytical Results for the
Surface Water Samples
- Method 8270 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-11 / 06/11/96
2,4-Dinitrophenol		<50 U
2,3,4,6-Tetrachlorophenol		<10 U
4-Chloro-3-methylphenol		<10 U
Benzoic acid		<50 U
Hexachloroethane		<10 U
Hexachlorocyclopentadiene		<10 U
Isophorone		<10 U
Diethyl phthalate		<10 U
Di-n-butyl phthalate		<10 U
Butyl benzyl phthalate		<10 U
N-Nitrosodiphenylamine		<10 U
2,6-Dichlorophenol		<10 U
Hexachlorobutadiene		<10 U
2,4,6-Trichlorophenol		<10 U
2-Nitroaniline		<10 U
2-Nitrophenol		<10 U
2-Chloronaphthalene		<10 U
3,3'-Dichlorobenzidine		<20 U
2-Methylphenol		<10 U
1,2-Dichlorobenzene		<10 U
2-Chlorophenol		<10 U
2,4,5-Trichlorophenol		<10 U
Nitrobenzene		<10 U
3-Nitroaniline		<10 U
4-Nitroaniline		<10 UJ
4-Nitrophenol		<10 U
Benzyl alcohol		<10 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-8270

TABLE 4-3

Summary of Analytical Results for the
Surface Water Samples
- Method 8270 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/23/97

CONSTITUENT (Units in ug/l)	SITE / SAMPLE ID / DATE	SW-11 / 06/11/96
4-Bromophenyl phenyl ether		<10 U
2,4-Dimethylphenol		<10 U
4-Methylphenol		<10 U
1,4-Dichlorobenzene		<10 U
4-Chloroaniline		<10 U
Phenol		<10 U
bis(2-Chloroethyl) ether		<10 U
Bis(2-chloroethoxy) methane		<10 U
bis(2-Ethylhexyl) phthalate		<10 UJ
Di-n-octyl phthalate		<10 U
Hexachlorobenzene		<10 U
1,2,4-Trichlorobenzene		<10 U
2,4-Dichlorophenol		<10 U
2,4-Dinitrotoluene		<10 U
O,O,O-Triethylphosphorothioate		<10 U
Dimethyl phthalate		<10 U
Dibenzofuran		<10 U
4,6-Dinitro-2-methylphenol		<10 U
1,3-Dichlorobenzene		<10 U
2,6-Dinitrotoluene		<10 U
N-Nitroso-di-n-propylamine		<10 UJ
2,3,5,6-Tetrachlorophenol		<10 U
4-Chlorophenyl phenyl ether		<10 U
Bis(2-chloroisopropyl) ether		<10 U
3 & 4 - Methylphenol		<10 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLI[illegible]270

TABLE 4-4

Summary of Analytical Results for the
Sediment Samples
- Method 589 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	SD-05	SD-05	SD-06	SD-06	SD-07	SD-07
	SAMPLE ID						
	DATE	06/13/96	06/13/96	06/13/96	06/13/96	06/13/96	06/13/96
	DEPTH (ft)	0.50	1.30	0.50	1.00	0.50	1.30
Pentachlorophenol		27 J	41 J	390 J	<16 UJ	20 J	<14 U
2,3,4,6 & 2,3,5,6-Tetrachlorophenol		<36 U	<34 U	<58 U	<32 U	<28 U	<28 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN 589

TABLE 4-4

Summary of Analytical Results for the
Sediment Samples
- Method 589 -
Koppers Industries, Inc.
Superior, Wisconsin

CONSTITUENT (Units in ug/kg)	SITE	SD-08	SD-08	SD-09	SD-09	SD-10	SD-10
	SAMPLE ID						
	DATE	06/13/96	06/13/96	06/10/96	06/10/96	06/12/96	06/12/96
	DEPTH (ft)	0.50	0.70	0.50	0.90	0.50	1.40
Pentachlorophenol		530 J	< 15 UJ	< 16 UJ	< 14 UJ	150 J	63
2,3,4,6 & 2,3,5,6-Tetrachlorophenol		< 118 UJ	< 30 UJ	< 32 UJ	< 28 UJ	< 30 UJ	< 34 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL Rt ,9

TABLE 4-4

Summary of Analytical Results for the
Sediment Samples
- Method 589 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	SD-11	SD-11	SD-12	SD-12	SD-13	SD-13
	SAMPLE ID						
	DATE	06/12/96	06/12/96	06/12/96	06/12/96	06/11/96	06/11/96
	DEPTH (ft)	0.50	0.80	0.50	1.20	0.50	1.00
Pentachlorophenol		24 J	<15 UJ	30 J	220 J	<15 UJ	24 J
2,3,4,6 & 2,3,5,6-Tetrachlorophenol		<34 UJ	<30 UJ	<36 UJ	48 J	<30 UJ	<28 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-589

TABLE 4-4

Summary of Analytical Results for the
Sediment Samples
- Method 589 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	SD-14	SD-14	SD-15	SD-15
	SAMPLE ID				
	DATE	06/11/96	06/11/96	06/11/96	06/11/96
	DEPTH (ft)	0.50	1.60	0.50	1.00
Pentachlorophenol		< 15 UJ	< 14 UJ	< 15 UJ	< 16 UJ
2,3,4,6 & 2,3,5,6-Tetrachlorophenol		< 30 UJ	< 28 UJ	< 30 UJ	< 32 UJ

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RI 3

TABLE 4-5

Summary of Analytical Results for the
Sediment Samples
- Method 8310 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT	SITE / SAMPLE ID / DATE / DEPTH (ft)		SD-05 06/13/96 0.50	SD-05 06/13/96 1.30	SD-06 06/13/96 0.50	SD-06 06/13/96 1.00	SD-07 06/13/96 0.50	SD-07 06/13/96 1.30
Benzo(a)pyrene		(ug/kg)	1700	8600	9700	3400	36000	<6.0 U
Dibenzo(a,h)anthracene		(ug/kg)	5300	<1700 U	<2900 U	11000	<14000 U	<7.2 U
Benzo(a)anthracene		(ug/kg)	2700	31000	14000	5600	62000	<6.0 U
Acenaphthene		(ug/kg)	<12000 U	<120000 U	<200000 U	<23000 U	<980000 U	<600 U
Phenanthrene		(ug/kg)	10000	112000	<49000 U	20000	610000	220
Fluorene		(ug/kg)	3400	74000	<20000 U	6900	220000	160
Naphthalene		(ug/kg)	<12000 U	<120000 U	<200000 U	26000	<980000 U	<600 U
2-Methylnaphthalene		(ug/kg)	<12000 U	<120000 U	<200000 U	<23000 U	<980000 U	<600 U
Anthracene		(ug/kg)	1000	100000	53000	6300	300000	<25 U
Pyrene		(ug/kg)	5900	110000	38000	17000	220000	<50 U
Dibenzofuran		(ug/kg)	<12000 U	<120000 U	<200000 U	<23000 U	<980000 U	<600 U
Benzo(ghi)perylene		(ug/kg)	1400	6300	<4900 U	3200	<24000 U	<12 U
Indeno(1,2,3-cd)pyrene		(ug/kg)	1300	4000	<4900 U	2800	<24000 U	<12 U
Benzo(b)fluoranthene		(ug/kg)	2300	13000	15000	5200	50000	11
Fluoranthene		(ug/kg)	7400	160000	52000	26000	310000	<60 U
Benzo(k)fluoranthene		(ug/kg)	780	5200	5600	1900	21000	<6.0 U
Acenaphthylene		(ug/kg)	<12000 U	<120000 U	<200000 U	<23000 U	<980000 U	<600 U
Chrysene		(ug/kg)	3400	44000	34000	9800	184000	<36 U
Methylnaphthalene		(ug/kg)	<12000 U	<120000 U	<200000 U	<23000 U	<980000 U	<500 U
Total PAH's		(ug/Kg)	46580	668100	221300	145100	2013000	391

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RFI-8310

TABLE 4-5

Summary of Analytical Results for the
Sediment Samples
- Method 8310 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT	SITE		SD-08	SD-08	SD-09	SD-09	SD-10	SD-10
	SAMPLE ID							
	DATE		06/13/96	06/13/96	06/10/96	06/10/96	06/12/96	06/12/96
	DEPTH (ft)		0.50	0.70	0.50	0.90	0.50	1.40
Benzo(a)pyrene		(ug/kg)	9100	4700	370 J	1200 J	6400	3500
Dibenzo(a,h)anthracene		(ug/kg)	< 2900 U	7500	< 16 UJ	< 140 UJ	< 2900 U	< 1700 U
Benzo(a)anthracene		(ug/kg)	11000	8500	170 J	350 J	5500	2900
Acenaphthene		(ug/kg)	< 210000 U	< 110000 U	< 1100 UJ	< 9700 UJ	< 200000 U	< 120000 U
Phenanthrene		(ug/kg)	< 5000 U	110000	610 J	2500 J	< 49000 U	< 29000 U
Fluorene		(ug/kg)	< 21000 U	33000	250 J	1700 J	< 20000 U	< 12000 U
Naphthalene		(ug/kg)	< 210000 U	< 110000 U	< 1100 UJ	< 9700 UJ	< 200000 U	< 120000 U
2-Methylnaphthalene		(ug/kg)	< 210000 U	< 110000 U	< 1100 UJ	< 9700 UJ	< 200000 U	< 120000 U
Anthracene		(ug/kg)	36000	9500	150 J	770 J	16000	8200
Pyrene		(ug/kg)	27000	44000	480 J	1800 J	< 20000 U	< 12000 U
Dibenzofuran		(ug/kg)	< 210000 U	< 110000 U	< 1100 UJ	< 9700 UJ	< 200000 U	< 120000 U
Benzo(ghi)perylene		(ug/kg)	< 5000 U	2700	460 J	1200 J	< 3400 U	< 2900 U
Indeno(1,2,3-cd)pyrene		(ug/kg)	< 5000 U	< 2600 U	560 J	1600 J	< 3400 U	< 2900 U
Benzo(b)fluoranthene		(ug/kg)	14000	6600	660 J	2100 J	9300	4800
Fluoranthene		(ug/kg)	38000	58000	740 J	2600 J	26000	14000
Benzo(k)fluoranthene		(ug/kg)	5300	2600	110 J	320 J	3700	2000
Acenaphthylene		(ug/kg)	< 210000 U	< 110000 U	< 1100 UJ	< 9700 UJ	< 200000 U	< 120000 U
Chrysene		(ug/kg)	26000	< 7700 U	250 J	< 700 UJ	< 14000 U	< 8500 U
Methylnaphthalene		(ug/kg)	< 210000 U	< 110000 U	< 1100 UJ	< 9700 UJ	< 200000 U	< 120000 U
Total PAH's		(ug/Kg)	166400	287100	4810	16140	66900	36400

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

TABLE 4-5

Summary of Analytical Results for the
Sediment Samples
- Method 8310 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT	SITE		SD-11	SD-11	SD-12	SD-12	SD-13	SD-13
	SAMPLE ID							
	DATE		06/12/96	06/12/96	06/12/96	06/12/96	06/11/96	06/11/96
	DEPTH (ft)		0.50	0.80	0.50	1.20	0.50	1.00
Benzo(a)pyrene		(ug/kg)	12000	14000	3000	82000	1900 J	880
Dibenzo(a,h)anthracene		(ug/kg)	<3400 U	<3000 U	<1800 U	<28000 U	<730 U	<280 U
Benzo(a)anthracene		(ug/kg)	30000	35000	4300	220000	3200 J	2200
Acenaphthene		(ug/kg)	<240000 U	220000	<120000 U	<2000000 U	<51000 U	<20000 U
Phenanthrene		(ug/kg)	220000	290000	<30000 U	2000000	47000 J	22000
Fluorene		(ug/kg)	88000	100000	<12000 U	710000	12000 J	6600
Naphthalene		(ug/kg)	<240000 U	480000	<120000 U	<2000000 U	<51000 U	<20000 U
2-Methylnaphthalene		(ug/kg)	<240000 U	<210000 U	<120000 U	<2000000 U	<51000 U	<20000 U
Anthracene		(ug/kg)	34000	26000	<6100 U	290000	5000	2300
Pyrene		(ug/kg)	920000	120000	16000	710000	13000	7900
Dibenzofuran		(ug/kg)	<240000 U	<210000 U	<120000 U	<2000000 U	<51000 U	<20000 U
Benzo(ghi)perylene		(ug/kg)	<5900 U	<5100 U	<3000 U	<48000 U	<1200 U	<480 U
Indeno(1,2,3-cd)pyrene		(ug/kg)	<5900 U	<5100 U	<3000 U	<48000 U	<1200 U	<480 U
Benzo(b)fluoranthene		(ug/kg)	18000	19000	4400	120000	2800 J	1300
Fluoranthene		(ug/kg)	130000	160000	25000	1100000	23000 J	120000
Benzo(k)fluoranthene		(ug/kg)	7300	<8100 U	2000	50000	1100 J	520
Acenaphthylene		(ug/kg)	<240000 U	<210000 U	<120000 U	<2000000 U	<51000 U	<20000 U
Chrysene		(ug/kg)	56000	62000	<8800 U	500000	<3700 U	3500
Methylnaphthalene		(ug/kg)	<240000 U	<210000 U	<120000 U	<2000000 U	<51000 U	<20000 U
Total PAH's		(ug/Kg)	1515300	1525000	53700	5782000	109000	167200

ues represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

TABLE 4-5

Summary of Analytical Results for the
Sediment Samples
- Method 8310 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT		SITE	SD-14	SD-14	SD-15	SD-15
		SAMPLE ID				
		DATE	06/11/96	06/11/96	06/11/96	06/11/96
		DEPTH (ft)	0.50	1.60	0.50	1.00
Benzo(a)pyrene	(ug/kg)		120 J	23 J	610 J	84 J
Dibenzo(a,h)anthracene	(ug/kg)		710 J	68 J	< 160 UJ	< 16 UJ
Benzo(a)anthracene	(ug/kg)		100 J	25 J	1100 J	130 J
Acenaphthene	(ug/kg)		< 1000 U	< 95 U	< 10000 UJ	< 1100 UJ
Phenanthrene	(ug/kg)		< 260 U	39	< 2600 UJ	< 270 UJ
Fluorene	(ug/kg)		< 100 U	< 9.5 U	< 1000 UJ	< 110 UJ
Naphthalene	(ug/kg)		< 1000 U	< 95 U	< 10000 UJ	< 1100 UJ
2-Methylnaphthalene	(ug/kg)		< 1000 U	< 95 U	< 10000 UJ	< 1100 UJ
Anthracene	(ug/kg)		220 J	10	1900 J	< 56 UJ
Pyrene	(ug/kg)		210 J	52 J	2700 J	380 J
Dibenzofuran	(ug/kg)		< 1000 U	< 95 U	< 10000 UJ	< 1100 UJ
Benzo(ghi)perylene	(ug/kg)		190 J	16 J	< 250 UJ	74 J
Indeno(1,2,3-cd)pyrene	(ug/kg)		180 J	16 J	480 UJ	86 J
Benzo(b)fluoranthene	(ug/kg)		180 J	44 J	940 J	130 J
Fluoranthene	(ug/kg)		300 J	87 J	4200 J	480 J
Benzo(k)fluoranthene	(ug/kg)		64 J	11 J	320 J	44 J
Acenaphthylene	(ug/kg)		< 1000 U	< 95 U	< 10000 UJ	< 1100 UJ
Chrysene	(ug/kg)		410 J	51 J	1600 J	160 J
Methylnaphthalene	(ug/kg)		< 1000 U	< 95 U	< 10000 UJ	< 1100 UJ
Total PAH's	(ug/Kg)		2674	442	13370	1568

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN O

TABLE 4-6

Summary of Analytical Results for the
Sediment Samples
- Method 8040 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	SD-05	SD-05	SD-06	SD-06	SD-07	SD-07
	SAMPLE ID						
	DATE	06/13/96	06/13/96	06/13/96	06/13/96	06/13/96	06/13/96
	DEPTH (ft)	0.50	1.30	0.50	1.00	0.50	1.30
2,4-Dinitrophenol		<179 U	<17200 U	<14400 U	82100	<1390 U	<143 U
4-Chloro-3-methylphenol		<89 U	<8590 U	<7190 U	7610	<696 U	<71 U
2,6-Dichlorophenol		<89 U	<8590 U	<7190 U	6080	<696 U	<71 U
2,4,6-Trichlorophenol		<179 U	<17200 U	<14400 U	(5140)	<1390 U	<143 U
2-Nitrophenol		<89 U	<8590 U	<7190 U	<4100 U	<696 U	<71 U
2-Methylphenol		<89 U	<8590 U	<7190 U	<4100 U	<696 U	<71 U
2-Chlorophenol		<89 U	<8590 U	<7190 U	<4100 U	<696 U	<71 U
2,4,5-Trichlorophenol		<179 U	<17200 U	<14400 U	21000	<1390 U	<143 U
4-Nitrophenol		<179 U	<17200 U	<14400 U	112000	<1390 U	<143 U
2,4-Dimethylphenol		<89 U	<8590 U	<7190 U	<4100 U	<696 U	<71 U
Phenol		<89 U	<8590 U	<7190 U	<4100 U	<696 U	<71 U
2,4-Dichlorophenol		<89 U	<8590 U	<7190 U	<4100 U	<696 U	<71 U
4,6-Dinitro-2-methylphenol		<179 U	<17200 U	<14400 U	72000	<1390 U	<143 U
3 & 4 - Methylphenol		<89 U	<8590 U	<7190 U	<4100 U	<696 U	<71 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

() = Less than Detection Limit

For RCL RI N-8040

TABLE 4-6

Summary of Analytical Results for the
Sediment Samples
- Method 8040 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	SD-08	SD-08	SD-09	SD-09	SD-10	SD-10
	SAMPLE ID						
	DATE	06/13/96	06/13/96	06/10/96	06/10/96	06/12/96	06/12/96
	DEPTH (ft)	0.50	0.70	0.50	0.90	0.50	1.40
2,4-Dinitrophenol		< 14700 U	< 15400 U	< 163 UJ	< 139 U	2000 J	< 1740 UJ
4-Chloro-3-methylphenol		< 7370 U	< 7690 U	< 81 U	< 69 U	200 J	< 871 U
2,6-Dichlorophenol		< 7370 U	< 7690 U	< 81 U	< 69 U	78 J	< 871 U
2,4,6-Trichlorophenol		< 14700 U	< 15400 U	< 163 U	< 139 U	< 145 UJ	< 1740 U
2-Nitrophenol		< 7370 U	< 7690 U	< 81 U	< 69 U	< 72 UJ	< 871 U
2-Methylphenol		< 7370 U	< 7690 U	< 81 U	< 69 U	< 72 UJ	< 871 U
2-Chlorophenol		< 7370 U	< 7690 U	< 81 U	< 69 U	< 72 UJ	< 871 U
2,4,5-Trichlorophenol		< 14700 U	< 15400 U	< 163 U	< 139 U	290 J	< 1740 U
4-Nitrophenol		< 14700 U	< 15400 U	< 163 U	< 139 U	3600 J	< 1740 U
2,4-Dimethylphenol		< 7370 U	< 7690 U	< 81 U	< 69 U	< 72 UJ	< 871 U
Phenol		< 7370 U	< 7690 U	< 81 U	< 69 U	< 72 UJ	< 871 U
2,4-Dichlorophenol		< 7370 U	< 7690 U	< 81 U	< 69 U	< 72 UJ	< 871 U
4,6-Dinitro-2-methylphenol		< 14700 U	< 15400 U	< 163 U	< 139 U	940 J	< 1740 U
3 & 4 - Methylphenol		< 7370 U	< 7690 U	< 81 U	< 69 U	< 72 U	< 871 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN

TABLE 4-6

Summary of Analytical Results for the
Sediment Samples
- Method 8040 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	SD-11	SD-11	SD-12	SD-12	SD-13	SD-13
	SAMPLE ID						
	DATE	06/12/96	06/12/96	06/12/96	06/12/96	06/11/96	06/11/96
	DEPTH (ft)	0.50	0.80	0.50	1.20	0.50	1.00
2,4-Dinitrophenol		<17200 U	<1610 U	<1750 U	<42000 U	<1470 UJ	<143 U
4-Chloro-3-methylphenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
2,6-Dichlorophenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
2,4,6-Trichlorophenol		<17200 U	<1610 U	<1750 U	<42000 U	<1470 U	<143 U
2-Nitrophenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
2-Methylphenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
2-Chlorophenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
2,4,5-Trichlorophenol		<17200 U	<1610 U	<1750 U	<42000 U	<1470 U	<143 U
4-Nitrophenol		<17200 U	42000	<1750 U	<42000 U	<1470 U	<143 U
2,4-Dimethylphenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
Phenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
2,4-Dichlorophenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U
4,6-Dinitro-2-methylphenol		<17200 U	<1610 U	<1750 U	<42000 U	<1470 U	<143 U
3 & 4 - Methylphenol		<8600 U	<763 U	<876 U	<21000 U	<734 U	<71 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

TABLE 4-6

Summary of Analytical Results for the
Sediment Samples
- Method 8040 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	SD-14	SD-14	SD-15	SD-15
	SAMPLE ID				
	DATE	06/11/96	06/11/96	06/11/96	06/11/96
	DEPTH (ft)	0.50	1.60	0.50	1.00
2,4-Dinitrophenol		<147 U	<136 U	<1470 UJ	<159 U
4-Chloro-3-methylphenol		<73 U	<68 U	<735 U	<79 U
2,6-Dichlorophenol		<73 U	<68 U	<735 U	<79 U
2,4,6-Trichlorophenol		<147 U	<136 U	<1470 U	<159 U
2-Nitrophenol		<73 U	<68 U	<735 U	<79 U
2-Methylphenol		<73 U	<68 U	<735 U	<79 U
2-Chlorophenol		<73 U	<68 U	<735 U	<79 U
2,4,5-Trichlorophenol		<147 U	<136 U	<1470 U	<159 U
4-Nitrophenol		<147 U	<136 U	<1470 U	<159 U
2,4-Dimethylphenol		<73 U	<68 U	<735 U	<79 U
Phenol		<73 U	<68 U	<735 U	<79 U
2,4-Dichlorophenol		<73 U	<68 U	<735 U	<79 U
4,6-Dinitro-2-methylphenol		<147 U	<136 U	<1470 U	<159 U
3 & 4 - Methylphenol		<73 U	<68 U	<735 U	<79 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN)

TABLE 4-7

Summary of Analytical Results for the
Sediment Samples
- Method 6010 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT	(Units in mg/kg)	SITE	SD-06	SD-06	SD-07	SD-07	SD-09	SD-09
		SAMPLE ID						
		DATE	06/13/96	06/13/96	06/13/96	06/13/96	06/10/96	06/10/96
		DEPTH (ft)	0.50	1.00	0.50	1.30	0.50	0.90
Lead			<14.4 U	<16.4 U	<13.9 U	<14.3 U	<16.3 U	<13.9 U
Arsenic			<14.4 U	<16.4 U	<13.9 U	<14.3 U	<16.3 U	<13.9 U
Barium			146	194	205	177	115	122
Cadmium			<0.72 U	<0.82 U	<0.69 U	<0.71 U	<0.81 U	<0.69 U
Chromium			85.6	49.2	38.6	37.6	31.6	32.6

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

TABLE 4-7

Summary of Analytical Results for the
Sediment Samples
- Method 6010 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in mg/kg)	SITE	SD-10	SD-10	SD-11	SD-11	SD-12	SD-12
	SAMPLE ID						
	DATE	06/12/96	06/12/96	06/12/96	06/12/96	06/12/96	06/12/96
	DEPTH (ft)	0.50	1.40	0.50	0.80	0.50	1.20
Lead		<14.5 U	<17.4 U	<17.2 U	<15.1 U	<17.5 U	<14.0 U
Arsenic		<14.5 U	<17.4 U	<17.2 U	<15.1 U	<17.5 U	<14.0 U
Barium		127	158	139	164	173	146
Cadmium		<0.72 U	<0.87 U	<0.86 U	<0.76 U	<0.87 U	<0.69 U
Chromium		32.1	36.9	35.6	36.1	45.3	47.9

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLI O

TABLE 4-7

Summary of Analytical Results for the
Sediment Samples
- Method 6010 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in mg/kg)	SITE	SD-13	SD-13	SD-14	SD-14	SD-15	SD-15
	SAMPLE ID						
	DATE	06/11/96	06/11/96	06/11/96	06/11/96	06/11/96	06/11/96
	DEPTH (ft)	0.50	1.00	0.50	1.60	0.50	1.00
Lead		<14.7 U	<14.3 U	<14.7 U	<13.6 U	<14.7 U	<15.9 U
Arsenic		<14.7 U	<14.3 U	<14.7 U	<13.6 U	<14.7 U	<15.9 U
Barium		112	108	103	120	107	113
Cadmium		<0.73 U	<0.71 U	<0.73 U	<0.68 U	<0.73 U	<0.79 U
Chromium		28.5	23.6	25.5	30.6	23.5	24.2

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-6010

TABLE 4-8

Summary of Analytical Results for the
Sediment Samples
- Miscellaneous Methods -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT		SITE	SD-05	SD-05	SD-06	SD-06	SD-07	SD-07
		SAMPLE ID						
		DATE	06/13/96	06/13/96	06/13/96	06/13/96	06/13/96	06/13/96
		DEPTH (ft)	0.50	1.30	0.50	1.00	0.50	1.30
Total Organic Carbon	(mg/Kg)		79000	33000	31000	37000	5800	3400
Ammonia	(mg/Kg)		--	--	<2000 U	<2000 U	--	--
Ortho Phosphate	(mg/Kg)		--	--	293	319	--	--
Sulfate	(mg/Kg)		--	--	<10 U	<10 U	--	--
Cation Exchange Capacity	(mg/kg)		--	--	45.9	43.7	--	--
Calcium	(mg/Kg)		--	--	17197	6878	--	--
Iron	(mg/Kg)		--	--	30311	36883	--	--
Magnesium	(mg/Kg)		--	--	12764	13945	--	--
Manganese	(mg/Kg)		--	--	928	548	--	--
Potassium	(mg/Kg)		--	--	2941	3713	--	--
Diesel Range Organics	(mg/Kg)		210	600	690	25000	230	<14 U
Nitrogen, Nitrate-Nitrite	(mg/Kg)		--	--	560	670	--	--
Leachable Nitrite	(mg/Kg)		--	--	480	600	--	--
Leachable pH	(S.U.)		--	--	6.6	6.0	--	--

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL OTH

TABLE 4-8

Summary of Analytical Results for the
Sediment Samples
- Miscellaneous Methods -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT		SITE	SD-08	SD-08	SD-09	SD-09	SD-10	SD-10
		SAMPLE ID						
		DATE	06/13/96	06/13/96	06/10/96	06/10/96	06/12/96	06/12/96
		DEPTH (ft)	0.50	0.70	0.50	0.90	0.50	1.40
Total Organic Carbon	(mg/Kg)		55000	44000	18000	9200	26000	11000
Ammonia	(mg/Kg)		--	--	--	--	< 2000 U	< 2000 U
Ortho Phosphate	(mg/Kg)		--	--	--	--	41.1	47.6
Sulfate	(mg/Kg)		--	--	--	--	< 10 U	< 10 U
Cation Exchange Capacity	(mg/kg)		--	--	--	--	41.4	47.9
Calcium	(mg/Kg)		--	--	--	--	7931	8693
Iron	(mg/Kg)		--	--	--	--	24400	30600
Magnesium	(mg/Kg)		--	--	--	--	10400	12400
Manganese	(mg/Kg)		--	--	--	--	456	571
Potassium	(mg/Kg)		--	--	--	--	2378	2688
Diesel Range Organics	(mg/Kg)		4100	1300	< 16 U	< 14 U	490	560
Nitrogen, Nitrate-Nitrite	(mg/Kg)		--	--	--	--	610	570
Leachable Nitrite	(mg/Kg)		--	--	--	--	540	510
Leachable pH	(S.U.)		--	--	--	--	6.4	6.3

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL OTHER

TABLE 4-8

Summary of Analytical Results for the
Sediment Samples
- Miscellaneous Methods -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT		SITE	SD-11	SD-11	SD-12	SD-12	SD-13	SD-13
		SAMPLE ID						
		DATE	06/12/96	06/12/96	06/12/96	06/12/96	06/11/96	06/11/96
		DEPTH (ft)	0.50	0.80	0.50	1.20	0.50	1.00
Total Organic Carbon	(mg/Kg)		29000	38000	160000	150000	18000	16000
Ammonia	(mg/Kg)		--	--	--	--	--	--
Ortho Phosphate	(mg/Kg)		--	--	--	--	--	--
Sulfate	(mg/Kg)		--	--	--	--	--	--
Cation Exchange Capacity	(mg/kg)		--	--	--	--	--	--
Calcium	(mg/Kg)		--	--	--	--	--	--
Iron	(mg/Kg)		--	--	--	--	--	--
Magnesium	(mg/Kg)		--	--	--	--	--	--
Manganese	(mg/Kg)		--	--	--	--	--	--
Potassium	(mg/Kg)		--	--	--	--	--	--
Diesel Range Organics	(mg/Kg)		5100	5300	1000	18000	270	460
Nitrogen, Nitrate-Nitrite	(mg/Kg)		--	--	--	--	--	--
Leachable Nitrite	(mg/Kg)		--	--	--	--	--	--
Leachable pH	(S.U.)		--	--	--	--	--	--

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL OTI

TABLE 4-8

Summary of Analytical Results for the
Sediment Samples
- Miscellaneous Methods -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT		SITE	SD-14	SD-14	SD-15	SD-15
		SAMPLE ID				
		DATE	06/11/96	06/11/96	06/11/96	06/11/96
		DEPTH (ft)	0.50	1.60	0.50	1.00
Total Organic Carbon	(mg/Kg)		7200	11000	15000	13000
Ammonia	(mg/Kg)		--	--	--	--
Ortho Phosphate	(mg/Kg)		--	--	--	--
Sulfate	(mg/Kg)		--	--	--	--
Cation Exchange Capacity	(mg/kg)		--	--	--	--
Calcium	(mg/Kg)		--	--	--	--
Iron	(mg/Kg)		--	--	--	--
Magnesium	(mg/Kg)		--	--	--	--
Manganese	(mg/Kg)		--	--	--	--
Potassium	(mg/Kg)		--	--	--	--
Diesel Range Organics	(mg/Kg)		<15 U	<14 U	<15 U	<16 U
Nitrogen, Nitrate-Nitrite	(mg/Kg)		--	--	--	--
Leachable Nitrite	(mg/Kg)		--	--	--	--
Leachable pH	(S.U.)		--	--	--	--

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL OTHER

TABLE 4-9

Summary of TCLP Analysis for the
Sediment Samples

Date: 02/28/97

Koppers Industries, Inc.
Superior, Wisconsin

CONSTITUENT (Units in ug/L)	SITE	SD-06	SD-06	SD-10	SD-10
	SAMPLE ID				
	DATE	06/13/96	06/13/96	06/12/96	06/12/96
	DEPTH (ft)	0.50	1.00	0.50	1.40
Lead (TCLP)		<100 U	<100 U	<100 U	<100 U
Silver (TCLP)		<10 U	<10 U	<10 U	<10 U
Arsenic (TCLP)		<100 U	<100 U	<100 U	<100 U
Barium (TCLP)		910	1000	820	1100
Cadmium (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
Chromium (TCLP)		<10 U	<10 U	<10 U	22
Mercury (TCLP)		<0.20 U	<0.20 U	<0.20 U	<0.20 U
2,4-Dinitrophenol (TCLP)		<12 U	19	<12 U	<12 U
2,3,4,6-Tetrachlorophenol (TCLP)		<0.50# U	<0.50# U	<12 U	<0.50# U
p-Chloro-m-cresol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-Dichlorophenol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,6-Dichlorophenol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-Nitrophenol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
2-Methylphenol (TCLP)		<50# U	<50# U	<50# U	<50# U
2-Chlorophenol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-Trichlorophenol (TCLP)		<50# U	<50# U	<50# U	<50# U
4-Nitrophenol (TCLP)		<12 U	44	<12 U	<12 U
2,4-Dimethylphenol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
Phenol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4-Dichlorophenol (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
4,6-Dinitro-2-methylphenol (TCLP)		<12 U	16	<12 U	<12 U
2,3,5,6-Tetrachlorophenol (TCLP)		<12 U	<12 U	<12 U	<12 U
3 & 4 - Methylphenol (TCLP)		<50# U	<50# U	<50# U	<50# U
Chlordane (TCLP)		<2.5 U	<2.5 U	<2.5 U	<2.5 U
gamma-BHC (Lindane) (TCLP)		<0.25 U	<0.25 U	<0.25 U	<0.25 U
Endrin (TCLP)		<0.50 U	<0.50 U	<0.50 U	<0.50 U
Methoxychlor (TCLP)		<2.5 U	<2.5 U	<2.5 U	<2.5 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

= Constituent ore than one test method, highest result reported.

For RCL TCLP

TABLE 4-9

Summary of TCLP Analysis for the
Sediment Samples

Date: 02/28/97

Koppers Industries, Inc.
Superior, Wisconsin

CONSTITUENT (Units in ug/L)	SITE	SD-06	SD-06	SD-10	SD-10
	SAMPLE ID				
	DATE	06/13/96	06/13/96	06/12/96	06/12/96
	DEPTH (ft)	0.50	1.00	0.50	1.40
Heptachlor (TCLP)		<0.25 U	<0.25 U	<0.25 U	<0.25 U
Heptachlor (TCLP)		<0.25 U	<0.25 U	<0.25 U	<0.25 U
Heptachlor epoxide (TCLP)		<0.25 U	<0.25 U	<0.25 U	<0.25 U
Toxaphene (TCLP)		<5.0 U	<5.0 U	<5.0 U	<5.0 U
2,4,5-TP (Silvex) (TCLP)		<0.050 U	<0.050 U	<0.050 U	<0.050 U
2,4-D (TCLP)		<0.50 U	<0.50 U	<0.50 U	<0.50 U
Carbon tetrachloride (TCLP)		<100 U	<100 U	<100 U	<100 U
Chloroform (TCLP)		<100 U	<100 U	<100 U	<100 U
Benzene (TCLP)		(22)	<100 U	<100 U	(90)
Vinyl chloride (TCLP)		<100 U	<100 U	<100 U	<100 U
1,1-Dichloroethene (TCLP)		<100 U	<100 U	<100 U	<100 U
2-Butanone (TCLP)		(27)	<200 U	(66)	<200 U
Trichloroethene (TCLP)		<100 U	<100 U	<100 U	<100 U
Chlorobenzene (TCLP)		<100 U	<100 U	<100 U	<100 U
Tetrachloroethene (TCLP)		<100 U	<100 U	<100 U	<100 U
1,2-Dichloroethane (TCLP)		(21)	<100 U	<100 U	<100 U
Hexachloroethane (TCLP)		<50 U	<50 U	<50 U	<50 U
Hexachlorobutadiene (TCLP)		<50 U	<50 U	<50 U	<50 U
Pentachlorophenol (TCLP)		<50# U	<50# U	<50# U	<50# U
Nitrobenzene (TCLP)		<50 U	<50 U	<50 U	<50 U
1,4-Dichlorobenzene (TCLP)		<50 U	<50 U	<50 U	<50 U
Pyridine (TCLP)		<50 U	<50 U	<50 U	<50 U
Hexachlorobenzene (TCLP)		<50 U	<50 U	<50 U	<50 U
Benzo(a)pyrene (TCLP)		<2.0 U	8.6	<0.50 U	8.9
Dibenzo(a,h)anthracene (TCLP)		<3.0 U	<7.5 U	<0.75 U	<3.0 U
Benzo(a)anthracene (TCLP)		<2.0 U	8.9	<0.50 U	8.6
Acenaphthene (TCLP)		<200 U	<500 U	<50 U	<200 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed
= Constituent in more than one test method, highest result reported. () = Less than Detection Limit

For RCL TCLP

TABLE 4-9

Summary of TCLP Analysis for the
Sediment Samples

Date: 02/28/97

Koppers Industries, Inc.
Superior, Wisconsin

CONSTITUENT (Units in ug/L)	SITE	SD-06	SD-06	SD-10	SD-10
	SAMPLE ID				
	DATE	06/13/96	06/13/96	06/12/96	06/12/96
	DEPTH (ft)	0.50	1.00	0.50	1.40
Phenanthrene (TCLP)		87	190	36	67
Fluorene (TCLP)		78	110	27	42
Naphthalene (TCLP)		300	1100	94	580
2-Methylnaphthalene (TCLP)		<200 U	<500 U	<50 U	<200 U
Anthracene (TCLP)		16	<25 U	4.8	23
Pyrene (TCLP)		<20 U	75	6.8	41
Dibenzofuran (TCLP)		<200 U	<500 U	<50 U	<200 U
Benzo(g,h,i)perylene (TCLP)		<5.0 U	<12 U	<1.2 U	<5.0 U
Indeno(1,2,3-cd)pyrene (TCLP)		<5.0 U	<12 U	<1.2 U	<5.0 U
Benzo(b)fluoranthene (TCLP)		4.3	12	<0.50 U	15
Fluoranthene (TCLP)		31	93	14	64
Benzo(k)fluoranthene (TCLP)		<2.0 U	<5.0 U	<0.50 U	5.0
Acenaphthylene (TCLP)		<200 U	<500 U	<50 U	<200 U
Chrysene (TCLP)		<15 U	<38 U	<3.8 U	<15 U
Methylnaphthalene (TCLP)		<200 U	<500 U	<50 U	<200 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL TCLP

TABLE 4-10
NOAA ER-L Values for Sediment
Koppers Industries, Inc.
Superior, Wisconsin

	NOAA ER-L Screening Values (mg/kg)
PAHs	
Acenaphthene	0.016
Acenaphthylene	0.044
Anthracene	0.085
Benzo(a)anthracene	0.261
Benzo(b)fluoranthene	0.085
Benzo(k)fluoranthene	0.261
Benzo(g,h,i)perylene	NA
Benzo(a)pyrene	0.43
Dibenzo(a,h)anthracene	0.063
Dibenzofuran	0.43
Chrysene	0.384
Fluorene	0.019
Fluoranthene	0.6
Indeno(1,2,3-cd)pyrene	0.019
Methylnaphthalene	0.6
2-Methylnaphthalene	0.07
Naphthalene	0.16
Phenanthrene	0.24
Pyrene	0.665

TABLE 4-11

Summary of Analytical Results for the
Ditch Bank Samples
- Method 589 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	DB-01	DB-02
	SAMPLE ID		
	DATE	06/14/96	06/14/96
	DEPTH (ft)	2.00	2.00
Pentachlorophenol		87000 J	100000 J
2,3,4,6 & 2,3,5,6-Tetrachlorophenol		<5700 U	<31000 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLI)

TABLE 4-12

Summary of Analytical Results for the
Ditch Bank Samples
- Method 8310 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT		SITE SAMPLE ID DATE DEPTH (ft)	DB-01 06/14/96 2.00	DB-02 06/14/96 2.00
Benzo(a)pyrene	(ug/kg)		<8400 U	6700
Dibenzo(a,h)anthracene	(ug/kg)		<12000 U	<3000 U
Benzo(a)anthracene	(ug/kg)		<8400 U	6600
Acenaphthene	(ug/kg)		<840000 U	<210000 U
Phenanthrene	(ug/kg)		<200000 U	<51000 U
Fluorene	(ug/kg)		<84000 U	<21000 U
Naphthalene	(ug/kg)		<840000 U	<210000 U
2-Methylnaphthalene	(ug/kg)		<840000 U	<21000 U
Anthracene	(ug/kg)		120000	<10000 U
Pyrene	(ug/kg)		<84000 U	28000
Dibenzofuran	(ug/kg)		<840000 U	<21000 U
Benzo(ghi)perylene	(ug/kg)		<20000 U	<5100 U
Indeno(1,2,3-cd)pyrene	(ug/kg)		<20000 U	<5100 U
Benzo(b)fluoranthene	(ug/kg)		13000	9400
Fluoranthene	(ug/kg)		<84000 U	40000
Benzo(k)fluoranthene	(ug/kg)		<8400 U	<2100 U
Acenaphthylene	(ug/kg)		<840000 U	<210000 U
Chrysene	(ug/kg)		<60000 U	<15000 U
Methylnaphthalene	(ug/kg)		<840000 U	<21000 U
Total PAH's	(ug/Kg)		133000	90700

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-8310

TABLE 4-13

Summary of Analytical Results for the
Ditch Bank Samples
- Method 8040 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in ug/kg)	SITE	DB-01	DB-02
	SAMPLE ID		
	DATE	06/14/96	06/14/96
	DEPTH (ft)	2.00	2.00
2,4-Dinitrophenol		<1140 U	<15300 U
4-Chloro-3-methylphenol		<571 U	<7670 U
2,6-Dichlorophenol		<571 U	<7670 U
2,4,6-Trichlorophenol		<1140 U	<15300 U
2-Nitrophenol		<571 U	<7670 U
2-Methylphenol		<571 U	<7670 U
2-Chlorophenol		<571 U	<7670 U
2,4,5-Trichlorophenol		<1140 U	<15300 U
4-Nitrophenol		<1140 U	<15300 U
2,4-Dimethylphenol		<571 U	<7670 U
Phenol		<571 U	<7670 U
2,4-Dichlorophenol		<571 U	<7670 U
4,6-Dinitro-2-methylphenol		<1140 U	<15300 U
3 & 4 - Methylphenol		<571 U	<7670 U

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN-8

TABLE 4-14

Summary of Analytical Results for the
Ditch Bank Samples
- Method 9060 -
Koppers Industries, Inc.
Superior, Wisconsin

Date: 02/28/97

CONSTITUENT (Units in mg/kg)	SITE	DB-01	DB-02
	SAMPLE ID		
	DATE	06/14/96	06/14/96
	DEPTH (ft)	2.00	2.00
Total Organic Carbon		220000	330000

Values represent total concentrations unless noted < = Not detected at indicated reporting limit -- = Not analyzed

For RCL RLN 9060

Table 4-15
Risk and Hazard Index for Hypothetical Adult and Child Trespasser
Koppers Industries, Inc
Superior, Wisconsin

PARAMETERS	UNITS	VALUES
EPCs = exposure point concentration in soil	mg/kg	see table
EPCa = exposure point concentration in air	mg/m^3	see table
EF = Exposure frequency	days/year	104
ED = Exposure Duration	years	30
ET = Exposure Time	hours/day	0
ATnc = Averaging Time for non-carcinogens	days	365
ATc = Average Time for carcinogens	days	25550
AF = Soil to skin adherence factor	mg/cm^2	1
SSA = Skin Surface area (age-adjusted)	cm^2	503
ABS = dermal absorption factor	unitless	see table
InhR = Inhalation rate (age-adjusted)	m^3/hour	11
IngR = Soil ingestion rate (age-adjusted)	mg/day	114
CF = conversion factor	mg/kg	1.00E-06
SF = cancer slope factor	(mg/kg-day)	see table
RfD = Reference dose	mg/kg-day	see table
PEF = Particulate Emission Factor	m^3/kg	1.30E+09

CARCINOGENS				DOSE			CSF			RISK			
Chemical	EPCs (mg/kg)	EPCa (mg/m^3)	ABS	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Total
				(mg/kg-day)			(mg/kg-day)^-1						
PCP	0.126	1.88E-05	2.50E-01	5.8E-08	6.5E-16	6.4E-08	0.12	0.12	0.12	7E-09	8E-17	8E-09	1E-08
Benzo(a)pyrene	9	1.37E-03	1.00E-01	4.2E-06	4.7E-14	1.9E-06	7.3	7.3	7.3	3E-05	3E-13	1E-05	4E-05

TOTAL RISK	4E-05

NON-CARCINOGENS				DOSE			RfD			HAZARD QUOTIENT			
Chemical	EPCs (mg/kg)	EPCa (mg/m^3)	ABS	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Total
				(mg/kg-day)			(mg/kg-day)						
PCP	87	1.30E-02	2.50E-01	2.8E-03	4.5E-13	4.5E-05	3.00E-02	3.00E-02	3.00E-02	9.4E-02	1.5E-11	1.5E-03	9.6E-02

HAZARD INDEX =	9.6E-02

When inhalation or dermal toxicity values were not avaliable, the oral value was used.

EPCs = Exposure Point Concentration in soil

EPAs = Exposure Point Concentration in air

CSF = Cancer Slope Factor

RfD = Reference Dose

TABLE 4-16
Summary of Field Immunoassay Test[1] Results vs. EPA Method 8310
Total PAHs
Unnamed Drainage Ditch And Crawford Creek Sediment
Koppers Industries, Inc.
Superior, Wisconsin

Sample Location[2]	1 PPM Detection Level (Y/N)[3]	4 PPM Detection Level (Y/N)[3]	40 PPM Detection Level (Y/N)[3]	Result	Method 8310 mg/Kg
SD-5A	Y	Y	N	> 4 PPM	46.6
SD-5B	Y	Y	Y	> 40 PPM	668.1
SD-6A	Y	Y	Y	> 40 PPM	221.3
SD-6B	Y	Y	Y	> 40 PPM	145.1
SD-7A	Y	Y	Y	> 40 PPM	2013
SD-7B	Y	Y	N	> 4 PPM	0.4
SD-8A	Y	Y	Y	> 40 PPM	166.4
SD-8B	Not Tested (insufficient quantity)	Not Tested (insufficient quantity)	Not Tested (insufficient quantity)	N/A	287.1
SD-9A	Not Tested	Not Tested	Not Tested	N/A	4.8
SD-9B	Not Tested	Not Tested	Not Tested	N/A	16.1
SD-10A	Y	Y	Y	> 40 PPM	66.9
SD-10B	Y	Y	Y	> 40 PPM	35.4
SD-11A	Y	Y	Y	> 40 PPM	1515.3
SD-11B	Y	Y	Y	> 40 PPM	1525
SD-12A	Y	Y	Y	> 40 PPM	53.7
SD-12B	Y	Y	Y	> 40 PPM	5782
SD-13A	Y	Y	Y	> 40 PPM	109
SD-13B	Y	Y	Y	> 40 PPM	167.2
SD-14A	Y	Y	N	> 4 PPM	2.7
SD-14B	Y	N	N	> 1 PPM	0.44
SD-15A	Y	Y	N	> 4 PPM	13.4
SD-15B	Y	Y	N	> 4 PPM	1.6

Notes:
1 = Immunoassay testing performed using EnSys, Inc. PAH kits for soil.
2 = "A" designates sample from upper six inches of sediment, "B" designates sample from below six inch depth. Samples SD-5 through SD-8 were collected from the unnamed drainage ditch, samples SD-9 through SD-15 were collected from Crawford Creek.
3 = "Y" indicates the presence of PAHs at the stated detection level, "N "indicates no detection of PAHs at the stated level.

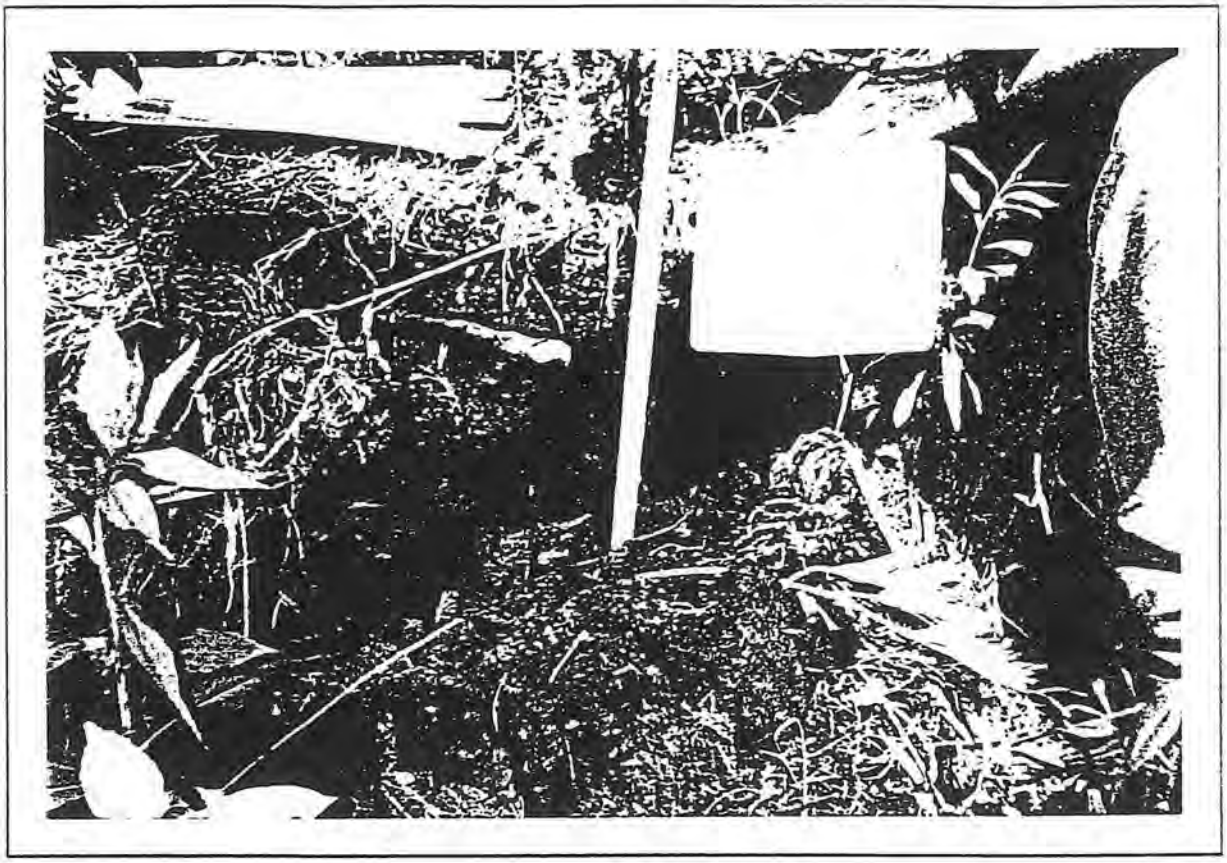
TABLE 4-16
Summary of Field Immunoassay Test[1] Results vs. EPA Method 8310
Total Pahs
Ditch Bank Soil

Koppers Industries, Inc.
Superior, Wisconsin

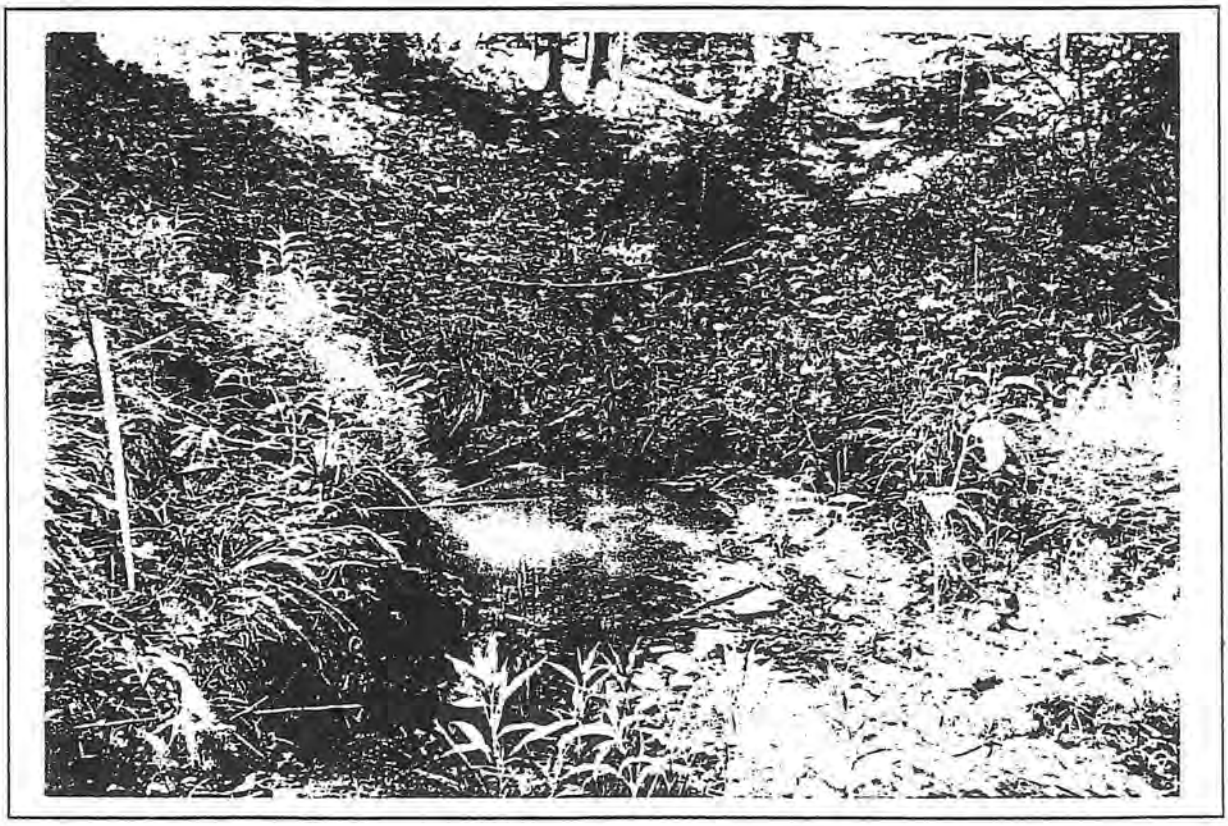
Sample Location	1 Ppm Detection Level (Y/N)[2]	.4 Ppm Detection Level (Y/N)[2]	40 Ppm Detection Level (Y/N)[2]	Result	Method 8310 mg/kg
DB-1	Not Tested	Not Tested	Not Tested	N/A	133.0
DB-2	Y	Y	Y	> 40 PPM	90.7

Notes:
1 = Immunoassay testing performed using EnSys, Inc. PAH kits for soil
2 = "Y" indicates the presence of PAHs at the stated detection level, "N "indicates no detection of PAHs at the stated level

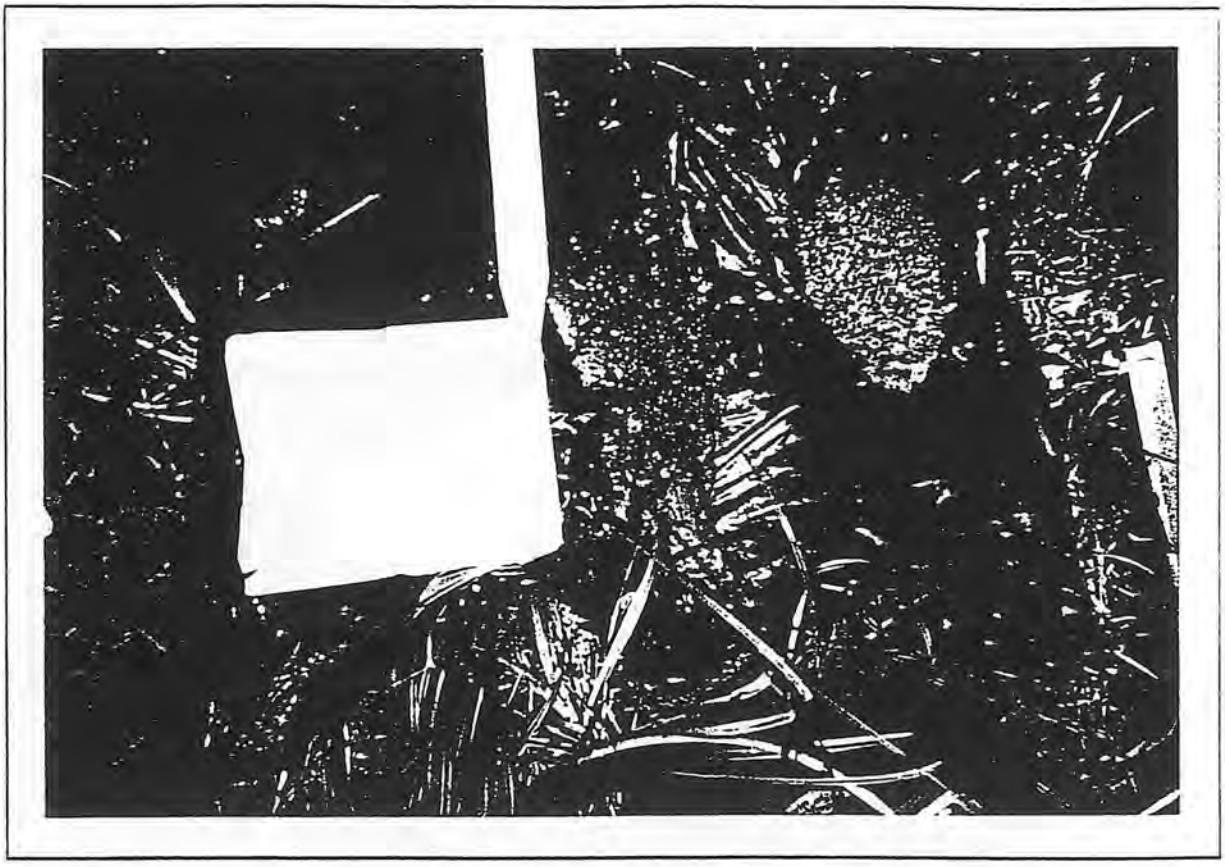
APPENDIX A
PHOTOGRAPHS



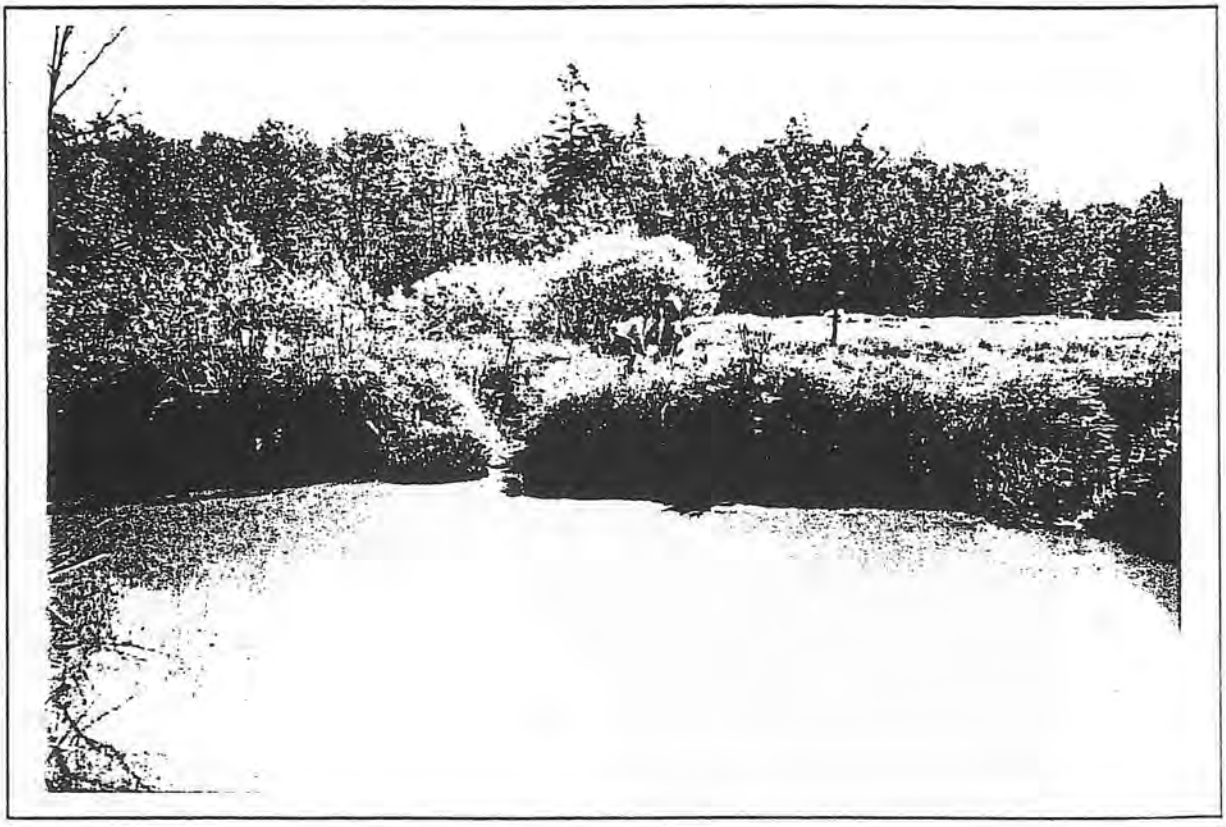
Close-up View of Ditch Bank Soil
Location DB-1



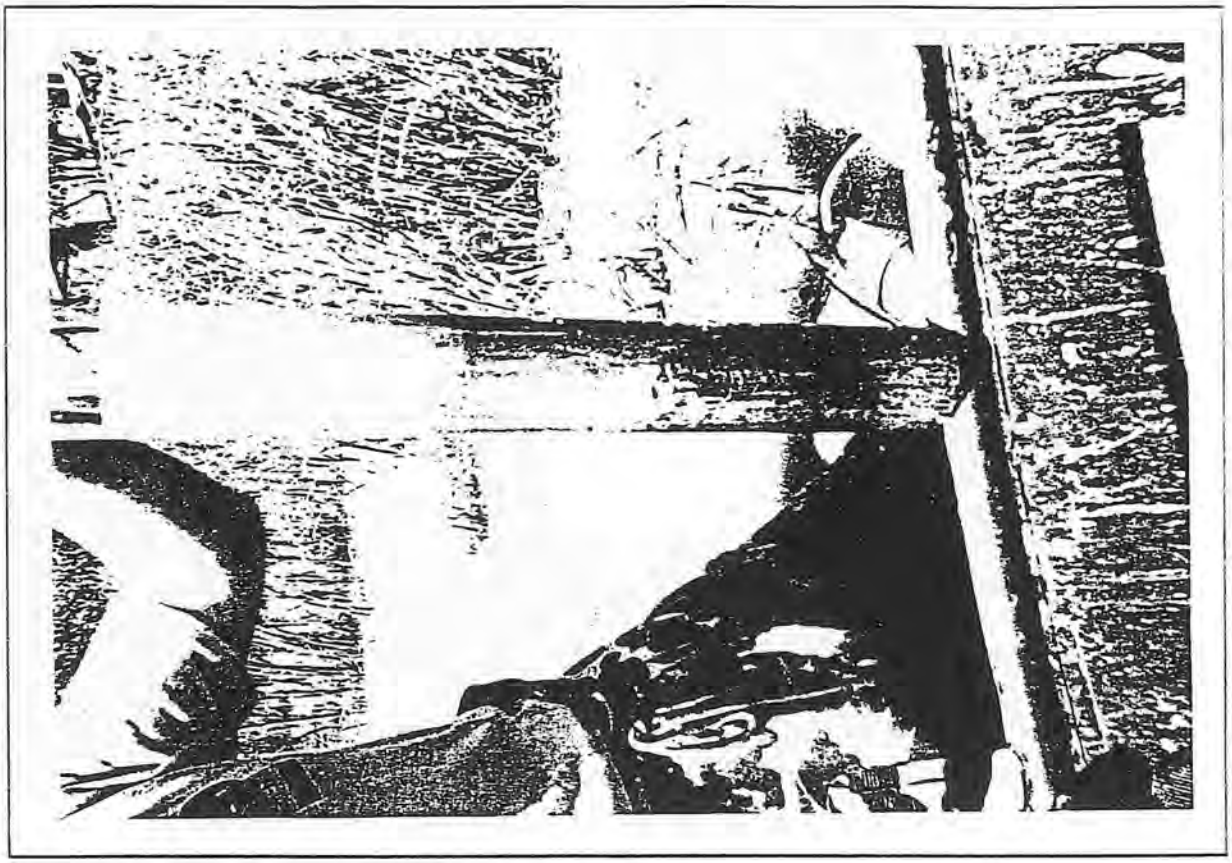
General Ditch Morphology and
Location DB-2 (Bottom Left)



Sediment Core SD-6 Depicting Sand and Gravel (0 to 6 inches)
Which Overlies A Clay Substrate

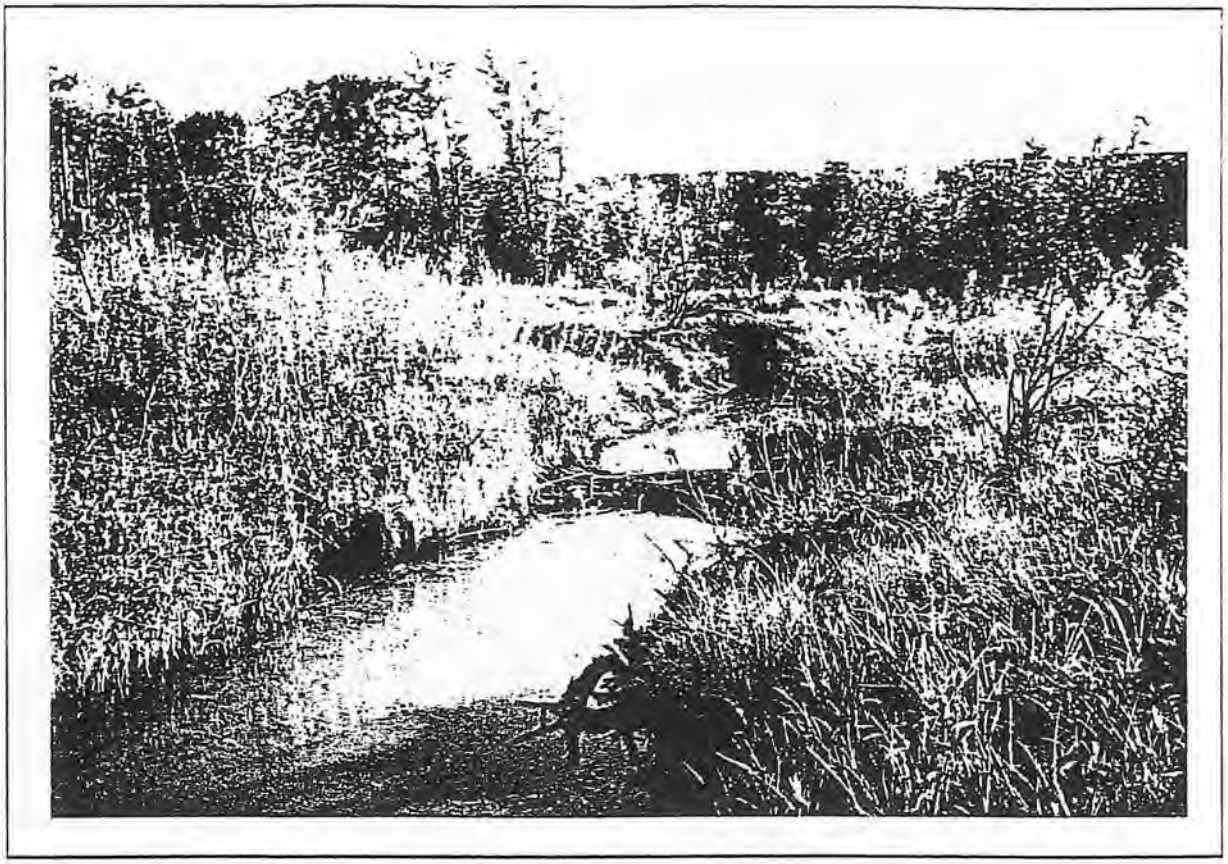


Confluence of the Unnamed Ditch
with Crawford Creek

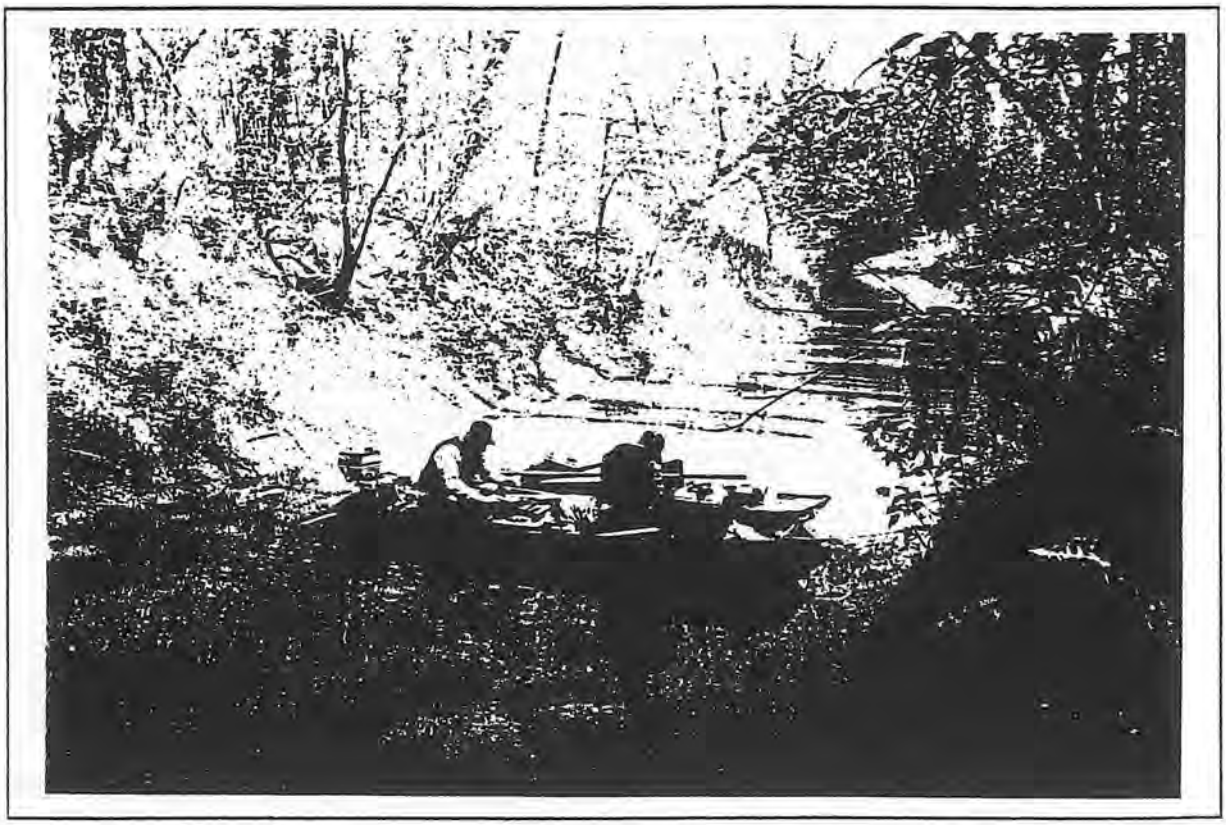


Sediment Core SD-12 Depicting Emergent Vegetation
and Stratification of Sediment

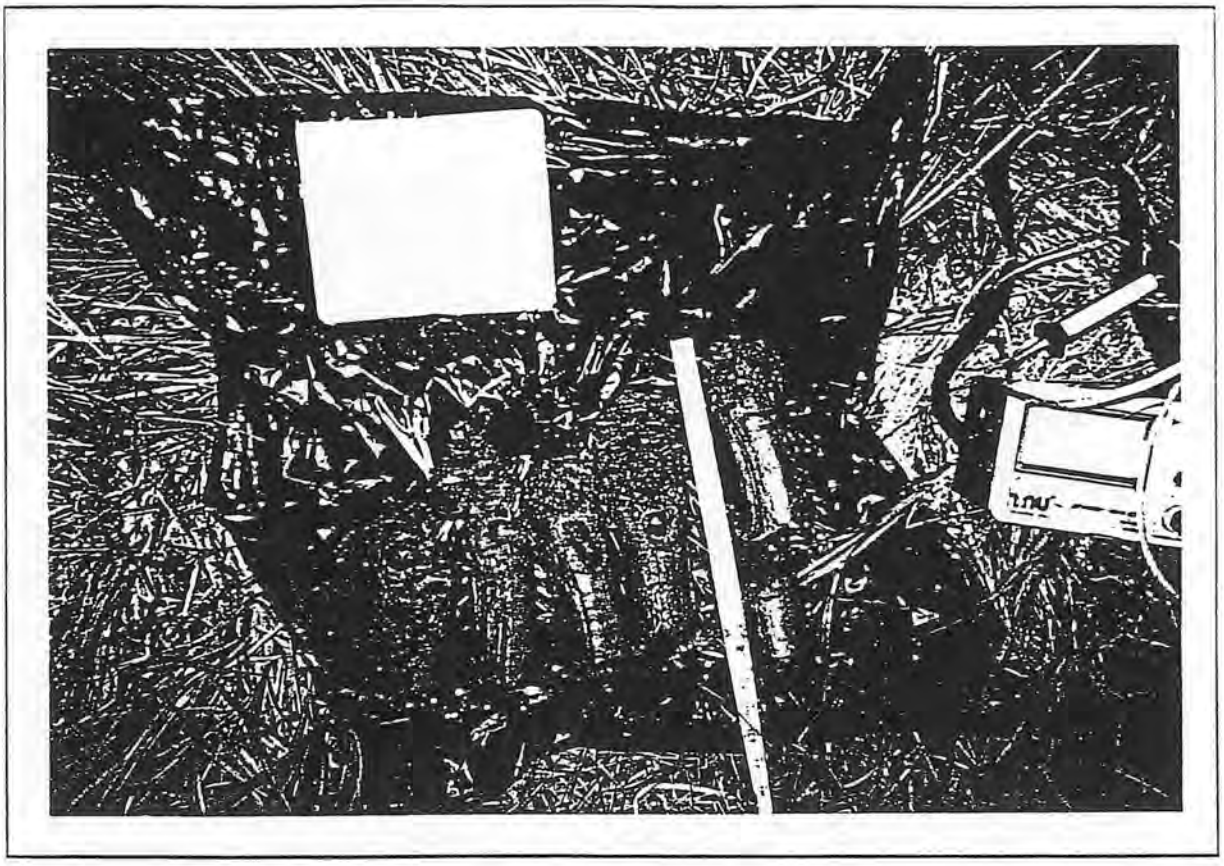
General Area View of
"Crawford Creek Pond"



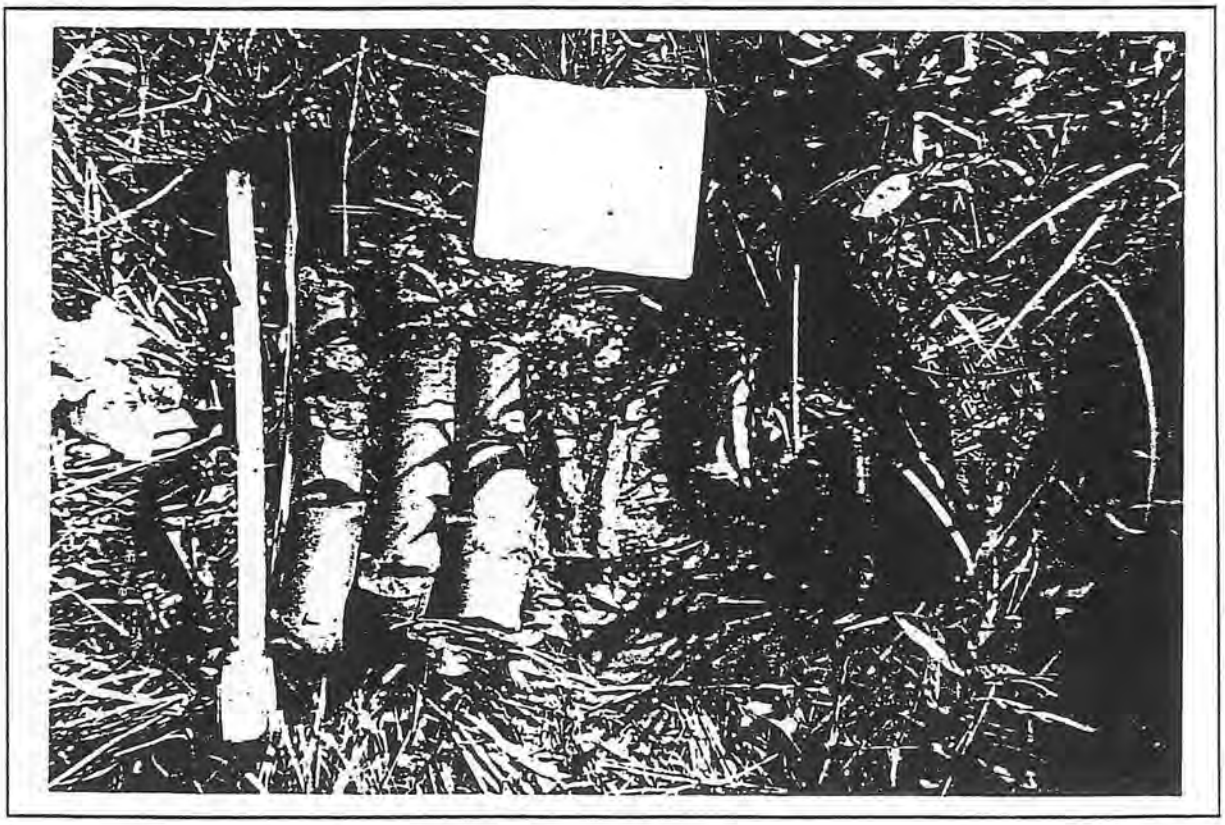
General View of Crawford Creek
Near Sediment Sampling Location SD-13



General View of Crawford Creek Prior to the Nemadji River
at Sediment Sampling Location SD-15



Sediment Core SD-13



Sediment Core SD-14
Depicting Brown Lean Clay

APPENDIX B
RESULTS OF GRAIN SIZE ANALYSIS

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LABORATORY TEST REPORT

July 22, 1996

Mr. Ken Kuzior
Recra Enviromental
3000 Tech Center Drive
Monroeville, PA 15146

Project No. 96144-01

RE: Soils Testing - P 96-0748

Transmitted herein are the results of the soils testing performed for P 96-0748 verified on the Project Verification Form, submitted July 2, 1996. We were unable to run a sieve and hydrometer tests for samples DB-1 and DB-2 due to a greasy substance found in the materials.

The testing was performed in accordance with the ASTM methods listed on the enclosed data sheets. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

Disclaimer

The test results are believed to be representative of the samples submitted but are indicative only of the specimens which were evaluated. Geotechnics has no direct knowledge of the origin of the samples, implies no position with regard to the disposition of the test results, i.e. pass/fail, and makes no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization of the Client and Geotechnics. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please do not hesitate to contact our office.

Respectively submitted,

David R. Backstrom
Laboratory Director

geotechnics

WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	JCM	Date	7-16-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-9A				
Soil Description	BROWN SANDY LEAN CLAY				

Wt. of Total Sample(dry)	291.66 gm.
Wt. of +#200 Sample	113.81 gm.
Wt. of -#200 Sample	177.85 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.90	0.3	0.3	99.7
3/8"	9.50	0.00	0.0	0.3	99.7
#4	4.75	1.85	0.6	0.9	99.1
#10	2.00	2.84	1.0	1.9	98.1
#20	0.85	4.67	1.6	3.5	96.5
#40	0.425	26.18	9.0	12.5	87.5
#60	0.250	35.17	12.1	24.6	75.4
#140	0.106	33.89	11.6	36.2	63.8
#200	0.075	8.31	2.8	39.0	61.0
Pan	-	177.85	61.0	100.0	-

Water Content	
Tare No.	1655
Wgt. Tare + WS.	567.50
Wgt. Tare + DS.	395.72
Wgt. Tare	104.06
Wgt. Of Water	171.78
Wgt. Of DS.	291.66
% Water	58.9

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	gcm	Date	7-16-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-9A				

Soil Sample Weight

Container No.	804		
Wt. Contain. & Dry Soil	129.22 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	104.10 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	20.12 gm.	% Finer Than No. 200	60.98
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	23.5	23.5	17.9	88.3	0.0318	53.9
5		23.0	17.4	85.9	0.0202	52.4
15		21.0	15.4	76.0	0.0118	46.4
36		20.0	14.4	71.1	0.0077	43.4
60		19.5	13.9	68.6	0.0060	41.9
250		17.5	11.9	58.8	0.0030	35.9
1440		15.0	9.4	46.5	0.0012	28.3

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-9A

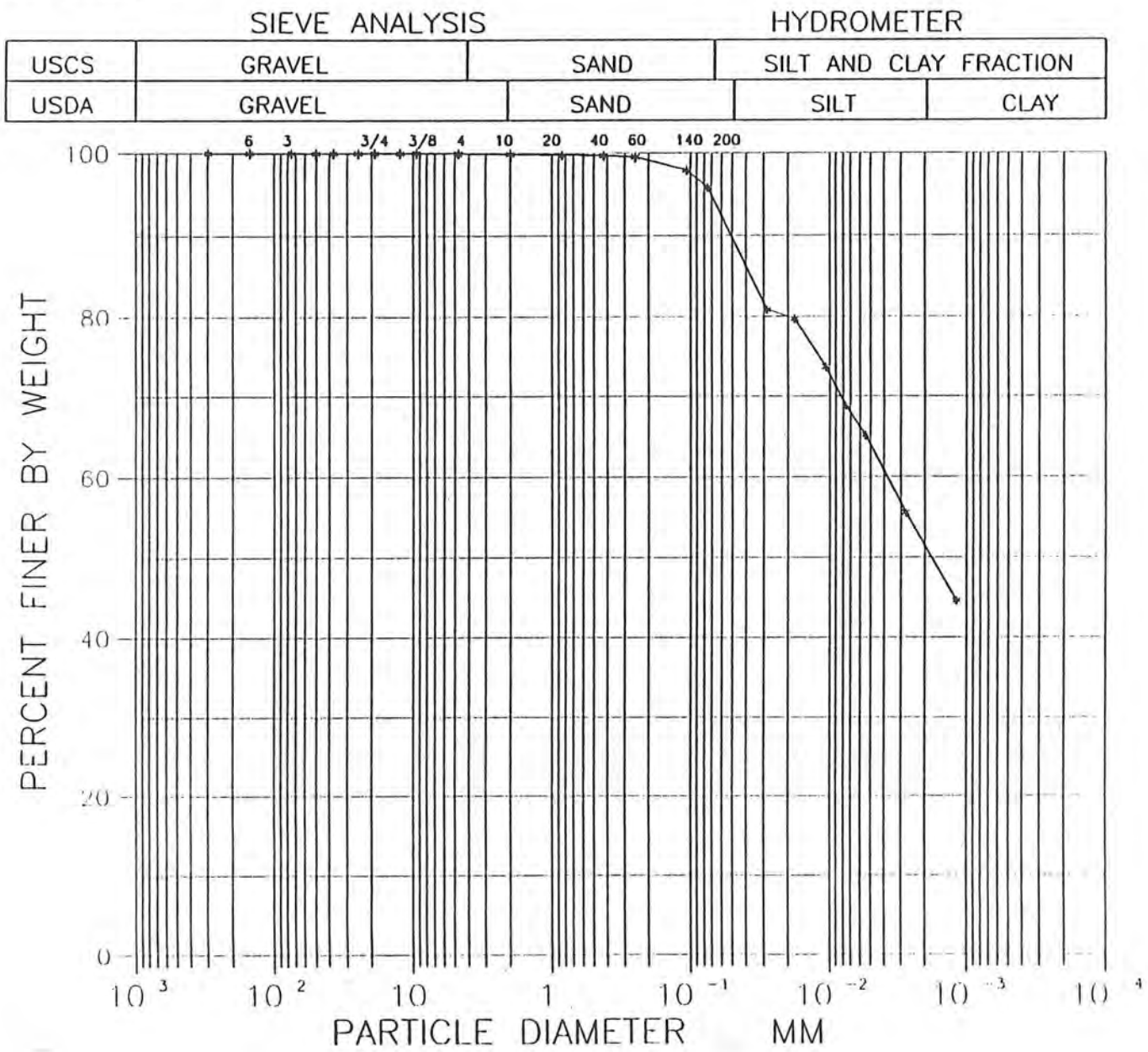
DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	99.7
9.5000	99.7
4.7500	99.1
2.0000	98.1
0.8500	96.5
0.4250	87.5
0.2500	75.4
0.1060	63.8
0.0750	61.0
0.0318	53.9
0.0202	52.4
0.0118	46.4
0.0077	43.4
0.0060	41.9
0.0030	35.9
0.0012	28.3

SIEVE OPENING (mm)	PERCENT FINER	PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
100.00	100.00			
		GRAVEL	1.92	0.00
2.00	98.08			
		SAND	40.47	41.26
0.05	57.61			
		SILT	25.16	25.65
0.002	32.45			
		CLAY	32.45	33.08

USDA CLASSIFICATION CLAY LOAM

Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-9B
USDA Classification CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-9B				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	285.59 gm.
Wt. of +#200 Sample	11.46 gm.
Wt. of -#200 Sample	274.13 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.11	0.0	0.0	100.0
#10	2.00	0.30	0.1	0.1	99.9
#20	0.85	0.22	0.1	0.2	99.8
#40	0.425	0.21	0.1	0.3	99.7
#60	0.250	0.52	0.2	0.5	99.5
#140	0.106	4.17	1.5	1.9	98.1
#200	0.075	5.93	2.1	4.0	96.0
Pan	-	274.13	96.0	100.0	-

Water Content	
Tare No.	874
Wgt. Tare + WS.	527.60
Wgt. Tare + DS.	397.31
Wgt. Tare	111.72
Wgt. Of Water	130.29
Wgt. Of DS.	285.59
% Water	45.6

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-9B				

Soil Sample Weight

Container No.	1092		
Wt. Contain. & Dry Soil	150.06 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	105.78 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	39.28 gm.	% Finer Than No. 200	95.99

Temperature C	24.5
Specific Gravity	2.70 Assumed

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	39.5	39.0	33.4	84.3	0.0284	80.9
5		38.5	32.9	83.0	0.0180	79.7
15		36.0	30.4	76.7	0.0106	73.7
30		34.0	28.4	71.7	0.0076	68.8
60		32.5	26.9	67.9	0.0055	65.2
250		28.5	22.9	57.8	0.0027	55.5
1440		24.0	18.4	46.5	0.0012	44.6

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-9B

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	100.0
2.0000	99.9
0.8500	99.8
0.4250	99.7
0.2500	99.5
0.1060	98.1
0.0750	96.0
0.0284	80.9
0.0180	79.7
0.0106	73.7
0.0076	68.8
0.0055	65.2
0.0027	55.5
0.0012	44.6

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	99.86
0.05	89.70
0.002	51.42

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	0.14	0.00
SAND	10.15	10.17
SILT	38.29	38.34
CLAY	51.42	51.49

USDA CLASSIFICATION CLAY

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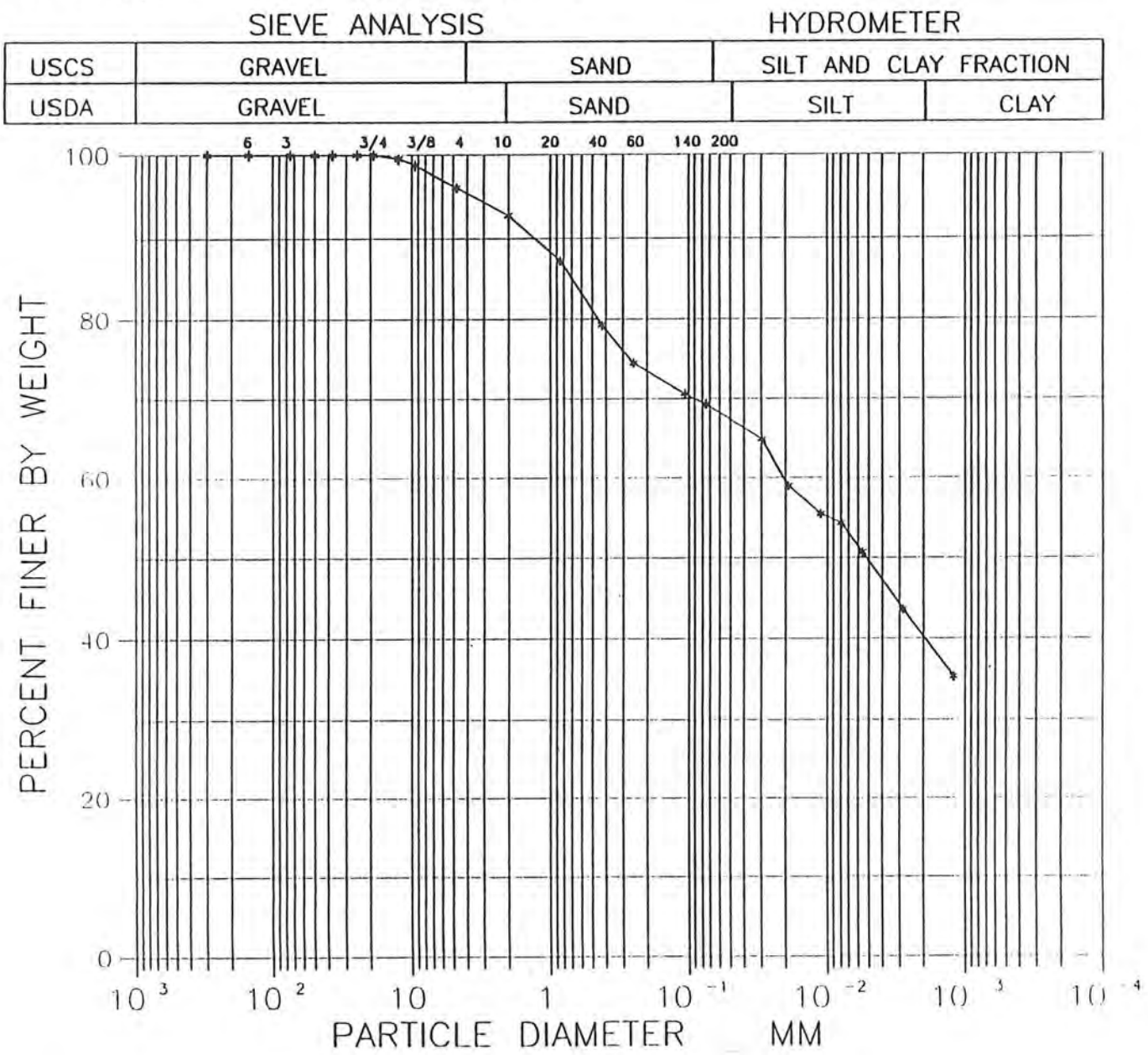
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN SANDY LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-10 B
USDA Classification CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-22-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-10 B				
Soil Description	BROWN SANDY LEAN CLAY				

Wt. of Total Sample(dry)	600.04 gm.
Wt. of +#200 Sample	184.35 gm.
Wt. of -#200 Sample	415.69 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	2.71	0.5	0.5	99.5
3/8"	9.50	4.53	0.8	1.2	98.8
#4	4.75	15.44	2.6	3.8	96.2
#10	2.00	20.25	3.4	7.2	92.8
#20	0.85	33.43	5.6	12.7	87.3
#40	0.425	48.04	8.0	20.7	79.3
#60	0.250	28.20	4.7	25.4	74.6
#140	0.106	23.30	3.9	29.3	70.7
#200	0.075	8.45	1.4	30.7	69.3
Pan	-	415.69	69.3	100.0	-

Water Content	
Tare No.	1133
Wgt. Tare + WS.	1030.00
Wgt. Tare + DS.	705.90
Wgt. Tare	105.86
Wgt. Of Water	324.10
Wgt. Of DS.	600.04
% Water	54.0

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-22-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-10 B				

Soil Sample Weight

Container No.	1677		
Wt. Contain. & Dry Soil	135.83 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	101.82 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	29.01 gm.	% Finer Than No. 200	69.28
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	32.0	33.0	27.4	93.7	0.0297	64.9
5		30.5	24.9	85.1	0.0192	59.0
15		29.0	23.4	80.0	0.0112	55.4
30		28.5	22.9	78.3	0.0079	54.3
62		27.0	21.4	73.2	0.0056	50.7
250		24.0	18.4	63.0	0.0028	43.6
1440		20.5	14.9	51.0	0.0012	35.3

Geotechnics

WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-22-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-11B				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	324.45 gm.
Wt. of +#200 Sample	18.67 gm.
Wt. of -#200 Sample	305.78 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.80	0.2	0.2	99.8
#10	2.00	3.35	1.0	1.3	98.7
#20	0.85	3.27	1.0	2.3	97.7
#40	0.425	3.18	1.0	3.3	96.7
#60	0.250	2.46	0.8	4.0	96.0
#140	0.106	3.61	1.1	5.1	94.9
#200	0.075	2.00	0.6	5.8	94.2
Pan	-	305.78	94.2	100.0	-

Water Content	
Tare No.	1315
Wgt. Tare + WS.	623.20
Wgt. Tare + DS.	432.37
Wgt. Tare	107.92
Wgt. Of Water	190.83
Wgt. Of DS.	324.45
% Water	58.8

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-30-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-11B				

Soil Sample Weight			
Container No.	1635		
Wt. Contain. & Dry Soil	145.82 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	101.35 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	39.47 gm.	% Finer Than No. 200	94.25
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	43.0	43.0	37.4	93.9	0.0274	88.5
5		41.5	35.9	90.2	0.0176	85.0
15		39.0	33.4	83.9	0.0104	79.1
32		37.0	31.4	78.9	0.0072	74.3
60		35.0	29.4	73.9	0.0053	69.6
250		29.0	23.4	58.8	0.0027	55.4
1440		24.0	18.4	46.3	0.0012	43.6

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-11B

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	99.8
2.0000	98.7
0.8500	97.7
0.4250	96.7
0.2500	96.0
0.1060	94.9
0.0750	94.2
0.0274	88.5
0.0176	85.0
0.0104	79.1
0.0072	74.3
0.0053	69.6
0.0027	55.4
0.0012	43.6

SIEVE OPENING (mm)	PERCENT FINER	PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
100.00	100.00			
		GRAVEL	1.28	0.00
2.00	98.72			
		SAND	6.78	6.87
0.05	91.94			
		SILT	40.93	41.46
0.002	51.01			
		CLAY	51.01	51.67

USDA CLASSIFICATION SILTY CLAY

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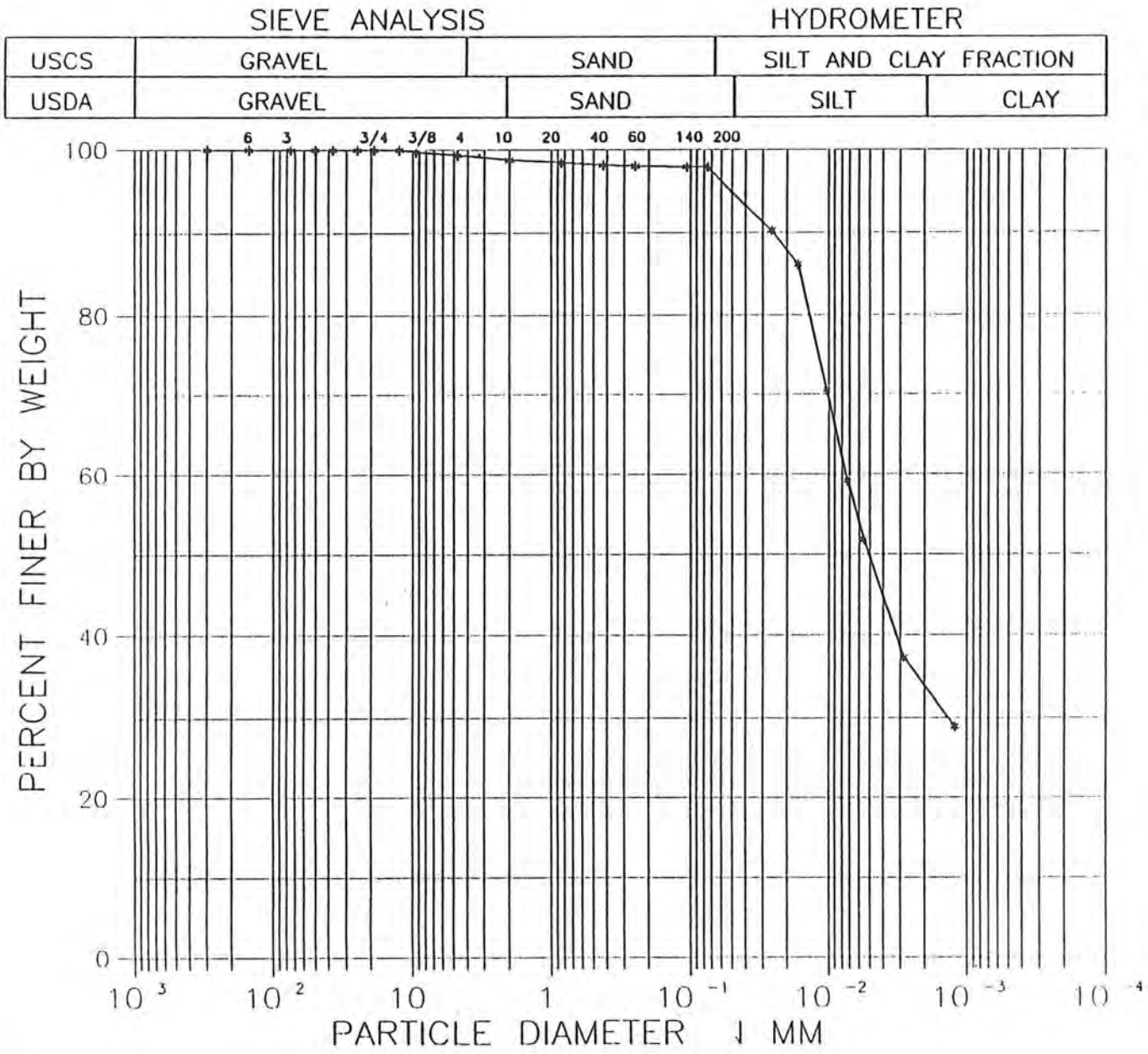
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SB-13 B
USDA Classification SILTY CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	JBS	Date	07-05-96
Client Project	P96 0748	Checked By	JCM	Date	7/6/96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SB-13 B				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	353.70 gm.
Wt. of +#200 Sample	7.38 gm.
Wt. of -#200 Sample	346.32 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	1.10	0.3	0.3	99.7
#4	4.75	1.25	0.4	0.7	99.3
#10	2.00	2.03	0.6	1.2	98.8
#20	0.85	1.13	0.3	1.6	98.4
#40	0.425	1.10	0.3	1.9	98.1
#60	0.250	0.42	0.1	2.0	98.0
#140	0.106	0.30	0.1	2.1	97.9
#200	0.075	0.05	0.0	2.1	97.9
Pan	-	346.32	97.9	100.0	-

Water Content	
Tare No.	867
Wgt. Tare + WS.	625.40
Wgt. Tare + DS.	462.27
Wgt. Tare	108.57
Wgt. Of Water	163.13
Wgt. Of DS.	353.70
% Water	46.1

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	Jcm	Date	7-16-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SB-13 B				

Soil Sample Weight

Container No.	1339		
Wt. Contain. & Dry Soil	155.80 gm.	K Factor	0.01275
Wt. Contain.	104.15 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	46.65 gm.	% Finer Than No. 200	97.91
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	48.5	49.0	43.4	92.2	0.0259	90.3
5		47.0	41.4	88.0	0.0167	86.1
15		39.5	33.9	72.0	0.0103	70.5
33		34.0	28.4	60.4	0.0073	59.1
60		30.5	24.9	52.9	0.0055	51.8
250		23.5	17.9	38.1	0.0028	37.3
1440		19.5	13.9	29.6	0.0012	29.0

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SB-13 B

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	99.7
4.7500	99.3
2.0000	98.8
0.8500	98.4
0.4250	98.1
0.2500	98.0
0.1060	97.9
0.0750	97.9
0.0259	90.3
0.0167	86.1
0.0103	70.5
0.0073	59.1
0.0055	51.8
0.0028	37.3
0.0012	29.0

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	98.76
0.05	95.00
0.002	33.85

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	1.24	0.00
SAND	3.76	3.81
SILT	61.15	61.92
CLAY	33.85	34.28

USDA CLASSIFICATION SILTY CLAY LOAM

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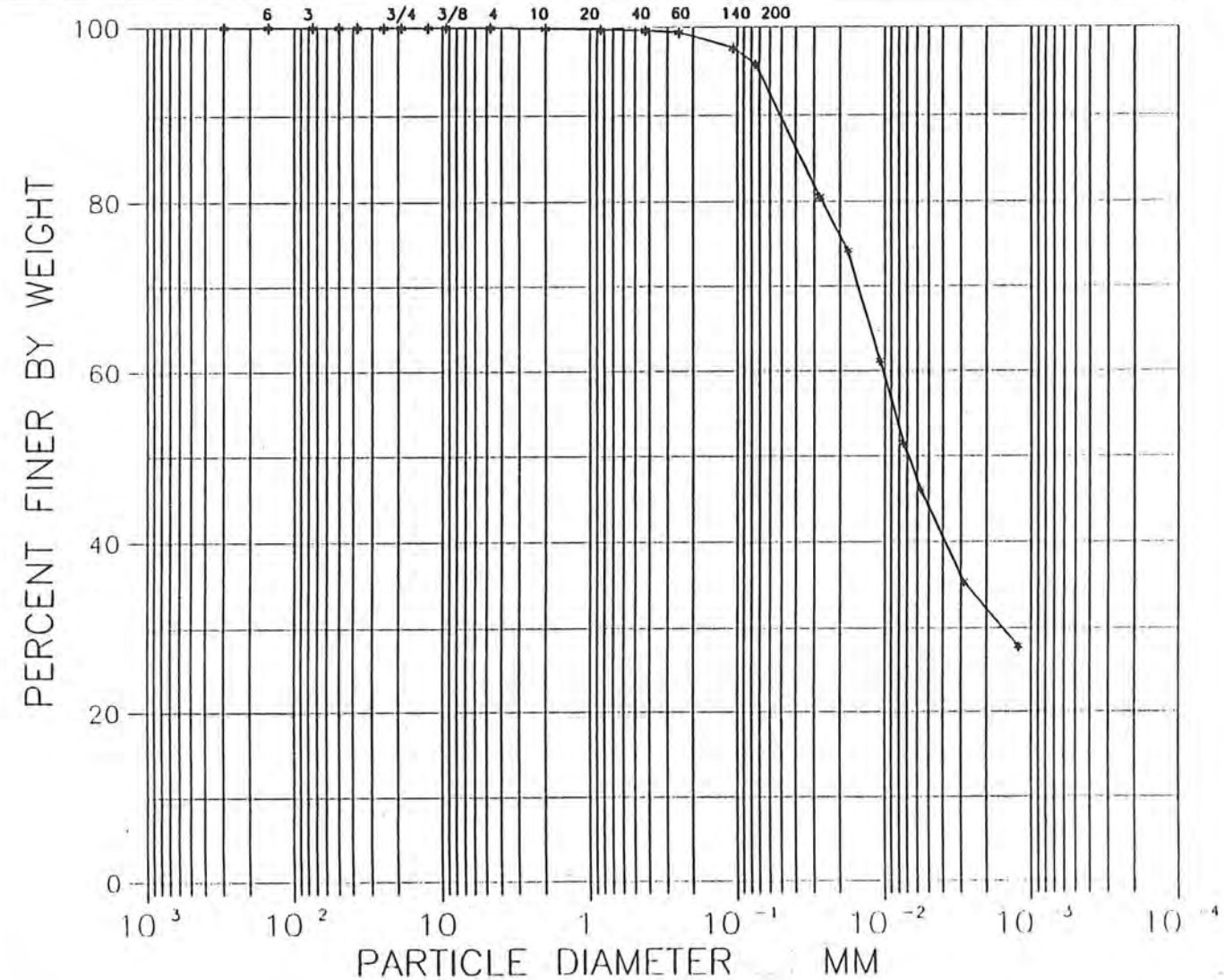
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-14 A
USDA Classification SILTY CLAY LOAM

SIEVE ANALYSIS HYDROMETER

USCS	GRAVEL	SAND	SILT AND CLAY FRACTION	
USDA	GRAVEL	SAND	SILT	CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 A				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	236.70 gm.
Wt. of +#200 Sample	9.65 gm.
Wt. of -#200 Sample	227.05 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.00	0.0	0.0	100.0
#10	2.00	0.27	0.1	0.1	99.9
#20	0.85	0.32	0.1	0.2	99.8
#40	0.425	0.30	0.1	0.4	99.6
#60	0.250	0.52	0.2	0.6	99.4
#140	0.106	4.06	1.7	2.3	97.7
#200	0.075	4.18	1.8	4.1	95.9
Pan	-	227.05	95.9	100.0	-

Water Content	
Tare No.	1653
Wgt. Tare + WS.	456.10
Wgt. Tare + DS.	338.97
Wgt. Tare	102.27
Wgt. Of Water	117.13
Wgt. Of DS.	236.70
% Water	49.5

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 A				

Soil Sample Weight

Container No.	1626		
Wt. Contain. & Dry Soil	149.90 gm.	K Factor	0.01275
Wt. Contain.	100.76 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	44.14 gm.	% Finer Than No. 200	95.92
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	43.0	43.0	37.4	84.0	0.0274	80.6
5		40.0	34.4	77.3	0.0178	74.1
15		34.0	28.4	63.8	0.0108	61.2
34		29.5	23.9	53.7	0.0074	51.5
60		27.0	21.4	48.1	0.0057	46.1
250		22.0	16.4	36.9	0.0029	35.4
1440		18.5	12.9	29.0	0.0012	27.9

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-14 A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	100.0
2.0000	99.9
0.8500	99.8
0.4250	99.6
0.2500	99.4
0.1060	97.7
0.0750	95.9
0.0274	80.6
0.0178	74.1
0.0108	61.2
0.0074	51.5
0.0057	46.1
0.0029	35.4
0.0012	27.9

SIEVE OPENING (mm)	PERCENT FINER	PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
100.00	100.00			
		GRAVEL	0.11	0.00
2.00	99.89			
		SAND	10.15	10.16
0.05	89.74			
		SILT	57.54	57.61
0.002	32.19			
		CLAY	32.19	32.23

USDA CLASSIFICATION SILTY CLAY LOAM

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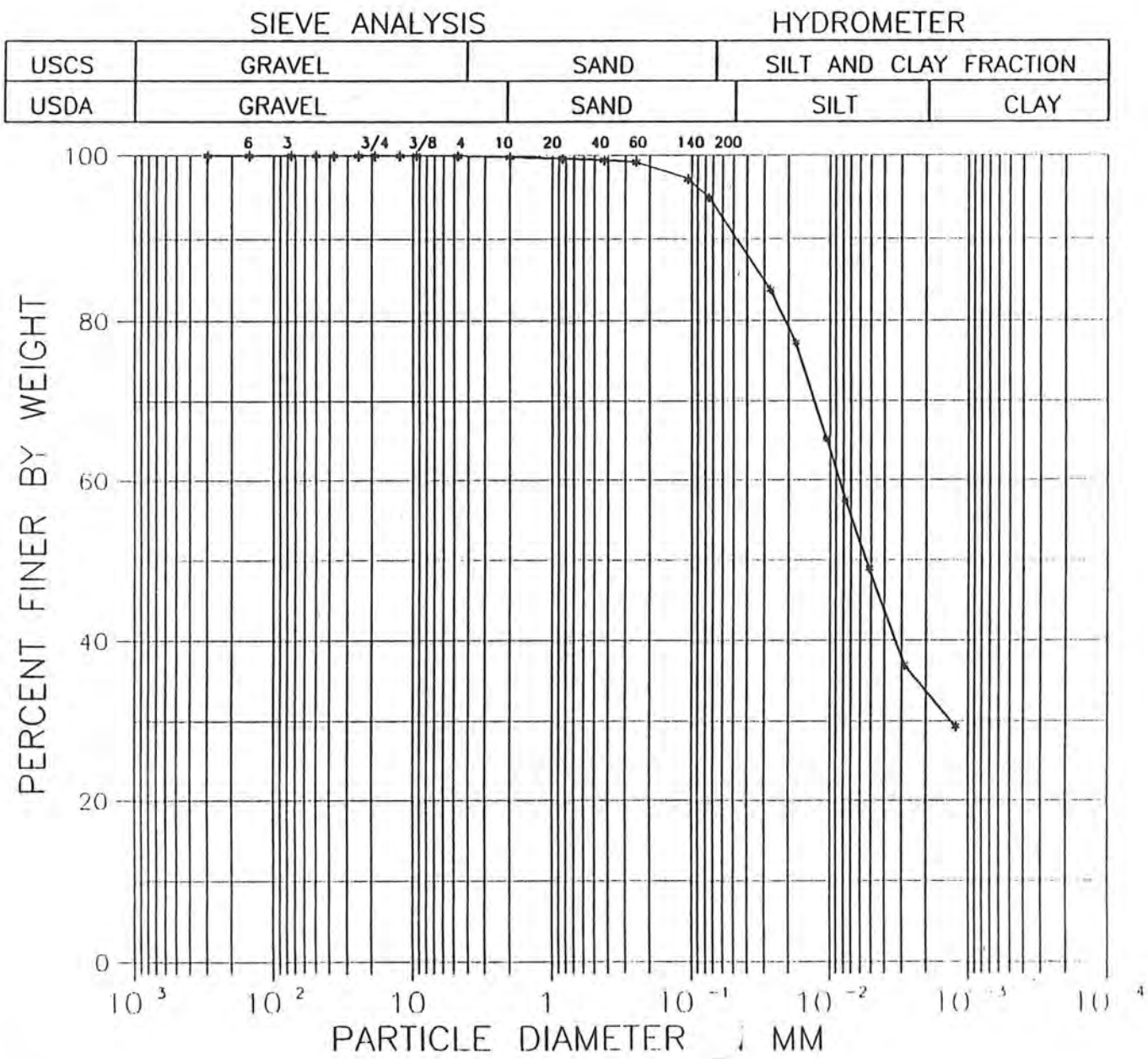
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-14 A DUP
USDA Classification SILTY CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LS	Date	7-22-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 A DUP				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	393.42 gm.
Wt. of +#200 Sample	19.41 gm.
Wt. of -#200 Sample	374.01 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.10	0.0	0.0	100.0
#10	2.00	0.71	0.2	0.2	99.8
#20	0.85	0.69	0.2	0.4	99.6
#40	0.425	0.62	0.2	0.5	99.5
#60	0.250	0.97	0.2	0.8	99.2
#140	0.106	7.83	2.0	2.8	97.2
#200	0.075	8.49	2.2	4.9	95.1
Pan	-	374.01	95.1	100.0	-

Water Content	
Tare No.	1654
Wgt. Tare + WS.	675.20
Wgt. Tare + DS.	495.90
Wgt. Tare	102.48
Wgt. Of Water	179.30
Wgt. Of DS.	393.42
% Water	45.6

Geotechnics

HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-22-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 A DUP				

Soil Sample Weight

Container No.	1096		
Wt. Contain. & Dry Soil	152.91 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	104.74 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	43.17 gm.	% Finer Than No. 200	95.07
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	44.5	44.0	38.4	88.2	0.0272	83.8
5		41.0	35.4	81.3	0.0176	77.3
15		35.5	29.9	68.7	0.0107	65.3
30		32.0	26.4	60.7	0.0077	57.7
71		28.0	22.4	51.5	0.0052	48.9
250		22.5	16.9	38.9	0.0029	36.9
1440		19.0	13.4	30.8	0.0012	29.3

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-14 A DUP

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	100.0
2.0000	99.8
0.8500	99.6
0.4250	99.5
0.2500	99.2
0.1060	97.2
0.0750	95.1
0.0272	83.8
0.0176	77.3
0.0107	65.3
0.0077	57.7
0.0052	48.9
0.0029	36.9
0.0012	29.3

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	99.79
0.05	90.58
0.002	33.74

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	0.21	0.00
SAND	9.22	9.24
SILT	56.83	56.95
CLAY	33.74	33.81

USDA CLASSIFICATION: SILTY CLAY LOAM

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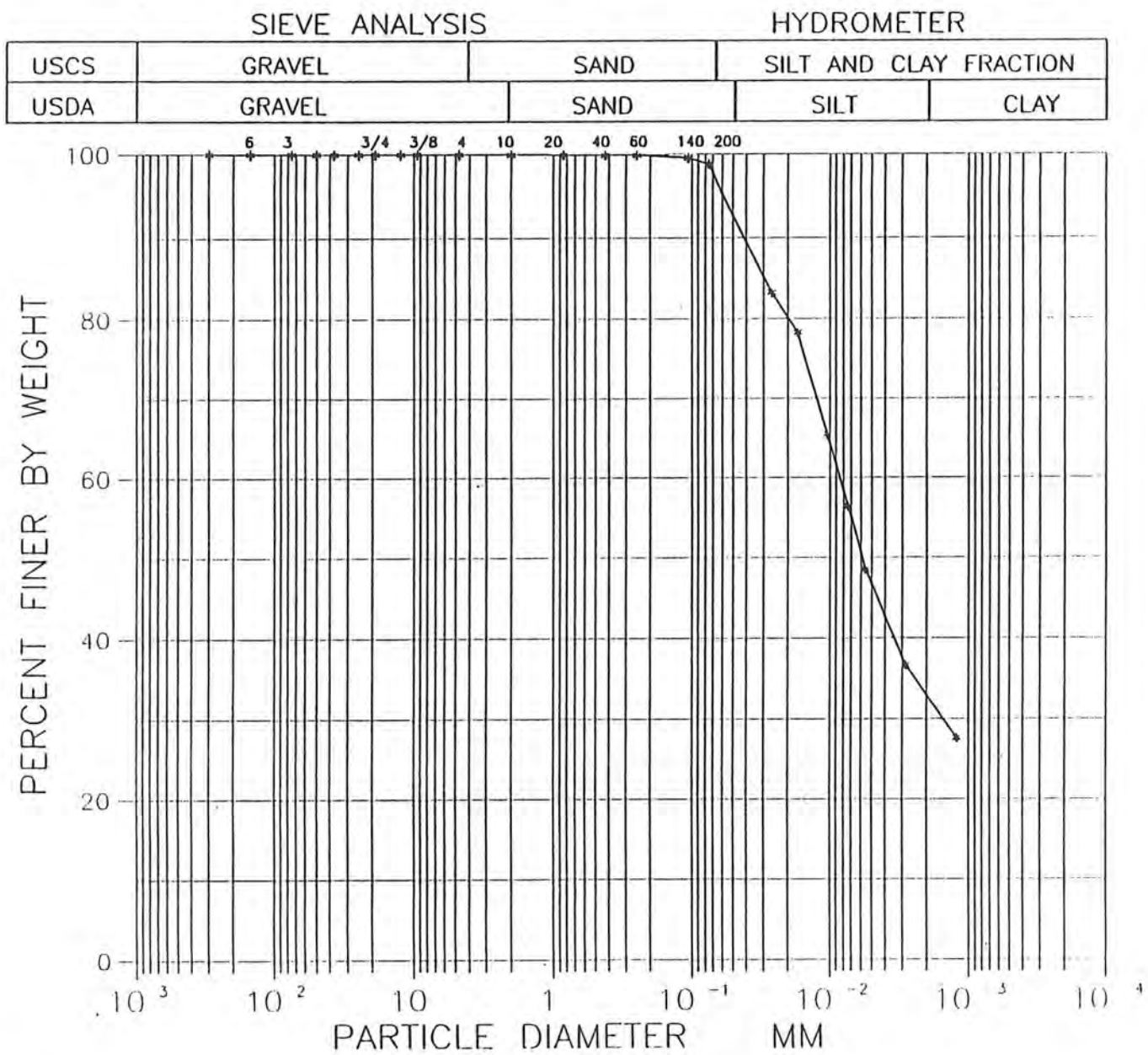
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-14 B
USDA Classification SILTY CLAY LOAM



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Geotechnics

WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 B				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	711.13 gm.
Wt. of +#200 Sample	8.26 gm.
Wt. of -#200 Sample	702.87 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.00	0.0	0.0	100.0
#10	2.00	0.17	0.0	0.0	100.0
#20	0.85	0.19	0.0	0.1	99.9
#40	0.425	0.17	0.0	0.1	99.9
#60	0.250	0.28	0.0	0.1	99.9
#140	0.106	2.22	0.3	0.4	99.6
#200	0.075	5.23	0.7	1.2	98.8
Pan	-	702.87	98.8	100.0	-

Water Content	
Tare No.	1633
Wgt. Tare + WS.	1082.10
Wgt. Tare + DS.	812.00
Wgt. Tare	100.87
Wgt. Of Water	270.10
Wgt. Of DS.	711.13
% Water	38.0

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Geotechnics

HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 B				

Soil Sample Weight

Container No.	1073		
Wt. Contain. & Dry Soil	159.28 gm.	K Factor	0.01275
Wt. Contain.	104.98 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	49.30 gm.	% Finer Than No. 200	98.84
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	47.5	47.5	41.9	84.2	0.0263	83.3
5		45.0	39.4	79.2	0.0170	78.3
15		38.5	32.9	66.2	0.0104	65.4
32		34.0	28.4	57.1	0.0074	56.5
60		30.0	24.4	49.1	0.0056	48.5
250		24.0	18.4	37.0	0.0028	36.6
1440		19.5	13.9	28.0	0.0012	27.7

Geotechnics

Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-14 B

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	100.0
2.0000	100.0
0.8500	99.9
0.4250	99.9
0.2500	99.9
0.1060	99.6
0.0750	98.8
0.0263	83.3
0.0170	78.3
0.0104	65.4
0.0074	56.5
0.0056	48.5
0.0028	36.6
0.0012	27.7

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	99.98
0.05	92.81
0.002	32.94

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	0.02	0.00
SAND	7.16	7.17
SILT	59.88	59.89
CLAY	32.94	32.94

USDA CLASSIFICATION: SILTY CLAY LOAM

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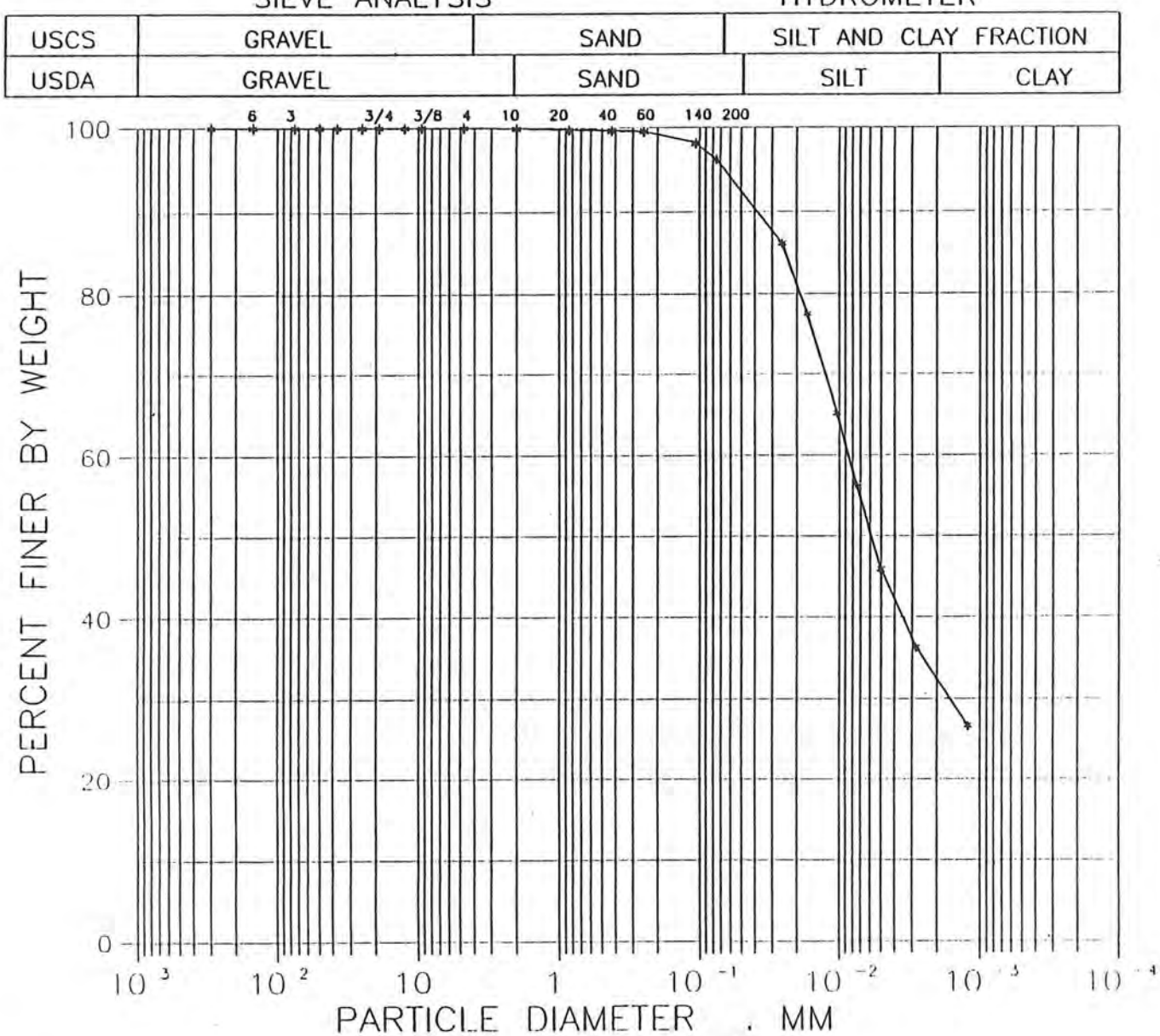
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-14 B DUP
USDA Classification SILTY CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 B DUP				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	562.10 gm.
Wt. of +#200 Sample	20.24 gm.
Wt. of -#200 Sample	541.86 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.03	0.0	0.0	100.0
#10	2.00	0.46	0.1	0.1	99.9
#20	0.85	0.85	0.2	0.2	99.8
#40	0.425	0.71	0.1	0.4	99.6
#60	0.250	0.54	0.1	0.5	99.5
#140	0.106	7.47	1.3	1.8	98.2
#200	0.075	10.18	1.8	3.6	96.4
Pan	-	541.86	96.4	100.0	-

Water Content	
Tare No.	1673
Wgt. Tare + WS.	885.90
Wgt. Tare + DS.	666.50
Wgt. Tare	104.40
Wgt. Of Water	219.40
Wgt. Of DS.	562.10
% Water	39.0

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Geotechnics

HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TC	Date	07-05-96
Client Project	P96 0748	Checked By	LG	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-14 B DUP				

Soil Sample Weight

Container No.	1134		
Wt. Contain. & Dry Soil	160.75 gm.	K Factor	0.01275
Wt. Contain.	105.97 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	49.78 gm.	% Finer Than No. 200	96.40
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	50.5	50.5	44.9	89.4	0.0255	86.2
5		46.0	40.4	80.4	0.0169	77.5
15		39.5	33.9	67.5	0.0103	65.1
30		35.0	29.4	58.6	0.0076	56.5
74		29.5	23.9	47.6	0.0050	45.9
250		24.5	18.9	37.7	0.0028	36.3
1440		19.5	13.9	27.7	0.0012	26.7

Geotechnics

Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-14 B DUP

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	100.0
2.0000	99.9
0.8500	99.8
0.4250	99.6
0.2500	99.5
0.1060	98.2
0.0750	96.4
0.0255	86.2
0.0169	77.5
0.0103	65.1
0.0076	56.5
0.0050	45.9
0.0028	36.3
0.0012	26.7

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	99.91
0.05	92.55
0.002	32.40

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	0.09	0.00
SAND	7.36	7.37
SILT	60.15	60.21
CLAY	32.40	32.43

USDA CLASSIFICATION: SILTY CLAY LOAM

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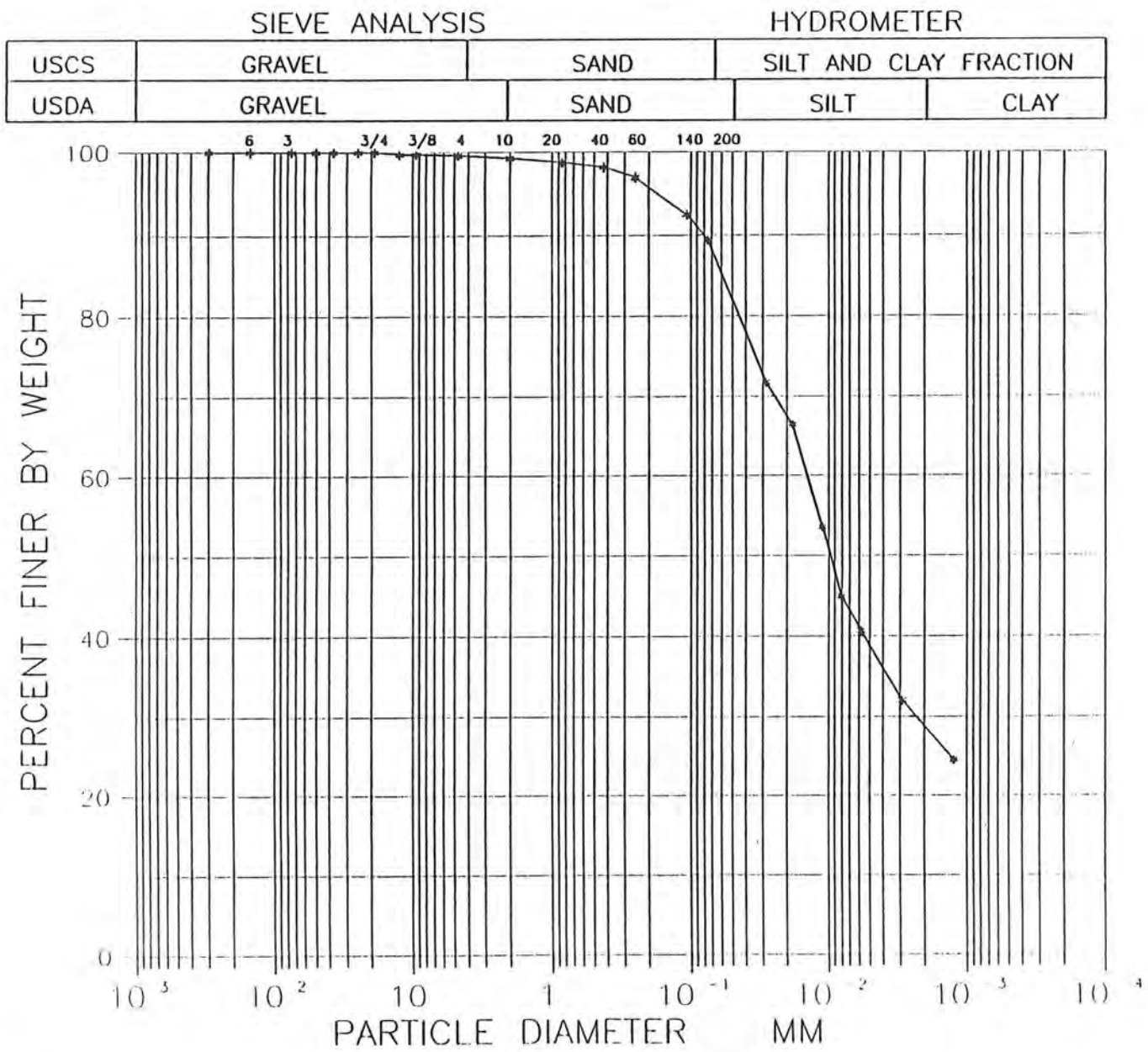
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-15 A
USDA Classification SILTY CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-15 A				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	415.87 gm.
Wt. of +#200 Sample	43.90 gm.
Wt. of -#200 Sample	371.97 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	1.21	0.3	0.3	99.7
3/8"	9.50	0.00	0.0	0.3	99.7
#4	4.75	0.59	0.1	0.4	99.6
#10	2.00	1.42	0.3	0.8	99.2
#20	0.85	2.20	0.5	1.3	98.7
#40	0.425	2.29	0.6	1.9	98.1
#60	0.250	4.88	1.2	3.0	97.0
#140	0.106	18.15	4.4	7.4	92.6
#200	0.075	13.16	3.2	10.6	89.4
Pan	-	371.97	89.4	100.0	-

Water Content	
Tare No.	863
Wgt. Tare + WS.	728.10
Wgt. Tare + DS.	523.81
Wgt. Tare	107.94
Wgt. Of Water	204.29
Wgt. Of DS.	415.87
% Water	49.1

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LS	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-15 A				

Soil Sample Weight

Container No.	1615		
Wt. Contain. & Dry Soil	147.57 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	101.32 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	41.25 gm.	% Finer Than No. 200	89.44

Temperature C	24.5	
Specific Gravity	2.70	
	Assumed	

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	39.5	39.0	33.4	80.3	0.0284	71.8
5		36.5	30.9	74.3	0.0183	66.4
15		30.5	24.9	59.9	0.0111	53.6
30		26.5	20.9	50.3	0.0080	45.0
60		24.5	18.9	45.5	0.0058	40.7
250		20.5	14.9	35.9	0.0029	32.1
1440		17.0	11.4	27.5	0.0012	24.6

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Geotechnics

Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-15 A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	99.7
9.5000	99.7
4.7500	99.6
2.0000	99.2
0.8500	98.7
0.4250	98.1
0.2500	97.0
0.1060	92.6
0.0750	89.4
0.0284	71.8
0.0183	66.4
0.0111	53.6
0.0080	45.0
0.0058	40.7
0.0029	32.1
0.0012	24.6

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	99.23
0.05	82.09
0.002	28.82

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	0.77	0.00
SAND	17.14	17.27
SILT	53.27	53.68
CLAY	28.82	29.04

USDA CLASSIFICATION SILTY CLAY LOAM

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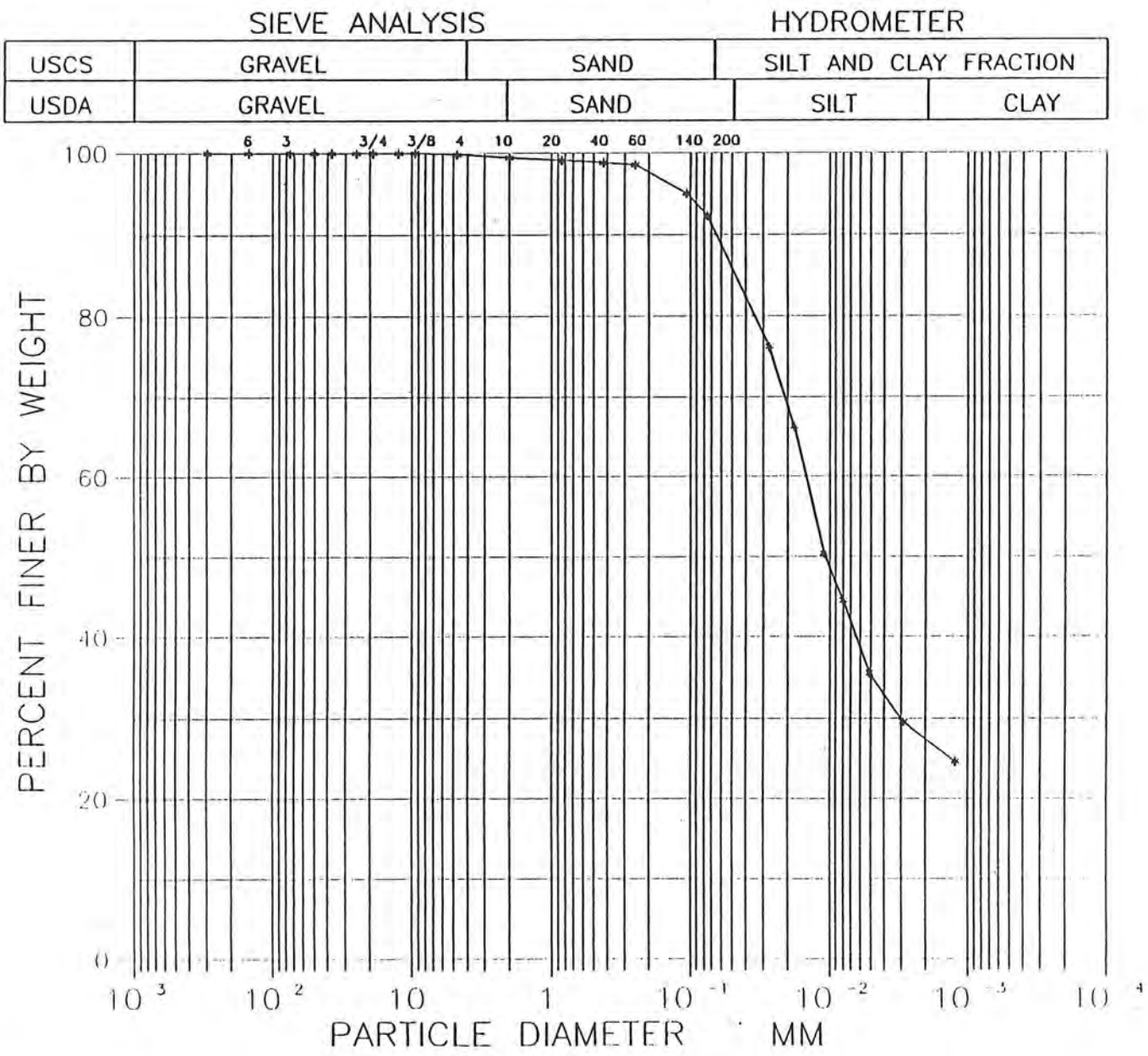
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-15 B
USDA Classification SILTY CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-03-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-15 B				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	203.26 gm.
Wt. of +#200 Sample	15.53 gm.
Wt. of -#200 Sample	187.73 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.34	0.2	0.2	99.8
#10	2.00	0.88	0.4	0.6	99.4
#20	0.85	0.66	0.3	0.9	99.1
#40	0.425	0.46	0.2	1.2	98.8
#60	0.250	0.57	0.3	1.4	98.6
#140	0.106	6.93	3.4	4.8	95.2
#200	0.075	5.69	2.8	7.6	92.4
Pan	-	187.73	92.4	100.0	-

Water Content	
Tare No.	1666
Wgt. Tare + WS.	405.80
Wgt. Tare + DS.	306.45
Wgt. Tare	103.19
Wgt. Of Water	99.35
Wgt. Of DS.	203.26
% Water	48.9

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-15 B				

Soil Sample Weight			
Container No.	1675		
Wt. Contain. & Dry Soil	155.48 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	104.34 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	46.14 gm.	% Finer Than No. 200	92.36
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	44.5	44.0	38.4	82.5	0.0272	76.2
5		39.0	33.4	71.8	0.0179	66.3
15		31.0	25.4	54.6	0.0110	50.4
30		28.0	22.4	48.2	0.0080	44.5
77		23.5	17.9	38.5	0.0051	35.6
250		20.5	14.9	32.1	0.0029	29.6
1440		18.0	12.4	26.7	0.0012	24.7

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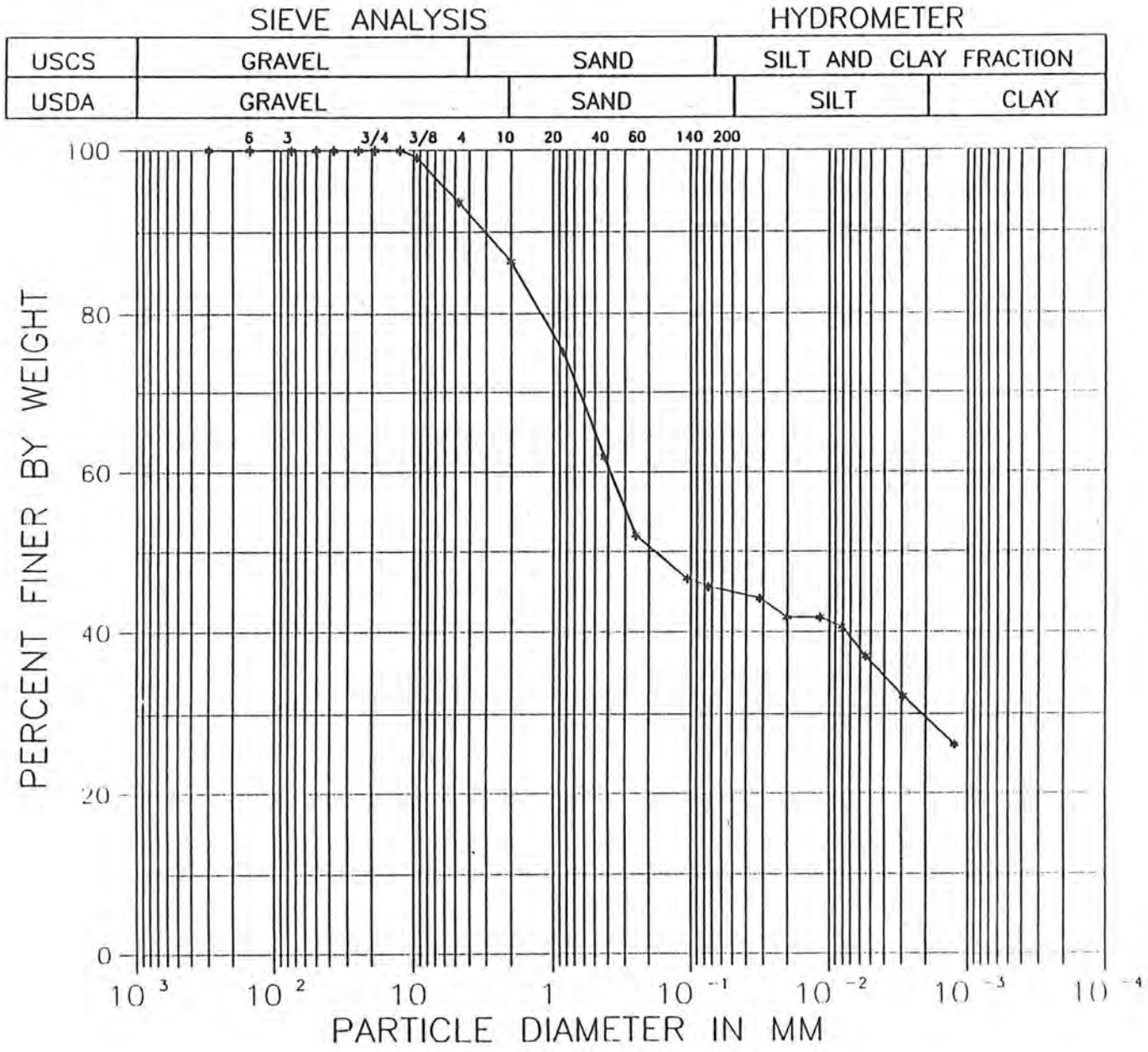
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification sc
Soil Description BROWN CLAYEY SAND

Boring No. NA
Depth(ft) NA
Sample No. SD-8A
USDA Classification SANDY CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	GCM	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-8A				
Soil Description	BROWN CLAYEY SAND				

Wt. of Total Sample(dry)	448.23 gm.
Wt. of +#200 Sample	243.18 gm.
Wt. of -#200 Sample	205.05 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	10[illegible]
1 1/2"	37.50	0.00	0.0	0.0	10
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	4.11	0.9	0.9	99.1
#4	4.75	24.09	5.4	6.3	93.7
#10	2.00	32.66	7.3	13.6	86.4
#20	0.85	50.30	11.2	24.8	75.2
#40	0.425	59.74	13.3	38.1	61.9
#60	0.250	43.93	9.8	47.9	52.1
#140	0.106	24.02	5.4	53.3	46.7
#200	0.075	4.33	1.0	54.3	45.7
Pan	-	205.05	45.7	100.0	-

Water Content	
Tare No.	1072
Wgt. Tare + WS.	742.20
Wgt. Tare + DS.	555.06
Wgt. Tare	106.83
Wgt. Of Water	187.14
Wgt. Of DS.	448.23
% Water	41.8

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	JCM	Date	7-18-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-8A				

Soil Sample Weight

Container No.	1914		
Wt. Contain. & Dry Soil	128.86 gm.	K Factor	0.01275
Wt. Contain.	104.97 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	18.89 gm.	% Finer Than No. 200	45.75
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	24.0	24.0	18.4	96.7	0.0317	44.2
5		23.0	17.4	91.4	0.0202	41.8
15		23.0	17.4	91.4	0.0116	41.8
31		22.5	16.9	88.8	0.0081	40.6
70		21.0	15.4	81.0	0.0055	37.0
250		19.0	13.4	70.5	0.0029	32.2
1440		16.5	10.9	57.4	0.0012	26.2

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-8A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	99.1
4.7500	93.7
2.0000	86.4
0.8500	75.2
0.4250	61.9
0.2500	52.1
0.1060	46.7
0.0750	45.7
0.0317	44.2
0.0202	41.8
0.0116	41.8
0.0081	40.6
0.0055	37.0
0.0029	32.2
0.0012	26.2

SIEVE OPENING (mm)	PERCENT FINER	PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
100.00	100.00			
		GRAVEL	13.58	0.00
2.00	86.42			
		SAND	41.39	47.89
0.05	45.03			
		SILT	15.44	17.87
0.002	29.59			
		CLAY	29.59	34.24

USDA CLASSIFICATION SANDY CLAY LOAM

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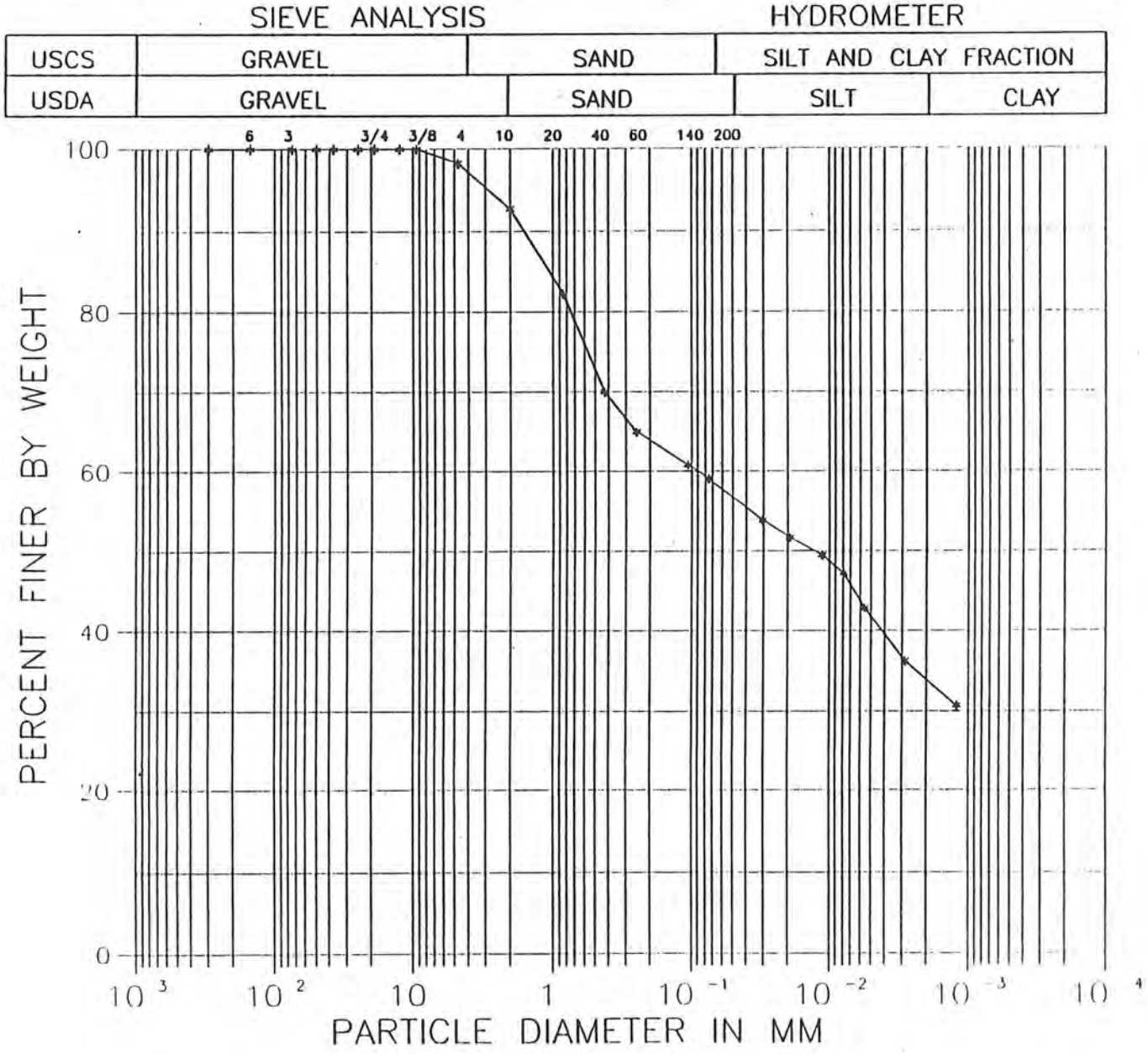
Client RECRA ENVIRONENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN SANDY LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-10A
USDA Classification CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-10A				
Soil Description	BROWN SANDY LEAN CLAY				

Wt. of Total Sample(dry)	295.46 gm.
Wt. of +#200 Sample	120.89 gm.
Wt. of -#200 Sample	174.57 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	-
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	5.15	1.7	1.7	98.3
#10	2.00	16.05	5.4	7.2	92.8
#20	0.85	31.24	10.6	17.7	82.3
#40	0.425	36.19	12.2	30.0	70.0
#60	0.250	14.83	5.0	35.0	65.0
#140	0.106	12.24	4.1	39.2	60.8
#200	0.075	5.19	1.8	40.9	59.1
Pan	-	174.57	59.1	100.0	-

Water Content	
Tare No.	1321
Wgt. Tare + WS.	521.50
Wgt. Tare + DS.	399.41
Wgt. Tare	103.95
Wgt. Of Water	122.09
Wgt. Of DS.	295.46
% Water	41.3

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-10A				

Soil Sample Weight

Container No.	882		
Wt. Contain. & Dry Soil	136.32 gm.	K Factor	0.01275
Wt. Contain.	104.79 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	26.53 gm.	% Finer Than No. 200	59.08
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	31.0	30.0	24.4	91.2	0.0304	53.9
5		29.0	23.4	87.5	0.0194	51.7
15		28.0	22.4	83.8	0.0113	49.5
31		27.0	21.4	80.0	0.0079	47.3
64		25.0	19.4	72.6	0.0056	42.9
250		22.0	16.4	61.4	0.0029	36.3
1440		19.5	13.9	52.1	0.0012	30.8

Geotechnics

Client	RECRA ENVIRONENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-10A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	98.3
2.0000	92.8
0.8500	82.3
0.4250	70.0
0.2500	65.0
0.1060	60.8
0.0750	59.1
0.0304	53.9
0.0194	51.7
0.0113	49.5
0.0079	47.3
0.0056	42.9
0.0029	36.3
0.0012	30.8

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	92.82
0.05	56.76
0.002	33.94

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	7.18	0.00
SAND	36.07	38.86
SILT	22.81	24.58
CLAY	33.94	36.57

USDA CLASSIFICATION CLAY LOAM

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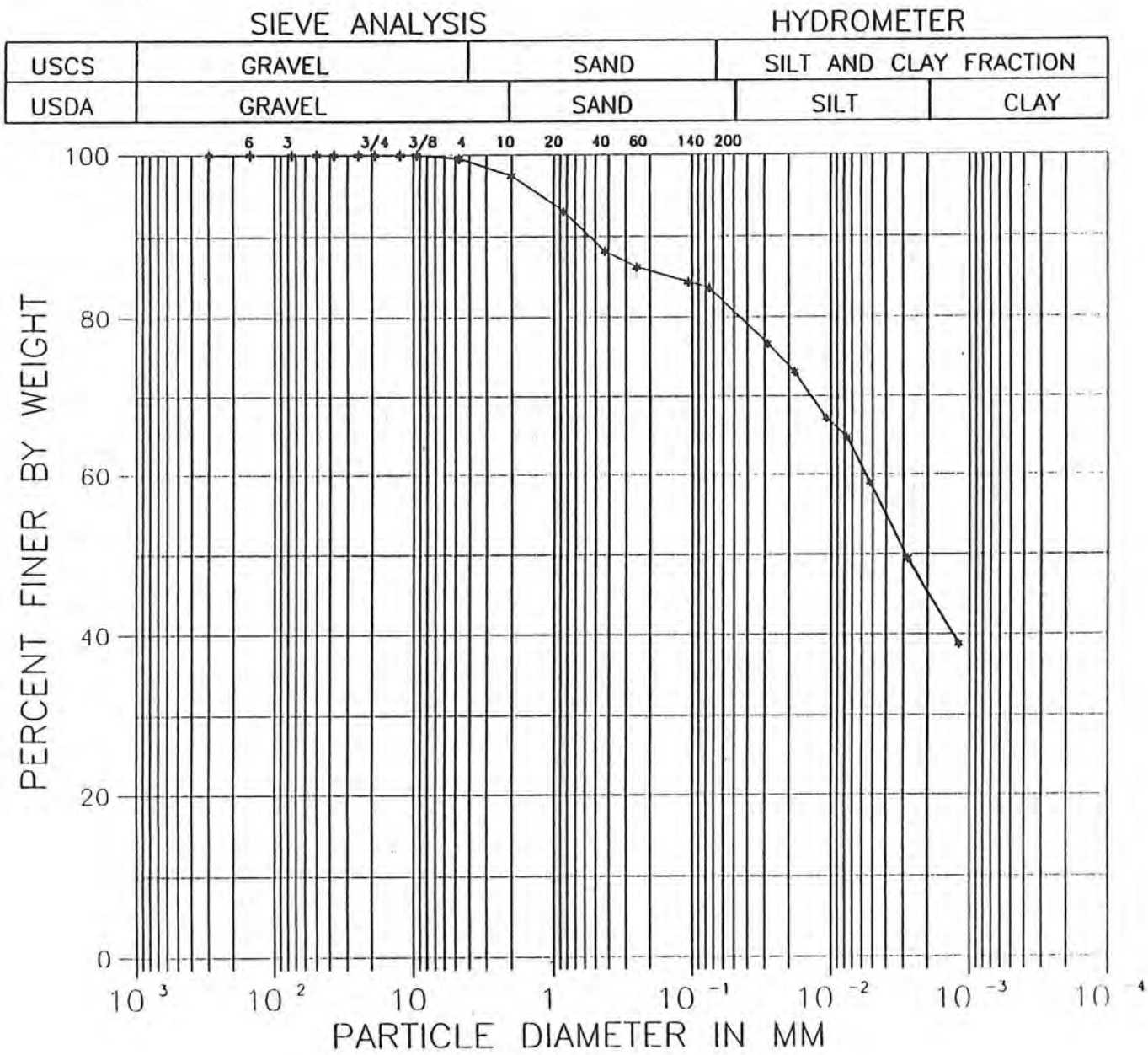
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY WITH SAND

Boring No. NA
Depth(ft) NA
Sample No. SD-11A
USDA Classification CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-9
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-11A				
Soil Description	BROWN LEAN CLAY WITH SAND				

Wt. of Total Sample(dry)	289.97 gm.
Wt. of +#200 Sample	47.33 gm.
Wt. of -#200 Sample	242.64 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	10[illegible]
1 1/2"	37.50	0.00	0.0	0.0	
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	1.28	0.4	0.4	99.6
#10	2.00	5.82	2.0	2.4	97.6
#20	0.85	12.68	4.4	6.8	93.2
#40	0.425	14.36	5.0	11.8	88.2
#60	0.250	5.76	2.0	13.8	86.2
#140	0.106	5.28	1.8	15.6	84.4
#200	0.075	2.15	0.7	16.3	83.7
Pan	-	242.64	83.7	100.0	-

Water Content	
Tare No.	1612
Wgt. Tare + WS.	606.40
Wgt. Tare + DS.	391.48
Wgt. Tare	101.51
Wgt. Of Water	214.92
Wgt. Of DS.	289.97
% Water	74.1

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LR	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-11A				

Soil Sample Weight

Container No.	1319		
Wt. Contain.		K Factor	0.01275
& Dry Soil	145.07 gm.	Composite Correction	5.55
Wt. Contain.	105.00 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	35.07 gm.	% Finer Than No. 200	83.68
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	38.5	38.0	32.4	91.6	0.0286	76.6
5		36.5	30.9	87.4	0.0183	73.1
15		34.0	28.4	80.3	0.0108	67.2
30		33.0	27.4	77.5	0.0077	64.8
67		30.5	24.9	70.4	0.0052	58.9
250		26.5	20.9	59.1	0.0028	49.5
1440		22.0	16.4	46.4	0.0012	38.9

Geotechnics

Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-11A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	99.6
2.0000	97.6
0.8500	93.2
0.4250	88.2
0.2500	86.2
0.1060	84.4
0.0750	83.7
0.0286	76.6
0.0183	73.1
0.0108	67.2
0.0077	64.8
0.0052	58.9
0.0028	49.5
0.0012	38.9

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	97.55
0.05	80.72
0.002	45.31

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	2.45	0.00
SAND	16.83	17.25
SILT	35.41	36.30
CLAY	45.31	46.45

USDA CLASSIFICATION CLAY

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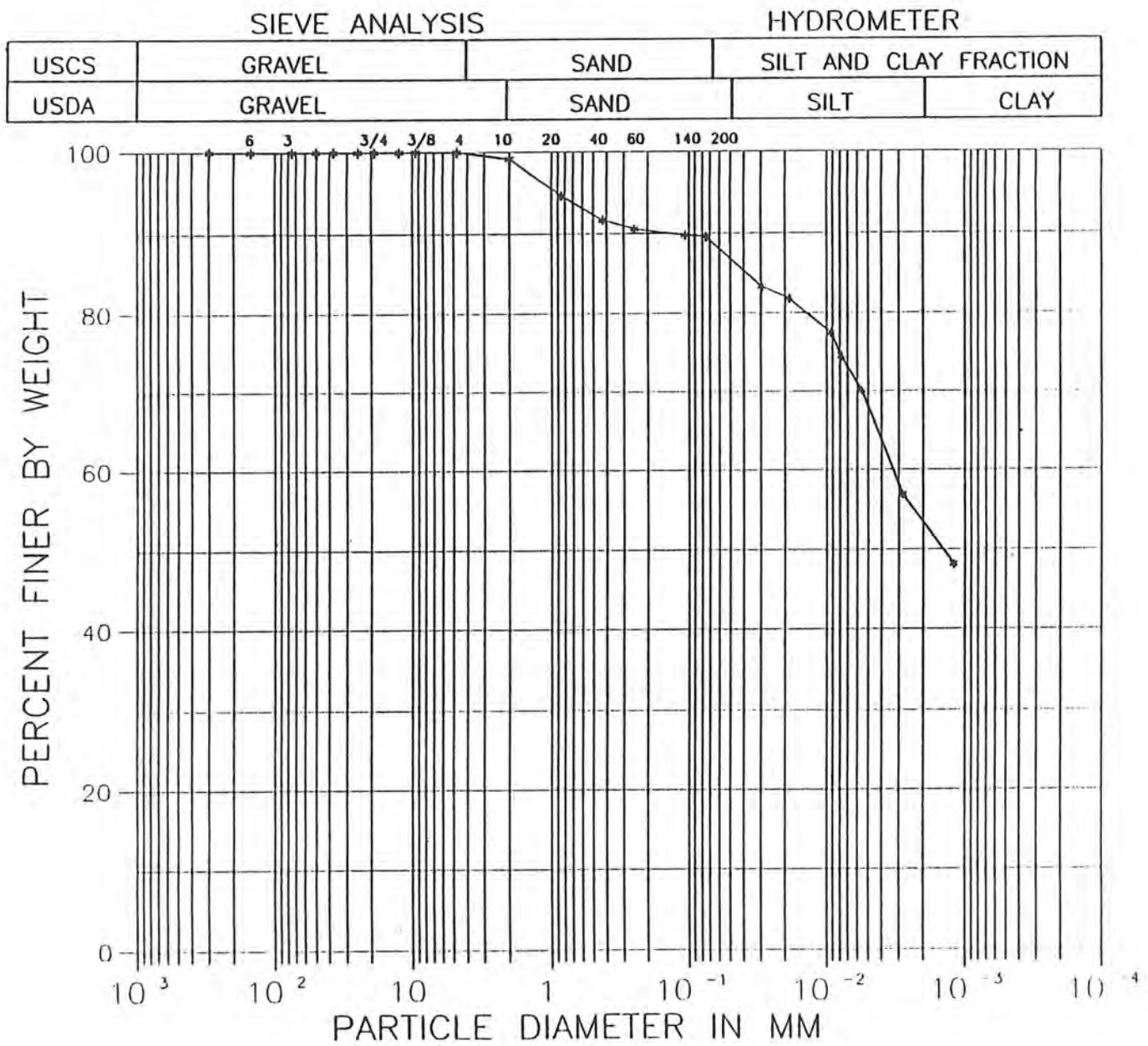
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-12 A
USDA Classification CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-12 A				
Soil Description	BROWN LEAN CLAY				

Wt. of Total Sample(dry)	355.28 gm.
Wt. of +#200 Sample	36.92 gm.
Wt. of -#200 Sample	318.36 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	1[illegible]
1 1/2"	37.50	0.00	0.0	0.0	10[illegible]
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.00	0.0	0.0	100.0
#10	2.00	3.16	0.9	0.9	99.1
#20	0.85	15.49	4.4	5.2	94.8
#40	0.425	10.59	3.0	8.2	91.8
#60	0.250	4.14	1.2	9.4	90.6
#140	0.106	2.86	0.8	10.2	89.8
#200	0.075	0.68	0.2	10.4	89.6
Pan	-	318.36	89.6	100.0	-

Water Content	
Tare No.	1656
Wgt. Tare + WS.	724.00
Wgt. Tare + DS.	460.79
Wgt. Tare	105.51
Wgt. Of Water	263.21
Wgt. Of DS.	355.28
% Water	74.1

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-12 A				

Soil Sample Weight

Container No.	1338		
Wt. Contain. & Dry Soil	141.01 gm.	K Factor	0.01275
Wt. Contain.	105.72 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	30.29 gm.	% Finer Than No. 200	89.61
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	33.5	34.0	28.4	93.0	0.0295	83.3
5		33.5	27.9	91.3	0.0187	81.9
21		32.0	26.4	86.4	0.0092	77.5
30		31.0	25.4	83.2	0.0078	74.5
60		29.5	23.9	78.3	0.0056	70.1
250		25.0	19.4	63.6	0.0028	57.0
1440		22.0	16.4	53.8	0.0012	48.2

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-12 A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	100.0
2.0000	99.1
0.8500	94.8
0.4250	91.8
0.2500	90.6
0.1060	89.8
0.0750	89.6
0.0295	83.3
0.0187	81.9
0.0092	77.5
0.0078	74.5
0.0056	70.1
0.0028	57.0
0.0012	48.2

SIEVE OPENING (mm)	PERCENT FINER	PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
100.00	100.00			
		GRAVEL	0.89	0.00
2.00	99.11			
		SAND	12.24	12.35
0.05	86.87			
		SILT	33.43	33.73
0.002	53.45			
		CLAY	53.45	53.93

USDA CLASSIFICATION CLAY

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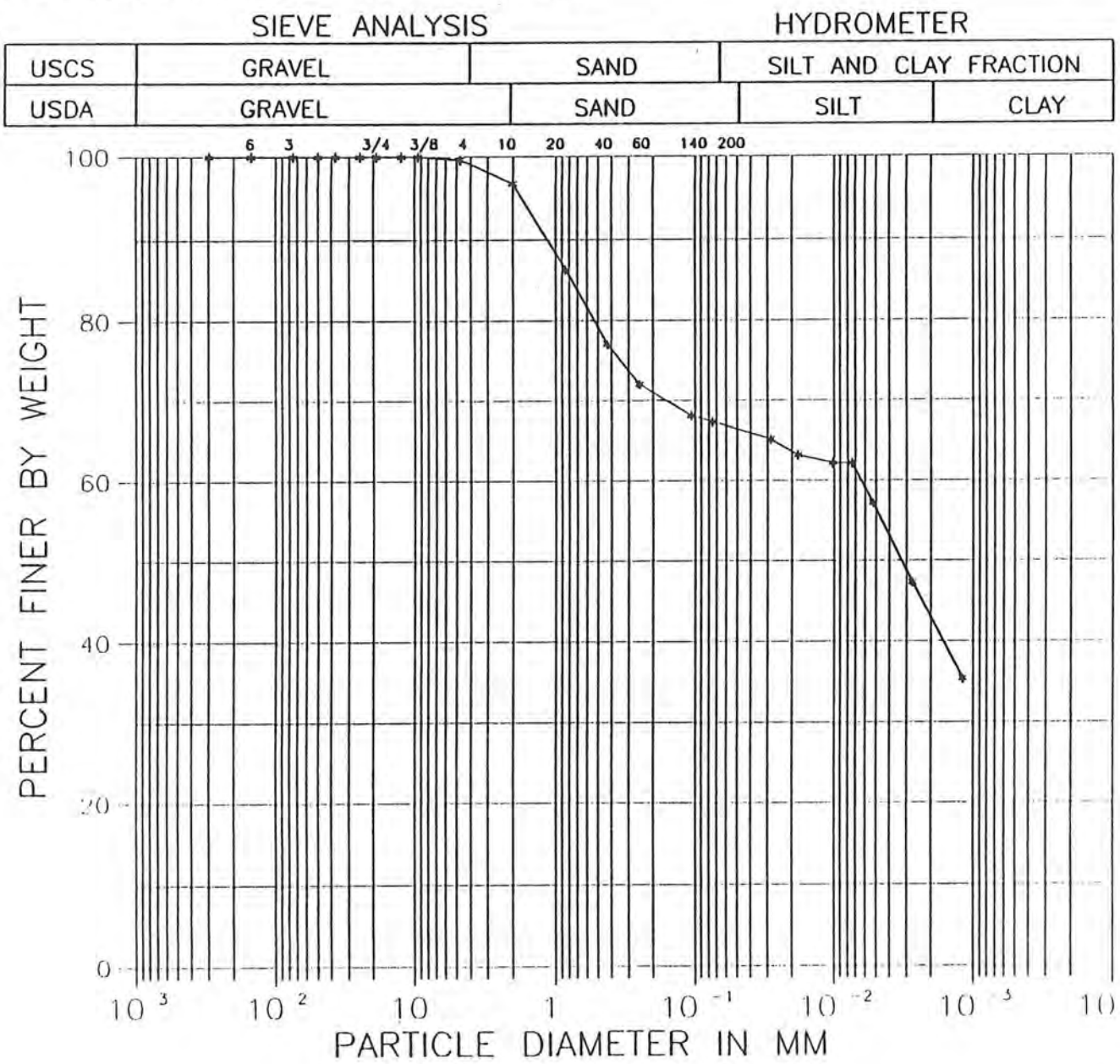
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN SANDY LEAN CLAY

Boring No. NA
Depth(ft) NA
Sample No. SD-12 B
USDA Classification CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-12 B				
Soil Description	BROWN SANDY LEAN CLAY				

Wt. of Total Sample(dry)	454.61 gm.
Wt. of +#200 Sample	148.73 gm.
Wt. of -#200 Sample	305.88 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	10[illegible]
1 1/2"	37.50	0.00	0.0	0.0	10[illegible]
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	1.79	0.4	0.4	99.6
#10	2.00	12.74	2.8	3.2	96.8
#20	0.85	47.44	10.4	13.6	86.4
#40	0.425	42.02	9.2	22.9	77.1
#60	0.250	22.80	5.0	27.9	72.1
#140	0.106	18.31	4.0	31.9	68.1
#200	0.075	3.63	0.8	32.7	67.3
Pan	-	305.88	67.3	100.0	-

Water Content	
Tare No.	724
Wgt. Tare + WS.	768.50
Wgt. Tare + DS.	564.36
Wgt. Tare	109.75
Wgt. Of Water	204.14
Wgt. Of DS.	454.61
% Water	44.9

Geotechnics

HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-12 B				

Soil Sample Weight			
Container No.	1657		
Wt. Contain. & Dry Soil	139.40 gm.	K Factor	0.01275
Wt. Contain.	100.69 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	33.71 gm.	% Finer Than No. 200	67.28
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	37.0	38.5	32.9	96.8	0.0285	65.1
5		37.5	31.9	93.8	0.0182	63.1
16		37.0	31.4	92.4	0.0102	62.1
30		37.0	31.4	92.4	0.0074	62.1
63		34.5	28.9	85.0	0.0052	57.2
250		29.5	23.9	70.3	0.0027	47.3
1440		23.5	17.9	52.7	0.0012	35.5

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Client	RECRA ENVIRONMENTAL
Client Project	PS6 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-12 B

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	99.6
2.0000	96.8
0.8500	86.4
0.4250	77.1
0.2500	72.1
0.1060	68.1
0.0750	67.3
0.0285	65.1
0.0182	63.1
0.0102	62.1
0.0074	62.1
0.0052	57.2
0.0027	47.3
0.0012	35.5

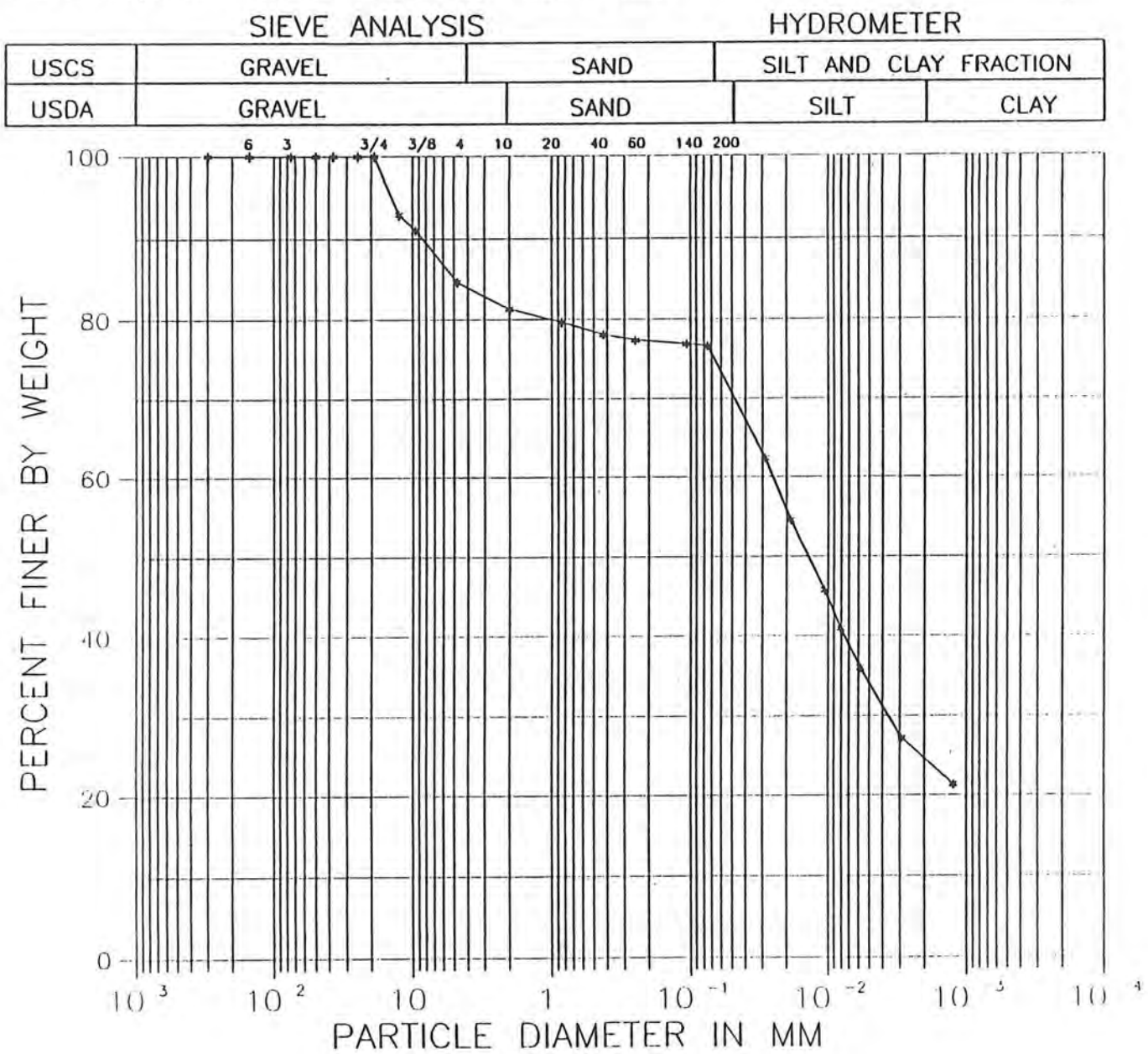
SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	96.80
0.05	66.37
0.002	42.90

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	3.20	0.00
SAND	30.43	31.44
SILT	23.47	24.24
CLAY	42.90	44.32

USDA CLASSIFICATION CLAY

Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY WITH GRAVEL

Boring No. NA
Depth(ft) NA
Sample No. SD-13 A
USDA Classification SILTY CLAY LOAM



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-13 A				
Soil Description	BROWN LEAN CLAY WITH GRAVEL				

Wt. of Total Sample(dry)	191.08 gm.
Wt. of +#200 Sample	44.67 gm.
Wt. of -#200 Sample	146.41 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	-
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	13.48	7.1	7.1	92.9
3/8"	9.50	3.53	1.8	8.9	91.1
#4	4.75	12.17	6.4	15.3	84.7
#10	2.00	6.44	3.4	18.6	81.4
#20	0.85	3.26	1.7	20.3	79.7
#40	0.425	2.99	1.6	21.9	78.1
#60	0.250	1.37	0.7	22.6	77.4
#140	0.106	0.93	0.5	23.1	76.9
#200	0.075	0.50	0.3	23.4	76.6
Pan	-	146.41	76.6	100.0	-

Water Content	
Tare No.	892
Wgt. Tare + WS.	386.31
Wgt. Tare + DS.	300.42
Wgt. Tare	109.34
Wgt. Of Water	85.89
Wgt. Of DS.	191.08
% Water	44.9

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LS	Date	7-17-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-13 A				

Soil Sample Weight

Container No.	1305		
Wt. Contain. & Dry Soil	147.06 gm.	K Factor	0.01275
Wt. Contain.	103.18 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	38.88 gm.	% Finer Than No. 200	76.62
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	38.0	37.5	31.9	81.4	0.0287	62.3
5		33.5	27.9	71.2	0.0187	54.5
17		29.0	23.4	59.7	0.0105	45.7
30		26.5	20.9	53.3	0.0080	40.9
60		24.0	18.4	47.0	0.0058	36.0
250		19.5	13.9	35.5	0.0029	27.2
1440		16.5	10.9	27.9	0.0012	21.4

Geotechnics

Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-13 A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	92.9
9.5000	91.1
4.7500	84.7
2.0000	81.4
0.8500	79.7
0.4250	78.1
0.2500	77.4
0.1060	76.9
0.0750	76.6
0.0287	62.3
0.0187	54.5
0.0105	45.7
0.0080	40.9
0.0058	36.0
0.0029	27.2
0.0012	21.4

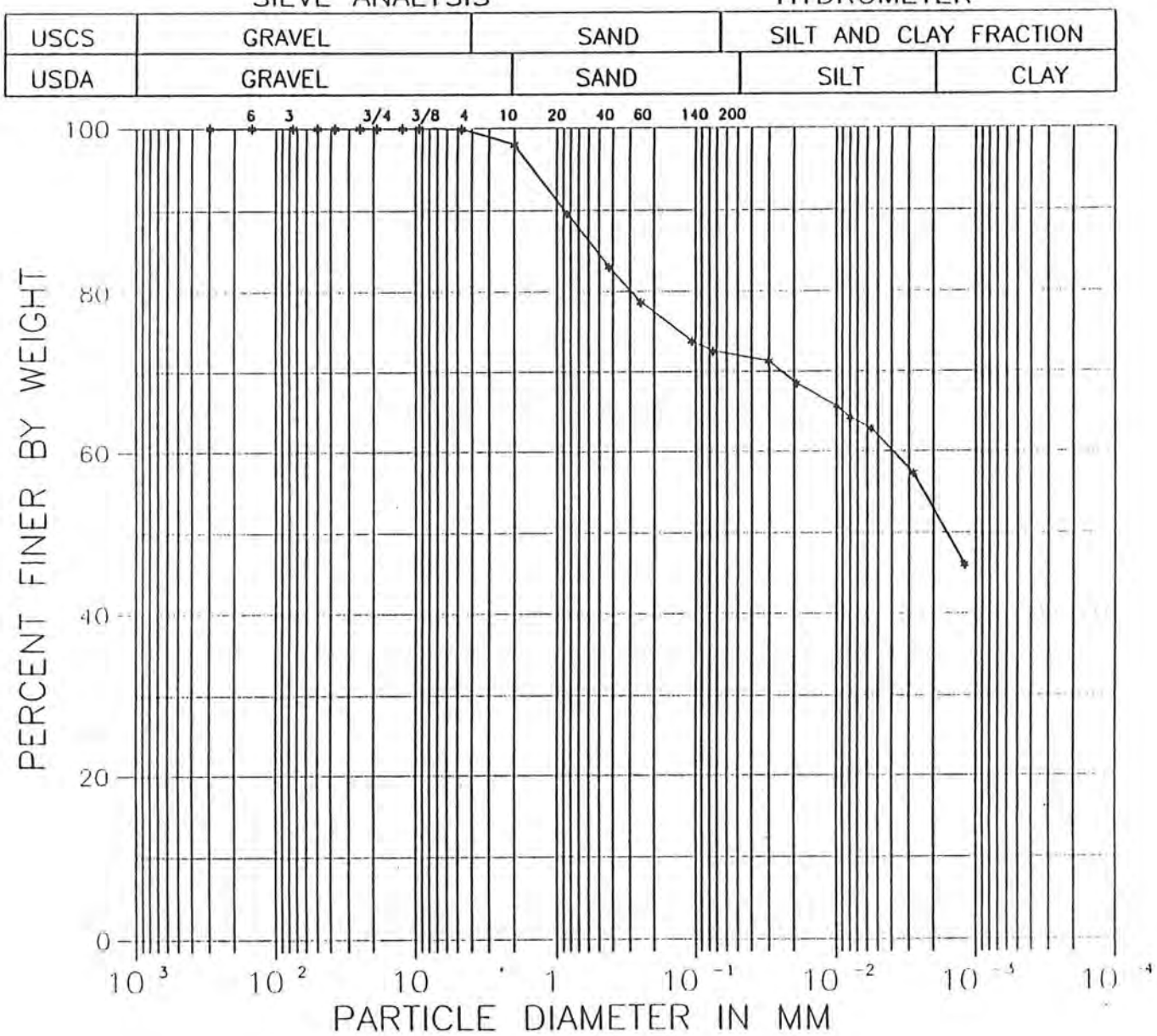
SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	81.36
0.05	70.59
0.002	24.63

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	18.64	0.00
SAND	10.77	13.24
SILT	45.95	56.48
CLAY	24.63	30.28

USDA CLASSIFICATION: SILTY CLAY LOAM

Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY WITH SAND

Boring No. NA
Depth(ft) NA
Sample No. SD-5A
USDA Classification CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LS	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-5A				
Soil Description	BROWN LEAN CLAY WITH SAND				

Wt. of Total Sample(dry)	157.25 gm.
Wt. of +#200 Sample	43.12 gm.
Wt. of -#200 Sample	114.13 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	100.0
1 1/2"	37.50	0.00	0.0	0.0	100.0
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	0.00	0.0	0.0	100.0
3/8"	9.50	0.00	0.0	0.0	100.0
#4	4.75	0.13	0.1	0.1	99.9
#10	2.00	2.98	1.9	2.0	98.0
#20	0.85	13.22	8.4	10.4	89.6
#40	0.425	10.25	6.5	16.9	83.1
#60	0.250	6.90	4.4	21.3	78.7
#140	0.106	7.61	4.8	26.1	73.9
#200	0.075	2.03	1.3	27.4	72.6
Pan	-	114.13	72.6	100.0	-

Water Content	
Tare No.	1005
Wgt. Tare + WS.	395.56
Wgt. Tare + DS.	265.11
Wgt. Tare	107.86
Wgt. Of Water	130.45
Wgt. Of DS.	157.25
% Water	83.0

Geotechnics

HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-5A				

Soil Sample Weight

Container No.	1328		
Wt. Contain. & Dry Soil	134.59 gm.	K Factor	0.01275
Wt. Contain.	103.95 gm.	Composite Correction	5.55
Wt. Dispers.	5.00 gm.	a Factor	0.99
Wt. Dry Soil	25.64 gm.	% Finer Than No. 200	72.58
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	31.0	31.0	25.4	98.3	0.0302	71.3
5		30.0	24.4	94.4	0.0192	68.5
19		29.0	23.4	90.5	0.0099	65.7
30		28.5	22.9	88.6	0.0079	64.3
60		28.0	22.4	86.7	0.0056	62.9
250		26.0	20.4	79.0	0.0028	57.3
1440		22.0	16.4	63.5	0.0012	46.1

Geotechnics

Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-5A

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	100.0
9.5000	100.0
4.7500	99.9
2.0000	98.0
0.8500	89.6
0.4250	83.1
0.2500	78.7
0.1060	73.9
0.0750	72.6
0.0302	71.3
0.0192	68.5
0.0099	65.7
0.0079	64.3
0.0056	62.9
0.0028	57.3
0.0012	46.1

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	98.02
0.05	72.02
0.002	52.88

	PERCENT OF EACH COMPONENT	CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	1.98	0.00
SAND	26.01	26.53
SILT	19.14	19.53
CLAY	52.88	53.94

USDA CLASSIFICATION CLAY

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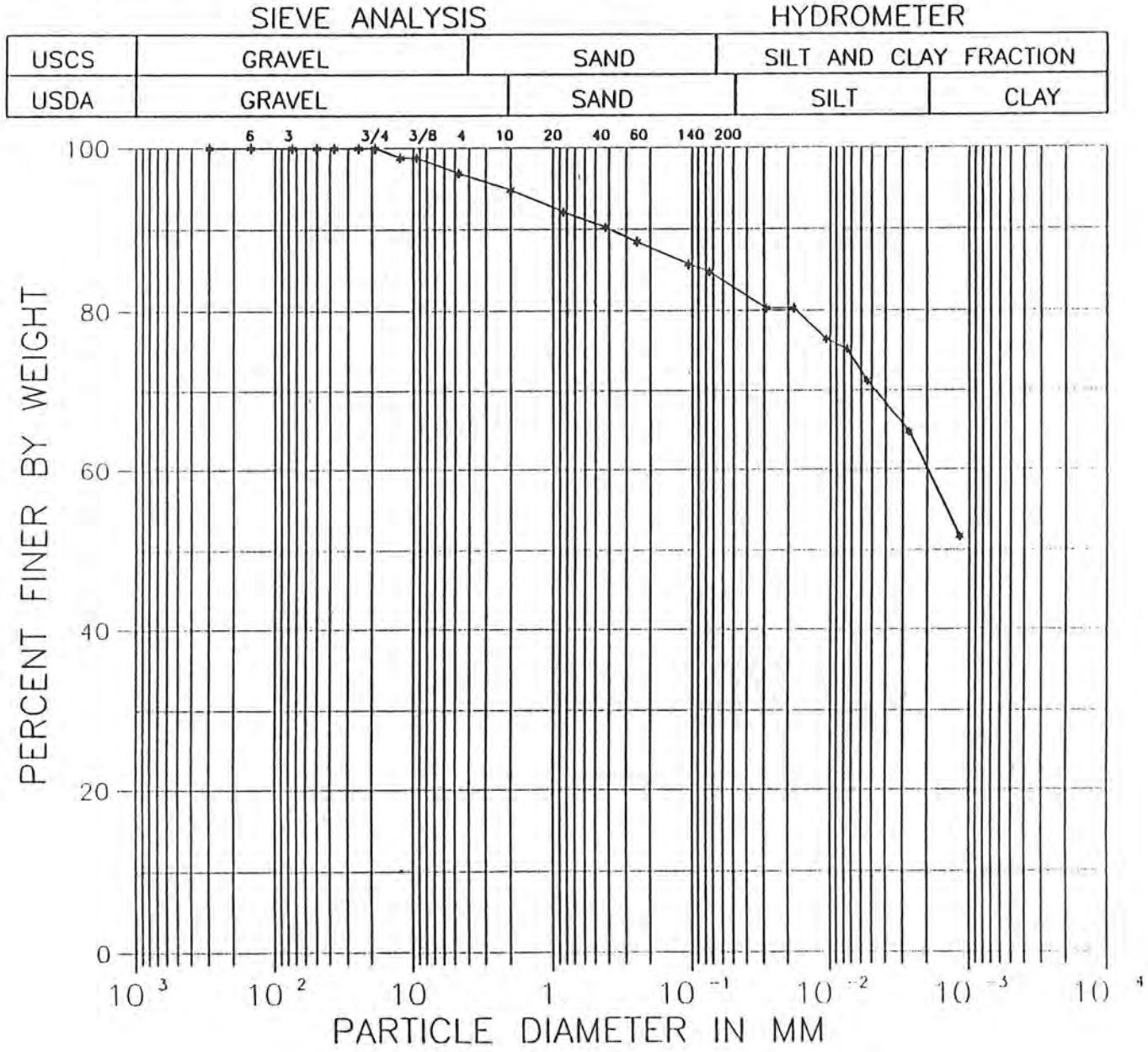
Client RECRA ENVIRONMENTAL
Client Project P96 0748
Project No. 96144-01
USCS Classification cl
Soil Description BROWN LEAN CLAY WITH SAND

Boring No. NA
Depth(ft) NA
Sample No. SD-5B
USDA Classification CLAY



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WASH SIEVE ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	BS	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-5B				
Soil Description	BROWN LEAN CLAY WITH SAND				

Wt. of Total Sample(dry)	129.60 gm.
Wt. of +#200 Sample	19.64 gm.
Wt. of -#200 Sample	109.96 gm.

Sieve	Sieve Opening (mm)	Wt. of Soil Retained (gm.)	Percent Retained	Accumulated Percent Retained	Percent Finer
12"	300.00	0.00	0.0	0.0	100.0
6"	150.00	0.00	0.0	0.0	100.0
3"	75.00	0.00	0.0	0.0	100.0
2"	50.00	0.00	0.0	0.0	10
1 1/2"	37.50	0.00	0.0	0.0	10
1"	25.00	0.00	0.0	0.0	100.0
3/4"	19.00	0.00	0.0	0.0	100.0
1/2"	12.50	1.52	1.2	1.2	98.8
3/8"	9.50	0.00	0.0	1.2	98.8
#4	4.75	2.52	1.9	3.1	96.9
#10	2.00	2.65	2.0	5.2	94.8
#20	0.85	3.44	2.7	7.8	92.2
#40	0.425	2.45	1.9	9.7	90.3
#60	0.250	2.35	1.8	11.5	88.5
#140	0.106	3.55	2.7	14.3	85.7
#200	0.075	1.16	0.9	15.2	84.8
Pan	-	109.96	84.8	100.0	-

Water Content	
Tare No.	1069
Wgt. Tare + WS.	344.00
Wgt. Tare + DS.	233.45
Wgt. Tare	103.85
Wgt. Of Water	110.55
Wgt. Of DS.	129.60
% Water	85.3

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HYDROMETER ANALYSIS

Client	RECRA ENVIRONMENTAL	Tested By	TO	Date	07-05-96
Client Project	P96 0748	Checked By	LB	Date	7-15-96
Project No.	96144-01				
Boring No.	NA				
Depth(ft.)	NA				
Sample No.	SD-5B				

Soil Sample Weight

Container No.	869		
Wt. Contain. & Dry Soil	147.58 gm.	K Factor	0.01275
		Composite Correction	5.55
Wt. Contain.	110.22 gm.	a Factor	0.99
Wt. Dispers.	5.00 gm.		
Wt. Dry Soil	32.36 gm.	% Finer Than No. 200	84.85
Temperature C	24.5		
Specific Gravity	2.70 Assumed		

Elapsed Time (min.)	R Measured		R Corrected	N (%)	D (mm)	N' (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	36.5	36.5	30.9	94.7	0.0289	80.3
5		36.5	30.9	94.7	0.0183	80.3
15		35.0	29.4	90.1	0.0107	76.4
30		34.5	28.9	88.6	0.0076	75.1
60		33.0	27.4	84.0	0.0054	71.2
250		30.5	24.9	76.3	0.0027	64.8
1440		25.5	19.9	61.0	0.0012	51.8

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Client	RECRA ENVIRONMENTAL
Client Project	P96 0748
Project No.	96144-01
Boring No.	NA
Depth(ft.)	NA
Sample No.	SD-5B

DIAMETER (mm)	PERCENT FINER
300.00	100.0
150.00	100.0
75.000	100.0
50.000	100.0
37.500	100.0
25.000	100.0
19.000	100.0
12.500	98.8
9.5000	98.8
4.7500	96.9
2.0000	94.8
0.8500	92.2
0.4250	90.3
0.2500	88.5
0.1060	85.7
0.0750	84.8
0.0289	80.3
0.0183	80.3
0.0107	76.4
0.0076	75.1
0.0054	71.2
0.0027	64.8
0.0012	51.8

SIEVE OPENING (mm)	PERCENT FINER
100.00	100.00
2.00	94.84
0.05	82.92
0.002	60.07

PERCENT OF EACH COMPONENT		CORRECTED PERCENT OF -2.0 mm MATERIAL FOR USDA DETERMINATION
GRAVEL	5.16	0.00
SAND	11.91	12.56
SILT	22.86	24.10
CLAY	60.07	63.34

USDA CLASSIFICATION CLAY

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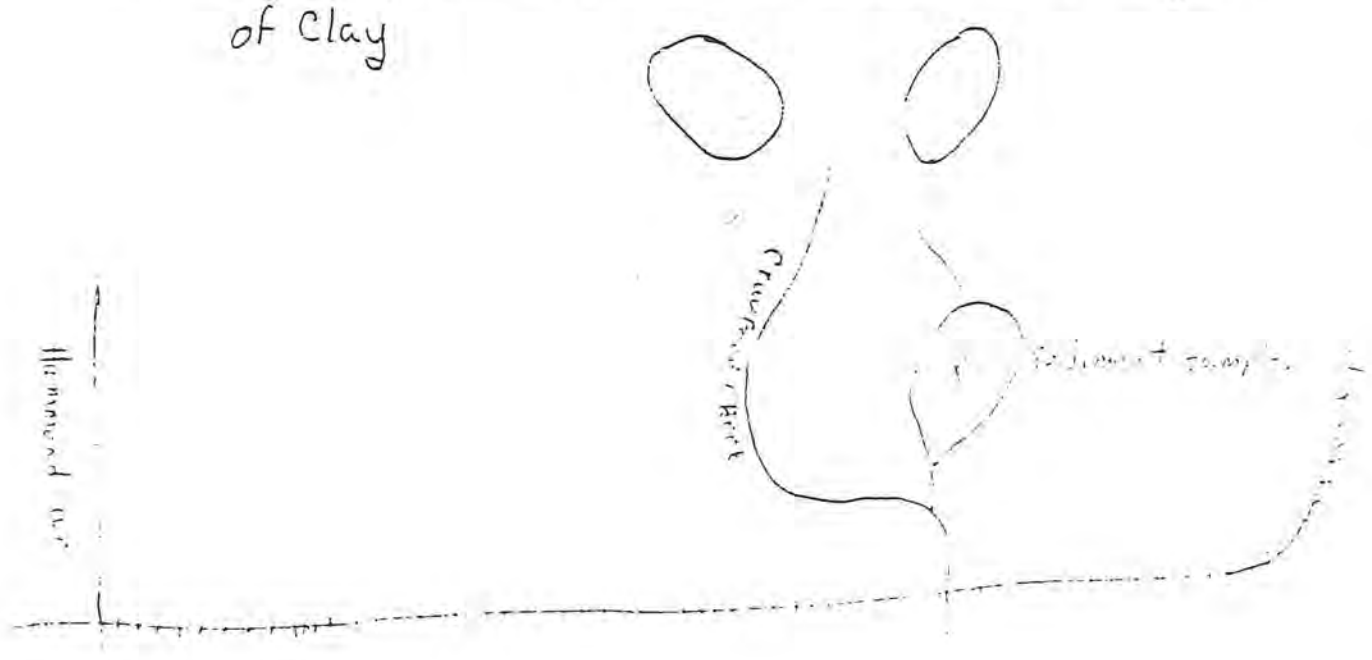
APPENDIX C
COMPILATION OF NOTES
FOR CRAWFORD CREEK

Koppers and Crawford Creek

Lee Leibenstien
Jack Sullivan
Dennis
Bill
Chuck E.

Objective: Collect Fish and Sediment Samples

* Rain the day before made it impossible to Electrofish
* Sediment Samples were taken in a Wetland approximately 2 miles downstream from Koppers (immediately upstream from railroad ~~bridge~~ tracks)
* Creosote product was found beneath a 5" layer of Clay



Crawford Creek Species List

Common Shiner	Notropis cornutus
Creek Chub	Semotilus atromaculatus
Trout Perch	Percopsis omiscomaycus
White Sucker	Catostomus commersoni

By Dennis Pratt

5-16-96

'95 Pesticide Samples

PLAT
BLUE
EATON

CRAWFORD CREEK

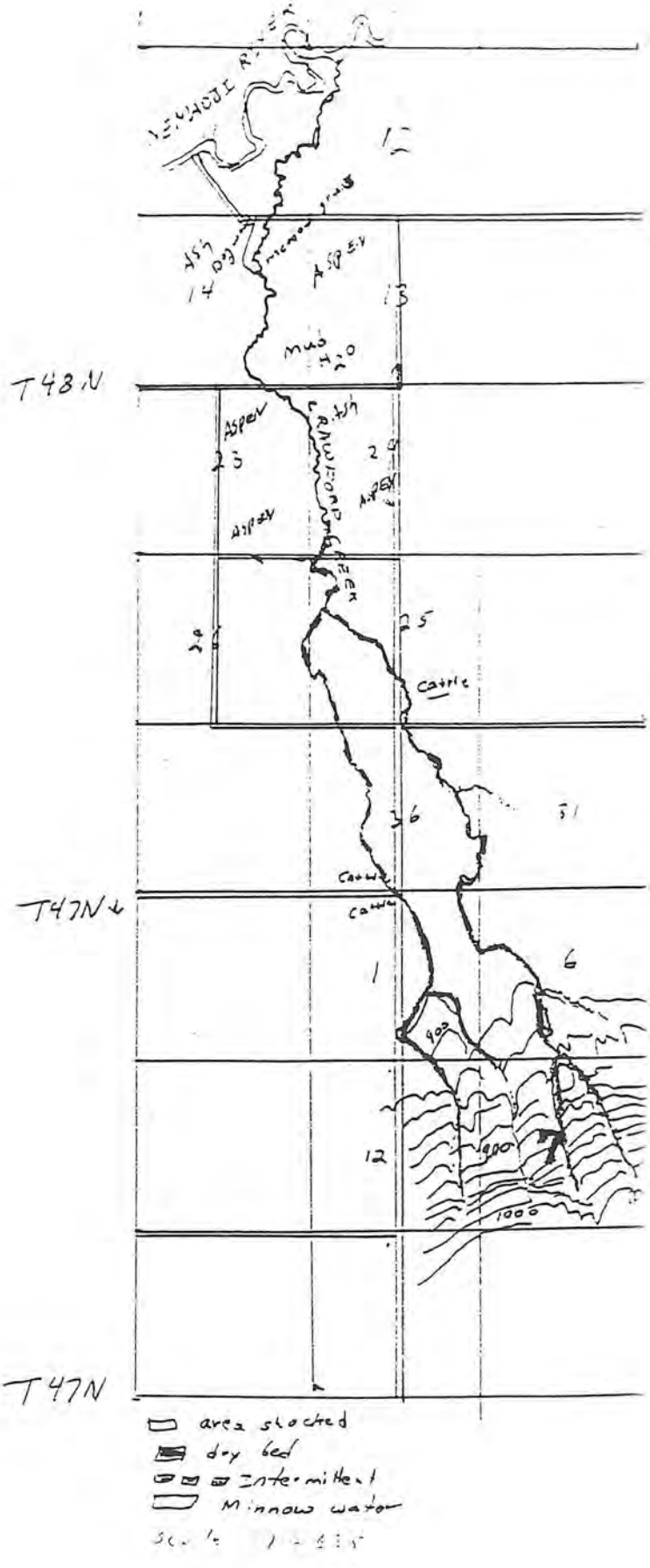
COLLECTED 8-2-95
HAMMOND AVE BRIDGE
STREAM SHOCKED

CREEK CHUB	Common Shiner
7.6	4.6
6.3	5.3
5.6	4.4
5.4	4.4
	3.9

White Sucker		TROUT Perch
11.3	6.0	3.1
9.0	6.1	3.0
10.6	5.9	3.0
9.2	5.9	3.0
8.7	5.8	3.3
8.9	5.5	
9.2	5.8	
8.8	5.5	
8.5	5.9	
7.8	5.4	
4.0	4.3	
4.4	4.7	
3.9	5.0	
4.6	4.5	
4.1		

observed heavy kreasote deposits in stream bed and bank below water line. ALSO observed wetland where bottom samples were taken - ponds were dried up and vegetation growing on bottom ~~sediment~~ sediment (ARROWING

CRAWFORD CREEK



County Douglas 1 6 Waters Crawford Creek 2

Location: Section 12 Township 48N Range 11W

Area (acres): .....

Type of Water: Lake ..... Stream X Impoundment .....

Dimensions: Length (miles and tenths) 0.20 Width .....

Depth: Mean ..... Maximum (feet) .....
> 20 feet (percent) .....
< 3 feet (percent) .....

Shore Length (miles and tenths): 12.40

Littoral Bottom Types (percent): Sand ..... Clay .....
Gravel ..... Hardpan .....
Bedrock ..... Boulder ..... Rubble .....
Silt or Muck ..... Marl ..... Detritus .....

Direct Drainage Area (square miles): 8.45

Watershed Land Cover (percent): Agriculture .....
Wetland ..... Wild .....

Watershed: Area (square miles) .....

Inlets: Number ..... Width (feet) ..... Navigability ..... Volume .....

Outlet: Width (feet) ..... Navigability ..... Volume .....

Landlocked: ☐ YES ☒ NO Intermittent to Nemadji River

Water Control Structure:
Owner ..... Height (feet) ..... Type ..... Purpose .....

Water Source: Drainage ..... Seepage ..... Spring ..... Drained .....

Flow of Outlet (cfs): .....

Water Chemistry:
Date ..... MPA Alkalinity (ppm) .....

pH: .....

Phosphates: (PO_4) Total ..... Dissolved .....

Conductance: C ..... (ambient temp.) C ..°F .....

Watercolor: Clear ..... Lt. Brown ..... Med. Brown..... Drk. Brown ..... Turbid .....

Secchi Disk (depth in feet): .....
Secchi Disk Conditions: .....

Gradient ft./mile 25' Chloride (ppm) .....

Comments: .....

ISH DATA
FORM 2600-6

DEPARTMENT OF NATURAL RESOURCES

County Douglas 1 2 Waters Crawford Creek 2

Problems
Water Yes X No ..... Frequency Annual complete

Macrophytic Vegetation
Yes ..... No X Control Measures .....

Species	Abundance	Species	Abundance	Species	Abundance

Algae: Yes ..... No X Species .....
Carp: Yes ..... No X Comment on Condition .....

Stunted Panfish: Yes ..... No X Species .....
Pollution: Yes ..... No X Source .....
Fluctuating Water Levels: None ..... Man ..... Natural X Range .....
Basic Management: None

Fish Species: Describe as Present (P), Common (C), or Abundant (A)

Esocidae
- Muskellunge .....
- Northern pike .....
- Mud pickerel .....

Percidae
- Walleye .....
- Sauger .....
- Perch .....

Centrarchidae
- Largemouth bass .....
- Smallmouth bass .....
- Bluegill .....
- Black crappie .....
- White crappie .....
- Rock bass .....
- Pumpkinseed .....
- Warmouth .....
- Green sunfish .....

Serranidae
- White bass .....
- Yellow bass .....

Ictaluridae
- Channel catfish .....
- Flathead catfish .....
- Black bullhead .....
- Brown bullhead .....
- Yellow bullhead .....

Salmonidae
- Lake trout .....
- Brook trout .....
- Brown trout .....
- Rainbow trout .....
- Cisco .....
- Whitefish .....

Carp .....

Catostomidae
- White sucker .....
- Buffalo .....
- Spotted sucker .....
- Quillback .....
- Sturgeon sucker .....
- Redhorse .....
- Lake chub sucker .....

Lepisosteidae
- Longnose gar .....
- Shortnose gar .....

Bowfin .....

Mooneye .....

Gizzard shad .....

Burbot .....

Sheepshead .....

Acipenseridae
- Rock sturgeon .....
- Shovelnose sturgeon .....

Cyprinidae
- Bluntnose minnow .....
- Common shiner .....
- Golden shiner .....
- Redbelly dace .....
- Creek chub .....
- Emerald shiner .....

Other species .....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Crayfish .....

Signed S. Johannes (Compiler) Date July 23, 1971

Rev. 1-70

PUBLIC ACCESS AND GAME ASSETS
FORM 3600-35

DEPARTMENT OF NATURAL RESOURCES

County Douglas 1 2 Waters Crawford Creek

ACCESS

Public name and number: Town 0 City
County 0 State 0 Federal
Access Roads With Parking (number):
Town "B" 1 City 0 County "A" & "C" 2 State 0 Federal 0
Access Roads Without Nearby Parking (number):
Town 0 City 0 County 0 State 0 Federal 0
Navigable Water Access: Yes No x Name
Unimproved or Difficult Access: Yes No x
Wilderness (describe)
Commercial and Cottage Facilities (number): Resorts 0 Boat Rentals
Campgrounds 0 Cottages or Dwellings 0 0 Private Camps
Observations:

GAME RESOURCES

Type of Wetland Area of Adjoining Wetland (acres) 0
Percent Woody Percent Nonwoody
Muskrat (significant or insignificant): Yes No x
Beaver (presence or absence): Yes No x
Waterfowl:

Broods	Yes	No x		Mallard	Yes	No x	
Black	Yes	No x		Teal	Yes	No x	
Wood	Yes	No x		Hooded Merganser	Yes	No x	
Coot	Yes	No x		Loon	Yes	No x	
				Heron Rookery	Yes	No x	

Other
Migration:

	Puddle Ducks	Diving Ducks	Coot	Canada Geese	Other
Spring	0	0	0	0	0
Fall	0	0	0	0	0

Restrictions on Hunting (refuges, local ordinances): None
Observations

OTHER DATA

Access Priority (describe): none needed
Public Frontage (miles and hundredths): Douglas County 0.40 mile (one side)
Watershed Number
Observations:

Signed J. Jaennes (Compiler) Date July 23, 1971

REV. 8-72

Crawford Creek, Douglas County

A typical minnow creek with a turbid water supply. Water medium brown because of a clay water supply. ~~Water medium brown~~ because of a clay suspension in the water. The bottom is a mucky clay. Banks 5 to 6 feet high and eroding into the creek.

Algae and scum coating old logs and debris in creek. Evidence of high water, log and brush jams occurring throughout the creek. The average width is 8 feet and average depth is 6 inches. Aspen, dogwood, alders and meadow grass found commonly along banks. Principal water source is runoff. Upper portions intermittent and dry in certain areas. Cattle grazing along banks and frequently in creek, in sections 25, 36 and 1. Strictly minnow habitat throughout the creek.

Charles E. Johnson

ck
8-3-64

From the information present this appears to be a warm water minnow stream. Howeber, the only shocker work done and only station on the cree that was reported was at the extreme lower end. The map shows two additional cross roads which could have been checked, water temperature and possibly fish popula: on if water temperatures indicated further investigation was needed.

Wallace Niemuth

WISCONSIN CONSERVATION DEPARTMENT
Madison, Wisconsin

STREAM SURVEY

NAME OF STREAM: Crawford Creek

COUNTY: Douglas Co.

POINT OF EXAMINATION: Downstream from bridge in SE¼ Sec. 11 T48N R14W

AVERAGE WIDTH	AVERAGE DEPTH	VELOCITY
8'	6"	

VOLUME OF FLOW:

DEGREE OF FLOODING: 2 feet above present level

COLOR	TURBIDITY	COVER
Clear	Medium brown	Meadow grass, dogwood poplar

TEMPERATURES AIR:	WATER:	TIME:
76°F	74°F	2:00 p.m.

BOTTOM TYPES: 100% mucky clay - sink in about a foot.

FISH COLLECTION

SPECIES	NUMBER	SIZE RANGE
White sucker	16	3.8 - 7.9
Creek chub	9	2.9 - 4.5
Small fry schools	Common	

GEAR USED: Stream shocker 230 V AC

DISTANCE SAMPLED: 300 yards

REMARKS: Brush and logs jams non active beaver evidence. Heavy clay suspension in water; algae and scum on debris in creek. Crayfish common 5 to 6 foot banks.

DATE: 8-5-64

INVESTIGATOR — Signature: Charles E. Johnson

REV. 11-54

WISCONSIN CONSERVATION DEPARTMENT
Madison 1, Wisconsin

STREAM MANAGEMENT RECORD

Name of Stream Crawford Creek Trib. to

Drainage Area Sq. Mi. County Douglas

Total Length 7 miles Average Width 5 feet

Use of Watershed

Water Supply

Use of Water

rincipal Sport Fish suckers

marks and Recommendations clay bottom - sandy, clay shoreline - vegetation abundant

5 miles from Superior on Co. Tr. "A"

ite Investigator

Planting record to remain with

APPENDIX D
CHAIN-OF-CUSTODY

GROUNDWATER TECHNOLOGY ®

CHAIN OF CUSTODY RECORD

PLANT CODE	PROJECT NAME	NUMBER OF CONTAINERS
	COBBINS / SUPERIOR	
SAMPLERS (Signature)		

STA. NO.	DATE	TIME	COMP	GRAB	WELL	STATION LOCATION	NUMBER OF CONTAINERS	8040	8310	624 5&8	TOC	GRAIN SIZE				CONDUCTIVITY	PH	REMARKS OR OBSERVATIONS
EQUIP. BLANK-SOIL	6/14/96	0900		✓		EQUIPMENT RINSE	4	✓	✓	✓	✓							WATER
DB-2	11	1045		✓		DITCH BANK-LOW	2	✓	✓	✓	✓	✓						SOIL
DB-1	11	1200		✓		DITCH BANK-HIGH	2	✓	✓	✓	✓	✓						SOIL

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
[signature]	6/14/96	1400	TO FEDEX				
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Ice Chest Temp °C	Ice Chest #	Chain of Custody Tag #

*DISTRIBUTION: Original accompanies shipment; Copy to Coordinator Field Files.

PROJ. MGR: ROB SMITH
FLOUR DANIEL GTI
477 RIDDOCK AVE
EAST PITTSBURGH, PA 15112

PAGE 1 OF 1

GROUNDWATER TECHNOLOGY

CHAIN OF CUSTODY RECORD

PLANT CODE	PROJECT NAME
	KOPPERS SUPERIOR

SAMPLERS (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	WELL	STATION LOCATION	NUMBER OF CONTAINERS	BTX	8310	8040	KEY SEQ	TPC	WISCONSIN DRO	GRAIN SIZE	CONDUCTIVITY	pH	REMARKS OR OBSERVATIONS
SW-6	6.13.94	0915		X			6	✓	✓		✓						LAND
SD-8A	"	1030		X			3		✓	✓	✓	✓	✓	✓			SHALLOW 0-6"
SD-8B	"	1030		X			1		✓	✓	✓	✓	✓				" 6"+
SW-5	"	1040		X			3	✓	✓		✓						LAND
SD-5A	"	1045		X			2		✓	✓	✓	✓	✓	✓			SHALLOW 0-6"
SD-5B	"	1115		X			2		✓	✓	✓	✓	✓	✓			" 6"+

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
	6.13.94	1700	FED EX				
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Ice Chest Temp °C	Ice Chest #	Chain of Custody Tag #

*DISTRIBUTION: Original accompanies shipment; Copy to Coordinator Field Files.

GROUNDWATER TECHNOLOGY

CHAIN OF CUSTODY RECORD

PLANT CODE | PROJECT NAME: KOPPERS / SUPERIOR

SAMPLERS (Signature):

STA. NO.	DATE	TIME	COMP.	GRAB	WELL	STATION LOCATION	NUMBER OF CONTAINERS	PAH 8310 / PHENOLS 8040	TEXTEX BY KEYSTONE SCG	AS, Ba, Cd, Cr, Pb	WESTERN ORS	NH3-N, NO3, NO2+NO3-N, SULFATE	TOC	TCLP - 8310 / 8270	TCLP - METALS, TCLP EXT. KEY SOP	METALS - TCLP EXT. - 1312	CONDUCTIVITY	PH, Ca, Fe, Mg, Na, K	TCLP PHENOLS, Cr, Ba, Pb	REMARKS OR OBSERVATIONS
SD-7A	6.13.96	1200		X		BELOW RR TRACK	2	✓	✓	✓	✓									SEDIMENT 0-6"
SD-7B	"	1200		X		"	2	✓	✓	✓	✓									" 6"+
SD-6A	"	1255		X		ABOVE RR TRACK	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			" 0-6"
SD-6B	"	1255		X		"	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			" 6"+
SW-5	"	1600		X		AT PROPERTY	3		✓									✓		WATER

Relinquished by: (Signature)	Date	Time	Received by: (Signature)
[signature]	6.13.96	1700	[signature]
Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)

Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received by: (Signature)

Date	Time	Ice Chest Temp	Ice Chest	Chain of Custody
		°C	#	Tag #

*DISTRIBUTION: Original accompanies shipment; Copy to Coordinator Field Files.

PAGE 1 OF 1

Chester LabNet
A Recra Environmental Company
3000 Tech Center Drive
Monroeville, PA 15146
Phone 412/825-9617
Fax 412/825-9727

CHAIN-OF-CUSTODY RECORD

Ship To: _____
Address: _____

Project Name: [illegible]
Project Number: _____
Project Location: (State) [illegible]

FOR LABORATORY USE ONLY
Laboratory Project# _____
Ice Chest Temp _____
Custody Seal Intact _____

Sampler Name (Print) [illegible]
Signature [illegible]

Relinquished By: [illegible]
Date/Time 6-15-96
Received By or Method of Shipment/Shipment I.D. Fed Ex
Date/Time

Relinquished By: _____
Date/Time
Received By or Method of Shipment/Shipment I.D.
Date/Time

Relinquished By: _____
Date/Time
Received By or Method of Shipment/Shipment I.D.
Date/Time

Sample Disposal (check one)
- ☐ Return to Site
- ☐ Laboratory Standard
- ☐ Other

Level of QC _____

Write in Analysis Method →

SAMPLE INFORMATION

ANALYSES REQUESTED

Sample ID Number	Lab ID	Collection Date	Collection Time	Description: Locator	Description: Depth	Container(s): #	Container(s): Type	Matrix Type	Pres. Type	TAT	TCL	8270	8310	[illegible]
[illegible]		6.12.96	1330	CRAWFORD	N/A	4/2	A/O	WATER	4/5			✓	✓	✓
[illegible]		"	1400	"	"	4/2	A/O	"	4/5			✓	✓	✓
FIELD BLANK 3		"	1415	EQUIPMENT	"	1	A	"	1		✓			

Special Instructions/Comments: _____

Container Types:
B = Brass Tube G = Glass Jar
A = 1 Liter Amber C = Cassette
P = Polyethylene V = Voa Vial
O = Other _____

TAT (Analytical Turn Around Time)
1 = 24 hours 2 = 48 hours
3 = 1 week 4 = 2 weeks
0 = Other _____

Preservative Type:
1. H2SO4 5. NaOH
2. HCl 6. HNO3 Diss
3. HNO3 7. Na2SO3
4. None 8. Other(s)

FOR LABORATORY USE ONLY Sample Condition Upon Receipt: _____

SEND DOCUMENTATION AND RESULTS TO:
Project Manager: [illegible]
Company: [illegible]
Address: [illegible]
Phone: _____ FAX

Chester LabNet
A Recra Environmental Company
3000 Tech Center Drive
Monroeville, PA 15146
Phone 412/825-9617
Fax 412/825-9727

CHAIN-OF-CUSTODY RECORD

Ship To:
Address: ABOVE

Project Name:
Project Number:
Project Location: (State)

FOR LABORATORY USE ONLY
Laboratory Project#:
Ice Chest Temp.
Custody Seal Intact:

Sampler Name (Print): David Pabst-Nabe
Signature: [illegible]

Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
[illegible]	6-12-95 1800	To FED EX	

Sample Disposal (check one)
- ☐ Return to Site
- ☐ Laboratory Standard
- ☐ Other

Level of QC

Write in Analysis Method →

ANALYSES REQUESTED

SAMPLE INFORMATION

Sample ID Number	Lab ID	Collection Date	Collection Time	Description: Locator	Description: Depth	Container(s): #	Container(s): Type	Matrix Type	Pres. Type	TAT	8270, 8310	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SD-12A		6-12-95	1215	Creek	0-6"	2	G	Sed.	4		✓	✓	✓	✓					✓	✓		
SD-12B		"	1240	"	6"+	2	G	"	"		✓	✓	✓	✓					✓	✓		
SD-11A		"	1625	"	0-6"	2	G	"	4		✓	✓	✓	✓					✓	✓		
SD-11B		"	1625	"	6"+	2	G	"	4		✓	✓	✓	✓					✓	✓		
SD-10A		"	1730	"	0-6"	2	G	"	4		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SD-10B		"	1730	"	6"+	2	G	"	4		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Special Instructions/Comments:

Container Types:
B = Brass Tube G = Glass Jar
A = 1 Liter Amber C = Cassette
P = Polyethylene V = Voa Vial
O = Other________

TAT (Analytical Turn Around Time)
1 = 24 hours 2 = 48 hours
3 = 1 week 4 = 2 weeks
0 = Other ________

Preservative Type:
1. H2SO4 5. NaOH
2. HCl 6. HNO3 Diss
3. HNO3 7. Na2SO3
4. None 8. Other(s)

FOR LABORATORY USE ONLY Sample Condition Upon Receipt:

SEND DOCUMENTATION AND RESULTS TO:
Project Manager: Rob Smith
Company: Fluor Daniel GTI
Address: 652 Bradford Rd, [illegible] Roswell, PA [illegible]
Phone: (610) [illegible] FAX: [illegible]

Chester LabNet
A Recra Environmental Company
3000 Tech Center Drive
Monroeville, PA 15146
Phone 412/825-9617
Fax 412/825 9727

CHAIN-OF-CUSTODY RECORD

Ship To: [illegible]
Address:

Project Name: [illegible]
Project Number:
Project Location: (State) [illegible]

FOR LABORATORY USE ONLY
Laboratory Project#:
Ice Chest Temp:
Custody Seal Intact:

Sampler Name (Print) [illegible] Signature [illegible] Shipped Via/Airbill #

Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time

Sample Disposal (check one)
- ☐ Return to Site
- ☐ Laboratory Standard
- ☐ Other

Level of QC

Write in Analysis Method →

SAMPLE INFORMATION

ANALYSES REQUESTED

Sample ID Number	Lab ID	Collection Date	Collection Time	Description Locator	Description Depth	Container(s) #	Container(s) Type	Matrix Type	Pres. Type	TAT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		6-10-96	1240	[illegible]	N/A	1	VOAs	WATER	VOAs	0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SB-1A		"	1730	BAR	6-6.5'	2	G	SEDIMENT	4	0				✓	✓			✓		✓	✓	✓	
SB-1B		"	1750	BAR	6-11'	2	G	SEDIMENT	4	0				✓	✓			✓		✓	✓	✓	

Special Instructions/Comments:

Container Types:
B = Brass Tube G = Glass Jar
A = 1 Liter Amber C = Cassette
P = Polyethylene V = Voa Vial
O = Other

TAT (Analytical Turn Around Time)
1 = 24 hours 2 = 48 hours
3 = 1 week 4 = 2 weeks
0 = Other

Preservative Type:
1 H2SO4 5 NaOH
2 HCl 6 HNO3 Diss
3 HNO3 7 Na2SO3
4 None 8 Other(s)

FOR LABORATORY USE ONLY Sample Condition Upon Receipt:

SEND DOCUMENTATION AND RESULTS TO:
Project Manager: Rob Smith
Company: [illegible]
Address: [illegible]
Phone: [illegible] FAX: [illegible]

Chester LabNet
A Recra Environmental Company
3000 Tech Center Drive
Monroeville, PA 15146
Phone 412/825-9617
Fax 412/825-9727

CHAIN-OF-CUSTODY RECORD

Ship To: _____
Address: _____

Project Name: KAPPERS/SUPERIOR
Project Number: _____
Project Location: (State) WISCONSIN

FOR LABORATORY USE ONLY
Laboratory Project#: _____
Ice Chest Temp: _____
Custody Seal Intact: _____

Sampler Name (Print): DAVID W. PARSONAGE
Signature: [signature]

Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time

Sample Disposal (check one)
- ☐ Return to Site
- ☐ Laboratory Standard
- ☐ Other

Level of QC: _____

Write in Analysis Method →

SAMPLE INFORMATION

ANALYSES REQUESTED

Sample ID Number	Lab ID	Collection Date	Collection Time	Description Locator	Description Depth	Container(s) #	Container(s) Type	Matrix Type	Pres. Type	TAT	PAH 8270	[illegible]	[illegible]
EQUIP. BLANK W		6/10/96	1355	EQUIPMENT	N/A	2/1	A/O	WATER	4/5	0	✓	✓	✓
SW-7		"	1550	GROUNDRA	SURF	4/2	A/O	"	4/5	0	✓	✓	✓

Special Instructions/Comments: _____

Container Types:
B = Brass Tube G = Glass Jar
A = 1 Liter Amber C = Cassette
P = Polyethylene V = Voa Vial
O = Other 250 ML AMBER

TAT (Analytical Turn Around Time)
1 = 24 hours 2 = 48 hours
3 = 1 week 4 = 2 weeks
0 = Other AS CONTRACTED W/ P.M.

Preservative Type:
1 H2SO4 5 NaOH
2 HCl 6 HNO3 Diss
3 HNO3 7 Na2SO3
4 None 8 Other(s)

FOR LABORATORY USE ONLY Sample Condition Upon Receipt: _____

SEND DOCUMENTATION AND RESULTS TO:
Project Manager: ROB SMITH
Company: FLUOR DANIEL GTI
Address: 637 BRADDOCK AVE
EAST PITTSBURGH, PA 15112
Phone: 412/823-5300 FAX: 412/[illegible]

Chester LabNet
A Recra Environmental Company
3000 Tech Center Drive
Monroeville, PA 15146
Phone 412/825-9617
Fax 412/825-9727

CHAIN-OF-CUSTODY RECORD

Ship To: ARCHIVE
Address:

Project Name: KOPPERS / SUPERIOR
Project Number:
Project Location: (State) WISCONSIN

FOR LABORATORY USE ONLY
Laboratory Project#:
Ice Chest Temp
Custody Seal Intact:

Sampler Name (Print): DAVID W. PERSONKE
Signature:

Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
DWPersonke	6.12.96	TO FEDEX	
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time

Sample Disposal (check one)
- ☐ Return to Site
- ☐ Laboratory Standard
- ☐ Other

Level of QC

Write in Analysis Method →

SAMPLE INFORMATION

ANALYSES REQUESTED

Sample ID Number	Lab ID	Collection Date	Collection Time	Description Locator	Description Depth	Container(s) #	Container(s) Type	Matrix Type	Pres. Type	TAT	PAH 8310	PAH 8270 SIM	Percent Moisture	As, Ba, Cd, Cr, Pb	Wisconsin DRO	Grain Size							
SD-15A		6.11.96	1330	CANAL	0"/6"	1	G	SEDIMENT	4	0	✓	✓	✓	✓	✓								
SD-15B		"	1330	"	6"+	2	G	"	4	"	✓	✓	✓	✓	✓	✓							
SD-14A		"	1705	"	0"6"	2	G	"	4	"	✓	✓	✓	✓	✓	✓							
SD-14B		"	1705	"	6"+	2	G	"	4	"	✓	✓	✓	✓	✓	✓							
SD-14A DUP		"	1705	"	0"6"	1	G	"	4	"	✓	✓	✓	✓	✓								
SD-14B DUP		"	1705	"	6"+	1	G	"	4	"	✓	✓	✓	✓	✓								
SD-13A		"	2000	"	0"6"	2	G	"	4	"	✓	✓	✓	✓	✓	✓							
SD-13B		"	2000	"	6"+	2	G	"	4	"	✓	✓	✓	✓	✓	✓							
SD-13A MS/MSD		"	2000	"	0"6"	1	G	"	4	"	✓	✓	✓	✓	✓								
SD-13B MS/MSD		"	2000	"	6"+	1	G	"	4	"	✓	✓	✓	✓	✓								

Special Instructions/Comments:

Container Types:
B = Brass Tube G = Glass Jar
A = 1 Liter Amber C = Cassette
P = Polyethylene V = Voa Vial
O = Other

TAT (Analytical Turn Around Time)
1 = 24 hours 2 = 48 hours
3 = 1 week 4 = 2 weeks
0 = Other SEE PM. ACCP.

Preservative Type:
1 H2SO4 5 NaOH
2 HCl 6 HNO3 Diss
3 HNO3 7 Na2SO3
4 None 8 Other(s)

FOR LABORATORY USE ONLY Sample Condition Upon Receipt:

SEND DOCUMENTATION AND RESULTS TO:
Project Manager: R.B. SMITH
Company: FLUOR DANIEL GTI
Address: 637 BRADDOCK AVE.
EAST PITTSBURGH, PA 15112
Phone: 412/351-8300 FAX: 412/351-2154

Chester LabNet
A Recra Environmental Company
3000 Tech Center Drive
Monroeville, PA 15146
Phone 412/825-9617
Fax 412/825-9727

CHAIN-OF-CUSTODY RECORD

Ship To: ABOVE
Address:

Project Name: KOPPERS / SUPERIOR
Project Number:
Project Location: (State) WISCONSIN

FOR LABORATORY USE ONLY
Laboratory Project#:
Ice Chest Temp:
Custody Seal Intact:

Sampler Name (Print): DAVID W. [illegible]
Signature: [signature]

Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
[signature]	6/23 /0800	SHIPPED [illegible]	

Sample Disposal (check one)
- ☐ Return to Site
- ☐ Laboratory Standard
- ☐ Other

Level of QC:

Write in Analysis Method →

ANALYSES REQUESTED

SAMPLE INFORMATION

Sample ID Number	Lab ID	Collection Date	Collection Time	Description Locator	Description Depth	Container(s) #	Container(s) Type	Matrix Type	Pres. Type	TAT	[illegible] 8270	[illegible]	[illegible]
SW-11		6-11-95	1155	CRAWFORD	N/A	4/2	A/O	WATER	4/5	O	✓	✓	✓

Special Instructions/Comments:

Container Types:
B = Brass Tube G = Glass Jar
A = 1 Liter Amber C = Cassette
P = Polyethylene V = Voa Vial
O = Other [illegible]

TAT (Analytical Turn Around Time)
1 = 24 hours 2 = 48 hours
3 = 1 week 4 = 2 weeks
0 = Other [illegible]

Preservative Type:
1. H2SO4 5. NaOH
2. HCl 6. HNO3 Diss
3. HNO3 7. Na2SO3
4. None 8. Other(s)

FOR LABORATORY USE ONLY Sample Condition Upon Receipt:

SEND DOCUMENTATION AND RESULTS TO:
Project Manager: ROB SMITH
Company: [illegible] DANIEL [illegible]
Address: 637 FRANKLIN AVE.
EAST PITTSBURGH, PA 15112
Phone: 412/[illegible] FAX: 412/[illegible]

Chester LabNet
A Recra Environmental Company

3000 Tech Center Drive
Monroeville, PA 15146
Phone 412/825-9617
Fax 412/825-9727

CHAIN-OF-CUSTODY RECORD

Ship To: _____
Address: _____

Project Name: KINZUA - SUPERIOR
Project Number: _____
Project Location: (State) WISCONSIN

FOR LABORATORY USE ONLY
Laboratory Project#: _____
Ice Chest Temp: _____
Custody Seal Intact: _____

Sampler Name (Print): DAVID W. PARSONAGE
Signature: [signature]

Relinquished By: [signature]	Date/Time 6-12-96 1:45	Received By or Method of Shipment/Shipment I.D. FEDEX	Date/Time
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time
Relinquished By:	Date/Time	Received By or Method of Shipment/Shipment I.D.	Date/Time

Sample Disposal (check one)
- ☐ Return to Site
- ☐ Laboratory Standard
- ☐ Other

Level of QC: _____

Write in Analysis Method →

SAMPLE INFORMATION

ANALYSES REQUESTED

Sample ID Number	Lab ID	Collection Date	Collection Time	Description: Locator	Description: Depth	Container(s): #	Container(s): Type	Matrix Type	Pres. Type	TAT	GRAIN SIZE	PAH 8310	METALS 6010	PCB'S/PESTICIDES 8080
SW-11 DUP		6.11.96	1155	CRAWFORD	N/A	2/1	A/O	WATER	4/5	0		✓	✓	✓
SD-15A		"	1330	"	0-6"	1	G	SEDIMENT	4	"	✓			
SW-10		"	1915	"	N/A	4/2	A/O	WATER	4/5	"		✓	✓	✓
SW-10 MS/MSD		"	1915	"	N/A	2/1	A/O	"	"	"		✓	✓	✓

Special Instructions/Comments: _____

Container Types:
B = Brass Tube G = Glass Jar
A = 1 Liter Amber C = Cassette
P = Polyethylene V = Voa Vial
O = Other 250 ml Amber

TAT (Analytical Turn Around Time)
1 = 24 hours 2 = 48 hours
3 = 1 week 4 = 2 weeks
0 = Other Set RUSH TAT

Preservative Type:
1 H2SO4 5 NaOH
2 HCl 6 HNO3 Diss
3 HNO3 7 Na2SO4
4 None 8 Other(s)

FOR LABORATORY USE ONLY Sample Condition Upon Receipt: _____

SEND DOCUMENTATION AND RESULTS TO:
Project Manager: ROB SMITH
Company: FLOOR DANIEL GTI
Address: 637 LAMONTE AVE.
LAKE ASTABULA, PA 15112
Phone: 440/593-5[illegible] FAX: 440/[illegible]

White - Client Canary - Laboratory Pink - Field

APPENDIX E
DATA VALIDATION LETTERS

RADIAN INTERNATIONAL LLC

To: Mr. Rob Smith
Fluor Daniel GTI
637 Braddock Avenue
East Pittsburgh, PA 15112

From: Andrew Mehalko
Radian International LLC

Date: February 16, 1997

Subject: **Data Validation of:**
Polynuclear Aromatic Hydrocarbons (PAHs)
Phenols
Pentachlorophenol and 2,3,4,6 and 2,3,5,6-Tetrachlorophenol

Re: Beazer - Superior

RECRA Labnet
Job No.: 96-0743

Sediment Samples:

SD-10A	SD-10B	SD-11A
SD-11B	SD-12A	SD-12B

Overview

This set of samples collected on June 12, 1996 and June 13, 1996 for the Beazer Superior site contains six (6) sediment samples. The samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) and phenols by U.S. EPA SW-846 Methods 8310 and 8040, respectively. The samples were also analyzed for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol by method Key 589.

Summary

All compounds were successfully analyzed in all samples. The analytical data were evaluated by the following quality assurance/quality control (QA/QC) parameters where applicable: technical holding times and preservation, initial and continuing calibrations, system monitoring compound/surrogate spike recoveries, method blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), analytical sequence, compound identification and quantitation, and transcription. Validated sample analysis results are listed on the attached Data Summary forms. Areas of concern with respect to data quality and usability are discussed below.

Major Issues

KEY 589 PHENOLS

The surrogate percent recoveries for 2,4,6-tribromophenol were less than ten percent in the original analyses of samples SD-12A, SD-12B, SD-11A, and SD-10A. As a result, all positive sample values were qualified as estimated "J" while the non-detect results were rejected "R".

Minor Issues

PHENOLS

The continuing calibration percent recoveries for 2,4-dinitrophenol run on July 10, 1996 were low. As a result, associated sample values were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively.

The surrogate percent recovery for 2,4,6-tribromophenol in sample SD-10A was high. As a result, positive values in this sample were qualified as estimated "J" while non-detect results were not impacted.

The chromatogram for sample SD-10A exhibited significant baseline rise which may have impacted compound quantitation. As a result, associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

KEY 589 PHENOLS

The re-extractions for the samples SD-12A, SD-12B, SD-11A, SD-11B, and SD-10A were performed outside of holding time. As a result, all associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

The percent recoveries for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol were outside control limits in many of the CCVs run on June 25, 1996 and July 3, 1996. As a result, when the CCV percent recoveries were high, associated positive sample results were qualified as estimated "J" while non-detect results were not impacted. Furthermore, when the CCV percent recoveries were low associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

The percent recoveries for 2,3,4,6 and 2,3,5,6-tetrachlorophenol were low in the June 19, 1996 and June 29, 1996 laboratory control samples. In addition, the percent recovery for pentachlorophenol in the June 21, 1996 LCS was high. As a result, when the LCS percent recoveries were high, associated positive sample results were qualified as estimated "J" while non-detect results were not impacted. Furthermore, when the LCS percent recoveries were low associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

The surrogate percent recovery for 2,4,6-tribromophenol in the re-analyses of sample SD-12B was high. As a result, positive sample values were qualified as estimated "J" while non-detect results were not impacted.

The percent differences between the primary and confirmation column results exceeded 25 percent for all positive hits in samples SD-12A, SD-12B, and SD-10A. As a result, these values were qualified as estimated "J".

Note that only the best results from the original and re-analyses of the samples were reported in the validated data summary.

Notes

Note that several transcription errors were found in the reporting of the phenol and key 589 analytes. These were corrected in the validated data summary.

Note that the case narrative stated that due to laboratory computer maintenance problems some confirmation data was missing from the data package although all positive hits were qualitatively confirmed either by second column GC or mass spectroscopy.

Note that the GC/MS used for confirmation of the phenol compounds was not calibrated for 2,6-dichlorophenol and as such all positive hits and non-detect results that exhibited values greater than the detection limit on the quantitating column could not be confirmed.

The surrogates diluted out of samples SD-12A, SD-12B, SD-11A, SD-11B, and SD-10B in the phenols analyses. As a result, the extraction efficiency or matrix problems for these samples could not be evaluated.

Note that MS/MSD analyses were not performed with this data package in any of the fractions. As a result, the samples could not be evaluated for this criteria.

Note that the extraction log for the re-extraction of samples in the key 589 analyses was not provided with the data package. As a result, any problems associated with this extraction could not be evaluated.

Note that due to a significant baseline rise and matrix interference in the original analysis of sample SD-11B the re-analysis key 589 results were reported in the validated data summary.

Note that several method blank and LCS surrogate percent recoveries were outside of control limits in the key 589 analyses. As the site sample surrogate percent recoveries were within control, except as noted above, no action was taken based on these exceedances.

The surrogates diluted out of all samples in the PAH analyses. As a result, the extraction efficiency or matrix problems for these samples could not be evaluated.

The data were reviewed according to the U.S. EPA's National Functional Guidelines for Organic Data Review (February, 1994).

Information Regarding Report Content

Attachments:

1. Glossary of data qualifier codes.
2. Data Summary. This may include:
   a) All positive results with qualifier codes, if applicable;
   b) All estimated detection limits qualified with UJ.
3. Appendix A - Results as Reported by the Laboratory.
4. Appendix B - Support Documentation includes details to support the statements made in this report.

RADIAN INTERNATIONAL LLC

To: Mr. Rob Smith
Fluor Daniel GTI
637 Braddock Avenue
East Pittsburgh, PA 15112

From: Andrew Mehalko
Radian International LLC

Date: February 14, 1997

Subject: **Data Validation of:**
Polynuclear Aromatic Hydrocarbons (PAHs)
Phenols
Pentachlorophenol and 2,3,4,6 and 2,3,5,6-Tetrachlorophenol

Re: Beazer - Superior

RECRA Labnet
Job No.: 96-0739

Sediment Samples:

SD-9A	SD-9B	SD-15A
SD-15B	SD-14A	SD-14B
SD-14A DUP	SD-14B DUP	DS-13A
SD-13B		

Equipment Rinsate Blank:

Equipment Blank

Field Duplicates:

Sample SD-14A DUP is a field duplicate of sample SD-14A.
Sample SD-14B DUP is a field duplicate of sample SD-14B.

Overview

This set of samples collected on June 10, 1996 and June 11, 1996 for the Beazer Superior site contains ten (10) sediment samples, including two (2) field duplicate pairs, and one equipment rinsate blank.

The samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) and phenols by U.S. EPA SW-846 Methods 8310 and 8040, respectively. The samples were also analyzed for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol by method Key 589.

Summary

All compounds were successfully analyzed in all samples. The analytical data were evaluated by the following quality assurance/quality control (QA/QC) parameters where applicable: technical holding times and preservation, initial and continuing calibrations, system monitoring compound/surrogate spike recoveries, method and field blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), field duplicates, analytical sequence, compound identification and quantitation, and transcription. Validated sample analysis results are listed on the attached Data Summary forms. Areas of concern with respect to data quality and usability are discussed below.

Major Issues

KEY 589 PHENOLS

The surrogate percent recoveries for 2,4,6-tribromophenol were less than ten percent in the original analyses of all samples except SD-13B and the equipment blank. As a result, all positive sample values were qualified as estimated "J" while the non-detect results were rejected "R".

Minor Issues

PHENOLS

A three point initial calibration for 4-nitrophenol was associated with the equipment rinsate blank instead of a 5 point initial calibration as specified in the method. As a result, the value for this compound in this sample was qualified as estimated "UJ" as it was non-detect.

The continuing calibration percent recoveries for 2,4-dinitrophenol run on July 10, 1996 were low. As a result, all associated sample results were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively.

The continuing calibration percent recoveries for 3/4-methylphenol run on June 23, 1996 were high. As a result, positive values in the associated samples were qualified as estimated "J" while non-detect results were not impacted.

The surrogate percent recoveries for 2,4,6-tribromophenol in sample SD-13B was high. As a result, positive values in these samples were qualified as estimated "J" while non-detect results were not impacted.

The percent recovery for 2,4-dinitrophenol in the aqueous LCSD was low. As a result, associated sample results were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively.

KEY 589 PHENOLS

All the re-extractions for the samples under this job number were performed outside of holding time. As a result, all associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

The percent recoveries for 2,3,4,6 and 2,3,5,6-tetrachlorophenol were low in the June 19, 1996 and June 29, 1996 laboratory control samples. In addition, the percent recovery for pentachlorophenol in the June 21, 1996 LCS was high. As a result, when the LCS percent recoveries were high, associated positive sample results were qualified as estimated "J" while non-detect results were not impacted. Furthermore, when the LCS percent recoveries were low, associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

The surrogate percent recoveries for 2,4,6-tribromophenol in the re-analyses of samples SD-14A, SD-14B DUP, SD-14B, SD-15B, and SD-9B were low. As a result, these sample values were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively.

Note that only the best results from the original and re-analyses of the samples were reported in the validated data summary.

PAHs

All the re-extractions for the samples under this job number were performed outside of holding time. As a result, all associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

An evaluation of the field duplicate sample results found them to be comparable with the exceptions of anthracene, benzo(a)anthracene, benzo(a)pyrene, and dibenzo(a,h)anthracene, in the field duplicate pair SD-14A and SD-14A DUP and benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene,

indeno(1,2,3-cd)pyrene, and pyrene in the field duplicate pair SD-14B and SD-14B DUP. As a result, these values in these samples were qualified as estimated, "J" and "UJ", for positive and non-detect results, respectively. Note that a control limit of +/- 2x the detection limit (DL) was used to evaluate the differences in the sample results when one or both of the values were less than 5xDL, otherwise a relative percent difference (RPD) of 50 percent was applied.

The chromatogram for sample SD-14A DUP RE exhibited significant baseline rise which may have impacted compound quantitation. As a result, associated positive and non-detect results were qualified as estimated "J" and "UJ", respectively.

A comparison between the original sample and reanalyses results showed several values to exceed control limits. As a result, these values were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively. Note that a control limit of +/- the detection limit (DL) was used to evaluate the differences in the sample results when one or both of the values were less than 5xDL, otherwise a relative percent difference (RPD) of 35 percent was applied.

Note that only the best results from the original and re-analyses of the samples were reported in the validated data summary.

Notes

Note that the CCV 4A03174 run on July 10, 1996 associated with the phenols analyses was not provided. As a result, the associated samples could not be evaluated for this criteria.

The surrogates diluted out of samples SD-13A and SD-15A in the phenols analyses. As a result, the extraction efficiency or matrix problems for these samples could not be evaluated.

The SD-13A MS/MSD percent recoveries for 2,4-dinitrophenol and the RPDs between the MS/MSD percent recoveries for 2-chlorophenol, 2,4-dichlorophenol, and 2,4-dimethylphenol were outside control limits. In addition, the SD-13B MS/MSD percent recoveries for 4,6-dinitro-2-methylphenol and 4-nitrophenol were low. As action is not based on MS/MSD criteria alone, no action was taken.

Note that confirmation column data was not provided with the data package for any of the analyses and therefore positive sample values and non-detect results which had values greater than the detection limit on the quantitating column could not be confirmed.

Note that the CCV 8A01224 run on June 21, 1996 associated with the key 589 analyses was not provided. As a result, the associated samples could not be evaluated for this criteria.

The SD-13A MS/MSD percent recoveries for 2,3,4,6 and 2,3,5,6-tetrachlorophenol and the SD-13B MS/MSD percent recoveries for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol were outside control limits. As action is not based on MS/MSD criteria alone, no action was taken.

Note that several method blank, LCS, and MS/MSD surrogate percent recoveries were outside of control limits in the key 589 analyses. As the site sample surrogate percent recoveries were within control, except as noted above, no action was taken based on these exceedances.

Note that all MS/MSD percent recoveries and several RPDs between the MS/MSD percent recoveries were outside control limits in the PAH analyses due to the high dilution factors used. As such, the matrix effects could not be evaluated for this fraction.

Note that the surrogate carbazole was not recovered in the original analyses for any samples except SD-13B and the equipment blank due to a laboratory spiking error. As the second surrogate benzo(e)pyrene was acceptable (except where it diluted out), no action was taken on the data.

In addition, the surrogates diluted out of all samples except for SD-14B, SD-14B DUP, and the equipment blank in the PAH analyses. As a result, the extraction efficiency or matrix problems for these samples could not be evaluated.

An evaluation of the field duplicate sample results found them to be comparable except as noted above. Note that a control limit of +/- 2xDL was used to evaluate the differences in the sample results when one or both of the values were less than 5xDL, otherwise a relative percent difference (RPD) of 50 percent was applied.

The data were reviewed according to the U.S. EPA's National Functional Guidelines for Organic Data Review (February, 1994).

Information Regarding Report Content

Attachments:

1. Glossary of data qualifier codes.
2. Data Summary. This may include:
   a) All positive results with qualifier codes, if applicable;
   b) All estimated detection limits qualified with UJ.
3. Appendix A - Results as Reported by the Laboratory.

4. Appendix B - Support Documentation includes details to support the statements made in this report.

RADIAN INTERNATIONAL LLC

To: Mr. Rob Smith
Fluor Daniel GTI
637 Braddock Avenue
East Pittsburgh, PA 15112

From: Andrew Mehalko
Radian International LLC

Date: February 14, 1997

Subject: **Data Validation of:**
Polynuclear Aromatic Hydrocarbons (PAHs)
Phenols
Pentachlorophenol and 2,3,4,6 and 2,3,5,6-Tetrachlorophenol

Re: Beazer - Superior

RECRA Labnet
Job No.: 96-0748

Sediment Samples:

DB-1 DB-2

Equipment Rinsate Blank:

Equipment Blank

Overview

This set of samples collected on June 14, 1996 for the Beazer Superior site contains two (2) sediment samples and one (1) equipment rinsate blank. The samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) and phenols by U.S. EPA SW-846 Methods 8310 and 8040, respectively. The samples were also analyzed for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol by method Key 589.

Summary

All compounds were successfully analyzed in all samples. The analytical data were evaluated by the following quality assurance/quality control (QA/QC) parameters where applicable: technical holding times and preservation, initial and continuing calibrations, system monitoring compound/surrogate spike recoveries, method and field blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), analytical sequence, compound identification and quantitation, and transcription. Validated sample analysis results are listed on the attached Data Summary forms. Areas of concern with respect to data quality and usability are discussed below.

Minor Issues

PHENOLS

The continuing calibration percent recoveries for 3/4-methylphenol run on June 23, 1996 were high. As a result, associated positive values were qualified as estimated "J" while non-detect results were not impacted.

The surrogate percent recoveries for 2,4,6-tribromophenol and 2-fluorophenol in the equipment blank were low. As a result, positive and non-detect results in this sample were qualified as estimated "J" and "UJ", respectively.

KEY 589 PHENOLS

The percent recoveries for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol were high in the July 8, 1996 CCV. As a result, associated positive sample results were qualified as estimated "J" while non-detect results were not impacted.

The percent recovery for pentachlorophenol in the June 21, 1996 LCS was high. As a result, associated positive sample results were qualified as estimated "J" while non-detect results were not impacted. This LCS was only associated with the sediment samples.

The percent difference between the primary and confirmation column results exceeded 25 percent for pentachlorophenol in samples DB-1 an DB-2. As a result, these values were qualified as estimated "J".

Notes

Note that several transcription errors were found in the reporting of the key 589 analytes. These were corrected in the validated data summary.

Note that the case narrative stated that due to laboratory computer maintenance problems some confirmation data associated with the phenols analyses was missing from the data package although all positive hits were qualitatively confirmed by mass spectroscopy.

Note that the GC/MS used for confirmation of the phenol compounds was not calibrated for 2.6-dichlorophenol and as such all positive hits and non-detect results that exhibited values greater than the detection limit on the quantitating column could not be confirmed.

The surrogates diluted out of samples DB-1 and DB-2 in the phenols, key 589, and PAH analyses. As a result, the extraction efficiency or matrix problems for these samples could not be evaluated.

Note that MS/MSD analyses were not performed with this data package in any of the fractions. As a result, the samples could not be evaluated for this criteria.

Note that confirmation data was not provided with the equipment blank in the phenols analyses. As a result, the reported non-detect results could not be confirmed.

The data were reviewed according to the U.S. EPA's National Functional Guidelines for Organic Data Review (February, 1994).

Information Regarding Report Content

Attachments:

1. Glossary of data qualifier codes.
2. Data Summary. This may include:
   a) All positive results with qualifier codes, if applicable;
   b) All estimated detection limits qualified with UJ.
3. Appendix A - Results as Reported by the Laboratory.
4. Appendix B - Support Documentation includes details to support the statements made in this report.

RADIAN INTERNATIONAL LLC

To: Mr. Rob Smith
Fluor Daniel GTI
637 Braddock Avenue
East Pittsburgh, PA 15112

From: Andrew Mehalko
Radian International LLC

Date: February 16, 1997

Subject: **Data Validation of:**
Polynuclear Aromatic Hydrocarbons (PAHs)
Phenols
Pentachlorophenol and 2,3,4,6 and 2,3,5,6-Tetrachlorophenol

Re: Beazer - Superior

RECRA Labnet
Job No.: 96-0749

Sediment Samples:

SD-8A	SD-8B	SD-5A
SD-5B	SD-7A	SD-7B
SD-6A	SD-6B	

Overview

This set of samples collected on June 13, 1996 for the Beazer Superior site contains eight (8) sediment samples. The samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) and phenols by U.S. EPA SW-846 Methods 8310 and 8040, respectively. The samples were also analyzed for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol by method Key 589.

Summary

All compounds were successfully analyzed in all samples. The analytical data were evaluated by the following quality assurance/quality control (QA/QC) parameters where applicable: technical holding times and preservation, initial and continuing calibrations, system monitoring compound/surrogate spike recoveries, method blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), analytical sequence, compound identification and quantitation, and transcription. Validated sample analysis results are listed on the attached Data Summary forms. Areas of concern with respect to data quality and usability are discussed below.

Minor Issues

PHENOLS

The surrogate percent recoveries for 2,4,6-tribromophenol in samples SD-5A and SD-7B were high. As a result, positive values in these samples were qualified as estimated "J" while non-detect results were not impacted.

KEY 589 PHENOLS

The surrogate percent recoveries for 2,4,6-tribromophenol in samples SD-8A and SD-8B were low. As a result, these sample values were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively.

The percent recovery for pentachlorophenol in the laboratory control sample was high. As a result, associated positive sample values were qualified as estimated "J" while non-detect results were not impacted.

Notes

Note that all positive sample results that were presented below the reporting limit but above the instrument detection limit were qualified by the laboratory as estimated "J" as there is an unacceptable level of inaccuracy at these levels.

Note that several transcription errors were found in the reporting of the PAH analytes. These were corrected in the validated data summary.

Note that the case narrative stated that due to laboratory computer maintenance problems some

confirmation data was missing from the data package although all positive hits were qualitatively confirmed either by second column GC or mass spectroscopy.

The surrogates diluted out of samples SD-5B, SD-6A, SD-6B, SD-7A, SD-8A, and SD-8B in the phenols analyses. As a result, the extraction efficiency or matrix problems for these samples could not be evaluated.

The percent recovery for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol in many of the key 589 confirmation column continuing calibrations were low. As all of the results were reported from the primary column, no action was taken.

Note that MS/MSD analyses were not performed with the phenol, key 589, or PAH analyses. As a result, the samples could not be evaluated for this criteria.

The surrogates diluted out of all samples in the PAH analyses. As a result, the extraction efficiency or matrix problems for these samples could not be evaluated.

The data were reviewed according to the U.S. EPA's National Functional Guidelines for Organic Data Review (February, 1994).

Information Regarding Report Content

Attachments:

1. Glossary of data qualifier codes.
2. Data Summary. This may include:
   a) All positive results with qualifier codes, if applicable;
   b) All estimated detection limits qualified with UJ.
3. Appendix A - Results as Reported by the Laboratory.
4. Appendix B - Support Documentation includes details to support the statements made in this report.

RADIAN INTERNATIONAL LLC

To: Mr. Rob Smith
Fluor Daniel GTI
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From: Andrew Mehalko
Radian International LLC

Date: February 16, 1997

Subject: **Data Validation of:**
Polynuclear Aromatic Hydrocarbons (PAHs)
Semivolatile Organic Compounds (SVOCs)
Pentachlorophenol and 2,3,4,6 and 2,3,5,6-Tetrachlorophenol

Re: Beazer - Superior

RECRA Labnet
Job Nos.: 96-0740, 96-0747, and 96-0750

Surface Water Samples:

SW-7	SW-8	SW-9
SW-11	SW-11 DUP	SW-10
SW-6	SW-5	

Equipment Rinsate Blank:

Equipment Blank

Field Duplicates:

Sample SW-11 DUP is a field duplicate of sample SW-11.

Overview

This set of samples collected on June 10, 1996 through June 13, 1996 for the Beazer Superior site contains eight (8) surface water samples, including one (1) field duplicate pair, and one (1) equipment rinsate blank. The samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) and semi-

volatile organic compounds (SVOCs) by U.S. EPA SW-846 Methods 8310 and 8270, respectively. The samples were also analyzed for pentachlorophenol and 2,3,4,6 and 2,3,5,6-tetrachlorophenol by method Key 589.

Summary

All compounds were successfully analyzed. The analytical data were evaluated by the following quality assurance/quality control (QA/QC) parameters where applicable: technical holding times and preservation, GC/MS instrument performance checks, initial and continuing calibrations, system monitoring compound/surrogate spike recoveries, method and field blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), internal standard areas and retention times, field duplicates, analytical sequence, compound identification and quantitation, and transcription. Validated sample analysis results are listed on the attached Data Summary forms. Areas of concern with respect to data quality and usability are discussed below.

Major Issues

PAHs

The surrogate carbazole was not recovered in the original analyses of samples SW-8 and SW-9 as well as the associated method blank and LCS/LCSD. As a result, all values in samples SW-8 and SW-9 were rejected "R" as they were all non-detect.

Minor Issues

SVOCs

The percent relative standard deviation between the initial calibration relative response factors for n-nitroso-di-n-propylamine in the calibration run on June 14, 1996 was outside control limits. As a result, all associated sample results were qualified as estimated, "J" and "UJ", for positive and non-detect results, respectively.

A comparison of the initial calibration mean RRFs and the continuing calibration RRFs for n-nitroso-di-n-propylamine, 4-nitroaniline, benzo(a)anthracene, and bis(2-ethylhexyl)phthalate on June 23, 1996 and n-nitroso-di-n-propylamine, n-nitroso-di-methylamine, benzoic acid, 4-chloroaniline, 3-nitroaniline, 2,4-dinitrophenol, 4-nitrophenol, 4-nitroaniline, and 3,3'-dichlorobenzidine on June 28, 1996 yielded percent differences that exceeded control limits. As a result, all associated sample results were qualified as estimated, "J" and "UJ", for positive and

non-detect results, respectively. Note that while the percent differences for non-target compounds were outside control limits on June 28, 1996 no action was taken as the target compound percent differences were all in control except as noted above.

Blank contamination was found for bis(2-ethylhexyl)phthalate (2.4 ug/L) in the equipment rinsate blank. As a result, sample values less than ten times the blank result were qualified as non-detect "U" as this is a common laboratory contaminant. Note that when affected sample values were less than the reporting limit they were raised to the reporting limit before being qualified.

PAHs

The re-extractions of samples SW-9 and SW-8 were performed outside of holding time. As a result, all values in these re-extractions were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively.

The relative percent difference (RPD) between the June 19, 1996 LCS/LCSD percent recoveries for acenaphthene and naphthalene were outside control limits. As a result, associated sample results were qualified as estimated "J" and "UJ" for positive and non-detect results, respectively.

Only the values from the re-extractions of samples SW-8 and SW-9 were reported on the validated data summary due to the surrogate problems with the original analyses.

Notes

Note that all positive sample results that were presented below the reporting limit but above the instrument detection limit were qualified by the laboratory as estimated "J" as there is an unacceptable level of inaccuracy at these levels.

Note that several transcription errors were found in the reporting of the SVOC and PAH analytes. These were corrected in the validated data summary.

Note that sample SW-5 was listed on two chain of custodies to be analyzed for the same parameters in this package. As the date of collection was the same for both sample collections there was no way to distinguish which sample was used for analysis. As no problems were reported , no action was taken.

Note that since no confirmation column data was provided with the Key 589 analyses the non-detect result for pentachlorophenol in sample SW-5 could not be confirmed as it was greater than the detection limit on the primary column. All other sample results were non-detect on the primary column.

In addition, note that the June 24, 1996 analysis run log associated with the key 589 analyses was not provided. As such, any problems associated with the runs performed on this day could not be evaluated.

Note that only the low level Key 589 analyses results were reported by the laboratory.

The laboratory did not provide percent recovery data for the June 17, 1996 and June 19, 1996 laboratory control samples associated with the SVOCs. As the true values were not known the associated data could not be evaluated for these criteria.

The MS/MSD percent recoveries and relative percent differences (RPDs) between the MS/MSD percent recoveries for many compounds associated with the SVOC analyses were outside control limits. As action is not based on MS/MSD criteria alone, none was taken.

The laboratory did not provide percent recovery data for any continuing calibrations associated with the PAHs. As the true values were not known the associated data could not be evaluated for these criteria.

In addition, note that all of the analysis run logs and several of the extraction logs associated with the PAH analyses were not provided. As such, any problems associated with the associated sample runs could not be evaluated.

Note that the positive results for 2-methylnaphthalene and dibenzofuran in sample SW-6 were combined and reported as one value in the validated data summary as these compounds co-elute.

The SW-5 matrix spike percent recoveries for pyrene and naphthalene associated with the PAH analyses were high. As action is not based on MS/MSD criteria alone, none was taken.

Note that compounds 1-methylnaphthalene and 2-methylnaphthalene/dibenzofuran were not present in the March 28, 1996 PAH initial calibration that was associated with the original analyses of samples SW-8 and SW-9. As the reanalyses results were reported in the validated data summary and their associated initial calibration contained these compounds, no action was necessary.

An evaluation of the field duplicate sample results found them to be comparable. Note that a

control limit of +/- 2x the detection limit (DL) was used to evaluate the differences in the sample results when one or both of the values were less than 5xDL, otherwise a relative percent difference (RPD) of 50 percent was applied.

The data were reviewed according to the U.S. EPA's National Functional Guidelines for Organic Data Review (February, 1994).

Information Regarding Report Content

Attachments:

1. Glossary of data qualifier codes.
2. Data Summary. This may include:
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   b) All estimated detection limits qualified with UJ.
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